



40 – 68 SILVER STREET
READING
ENERGY & SUSTAINABILITY
STATEMENT



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1. Executive Summary

- 1.1 This Energy Statement presents the energy strategy for the proposed scheme at 40 -68 Silver Street, Reading.
- 1.2 The proposed scheme includes the redevelopment of the site to provide a multi storey residential development.
- 1.3 Consideration has primarily been given to the planning policy context and other requirements prior to establishing a strategy based upon the energy hierarchy; with a priority given to energy reduction and efficiency. Renewable and low carbon technologies have also been considered in the context of their technical feasibility and financial viability.
- 1.4 The following is therefore proposed:
- High performance building fabric and energy efficient lighting, services and equipment;
 - Passive design measures to reduce energy demand for heating, cooling, ventilation and lighting;
 - Centralised Air source Heat Pumps generating low temperature hot water (LTHW) serving Heat Interface Units (HIU's) within each residential demise.
 - Heat recovery ventilation (MVHR).
 - PV panels to block B
- 1.5 In line with the council's Local Plan Policy H5, All major new build residential developments should be designed to achieve zero carbon homes.
- The implementation of the building services systems indicated above results in circa 36% reduction in carbon emissions when compared to part L1a of the building regulations 2013.**
- This is a significant achievement on a large development and embraces the council's planning policies and commitment to improve energy efficiency & reduce CO² emissions.
- 1.6 A contribution of £1800 per tome of carbon shall be provided towards carbon offsetting. The level of carbon offset is estimated at 51.51 Tonnes CO2 equating to £92,730.00
- 1.6 Overall, the proposed energy strategy is considered consistent with the National Planning Policy Framework and policies of the Council. The development goes beyond the framework set out and exceeds the targets expected of a building of this nature. When implemented the energy strategy will provide an efficient and low carbon development.

2. Introduction

- 2.1 Quality Engineering Design Ltd was commissioned by Morlet Properties Ltd to produce an Energy Statement for the proposed residential development at 40-68 Silver Street, Reading.

Site & Surroundings

- 2.2 The Application Site is located within the borough of Reading, on Silver Street to the south East of the town centre.

The wider area comprises a mixture of residential, commercial and office space.

Proposed Development

- 2.3 Development proposals are for the redevelopment of the site to provide a multi-storey residential development comprising 2 bed terrace houses, 1-bed and 2-bed apartments.

Report Objective

- 2.4 The objective of the Energy Statement is to assess the predicted energy performance and carbon dioxide emissions of the proposed development utilising passive and LZC technologies to align the development with the council planning policies.

3. Assessment Methodology

Analysis Methodology

- 3.1 There is a broad consensus that the preferred approach to minimising carbon emissions from buildings is to firstly focus on reducing the demand for energy before reviewing efficient and renewable technology options.
- 3.2 However, priorities and performance targets can vary at a local level and the report therefore commences with a review of the planning policy and other considerations.
- 3.3 A site context appraisal is then undertaken to establish the site specific parameters for climatic conditions and available energy infrastructure. The subsequent sections follow the Energy Hierarchy (discussed below) and review the design proposals in relation to passive design and energy efficiency as well as the potential to incorporate low carbon and renewable technology.

Energy Hierarchy

- 3.4 The tiers of the Energy Hierarchy are:

Energy Hierarchy

1. Be Lean	Reduce Energy Demand
2. Be Clean	Use Energy More Efficiently
3. Be Green	Use Renewable Energy

- 3.5 The first principle of the Hierarchy is to reduce demand and the need for energy in the first place. Where opportunities to improve the efficiency of the design have been maximised, consideration is then given to the second principle whereby priority is given to the efficient use of energy. This is on the basis that low carbon technologies can be cost-effective and provide significant carbon savings when compared to conventional technologies.
- 3.6 The third principle of the hierarchy promotes the use of renewable technologies. Whilst these technologies can be relatively expensive to install, they do offer the potential to significantly reduce carbon emissions.
- 3.7 The summary section of the report presents an overview of the findings and the strategy.

4. Planning Policy Context

- 4.1 National and local planning policy relevant to sustainable development is considered in detail below:

National Planning Policy Framework

- 4.2 The Department for Communities and Local Government determines national policies on different aspects of planning and the rules that govern the operation of the system.
- 4.3 The transition to a low carbon economy is promoted in paragraphs 17, 93 through to 97 of the NPP dated February 2019

Local Planning Policy

- 4.4 The relevant planning authority is Reading Borough Council and the 'Local Plan' for the area (adopted November 2019) explains the various policies relevant to residential development.
- 4.5 The Local Plan contain policies and proposals for the physical development and use of land, including measures for the improvement of the environment and management of traffic, and takes social and economic factors into account.
- 4.6 Various policies are presented within the documents, the most relevant to energy are detailed below:

Policy CC2 – Sustainable Design & Construction

This policy seeks improved sustainability performance for buildings

- a. It sets out the general principles of sustainability in new residential and non residential developments

Policy CC3 – Adaption to Climate Change

This policy identifies measures to reduce the usage of resources

- a. Designing developments to increase energy efficiency and reduce energy consumption.
- b. Promoting developments that reduce surface water run off.

Policy CC4 – Decentralised Energy

This policy requires developers to consider inclusion of decentralised energy infrastructure.

- a. Help achieve a shift to sustainable energy consumption
- b. reduce dependence on centralised network or grid

Policy H5 – Housing Standards

This policy outlines standards for new build housing

- a. All major developments must achieve zero carbon homes.
- b. All new build housing must be built to the higher water efficiency standard within the building regulations.

