Intended for
Plot 4, First Street

Project no.
31204

Date
30 November 2012

PLOT 4, FIRST STREET

ENVIRONMENTAL STANDARDS STATEMENT

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Revision History

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-	30-11	Planning Issue	31204-ESS1	Issue for planning
A	05-12	Planning Issue	31204-ESS1-A	Incorporate client comments
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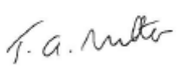
Prepared By



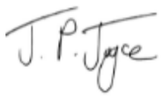
Andy Mutter
Principal Engineer

Reviewed By



Stuart Moses
Sustainability Engineer

Approved By



John Joyce
Director

Ramboll
3rd Floor
Kings Court
2-4 Exchange Street
St Mary's Gate
Manchester M2 7HA
United Kingdom

tel +44 (0)161 827 1890
fax +44 (0)161 819 5703
manchester@ramboll.co.uk

1. EXECUTIVE SUMMARY

1.1 General

The Environmental Standards Statement for the development of plot 4 First St demonstrates how the development will meet the objectives of section 4 of the Councils "Guide to Development in Manchester Supplementary Planning Document and Planning Guidance, Adopted April 2007".

All areas of the policy have been addressed in separate submissions with the exception of construction management where this has been dealt with in outline until the appointment of the principal contractor is made.

1.2 Energy Efficiency

Measures have been taken to reduce the energy demand of the building both in terms of the fixed elements and the appliances.

1.3 Renewable Energy

A centralised combined heat and power system has been included to exceed the required 15% reduction in carbon emissions.

1.4 Environmental design

The development is targeting BREEAM Very Good and a pre-assessment and workshops have been held.

1.5 Water Management and Weather resilience

A flood risk assessment has been undertaken and the development does not have exposure to flood risk and has minimum impact on the offsite Land.

1.6 Waste management

A waste strategy has been prepared for the development detailing the means of reducing waste during and post construction.

1.7 Construction management

The eventual contractor will be obliged to score in excess of 32 in the considerate constructors scheme that would address issues of site waste management etc. The origin and environmental credentials of the building materials have been covered within the BREEAM assessment and will be selected from the GREEN GUIDE aiming towards the A+ materials. All timber will be certified by the Forest Stewardship Council.

1.8 Biodiversity

The ecology of the site has been studied and recommendations made to ensure that the Councils policy is implemented.

1.9 Water ways

There are no waterways affected by the development.

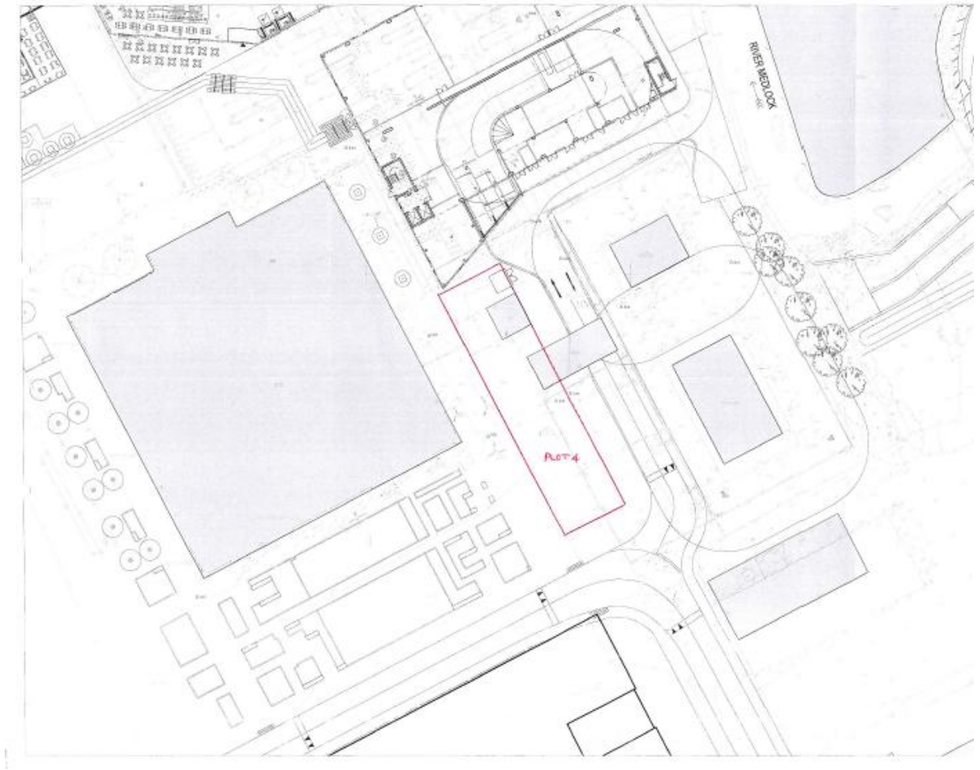
2. INTRODUCTION

This Environmental Standards Statement has been prepared to provide supplementary information for the planning submission in respect of Plot 4, First Street, Manchester and follows the guidance contained in the Environmental Standards section of Manchester City Council's (MCC) Document "Guide to Development in Manchester Supplementary Planning Document and Planning Guidance Adopted April 2007".

The guide makes reference to the Unitary Development Plan (UDP) policy documents. We understand that the UDP has now been superseded by the Local Development Framework document the "Core Strategy Development Plan Document" which was adopted in July 2012. The cross references within the April 2007 guidance will still be referred to in this Environmental Standard Statement and not those in the July 2012 document, we understand that transitional arrangements will be in place until the relevant supporting documents for the Local Development Framework are available (expected to be some time in 2013). This statement also addresses current relevant Core Strategy Policies

The project will comprise the demolition of any on-site structures and redevelopment of the site for 279 serviced apartments with ancillary reception area, gymnasium, lounges/meeting areas, plus ground floor commercial unit for uses with Class A1, A3 or A4, and associated cycle parking, servicing and access arrangements.

The site is constrained by the development of plots 1-3 and No. 1 First St.



The statement has been partly prepared based on separate documents submitted as part of the planning application as follows: -

A.1 Planning Application Drawings (GA's, Elevations) – 5 Plus Architects

A.2 Energy Strategy – Ramboll UK

A.3 BREEAM 2011 pre-assessment – Ramboll UK

A.4 Environmental Noise Study, ref P1459-REP01 rev B -MFP – Sol Acoustics

A.5 Flood Risk Assessment, First Street North, Plot 4, ref SS018716 – Capita Symonds

A.6 Plot 4 First Street, Waste Management Strategy November 2012 – 5 Plus Architects

A.7 Construction Management Approach – Carillion

A.8 First Street Habitat Survey Report, ref 100524 – Penny Anderson Associates

3. ENERGY EFFICIENCY

3.1 General

The guidance makes reference to UDP Part 1 Policy E1.5 and the need to encourage high standards of energy efficiency in new developments. We have demonstrated below the steps that we have taken to reduce energy demand at this stage in the design. A preliminary model of the building has been constructed within IES(Thermal simulation software) to assess the thermal comfort for occupants and JPA (SAP 2009 software) to determine the projected energy demands of the building.

3.2 Improved envelope performance

Although the site constraints restrict the opportunity to optimise the orientation and form of the building there have been assessments undertaken to rationalise the glazing and thermal weight of the structure to balance solar gain and daylight penetration.

The building envelope has been improved from typical details to provide for enhanced thermal performance of the walls, floor, roof and glazing. In addition the air leakage of the building will be tightly controlled at the envelope to ensure the building has a lower leakage rate than normally expected for the exposure and height of the building.

The junctions of the external wall system and the floor plates and internal partitions will be detailed with attention to reducing any thermal bridging.

The thermal mass of the building has been exposed where possible to aid in passive cooling of the structure to even out temperature rises and allow for the building to recover with night time ventilation.

3.3 Minimise Solar gain

Solar performing glass with low emissivity and solar shading coefficients reduce heat losses and gains, the window frames themselves will be of the thermally broken type to reduce the conduction between internal and external environments.

There will be a proportion of finned elements to the elevation treatment on the East and West facades, this will provide some shading thus slightly reducing solar gains but due to the East and West orientation the performance of these fins will be limited.

3.4 Specification of energy and water efficient appliances and systems

A boosted system of water delivery will use multiple variable speed pumps to match demand without running pumps unnecessarily.

Hot water will be generated through heat interface units with rapid response plate exchangers thus avoiding high standing losses associated with cylinders in each apartment.

Peak heating will be by high efficiency gas fired boilers operating in condensing mode to deliver the best efficiency, heat will be distributed to all areas through a pumped and zoned heat network.

Peak cooling/ load lopping, where required due to the sealed nature of parts of the building, will be achieved by high efficiency air source heat pumps.

The apartments will be serviced with high efficiency mechanical ventilation with heat recovery units running in continuous minimum ventilation mode with a boost facility to cope with high humidity/ temperatures when cooking/ bathing. The units will also have as standard a summer by-pass facility so that night time cooling can be achieved when external temperatures are lower than internal temperatures.

The fitted kitchens in the apartments will be provided with A+ rated appliances

The Laundry will be supplied with high efficiency washing machines.

Lighting fittings in the building as a whole will be of the high frequency or LED high efficiency type to minimise use with a level of automatic control to ensure infrequently travelled areas are not illuminated unnecessarily.

The building services will be set up by a commissioning company to there optimum efficiencies and this shall be reviewed post occupancy to ensure that the systems are operating correctly for the different seasons.

The management suite will be provided with a central control system to optimise the delivery of heat and hot water and to monitor the energy consumption of plant and systems to ensure that there are no situations where plant is running uncontrolled.

Lifts for the building will be selected so that they are energy efficient, have variable speed regenerative drives and standby facilities to minimise power use when traffic is low.

3.5 Utilisation of low and zero carbon technologies.

Having taken the above measures the demand for hot water from the building is the dominant energy consumer and this can be largely catered for by 2 number small scale modulating CHP units having a minimum electrical output of 10 kW – rising to 20kW , and a minimum thermal output of 20kW rising to 40kW. At least one of the units will run a minimum of 16 hours each day and the 2nd a minimum of 13 hours each day. In order to cope with the fluctuations in demand a buffer storage capacity will be provided. At times of peak DHW and heating demand then there shall be back-up boilers available. The CHP sets are predicted to provide over 50% of the annual site thermal energy and provide carbon savings in excess of 15% as required for the MCC guidance. This also assists in obtaining credits for the BREEAM scheme.

A variety of renewable resources were considered for the scheme ([A.2] Appendix 1) and from the analysis 2 no 40kW thermal modulating CHP units were determined to be the preferred solution to deliver the energy required and the carbon reduction demanded. The CHP units will be located in the ground floor plant room with the heating plant.

4. RENEWABLE ENERGY

4.1 General

The guidance refers to reducing energy demand and avoiding the harmful impact of using energy from non-renewable resources as UDP Part 1 policy E1.5.

The intention is to use a local district heating scheme within the building to feed the apartments with centralised heat from a combined heat and power plant, this will effectively reduce the carbon emissions compared to a conventional gas heated or electrically heated apartment and will also deliver a minimum of 15% carbon saving over the 2010 part L building regulations – present indications are that this may be anywhere between 19 and 25% dependent on the hot water demand being maintained at a reasonable level during the summer period. This will reduce the demand on the national electricity network.

5. ENVIRONMENTAL DESIGN

5.1 General

The guide encourages developers to use the Building Research Establishment Environmental Assessment Method (BREEAM) to demonstrate energy efficiency and environmental performance and suggests that the target for design and post-construction should be Very Good. The applicants aim is to achieve a rating of Very Good for the building and to that end Ramboll UK have been engaged to prepare a BREEAM study.

5.2 BREEAM

The building has been the subject of a BREEAM 2011 pre-assessment [A.3] by an accredited BREEAM assessor, in addition two follow on BREEAM workshops were conducted to determine the improvements needed in the principal areas covered by BREEAM ie

- Management
- Health and Well Being
- Energy
- Transport
- Water
- Materials
- Waste
- Ecology
- Pollution

The pre-assessment is attached at Appendix 2 and a "shopping list" of improvements has been produced to take the assessment from a marginal pass at VERY GOOD to a level where it is deemed appropriate for the proposed procurement process.

Several of these aspects are referred to directly within this statement other elements are dealt with below:

5.2.1 Noise

An acoustic report has been prepared by Sol Acoustics[A.4] this sets out the key constraints for the systems and the envelope of the building as the project progresses.

