

# **Broomfield House Stage D Report final 01**

## **Appendix E**

### **Sustainability Report**

for The London Borough of Enfield





## **Broomfield House Development**

*Environmental and Sustainability Strategy Statement -Draft*

For Faithful & Gould

February 2011

Project No. 7997/60

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## 1 Executive Summary

This report presents the sustainability, energy efficiency and renewable energy design features of the Broomfield House development. This sustainability strategy has been compiled to respond to and improve on the planning requirements and Design Guide criteria of the GLA and of London Borough of Enfield.

A renewable energy feasibility study has been carried out for the development, and Photovoltaics panels have been found to be the most suitable option for the renewable energy supply of the development. These PV modules will be installed on all the new dwellings and on the roof of some of the refurbished units (Broomfield House). The masterplan has been optimised to allow for efficient use of Photovoltaics on these dwellings. This renewable energy strategy (73 m<sup>2</sup> of PV) is anticipated to lead to approximately 4.0% renewable energy on site and to 7.3% CO<sub>2</sub> emission reduction across the residential part of the development and 3.6% renewable energy contribution and 6.6% CO<sub>2</sub> emission reduction across the entire development. We estimate approximately 230m<sup>2</sup> of PV would be needed to achieve 20% CO<sub>2</sub> emission reduction across the whole site (not practical).

The main sustainable features of the Broomfield House development include:

- Very energy efficient design: Through optimised energy efficient building fabric, air tightness, and heating system efficiency and controls, **an improvement over Part L 2010 of 23%** or more will be achieved for each new unit. The addition of renewable energy system will lead to an improvement of 46% or more the new unit.
- Refurbished dwellings will meet and exceed the building fabric element standards of Part L1B-2010 wherever possible taking into account the heritage constraints of some elements
- **Code for Sustainable Homes level 4** will be achieved for the new dwellings of the development (72.3% score at pre-assessment), particularly with a very good score in the energy, management section and health and wellbeing section;
- **EcoHomes Very Good** will be achieved for the refurbished dwellings of the development (61.54% score at pre-assessment);
- The majority of the construction materials will have an **A or A+ rating** according to the BRE online Green Guide to Specification;
- All structural timber will be FSC or PEFC certified; and the majority of the material manufacturers will have **environmental certification** such as ISO14001, BES6001 or EMAS;
- **Water efficient features** will be installed in all dwellings.
- **PV panels will be installed on approximately 40% of the development** (all the new units and some of the refurbished). These renewable energy systems are expected to lead to 3.6% on site renewable energy for the development as well as 6.6% reduction of CO<sub>2</sub> emissions emission reduction across the whole development (7.3% CO<sub>2</sub> emission reduction achieved across the residential part of the development).

These features will enable Broomfield House to be a sustainable development which balances heritage constraints with sustainable progress.

## 2 Introduction

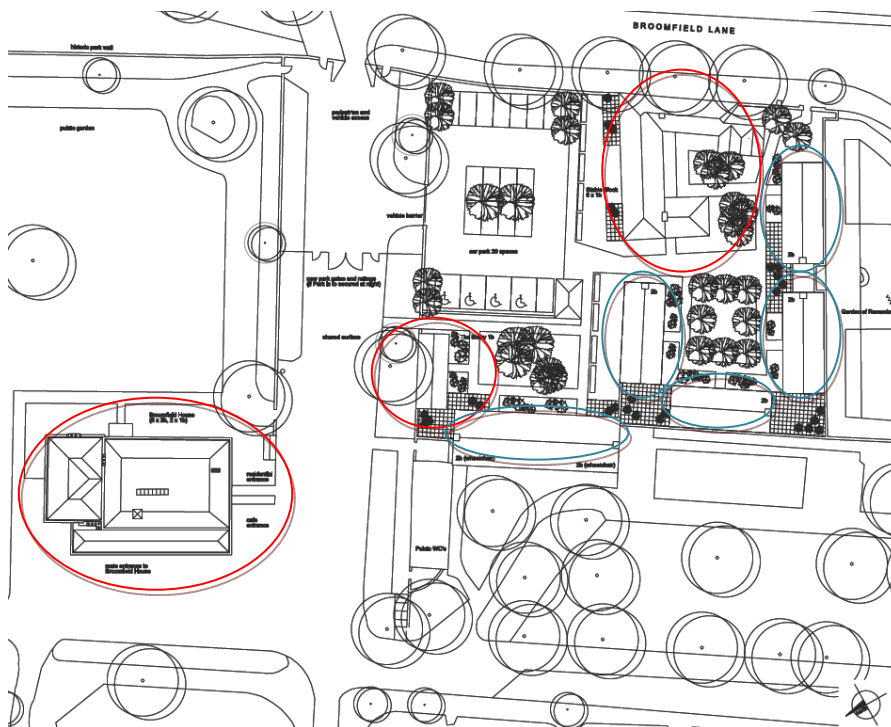
The development is located on the southern edge of Broomfield Park in Enfield, Greater London.



**Figure 1: Location of the Broomfield House development**

The development will be composed of:

- 6 new units – kitchen garden cottages (4 detached houses and 2 semi-detached houses)
- Refurbishment of Broomfield House – 7 flats
- Refurbishment of a detached house – The Bothy
- Refurbishment of the Stable block – 6 flats



**Figure 2: Broomfield House development - Site Layout**

Redevelopments such as Broomfield House require a significant quantity of material, water and energy resources which can lead to damage to the environment. Sustainable buildings aim to minimise both construction and operational energy and water consumption through the responsible sourcing of materials, the adoption of highly efficient construction techniques, and the incorporation of water efficient features, key passive design principles and highly efficient servicing plant.

This report presents the sustainability, energy efficiency and renewable energy options included within the detailed design of the Broomfield House development.

The following issues have been considered: Energy Efficiency, Renewable Energy Supply, Materials, Waste, Water, Health & Comfort, Pollution, Ecology and Land Use.

In particular, the following targets have been addressed:

- EcoHomes environmental rating "Very Good" for the refurbished dwellings
- Code for Sustainable Homes level 4 for the new dwellings
- 25% Improvement over New Part L 2010 of the Building Regulation for the new dwellings
- Renewable energy supply to the development

The following sections summarise the findings of Ramboll's sustainability consultancy services. They detail the sustainable aspects included in the design of the Broomfield House development and assess their impact both on the development as a whole and its residents.

### **3 Energy Efficiency Assessment**

The design of the Broomfield House development has been optimised to respond to and improve on the energy efficiency design requirement of the GLA and of the code for sustainable homes.

This required a 25% improvement in carbon emissions over Building Regulations through energy efficiency and renewable energy supply for the new dwellings and meeting the different requirements of Part L1B for the refurbished units of the development.

This section details the SAP-NHER indicative energy simulation performed on typical new and refurbished dwellings of Broomfield House, which has been carried out using National Home Energy Rating (NHER) software.

#### **3.1 Definition**

##### 3.1.1 Standard Assessment Procedure

The Standard Assessment Procedure (SAP 2009) forms the basis for demonstrating dwelling compliance with Part L1 of the Building Regulations 2010 and as such it has been used to predict likely building energy consumption ratings and annual CO<sub>2</sub> emissions of the dwellings.

The SAP 2005 has also been used for the refurbished flat to lead to dwelling emission rate that can be used in the EcoHomes assessment.

##### 3.1.2 Energy efficiency features considered

- Thermal insulation of the building fabric;
- Control and efficiency of the heating systems;
- Ventilation characteristics of the dwelling;
- Solar gain characteristics;
- Local weather conditions;
- Differences in rooms temperatures between zones;
- Household size and composition.
- Building solar design (windows preferably located on the south side, reduction of window area on the north side) results in energy savings;
- "Warm" rooms preferably situated on the south side;
- Very low U-Values;
- Low E double glazing;
- Air-tight building, with highly sealed windows;
- Minimisation of overshadowing for maximisation of solar gains.
- High performance condensing boiler (seasonal efficiency minimum 90%) with load compensator;
- Room thermostat / local control;
- Hot water demand reduced through efficient appliances;
- Energy efficient lighting and appliances;
- Reduction of number of vents / fans.

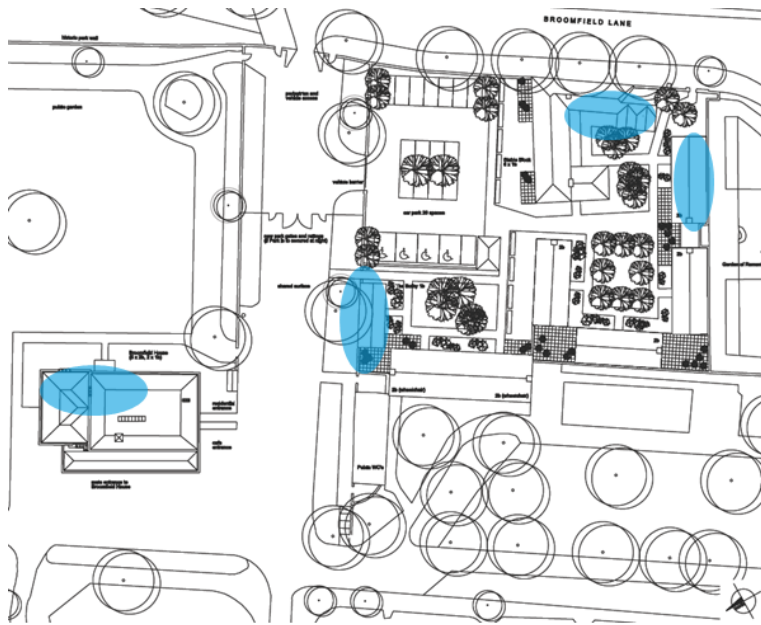
#### **3.2 Assumptions for simulation**

##### 3.2.1 Dwellings Selected

A selection of indicative typical dwellings types have been simulated to form a basis of estimation of the energy demand of the development, and to lead the formulation of the strategy to reach the energy targets of the Code for Sustainable Homes and of the GLA.

Both refurbished and new dwellings have been simulated to give a balanced representation.

- Broomfield House Ground floor – Flat A
- Stable block top floor - Flat sF
- Kitchen garden cottage
- The Bothy House

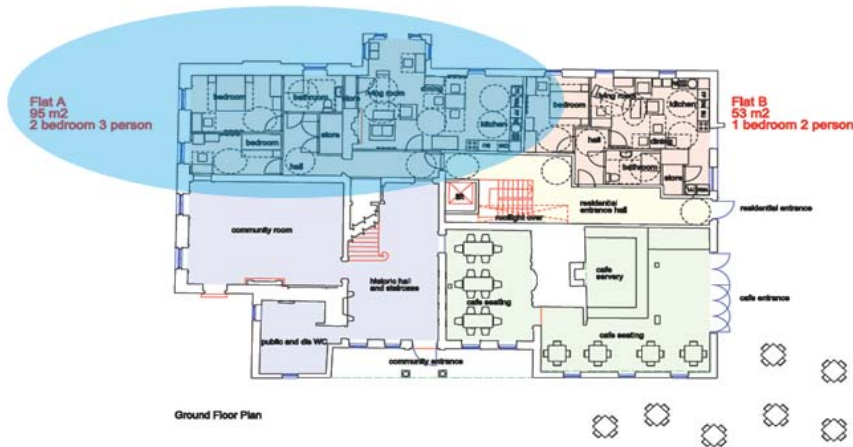


**Figure 3: Dwellings simulated**

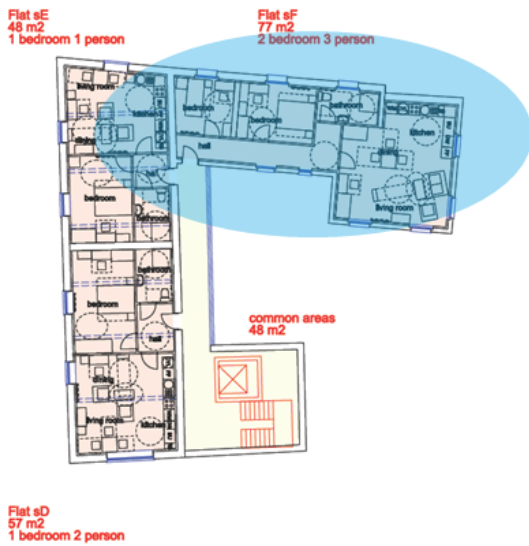
Simulations are based upon the Shepherd Epstein Hunter - Feasibility Study – Plans – 261110.

Simulations are undertaken in NHER software version 4.1 (SAP2005) and 5.1 (SAP2009), and aim to offer indicative results upon which the strategy may be based. It will be very important to simulate every dwelling on the site post planning to ensure the agreed strategy will meet all applicable targets for every dwelling.

Figures 4-7 show plans and elevations of the simulated dwellings:



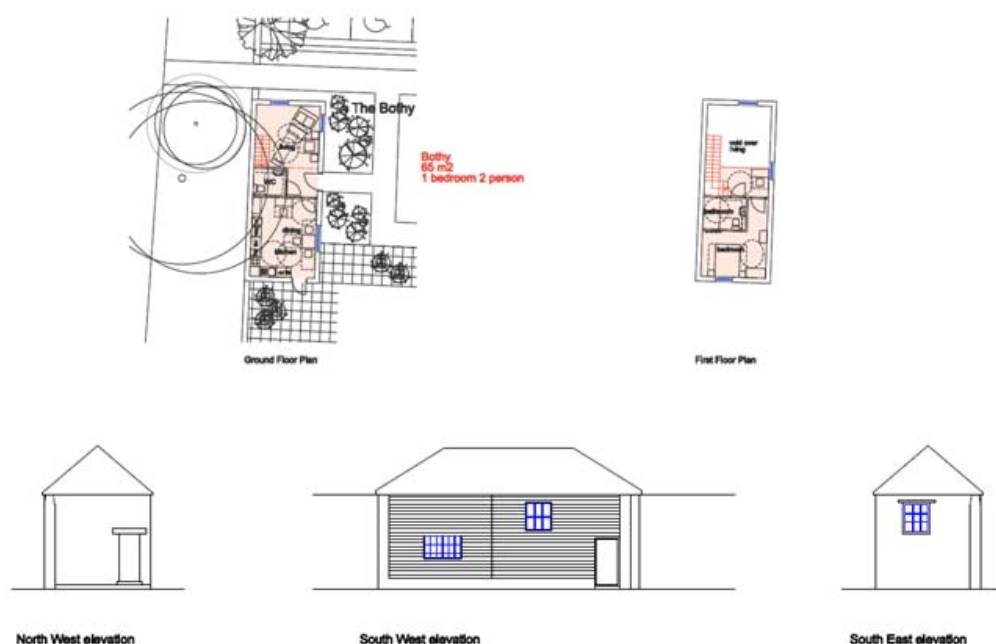
**Figure 4: Broomfield House ground floor flat A - floor plan**



**Figure 5: Stable Block top floor flat - Flat sF – floor plan**



**Figure 6: Kitchen Garden cottage – south-east – floor plan and elevations**



**Figure 7: The Bothy – floor plan and elevations**

### 3.2.2 Building Fabric

The building fabric U-values and air tightness for the constructions proposed have been agreed through discussion with Shephard Epstein Hunter (Table 2). They meet and exceed the building fabric element standards of Part L1B-2010 for the refurbished dwellings wherever possible taking into account the heritage constraints of some elements. The values listed will be applied as far as practically possible to all dwellings across the site, to ensure best practice building envelope energy efficiency.

