C80 solutions
Straightforward Building Compliance

PROPOSED RESEDENTIAL DEVELOPMENT

BROADLANDS

NORTH POLE ROAD

BARMING

ME16 9HG

LZC FEASIBILTY STUDY

FOR

BUILDING DESIGN STUDIO

May 2022

Project no. 14372

C80 Solutions Ltd
T: 0113 258 8445
E: mail@c80solutions.co.uk
W: www.c80solutions.co.uk
Registered Office: Sanderson House, 22 Station Road, Horsforth, Leeds, West Yorkshire, LS18 5NT

C80

C80 solutions
Straightforward Building Compliance

PROPOSED RESEDENTIAL DEVELOPMENT

BROADLANDS

NORTH POLE ROAD

BARMING

ME16 9HG

LZC FEASIBILTY STUDY

BUILDING DESIGN STUDIO

REVISION	DATE	PREPARED BY	REVIEWED BY	COMMENTS
0	25/05/2022	Harry Hinchliffe	J Hill	For Comment

The current report provides a brief overview of the wide range of opportunities for renewable energy and is not intended as detailed design advice. As such data and information should only be treated as INDICATIVE at this stage of the process. Further investigation can be undertaken when more accurate and detailed information is required on specific measures.

C80 Solutions Ltd
2nd Floor Suite
Sanderson House
22 Station Road
Horsforth
LS18 5NT
www.c80solutions.co.uk

C80 solutions
Straightforward Building Compliance

Contents Page

1.0 Introduction 4

1.1 About C80 Solutions Ltd 4

1.2 Introduction to Developments 4

1.3 Planning Policy 8

1.4 Methodology 10

2.0 Predicted Annual Carbon Emissions 11

3.0 Predicted Annual Energy Demand 13

4.0 Reducing Carbon Emissions through Energy Reduction 14

5.0 Feasibility Study of Renewable Technologies 13

6.0 Improvements to Provide 19% CO2 Reduction 19

1.0 Introduction

1.1 About C80 Solutions Ltd

C80 Solutions are independent Sustainability and Energy Consultants providing carbon reduction solutions to help the UK achieve its carbon emission reduction target of 100% by 2050.

Our range of affordable but comprehensive solutions for the construction industry are broken down into two sectors; i) Building Compliance and ii) Consultancy.

Building Compliance:

Our Building Compliance services include; Code for Sustainable Homes Assessments, SAP Calculations, On Construction Energy Performance Certificates, Water Efficiency Calculations, SBEM Calculations, Commercial EPCs, BREEAM assessments and Air Tightness Testing.

Consultancy:

Our experience and exposure to building compliance combined with previous experience and IEMA accredited training means we have built up a vast amount of knowledge which enables us to provide our clients with invaluable advice. Our Consultancy services include; Renewable Energy Feasibility Reports, Energy Statements for planning, Sustainability Statements and Building Compliance Advisory Reports.

1.2 Introduction to Developments

C80 Solutions have been instructed to prepare an LZC feasibility study by Building Design Studio for the proposed new build residential development at Broadland, North Pole Road, Barming, Maidstone, ME16 9HG.