5. Other Policy & Regulatory Considerations

- 5.1 This section comprises an overview of other considerations relevant to the Energy Statement.

Building Regulations

Update 2013 (Part L Conservation of Fuel & Power)

- 5.2 The Department for Communities and Local Government announced on 30 July 2013 that the update to Building Regulations Part L would include a further 6% carbon reduction for residential schemes from 6 April 2014.

Note: A reduction in carbon emissions roughly averaging 25% was implemented in the update from Part L 2006 to Part L 2010.

National Planning Practice Guidance

Climate Change

- 5.3 Advises how planning can identify suitable mitigation and adaption measures in plan-making and the application process to address the potential for climate change.

Renewable and Low Carbon Energy

- 5.4 The guidance is intended to assist local councils in developing policies for renewable energy in local plans, and identifies the planning considerations for a range of renewable sources.

Local Planning Policy Guidance

Sustainable Design & Construction Supplementary Planning Document (Adopted December 2019)

- 5.5 The supplementary planning document (SPD) involves more specific guidelines, expanding upon particular parts of the local plan policies and supporting text.

6. Site Context Appraisal

- 6.1 Local climatic conditions, natural resources and energy infrastructure are addressed within this section.

Local Climate

- 6.2 An assessment of the local climate and natural resources has been compiled from Met Office, Department of Energy and Climate Change and British Geological Survey data. Consideration has been given to the data for Reading as the nearest climate station to the site.

Table 6.1 Averages Table (Climate Period 1981-2010)

Month	Max temp (oC)	Min temp (oC)	Days of air frost (days)	Sunshine (hours)	Rainfall (mm)	Days of rainfall ≥1mm (days)	Monthly mean wind speed at 10m (knots)
January	7.7	1.9	9.1	56.8	61	11.2	–
February	8	1.7	9.4	76	41.2	9.1	–
March	10.8	3.4	5.1	109	44.5	9.7	–
April	13.5	4.7	2.2	160.6	48	9.3	–
May	17	7.7	0.2	188.2	46.4	8.8	–
June	20	10.6	0	189.1	44.6	7.7	–
July	22.4	12.7	0	197.3	46	7.7	–
August	22.1	12.5	0	191.6	52.3	7.9	–
September	19	10.3	0	138	50.3	7.9	–
October	14.9	7.6	1.1	106.4	71.8	10.5	–
November	10.7	4.4	4.4	63.1	66.3	10.7	–
December	7.9	2.2	9.8	46.9	62.9	10.6	–
Annual	14.5	6.7	41.3	1522.9	635.4	111.1	–

Microclimate

- 6.3 The term “microclimate” refers to the climatic conditions at a certain area, which may differ from the surroundings. In the context of sustainability in urban developments, the interest lies at the microclimate within the development site and immediate surroundings as this will have an impact on the actual energy performance of the buildings, the potential for renewables exploitation, indoor/outdoor comfort and safety conditions for occupants and the public.
- 6.4 Given the complex interrelationship between building configuration and microclimatic variables (e.g. air temperature, humidity, wind speed/direction, solar radiation), the microclimatic analysis requires advanced modelling techniques and computational simulations which fall out of the scope of the standard approach towards the formulation of an overarching energy strategy.