	<b>New dwellings</b>	<b>Refurbished dwellings</b>
Number of units	6	14
Part L - Building Regulation*	Part L1 A 2010	Part L1 B 2010 & Part L2 B 2010
Uvalue - wall - new	0.12	0.28
Uvalue - wall - retained and upgraded	N/A	0.3
Uvalue - ground floor - new	0.13	0.22
Uvalue - ground floor - retained and upgraded	N/A	0.25
U value - windows - new	0.8	1.6
U value glazed door	0.8	1.8
Building fabric U value door	0.8	1.8
Building fabric U value - roof - new	0.10	0.16 (ins at ceiling level) -0.18 (ins at rafter level or flat roof or roof with integral insulation)
Building fabric U value - roof - retained and upgraded	N/A	0.16 (ins at ceiling level) -0.18 (ins at rafter level or flat roof or roof with integral insulation)
Insulation party walls	Filled and sealed	0.55 to be achieved if cavity insulation feasible
<b>Air Tightness</b>	<b>4</b>	<b>10</b>

**Table 1: Building fabric and air tightness values used for the simulation**

### 3.2.3 Renewable energy systems

For each dwelling type, an energy simulation has been carried out for:

- **Scenario 1:** Energy efficiency features only – no renewable energy systems;
- **Scenario 2:** Energy efficiency features plus the integration of the renewable energy systems found to be the most suitable for the development (See Renewable energy feasibility study - Section 5), which is 1 kW Photovoltaic per suitable dwelling

### 3.2.4 Other Characteristics

- **Ventilation:** A permeability rate of  $4\text{m}^3/\text{m}^2\text{h}$  at 50 Pa has been agreed and there will be efficient whole house extract mechanical ventilation in each dwelling.
- **Heating system:** The primary heating system chosen is a gas condensing combi boiler with a 91.1% SEDBUK efficiency. The main heating controls consist of programmers, room thermostats and Thermostatic Radiator Valves (TRVs) and for the new dwellings of time and temperature zone controls. No secondary heating has been considered and the hot water supply is served from the main heating boilers.
- **Lighting fittings:** All the lighting will be through dedicated low energy lighting outlets.
- **Thermal Bridging:** Accredited construction details used for all thermal bridges

### **3.3 Results of the simulation**

The energy efficiency and renewable energy systems simulated, and the main results of the simulation, can be found in Table 2

#### **3.3.1 SAP result**

The CO<sub>2</sub> emissions from buildings are an important measure of the building performance. The amount of CO<sub>2</sub> produced is assessed in terms of the Dwelling CO<sub>2</sub> Emission Rate (DER) and the Target CO<sub>2</sub> Emission Rate (TER) of a respective notional dwelling. The DER should always be lower than the TER to pass the first criterion (CO<sub>2</sub> emissions) of the 2010 Part L1A requirements applicable to the new dwellings only.

- Through optimised energy efficiency features, the simulated new dwelling – kitchen garden cottage achieves a 23.6% reduction in carbon emissions
- An improvement over Part L of 46.3% is achieved for scenario 2 for the new dwelling assessed under the Code for Sustainable Homes. The minimum standard of Code level 4 in terms of improvement over Part L is therefore achieved. A score of 4 out of 15 has therefore been entered in the Code for Sustainable Homes pre-assessment for credit Energy 1 (See Section 8).
- A Fabric Energy Efficiency FEE value of 59.9 kWh/m<sup>2</sup>/year is achieved. . A score of 3 out of 9 has therefore been entered in the Code for Sustainable Homes pre-assessment for credit Energy 2 (See Section 8).
- The dwelling emission rates of the refurbished dwellings simulated (in SAP2005 EcoHomes methodology) are within the range of 19 to 30 kgCO<sub>2</sub>/m<sup>2</sup>/year (SAP 2006 used for EcoHomes assessment). As Ecohomes averages performance across the site a conservative estimate of 6 credits under Ecohomes Ene 1 is assumed (see Section 7).

#### **3.3.2 Heat Loss Parameter - SAP 2005**

The value of the heat loss parameter across a dwelling building envelope demonstrates the thermal performance of its building fabric.

The energy simulations carried out show that the heat loss parameters for the refurbished dwellings simulated are in the range of 1.5 to 1.8, demonstrating a very high level of energy efficiency for flats where the level of refurbishment is limited due to heritage reasons.

	Kitchen Garden cottages	Stables	Bothy	Broomfield House
Number of units	6	6	1	7
Part L - Building Regulation*	Part L1 A 2010	Part L1 B 2010	Part L1 B 2010	Part L1 B 2010
Environmental Assessment	Code for Sustainable Homes	EcoHomes	EcoHomes	EcoHomes
Version - Environmental assessment	2010	2006	2006	2006
Level targeted	Level 4	Very Good	Very Good	Very Good
Building fabric				
Uvalue - wall - new	0.12	0.28	0.28	0.28
Building fabric				
Uvalue - wall - retained and upgraded	None	0.3	0.3	0.3
Building fabric				
Uvalue - ground floor - new	0.13	0.22	0.22	0.22
Building fabric				
Uvalue - ground floor - retained and upgraded	None	0.25	0.25	0.25
Building fabric				
U value - windows - new	0.8	1.6	1.6	1.6
Building fabric				
U value - windows - retained and upgraded	None all windows replaced	None all windows replaced	None all windows replaced	None all windows replaced
Building fabric				
U value glazed door	0.8	1.8	1.8	1.8
Building fabric				
U value door	0.8	1.8	1.8	1.8
Building fabric				
U value - roof - new	0.10	0.16 (ins at ceiling level) -0.18 (ins at rafter level or flat roof or roof with integral insulation)	0.16 (ins at ceiling level) -0.18 (ins at rafter level or flat roof or roof with integral insulation)	0.16 (ins at ceiling level) -0.18 (ins at rafter level or flat roof or roof with integral insulation)
Building fabric				
U value - roof - retained and upgraded	None	0.16 (ins at ceiling level) -0.18 (ins at rafter level or flat roof or roof with integral insulation)	0.16 (ins at ceiling level) -0.18 (ins at rafter level or flat roof or roof with integral insulation)	0.16 (ins at ceiling level) -0.18 (ins at rafter level or flat roof or roof with integral insulation)
Insulation party walls	Filled and sealed	0.55 to be achieved if cavity insulation feasible	0.55 to be achieved if cavity insulation feasible	0.55 to be achieved if cavity insulation feasible
Air permeability	5	10	10	10
Thermal bridges	Accredited Construction Details	Accredited Construction Details	Accredited Construction Details	Accredited Construction Details
Heating systems	Gas fired boiler	Gas fired boiler	Gas fired boiler	Gas fired boiler
Efficiency heating systems	91%	91%	91%	91%
Renewable energy systems	1 kWp PV panel (8m2) SW or SE	1 kWp PV panel (8m2) SW or SE	1 kWp PV panel (8m2) SW or SE	1 kWp PV panel (8m2) SW or SE
TER (kgCO2/m2/year)	24.99	20.09	23.69	19.91
DER (kgCO2/m2/year) without renewable	19.09	24.08	28.87	26.01
DER (kgCO2/m2/year) with renewable	13.42	N/A	N/A	20.3
Percentage improvement over Part L 2010 without renewable	23.6%	-19.9%	-21.9%	-30.6%
Percentage improvement over Part L 2010 with renewable	46.3%	N/A	N/A	-2.0%
Percentage CO2 emission reduction achieved by renewable technology	17% - PV	N/A	N/A	14.15% - PV
Fabric Energy Efficiency (kWh/year/m2)	59.95	69.6	N/A	N/A
Heat loss Parameter (W/m2/K)	N/A	1.59	1.8	1.74
DER - EcoHomes Points(2006)	N/A	SAP2006 - DER - 25.03 without PV - 7/15 points SAP2006 - 19.43 with PV - 10/15 points	SAP2006 - DER - 29.84 without PV - 5/15 points SAP2006 - 23.00 with PV - 8/15 points	SAP2006 - DER - 28.73 without PV - 5/15 points SAP2006 - 24.02 with PV - 9/15 points

**Table 2: Result of the energy simulation of typical dwellings of the development**

### 3.4 Conclusion

This section details the SAP-NHER indicative energy simulation performed on typical new and refurbished dwellings of the Broomfield House development, which has been carried out using National Home Energy Rating (NHER) software. Simulation on all dwellings types with the final specification must be carried out at detailed design to ensure each will meet the applicable standards.

A SAP assessment has been carried out for a typical detached new Kitchen Garden Cottage and for the refurbished Bothy House and two typical refurbished flats from Broomfield House and from the Stable Block. Each dwelling has been modelled for two different scenarios using optimised energy efficiency features, and additional Photovoltaics modules for scenario 2.

These simulations have demonstrated that through optimised energy efficiency features the refurbished dwellings will meet Part L1B -2010 and the new dwellings will achieve an improvement over Part L1A-2010 even for the scenario with energy efficiency features only (23.6% Improvement).

An improvement of more than 25% (46.3%) over Building Regulations is achieved for scenario 2 for the new dwellings through the use of renewable energy systems.

This study has allowed us to select:

- Scenario 1 – Optimised energy efficiency features for The Bothy House and some of the refurbished flats
- Scenario 2 – Optimised energy efficiency features and Photovoltaic modules for all the new kitchen garden cottages and for some of the refurbished flats (See Renewable Energy Feasibility Study Section 5).

The design of the Broomfield House development has been optimised to reach an exemplary level of energy standard through:

- Energy efficient building fabric
- Very good air tightness of 5 m<sup>3</sup>/m<sup>2</sup>/hr @ 50Pa for the new dwellings;
- Highly efficient heating system and control system;
- 100% dedicated energy efficient lighting;
- Photovoltaic modules to provide a part of the electricity demand of the dwellings leading to 13-17% CO<sub>2</sub> emission reduction

These features will lead to a significant reduction in anticipated energy consumption and CO<sub>2</sub> emissions compared to a standard development, through very good passive building design in the first instance and then by the specification of energy saving features within the services design.

## 4 Energy Demand Estimation

### 4.1 Residential

The energy demand of the residential part of the development has been estimated using the schedule of the development (Table 10) and the results of the energy simulation carried out for typical dwellings of the development with the energy efficiency features agreed (See scenario 1 of the Energy Efficiency Section 3) and the BREDEM methodology required by the GLA for the cooking and appliances figures. Tables 3 -6 summarise the energy demand resulting from the energy simulation carried out for typical dwellings of the development using NHER software.

	kWh/year	kWh/year/m2
space heating	2,451	32
water heating	2,317	30
pump and fans	393	5
lightings and appliances	2,724	36
cooking	1,328	17
Total	9,213	120

**Table 3: Estimated energy use – Kitchen garden cottage**

	kWh/year	kWh/year/m2
space heating	6,563	70
water heating	2,460	26
pump and fans	438	5
lightings and appliances	3,047	33
cooking	1,328	14
Total	13,836	148

**Table 4: Estimated energy use – refurbished Flat A – Broomfield House**

	kWh/year	kWh/year/m2
space heating	4,739	73
water heating	2,137	33
pump and fans	324	5
lightings and appliances	2,074	32
cooking	1,161	18
Total	10,435	162

**Table 5: Estimated energy use – Refurbished dwelling – The Bothy House**

	kWh/year	kWh/year/m2
space heating	4,647	60
water heating	2,342	30
pump and fans	355	5
lightings and appliances	2,750	35
cooking	1,328	17
Total	11,421	146

**Table 6: Estimated energy use - refurbished Flat sF – Stable Block**

The energy demand of the development has been estimated using the schedule of the development supplied (Table 7) and the results of the energy simulation, and can be found in Table 8.

	Number of dwelling	Floor area (m <sup>2</sup> )
Kitchen garden cottage	4	74
Kitchen garden cottage - wheelchair home	2	86
The Bothy	1	62
Broomfield - Flat A	1	89
Broomfield - Flat B	1	51
Broomfield - Flat C	1	51
Broomfield - Flat D	1	67
Broomfield - Flat E	1	64
Broomfield - Flat F	1	83
Broomfield - Flat G	1	78
Stable Block - Flat sA	1	56
Stable Block - Flat sB	1	48
Stable Block - Flat sC	1	77
Stable Block - Flat sD	1	56
Stable Block - Flat sE	1	48
Stable Block - Flat sF	1	77
<b>Total</b>	<b>20</b>	<b>1375</b>

**Table 7: Schedule of the development**

	Energy use (kWh/year)	Carbon emissions (kgCO <sub>2</sub> /year)
space heating	75,204	14,890
water heating	39,869	7,894
pump and fans	6,636	3,431
lightings and appliances	47,220	24,413
cooking	22,294	4,414
<b>Total resi</b>	<b>191,223</b>	<b>55,042</b>

**Table 8: Energy demand estimated for the residential part of the development without renewable energy systems**

This energy demand has been used to estimate the percentage of on-site renewable energy and the percentage CO<sub>2</sub> emission reduction provided by the renewable energy strategy for the development (See Section 5).

#### 4.2 Commercial

The energy demand of the non-residential area of the development has been estimated based on CIBSE – benchmarks. The benchmarks for light use general public spaces have been used.

	Energy Use (kWh/year)	CO <sub>2</sub> emissions (kgCO <sub>2</sub> /year)
Gas	18,585	3,680
Electricity	3,540	1,830

**Table 9: Energy demand estimated for the non-residential part of the development without renewable energy systems**

**4.3 Total Energy demand**

	Energy use (kWh/year)	Carbon emissions (kgCO <sub>2</sub> /year)
space heating	75,204	14,890
water heating	39,869	7,894
pump and fans	6,636	3,431
lightings and appliances	47,220	24,413
cooking	22,294	4,414
Total resi	191,223	55,042
Non-residential areas	22,125	5,510
<b>Total</b>	<b>213,348</b>	<b>60,552</b>

**Table 10: Energy demand estimated for the whole development without renewable energy systems**

## 5 Renewable Energy Technologies

This section introduces the technologies that have been considered for the renewable energy supply of the Broomfield House development. The technologies that have been considered are wind turbines (roof mounted and stand alone), photovoltaics, solar hot water, biomass heating (building integrated and district), biomass CHP and ground sourced heating and cooling.

### 5.1 Technologies

#### 5.1.1 Wind Turbines

The assessment of wind speeds and directions, and of the impact of local obstructions on the wind regime on site would require a detailed survey. However, in some urban areas it is possible to reach 6m/s, the figure generally taken as the minimum for a stand alone turbine.



**Figure 8: Wind turbines**

However, Broomfield House development is located in a suburban location where stand alone turbines would make an obvious impact on the local landscape and be likely raise considerable local opposition and encounter problems in planning. The turbines may also be unpopular with the residents of the new development. Further concerns exist relating to the issue of visual “flicker” and possible noise problems. These concerns are all heightened by the fact that any turbine would need to be of significant size to make a meaningful contribution to the site’s energy demand. Therefore, although this option is technically feasible (wind regime permitting), it is not recommended unless no other more suitable technologies are available.