5.2.2 Vibration

Earlier studies for the plots 1, 2 and 3 on the development site have effectively demonstrated that there would be no requirement for vibration control measures to be considered for plot 4 as it was determined this was further away from the main source of vibration - the mainline track and viaduct that runs to the North of the site from Oxford Road Station in the East to Deansgate Station in the West.

5.2.3 Materials

All building element specifications will be assessed using the Building Research Establishment's Green Guide which gives an environmental rating for alternative specifications of main building elements, with A+ rated materials having the lowest comparable impact. During the development of the detailed design and specifications, further reference will be made to the Green Guide to ensure that the specifications for the main building elements are appraised before being finalised and their embodied impact minimised. All timber will be certified by the Forest Stewardship Council.

6. WATER MANAGEMENT AND WEATHER RESILIENCE

6.1 General

The UDP Part 1 Policy E1.3 states that the Council will promote measures to decrease the level of pollution in the City's watercourses and groundwater sources. Development control policy DC21.1 refer to development not normally being permitted where it would be at risk from flooding or increase the risk of flooding elsewhere.

To address these matters a flood risk assessment has been conducted by Capita Symonds for plot 4 within the overall development of First Street [A.5].

6.2 Extract from flood risk assessment

The conclusions reached are as follows:-

- There is minimal risk from River Flooding to the subject site at present or allowing for climate change for 1:100 year events (1% AEP + CC).
- The subject site is not at risk from Sea flooding at present or in the future.
- There is no risk of offsite Land (Surface Water) flooding to the site at present or allowing for climate change.
- The risk of Land (Surface Water) flooding generated by the proposed development cannot be eliminated but is reduced.
- There is no risk of flooding from Groundwater to the subject site at present or allowing for climate change.
- The risk of Groundwater flooding is reduced by the proposed development.
- There is no risk of flooding to public combined sewers from the surface water generated by the proposed development.
- The onsite surface water drainage offers enhanced protection to the site.
- There is no risk from or to artificial sources of flooding at present or allowing for climate change.

The consumption of water in plot 4 has been assessed on the basis that the sanitaryware and appliances are all of efficient design that minimises water consumption as follows:-

- Washing machines
- 6/4 litre dual flush WC
- 9lpm mixing shower
- taps 0.015 l/s maximum flow

This will reduce the daily cold water consumption and the peak simultaneous demand which will reduce the energy required to the water boosting equipment.

7. WASTE MANAGEMENT

7.1 General

The Development control policy DC 27.1 sets out how the council will deal with applications for development involving the disposal or recycling of waste materials. Greater emphasis is now being placed on the reduction and recycling of waste at source (PPS10).

In order to demonstrate how this is being considered a waste management strategy plan has been prepared by 5 Plus Architects [A.6]. The general provisions are outlined below.

7.2 Extract from waste management strategy

During construction the Site will be registered under the Considerate Constructors Scheme and the contractor will commit to going significantly beyond best practice (greater than 32 points) under the scheme and will be required to operate a certified ISO 14001 Environmental Management System during construction. The Site will be monitored by an experienced industry professional to assess performance against the eight point Code of Considerate Practice. A construction waste target of 90% waste by weight/volume diverted from landfill will be adopted.

Operational waste management will be controlled by the First Street Management Company's management team. The Proposed Development falls within the City of Manchester and is therefore subject to its waste requirements and BS5906:2005 storage and on-site treatment of solid waste from buildings.

Sufficient information, instruction and training will be given to all levels of staff within the First Street Management Company to ensure appropriate awareness of the Cleaning and Waste Management Contract. All employees of the First Street Management Company will take reasonable steps to minimise the waste produced, and via the proposed Green Management Board, will work with tenants to further minimise waste streams.

Where items are no longer required, the relevant tiers of the waste hierarchy will be followed:

- re-use;
- recycle/compost;
- energy recovery;
- and disposal.

First Street Management Company is committed to achieving the following targets:

- 100% of food waste will be separated or bagged for composting off-site.
- 100% of paper and cardboard from general use will be separated for recycling and collected once a week.
- 100% of dry recyclables will be separated for recycling and collected by a private contractor weekly or returned to the supplier if appropriate.
- 100% of landscaping waste and grass cuttings will be collected for local off-site composting.
- Working towards 100% residual waste to be utilised for waste to energy locally within Greater Manchester.

8. CONSTRUCTION MANAGEMENT

8.1 General

UDP part 1 policy E1.6 requires the building materials used in new developments and refurbishment schemes to be environmentally friendly wherever possible, and encourages the use of recycled building materials. The guide calls for a site waste management plan to be implemented. Recycling materials is encouraged as is the use of environmentally friendly, locally source, low embodied energy materials. Materials containing damaging chemicals are to be avoided.

8.2 Contractors construction management plan

At this stage no firm engagement of the construction management team has been made however it has been confirmed that the eventual contractor is required to establish a suitable construction management plan and to aim for at least 32 points in the considerate contractors scheme [A.7].

9. BIODIVERSITY

9.1 General

UDP Part 1 policy E2.3 and E2.4 require the protection of wildlife, wildlife habitats, and where possible the creation of new nature reserves and features which will sustain life. UDP Part 1 Policy E2.6 states that the Council wishes to prevent the loss of existing trees.

9.2 Habitat survey report

The Applicant has appointed ecologists to assess the baseline ecological value of the site, identify any flora and fauna requiring protection and advise on measures to enhance local biodiversity. Further details of the ecology are contained in the First Street Habitat Survey Report, ref 100524 [A.8]

The Proposed Development will not adversely affect any statutory designation of nature conservation value. However, two statutory Sites of Biological Importance (SBIs) are located within 1.5km: Rochdale Canal Stott's Lane – Ducie Street Basin, and Ashton Canal (West).

Whilst it is concluded that the Site has a very limited habitat function for wildlife, 29 different bird species of conservation importance were recorded in surveys up to 1.5km from the site with six of these species included on the UKBAP. However, many of these birds would not be expected to use the Site due to the lack of suitable habitat. There are no on site trees or shrubs that would have the potential to support breeding birds. The amenity grassland areas close to the application could provide foraging areas for thrushes.

There is an overarching landscape Masterplan for the First Street Masterplan. The landscape proposals for First Street include large planted squares, and smaller sub-spaces located along First Street and a number of the other streets. The planting and ecology strategy is based on a number of key objectives: provide a network of trees and green space; enhance wildlife habitats in the urban area; promote sustainable planting; and improve local biodiversity. This will provide a quantified net biodiversity gain for the Masterplan area.

Planting will be used to create visually interesting areas throughout the year. Evergreen planting will create a year round carpet of green whilst a range of herbaceous planting will provide injections of colour throughout the seasons. Varied planting will allow a prolonged flowering season and planting fruit and nectar rich species will provide food for birds and insects (and in turn food for bats). The form and structure of the planting will also create sheltered nesting opportunities for birds. Where necessary, shade tolerant species will be chosen to ensure the planting is luscious and green.

It is understood that there is a bat roost in the culverted river Medlock, the construction of the serviced apartments at plot 4 will have no impact on the entry and egress from the culvert.

10. WATERWAYS

It is understood that the River Medlock is located in a culvert beneath the site and this work was undertaken some years ago. No works are proposed to the culvert as part of this planning application. [A.8]

11. CONCLUSION

The project team have been engaged in the process of energy reduction and sustainable design through various studies and workshops and have arrived at a solution that will deliver the required performance and achieve the objective of reducing carbon emissions by at least 15%.

There is a commitment to achieve BREEAM very good.

12. APPENDICES

1. Energy strategy statement
2. BREEAM

DRAFT

Intended for
Plot 4, First Street

Project no.
31204

Date
29 November 2012

PLOT 4, FIRST STREET

ENERGY STRATEGY STATEMENT

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Revision History

Revision	Date	Purpose / Status	Document Ref.	Comments
A	29-11	Planning Issue	31204-ES1-A	Incorporating client comments
B	05-12	Planning Issue	31204-ES1-B	Adjust Introduction and part 3.1
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Prepared By	Reviewed By	Approved By
Stuart Moses	**Andy Mutter**	**John Joyce**
Engineer	Principal Engineer	Director

Ramboll
3rd Floor
Kings Court
2-4 Exchange Street
St Mary's Gate
Manchester M2 7HA
United Kingdom

tel +44 (0)161 827 1890
fax +44 (0)161 819 5703
manchester@ramboll.co.uk

1. EXECUTIVE SUMMARY

Manchester City Council's (MCC) Core Strategy outlines energy requirements for new buildings. These requirements include reducing energy requirements, implementing energy efficiency and then applying appropriate low or zero carbon technologies (LZCTs). MCC require a 15% reduction in CO2 emissions over Part L 2010 using the strategy outlined above.

From an initial BREEAM pre-assessment, 2 credits under ENE 4 are being targeted. This is to say that a 10% reduction in CO2 emissions is required from LZCTs.

An energy and carbon emission study, looking at reducing and applying energy efficiencies determined that the most appropriate areas for LZCTs to offer savings would be for domestic hot water and electricity

From the analysis a number of options were reviewed in order to meet at least a 10% carbon reduction as required by BREEAM and the 15% reduction over Part L 2010 which is required by MCC.

Preferred Option: CHP

The preferred option would be to use a Combined Heat and Power (CHP) system to provide electricity to the building as well as using the heat by-product to provide domestic hot water and space heating. By using a system of two modulating CHP units in parallel with one another, it will provide enough flexibility to provide for the building as the load varies. This is in contrast to a traditional single CHP system which tends to be quite large with little modulating capacity.

This could be capable of achieving the 10% carbon emissions saving for BREEAM and the 15% required for the Core Strategy Policy without any additional technologies involved, keeping installation costs low and aiding the simplicity of the buildings services design.

A CHP system would have a minimal impact on the building, requiring additional plant room space only. Payback periods are highly reliant on run hours of the CHP, so it is important that the CHP is correctly designed to run for a significant period each day and that the demand is present throughout the year.

2. INTRODUCTION

Plot 4, First Street, Manchester is a high quality, new build, multi-residential development. The project will comprise the demolition of any on-site structures and redevelopment of the site for 279 serviced apartments with ancillary reception area, gymnasium, lounges/meeting areas, plus ground floor commercial unit for uses with Class A1, A3 or A4, and associated cycle parking, servicing and access arrangements.

Ramboll have been commissioned to complete an energy and Low or Zero Carbon Technology (LZCT) review of the Plot 4, First Street development. The report will make predictions of the buildings energy and carbon emissions and then based on this and the site constraints, analyse which renewable solutions will be best applicable to the development. This is designed to meet the Energy Policies within Manchester City Councils Core Strategy and in line BREEAM

This report also looks at the potential savings that the applicable technologies could provide as well as any grants that are available.

3. REGULATIONS AND POLICIES

3.1 Part L – Conservation of Fuel and Power

Building Regulations Part L – Conservation of Fuel and Power is a government approved document which aims to minimise energy consumption and associated carbon emissions. There are 4 guidance documents covering new and existing dwellings and commercial properties. The current regulations which will be applicable for Plot 4, First Street are the 2010 version of the regulations.

At plot 4, First St, the units are to be self-contained apartments, which are to be let, as such the building would be classed as dwellings rather than a non-domestic building. Therefore the building will need to comply with Part L1A 2010, covering new dwellings.

Part L1A 2010 will need to meet the Standard Assessment Procedure (SAP) calculations version 9.90, which is a government tool approved for demonstrating compliance with Part L1A 2010. The tool uses a Notional Building, based on a 2002 standard building and applies an improvement factor to set a Target Emission Rate (TER). The actual building (Dwelling Emission Rate, DER) must be equal to or better than the TER in order to comply with the regulations.

3.2 Planning Policy

Plot 4, First Street falls under Manchester City Councils (MCC) remit. MCC's planning policy is outlined in the Core Strategy Development Plan Document which was adopted in July 2012. This discusses what is required by private residential developments in terms of energy efficiency and CO_2 emission reductions.

Policy ENE4 - Reducing CO_2 Emissions by Enabling Low and Zero Carbon Development

The Council will seek to reduce fuel poverty and decouple growth in the economy, growth in CO_2 emissions, and rising fossil fuel prices, through the following actions:

- All development must follow the principle of the Energy Hierarchy, being designed:
  - to reduce the need for energy through design features that provide passive heating, natural lighting and cooling
  - to reduce the need for energy through energy efficient features such as improved insulation and glazing
  - to meet residual energy requirements through the use of low or zero carbon energy generating technologies
- Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies.
- Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings.
- Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes.
- The use of building materials with low embodied carbon in new development and refurbishment schemes.