District Heating Opportunities & Heat Maps

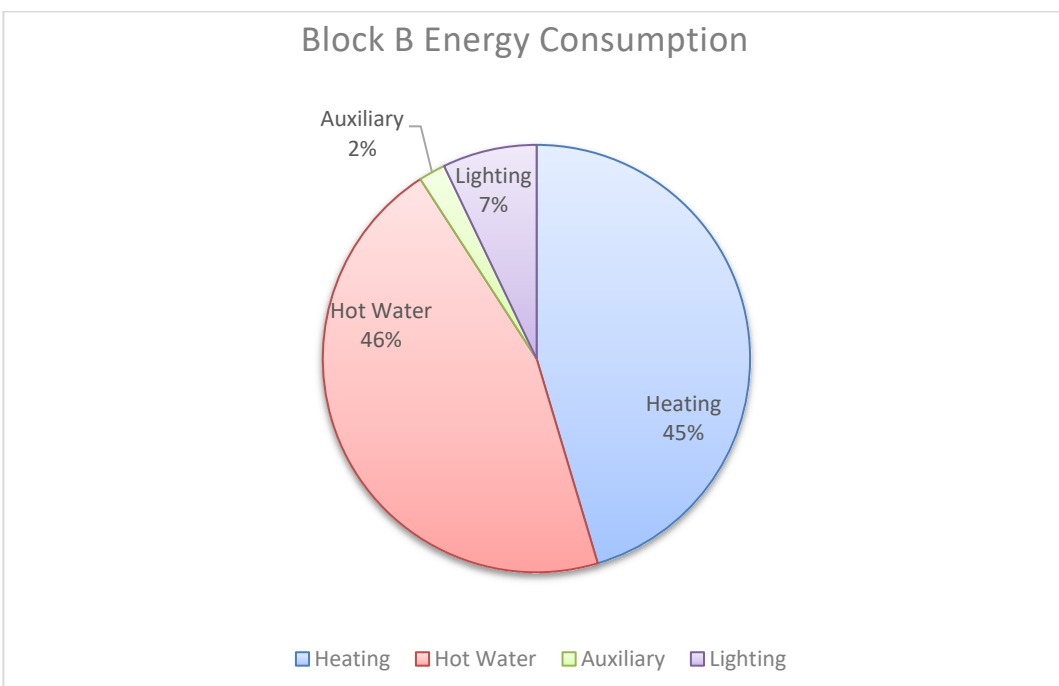
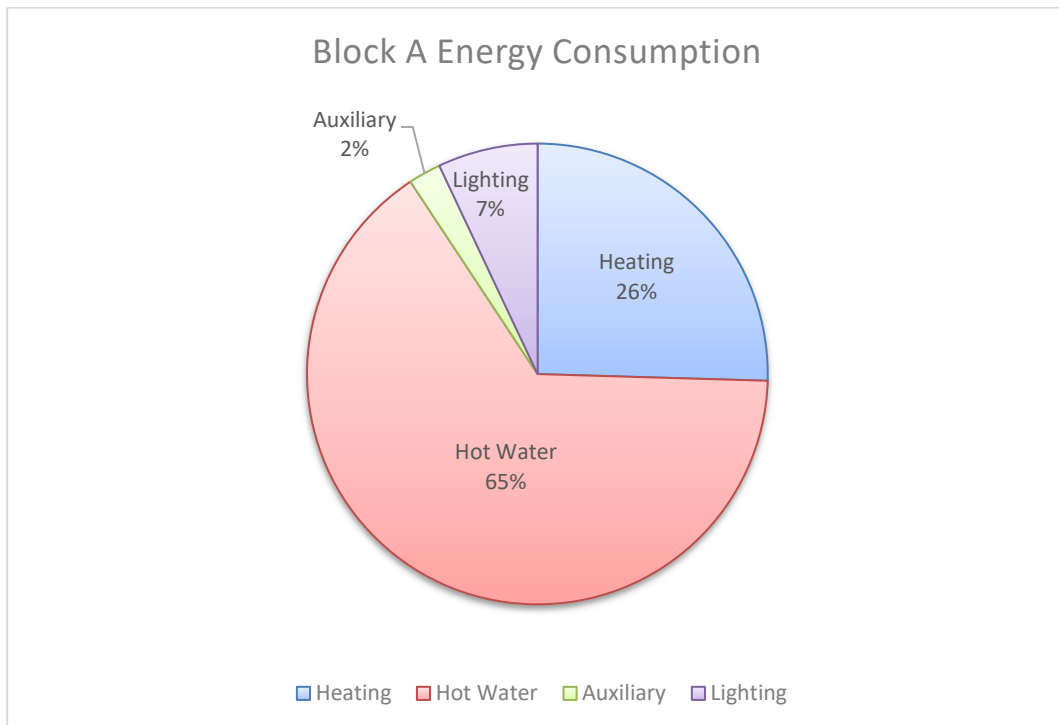
- 6.5 The National Heat Map, which was initially commissioned in 2010 by the Department of Energy and Climate Change - now the Department for Business, Energy & Industrial Strategy (BEIS) was de-commissioned in April 2018.
- 6.6 Reading does not have an existing district energy network however there are 4 clusters currently under review within and around the town centre. Developments of over 20 dwellings should consider inclusion of decentralised energy provision within the site and developments of over 10 dwellings to link into an existing district energy network.
- 6.7 Following a review of the potential local district heating network within the town it is concluded that connection to any future network is NOT viable due to distance and resulting cost to extend the network. The development will therefore seek to utilise energy efficiently and generate some of the energy needed on site through the use of heat pump systems and PV.

7. Baseline Energy Model

7.1 To review the Local Plan policy H5; first a baseline position must be established of the energy requirements, which is calculated using SAP Assessment.

7.2 The following represents the energy consumption for Blocks A & B

Figure 7.2 Baseline Energy Requirement



Energy Target

- 7.3 The planning policies do not set energy targets

Carbon Emission Reduction

- 7.4 The Sustainable Design and Construction Supplementary Planning Document, paragraph 3.11: “The building must achieve a minimum of 35% improvement in regulated emissions over the Target Emissions Rate in the 2013 Building Regulations, plus a Section 106 contribution of £1,800 per remaining tonne towards carbon offsetting within the Borough (calculated as £60/tonne over a 30-year period)”.

The baseline average area weighted Part L TER for the development is circa 29.03 kgCO₂/m² & 27.23 kgCO₂/m² for block A & B respectively. Based on a centralised heat pump installation the average area weighted DER calculates to circa 18.48 kgCO₂/m² & 17.20 kgCO₂/m² for block A & B respectively, when implementing heat pump hot water and photovoltaics, this demonstrates a potential reduction in carbon emissions below the baseline model in excess of 35% and thus compliance with paragraph 3.11.

The photovoltaic requirements are 1.9 kW per dwelling for block B totalling 11.4kW

The total annual CO₂ emissions for block A & B is 24.8 tonnes & 6.9 tonnes respectively totalling 31.7 tonnes, this totals £57,060.