Roof mounted turbines offer better opportunities at this site for several reasons. They require much lower cut in speeds, do not require dedicated land for towers or guy ropes, have much reduced noise problems and are designed to work in the turbulent, urban wind regime. They are also more discrete and likely to raise fewer concerns at planning. However, their implementation on a wide scale (on all the roofs of all dwellings) would result in significant nuisance due to flicker and possibly noise. For these reasons, roof mounted turbines may be considered further on some of the dwellings, but will not be considered for site-wide implementation.

#### 5.1.2 Photovoltaics

Photovoltaics are generally technically suitable for residential developments however their use can be limited due to their high capital cost. However with the introduction of the feed in tariff the high capital cost could be balanced with the running cost savings and the fix tariff offered during a set period of time.

For this development, overshadowing is unlikely to be a concern.

South – SW- SE orientated tilted roof could be found on the kitchen garden cottages, Broomfield House roof and potentially some part of the roof of the stable blocks.



**Figure 9: Photovoltaic panels**

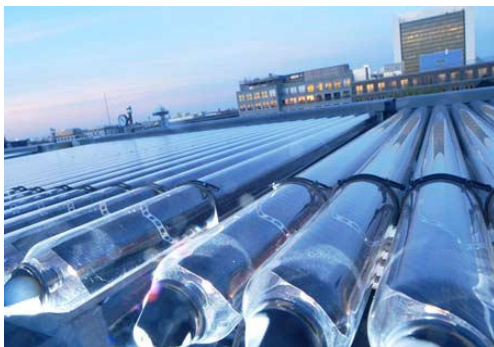
Due to the small roof area of The Bothy House we would not recommend the installation of PV for this unit.

Photovoltaics offer the following advantages:

- Low maintenance
- Educational aspect
- Simple installation
- Self cleaning
- Potential use of feed in tariff
- Can allow the achievement of CSH level 4 energy requirement for the new dwellings

It is recommended that PV is retained as a feasible solution for the renewable electricity provision of the new dwellings and some of the refurbished flats.

### 5.1.3 Solar Hot Water



Solar hot water installations are suited to domestic properties given their relatively constant and significant hot water demand.

However the requirement to install a dedicated hot water storage tank for this application limit the feasibility of this technology for this development where space is key. Moreover, this technology could not be itself lead to the improvement required by the CSH level 4 energy requirement.

**Figure 10: Solar collectors**

However, it is recommended that SHW is retained as an alternative solution to PV for the roof of Broomfield flat where potentially a mix of solar PV and solar thermal technologies could be installed.

### 5.1.4 Biomass Heating

Biomass heating is a mature and cost effective renewable energy supply, capable of meeting a significant proportion of the base heating load for a building. For residential developments, the system can be used in each property (as a wood burning stove) or to fuel a central, district heating system.



**Figure 11: Wood chips**

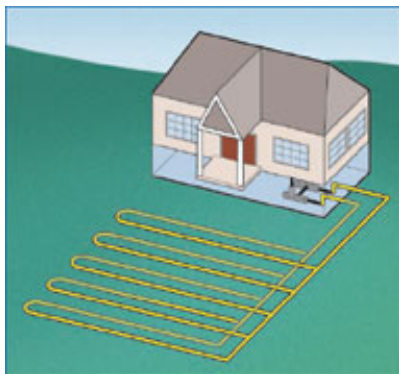
Stove systems can be considered an attractive feature in the modern housing market, but this solution has several drawbacks. There is no guarantee that the owner of a property will use the system once installed. This is particularly true as the fuel must be ordered, paid for and stored. The fact that the system must also be manually fed is an inconvenience to many and makes the system impossible to use for some elderly or disabled residents. It is recommended that this technology is not retained as a main option for energy supply, and that a more user friendly technology is sought.

Biomass district heating removes many of the concerns over stove based systems. There are no requirements on the residents and the system and fuel supply can be managed by a professional management company. District heating itself is an efficient system and the fuel is reasonably priced (and cheaper than gas in many cases). The main difficulties with biomass district heating are the need to secure a reliable, long term, local fuel source, the need to deliver the fuel, often in large trucks, to a suburban residential area, and finally the fact that a the plant needs to be managed, possibly through an ESCO (Energy Services Company). Finally, the installation of a district heating network would result in a requirement for separate hot water (for both heating and DHW) billing, which may significantly reduce the value of the properties. This development would also not be the most appropriate for this type of application, as the density of the development may not be sufficient to warrantee good levels of energy efficiency. This option is therefore not retained for this development.

#### 5.1.5 Biomass CHP

Biomass CHP is affected by the same issues as biomass district heating. Moreover, as this site is residential, it will lack a significant demand for heat during the summer months. While solar hot water can be sized on each house to suit the summer domestic hot water demand, CHP would require a much more constant and much larger demand to operate at reasonable efficiencies. It is therefore not recommended that biomass CHP be considered further.

#### 5.1.6 Ground Source Heating



**Figure 12: Ground Source Heat Pump**

Ground source heating systems are not common in residential developments in the UK, but there is now no technical reason for this given the low U-values and high air tightness requirements in modern homes. Underfloor heating would be required in all properties to allow the system to operate at high efficiencies.

The most significant problem with domestic applications is the amount of land required for the system. A detached house may require 3 trenches of 30m length, separated by 5m to allow enough piping for the heating system to function. In many urban locations, this is simply not practical. It is possible to use vertical boreholes rather than horizontal trenches, but the requirement to drill significantly increases the system cost. Moreover, significant ground investigation would be required to ensure the ground is suitable for this application.

Ground source heating is therefore not retained for this site.

#### 5.1.7 Ground Cooling Systems

The development does not have a cooling demand, so ground source cooling is not considered further.

#### 5.1.8 Technology selected

In conclusion, Photovoltaic is the favoured technology for Broomfield House development. It is recommended solar PV modules to be installed on south / south-east or south-west orientated roofs of the new kitchen garden cottages and on some roof spaces of Broomfield House and potentially of the stable block flats.

Solar hot water is retained as an option and might be installed in addition to solar PV on the roof of Broomfield House to provide a part of the hot water demand of the dwellings of the refurbished house.

## 5.2 Photovoltaics for Broomfield House development

The renewable energy feasibility study carried out concludes that a small PV array providing a part of the electricity demand the dwellings is the most suitable option for the renewable energy supply of the development.

### 5.2.1 Units selected for PV installation

The location of the new dwellings within the development has been optimised to allow for the very efficient use of PV systems on these units (See Figure 13 and Table 11).

	Units	PV area	PV area (m2)
Kitchen garden cottage	4	8.48 m2 on each dwellings	33.9
Kitchen garden cottage - wheelchair home	2	8.48 m2 on each dwellings	17.0
Broomfield House	7	22.3m2 on the rooftop	22.3
Stable Blocks	6	PV not recommended	20
The Bothy	1	PV not recommended	0
<b>Total</b>	<b>20</b>	<b>108</b>	<b>73.2</b>

**Table 11: Schedule of the development - units selected for their suitability for PV systems**

The PV modules installed on all the new units, in addition to very energy efficient features, will allow the achievement of the energy standard of the Code for Sustainable Homes level . (See scenario 2 of Energy Efficiency Section 3).

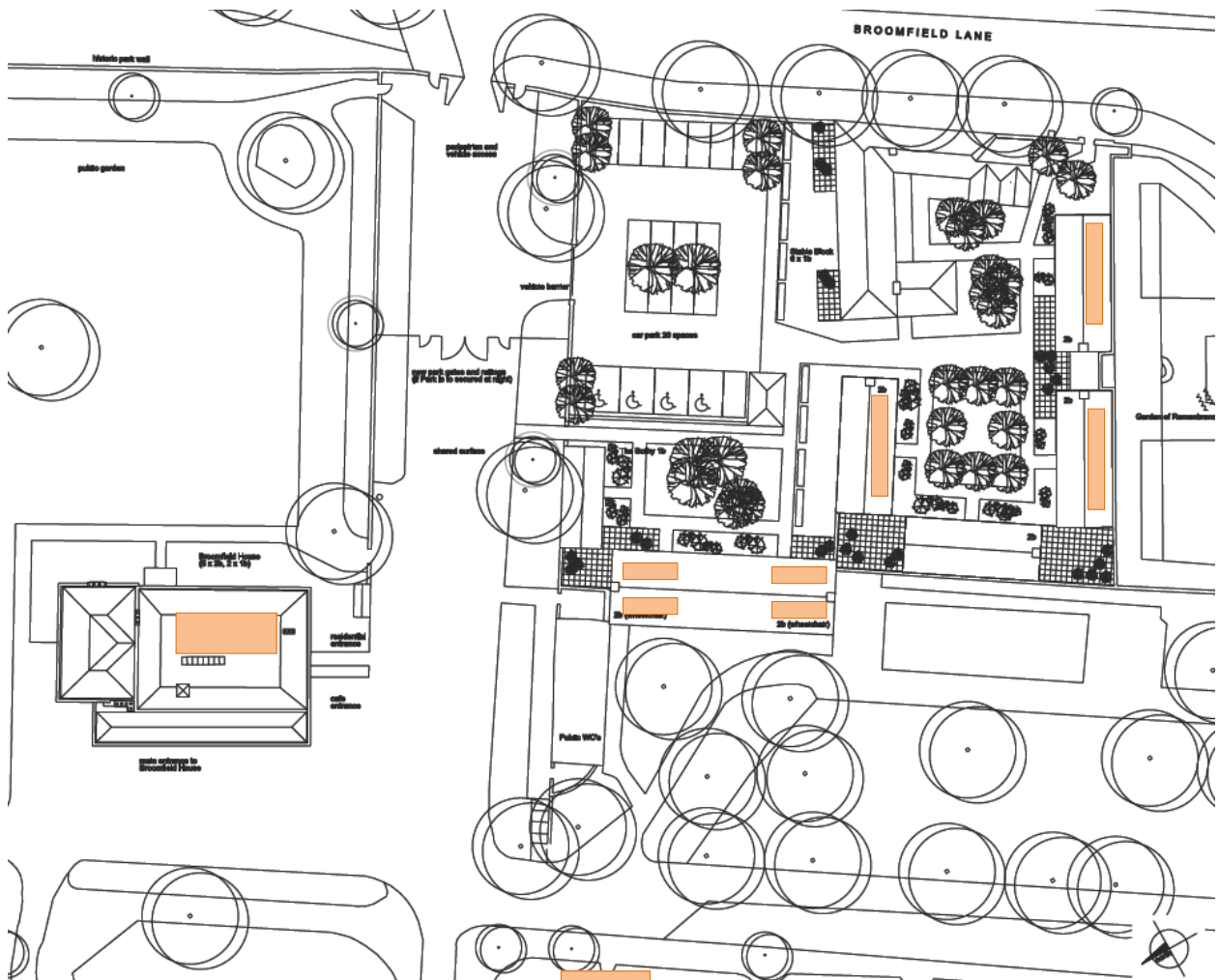
### 5.2.2 CO<sub>2</sub> emission reduction

The percentage of renewable energy across the site as well as the percentage CO<sub>2</sub> emission reduction has been estimated owing to the energy demand estimation and the schedule of units selected for their suitability for PV system use (See Section 5.2.1).

PV will provide 20 to 30% of the electricity of each dwelling they are installed on. Therefore the installation of PV on all the new units as well as on a part of the rooftop of Broomfield House and of the Stable Blocks will lead to a percentage renewable energy of approximately 4.9%, and a percentage CO<sub>2</sub> emission reduction of 9.1% emission reduction across the residential part of the development. (See Tables 12 and 13).

	PV installation	Electricity displaced by PV (kWh/year)	CO2 emission reduction	Percentage renewable energy	Percentage CO2 emission
Kitchen garden cottage	4 * 8.48m <sup>2</sup>	3,595.5	1,858.9	10.1%	17.1%
Kitchen garden cottage - wheelchair home	2* 8.48m <sup>2</sup>	1,797.8	929.4	8.7%	14.7%
The Bothy	0m <sup>2</sup>	0.0	0.0	0.0%	0.0%
Broomfield House	22.26m <sup>2</sup>	2,332.0	1,205.6	3.3%	6.1%
Stable Blocks	0m <sup>2</sup>	0.0	0.0	0.0%	0.0%
<b>Total - residential</b>	<b>73.1</b>	<b>7,725.3</b>	<b>3,994.0</b>	<b>4.0%</b>	<b>7.3%</b>

**Table 12: Estimation of electricity demand substituted by PV**



**Figure 13: Proposed locations for PV**

	Energy use (kWh/year)	Energy use substituted by PV (kWh/year)	Carbon emissions (kgCO2/year)	Carbon emissions (kgCO2/year) - Renewable energy strategy of the development
Gas demand	155,952	0	30,878	30,878
Electricity demand	57,397	7,725	29,674	25,680
Total	213,348	7,725	60,552	56,559
Percentage renewable energy	<b>3.62%</b>			
Percentage CO2 emission reduction	<b>6.60%</b>			

**Table 13: Percentage on site renewable energy and CO2 emission (across the residential part of the development) reduction owing to the renewable energy strategy**

### 5.3 Conclusion

This section has presented the result of the renewable energy feasibility study carried out for the Broomfield House development. Wind power (roof mounted and stand alone), photovoltaics, solar hot water, biomass heating (stove and district system), CHP and ground source heating and cooling were all considered. Photovoltaics modules were selected as the most viable and practical option for the development.

**The Broomfield House development will feature PV for all the new dwellings as well as on the rooftop of Broomfield house (72-73m2).**

**This will correspond to 4.0% of on-site renewable energy contribution and 7.3% CO2 emission reduction for the residential part of the development and 3.6% renewable energy contribution and 6.6% CO2 emission reduction for the whole site.**

## 6 Material Strategy



**Figure 14: Bricks**

The processes and materials associated with building construction use a considerable proportion of natural resources which in the UK equate to about 6 tonnes of building material per person per year. Construction materials also have a significant impact on energy use and pollution of the air, land and water resources.

Modern homes construction incorporates a diverse range of materials including natural resources and manufactured products. Whilst many raw materials are renewable, all require careful management to ensure their future sustainability and adequate provision for future demands.

### 6.1 Material Specification – Green Guide for Housing Specification



**Figure 15:**  
**BRE logo**

The online Green Guide rates the environmental impact of each construction element with an 'A+' rating denoting the best overall environmental performance.

The performance of each specification is measured against a range of environmental impacts including: climate change, toxicity, fossil fuel and ozone depletion, levels of emissions and pollutants, mineral and water extraction.

Materials re-used in situ for the refurbished parts of the development gain an A+ rating by default. The following material specification is proposed for the new materials of the Broomfield House development.

#### 6.1.1 Ground floors

The following B rated material specification is proposed:

Screed on insulation laid on grouted beam and dense solid block flooring  
Element Number - 820140032

#### 6.1.1 Upper floors

|The specification of the upper floors is under discussion

#### 6.1.2 Roof

The following A rated material specification is proposed:

Structurally insulated timber panel system with OSB/3 each side, roofing underlay, counterbattens, battens and UK produced clay plain tiles  
Element Number – 812410069

#### 6.1.3 External Walls

The following A+ rated material specification is proposed:

Brickwork outer leaf, insulation, medium dense solid blockwork inner leaf, cement:lime mortar, plasterboard on battens, paint  
Element Number – 806170087

#### 6.1.4 Internal Walls

The following A+ rated material specification is proposed:

Timber stud, plasterboard, paint  
Element Number - 809760003

#### 6.1.5 Party walls

|The specification of the party walls is under discussion.