Policy ENE6 - Target Framework for CO2 reductions from low or zero carbon energy supplies

Applications for residential development of 10 or more units and all other development over 1,000 sq m will be expected as a minimum to meet the target shown in Tables 12.1 or 12.2, unless this can be shown not to be viable. This should be demonstrated through an energy statement. Such a statement will be expected to set out the projected regulated energy demand and associated CO_2emissions for all phases of the development.

Developments smaller than the above threshold, but involving the erection of a building or substantial improvement to an existing building will also be expected to meet the minimum target, where viable, but will not be expected to submit an energy statement.

The target framework relates to three broad development locations and their potential for low and zero carbon, decentralised energy. The areas are defined as follows

- Target 1 Network development areas: Locations where the proximity of new and existing buildings, the mix of uses and density of development provide the right conditions to support district heating (and cooling).
- Target 2 Electricity intense areas: Locations where the predominant building type has an all-electric fit-out such as retail units and leisure complexes.
- Target 3 Micro-generation areas: Locations where lower densities and a fragmented mix of uses tend to mean that only building scale solutions are practical.

Domestic CO_2 emissions reduction targets

Table 12.1

Target	% Minimum requirement
Target 1: Network development area	CHP/district heating anchor or connection or where not feasible a 15% increase on Part L 2010
Target 2: Electricity intense buildings	+15% increase on Part L 2010
Target 3: Micro generation area	+15%increase on Part L 2010

Plot 4, First Street falls under 'Target 3: Micro-generation area' due to the development being a single building construction with no access to a district network. Therefore the development will use building scale solutions only. **A 15% improvement over Part L 2010 will be the driver for the new building.**

3.3 BREEAM

The BREEAM requirement for the development is a 'very good' rating. In achieving this level, 2 credits are targeted under ENE5 – Low or Zero Carbon Technologies. This requires a LZCT feasibility report, which forms part of this document, as well as a 10% carbon emission saving from the proposed LZCTs.

3.4 Summary

The reduction in CO2 emissions aligns with Ramboll's philosophy of:

- Reduce the requirement for energy as far as practical
- Apply energy efficiency features and systems
- Apply low or zero carbon technologies

Based on the details in this section, Plot 4, First Street, will need to not only comply with Part L1A 2010, but also improve upon it by 15%.

4. PREDICTED ENERGY CONSUMPTION

Early stage energy usage predictions for the building have been made using JPA, a tool accredited for SAP 2009 calculations. Analysis has been applied to a selection of key rooms and interpolated to determine the total energy for the site.

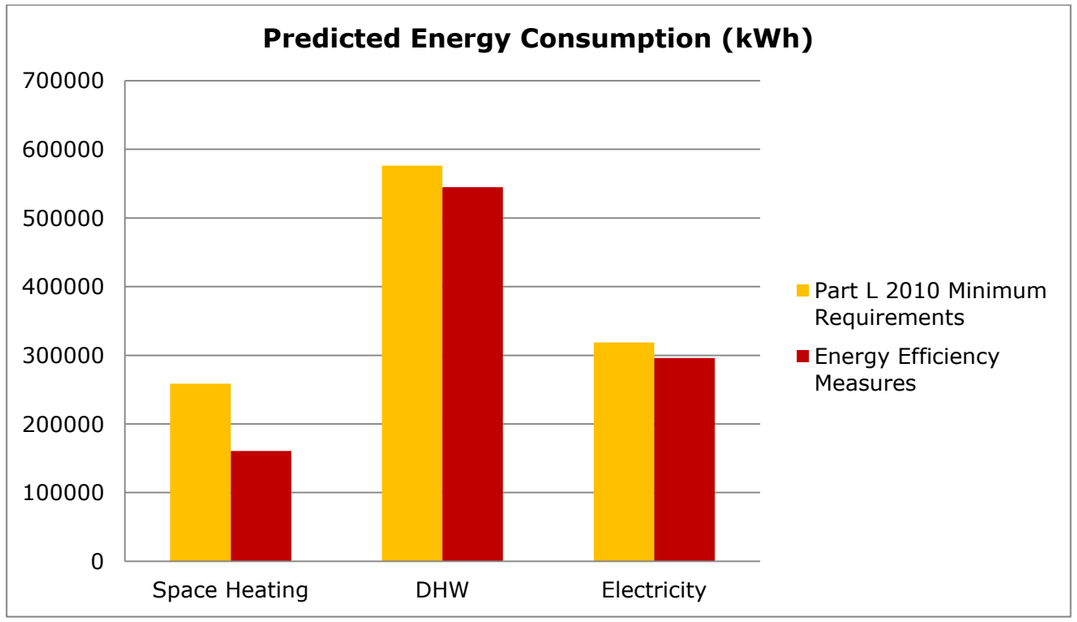
Please note that the results are based on the SAP 2009 methodology, and the following is the current prediction of the energy consumption and carbon emission.

Two sets of results have been included. The first of these uses the minimum requirements under part L1A 2010, whereas the second applies energy efficiency measures such as improved boiler efficiency, U-values and building air permeability as well as lighting efficiencies. In both scenarios a whole house mechanical ventilation system with heat recovery is utilised, which is a low energy system for providing ventilation whilst minimising heat losses.

The two sets of results are shown in the table below:

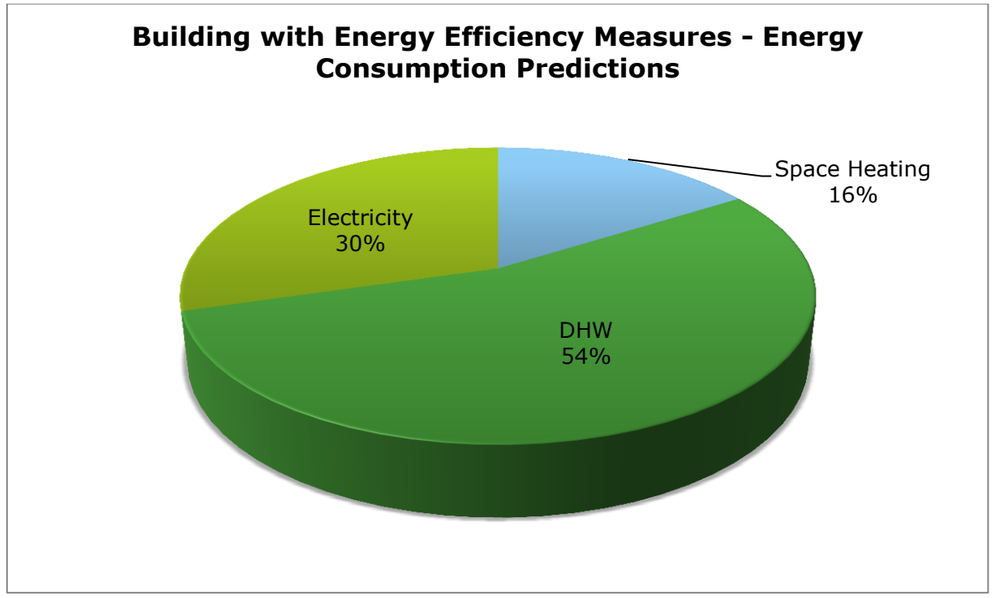
	Heating (MWh)	Domestic Hot Water, DHW (MWh)	Small Power & Lighting (MWh)	Total Energy (MWh)
Minimum Requires under Part L 2010	258.7	576.2	318.7	1153.6
Energy reduction measures and efficient building performance	160.6	544.9	296.1	1001.7

These results can also be seen graphically below:



It is predicted that the dominant energy load will be for domestic hot water (DHW) followed by electricity and then space heating. When energy efficiency measures are applied such as improved boiler efficiency, improved U-values above the minimum requirements, better building air permeability etc., it can be seen that energy consumption drops by around 13%.

The results with energy efficiency measures applied are shown as a percentage of the buildings total predicted energy usage below:



As shown in the chart above, it has been predicted that DHW will make up 54% of the buildings total energy consumption, electricity at 30% and space heating making up the final 16%.

5. PREDICTED CARBON EMISSIONS

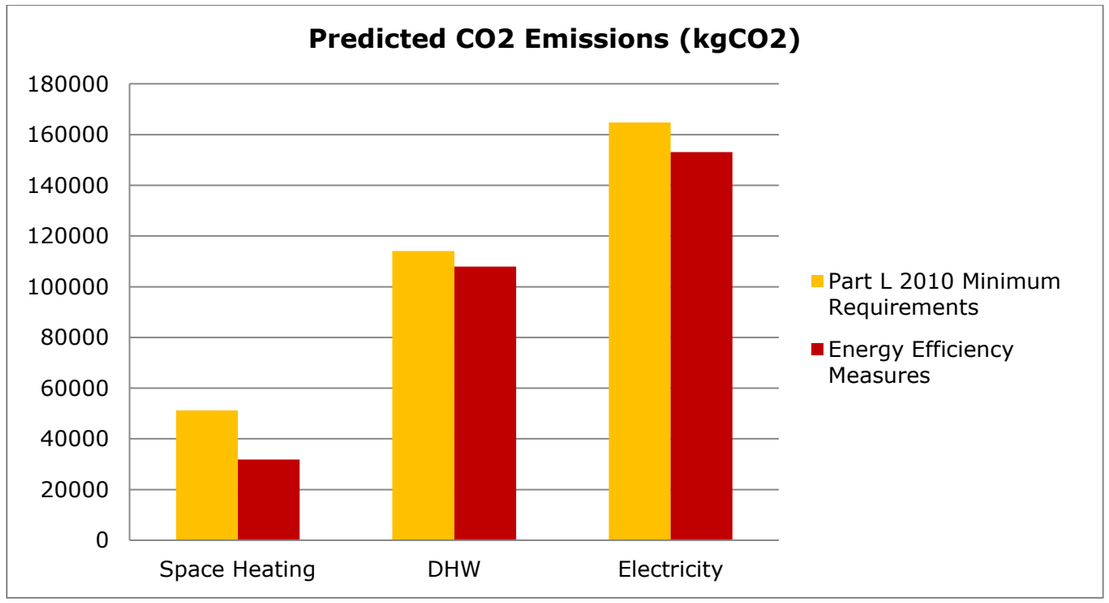
Using the energy analysis from section 4 and applying the relative carbon factors of the fuels used to produce the energy, a table has been produced showing the breakdown of the buildings predicted carbon emissions. This is based on the two scenarios discussed; the building with the minimum requirements under part L1A 2010 and the building with energy reduction and efficiency measures applied.

The results from the carbon emission analysis are as follows:

	Heating (kgCO2)	Hot Water (kgCO2)	Small Power & Lighting (kgCO2)	Total Carbon (kgCO2)
Minimum Requires under Part L 2010	51216	114096	164759	330071
Energy reduction and efficient building	31802	107897	153096	292795

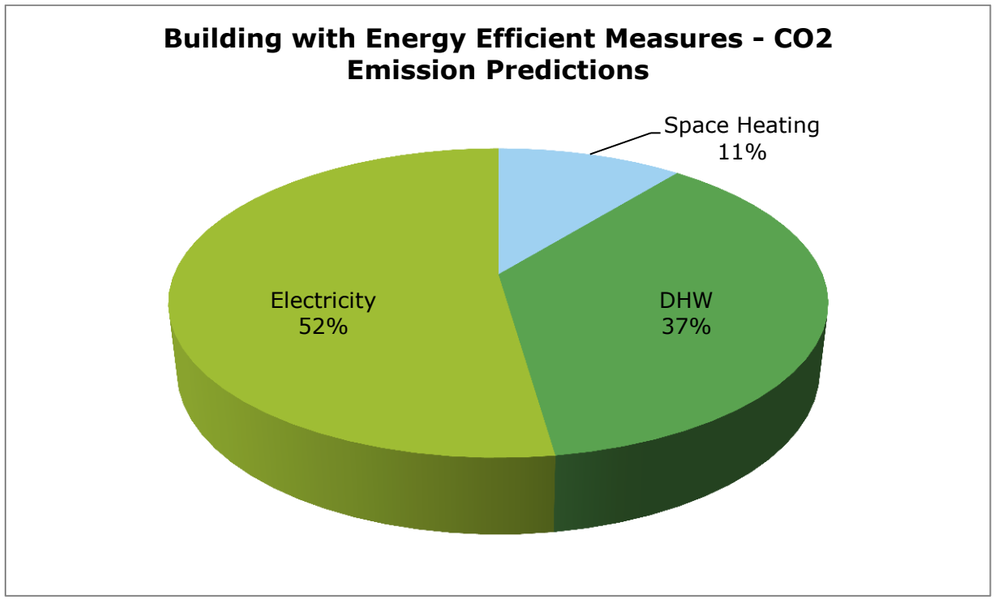
With the efficiencies applied, the total carbon emission generation is estimated at 293 tonnes CO_2 per year, whereas without these improvements it is predicted to be 330 tonnes CO_2 per year. This shows an 11.3% reduction in CO_2 emissions from the improvements made above the minimum requirements.