Block A

Area	2421m ²
TER	29.03 kgCO ₂ /m ²
36.3% of TER improvement	10.82 kgCO ₂ /m ²
63.7% of TER improvement	18.48 kgCO ₂ /m ²
Annual excess CO ₂ emission x £1800 = S106 contribution £80,532.00	

Block B

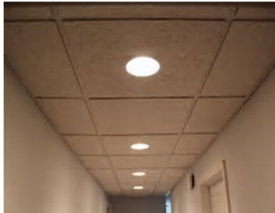
Area	394m ²
TER	27.23 kgCO ₂ /m ²
36.8% of TER improvement	10.03 kgCO ₂ /m ²
63.2% of TER improvement	17.20 kgCO ₂ /m ²
Annual excess CO ₂ emission x £1800 = S106 contribution £12,198.00	

8. Passive Design & Energy Efficiency

8.1 This section considers features of the proposed design (including indicative performance levels) relevant to passive design and energy efficiencies

Table 8.1 - Passive Design & Energy Efficiency Design Features

Aspect	Description	Appraisal
Passive Design 	Passive design seeks to maximize the use of natural sources of heating, cooling and ventilation to maintain thermal comfort levels within the building.	<u>Building Massing & Orientation</u> The building comprises a multi storey residential development surrounded by a mixture of similar buildings. The adjacent multi storey buildings offer partial shading to the South Elevation. <u>Passive Heating / Cooling</u> It is intended that windows will be set back slightly to provide a degree of shading from the sun. It is intended that the building will have the potential to be naturally ventilated (via background trickle vents / openable windows), with ventilation rates calculated to ensure sufficient air changes per hour to maintain temperatures within a comfortable range. <u>Lighting and Daylighting Design</u> The design of the glazed areas will seek to offer good access to natural daylight to reduce consumption of energy for artificial lighting. Overall, a balance shall be sought between achieving daylighting levels and winter solar gains, whilst minimising summer heat gains and cooling loads.
Fabric Efficiency 	Fabric efficiency concerns the thermal properties associated with the building fabric and construction.	<u>Insulation</u> Heat Transfer Coefficients, otherwise referred to as U-Values, are a measure of the rate of heat transfer through a building element over a given area, under standardised conditions (i.e. the rate at which heat is lost or gained through a fabric). It is intended that the performance of the building fabric will incorporate relatively low U-Values to reduce the rate at which the building loses heat, preserving the heat within the space and reducing the requirement for mechanical heating.

		The following U-values are provided as a guide for the basic building elements: - External Walls 0.16 W/m²K; - Roof 0.13 W/m²K; - Ground Floor 0.13 W/m²K; - Windows 1.4 W/m²K. <u>Air Tightness</u> A high level of air tightness is proposed and a level equal to or below 3m³/h/m² is targeted, meaning that air infiltration between the internal and the external environment will be largely controlled and space heating demand further reduced. <u>Thermal Bridging</u> Thermal bridging is the penetration of the insulation layer by a highly conductive non-insulating material allowing rapid heat transfer from an interior to exterior environment (and vice versa). In well insulated buildings, as much as 30% of heat loss can occur through thermal bridges. The building fabric shall be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements. Accredited thermal bridging details shall be adopted.
System Efficiency 	System efficiency concerns the energy efficiency of the heating, cooling, lighting and auxiliary systems employed within the building.	<u>Metering</u> The major energy uses shall be monitored via separate energy meters and a Building Energy Management System (BEMS) will be installed, which will allow for optimum operational control and performance of complex building services in the development.

		<u>Lighting Efficacy</u> At this stage, detailed lighting design calculations have not yet been undertaken, but lighting design is intended to be highly efficient and in excess of Building Standards requirements. It is intended that lighting efficacy shall be in excess of 80 lumens/circuit Watt. Lighting controls (e.g. PIR occupancy sensors) shall be employed throughout common areas and zoned to suit the different space uses to further reduce the energy consumption for artificial lighting. External lighting shall be highly efficient and employ controls to avoid energy wastage from unnecessary operation during daytime.
Overheating Mitigation 	The issue of overheating will need detailed and considered assessment at a later stage of design on the basis that, as buildings become progressively better sealed and insulated, the potential for overheating increases.	<u>Limiting Summer External Gains</u> Solar control glazing shall be installed to the elevations most affected; the precise specification of glazing types for windows and glazed curtain walling is to be based upon further analysis at later stages so that the appropriate balance is found between limiting summer heat gains without compromising daylight harvesting and winter solar gains. Thermal mass (discussed above) and internal occupant-controlled shading elements will be considered at the more detailed design stage along with heat reflective finishes of the external building surfaces. The above shall be considered in conjunction and interrelationship with the ventilation strategy, to ensure thermal comfort for occupants and energy savings. <u>Limiting Internal Heat Gains</u> Heat gains from people and equipment are considered to be relatively low. Heat emitting distribution pipework in common areas present limited risk of overheating in these spaces. However, it is expected that attention will be given to: - The performance of pipework thermal insulation; - Maximising the natural ventilation potential of spaces; - The (mechanical) ventilation of spaces;

9. District Energy & Low Carbon Technology Appraisal

- 9.1 Low carbon technologies are energy generation systems which offer the capability to make more efficient and effective use of primary energy resources, emitting significantly lower levels of carbon dioxide than conventional energy generation methods.