#### 6.1.6 Windows

The following A+ rated material specification is proposed:

Durable hardwood window, double glazed, water based stain (TWAS)  
Element Number - 813100005

#### 6.1.7 Impact for the Code for Sustainable Homes and EcoHomes assessment

It is anticipated that 11-13 points will be achieved for the new dwellings for the Code for Sustainable Homes assessment credit Mat 1:

External Walls: A+ - 3 points

Roof: A – 2 point

Ground floor and upper floor – B - 1 point ( upper floor rating to be clarified)

Internal and Part walls – A+ - 3 points (party wall rating to be clarified)

Windows – A+ - 3 points

All reused materials will be 'A' rated by default for the EcoHomes assessment. A lot of the other new materials will be as per description above A or A+ rated (3 points for A rated roof, 3 points for A rated walls and 2 points for A rated windows). It is therefore anticipated that at least 8/16 points to be achieved for credit Mat 1 for the refurbished dwellings.

## **6.2 Timber**

Timber is a widely available renewable resource and is largely of low environmental impact. However the embodied energy associated with transportation and the environmental and social implications of deforestation are of increasing concern.

The team has committed to use **100% FSC** (Forest Stewardship Council) or equivalently certified timber for structural and finishing elements. The Forest Stewardship Council's Trademark is a label on timber and wood products which indicates that the wood comes from a well-managed forest. FSC sets high standards that ensure forestry is practiced in an environmentally responsible, socially beneficial, and economically viable way.

## **6.3 Insulation**

All the insulants materials used for the dwellings of Broomfield House Development will have a global warming potential (GWP) of less than 5.

## **6.4 Environmental Certification - Environment Management System**

An environmental management system:

- Serves as a tool to improve environmental performance;
- Provides a systematic way of managing an organization's environmental affairs;
- Is the aspect of the organization's overall management structure that addresses immediate and long-term impacts of its products, services and processes on the environment;
- Gives order and consistency for organizations to address environmental concerns through the allocation of resources, assignment of responsibility and ongoing evaluation of practices, procedures and processes;
- Focuses on continual improvement of the system.

ISO 14001, BES 6001 and EMAS certification are the internationally recognised standard for the environmental management of businesses. They prescribe controls for those activities that have an effect on the environment. These include the use of natural resources, handling and treatment of waste and energy consumption.

The team has committed to use manufacturers who hold ISO 14001, BES 6001 or equivalent certification for the sourcing of all materials used for the development.

## 7 EcoHomes Statement – Refurbished Dwellings

The EcoHomes environmental assessment for dwellings has been superseded by the Code for Sustainable Homes, however it remains in use for refurbished dwellings for which the Code for Sustainable Homes is not applicable.

EcoHomes balances environmental performance with the need for a high quality of life and a safe and healthy internal environment. The issues assessed are grouped into seven categories: energy; water; pollution; materials; transport; ecology and land use; health and well-being. Many of the issues are optional, ensuring EcoHomes is flexible enough to be tailored to a particular development or market.

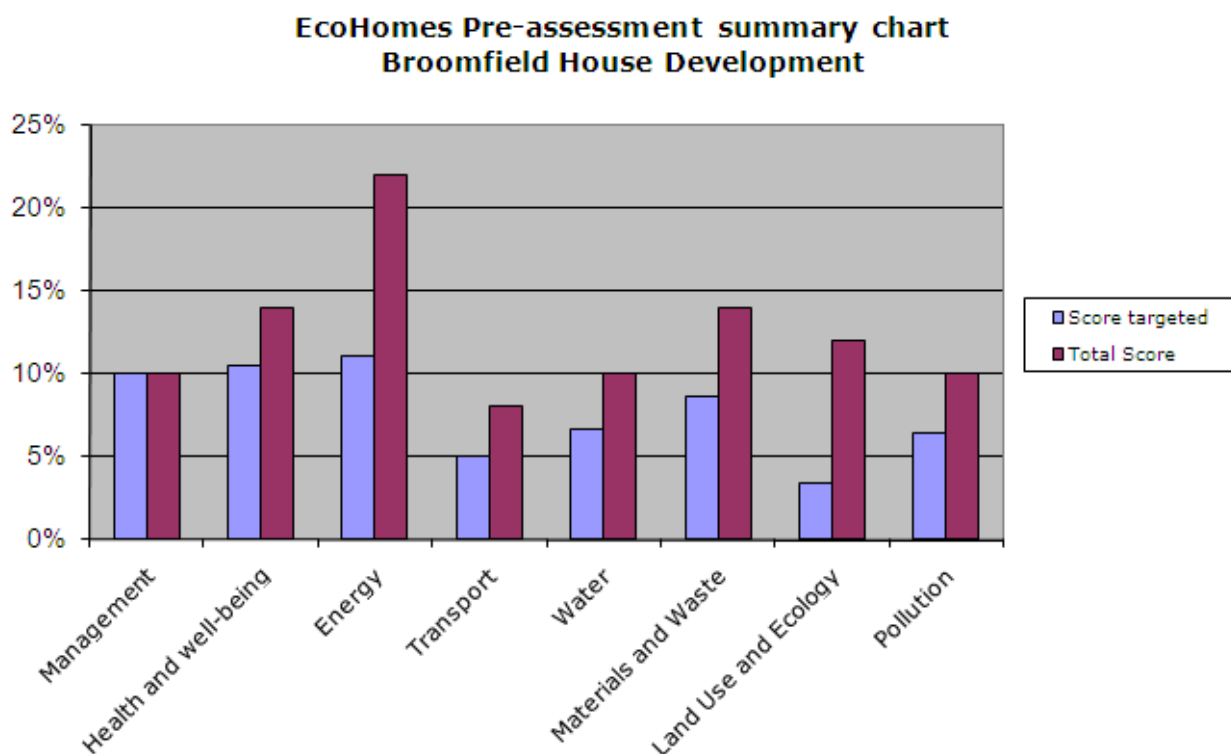
The EcoHomes pre-assessment checklist provides an approximate indication of how a future formal assessment may score and the likely rating that could be achieved. The prediction checklist should therefore not be used as a guarantee of a subsequent rating but will inform how credits should be targeted during the formal assessment procedure.

The pre-assessment checklist was completed using information provided by the design team, Energy, CO<sub>2</sub> emissions and water use calculations were carried out for typical dwelling types within the development to give an approximate average across the site.

The following sections describe how the 14 refurbished units of the Broomfield House development may achieve an EcoHomes rating of “Very Good”.

### 7.1 Summary of pre-assessment checklist results

Figure 16 and Table 14 show a resume of EcoHomes credits, with the completed EcoHomes assessment table in Appendix B. The current target is “Very Good”.



**Figure 16: EcoHomes summary chart – Refurbished**

Category and Weighting		Issue	Credits Available	Credits Targeted	Weighted Score
<b>Management</b> 10%	Man1	Home User Guide	3	3	10.00%
	Man2	Considerate Constructors	2	2	
	Man3	Construction Site Impacts	3	3	
	Man4	Security	2	2	
	<b>Total</b>		<b>10</b>	<b>10</b>	
<b>Health and well-being</b> 14%	Hea1	Daylighting	3	3	10.50%
	Hea2	Sound Insulation	4	3	
	Hea3	Private Space	1	0	
	<b>Total</b>		<b>8</b>	<b>6</b>	
<b>Energy</b> 22%	Ene1	Dwelling Emission Rate	15	6	11.00%
	Ene2	Building Fabric	2	0	
	Ene3	Drying Space	1	1	
	Ene4	EcoLabelled Goods	2	2	
	Ene5	Internal Lighting	2	1	
	Ene6	External Lighting	2	2	
	<b>Total</b>		<b>24</b>	<b>12</b>	
<b>Transport</b> 8%	Tra1	Public Transport	2	2	5.00%
	Tra2	Cycle Storage	2	0	
	Tra3	Local Amenities	3	2	
	Tra4	Home Office	1	1	
	<b>Total</b>		<b>8</b>	<b>5</b>	
<b>Water</b> 10%	Wat1	Internal Potable Water Use	5	3	6.67%
	Wat2	External Potable Water Use	1	1	
<b>Total</b>		<b>6</b>	<b>4</b>		
<b>Materials and Waste</b> 14%	Mat1	Environmental Impact of Materials	16	8	8.58%
	Mat2	Responsible Sourcing of Materials: Basic Building Elements	6	4	
	Mat3	Responsible Sourcing of Materials: Finishing Elements	3	1	
	Mat4	Recycling Facilities	6	6	
	<b>Total</b>		<b>31</b>	<b>19</b>	
<b>Land Use and Ecology</b> 12%	Eco1	Ecological Value of Site	3	0	3.43%
	Eco2	Ecological Enhancement	4	1	
	Eco3	Protection of Ecological Features	1	0	
	Eco4	Change of Ecological Value of Site	4	3	
	Eco5	Building Footprint	2	0	
	<b>Total</b>		<b>14</b>	<b>4</b>	
<b>Pollution</b> 10%	Pol1	Insulant GWP	1	1	6.36%
	Pol2	NO <sub>x</sub> Emissions	3	2	
	Pol3	Reduction of Surface Runoff	2	1	
	Pol4	Renewable and Low Emission Energy Source	3	1	
	Pol5	Flood Risk	2	2	
	<b>Total</b>		<b>11</b>	<b>7</b>	
<b>Total pre-assessment score</b>			<b>61.54%</b>		
<b>EcoHomes pre-assessment rating achieved</b>			<b>Very Good</b>		

Table 14: EcoHomes summary table- Refurbished Units

## 7.2 Analysis of the EcoHomes results

The pre-assessment exercise demonstrates the rating 'Very Good' for the refurbished dwellings may be targeted with a very comfortable margin. Indeed, the pre-assessment shows a score of **61.54%**, 3.54% higher than required to pass Very Good.

- **Management:** Good score in this section with provision on a home user guide to all dwellings. Compliance to best practice Considerate Constructors Scheme standards, and respect of good environmental practice on site.
- **Health and Well Being:** A good score is expected due to acoustic testing which will be carried out
- **Transport:** Good public transport and amenity links are available, and cycle space will be provided for at least 95% of the dwellings. Home office spaces will also be provided.
- **Energy:** A very good score is targeted owing to a combination of a highly efficient building envelope, good practice design, and energy efficient boilers. In addition a number of dwellings utilise PV systems.
- **Water:** The provision of very efficient water fittings will contribute to an optimised water efficient strategy, and rainwater harvesting is under consideration to further enhance performance.
- **Materials and Waste:** The majority of the materials will be A rated in the Green Guide for Housing Specification (external and internal walls, roof). The manufacturers of the majority of the materials of the development have ISO14001, BES 6001 or EMAS accreditation and use FSC certified timber. Recycling facilities will also be provided.
- **Land and Ecology:** An ecological consultant will be employed and their recommendations followed to ensure a neutral or positive enhancement of the ecological value of the site.
- **Pollution:** Pollution will be minimised through the use of low NOx boilers, and low GWP / ODP zero insulants.

The pre-assessment checklist demonstrates that **the target of "Very Good" is achievable with a margin of more than 3%**. The pre-assessment shows a very good balance of score in all sections, with particularly good scores in the management, water, energy and material sections.

## 8 Code for Sustainable Homes Statement – New Units

### 8.1 Introduction

The Code for Sustainable Homes replaces Ecohomes in assessing residential developments for environmental performance whilst maintaining high quality of life and a safe and healthy internal environment. The issues assessed are grouped into nine categories: energy; surface water run-off, water; pollution; materials; management, waste, ecology and land use; health and well-being. Of the nine categories energy and water require minimum standards for achievement of each code level, whereas the other categories afford flexibility in gaining points ensuring the Code is flexible enough to be tailored to a particular development or market, although minimum standards for code entry may apply.

The Code for Sustainable Homes pre-assessment checklist provides an approximate indication of how a future formal assessment will score and the rating that will be achieved. The prediction checklist should therefore not be used as a guarantee of a subsequent rating but will inform how credits should be targeted during the formal assessment procedure.

The pre-assessment checklist was completed using information provided by the design team. Energy, CO<sub>2</sub> emissions and water use calculations were carried out for typical house types within the development.

### 8.2 Code for Sustainable Homes levels

There are 6 different levels for the Code for Sustainable Homes which are related to total number of credits obtained:

Code Level	Total Points Score (equal or greater than)
Level 1	36 points
Level 2	48 points
Level 3	57 points
Level 4	68 points
Level 5	84 points
Level 6	90 points

**Table 15: Pass Rates Code for Sustainable Homes**

### 8.3 Code for Sustainable Homes minimum standards

The Code for Sustainable Homes requires minimum standards in some of the categories for achievement of each code level:

Criteria		
% Improvement 2010 DER/TER*1	Credits*2	Mandatory Requirements
≥ 8%	1	Level 4
≥ 16%	2	
≥ 25%	3	
≥ 36%	4	
≥ 47%	5	
≥ 59%	6	
≥ 72%	7	
≥ 85%	8	
≥ 100%	9	
Zero Net CO <sub>2</sub> Emissions	10	Level 6
Default Cases		
None		

**Table 16: Code for Sustainable Homes minimum requirement for energy**

- i Percentage improvement over Target Emission Rate (TER) as determined by the 2010 Building Regulation Standards

SAP/NHER energy simulations have been carried out on typical units of the development, and owing to very energy efficient features and renewable energy systems, a percentage improvement over Target Emission Rate as determined by the 2010 Building Regulation Standards of 25% will be achieved for the new dwellings of the development (Please see the Energy efficiency and Renewable energy section for the details of the energy simulation results Section 3 and 5).

- ii Internal Potable Water Use

Criteria		
Water consumption (litres/person/day)	Credits	Mandatory Levels
≤ 120 l/p/day	1	Levels 1 and 2
≤ 110 l/p/day	2	
≤ 105 l/p/day	3	Levels 3 and 4
≤ 90 l/p/day	4	
≤ 80 l/p/day	5	Levels 5 and 6
Default Cases		
None		

**Table 17: Code for Sustainable Homes minimum requirement for Internal Potable Water Use**

Water use calculations have been performed using the BRE calculator tool. A new Water Tool 2009 is currently under development, preliminary studies suggest that the specification will perform better in this tool. The scenarios described in Table 18 are proposed, consisting of very low water consumption appliances to allow the development to achieve an internal potable water use of less than 105 litres/person/day.