The results can be seen graphically below:



Due to the higher carbon factor of electricity than gas the total carbon emissions produced from the electrical load is the dominant source of carbon emissions, even though the domestic hot water was the dominant energy load.

The results with energy efficiency measures applied are shown as a percentage of the buildings total predicted CO2 emissions in the chart below:



The predicted results show that 52% of the buildings carbon emissions will come from electricity, with 37% coming from domestic hot water consumption and 11% from space heating demand.

A key planning condition for the development is to reduce CO2 emissions beyond the Part L1A 2010 Target Building by 15%, we can now see how best that can be achieved. The chart shows that Electricity and domestic hot water provide the best opportunities for CO2 emission reduction, so Low or Zero Carbon Technologies (LZCTs) that provide savings in these areas should be targeted.

6. SUSTAINABILITY AND LOW OR ZERO CARBON TECHNOLOGIES (LZCT)

This section provides a feasibility assessment of each of the LZCT which may be suitable for the project and also considers other energy reduction techniques for the new residential development.

The carbon calculations are based on the current carbon factors as produced in the present regulations (Part L1A 2010).

6.1 Biomass

6.1.1 Overview

Biomass is the burning of any plant-derived organic material (such as wood) that renews itself over a short period to generate energy, and this energy is usually used for heating and hot water applications by burning the fuel in boilers specifically made for biomass fuels.



6.1.2 Site Specific

Due to the number and size of the apartments, only a centralised biomass heating scheme would be economically viable and practical for this development. A centralised scheme could potentially be used to provide a proportion of the heating and domestic hot water demand. However, due to the restriction of the site, availability of space for plant, storage and deliveries is unavailable.

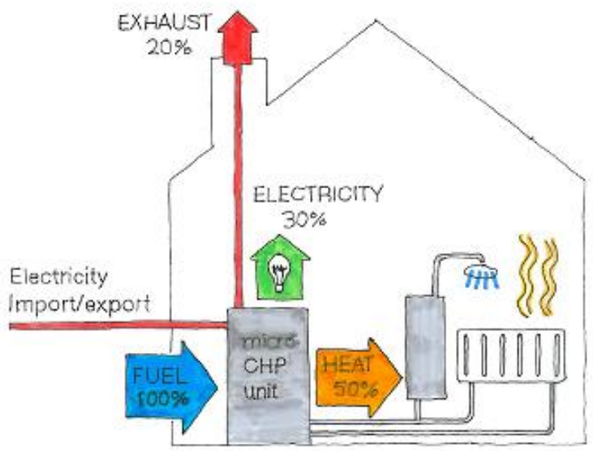
Due to the city centre location of the building, it makes deliveries a difficult procedure and distance to local suppliers does not favour a biomass system.

Due to the requirements for plant area, fuel storage and access for deliveries, ***a biomass plant is not recommended for this development***.

6.2 Combined Heat and Power (CHP)

6.2.1 Overview

Combined Heat and Power (CHP), also known as co-generation, is the simultaneous generation of both usable heat and electrical power from the same source. CHP systems are ideal for use in buildings with very high, almost continuous hot water and/or heating demands, such as buildings with heated swimming pools.



6.2.2 Site Specific

Typically CHP is best suited to buildings with a continuous domestic hot water load. Plot 4, First Street, as it is serviced apartments, is likely to see two key peaks during the day, one in the morning and one in the evening. It is possible to use hot water storage vessels to take the load during quieter periods of the day and then have the capacity to serve these peaks when required.

New CHP technology is available which allow smaller modules to be connected together which are able to modulate according to demand. This means that units can be switched on or off and modulated down to run at a much lower load than older CHP type systems. Running hours are still very important and need to be maximised as far as possible. This is due to high maintenance costs and savings directly linked to the amount of energy it is supplying.

Due to this, CHP could be a potential option for the building, but additional plant space will be required for housing the CHP units and storage vessels.

For the development a gas CHP system gives the following figures:

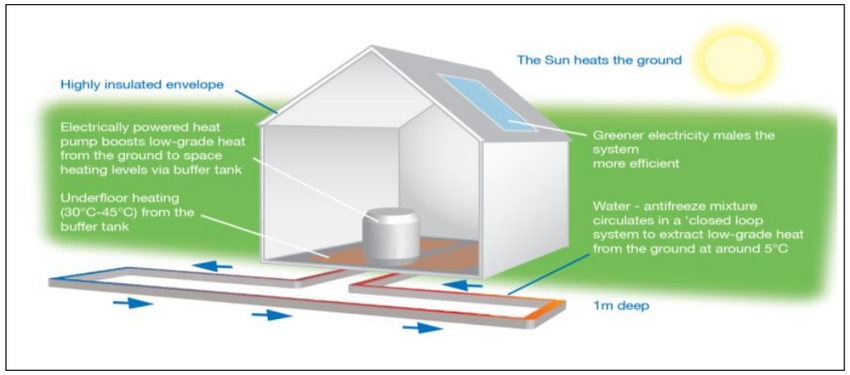
Electrical System	80kW$_{th}$ and 40 kW$_e$ (2 units at 40 kW$_{th}$ and 20 kW$_e$ each)
Carbon saving	14%
Life Cycle Cost	42 tonnesCO_2/year, so over 15 years could save 630 tonnes CO_2
Energy Saving	-6% (equivalent to an additional 58 MWh/year)

A gas CHP system could provide reasonable carbon savings on this project. As such ***CHP should be considered as a potential LZCT*** for inclusion. However, more detailed investigation will be required for determining its feasibility, as run hours, storage space and energy demand (both heat and electrical) are key to its success.

6.3 Ground Source Heat Pump (GSHP)

6.3.1 Overview

GSHPs transfer heat from the ground into a building to provide space heating and/or pre-heat hot water; they can also be reversed so that heat from a building is placed into the ground to provide cooling during the summer months.



6.3.2 Site Specific

The new multi residential building is in a city centre location, meaning that little land is available for locating horizontal or slinky loops. A vertical bore hole system could be an option, but due to the expensive ground work cost is not recommended for this building.

Due to the high cost per carbon saving and the land requirement ***it is recommended that a GSHP not be used***. It is felt that there are other technologies available that can help to produce a better carbon saving.

6.4 Air Source Heat Pump (ASHP)

6.4.1 Overview

Much like a GSHP, an ASHP is a low carbon technology as it requires electrically powered pumps in order to function. An ASHP works by converting latent heat from the outside air into useable heat for space heating. In the summer months when the demand will not be for heating but for cooling, the pump can be reversed.



6.4.2 Site Specific

ASHP's tend to work best at low temperatures as this allows them to achieve higher efficiencies, so are ill-suited to radiators. Underfloor heating is unsuitable due to its long response times (in addition to cost). The most appropriate system therefore would be to provide heating to the space via a fan coil unit using an air-to-air system.

A location will need to be provided for the ASHP's to be placed, this could be on the roof of the building or in a designated area external to the development. If this technology is preferred a location can be sort in a more detailed assessment later in the design process.

For the development, estimated figures for an ASHP are

System Size	350 kW (heat generation)
Carbon Saving	5.0%
Life Cycle Cost	14 tonnes CO_2/year, so over 20 years could save 280 tonnes CO_2
Energy Saving	11.0% (equivalent to 114 MWh/year)

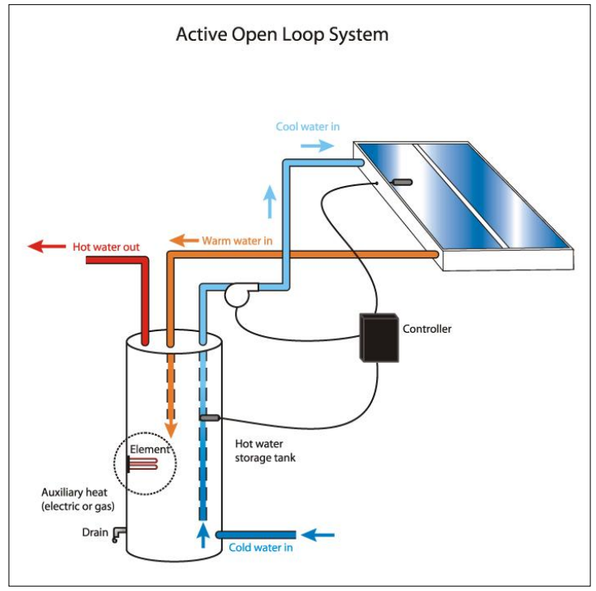
Based on an ASHP with a CoP of 3.9 for heating

A reasonable carbon saving could be made through the use of an ASHP to provide heating to the development. However, the carbon savings for this technology are quite low, so it would be best to combine this with other technologies, if the required savings are to be achieved.

6.5 Solar Thermal

6.5.1 Overview

Solar thermal technologies generate hot water from the sun's energy through the use of solar collectors. The sun's heat energy is accumulated by the solar cells, and water is pumped through these, thus heating the water. The heated water is then stored or distributed for domestic use. These systems tend to be incorporated on to the roof space of a building so that they are clear of obstacles which may obstruct the collectors view of the sun, as obstructions can affect the energy production from a solar collector array. Solar collectors are most effective if they are in a South-facing position on an incline between 30-40 degrees.



6.5.2 Site Specific

The carbon analysis concluded that the predicted carbon consumption for domestic hot water is around 37% of the developments total carbon emission production. Therefore the use of solar thermal hot could provide a proportion of the hot water requirement. It may be possible to incorporate it as part of a mixed LZCT approach.

Solar thermal collectors work best during the summer months when the days are longer and warmer. It is currently assumed that the apartments will be occupied during the summer months so the solar thermal hot

water panels could produce a reasonable proportion of the domestic hot water demand. This would mean that there would be less reliance on fossil fuel alternatives during these warmer months.

The renewable heat incentive is now in place. This will mean that people or companies with heat producing LZCT can receive money for each kWh that they produce. This could make the use of solar thermal more appealing and may significantly reduce the payback period. See appendix A for details.

For the development, estimated figures for solar thermal collectors with a pump powered by Photovoltaic cells are:

Size of system	80 m^2
Carbon Saving	7 %
Life Cycle Cost	21 tonnes CO_2/year, so over 20 years could save 420 tonnes CO_2
Energy Saving	10 % (equivalent to 108 MWh/year)

Assuming all generated hot water is utilised (including during the summer months), flat plate collectors are sourced and the collectors are South-East to South-West facing at a 30-40 degree incline.

The Solar Thermal Hot Water would be used as a way of pre-heating the buildings hot water; as such the panels would ideally need to be located on the roof of the building in a Southerly facing position. The panels produce hot water based on the amount of sun's heat energy incident upon them, therefore any obstructions that may block the path between the sun and the panel's needs to be kept to a minimum for good energy production.

If chosen then it is recommended that attention is paid to the progression of the Renewable Heat Incentive (RHI) scheme, and the intention to collect the tariff is made at an early stage.

6.6 Wind Turbine

6.6.1 Overview

Wind turbines harness the power of the wind to produce electricity through circular motion. They can produce electricity without creating any carbon dioxide emissions, and range in outputs from watts to megawatts. The most common design has three blades mounted on a horizontal axis, Horizontal Axis Wind Turbine (HAWT), which is free to rotate into the wind on a mast. The blades drive a generator either directly or via a gearbox (generally for larger machines) to produce electricity. The electricity can either link to a distribution network or charge batteries (batteries tend to have a poor life-time and are expensive). An inverter is required to convert the electricity from direct current (DC) to alternating current (AC).



6.6.2 Site Specific

The plot 4 development is in a city centre location which is surrounded by buildings, trees and roads. As such, the use of a wind turbine is quite restrictive.

The wind speed database (created by the BWEA) gives very low wind speeds for the location of the First Street development. It is usually recommended that an average wind speed in excess of 6m/s is required for a reasonable energy production, whereas the site in question has an average wind speed of 4.4m/s (10m above ground level). This is quite low and so makes it hard to justify using a wind turbine.

Noise and light flickering from the blades need to be considered for the site particularly near to the neighbouring residential area and commercial buildings.

Due to the lack of space, the planning issues and low average wind speed, which leads to a poor energy and carbon saving, it is advised that the ***use of a wind turbine should be avoided for the development***. It is felt that other LZCT are better suited to the building.