Table 9.1 - District Energy & Low Carbon Technology Appraisal

Technology	Description	Appraisal	Proposed
District Energy 	The term “district energy” applies to the energy distribution network, rather than the origins of the energy and the extent of any carbon savings will be largely determined by the energy source and heat losses on the network.	<u>Opportunities</u> - A seasonal heating demand exists on site which would be sufficient to justify a District Energy Connection; <u>Limitations</u> - Connection costs and energy prices may be high/fluctuate, - The carbon factor associated with the fuel source is beyond the control of the developer. <u>Appraisal</u> - A district heating system is not present within the vicinity of the site.	No
Combined Heat & Power 	Combined Heat & Power (CHP) systems generate electrical energy and provide the waste heat to the site. They are typically gas-powered but can be run off alternative fuel sources. CHP is regarded as a highly efficient means to supply heat in developments, providing significant carbon savings and wider environmental benefits (the power generation is much less	<u>Opportunities</u> - A seasonal heating demand exists, which is sufficient to justify a CHP system <u>Limitations</u> - The space heating/hot water demand presents a variable daily, weekly and seasonal trend; this potentially introduces design complexity and viability implications for the technology; - Large central plant space is required for CHP plant and back up heat generation. - Studies have indicated that CHP system operational efficiencies are much lower than predicted by the plant data - Distribution mains continually operating can contribute to potential overheating issues in common areas of the building. <u>Appraisal</u> - CHP is not seen as a “true” sustainable energy source as it is fuelled by natural gas. - The GLA; ‘Guidance on Energy Assessments’, published in October 2018 identifies that	No

	resource intensive and carbon emitting compared to grid electricity from the average UK power station).	under SAP 10 carbon factors, the potential electricity produced has lower CO2-value which may not offset the additional gas burned to generate it. - CHP is therefore not currently considered feasible due to the imminent change in electricity decarbonising. - The SPD indicates heat pumps should be considered before CHP - The required plant space for the CHP engine and back up heat generation plant, potential existing air quality issues, distribution efficiencies and high maintenance costs also contribute to the unsuitability of a CHP installation.	
Mechanical Ventilation with Heat Recovery 	Mechanical Ventilation Heat Recovery (MVHR) systems provide fresh and exhaust air ventilation to a space whilst recovering heat in winter and providing free cooling in summer.	<u>Opportunities</u> - A requirement for extract ventilation exists within each apartment with continuous fresh air make up. <u>Limitations</u> - The systems are more expensive to install than extract only with back ground trickle ventilation. - The fan units require additional space and commissioning - MVHR units are not able to perform as sufficiently as openable windows when managing overheating. <u>Appraisal</u> - MVHR systems reduce the energy lost through infiltration and improve indoor air quality, and limit noise ingress when openable windows are closed. - The MVHR systems can provide nigh-time cooling and assist in reduction of overheating during unoccupied periods. - The inclusion of MVHR units generates energy savings to assist with CO2 reduction - MVHR units are therefore recommended	Yes

10. Renewable Technology Appraisal

- 10.1 Renewable technologies are those which take their energy from sources which are considered to be inexhaustible (e.g. sunlight, wind etc.). Emissions associated with renewables are generally considered to be negligible and the technologies are frequently referred to as “zero carbon”.

Table 10.1 Renewable Technology Appraisal

Technology	Description	Appraisal	Proposed
Biomass Systems 	Biomass systems are heating systems that use agricultural, forest, urban and industrial residues and waste to produce heat and (depending on the system) electricity. Biomass is a clean, renewable energy source. At the building scale, biomass boilers using wood pellets or woodchips are the norm. Biomass should be sourced locally to limit “embodied carbon” associated with transport. Trees, crops, and municipal solid waste are consistently available and can be managed sustainably.	<u>Opportunities</u> - A seasonal heating demand exists, which is sufficient to justify a Biomass system - Renewable Heat Incentive (RHI) available to compensate for the initial capital cost. <u>Limitations</u> - The space heating/hot water demand presents a variable daily, weekly and seasonal trend; this potentially introduces design complexity and viability implications for the technology but can be overcome with detailed design and buffer storage for efficient operation. - Significant central plant space is required for biomass plant and fuel storage. - Biomass boilers need to be cleaned regularly, around once a week. However, modern models have simplified the process. - Distribution mains continually operating can contribute to potential overheating issues in common areas of the building. <u>Appraisal</u> - Biomass is considered a renewable source of energy because it can be obtained relatively quickly by replacing or growing new plants or trees when compared to generation of fossil fuels, i.e. natural gas. - Biomass is considered a carbon-neutral form of energy because the same amount of carbon dioxide released by the burning process is later re-absorbed by growing plants. - Plant space and fuel stores require larger areas and regular fuel deliveries are necessary. - Whilst the technology is viable the management, maintenance and supervision required do not make Biomass a preferred solution.	No

Heat Pumps: Air Source Heat Pumps 	Heat pumps draw thermal energy from the air, water or ground ("source") and upgrade it to be used as useful heat at another location ("sink"). Heat pumps require electricity to operate (or gas in the case of Gas Absorption Heat Pumps) as mechanical input is required to convert harvested energy to useful heat and complete its transport to the "sink". Heat pumps are generally considered as renewable (despite an electrical or gas requirement) because the source of the heat is the ambient temperature in the exterior environment, which is ultimately heated via the sun. Reversible systems can provide air conditioning comfort cooling; however, when in cooling mode, the system is not considered renewable as it is not taking advantage of a renewable source of energy.	<u>Opportunities</u> - A sufficient heating demand exists, which ASHPs could accommodate; <u>Limitations</u> - The performance of ASHPs typically varies more than other heat pump options due to greater fluctuations in air temperatures, relative to other heat sources; - Significant external plant space is required for condensers. - Performance reduces when systems are required to achieve higher temperatures. Heat pumps are therefore normally better applied to space heating & cooling rather than hot water and specifically to low supply temperature systems (e.g. underfloor heating); - All heat pumps generate noise associated with the movement of refrigerant and (any) fans; - Whilst less expensive than other heat pump systems, relative to other technologies, capital and maintenance costs are high; <u>Appraisal</u> - Heat pump boilers are now regularly used to deliver hot water for building usage and are therefore the preferred solution for this development.	Yes
Ground Source Heat Pumps 	Reversible systems can provide air conditioning comfort cooling; however, when in cooling mode, the system is not considered renewable as it is not taking advantage of a renewable source of energy.	<u>Opportunities</u> - A sufficient heating demand exists, which GSHPs could accommodate; <u>Limitations</u> - Capital costs for vertical & horizontal installations are significantly greater than for ASHP systems; - Thermal properties of the ground will depend upon a number of factors including geology and depth, also significant space is required for the bore holes. - Performance reduces when systems are required to achieve higher temperatures. Heat pumps are therefore normally better applied to space heating & cooling rather than hot water and specifically to low supply temperature systems (e.g. underfloor heating); Significant plant space is required for condensers. <u>Appraisal</u> - A GSHP system would be technically feasible for supplying heat to part of the development; - However, uncertainties exist with regards to the thermal properties of the ground and performance; plus the space required for the bore holes is not available. - GSHPs are not proposed; principally for spatial & financial viability reasons and on the basis that it would represent a relatively expensive means of reducing carbon.	No