		House Type:		Type 1		Type 2		Type 3	
		Description:		Example 1		Example 2		Example 3	
Installation Type	Unit of measure	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day
Is a dual or single flush WC specified?		Dual		Single		Dual			
WC	Full flush volume	6	8.76	4.5	19.89	6	8.76		
	Part flush volume	3	8.88			4	11.84		
Taps (excluding kitchen and external taps)	Flow rate (litres / minute)	5	9.48	5	9.48	3	6.32		
Are both a Bath & Shower Present?		Bath & Shower		Bath & Shower		Bath & Shower			
Bath	Capacity to overflow	149	16.39	149	16.39	149	16.39		
Shower	Flow rate (litres / minute)	8	34.96	9	39.33	8	34.96		
Kitchen sink taps	Flow rate (litres / minute)	10	14.76	8	13.88	8	13.88		
Has a washing machine been specified?		No		Yes		No			
Washing Machine	Litres / kg		17.16	6	12.60		17.16		
Has a dishwasher been specified?		No		Yes		No			
Dishwasher	Litres / place setting		4.50	1	3.60		4.50		
Has a waste disposal unit been specified?		No		No		No			
Water Softener	Litres / person / day		0.00		0.00		0.00		
Calculated Use		114.9		115.2		113.8			
Normalisation factor		0.91		0.91		0.91			
Total Consumption		104.5		104.8		103.6			
Code for Sustainable Homes	Mandatory level	Level 3/4		Level 3/4		Level 3/4			

**Table 18: Water appliances leading to a water consumption level better than code level 4 requirements**

iii Materials

Minimum standard for all the different code levels: At least three of the following 5 key elements of construction are specified to achieve a BRE Online Green Guide rating of at least 'D': Roof structure and finishes, External walls, Upper floor, Internal walls, Windows and Doors.

No material in the Broomfield development will have a rating less than 'D', and the majority of major building arterials re proposed to be 'A' and 'A+' rated.

See Section 6

iv Surface water run-off

Minimum standard for all code levels: Ensure that peak run-off rates and annual volumes of run-off will be no greater than the previous conditions for the development site. This requirement will be followed and improved on by the development (See full Code pre-assessment checklist Appendix C).

v Waste

Minimum standard for all code levels:

**Site waste management:** Ensure there is a site waste management plan in operation which requires the monitoring of waste on site and the setting of targets to promote resource efficiency.

**Household waste storage:** Where there is adequate space for the containment of waste storage for each dwelling. This should allow for the greater (by volume) of the following:

An *adequate external space* should be allocated for waste storage and sized to accommodate containers according to the largest of the following two volumes:

- The minimum volume recommended by British Standard 5906 (British Standards Institution, 2005) based on a maximum collection frequency of once per week. This volume is 100 litres for a single bedroom dwelling, with a further 70 litres for each additional bedroom.
- The total volume of the external waste containers provided by the Local Authority.

Storage space must provide *inclusive access and usability* (Checklist IDP). Containers must not be stacked

This requirement will be followed and improved on by the development (See full Code pre-assessment checklist Appendix C).

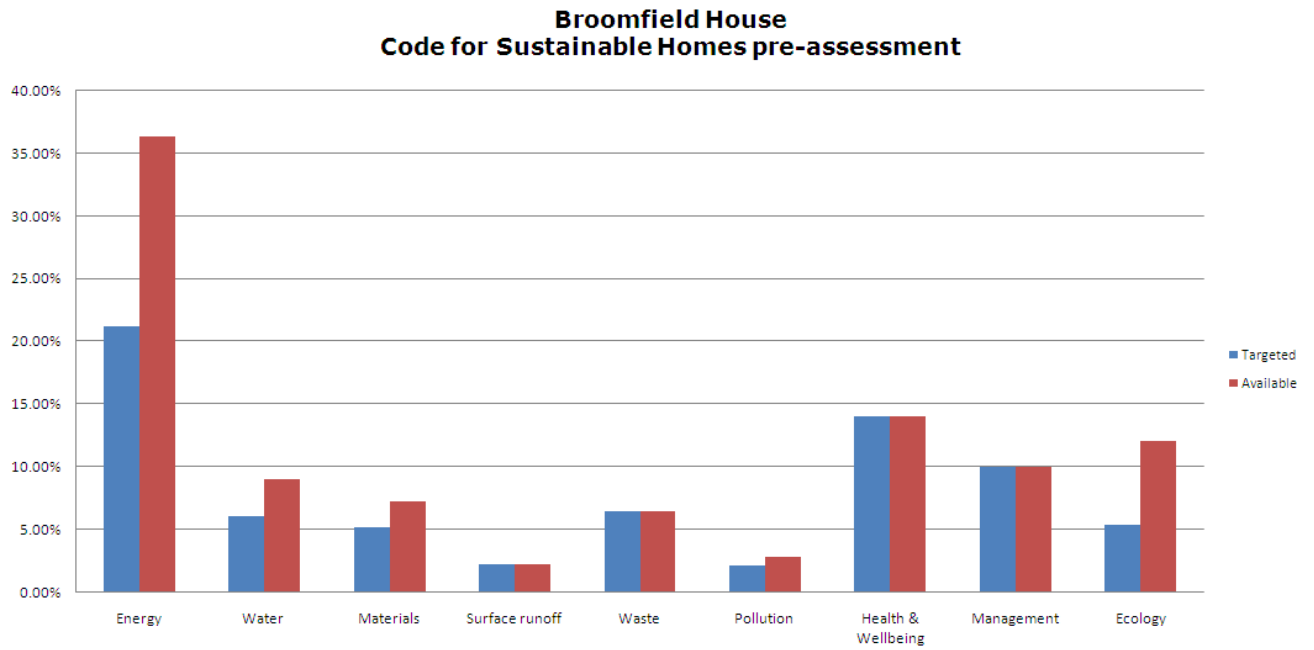
#### **8.4 Resume of pre-assessment checklist results**

The Figure 17 and Table 19 show a resume of Code for Sustainable Homes credits, with the completed Code for Sustainable Homes pre-assessment table in Appendix C.

The Code for Sustainable Homes pre-assessment checklist provides an approximate indication of how a future formal assessment will score and the rating that will be achieved. The prediction checklist should therefore not be used as a guarantee of a subsequent rating but will inform how credits should be targeted during the formal assessment procedure.

Category and Weighting		Issue	Credits Available	Credits Targeted	Weighted Score
<b>Energy</b>  36.4%	Ene 1	Dwelling Emission Rate	10	4	21.14%
	Ene 2	Fabric Energy Efficiency	9	3	
	Ene 3	Energy display devices	2	2	
	Ene 4	Drying Space	1	1	
	Ene 5	Energy Labelled White Goods	2	2	
	Ene 6	External Lighting	2	2	
	Ene 7	Low and Zero Carbon (LZC) Technologies	2	1	
	Ene 8	Cycle Storage	2	2	
	Ene 9	Home Office	1	1	
<b>Total</b>			<b>31</b>	<b>18</b>	
<b>Water</b> 9.0%	Wat 1	Indoor Water use	5	3	6.00%
	Wat 2	External Water Use	1	1	
<b>Total</b>			<b>6</b>	<b>4</b>	
<b>Materials</b>  7.2%	Mat 1	Environmental Impact of Materials	15	11	5.10%
	Mat 2	Responsible Sourcing of Materials - Basic Building Elements	6	4	
	Mat 3	Responsible Sourcing of Materials - Finishing Elements	3	2	
<b>Total</b>			<b>24</b>	<b>17</b>	
<b>Surface run-off</b> 2.2%	Sur 1	Management of Surface Water Run-off from Developments	2	2	2.20%
	Sur 2	Flood Risk	2	2	
<b>Total</b>			<b>4</b>	<b>4</b>	
<b>Waste</b>  6.4%	Wat1	Household Waste Storage and Recycling Facilities	4	4	6.40%
	Wat2	Construction Site Waste Management	3	3	
	Wat3	Composting	1	1	
<b>Total</b>			<b>8</b>	<b>8</b>	
<b>Pollution</b> 2.8%	Pol 1	Global Warming Potential (GWP) of Insulants	1	1	2.10%
	Pol 2	NOx Emissions	3	2	
<b>Total</b>			<b>4</b>	<b>3</b>	
<b>Health and Wellbeing</b>  14.0%	Hea 1	Daylight	3	3	14.00%
	Hea 2	Sound Insulation	4	4	
	Hea 3	Private Space	1	1	
	Hea 4	Lifetime Homes	4	4	
<b>Total</b>			<b>12</b>	<b>12</b>	
<b>Management</b>  10.0%	Man 1	Homes User Guide	3	3	10.00%
	Man 2	Considerate Constructors Scheme	2	2	
	Man 3	Construction Site Impacts	2	2	
	Man 4	Security	2	2	
<b>Total</b>			<b>9</b>	<b>9</b>	
<b>Ecology</b>  12.0%	Eco 1	Ecological Value of the Site	1	0	5.33%
	Eco 2	Ecological Enhancement	1	1	
	Eco 3	Protection of Ecological Features	1	0	
	Eco 4	Change in Ecological value of the Site	4	3	
	Eco 5	Building Footprint	2	0	
<b>Total</b>			<b>9</b>	<b>4</b>	
<b>Total pre-assessment score</b>			<b>72.27%</b>		
<b>Code for Sustainable Homes pre-assessment rating achieved</b>			<b>CSH Level 4</b>		

Table 19: Code for Sustainable Homes summary table



**Figure 17: Code for Sustainable Homes summary chart – New Units**

## 8.5 Analysis of the Code for Sustainable Homes Results

The pre-assessment checklist demonstrates that **the target of Code level 4 is targeted with a very good margin (72.27% score of the pre-assessment)**. This pre-assessment shows a very good balance of scores in all sections, with a particularly good score in the waste, water and management sections.

- **Energy:** An optimised energy efficient design will minimise the energy demand of the development. In addition the use of renewable energy in the form of PV will provide a significant proportion of energy use.
- **Water:** The provision of water efficient fittings will reduce consumption to less than 105 litres/person/day. Water butts will be provided for garden irrigation of all the residential units.
- **Materials:** The main manufacturers of the materials will be required to hold ISO14001, BES 6001 or EMAS accreditation and use FSC certified timber. The majority of the main building elements will receive an 'A' or 'A+' rating.
- **Surface water runoff:** SUD attenuation may be provided.
- **Waste:** Strategies for all types of construction and operational waste are committed to, and compost bins will be supplied to all dwellings.
- **Pollution:** Will be minimised through the use of low GWP insulants and extremely low NOx boilers.
- **Health and Well-Being:** Private space will be provided for all the dwellings, and the masterplan and the building layout have been optimised to ensure good daylight for all dwellings. Robust Details will ensure acoustic performance 8dB better than Building Regulations.
- **Management:** Compliance to best practice Considerate Constructors Scheme standards, respect of good environmental practice on site and provision of user guides to inform future practice.
- **Ecology:** An ecologist will be employed and their recommendations followed to ensure a neutral or positive impact on biodiversity. Where practical the ecological feature present on the site are protected.

## 9 Conclusion

This report has presented the sustainability, energy efficiency and renewable energy design features of Broomfield House development.

This sustainability strategy has been compiled to respond to and improve on the planning requirements and Design Guide criteria of the GLA and of London Borough of Enfield.

The main sustainable features of the Broomfield House development include:

- Very energy efficient design: Through optimised energy efficient building fabric, air tightness, and heating system efficiency and controls, **an improvement over Part L 2010 of 23%** or more will be achieved for each new unit. The addition of renewable energy system will lead to an improvement of 46% or more the new unit.
- Refurbished dwellings will meet and exceed the building fabric element standards of Part L1B-2010 wherever possible taking into account the heritage constraints of some elements
- **Code for Sustainable Homes level 4** will be achieved for the new dwellings of the development (72.3% score at pre-assessment), particularly with a very good score in the energy, management section and health and wellbeing section;
- **EcoHomes Very Good** will be achieved for the refurbished dwellings of the development (61.54% score at pre-assessment);
- The majority of the construction materials will have an **A or A+ rating** according to the BRE online Green Guide to Specification;
- All structural timber will be FSC or PEFC certified; and the majority of the material manufacturers will have **environmental certification** such as ISO14001, BES6001 or EMAS;
- **Water efficient features** will be installed in all dwellings.
- **PV panels will be installed on approximately 40% of the development** (all the new units and some of the refurbished). These renewable energy systems are expected to lead to 3.6% on site renewable energy for the development as well as 6.6% reduction of CO<sub>2</sub> emissions emission reduction across the whole development (7.3% CO<sub>2</sub> emission reduction achieved across the residential part of the development).

These features will enable the Broomfield House development to be an exemplary development of sustainable design.

## 10 Appendices

**10.1 Appendix A – EcoHomes Pre-Assessment checklist**

	Issue	Credit description	Points Available	Points Targeted for refurbished dwellings	Comments
<b>Management</b>					
Man 1	Home User Guide	Two credits are awarded where each home is provided with a simple guide that covers information relevant to the non technical operation and environmental performance of their home. One additional credit is awarded where evidence provided demonstrates that the guide also covers information relating to the site and its surroundings.	3	3	This credit will be achieved for the development through the provision of a simple home user guide covering the dwelling and its surrounding.
Man 2	Considerate Constructors	One credit where there is a commitment to achieve a CCS score between 24 and 31.5. Two credits where there is a commitment to achieve a CCS score between 32 and 40.	2	2	The site will be registered under the CCS scheme and a very good score is expected to be achieved due to very good environmental condition at the construction site.
Man 3	Construction Site Impacts	One credit: procedures that cover 2 or more of the following items: e. Monitor, report and set targets for CO2 production or energy use arising from site activities; b. Monitor and report CO2 or energy use arising from commercial transport to and from site; c. Monitor, report and set targets for water consumption from site activities; d. Adopt best practice policies in respect of air (dust) pollution arising from site activities; e. Adopt best practice policies in respect of water (ground and surface) pollution occurring on the site; f. 80% of site timber is reclaimed, reused or responsibly sourced. Two credits are awarded where 4 or more of items listed. One credit is awarded where evidence provided demonstrates a commitment and a strategy to monitor, sort and recycle construction waste on site.	3	3	The contractor will include the inclusion of these site management principles . It is expected that all points except potentially b will be achieved.
Man 4	Security	One credit is awarded where there is a commitment to appoint an Architectural Liaison officer (ALO), to adopt their recommendations in the early design stages and to achieve the 'Secured by Design Award' covering site layout, external lighting, car parking, planting, footpaths, communal areas, doors and windows. One credit is awarded where security standards for external doors and windows achieve a minimum of either LPS1175 SR1 or PAS24-1 for all external pedestrian doorsets falling within the scope of PAS24-1 and BS7950 for all windows falling within the scope of BS7950.	2	2	The advice of an ALO or CPDA have been sought and the recommendation will be implemented in the proposed design.