6.7 Photovoltaics (PV)

6.7.1 Overview

Photovoltaics (PV) or solar cells, as they are often referred to, are semiconductor devices that convert sunlight into direct current (DC) electricity. Groups of PV cells are electrically configured into modules and arrays which can be used to charge batteries, operate motors and power any number of electrical loads. With the appropriate power conversion equipment (inverters), PV systems can produce alternating current (AC) compatible with any conventional appliances and operate in parallel with the utility grid.



6.7.2 Site Specific

The development has been predicted to have a high electrical load, so a PV array could mitigate some of the carbon involved in the electrical supply.

A location for PV would need to be sought. Due to the constraints of the site and the surrounding buildings and other obstructions the best location for a PV array would be on the roof of the building. It is important that if PV panels are to be arranged on the roof that there is the structure in place to support them. Ideally the panels need to be in a South facing position at a 30-45 degree angle.

The PV panels will be producing the majority of their electricity during the summer months, but it is assumed that the building will still be occupied during this period. Therefore reasonable savings could be achieved.

If the Feed-in-Tariff scheme is used then the owner of the PV's could be paid for each kWh of electricity produced (for a 4-10kW PV system it is likely to be of the order of 12.5p/kWh). It is predicted that all

electrical energy will be used on site, so not export tariff will be sought or paid. Please see Appendix A for more details.

For the development, estimated figures for this technology are:

Size of system	70 m^2
Carbon Saving	1.5%
Life Cycle Cost	4 tonnes CO_2/year, so over 20 years could save 80 tonnes CO_2
Energy Saving	1.0% (equivalent to 8.5 MWh/year)
Budget Cost	£32,000
Simple Payback	35 years
Simple payback (FIT)	16.0 years

A large PV array seems unfeasible due to the roof area required and as such the additional structural support. Therefore, it would seem sensible for this to be used as a small array as part of a mixed LZCT strategy.

6.8 Energy Efficiencies

6.8.1 Constructions

Energy efficiency measures for constructions can be applied in the form of improved U-values. It is important to choose materials that boost thermal performance but are also economically viable.

Improved air tightness can also be a good energy efficiency measure for a building. Air tightness is the infiltration of air through the building fabric. However, if air tightness is too good then it can cause ventilation and overheating issues. Therefore the right balance needs to be found.

The U-values that we will be targeting are as follows:

External Walls – 0.26 W/m^2K

Exposed/Ground Floor – 0.18 W/m^2K

Roof – 0.18 W/m^2K

Glazing – 1.80 W/m^2K

Air Permeability – 5 $m^3/(m^2.h)$

However, these may require further improvement in order to meet the 15% betterment of Part L 2010 as required by Manchester City Councils Core Strategy.

6.8.2 Lighting

Energy efficient lighting will be applied throughout the buildings as well as external lighting for paths and roadways. Where possible the use of natural daylight should be maximised, minimise the use of artificial lighting and providing energy savings. Controls will be used where practical, ideally absence/presence and daylight linking controls.

6.8.3 Equipment

Where possible any equipment used on the site should be high efficiency and low energy in order to keep the carbon and energy usage low. This also reduces heat gains, decreasing the requirement for cooling and the risk of overheating.

7. PREFERRED OPTION

An evaluation of the plausible low or zero carbon technologies for the new building has been completed. From the analysis the preferred option of CHP has been created in order to meet at least a 10% carbon reduction as required by BREEAM and 15% carbon reduction for the MCC core strategy.

Preferred Option: CHP

The preferred option would be to use a Combined Heat and Power (CHP) system to provide electricity to the building as well as using the heat by-product to provide domestic hot water and space heating. By using a system of two modulating CHP units in parallel with one another, it will provide enough flexibility to provide for the building as the load varies. This is in contrast to a traditional single CHP system which tends to be quite large with little modulating capacity.

This could be capable of achieving the 10% carbon emissions saving for BREEAM and the 15% required for the Core Strategy Policy without any additional technologies involved, keeping installation costs low and aiding the simplicity of the buildings services design.

A CHP system would have a minimal impact on the building, requiring additional plant room space only. Payback periods are highly reliant on run hours of the CHP, so it is important that the CHP is correctly designed to run for a significant period each day and that the demand is present throughout the year.

8. PART L1A

Part L1A SAP 2009 analysis has been carried out for a selection of apartment types within the building. The carbon emission ratings for a variety of energy sources has been completed and the results are presented in Appendix B. These demonstrate that the CHP solution is the preferred scheme to deliver Manchester City Councils Core Strategy, which requires a 15% improvement over the Part L 2010 Target Emission Rate (TER).

APPENDIX A – GRANTS

Feed-In Tariff (FIT) and Renewable Heat Incentive (RHI)

Support for low carbon technologies is provided by the Feed-In Tariff (FIT) for electricity generating technologies and the Renewable Heat Incentives (RHI) for any heat generating technologies. These schemes cover LZCTs up to 5MW in size and pay a set price for each kWh produced by the technology. On top of that the owner will also receive the benefit of a reduced electricity/heating bill. Finally there is also an extra 3p/kWh which will be paid by the energy supplier for any surplus energy generated (FIT scheme only).

Below is the tariff table for the FIT scheme as it currently stands, however this is subject to a certain amount of variation and could fall. Once a tariff has been achieved it is guaranteed for twenty years apart from inflation-linking:

Listing of all Generation Tariff levelsfrom 1st August 2012 to 31st October 2012

Energy Source	Scale	Type / Rate	Tariff (p/kWh)
Anaerobic digestion	≤250kW		14.7
Anaerobic digestion	>250kW - 500kW		13.6
Anaerobic digestion	>500kW		9.9
Hydro	≤15 kW		21.9
Hydro	>15 - 100kW		19.6
Hydro	>100kW - 2MW		12.1
Hydro	>2MW - 5MW		4.8
Micro-CHP	<2 kW	(limited)	11.0
Solar PV	≤4 kW	Higher rate	16.00
Solar PV	≤4 kW	Medium rate	14.40
Solar PV	>4 - 10kW	Higher rate	14.50
Solar PV	>4 - 10kW	Medium rate	13.05
Solar PV	>10 - 50kW	Higher rate	13.50
Solar PV	>10 - 50kW	Medium rate	12.15
Solar PV	>50 - 250kW	Higher rate	11.50
Solar PV	>50 - 250kW	Medium rate	10.35
Solar PV	≤250kW	Lower rate	7.1
Solar PV	>250kW - 5MW		7.1
Solar PV	≤5MW	Standalone	7.1
Wind	≤1.5kW		35.8
Wind	>1.5 - 15kW		28.0
Wind	>15 - 100kW		25.4
Wind	>100 - 500kW		20.6
Wind	>500kW - 1.5MW		10.4
Wind	>1.5MW - 5MW		4.9
Any	existing systems transferred from RO		9.9

The RHI has published it's tariff levels for non-domestic buildings (which it is understood Plot 4 will fall under, but clarification will need to be sought):

Non-residential Installations

The following tariffs have been published for the initial phase of the scheme:

Tariff name	Eligible technology	Eligible sizes	Tariff rate (p/kWh)
Small biomass	Solid biomass; Municipal Solid Waste (incl. CHP)	Less then 200 kWth	*Tier 1:* 7.9 *Tier 2:* 2.0
Medium biomass		200 kWth and above; less than 1000 kWth	*Tier 1:* 4.9 *Tier 2:* 2.0
Large biomass		1000 kWth and above	1.0
Small ground source	Ground-source heat pumps; Water-source heat pumps; Deep geothermal	Less than 100 kWth	4.5
Large ground source		100 kWth and above	3.2
Solar thermal	Solar thermal	Less than 200 kWth	8.5
Biomethane	Biomethane injection & biogas combustion, except landfill gas	Biomethane all scales; biogas < 200 kWth	6.8

The FIT and RHI schemes are currently active:

For more information on the FIT visit http://www.fitariffs.co.uk/

For more information on the RHI visit http://www.rhincentive.co.uk/

Predicted Future Feed-In Tariff Rates:

Table D: Projected future Feed-in Tariffs

This table shows the starting tariff levels in the current period, and future projections based on published degression rates.
The orange column matches Table A. Refer to notes here, which explain other colours and also give details of tables of historical tariffs levels.