Water Source Heat Pumps 		<u>Opportunities</u> - A sufficient heating demand exists, which WSHPs could accommodate; <u>Limitations</u> - There is no surface water course in close proximity to the site. <u>Appraisal</u> - WSHP is not considered an option for the site; primarily for technical feasibility considerations.	No
Micro Hydro Power 	Micro hydro power systems harnesses energy from flowing water by using height differences (called "head"); the minimum allowable head is 1.5m and ideally not lower than 10m.	<u>Opportunities</u> - A sufficient electricity demand exists, which micro hydro power could address. <u>Limitations</u> - No suitable water body is found in the vicinity of the site. <u>Appraisal</u> - Micro hydro is therefore not considered an option for the site, for technical feasibility reasons.	No
Micro Wind Power 	Wind turbines are used to generate electricity; with power production determined by the rotation of the blades and being proportionate to the speed of their rotation. The technology is most efficient for constant, low turbulence wind profiles.	<u>Opportunities</u> - A sufficient electricity demand exists, which micro wind power could contribute towards; <u>Limitations</u> - Due to the local environment, the wind profile is expected to be turbulent, reducing the efficiency of the system; - Roof mounted turbines would add height to the buildings with associated aesthetic and planning considerations; and - Moving plant on the roof potentially creates noise and vibration, with associated nuisance and structural considerations. <u>Appraisal</u> - Whilst wind turbines are considered technically feasible in a limited capacity, wind speeds are turbulence are likely to cause the technology to underperform; - Additional height would be added to the building which may be a planning concern. - On-site & real-time wind speed measurements for at least a year would be required prior to establishing a case for this technology (should the end users wish to investigate further); - Given the uncertainty over performance, the fact that any contribution will likely be quite minor, micro wind turbines are not proposed for the development.	No

Solar Systems: Photovoltaics 	Both solar thermal and Photovoltaic (PV) systems convert energy from the sun into a form which can be applied within the building. Solar thermal generates energy for heating (usually for hot water) and PV generates electricity. Hybrid photovoltaic/solar thermal collectors are also available and co-generate heat and power. To maximise the performance from the technology, the solar collectors should be pointed towards the sun, which in the UK is maximised when oriented to the south and at an angle of 30°.	<u>Opportunities</u> - A sufficient electricity demand exists; which PV could partially address; - An extent of roof space exists on the site, which is not subject to significant over-shading. <u>Limitations</u> - A large area of PV is required to achieve significant reductions in carbon emissions. - The technology tends to have a high capital cost per unit of carbon saved. - PV panels are unsuited to green roof installations <u>Appraisal</u> - Whilst PV has a relatively higher capital cost the life cycle cost is low. - PV arrays would be an option for reducing carbon emissions in conjunction with other technologies. - A PV array would be appropriate for the block B terrace housing.	Yes
PV-T 	Both solar thermal and Photovoltaic (PV) systems convert energy from the sun into a form which can be applied within the building. Solar thermal generates energy for heating (usually for hot water) and PV generates electricity. Hybrid photovoltaic/solar thermal collectors are also available and co-generate heat and power. To maximise the performance from the technology, the solar collectors should be pointed towards the sun, which in the UK is maximised when oriented to the south and at an angle of 30°.	<u>Opportunities</u> - A sufficient electricity demand exist; which PV-T could partially address - An extent of roof space exists on the site, which is not subject to significant over-shading <u>Limitations</u> - Potential carbon savings are jeopardised by auxiliary power needed to move the heat around the development. - Large plant space and distributions are required together with additional heating. <u>Appraisal</u> - Whilst technically feasible in a limited capacity, the potential maximum application of the technology is unlikely to provide significant carbon dioxide reductions for the development; - The high capital costs compared to anticipated savings render this option financially unviable; - Large plant space is required together with additional heating - PV-T panels are therefore not a preferred option for the energy strategy.	No