Health and Well Being						
Hea 1	Daylighting	<p><b>One credit</b> is awarded where kitchens achieve a minimum average daylight factor of at least 2%*.</p> <p><b>One credit</b> is awarded where living rooms, dining rooms and studies achieve a minimum average daylight factor of at least 1.5%*.</p> <p><b>One credit</b> is awarded where living rooms, dining rooms and studies and worktops and tables in kitchens have a view of the sky, from a height of 0.85m from the floor for 80% of the room area.</p>	3	3		Very good daylight penetration and view of the sky will be achieved in all dwellings. 3 credits are expected to be achieved.
Hea 2	Sound Insulation	<p><b>One credit or two credits</b> are awarded where there is a commitment to carry out a programme of pre-completion testing based on the frequency listed in Table 2, column A or B respectively for every group or subgroup* of houses or flats and where there is a commitment to achieve the performance standards set out in the Building Regulations for England and Wales, Approved Document E (2003 Edition).</p> <p><b>Three or four credits</b> are awarded where two credits are achieved, as above and where there is a commitment to achieve airborne sound insulation values that are at least 3dB or 5dB higher and impact sound insulation values that are at least 3dB or 5dB lower, respectively, than the performance standards set out in Approved Document E.</p> <p>Field sound insulating testing should be carried out by an acoustic consultancy accredited by UKAS or a European equivalent, or carried out in accordance with the relevant ISO requirements and checked and verified by an organisation with UKAS accreditation for field sound insulation testing.</p> <p>*Groups and subgroup defined in Section 1 of the Building Regulations, Approved Document E (2003 Edition).</p>	4		3	Very good sound insulation will be achieved leading to the achievement of 3 credits.
Hea 3	Private Space	<p><b>One credit</b> is awarded where an accessible outdoor space is provided of a size allowing all occupants to sit outside (1.5m<sup>2</sup>/bedspace with a minimum of 3m<sup>2</sup>/home for a private space and 1m<sup>2</sup>/bedspace for a shared space).</p>	1		0	The credit will be achieved for all dwellings through the provision of balconies and communal compliant gardens.

Energy							
Ene 1	Dwelling Emission Rate	Up to 15 credits are awarded on the basis of the Dwelling Emission Rate (DER) from the Standard Assessment Procedure (SAP) 2005 related average CO <sub>2</sub> emission. The credits are awarded as follows:  <b>Credit:</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 Max CO <sub>2</sub> emissions DER: 40 35 32 30 28 26 24 22 20 18 15 10 5 0 -10 (kg/m <sup>2</sup> /year)	15	6	The energy modelling carried out on typical refurbished flats show that 6 credits should be achieved due to a DER of 26kg/m <sup>2</sup> /year or less.		
Ene 2	Building Fabric	Up to <b>two credits</b> are awarded where the Heat Loss Parameter taken directly from the Standard Assessment Procedure (SAP) 2005 worksheets for each home and averaged for the whole development is:  <b>Credits:</b> 1 2 New Build (W/m <sup>2</sup> K): ≤1.3 ≤1.1	2	0	Although improvement on the building fabric will be achieved in line with Part L 1B, no credit can be achieved for the heat loss parameter of the dwellings.		
Ene 3	Drying Space	<b>One credit</b> is awarded where an internal or external space is provided to hold 6m line for 3+bedspaces and 4m line for 1-2 bedspaces: <ul style="list-style-type: none"> <li>private or communal garden or balcony with posts, footings and fixings for drying line;</li> <li>an i) unheated and natural ventilated or ii) heated and passive vent or humidistat controlled ventilation with fixings to hold drying line.</li> </ul> Drying space should not prevent the intended use of the space/room.	1	1	The credit will be achieved through the specification of drying line in the bathrooms.		
Ene 4	EcoLabelled Goods	<b>One credit</b> is awarded where the fridges, freezers and fridge/freezers have an A+ rating under the EU Energy Efficiency Labelling Scheme. <b>One credit</b> is awarded where the washing machines and dishwashers have an A rating and where the washer dryers and tumblers dryers have a B rating. If no white goods are provided, <b>one credit</b> is awarded where information about the EU Energy Efficiency Labelling Scheme, covering what the energy labels are and how they work, is supplied to the occupier.	2	2	Two credits will be achieved through the provision of energy efficient white goods.		
Ene 5	Internal Lighting	Up to <b>two credits</b> are awarded where a percentage of the fixed internal light fittings are dedicated energy efficient fittings (which comprise of the lamp, control gear, and an appropriate housing, reflector, shade or diffuser) and can only be fitted with lamps of a luminous efficacy greater than 40 lumens per circuit Watt.  <b>Credits:</b> 1 2 Percentage of dedicated energy efficient fittings: 40 75	2	1	Efficient internal lighting will be specified for more than 75 % of all dwellings.		
Ene 6	External Lighting	<b>One credit</b> is awarded where all space lighting fittings are specifically designed to accommodate only compact fluorescent lamps (CFL) luminaires or strip lights and have sockets that only accept lamps with an efficacy greater than 40 lumens per circuit watt.  Fittings in external communal areas must be equipped with dedicated fluorescent fittings or more efficient luminaires and must be controlled by a timelock or daylight sensor. Fittings in internal communal areas must be equipped with dedicated fluorescent fittings controlled by push button time switches/occupant sensors or equivalent  <b>One credit</b> is awarded where all security light fittings are designed for energy efficiency and where all specified security light fittings: <ul style="list-style-type: none"> <li>Have a maximum wattage of 150W and are fitted with movement detecting shut-off devices (PIR) and a daylight cut-off devices;</li> <li>OR</li> <li>Only accommodate lamps with an efficacy greater than 40 lumens per circuit watt and are fitted with dawn-to-dusk sensors or timers.</li> </ul>	2	2	The external lighting design and controls will allow the achievement of both credits.		

Transport					
Tra 1	Public Transport	<p>Up to two credits are awarded where 80% of the development is provided with a safe walking route to a transport node providing a service to a local centre, town, city or a major transport node at peak (07:30-10:00 and 17:00-19:00 from Monday to Friday) and off-peak times (07:00 and 22:00 from Monday to Saturday)</p> <p><b>One credit:</b> transport within 1000m, frequency 30mins peak and 60mins off-peak</p> <p><b>Two credits:</b> transport within 500m, frequency 15mins peak and 30mins off-peak</p> <p>For rural locations credits up to two credits can be awarded on the basis of off-peak times only. The two credits are awarded automatically if a community bus service is in place which operates at the request of the residents.</p>	2	2	The development is located within close proximity of frequent buses.
Tra 2	Cycle Storage	<p><b>One or two credits</b> are awarded if 50% or 95% of dwellings, respectively, have safe and weather-proof storage provision for:</p> <p>One cycle (200mm x 75mm) for 1 and 2 bedspaces; Two cycles (200mm x 150mm) for 3 bedspaces; Four cycles (200mm x 250mm) for 4 + bedspaces.</p> <p>Space can be provided in sheds, garages and other spaces where the intended use is not hindered. Communal storage must be provided at the same rate and must be located within 100m of the entrance to the block.</p>	2	0	Compliant - cycling space will be provided however they might not be sufficient to allow the achievement of these credits.
Tra 3	Local Amenities	<p><b>One credit</b> is awarded where 80% of the development is within 500m of a food shop and a post box.</p> <p><b>One credit</b> is awarded where 80% of the development is within 1000m of 5 of the following amenities: postal facility, bank/cash, pharmacy, primary school, medical centre, leisure centre, community centre, place of worship, public house, children's play area, outdoor open access public area, food shop (greater than 500m from the development).</p> <p><b>One credit</b> is awarded where safe pedestrian routes to the local amenities is provided and where one of the two previous credits has been achieved.</p> <p><i>All distances must be measured along pedestrian routes .</i></p>	3	2	A food shop and a postbox will be present on site. The third credit is considered challenging for the site.
Tra 4	Home Office	<p><b>One credit</b> is awarded where space and services are provided in a quiet room allowing the occupants to set up a home office. The room should have a minimum size of 1.8m* wall length, a window, ventilation, two double sockets and two telephone points or access to a cable network, broadband or similar.</p>	1	1	A compliant home office will be incorporated into all dwelling types.

Water															
Wat 1	Internal Potable Water Use	<p>Up to <b>5 credits</b> are awarded based on the BREEAM water consumption calculator. The credits are awarded as follows:</p> <p><b>Credits:</b></p> <p>Water consumption (m<sup>3</sup>/bedspace/year):</p> <table border="1"> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>≤52</td> <td>≤47</td> <td>≤42</td> <td>≤37</td> <td>≤32</td> </tr> </table>	1	2	3	4	5	≤52	≤47	≤42	≤37	≤32	5	3	<p>This water consumption level will be achieved through the specification of water efficient fittings such as dual flush WCs, low flow taps and showers (such as aerated showers), small baths, and water efficient appliances.</p>
1	2	3	4	5											
≤52	≤47	≤42	≤37	≤32											
Wat 2	External Potable Water Use	<p><b>One credit</b> is awarded where a water butt, with a lid, tap and automatic overflow, is fitted to the rainwater downpipe at a rate of:</p> <ul style="list-style-type: none"> <li>at least 100 litres for individual patios and terraces;</li> <li>150 litres for one or two bedrooms homes with private garden;</li> <li>200 litres for 3+ bedrooms with private garden.</li> </ul>	1	1	<p>This credit will simply and economically achieved by installing an appropriate water butt in all communal gardens.</p>										

Materials and Waste					
Mat 1	<p>Environmental Impact of Materials</p> <p>Up to <b>16 credits</b> are awarded where an 'A' rating from the Green Guide for Housing Specification is obtained, for 80% by area of the element, for each of the following elements of all dwellings:</p> <ul style="list-style-type: none"> <li>• Roof (3 credits available);</li> <li>• External walls (3 credits available);</li> <li>• Internal walls: party walls and internal partitions (3 credits available);</li> <li>• Floors: upper and ground floor (3 credits available);</li> <li>• Windows (2 credits available);</li> <li>• External Surfacing: driveways, paths and patios (1 credit available);</li> <li>• Boundary protection (1 credit available).</li> </ul>	16	8	B or more credits will be achieved for the development due to the specification of A rated material and the re-use of a lot of materials.	
Mat 2	<p>Responsible Sourcing of Materials: Basic Building Elements</p> <p>Up to <b>6 credits</b> are awarded where responsibly sourced materials are used for at least 80% of the major building elements; roof, frame, external and internal walls, ground and upper floors, foundations/substructures, staircase.</p> <p>Responsible sourcing methods include Environmental Management Systems at extraction and process stages and timber certification.</p>	6	4	Suppliers of materials will be required to hold appropriate environmental certification. For timber this includes certification such as FSC (Forest Stewardship Council), concrete manufactures' ma hold BECS6001 certification, and for other materials ISO14001 certification for the extraction and process stages. An increasing number of manufactures now hold these certifications as standard.	
Mat 3	<p>Responsible Sourcing of Materials: Finishing Elements</p> <p>Up to <b>3 credits</b> are awarded where responsibly sourced materials are used for at least 80% of the secondary building and finishing elements; stairs, windows, external and internal doors, skirting, panelling, furniture, facias and any other significant use. Responsible sourcing methods include Environmental Management Systems at extraction and process stages and timber certification.</p>	3	1	As above	
Mat 4	<p>Recycling Facilities</p> <p><b>Two credits</b> are awarded where:</p> <ul style="list-style-type: none"> <li>• three dedicated internal storage bins are provided, with minimum total capacity of 60 litres and minimum individual bin capacity of 15 litres</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• three dedicated external covered bins are provided within 2m of an external door, with a minimum total capacity of 180 litres and minimum individual bin capacity of 40 litres</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• a local authority collection scheme for recyclable material is provided or will be provided within one year of the completion date.</li> </ul> <p><b>Six credits</b> are awarded where:</p> <ul style="list-style-type: none"> <li>• three dedicated internal storage bins are provided, with minimum total capacity of 30 litres and minimum individual bin capacity of 7 litres</li> </ul> <p>AND EITHER</p> <ul style="list-style-type: none"> <li>• three dedicated external covered bins are provided within 10m of an external door, with a minimum total capacity of 180 litres and minimum individual bin capacity of 40 litres</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• a local authority collection scheme for recyclable material is provided or will be provided within one year of the completion date.</li> </ul>	6	6	The draft operational waste management plan for the site developed by Atkins has been tailored to ensure these credits are met.	

Land Use and Ecology					
Eco 1	Ecological Value of Site	One credit is awarded where the construction zone is defined as a land of inherently low ecological value, either with the EcoHomes checklist or by a suitable qualified ecologist) - who must state in an ecological report that the land being developed is of low or insignificant ecological value or that the land will remain undisturbed by the construction works in areas of ecological value and where existing ecological features are protected during construction.	1	0	This credit is not achievable for the site as the site is on a not on a land of low ecological value.
Eco 2	Ecological Enhancement	One credit is awarded where a suitably qualified ecologist is appointed and where all their key recommendations and 30% of their additional recommendations on the enhancement of the site ecology are followed.	1	1	An ecologist is employed and its recommendation for ecological enhancement will be incorporated into the design.
Eco 3	Protection of Ecological Features	One credit is awarded where all existing features of ecological value on the site and boundary area are adequately protected* from damage during clearance, preparation and construction work. A feature can be removed if a suitably qualified ecologist has confirmed it has no significant ecological value. The credit is awarded by default if credit Eco 1 is awarded. <i>*Protection must comply with and exceed current EU and UK legislation relating to protected species and habitats applicable to the development site.</i>	1	0	This credit is unlikely to be achievable for the site due to the removal of some ecological features - the ecologist will advise further on whether potentially one credit could be achieved.
Eco 4	Change of Ecological Value of Site	Up to four credits are awarded where the change in the ecological value of the site (as defined by the assessor's calculator tool or by an appropriate qualified ecologist) is: <b>Credits:</b> 1 2 3 4 Change of ecological value: -9.5 ≤ -3 -3.5 ≤ +3 +3.5 ≤ +9 +9.5 (Species)	4	3	A positive enhancement of the site is expected through the specification of several new features on the site.
Eco 5	Building Footprint	One credit is awarded where the total combined floor area to footprint ratio for all houses and all flats on the site is greater than 2.5:1 and 3.5:1 respectively. Two credits are awarded where the total combined floor area: footprint ratio for all dwellings on the site is greater than 3.5:1.	2	0	The site layout do not allow for any credit to be achieved.