Future Starting tariffs (p/kWh) Installation eligibility dates between>			01-Aug-12 - 31-Oct-12	01-Nov-12 - 30-Nov-12	01-Dec-12 - 31-Jan-13	01-Feb-13 - 31-Mar-13	01-Apr-13 - 31-Jul-13	01-Aug-13 - 31-Oct-13	01-Nov-13 - 31-Jan-14	01-Feb-14 - 31-Mar-14	01-Apr-14 - 31-Jul-14	01-Aug-14 - 31-Oct-14	01-Nov-14 - 31-Jan-15	01-Feb-15 - 31-Mar-15	01-Apr-15 - 31-Jul-15	01-Aug-15 - 31-Oct-15	01-Nov-15 - 31-Jan-16	01-Feb-16 - 31-Mar-16	01-Apr-16 - 31-Jul-16	01-Aug-16 - 31-Oct-16
Source	Capacity	Type / rate																		
		RPI index	1.098	1.098	1.098	1.098	*RPI figures not yet available - italic figures then subject to indexation*													
AD biogas	≤250kW		14.7	14.70	14.70	14.70	*14.70*	*14.70*	*14.70*	*14.70*	*13.97*	*13.97*	*13.97*	*13.97*	*13.27*	*13.27*	*13.27*	*13.27*	*12.61*	*12.61*
AD biogas	>250kW - 500kW		13.6	13.60	13.60	13.60	*13.60*	*13.60*	*13.60*	*13.60*	*12.92*	*12.92*	*12.92*	*12.92*	*12.27*	*12.27*	*12.27*	*12.27*	*11.66*	*11.66*
AD biogas	>500kW - 5MW		9.9	9.90	8.96	8.96	*8.96*	*8.96*	*8.96*	*8.96*	*8.51*	*8.51*	*8.51*	*8.51*	*8.08*	*8.08*	*8.08*	*8.08*	*7.68*	*7.68*
Hydro	≤15kW		21.9	21.90	21.00	21.00	*21.00*	*21.00*	*21.00*	*21.00*	*19.95*	*19.95*	*19.95*	*19.95*	*18.95*	*18.95*	*18.95*	*18.95*	*18.00*	*18.00*
Hydro	>15kW - 100kW		19.6	19.60	19.60	19.60	*19.60*	*19.60*	*19.60*	*19.60*	*18.62*	*18.62*	*18.62*	*18.62*	*17.69*	*17.69*	*17.69*	*17.69*	*16.81*	*16.81*
Hydro	>100kW – 500kW		12.1	12.10	15.50	15.50	*15.50*	*15.50*	*15.50*	*15.50*	*14.73*	*14.73*	*14.73*	*14.73*	*13.99*	*13.99*	*13.99*	*13.99*	*13.29*	*13.29*
Hydro	>500kW - 2MW		12.1	12.10	12.10	12.10	*12.10*	*12.10*	*12.10*	*12.10*	*11.50*	*11.50*	*11.50*	*11.50*	*10.93*	*10.93*	*10.93*	*10.93*	*10.38*	*10.38*
Hydro	>2MW - 5MW		4.9	4.90	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48
Micro-CHP	≤2kW		11.0	11.00	12.50	12.50	*12.50*	*12.50*	*12.50*	*12.50*	*12.50*	*12.50*	*12.50*	*12.50*	*12.50*	*12.50*	*12.50*	*12.50*	*12.50*	*12.50*
Solar PV	≤4kW	higher rate	16.00	15.44	15.44	14.90	*14.90*	*14.38*	*13.88*	*13.39*	*13.39*	*12.92*	*12.47*	*12.03*	*12.03*	*11.61*	*11.20*	*10.81*	*10.81*	*10.43*
Solar PV	≤4kW	medium rate	14.40	13.90	13.90	13.41	*13.41*	*12.94*	*12.49*	*12.05*	*12.05*	*11.63*	*11.22*	*10.83*	*10.83*	*10.45*	*10.08*	*9.73*	*9.73*	*9.39*
Solar PV	>4kW - 10kW	higher rate	14.50	13.99	13.99	13.50	*13.50*	*13.03*	*12.57*	*12.13*	*12.13*	*11.71*	*11.30*	*10.90*	*10.90*	*10.52*	*10.15*	*9.79*	*9.79*	*9.45*
Solar PV	>4kW - 10kW	medium rate	13.05	12.59	12.59	12.15	*12.15*	*11.72*	*11.31*	*10.91*	*10.91*	*10.53*	*10.16*	*9.80*	*9.80*	*9.46*	*9.13*	*8.81*	*8.81*	*8.50*
Solar PV	>10kW - 50kW	higher rate	13.50	13.03	13.03	12.57	*12.57*	*12.13*	*11.71*	*11.30*	*11.30*	*10.90*	*10.52*	*10.15*	*10.15*	*9.79*	*9.45*	*9.12*	*9.12*	*8.80*
Solar PV	>10kW - 50kW	medium rate	12.15	11.72	11.72	11.31	*11.31*	*10.91*	*10.53*	*10.16*	*10.16*	*9.80*	*9.46*	*9.13*	*9.13*	*8.81*	*8.50*	*8.20*	*8.20*	*7.91*
Solar PV	>50kW - 250kW	higher rate	11.50	11.50	11.50	11.10	*11.10*	*10.71*	*10.34*	*9.98*	*9.98*	*9.63*	*9.29*	*8.96*	*8.96*	*8.65*	*8.35*	*8.06*	*8.06*	*7.78*
Solar PV	>50kW - 250kW	medium rate	10.35	10.35	10.35	9.99	*9.99*	*9.64*	*9.30*	*8.97*	*8.97*	*8.66*	*8.36*	*8.07*	*8.07*	*7.79*	*7.52*	*7.26*	*7.26*	*7.01*
Solar PV	>150kW - 250kW	higher rate	11.00	11.00	11.00	10.62	*10.62*	*10.25*	*9.89*	*9.54*	*9.54*	*9.21*	*8.89*	*8.58*	*8.58*	*8.28*	*7.99*	*7.71*	*7.71*	*7.44*
Solar PV	>150kW - 250kW	medium rate	9.90	9.90	9.90	9.55	*9.55*	*9.22*	*8.90*	*8.59*	*8.59*	*8.29*	*8.00*	*7.72*	*7.72*	*7.45*	*7.19*	*6.94*	*6.94*	*6.70*
Solar PV	all above bands	lower rate	7.10	7.10	7.10	6.85	*6.85*	*6.61*	*6.38*	*6.16*	*6.16*	*5.94*	*5.73*	*5.53*	*5.53*	*5.34*	*5.15*	*4.97*	*4.97*	*4.80*
Solar PV	>250kW - 5MW		7.10	7.10	7.10	6.85	*6.85*	*6.61*	*6.38*	*6.16*	*6.16*	*5.94*	*5.73*	*5.53*	*5.53*	*5.34*	*5.15*	*4.97*	*4.97*	*4.80*
Solar PV	≤5MW	Standalone	7.10	7.10	7.10	6.85	*6.85*	*6.61*	*6.38*	*6.16*	*6.16*	*5.94*	*5.73*	*5.53*	*5.53*	*5.34*	*5.15*	*4.97*	*4.97*	*4.80*
Wind	≤1.5kW		35.8	35.80	21.00	21.00	*21.00*	*21.00*	*21.00*	*21.00*	*19.95*	*19.95*	*19.95*	*19.95*	*18.95*	*18.95*	*18.95*	*18.95*	*18.00*	*18.00*
Wind	>1.5kW - 15kW		28.0	28.00	21.00	21.00	*21.00*	*21.00*	*21.00*	*21.00*	*19.95*	*19.95*	*19.95*	*19.95*	*18.95*	*18.95*	*18.95*	*18.95*	*18.00*	*18.00*
Wind	>15kW - 100kW		25.4	25.40	21.00	21.00	*21.00*	*21.00*	*21.00*	*21.00*	*19.95*	*19.95*	*19.95*	*19.95*	*18.95*	*18.95*	*18.95*	*18.95*	*18.00*	*18.00*
Wind	>100kW - 500kW		20.6	20.60	17.50	17.50	*17.50*	*17.50*	*17.50*	*17.50*	*16.63*	*16.63*	*16.63*	*16.63*	*15.80*	*15.80*	*15.80*	*15.80*	*15.01*	*15.01*
Wind	>500kW - 1.5MW		10.4	10.40	9.50	9.50	*9.50*	*9.50*	*9.50*	*9.50*	*9.03*	*9.03*	*9.03*	*9.03*	*8.58*	*8.58*	*8.58*	*8.58*	*8.15*	*8.15*
Wind	>1.5MW - 5MW		4.9	4.90	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48	4.48
Any	transferred	from RO	9.9	9.90	9.90	9.90	*9.90*	*9.90*	*9.90*	*9.90*	*9.90*	*9.90*	*9.90*	*9.90*	*9.90*	*9.90*	*9.90*	*9.90*	*9.90*	*9.90*
Solar PV	export tariff		4.5	4.50	4.50	4.50	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*
All other	export tariff		3.20	3.20	4.50	4.50	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*	*4.50*

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Plot 4, First Street
SAP Calculation Results

		Option 1	Option 2	Option 3
		ASHP (Fan Coil Htg Only)	**ASHP (Fan Coil Htg & Cooling)**	**CHP**
Construction	Wall (W/m2K)	0.23	0.23	0.26
	Roof (W/m2K)	0.15	0.15	0.18
	Glazing (W/m2K)	1.60 (40% Glazing Ratio)	1.60 (40% Glazing Ratio)	1.80 (50% Glazing Ratio)
	Glazing g-value	0.42	0.42	0.42
	Air Permeability (m3/(h.m2))	3	3	5
	Construction Details	Accredited, y=0.07	Accredited, y=0.07	Not Accredited (y=0.15)
Heating	Heating Type	Fan Coil(htg only)	Fan Coil(htg & Cooling)	Community CHP 40% heat load Nat Gas 60%
	Heating Eff	390%	390% (EER of 4 for Cooling)	CHP (56.7% heat, 28.3% Elec) Gas (95%)
DHW	DHW Type	Nat Gas Community DHW Boiler	Nat Gas Community DHW Boiler	Community CHP 40% heat load Nat Gas 60%
	DHW Eff	95%	95%	CHP (56.7% heat, 28.3% Elec) Gas (95%)
Ventilation	Ventilation	Vent Axia Sentinal Kinetic	Vent Axia Sentinal Kinetic	Vent Axia Sentinal Kinetic
LZCT's	Additional LZCTs	0.29 m2 of STHW (+11 litres of storage) per apartment (80m2 total) 0.25 m2 of PV* per aparment (70m2 total)	0.29 m2 of STHW (+11 litres of storage) per apartment (80m2 total) 0.25 m2 of PV* per aparment (70m2 total)	None
RESULTS				
Mid-floor Apartment Corner	Target Emission Rate	31.99	31.99	32.14
	Actual Emission Rate	25.84	26.19	26.26
	Pass/Fail	**19.2%**	**18.1%**	**18.3%**
Mid-floor Apartment Central	Target Emission Rate	29.5	29.5	29.65
	Actual Emission Rate	25.58	26.04	24.84
	Pass/Fail	**13.3%**	**11.7%**	**16.2%**
Top-floor Apartment Corner	Target Emission Rate	34.28	34.28	34.44
	Actual Emission Rate	27.56	27.84	28.92
	Pass/Fail	**19.6%**	**18.8%**	**16.0%**
Top-floor Apartment Central	Target Emission Rate	31.65	31.65	31.81
	Actual Emission Rate	26.9	27.3	26.8
	Pass/Fail	**15.0%**	**13.7%**	**15.7%**

Please note that not all rooms are currently meeting the 15% reduction in CO2 emissions over the TER, which is planning policy condition

BREEAM Scheme: New Construction 2011
Building Name: Plot 4, First Street
BREEAM Registration No.: BREEAM 0000 0000
BREEAM Assessor: Mairi Murray

Ref	Title	Sub-credits	credits available	credits targeted	credits awarded	Information Required	Team member responsible for providing evidence	Comments/Actions
Management								
Man 1	Sustainable Procurement	Project brief and design	4	0		**One credit** From RIBA stage B the client, building occupier, design team and contractor are involved in contributing the the decision making process. As a minimum this includes meeting to identify and define their roles, responsibilities and contributions during: a). Design b). Construction c). Commissioning and Handover d). Occupation The roles and responsibilities outlined above include: a). End user requirements b). Aims of design and strategy c). Particular installation and construction requirements d). Occupiers budget and technical expertise in maintaining any proposed systems e). Usability and manageability of any proposals f). Production of documentation g). Commissioning, training and aftercare support There is a schedule of training identified for the relevant building occupiers/premises manager including the following: a). Contents of the building user guide as specified in Man04 b). Design strategy c). Installed systems and key features d). Documentation to be provided e). Training responsibilities	**Client/M&E/ Contractor**	
		Construction and handover	2	1		**1st credit** 1). Main contractor accounts for thermographic survey within the project budget 2). Thermgraphic study carried out to appropriate standards by a professional holding cert in thermography. Survey confirms: a). Continuity of insulation b). Avoidance of excessive thermal bridging 3). Avoidance of air leakage paths through fabric 3). Any defects are rectified **2nd credit** 1).Appropriate team member is appointed to monitor and programme pre-commissioning, commissioning and re-commissioning 2). Commissioning carried out in line with current building regulations and standards 3). Main contract accounts for commissioning programme 4). Specialist commissioning manager appointed to commission complex systems	**Contractor/M&E**	
		Aftercare	2	2		**1st credit** 1). Seasonal commissioning carried out over first 12 months of operation **2nd credit** 1). Collect energy and water consumption data for 12 months after occupation 2). Commitment to provide aftercare support to all building occupiers including a meeting with users after handover to introduce handover team, initial aftercare such as on site attendance on a weekly basis for at least 4 weeks after handover	**Client/M&E/ Contractor**	
Man 2	Responsible Construction Practices	CCS score between 24 and 31.5 = one credit OR	1	1			**Contractor**	Score of 36 targeted
		CCS score between 32 and 35.5 = two credits	1	1				
Man 3	Construction Site Impacts	Energy consumption	1	1		1). Monitor and record data on energy consumption from construction plant, equipment and transport consumption	**Contractor**	
		Water consumption	1	1		1). Monitor and record data on water consumption from use of construction plan equipment and site accommodation		
		Transport of construction materials & waste	1	1		1). Monitor and record data on transport resulting from delivery of majority of construction material to site and construction waste from site. Materials are those used in major building elements and waste groups outlined in SWMP		
		Timber procurement	1	1		1). All site timber is sourced in accordance with UK Government Timber Procurement Policy		
		Construction site management	1	1		1). Contractor operates an Environmental Management System (ISO 14001) 2). Implement best practise pollution prevention policies and procedures through compliance with items in checklist section 2.2.5 of 'Building a Better Environment'		