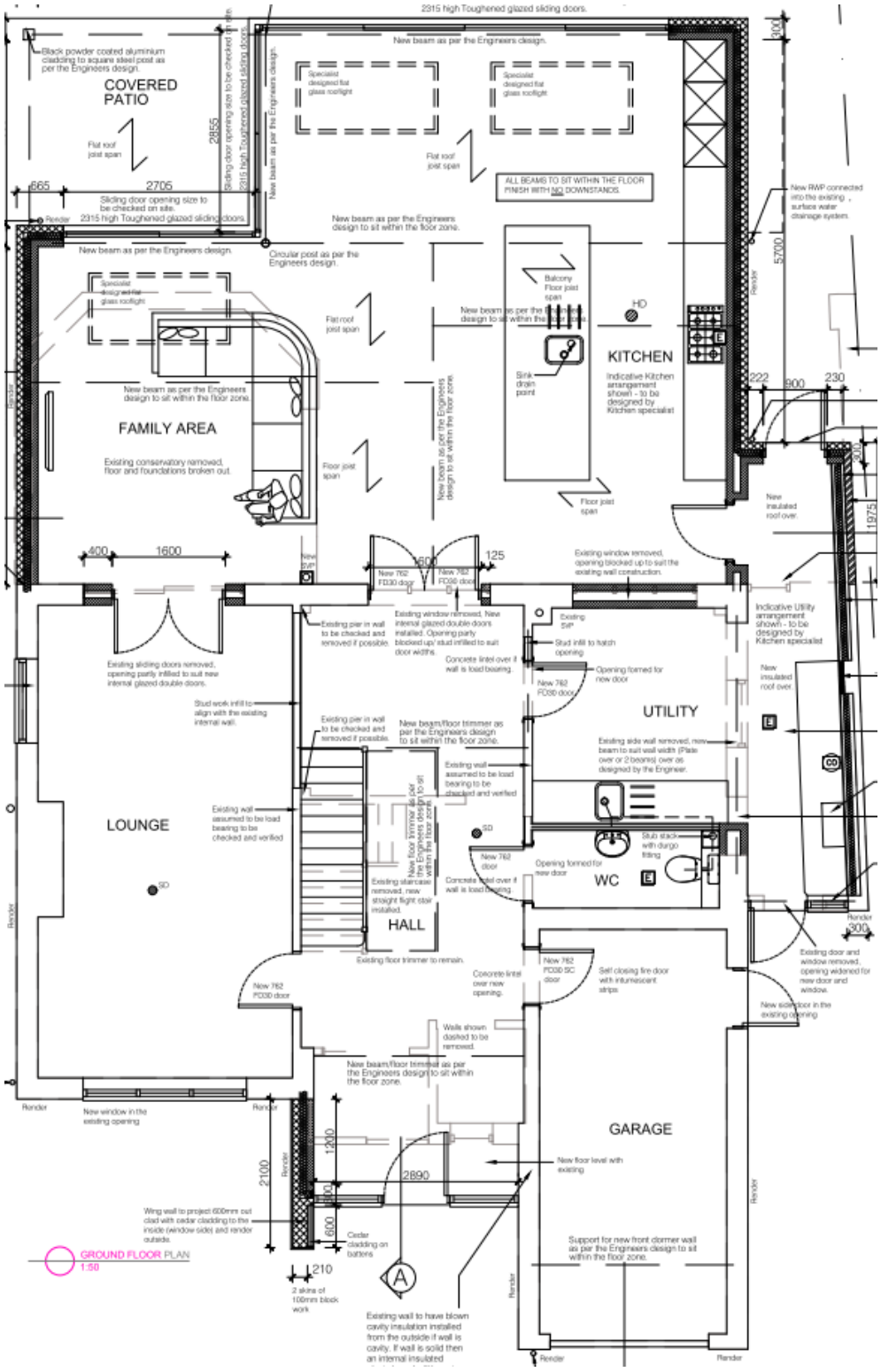
The project anticipates the provision of a two storey front extension, a single storey side and rear extension and a conversion of garage into store/habitable space with insertion of front dormer.

The site is located in a predominantly residential area of Barming, Maidstone.

The plan of the proposed development can be seen in Figures 1-2 below.