Pollution																	
Pol 1	Insulant GWP	<p><b>One credit</b> is awarded where insulants specified for the roof, the internal and external walls, the floor including foundations, the hot water cylinder, the pipe insulation and other thermal store have an Ozone Depleting Potential (ODP) of zero and a Global Warming Potential (GWP) of 5 or less in either manufacture or composition.</p>	1	1	This credit will be achieved through careful specification of insulants.												
Pol 2	NO <sub>x</sub> Emissions	<p>Up to three credits are awarded where the maximum dry NO<sub>x</sub> emission arising from operation of space heating and hot water systems across 95% of dwellings throughout the development estimated under normal operating conditions are:</p> <p><b>Credits:</b></p> <table border="1"> <tr> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>Maximum dry NO<sub>x</sub> emission at 0% excess O<sub>2</sub> (mg/kWh):</td> <td>≤ 100</td> <td>≤ 70</td> </tr> <tr> <td>Boiler Class (BS EN 297:1994):</td> <td>4</td> <td>5</td> </tr> <tr> <td></td> <td>above</td> <td>above</td> </tr> </table>	1	2	3	Maximum dry NO <sub>x</sub> emission at 0% excess O <sub>2</sub> (mg/kWh):	≤ 100	≤ 70	Boiler Class (BS EN 297:1994):	4	5		above	above	3	2	The specified class 5 gas boiler will lead to the achievement of 2 credits.
1	2	3															
Maximum dry NO <sub>x</sub> emission at 0% excess O <sub>2</sub> (mg/kWh):	≤ 100	≤ 70															
Boiler Class (BS EN 297:1994):	4	5															
	above	above															
Pol 3	Reduction of Surface Runoff	<p><b>One credit</b> is awarded where rainwater holding facilities and/or sustainable drainage techniques are used to provide attenuation of water run-off to either natural watercourses and/or municipal drainage systems and achieve attenuation by 50% in areas of low probability of flooding, 75% in areas of medium flood risk and 100% in areas of high flood risk (or 75% in area with high flood risk which had been previously occupied by buildings or hard surface), at peak times from hard surfaces or roofs.</p> <p><b>Two credits</b> are awarded if the facilities provide the adequate attenuation from hard surfaces and roofs.</p>	2	1	SUD will be used to attenuate water run-off from hard surface or roofs.												
Pol 4	Renewable and Low Emission Energy Source	<p><b>One credit</b> is awarded where a feasibility study has been commissioned or undertaken at the RIBA stage C to establish the most appropriate renewable and/or low emission energy source for the development, and where a renewable and/or low emission technology has been specified in line with the recommendations of the study.</p> <p><b>A second credit</b> is awarded where a 'local' renewable and/or low emission energy technology is specified to provide the development with at least 10% of its total energy demand (kWh), in line with the recommendation of the feasibility study.</p> <p><b>A third credit</b> is awarded where the 'local' renewable and/or low emission energy technology specified for the development provides at least 15% of the total energy demand.</p>	3	1	A feasibility study has been carried out recommending PV as the main renewable technology to be installed for Broomfield House. This has been incorporated in the proposed design.												
Pol 5	Flood Risk	<p><b>One credit</b> is awarded where the development is located in a zone defined as having a medium annual probability of flooding and the ground level of the building, car parking and access is at least 600mm above the design flood level for the site's location.</p> <p><b>Two credits</b> are awarded where the development is located in a zone defined as having a low annual probability of flooding.</p>	2	2	The site is in an area of low floor risk therefore two credits can be targeted .												

<b>Total score</b>	<b>61.54%</b>
<b>Ecomes Level</b>	<b>Very Good</b>

**10.2 Appendix B – Code for Sustainable Homes Pre-Assessment checklist**

Section	Credit description	Total Available credits	Targeted credits - Level 4	Mandatory score for Level 4	Comments
Energy					
Env 1	<p>Credits for percentage improvement over Building Regulations Approved Document L (2010) - Conservation of Fuel &amp; Power, calculated using SAP-2009. There are additional requirements for level 5.</p> <p>%Improvement: 6 10 25 36 47 59 72 85 100 Zero Carbon Points awarded: 1 2 3 4 5 6 7 8 9 10</p>	10	4	3	<p>This credit is a mandatory standard for levels 4, 5 or 6 of Code achievement.</p> <p>Level 4 - 25% improvement over Building Regulations (3 points)</p> <p>Energy modeling has been carried out on typical dwellings, and 46% improvement over Building Regulations should be achieved based on the following energy good energy efficiency features:</p> <ul style="list-style-type: none"> <li>U wall: 0.12 W/m2K</li> <li>U roof: 0.10 W/m2K</li> <li>Upgraded floor: 0.13 W/m2K</li> <li>U windows and rooflights: 0.8 W/m2K</li> <li>Air tightness: 4 m3/m2 @ 50 Pa</li> </ul> <p>and the specification of 100% - 0.450 of PV on each dwelling.</p> <p>4 credits are therefore confidently targeted.</p>
Env 2	<p>Up to 9 credits awarded where thermal performance based on the Fabric Energy Efficiency (FEE, from SAP 2010) method meets the following requirements:</p> <p>FEE (W/m2K): Apartment Blocks &amp; M5a Terrace: 48 45 43 41 39 38 32 FEE (W/m2K): Det-Towna Serv &amp; attached: 60 55 52 49 46 42 38 Points awarded: 3 4 5 6 7 8 9</p>	9	3	-	<p>The preliminary energy modeling carried out on typical dwellings shows that a Fabric Energy Efficiency (FEE) value of 50.9 W/m2K/year is achieved based on the very good energy efficiency features of the development.</p> <p>A score of 3 out of 9 is therefore confidently targeted.</p>
Env 3	<p>Where current electricity OR primary heating fuel consumption data are displayed to occupants by a correctly specified energy display device. 1 Credit</p> <p>Where current electricity AND primary heating fuel consumption data are displayed to occupants by a correctly specified energy display device. 2 Credits</p> <p>Default Class</p> <p>Where electricity is the primary heating fuel and current electricity consumption data are displayed to occupants by a correctly specified energy display device. 2 Credits</p>	2	2	-	<p>Current electricity and primary heating fuel consumption data will be displayed to occupants by a correctly specified energy display device.</p>
Env 4	<p>Where space with pots and lockers or large capable of holding items of drying line for 1-2 bed dwellings, and one of drying line for 3+ bed dwellings, is provided for drying clothes. This space (internal or external) should be secure.</p>	1	1	-	<p>The credit will be achieved through the specification of rotary lines to dwellings with private gardens.</p>
Env 5	<p>EITHER where flags, features and fittings have an A+ rating under the EU Energy Efficiency Labeling Scheme; AND/OR Second point where washing machines and dishwashers have an A rating under the EU Energy Efficiency Labeling Scheme; AND And water driers and tumble driers have a B rating; OR One point if no white goods are provided, information on the EU Energy Efficiency Labeling Scheme of efficient white goods is provided to each dwelling.</p>	2	2	-	<p>Two credits will be achieved through the provision of energy efficient white goods.</p>
Env 6	<p>One point where all external space lighting, including lighting in common areas, is provided by dedicated energy efficient fittings, taking into account the following criteria: - All fittings are LED - Note: Standby safety lighting is not covered by this requirement. AND Second point where all security light fittings are designed for energy efficiency and are controlled such that: - a minimum wattage of 150W AND - movement detecting control devices (PIR), AND - daylight cut-off sensors. All other security lighting - is dedicated energy efficient fittings AND - is fitted with daylight cut-off sensors OR timers.</p>	2	2	-	<p>The external lighting design and controls will allow the achievement of both credits.</p>
Env 7	<p>Where energy is supplied from local renewable or low carbon energy sources funded under the Low Carbon Building Programme (or similar), or is designed and installed in a manner endorsed by a feasibility study prepared by an independent energy specialist. AND One point where there is a 10% reduction in carbon emissions as a result of the method of supply. OR Two points where there is a 15% reduction in carbon emissions as a result of the method of supply.</p>	2	1	-	<p>The BWP PV panels on each dwelling, should lead to CO2 emission reduction between 14-17% , therefore 1-2 credits will be achieved.</p>

Section	Credit description	Total Available credits	Targeted credit - Level 4	Mandatory score for Level 4	Comments
Env 3	<p>Cycle Storage</p> <p>Where either individual or communal cycle storage is provided that is adequate, secure and well-located for the following number of cycles:</p> <p>One point</p> <ul style="list-style-type: none"> <li>- Studio or 1 bedroom dwelling – 1 cycle for every two dwellings (only applicable to communal storage);</li> <li>- 2 and 3 bedroom dwellings – storage for 1 cycle;</li> <li>- 4 bedrooms and above – storage for 2 cycles.</li> </ul> <p>Two points</p> <ul style="list-style-type: none"> <li>- Studio or 1 bedroom dwellings – storage for 1 cycle;</li> <li>- 2 and 3 bedroom dwellings – storage for 2 cycles;</li> <li>- 4 bedrooms and above – storage for 4 cycles.</li> </ul> <p>Note: The requirements for secure cycle storage are met where compliance with clause 35 of Secured by Design (SBD) (New Homes 2010) is achieved.</p>	2	2	-	Cycle storage will be provided through incorporation of a shed. This will provide compliant cycling space for 2 bikes per studio garden cottage.
Env 3	<p>Home Office</p> <p>Where sufficient space and services have been provided which allow the occupants to set up a home office in a suitable quiet room:</p> <ul style="list-style-type: none"> <li>- 1.5m x 1m net length for desk and filing cabinet/drawers;</li> <li>- 2. double power sockets;</li> <li>- 2 telephone points or a double point, or 1 if the dwelling is connected to broadband;</li> <li>- window;</li> <li>- The space allocated for use as a home office must have adequate ventilation and achieve an average daylight factor of 1.5%.</li> </ul>	1	1	-	A compliant home office will be incorporated through dwelling layout.
<b>Total</b>		<b>31</b>	<b>18</b>		
<b>Section weighting</b>		<b>38.4%</b>			
<b>Weighted score</b>			<b>21.14%</b>		

Section	Credit description	Total Available credits	Targeted credit - Level 4	Mandatory score for Level 4	Comments
Water					
Wat 1	<p>Reduce Water use</p> <p>Predicted average household water consumption (calculated using the Water Efficiency Calculator for New Dwellings) for the dwelling type.</p> <p>Consumption limit: 120 110 105 90 80</p> <p>Points awarded: 1 2 3 4 5</p>	5	3	3	This credit is a mandatory standard for each level of Code achievement. Levels 3 and 4 – maximum 104 lpcd This level will be achieved through the specification of water efficient fittings such as dual flush WCs, low flow taps and showers (such as sensor showers), small baths, and water efficient appliances.
Wat 2	<p>Reduce Water Use</p> <p>One point where a certified specified system to collect rainwater for external/indoor irrigation use has been provided to a dwelling with a garden, patio or communal garden space (examples of such systems include rainwater butts and central rainwater collection systems).</p> <p>If no individual or communal garden spaces are specified or if only balconies are provided, the credit can be awarded by default.</p> <p>If a rainwater butt or other large water consuming feature is present, it must be provided with 100% rainwater or greywater, to BSU leading water demands.</p>	1	1	-	This credit will simply and economically be achieved by installing an appropriate water butt in all private gardens.
<b>Total</b>		<b>6</b>	<b>4</b>		
<b>Section weighting</b>		<b>8.0%</b>			
<b>Weighted score</b>			<b>6.00%</b>		

# Broomfield House Development Environmental & Sustainability Strategy Statement



Section	Credit description	Total Available credits	Targeted credits - Level 4	Mandatory score for Level 4	Comments
<b>Materiality</b> Mat 1	Where at least three of the following five key elements achieve a relevant Green Guide rating from the 2015 version of The Green Guide of A+ to D: - External Walls - Internal Walls (including separating walls) - Upper and Ground Floors (including separating floors) - Windows The CSI Materials Calculator is used to assess the number of credits awarded for the five key elements described above.	15	11	-	The credit holds a mandatory standard for at least 4 elements to be D rated or better. The credit is awarded for A and A+ ratings where possible, with reference to <a href="http://www.bregoguide.co.uk">www.bregoguide.co.uk</a> , a resource that is available to everyone. The list below is an example of how a standard dwelling might achieve points in this section: 5.1.1 Ground floors - The following B rated material specification is proposed: Based on insulation laid on ground beam and dense solid block flooring - Element Number - 820140232 5.1.1 Upper floors - The specification of the upper floors is under discussion 5.1.2 floor - The following A rated material specification is proposed: Non-rigid timber panel system with CO2CO each side, ceiling ceiling, counterpanels, battens and UK produced dry plain tiles - Element Number - 820140000 5.1.3 External Walls - The following A+ rated material specification is proposed: Blockwork outer leaf, insulation, medium density solid blockwork inner leaf, connections masonry, plasterboard on battens, paint - Element Number - 825170207 5.1.4 Internal Walls - The following A+ rated material specification is proposed: Timber stud, plasterboard, paint - Element Number - 820782223 5.1.5 Party walls - The specification of the party walls is under discussion. 5.1.6 Windows - The following A+ rated material specification is proposed: Double hardened uPVC, double glazed, water based film (79/645) - Element Number - 813100008 It is anticipated that 10-13 points will be achieved for the new dwellings for the Code for Sustainable Homes assessment credit Mat 1: External Walls - A+ - 3 points Roof A - 2 points Ground floor and upper floor - B - 1 point (upper floor rating to be clarified) Internal and Part walls - A+ - 3 points (party wall rating to be clarified) Windows - A+ - 3 points
Mat 2	Where 50% of the assessed materials in the following Building Elements are responsibly sourced: A. Frame; B. Ground floor; C. Upper floor (including separating floors); D. External walls; E. Internal walls (including separating walls); F. Foundations/structure; G. Services. Additionally, 100% of any timber in these elements must be legally sourced. The CSI Materials Calculator is used to assess the number of credits awarded for the five key elements described above.	6	4	-	Suppliers of materials will be required to hold appropriate environmental certification. For timber this includes certification such as FSC (Forest Stewardship Council), concrete manufacturers must hold ISO9001 certification, and for other materials ISO14001 certification for the extraction and process stages. An increasing number of manufacturers now hold these certifications as standard.
Mat 3	Where 50% of the assessed materials in the following Finishing Elements are responsibly sourced: A. Door; B. Window; C. External & Internal door; D. Skirting; E. Paneling; F. Furniture; G. Floor coverings; H. Appliances; I. Air conditioning equipment. Additionally, 100% of any timber in these elements must be legally sourced. The CSI Materials Calculator is used to assess the number of credits awarded for the five key elements described above.	3	2	-	As for Mat 2 above.
Total Section weighting		24	17		
Weighted score		7.2%	5.15%		

# Broomfield House Development Environmental & Sustainability Strategy Statement



Section	Credit description	Total Available credits	Targeted credits - Level 4	Mandatory score for Level 4	Comments
<b>Surface Runoff</b>					
Str 1	<p>Management of Surface Water Run-off from Developments</p> <p>Two points for using SUDS to improve water quality of the rainwater discharged or for protecting the quality of the receiving water by:</p> <ol style="list-style-type: none"> <li>Ensuring no discharge to the watercourse for matter deeper up to 50mm (follow guidance in the Inform Code of Practice for Sustainable Drainage Systems - CIRIA, 2004)</li> <li>The run-off from all hard surfaces shall receive an appropriate level of treatment in accordance with The SUDS Manual to minimise the risk of pollution.</li> </ol>	2	2	-	The credit has a mandatory standard for ensuring that peak run-off rates and annual volumes of run-off post development will be no greater than the previous conditions for the site. These credits will be achieved for the site.
Str 2	<p>Flood Risk</p> <p>CR - Low points - low annual probability of flooding  CR - One route - medium/high annual probability of flooding (subject to them being approved by the relevant statutory bodies) and where the ground level of all dwellings, access routes to the ground level and the site must be designed so they are at least 500mm above the design flood level of the flood zone in which the intended development is located.  CR - Where the development has been permitted even though the ground levels of the topography/infrastructure immediately adjacent to the site lie below the 500mm threshold, the credit can still be awarded, provided:  - there are no other practical solutions for site access above this level  - safe access to the site and the dwellings can still be provided by raising both the access and the lowest occupied rooms to at least 500mm above the relevant flood level.  CR - Undertake an assessment of how the building and its contents will need to be protected from flooding and where necessary, use flood resilient construction to mitigate risk.  CR - Maintained flood defences are in place  CR - Flood resilient measures are used to reduce risk to the development, e.g. flood storage  CR - Flood resilient measures are used to reduce risk to the development, e.g. flood storage  In all cases, credits will be withheld if the criteria set out in the Inform Code of Practice for Sustainable Drainage Systems are not met or the performance of functional flood plans, elsewhere</p>	2	2	-	The site is in an area of low flood risk therefore two credits can be assigned.
<b>Total</b>		<b>4</b>	<b>4</b>		
<b>Section weighting</b>		<b>2.5%</b>			
<b>Weighted score</b>			<b>2.50%</b>		