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Man 4	Stakeholder participation	Consultation	1	1		1). During preparation of brief, all relevant parties are identified and consulted by the design team. The finding influence the design and therefore must have been held before key design decisions are made 2). A consultation plan has been prepared and includes timescales and methods of consultation from all relevant parties 3). Minimum consultation content is covered 4). During design stage, consultation feedback has been given to and received by all relevant parties regarding suggestions made 5). Project team ensures any areas of historic/heritage value are protected	**Client/Architect**	Requirements for consulation content shown in credit statement document. All requirements must be covered to achieve the credit.
		Inclusive and accessible design	1	1		1). The building is fit for purpose and accessible by all users 2). Access statement is developed in line with the CABE publication Design and Access Statement and any relevant Scottish standards 3). Provision of facilities is made for future building occupants and users	**Architect**	Architect to review the requirements for CABE to check whether this can be achieved
		Building user information	1	1		1). User guide confirming to BREEAM guidance is provided	**Client/Contractor/ M&E**	
		Post Occupancy Evaluation (POE) and information dissemination	1	0		The client makes a commitment to carry out Post Occupancy Evaluation one year after building occupation to gain building performance feedback. POE should be carried out by an independent third party and should cover: a). A review of the design and construction process b). Feedback from a wide range of the building users including Facilities Management covering: i). Internal environmental conditions ii). Control, operation and maintenance iii). Facilities and amenities iv). Access and layout v). Other relevant issues Client commits to carry out the appropriate dissemination of information on buildings post occupancy performance c). Sustainability performance	**Client**	
Man 5	Lifecycle cost & service life planning		3	0			**QS/Cost consultant**	
Health & Wellbeing			22	13	0			
Hea 1	Visual comfort	Prerequisite - high frequency lighting	0	0			**M&E**	
		Daylighting	1	0		Kitchens to achieve DF of 2% or more Living rooms/Bedrooms to achieve DF of 2% or more No residential/communal occupied spaces to achieve 2% over 80% of floor area and room depth criteria achieved	**Architect/M&E**	This has been added as a potential credit. Calculations to be carried out to accertain whether this can be achieved. Daylight factor requirements shown opposite
		Glare control and view out	1	1		Blinds provided to alll occupied spaces All positions are within 7m of a wall with a window. Window must be 20% of the surrounding wall	**Architect**	
		Internal and external lighting	1	1		1). Internal lighting are specified in accordance with CIBSE Code of Lighting 2009. Where computers are present, the lighting complies with CIBSE Lighting Guide 7 sections 3.3, 4.6, 4.7, 4.8 2). External lighting is specified in accordance with BS5489-1:2003 + A2:2008	**Architect/M&E**	
Hea 2	Indoor air quality	Minimising sources of air pollution	3	1		1). Indoor air quality plan required 2). For air conditioned and mixed mode buildings intakes and exhausts are over 10m apart and intakes are 20m from external sources of pollution 3). VOC for products conform to the relevant standards set out in Table 5-3 of the BREEAM user manual	**Architect/M&E**	Criteria 2 cannot be achieved therefore only 1 credit is achieved. Potential credit for post construction formaldehyde testing to be carried out.
		Potential for natural ventilation	1	0		1). Opening window area is at least 5% of gross internal floor area. For rooms between 7-15m deep, windows on two sides are required	**Architect/M&E**	This cannot be achieved as some windows on elevations are not openable
Hea 3	Thermal comfort		2	0		**1st credit** 1). Thermal modelling has been carried out using software in accordance with AM11 and the modelling demonstrates the building design and services strategy can deliver thermal comfort levels set out in CIBSE Guide A **2nd credit** 1). Thermal modelling has informed the temperature control strategy for building 2). Strategy has addressed zoning, amount of occupant control, building services user knowledge, occupancy type/patterns, user interaction, user expectations	**M&E**	IES model of the building is not being created therefore these credits are not achievable
Hea 4	Water Quality		1	0		1). All water systems are designed in compliance with Health and Safety Executive 'Legionnaires' disease - The control of bacteria in water systems. 2). Where humidification is present, a failsafe humidification system is provided 3). Provision of drinking water that is chilled mains fed	**Architect/M&E**	This has been changed to potential as chilled mains fed drinking water is not being provided. BREEAM Assessor to ask BRE for guidance on the requirements in multi res buildings
		Prerequisite - appoint acoustician	0	0		Suitably qualified acoustian appointed at pre-bid/briefing stage to advise on: 1). External sources impacting the chosen site 2).Site layout and zoning of the building for good acoustics 3).Acoustic requirements for users with special hearing and communication 4).Acoustic treatment of different zones and facades	**Client/Acoustician**	

Hea 5	Acoustic Performance	Acoustic performance	**4**	**1**		1 credit - Sound insulation values are 3dB higher and sound impact levels are 3dB lower than performance standards in Building Regulations (Bedrooms only) 3 credits - Sound insulation values are 5dB higher and sound impact levels are 5dB lower than performance standards in Building Regulations (Bedrooms only) 4credits - Sound insulation values are 8dB higher and sound impact levels are 8dB lower than performance standards in Building Regulations (Bedrooms only)	**Architect /Acoustician**	BREEAM Assessor to send requiremnts to acoustician. Further credits are potentially available depending on levels of sound insulation provided
Hea 6	Safety and security	Safe access	**1**	**1**		1. Dedicated cycle lanes are provided and have been designed and constructed in accordance with either: a. Local Transport Note 2/08 b. National cycle network guidelines and practical details issue 2, Sustrans and the relevant parts of Appendix VI NCN Design Construction Checklist 2. The cycle lanes provide direct access from the site entrance to any cycle storage facilities provided, without the need to deviate from the cycle path and, if relevant, connects to off site cycle paths where these run adjacent to the development site boundary 3. Footpaths on site provide direct access from the site entrance to the building and connect to public footpaths off site, providing access to the local transport nodes and other off site amenities 4. Where provided, drop off areas are designed off/adjoining to the access road and provide direct access to the pedestrian footpaths, therefore avoiding the need for the pedestrian to cross vehicle access routes 5. Where a dedicated pedestrian crossing of a vehicle access route is provided, the road is raised to the pavement level unless pavement is at road level 6. For large developments with a high number of publicuser/visitors, pedestrian pathways must be signposted to the other local amenities 7. Lighting for access roads, pedestrian areas, footpaths and cycle lanes is compliant with the external lighting criteria defined in Hea01 8. Where dedicated access and drop off areas form part of the assessed development delivery areas are not directly accessed through general parking areas and do not cross or share pedestrian and cyclist routes 9. There is a seperate parking/waiting area for goods vehicles away from/adjacent to the manoeuvering area and staff/visitor car parking 10. Parking and turning areas are designed for simple manoeuvring according to the type of delivery vehicle likely to access the site, thus avoiding the need for repeated shunting 11. Dedicated space for storage of refuse skips and pallets away from the delivery vehicle manoeuvring area and staff/visitor car parking	**Architect/Transport consultant**	BREEAM Assessor to send requirements to landscape architects
		Security of site & building	**1**	**1**		Security of site and building 12. The project team have accounted for security considerations in the new building design and site layout through consultation with a suitably qualified security consultant. 13. Consultation with the suitably qualified security consultant occurred during or prior to the concept design stage **(RIBA stage C)** or equivalent. 14. The final design embodies the recommendations/solutions of the suitably qualified security consultant and is built to conform to either : a. The principles and guidance of Secured by Design (SbD)60 and/or Safer Parking (SP) Scheme61 Or where SbD/SP is of less relevance to the building type/operation: b. A site specific security risk and threat assessment and subsequent security strategy and recommendations for security measures (as developed/recommended by the suit-ably qualified security consultant).	**Architect/ALO**	
Energy			16	6	0			
Ene 1	Reduction of CO2 Emissions		**15**	**3**		1). EPR value for the building must be 0.25 to achieve the 3 credits based on approved modelling software	**M&E**	
Ene 2	Energy monitoring	BMS by energy use	**1**	**1**		1). Major consuming systems are monitored via BMS or by separate accessible energy sub meters with pulsed output: a). Space heating b). DHW c). Humidification d). Cooling e). Fans f). Lighting g). Small Power	**M&E**	MVHR in each apartment meaning localised ventilation plant. BREEAM Assessor to ask BRE on the requirements for metering in each apartment
Ene 3	External Lighting		**1**	**1**		1). All external lighting for buildings have a luminous efficacy of at least 50lamps lumens/circuit watt with a colour rendering index greater than 60 OR at least 60 lamp lumens/circuit watt with a colour rendering index less than 60	**M&E**	
		Feasibility study OR renewable energy supply contract	**1**	**1**		1). LZC feasibility study covering all technologies listed in BREEAM manual has been carried out. The most viable option is selected and included in the design. The feasibility studies carried out at Stage C	**M&E**	CHP or ASHP+Solar+PVs are the options for this

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Ene 4	Low zero carbon technologies	Low or zero carbon technology specification and installation Regulated carbon reductions: (10% reduction = 2credits, 20% reduction = 3credits, 30% reduction = exemplary level credit) OR Lifecycle carbon reductions: study only = 2 credits, 10% reduction = 3 credits, 20% reduction = 4credits, 30% reduction = exemplary level credit)	**4**	**2**		2credit = 10% reduction in CO2 through use of renewable 3 credits = 20% reduction in CO2 through use of renewable	**M&E**	
		Free cooling	**1**	**0**			**M&E**	
Ene 6	Energy efficient transportation systems		**2**	**2**		**1st credit** 1). Where lifts are required: a). Analysis of transportation demand and usage patterns for the building has been carried out to determine optimum number and size of lifts b). Energy consumption has been estimated for one of the following: i). At least two types of systems or ii). An arrangement of systems iii). A strategy that is 'fit for purpose' **2nd credit** 1). First credit is awarded 2). Energy efficiency features for three that offer the greatest energy savings are specified: a). Lifts can operate in standby b). Lift car uses high efficiency lighting c). Lifts uses drive controllers capable of variable speed, variable voltage, variable frequency d). Lift has a regenerative drive unit so energy generated by a traction lift is returned back to the electricity utility supplier	**M&E**	
Ene 8	Energy Efficient Equipment		**2**	**0**			**PM**	
Ene 9	Drying space		**1**	**0**			**Architect**	Not achievable
Transport			30	10	0			
Tra 1	Public transport accessibility		**3**	**3**		1). Compliant transport nodes: Bus stops within 650m of the building Train stations within 1000m of the building	**Transport consultant**	
Tra 2	Proximity to amenities		**2**	**2**		1). Where the building is within close proximity to amenities. For this building type, amenities need to be within 500m e.g. Grocery shops, post box, cash machine 2). The following 8 of 10 within 1000m of the building: Grocery shop, post box, cash machine, pharmacy, GP surgery, leisure sport centre, open public assess area, pub, community centre, place of worship	**Transport consultant**	
Tra 3	Cyclist Facilities		**2**	**0**		1). This credit is awarded based on building type. For this building, mulit resi - 1 space for 10 staff, 1 for 2 residents.	**Architect/M&E**	
Tra 4	Maximum car parking capacity		**2**	**2**				
Tra 5	Travel plan		**1**	**1**		1). A travel plan has been developed as part of the feasibility and design stages considering all types of travel relevant to the building types and users 2). The travel plan is structured to meet the needs of the particular site and takes into consideration the results of a site specific transport survey and assessment that covers the following: a). Existing travel patterns and opinions of existing building users towards cycling and walking so constraints can be identified b). Travel patterns and transport impact of future users c). Current local environment for walkers and cyclists d). Disabled access e). Public transport links serving the site f). Current facilities for cyclists 3). Travel plan includes a package of measures that have been used to steer the design of the development in order to meet travel plan objectives and minimise care based travel patterns. Examples as such: a). Providing parking priority spaces for car shares b). Providing dedicated and convenient cycle storage	**Transport consultant**	Requirements for the travel plan to be sent to Transport Consultant for review

Water			10	8	0			
Wat 1	Water Consumption		**5**	**2**		Information on l/p/day of domestic hot water consumption required	**Architect/ M&E**	
Wat 2	Water monitoring		**1**	**1**		1). Specification of a water meter on mains supply provided 2). Water consuming plant consuming more than 10% of building total water demand are separately metered 3). Meters have a pulsed output connected to the BMS	**M&E**	
Wat 3	Water leak detection & prevention	Leak detection - 1 credit Leak prevention - 1 credit	**2**	**2**		**1st credit** 1). A leak detection system which is capable of detecting a major water leak on the mains 2). Leak detection is: a). Audible when activated b). Activated when the flow of water passing through the water meter is at a flow rate above a pre-set maximum c). Able to identify different flows and therefore leakage rates d). Programmable to suit users e). Designed to avoid false alarms where applicable **2nd credit - only applicable to non domestic toilet areas** 1). One of the following types of flow control devices are fitted a). Automatic timer switch device to switch off water supply a set time b). A programmed time controller c). A volume controller d). A presence detector e). A central control unit	**M&E**	
Wat 4	Water efficient equipment		**1**	**1**			**Landscape architect**	
Materials			8	6	0			
Mat 1	Life cycle impacts		**6**	**3**		Major building elements use construction materials which have low embodied energy	**Architect/ Contractor**	
Mat 2	Hard landscaping and boundary protection		**1**	**0**		At least 80% of all external hard landscaping have a Green Guide Rating of A/A+	**Architect**	This cannot be achieved
Mat 3	Responsible sourcing of materials		**3**	**1**		Specified materials are responsibly sourced. For any given building element 80% of material must be responsibly sourced	**Architect/ Contractor**	
Mat 4	Insulation	Prerequisite - all new insulation assessed	**0**	**0**		All new insulation products have been assessed: a). External Walls b). Ground floor c). Roof d). Building services	**Architect/ M&E/ Contractor**	
		Embodied impact	**1**	**1**		Insulation products required to have low embodied energy		
		Responsible sourcing	**1**	**1**		Insulation products required to be responsibly sourced		
Mat 5	Designing For Robustness		**1**	**1**		1). Areas of the building have been identified where vehicular, trolley and pedestrian movement occur 2). Design incorporates suitable durability and protection measures	**Architect/structures**	
Waste			13	7	0			
Wst 1	Construction Site Waste Management	Construction resource efficiency	**3**	**2**		1). SWMP plan required 2). For one credit: <13.3m3/100m2 floor area 3). For two credits <7.5m3/100m2 floor area 4). For three credits <3.4m3/100m2 floor area	**Contractor**	