Solar Thermal 		<u>Opportunities</u> - A sufficient heating demand exists; which Solar Thermal could partially address; - An extent of roof space exists on the site, which is flat and not subject to significant over-shading. <u>Limitations</u> - The technology tends to have a high capital cost per unit of carbon saved; - Potential carbon savings are jeopardised by auxiliary power needed to move the heat around the development; - Large plant space, distribution and additional heating plant required. <u>Appraisal</u> - Whilst technically feasible in a limited capacity, the potential maximum application of the technology is unlikely to provide significant carbon dioxide reductions for the development; - The high capital costs compared to anticipated savings render this option financially unviable;	No
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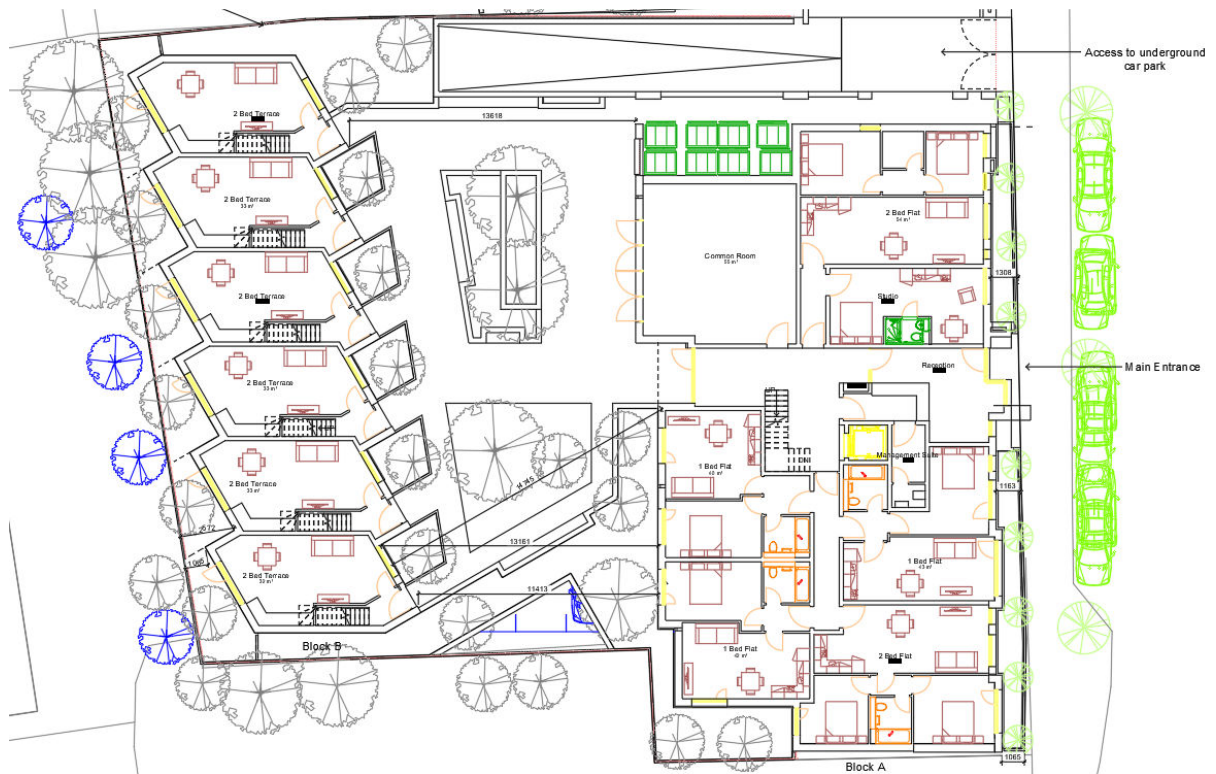
11 Summary

- 11.1 This Energy & Sustainability Statement provides an overview of the energy strategy in consideration of the site context, anticipated energy requirements and local priorities and initiatives.
- 11.2 A review of Reading Borough Council's planning policy has identified several requirements relating to energy. Of these, the Local Plan is considered of greatest pertinence specifically policy H5. Consideration has also been given to policies CC2-5. The Sustainable Design & Construction SPD for Reading has also been reviewed.
- 11.3 The approach follows the Energy Hierarchy, with priority given to efficient design on the basis that it is preferable to reduce carbon emissions by reducing energy demand than through the use of low and/or zero carbon technologies.
- 11.4 The building's fabric shall be constructed to a high performance, achieving high levels of thermal insulation and low air permeability. Energy efficient lighting and appropriate controls shall be employed throughout the development.
- 11.5 A centralised Heat Pump boiler installation shall be used to supply all the hot water requirements of the residential development in conjunction with grid supplied electricity for ventilation and general power & lighting.
- 11.6 MVHR heat recovery ventilation shall be used to reduce heat losses and improve air quality whilst reducing CO2 production.
- 11.7 Photo Voltaic panels shall be employed on block B terrace housing to generate on site energy and further reduce carbon emissions.
- 11.8 In line with the Council's local plan policy, H5 clause c; All new-build residential development should be designed to achieve zero carbon homes; Generate further renewable or low carbon energy or incorporate design measures sufficient to reduce the developments overall predicted carbon dioxide emissions by 35%.
- 11.9 Initial energy modelling indicates the heat pumps, MVHR and PV installation shall generates an average area weighted reduction in carbon emissions of over 35% when compared to a SAP Assessment 2013 Part L baseline model thus complying with H5, clause c.

11.10 Overall, the proposed energy strategy is considered consistent with the National Planning Policy Framework and policies of the Council and, when implemented, will provide an efficient and low carbon development.