# Broomfield House Development Environmental & Sustainability Strategy Statement



Section	Credit description	Total Available credits	Targeted credits - Level 4	Mandatory score for Level 4	Comments
Waste					
Waste 1	<p><b>Household Waste Storage and Recycling Facilities</b></p> <p><b>Minimum Standard:</b> An adequate external space should be allocated for waste storage and used to accommodate containers according to the layout of the following two options:  <ul style="list-style-type: none"> <li>- The minimum volume recommended by British Standard 5522 (British Standards Institution, 2005) based on a maximum collection frequency of once per week. This volume is 100 litres for a single bedroom dwelling, with a further 70 litres for each additional bedroom.</li> <li>- The total volume of the external waste containers provided by the Local Authority.</li> </ul>           The total volume of the external waste containers provided by the Local Authority should be at least 10% of the total floor area of the development. This total volume must be a combination of adequate in-house storage plus either a Local Authority Collection Scheme or external storage consisting of:            EITHER: Three external storage bins for recyclable waste:  <ul style="list-style-type: none"> <li>- with a minimum total capacity of 50 litres;</li> <li>- where no individual bin is smaller than 7 litres;</li> <li>- located in an Adequate external space;</li> </ul>           OR:            Four prisms where the above is achieved AND            EITHER:  <ul style="list-style-type: none"> <li>- provision of adequate external storage space for bins plus a Local Authority scheme collecting at least three types of recyclable waste;</li> <li>- OR</li> <li>- For individual dwellings: an adequate external space for storing three external bins (as specified below) for recyclable waste:  <ul style="list-style-type: none"> <li>- a minimum total capacity of 100 litres;</li> <li>- no individual bin smaller than 40 litres;</li> <li>- located within 10m of an external door;</li> </ul> </li> <li>- OR</li> <li>- For blocks of flats, a prism recycling scheme operator is appointed to maintain the bins and collect recyclable waste on a regular basis. The recycling containers must:  <ul style="list-style-type: none"> <li>- be located within 10m of an external space;</li> <li>- be sized dependent on the frequency of collection, based on guidance from the recycling scheme operator;</li> <li>- store at least 3 types of recyclable waste;</li> <li>- be located within 5cm of an external door.</li> </ul> </li> </ul> </p>	4	4	-	The client operational waste management plan for the site developed by Adams has been tailored to ensure these credits are met.
Waste 2	<p><b>Minimising Construction Waste</b></p> <p><b>Client:</b> There is a completed Site Waste Management Plan (SWMP) that includes:            a. Target benchmarks for resource efficiency (i.e. m<sup>3</sup> of waste per 100 m<sup>2</sup> of floors of waste per 100 m<sup>2</sup> wall) in accordance with best practice waste groups and commitments to minimise non-hazardous construction waste at design stage, specify waste minimisation actions relating to at least 3 waste groups and support them by appropriate working of waste.            b. Procedures for minimising hazardous waste            c. Monitoring, measuring and reporting of hazardous and non-hazardous site waste production according to the defined waste groups (according to the waste streams generated by the scope of the works)  <b>Designing Waste from Landfill</b>            Where there is a completed Site Waste Management Plan (SWMP) including procedures and commitments to sort and divert waste from landfill through either:            a. Re-use on site (in situ) or for new applications            b. Re-use on other sites            c. Salvage/dismantle for re-use            d. Return to the supplier via a 'take-back' scheme            e. Recovery and recycling using an approved waste management contractor            f. Compost            g. Energy to be derived waste groups (in line with the waste streams generated by the scope of the works).            One of the following has been achieved:            CR Where at least 50% by weight or by volume of non-hazardous construction waste generated by the project has been diverted from landfill. 2 Credits            CR Where at least 100% by weight or by volume of non-hazardous construction waste generated by the project has been diverted from landfill. 3 Credits</p>	3	3	-	The client construction waste management plan for the site developed by Adams has been tailored to ensure these credits are met.
Waste 3	<p><b>Composting</b></p> <p>One point where individual home composting facilities are provided:            CR Where at least 5% of dwellings have a dedicated composting space within 5cm of the external door, where Local Authority run or where there is a management plan in place            CR            All facilities must be in a dedicated position and be accessible to disabled people.</p>	1	1	-	A compost bin will be provided in all private gardens.
		<b>Total</b>	<b>8</b>	<b>8</b>	
		<b>Section weighting</b>	<b>8.4%</b>	<b>8.40%</b>	

# Broomfield House Development Environmental & Sustainability Strategy Statement



section	Credit description	Total Available credits	Targeted credits - Level 4	Mandatory score for Level 4	Comments									
<b>Pollution</b>														
Pw 1	<p>Global Warming Potential (GWP) of Insulation</p> <p>All elements listed below have a GWP of less than 5 in their manufacture and installation or we claimed to satisfy the requirement:</p> <ul style="list-style-type: none"> <li>-Roofs, including loft access;</li> <li>- Walls, internal and external including details and all acoustic insulation;</li> <li>- Windows, doors and external cladding;</li> <li>- Hot water cylinder, pipe insulation and other thermal stores;</li> <li>- Cold water storage tanks where provided;</li> <li>- External Doors.</li> </ul>	1	1	-	The credit will be achieved through careful specification of materials.									
Pw 2	<p>NOx Emissions</p> <p>NOx (NO<sub>2</sub> level (mg/m<sup>3</sup>)) Boiler class (BS EN 257: 1994)</p> <table border="1"> <tr> <td>5 100</td> <td>4</td> <td>1</td> </tr> <tr> <td>5 70</td> <td>5</td> <td>2</td> </tr> <tr> <td>5 40</td> <td>-</td> <td>3</td> </tr> </table> <p>Credits</p>	5 100	4	1	5 70	5	2	5 40	-	3	3	2	-	The specified class 5 gas boiler will lead to the achievement of 2 credits.
5 100	4	1												
5 70	5	2												
5 40	-	3												
<b>Total section weighting</b>		<b>4</b>	<b>3</b>											
		<b>2.8%</b>	<b>2.10%</b>											

# Broomfield House Development Environmental & Sustainability Strategy Statement



Section	Credit description	Total Available credits	Targeted credits - Level 4	Mandatory score for Level 4	Comments
<b>Health and Wellbeing</b>					
Item 1	<p><b>Daylight</b></p> <p>One point: Architects must achieve a minimum average daylight factor of at least 2%.</p> <p>Second point: All living rooms, dining rooms and studies (including any room designated as a home office) must have a minimum average daylight factor of at least 1.5%.</p> <p>Third point: 60% of the working plans in kitchens, living rooms, dining rooms and studies (including any room designated as a home office) must have a view of the sky.</p>	3	3	-	Very good daylight penetration and view of the sky will be achieved in all dwellings. 3 credits are expected to be achieved.
Item 2	<p><b>Sound insulation</b></p> <p>A commitment to:</p> <ul style="list-style-type: none"> <li>One point: Carry out a programme of pre-completion testing based on the Normal programme of testing described in Approved Document E for every group or sub-group of houses or flats, and to achieve airborne sound insulation values that are at least 5dB higher, and impact sound insulation values that are at least 3dB lower, than the performance standards set out in the Building Regulations for England and Wales, Approved Document E (2003 Edition, with amendments 2004).</li> <li>Two points: Carry out a programme of pre-completion testing based on the Normal programme of testing described in Approved Document E for every group or sub-group of houses or flats, and to achieve airborne sound insulation values that are at least 5dB higher, and impact sound insulation values that are at least 5dB lower, than the performance standards set out in the Building Regulations for England and Wales, Approved Document E (2003 Edition, with amendments 2004).</li> </ul> <p>A commitment to use constructions for all relevant building elements that have been assessed and approved by Robur Details Limited, and found to meet the performance standards.</p> <p>This includes a programme of pre-completion testing based on the Normal programme of testing described in Approved Document E for every group or sub-group of houses or flats, and to achieve airborne sound insulation values that are at least 5dB higher, and impact sound insulation values that are at least 5dB lower, than the performance standards set out in the Building Regulations for England and Wales, Approved Document E (2003 Edition, with amendments 2004).</p> <p>A commitment to use constructions for all relevant building elements that have been assessed and approved by Robur Details Limited, and found to achieve the above performance standards.</p> <p>Four points: A commitment to carry out a programme of pre-completion testing based on the Normal programme of testing described in Approved Document E for every group or sub-group of houses or flats, and to achieve airborne sound insulation values that are at least 5dB higher, and impact sound insulation values that are at least 5dB lower, than the performance standards set out in the Building Regulations for England and Wales, Approved Document E (2003 Edition, with amendments 2004).</p> <p>A commitment to use constructions for all relevant building elements that have been assessed and approved by Robur Details Limited, and found to achieve the above performance standards.</p> <p>Default clause:</p> <p>Detached dwellings - 4 points.</p> <p>Attached dwellings where separating walls and floors only occur between non-habitable rooms - 2 points.</p>	4	4	-	These credits will be awarded by default for the detached dwellings. The required sound insulation levels will be achieved for the semi-detached and garden garden cottages.
Item 3	<p><b>Private Space</b></p> <p>Where outdoor space (private or semi-private) has been provided that is:</p> <ul style="list-style-type: none"> <li>- Of a minimum size that allows all occupants to use the space.</li> <li>- Provided with inclusive access and usability (Checklist DP).</li> <li>- Accessible only to occupants of designated dwellings.</li> </ul>	1	1	-	The credit will be achieved for all dwellings through the provision of private gardens.
Item 4	<p><b>Lifestyle Homes</b></p> <p>Where all the principles of Lifestyle Homes have been complied with.</p>	4	4	-	All the criteria of Lifestyle Homes will be complied with.
<b>Total</b>		<b>12</b>	<b>12</b>		
<b>Section weighting</b>		<b>14.0%</b>			
<b>Weighted score</b>			<b>14.00%</b>		

# Broomfield House Development Environmental & Sustainability Strategy Statement



Section	Credit description	Total Available credits	Targeted credits - Level 4	Mandatory score for Level 4	Comments
<b>Management</b>					
Man 1	Home User Guide Two points where a manufacturer Home User Guide, completed using Checklist Man 1 Part 1 together with information that the guide is available in alternative accessible formats. One additional point where the guide also covers information relating to the site and its surroundings, completed using Checklist Man 1 Part 2.	3	3	-	These credits will be simply and economically achieved through the provision of a booklet pack to all dwellings containing the required information about the dwelling and surroundings.
Man 2	Construction Site Management Two points where there is regular waste under a nationally or locally recognised independent certification scheme such as certification under the Construction Site Management Code of Practice. Two points where the contractor is to go significantly beyond best practice including a negative audit under a nationally or locally recognised independent certification scheme such as, or comparable to the Construction Contractors Scheme and a CCS score above 32.	2	2	-	This will be registered under the CCS scheme and a very good score is expected to be achieved due to very good environmental condition of the construction site.
Man 3	Construction Site Impacts One point: procedures that cover 2 or more of the following items: a. Monitor, report and set targets for CO2 production or energy use arising from site activities; b. Monitor and report CO2 or energy use arising from commercial transport to and from site; c. Monitor, report and set targets for water consumption from site activities; d. Adopt best practice practices in respect of air (dust) pollution arising from site activities; e. Adopt best practice practices in respect of water (ground and surface) pollution (counting on the site). 60% of one point is reclaimed, reused or responsibly sourced. Two points: where there are procedures that cover 4 or more of the items listed above.	2	2	-	The contractor will include the inclusion of these site management principles. It is expected that all points except potentially b will be achieved.
Man 4	Security Where an Architectural Liaison Officer (ALO) or Client Protection Design Advisor (CPDA) from the local police force is consulted at the design stage and their recommendations are incorporated into the design of the dwelling (an actual Security by Design Certificate is not required).	2	2	-	The advice of an ALO or CPDA, have been sought and the recommendations will be implemented in the proposed design.
<b>Total</b>		<b>9</b>	<b>9</b>		
<b>Section weighting</b>		<b>10.0%</b>			
<b>Weighted score</b>			<b>10.00%</b>		

# Broomfield House Development Environmental & Sustainability Strategy Statement



Section	Credit description	Total Available credits	Targeted credits - Level 4	Mandatory score for Level 4	Comments
Eco 1 Ecological Value of the Site	Where the development site is confirmed as being of inherently low ecological value EITHER: - By meeting the criteria for low ecological value (using Checklist Eco 1) OR - By being confirmed by a Suitably Qualified Ecologist. Where an independent ecological report of this site, prepared by a Suitably Qualified Ecologist, states that the construction zone is of low or insignificant ecological value and any loss of ecological value outside the construction zone but within the development site will remain offsettable by the construction work.	1	0	-	This credit is not achievable for this site as the site is on a list of low ecological value.
Eco 2 Ecological Enhancement	Where a Suitably Qualified Ecologist has been appointed to recommend appropriate ecological features that will positively enhance the ecology of the site. AND Where the developer adopts all key recommendations and 50% of additional recommendations.	1	1	-	An ecologist is employed and its recommendation for ecological enhancement will be incorporated into the design.
Eco 3 Protection of Ecological Features	Where all existing features of ecological value on the development site are identified as being of low ecological value in accordance with Eco 1 - Ecological Value of the Site and no features of ecological value have been identified. If a Suitably Qualified Ecologist has confirmed a feature can be removed due to insignificant ecological value or poor health/condition (e.g. damaged trees which require felling, either for health and safety or/and conservation reasons), the credit can be achieved provided all other features are adequately protected in accordance with the ecologist's recommendations.	1	0	-	This credit is unlikely to be achievable for this site due to the removal of some ecological features - the ecologist will advise further on whether potentially one credit could be achieved.
Eco 4 Change in Ecological Value of the Site	The ecological value before and after development is measured, and the overall change in species per hectare is: - Minor negative change between -0 and -3: One point - Neutral: Between -3 and +3: Two points - Minor enhancement: greater than +3: Three points - Major enhancement: greater than +3: Four points	4	3	-	A positive enhancement of the site is expected through the specification of several new features on the site.
Eco 5 Building Footprint	One point for houses: where the Net Internal Floor Area: Net Internal Ground Floor Area ratio is greater than 2.5:1 OR Blocks of flats: Where the Net Internal Floor Area: Net Internal Ground Floor Area is greater than 3:1 OR For a combination of houses and flats: a ratio of total Net Internal Floor Area: total ground floor area greater than the area weighted average of the two ratios above Two points for houses: Where the Net Internal Floor Area: Net Internal Ground Floor Area ratio is greater than 3:1 OR For blocks of flats: Where the Net Internal Floor Area: Net Internal Ground Floor Area is greater than 4:1 OR For a combination of houses and flats: a ratio of total Net Internal Floor Area: Total Ground Floor Area greater than the area weighted average of the two ratios above	2	0	-	The credits are not achievable for this site due to the fact the section garden cottages are only one storey.
<b>Total</b>		<b>8</b>	<b>4</b>		
<b>Section weighting</b>		<b>12.0%</b>			
<b>Weighted score</b>			<b>5.33%</b>		

Final Score	72.27%
CSH	Level 4