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		Diversion of resources from landfill	1	1		70% volume of 80% tonnage of non hazardous construction diverted from landfill		
Wst 2	Recycled aggregates		1	0			**Contractor/ Structural**	
Wst 3	Operational Waste		1	1			**Architect/Client**	
Wst 4	Speculative floor and ceiling finishes		1	0			**Architect/Client**	
Land Use & Ecology			6	4	0			
LE1	Site selection	Previously developed land	1	1		At least 75% of proposed development footprint is on land which was developed for use by industrial, commercial or domestic purposes	**Geotechnical Engineer/ Landscape Architect/ Architect**	
		Contaminated land	1	1		1). The site is deemed to be significantly contaminated and confirmed by a specialist site investigation a). Degree of contamination b). The contaminant sources c). Options for remediating sources of pollution 2). The client or contractor confirms that remediation of the site will be carried out		The contamination report to be sent through to BREEAM Assessor for review
LE2	Ecological value of site and protection of ecological features		1	0		1). Land is in a construction zone defined as 'low ecological value' either using: a). BREEAM checklist b). SQE has identified this via ecological assessment report 2). All existing features of ecological value surrounding the construction zone are protected	**Landscape Architect/ Ecologist/ Contractor**	The site has little or no external landspacing. At present no ecologist is being utilised therefore no credits can be achieved
LE3	Mitigating Ecological impact		2	0		**1st credit** 1). The change in ecological value of the site is less than zero but equal or greater than -9. Information provided via SQE or BREEAM tables **2nd credit** 2). Change in ecological value is greater than or equal to zero	**Landscape Architect/ Ecologist/ Contractor**	The site has little or no external landspacing. At present no ecologist is being utilised therefore no credits can be achieved
LE4	Enhancing Site Ecology		3	0		**One credit** A suitably qualified ecologist (SQE) has been appointed to report on enhancing and protecting the ecology of the site and: a). SQE provides a ecology report with the appropriate recommendations for protection and enhancement of site ecology b). The report is based on a site visit/survey by the SQE The general recommendations of the Ecology Report for enhancement and protection have been/will be implemented **Two credits** (all building types except those on HM Prison sites) Criteria 1 and 2 are achieved. The recommendations of the Ecology Report for enhancement and protection of site ecology have been implemented, and the suitably qualified ecologist confirms that this will result in an increase in ecological value of the site up to (but not including) 6 plant species. The increase in plant species has been calculated using the BREEAM LE03/LE04 calculator, using actual plant species numbers. **Three credits** (all building types except those on HM Prison sites) The requirements of the first credit are achieved. The recommendations of the Ecology Report for enhancement and protection of site ecology have been implemented, and the suitably qualified ecologist confirms that this will result in an increase in ecological value of the site of 6 plant species or greater. The increase in plant species has been calculated using the BREEAM LE 03/LE 04 calculator, using actual plant species numbers.	**Landscape Architect/ Ecologist/ Contractor**	The site has little or no external landspacing. At present no ecologist is being utilised therefore no credits can be achieved
LE5	Long term impact on biodiversity		2	0		**Mandatory criteria** 1). A suitably qualified ecologist has been appointed prior to commencement on site 2). SQE confirms all UK and EU legislation relating to protection and enhancement have been complied with 3). A 5 year landscape and habitat management plan has been carried out **1st credit (2 of 5 below achieved)** **2nd credit (4 of 5 below achieved)** 1). Contractor nominates a 'biodiversity champion' 2). Contractor trains workforce on how to protect site ecology during the project. e.g. toolbox talks 3). Contractor records action taken to project biodiversity and monitors there effectiveness 4). Where a new ecologically valuable habitat is created it supported nationally, regionally or locally important biodiversity 5). Where flora/or fauna habitats exist on site the contractor programmes site works to minimise disturbance to wildlife	**Landscape Architect/ Ecologist/ Contractor**	The site has little or no external landspacing. At present no ecologist is being utilised therefore no credits can be achieved
Pollution			10	2	0			
Pol 1	Impact of refrigerants		3	0			**M&E**	If ASHP are installed these credits is not achievable.
Pol 2	NOx emissions		3	1			**M&E**	If ASHP are installed this credit is not achievable, CHP would only result in a maximum of 1 credir

Pol 3	Surface water run off	Flood risk	2	2		**2 credits** 1). Assessed development is situated in a flood zone defined by relevant planning, policy and technical guidance as having a low annual probability of flooding 2). A site specific flood risk assessment confirms a low risk of flooding from all sources	**C&S**	Flood risk assessment prepared. BREEAM Assessor to send through requirements to Structural engineer
		Surface water run off	2	2		**Pre-requisite** An appropriate consultant is appointed to carry out, demonstrate the following criteria: a). Where drainage measures are specified to ensure that the peak rate of run-off from the site watercourse is no greater for the developed site than for the pre-developed site. Complying with 1 year and 10year return periods b). Calculations include an allowance for climate change, this should be made	**C&S**	BREEAM Assesor to send requirements to Structural engineer
		Minimising watercourse pollution	1	1		1). Appropriate consultant confirms no discharge from the developed site for rainfall up to 5mm 2). Specification of SUDs drainage scheme or source control systems such as permeable surfaces or infiltration trenches where run-off drains are in areas of low risk of watercourse pollution 3). Specification of oil/petrol separator where there is a high risk of contamination 4). All water prevention systems have been designed and detailed in accordance with recommendations in PPG7 and SUDs manual 5). Up to date drainage plan will be made available to site owners/occupiers 6). Where the building has chemical/liquid storage areas are provided, shut-off valves are fitted 7). Where present, all external storage and delivery areas are designed and detailed in accordance with recommendations of Environmental Agency publication Pollution Prevention Pays Guidance	**C&S**	BREEAM Assesor to send requirements to Structural engineer
Pol 4	Reduction of Night Time Light Pollution		1	1		1). External lighting strategy has been designed in accordance with Table 1 of ILE Guidance notes for reduction of obstructive light 2). All external lighting is switched off between 23:00 and 07:00 3). If security lighting is present between 23:00 and 07:00 then this part of the lighting system complies with lower levels of lighting recommended in Table 1 of ILE Guidance notes Buildings in Scotland must comply with 'Controlling light pollution and reducing lighting energy consumption which can be demonstrated through compliance with checklists Annexes B and C of the document	**M&E**	
Pol 5	Noise Attenuation		1	1		1). Credit awarded by default if no noise sensitive areas with 800m radius 2). Where there are noise sensitive areas within 800m, a noise impact assessment in accordance with BS 7445:1991 has been carried out and following noise levels determined: a). Existing background noise levels at the nearest point or most exposed areas b). Rating noise level from new development 3). Noise impact assessment carried out by suitably qualified acoustician 4). Noise level from proposed site is no greater than +5dB during the day (07:00-23:00) and +3dB at night 5). Where noise sources from the building are greater than levels stated in 4). then measures to attenuate the noise level	**Contractor/ Acoustician/ Architect**	
Exemplary level innovation credits			13	8	0			
Man 1	Sustainable Procurement	There is commitment or contract for the facilities manager or equivalent to undertake checks at quarterly intervals for the first 3 years after occupation	1	1		There is a commitment during the first 3 years to carry out the following: a). Collect the occupant satisfaction, energy consumption and water consumption data b). Utilise the data to check the building is performing c). Set targets for reducing water and energy consumption and monitor progress towards these d). Feedback any 'lessons learned' to the design team and developer e). Provision of the actual annual building energy, water consumption and occupant satisfaction data to BRE global	**Client**	Added in to target score
Man 2	Responsible Construction Practices	Where the principal contractor's performance against the compliant scheme has been con-firmed by independent assessment and verification and the contractor achieves compliance with the criteria of the compliant scheme to an exemplary level of practice. (CCS score >36)	1	1			**Contractor**	
				3	0			
	Number of additional approved Innovation credits achieved?						**All**	

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BREEAM Scheme: New Construction 2011
Building Name: Plot 4, First Street
BREEAM Registration No.: BREEAM 0000 0000
BREEAM Assessor: Mairi Murray

Ref	Title	Sub-credits	credits available	credits targeted	credits awarded	Information Required	Team member responsible for providing evidence	Potential Uplift in Score	Cost
Management									
Man 1	Sustainable Procurement	Construction and handover	**2**	**2**		**1st credit** 1). Main contractor accounts for thermographic survey within the project budget 2). Thermgraphic study carried out to appropriate standards by a professional holding cert in thermography. Survey confirms: a). Continuity of insulation b). Avoidance of excessive thermal bridging 3). Avoidance of air leakage paths through fabric 3). Any defects are rectified	**Contractor/M&E**	**0.54%**	
Man 4	Stakeholder participation	Post Occupancy Evaluation (POE) and information dissemination	**1**	**1**		The client makes a commitment to carry out Post Occupancy Evaluation one year after building occupation to gain building performance feedback. POE should be carried out by an independent third party and should cover: a). A review of the design and construction process b). Feedback from a wide range of the building users including Facilities Management covering: i). Internal environmental conditions ii). Control, operation and maintenance iii). Facilities and amenities iv). Access and layout v). Other relevant issues Client commits to carry out the appropriate dissemination of information on buildings post occupancy performance c). Sustainability performance	**Client**	**0.54%**	
Health & Wellbeing			22	15	0				
Hea 1	Visual comfort	Daylighting	**1**	**1**		Kitchens to achieve DF of 2% or more Living rooms/Bedrooms to achieve DF of 2% or more No residential/communal occupied spaces to achieve 2% over 80% of floor area and room depth criteria achieved	**Architect/M&E**	**0.93%**	
Hea 2	Indoor air quality	Minimising sources of air pollution	**3**	**2**		1). Indoor air quality plan required 2). For air conditioned and mixed mode buildings intakes and exhausts are over 10m apart and intakes are 20m from external sources of pollution 3). VOC for products conform to the relevant standards set out in Table 5-3 of the BREEAM user manual Formaldehyde concentration level is measured post construction (but pre-occupancy) and is found to be less than or equal to 100µg/m3 averaged over 30 minutes (WHO guidelines, source BRE Digest 464 part 220).	**Architect/M&E**	**0.93%**	
Hea 3	Thermal comfort		**2**	**1**		**1st credit** 1). Thermal modelling has been carried out using software in accordance with AM11 and the modelling demonstrates the building design and services strategy can deliver thermal comfort levels set out in CIBSE Guide A	**M&E**	**0.93%**	
Hea 5	Acoustic Performance	Acoustic performance	**4**	**3**		1 credit - Sound insulation values are 3dB higher and sound impact levels are 3dB lower than performance standards in Building Regulations (Bedrooms only) 3 credits - Sound insulation values are 5dB higher and sound impact levels are 5dB lower than performance standards in Building Regulations (Bedrooms only) 4credits - Sound insulation values are 8dB higher and sound impact levels are 8dB lower than performance standards in Building Regulations (Bedrooms only)	**Architect /Acoustician**	**1.87%**	
Energy			16	11	0				
Transport			30	10	0				
Water			10	8	0				
Materials			8	6	0				
Mat 1	Life cycle impacts		**6**	**4**		Major building elements use construction materials which have low embodied energy	**Architect/ Contractor**	**0.96%**	
Waste			13	8	0				
Land Use & Ecology			6	4	0				
LE2	Ecological value of site and protection of ecological features		**1**	**1**		1). Land is in a construction zone defined as 'low ecological value' either using: a). BREEAM checklist b). SQE has identified this via ecological assessment report 2). All existing features of ecological value surrounding the construction zone are protected	**Landscape Architect/ Ecologist/ Contractor**	**1.00%**	

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LE5	Long term impact on biodiversity		**2**	**2**		**Mandatory criteria** 1). A suitably qualified ecologist has been appointed prior to commencement on site 2). SQE confirms all UK and EU legislation relating to protection and enhancement have been complied with 3). A 5 year landscape and habitat management plan has been carried out **1st credit (2 of 5 below achieved)** **2nd credit (4 of 5 below achieved)** 1). Contractor nominates a 'biodiversity champion' 2). Contractor trains workforce on how to protect site ecology during the project. e.g. toolbox talks 3). Contractor records action taken to project biodiversity and monitors there effectiveness 4). Where a new ecologically valuable habitat is created it supported nationally, regionally or locally important biodiversity 5). Where flora/or fauna habitats exist on site the contractor programmes site works to minimise disturbance to wildlife	**Landscape Architect/ Ecologist/ Contractor**	**2.00%**	
Pollution			10	5	0				
Exemplary level innovation credits			13	8	0				
				3	0				
	Number of additional approved Innovation credits achieved?						**All**		