Appendices

A. Site Plan



B. Energy Modelling Outputs

Block A SAP Assessment Output

Quality Engineering Design
Chris Gunn
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Block Compliance WorkSheet: Block A

User Details

Assessor Name:

Stroma Number:

Software Name: Stroma FSAP

Software Version:

Version: 1.0.5.7

Calculation Details

Dwelling	DER	TER	DFEE	TFEE	TFA
A001 (2B)	24.06	29.22	53.3	51.7	54
A002 (1B)	20	30	44.2	43	40
A003 (1B)	21.45	29.98	46.9	44.7	42
A004 (1B)	19.63	28.93	43.8	43.1	43
A005 (2B)	23.53	28.68	52	50.2	55
A006 (1BS)	19.41	36.39	41	40.8	26
A101 (2B)	32.26	47.39	68	64.2	21
A102 (1BS)	14.63	32.99	24.1	28.5	26
A103 (1B)	12.68	25.96	27.3	30.9	41
A104 (1B)	12.65	26.41	26.5	30.1	39
A105 (1B)	14.75	27.12	32.9	35.5	42
A106 (2B)	16.94	26.04	39.1	41	52
A107 (1BS)	14.69	33.14	25.2	29.7	26
A108 (1B)	16.72	26.02	39	35.7	44
A109 (1B)	12.56	25.33	27.6	31.6	43
A110 (2B)	15.8	25.2	36.5	39	55
A201 (2B)	36.13	49.08	75.6	70	21
A202 (1BS)	15.42	33.9	28.7	31.9	26
A203 (1B)	14.13	26.8	31.3	33.8	41
A204 (1B)	15.77	28.17	34.9	36.3	39
A205 (1B)	16.95	28.2	38	39.2	42
A206 (2B)	17.88	26.48	41.1	42.5	52
A207 (1BS)	15.14	33.64	27.7	31.6	26
A208 (1B)	18.15	26.76	42.1	38.2	44
A209 (1B)	13.72	26.01	42.1	38.2	43
A210 (2B)	19.24	26.77	43.7	44.3	55

Dwelling	DER	TER	DFEE	TFEE	TFA
A301 (1B)	20.42	27.6	44	41.1	48
A001 (2B)	24.06	29.22	53.3	51.7	54
A002 (1B)	20	30	44.2	43	40
A003 (1B)	21.45	29.98	46.9	44.7	42
A004 (1B)	19.63	28.93	43.8	43.1	43
A005 (2B)	23.53	28.68	52	50.2	55
A006 (1BS)	19.41	36.39	41	40.8	26
A101 (2B)	32.26	47.39	68	64.2	21
A102 (1BS)	14.63	32.99	24.1	28.5	26
A103 (1B)	12.68	25.96	27.3	30.9	41
A104 (1B)	12.65	26.41	26.5	30.1	39
A105 (1B)	14.75	27.12	32.9	35.5	42
A106 (2B)	16.94	26.04	39.1	41	52
A107 (1BS)	14.69	33.14	25.2	29.7	26
A108 (1B)	16.72	26.02	39	35.7	44
A109 (1B)	12.56	25.33	27.6	31.6	43
A110 (2B)	15.8	25.2	36.5	39	55
A201 (2B)	36.13	49.08	75.6	70	21
A202 (1BS)	15.42	33.9	28.7	31.9	26
A203 (1B)	14.13	26.8	31.3	33.8	41
A204 (1B)	15.77	28.17	34.9	36.3	39
A205 (1B)	16.95	28.2	38	39.2	42
A206 (2B)	17.88	26.48	41.1	42.5	52
A207 (1BS)	15.14	33.64	27.7	31.6	26
A208 (1B)	18.15	26.76	42.1	38.2	44
A209 (1B)	13.72	26.01	42.1	38.2	43
A210 (2B)	19.24	26.77	43.7	44.3	55
A301 (1B)	20.42	27.6	44	41.1	48
A302 (1BS)	21.4	32.37	45.6	42.9	34
A303 (1BS)	26.13	35.52	55.6	52.9	32



Block Compliance WorkSheet: Block ACont...

Dwelling	DER	TER	DFEE	TFEE	TFA
A304 (2B)	23.33	26.45	50.5	48	66
A305 (1BS)	21.27	34.62	44.9	43	29
A306 (1BS)	20.7	34.32	43.7	42.2	29
A307 (2B)	22.27	26.7	47.9	45.1	59

Calculation Summary

Total Floor Area	2421.00
Average TER	29.03
Average DER	18.48

Block B SAP Assessment Output



Block Compliance WorkSheet: Block B

User Details

Assessor Name: Stroma Number:
Software Name: Stroma FSAP Software Version: Version: 1.0.5.7

Calculation Details

Dwelling	DER	TER	DFEE	TFEE	TFA
B006 (2BT)	30.97	30.4	64.6	59.1	66
B001 (2BT)	21.43	25.64	46.3	43.1	66
B002 (2BT)	21.43	25.64	46.3	43.1	66
B003 (2BT)	21.43	25.64	46.3	43.1	66
B004 (2BT)	21.43	25.64	46.3	43.1	66
B005 (2BT)	30.79	30.52	64.2	58.8	64

Calculation Summary

Total Floor Area	394.00
Average TER	27.23
Average DER	24.55

C. General Notes

The report is based on information available at the time of the writing and discussions with the client during any project meetings. Where any data supplied by the client or from other sources have been used it has been assumed that the information is correct. No responsibility can be accepted by Quality Engineering Design Ltd for inaccuracies in the data supplied by any other party.

The review of planning policy and other requirements does not constitute a detailed review. Its purpose is as a guide to provide the context for the development and to determine the likely requirements of the Local Authority.

No site visits have been carried out, unless otherwise specified.

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