Figure 1; Proposed Floor Plans

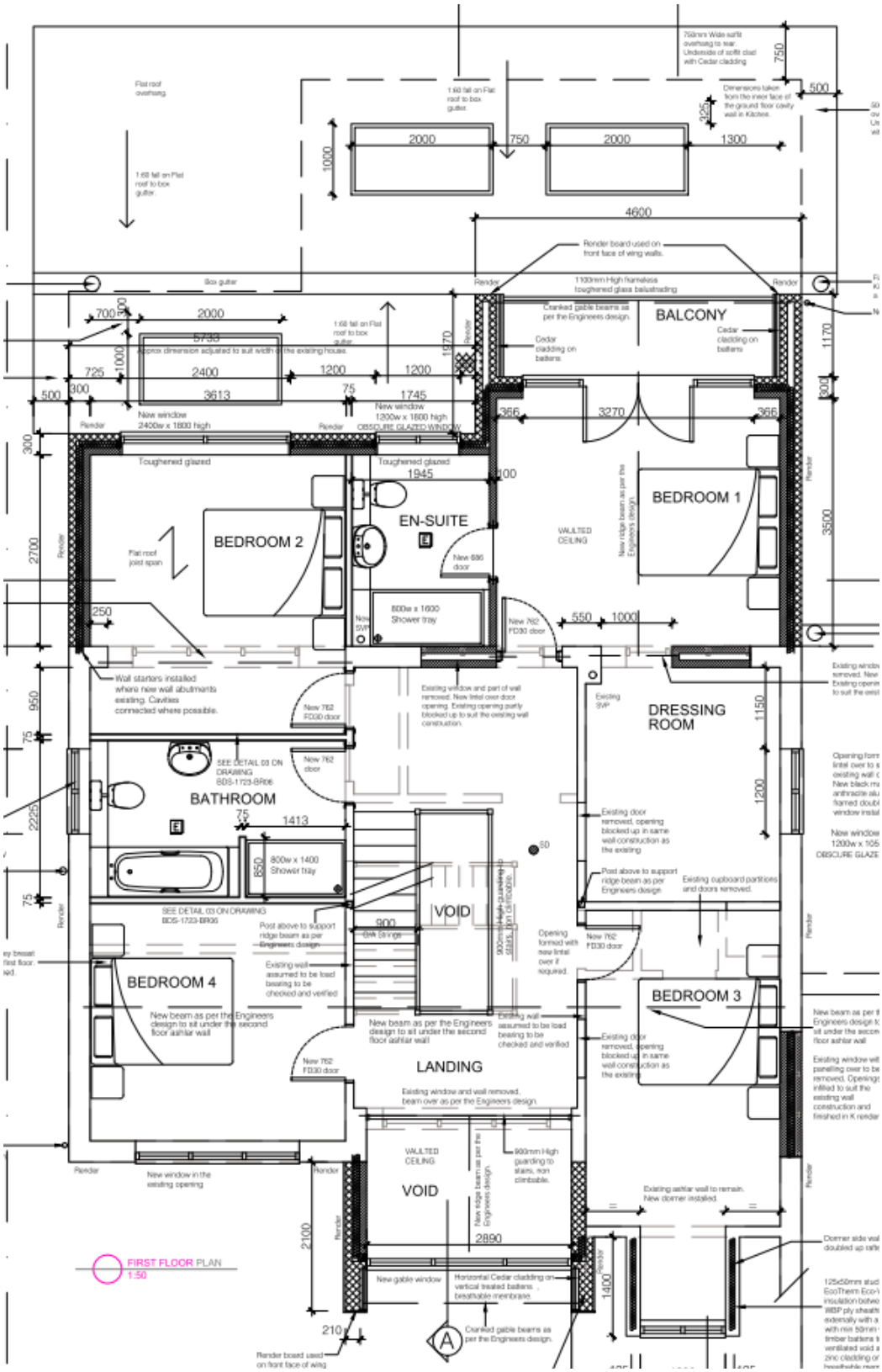
Ground Floor



C80 Solutions Ltd
T: 0113 258 8445
E: mail@c80solutions.co.uk
W: www.c80solutions.co.uk
Registered Office: Sanderson House, 22 Station Road, Horsforth, Leeds, West Yorkshire, LS18 5NT

C80 solutions
Straightforward Building Compliance

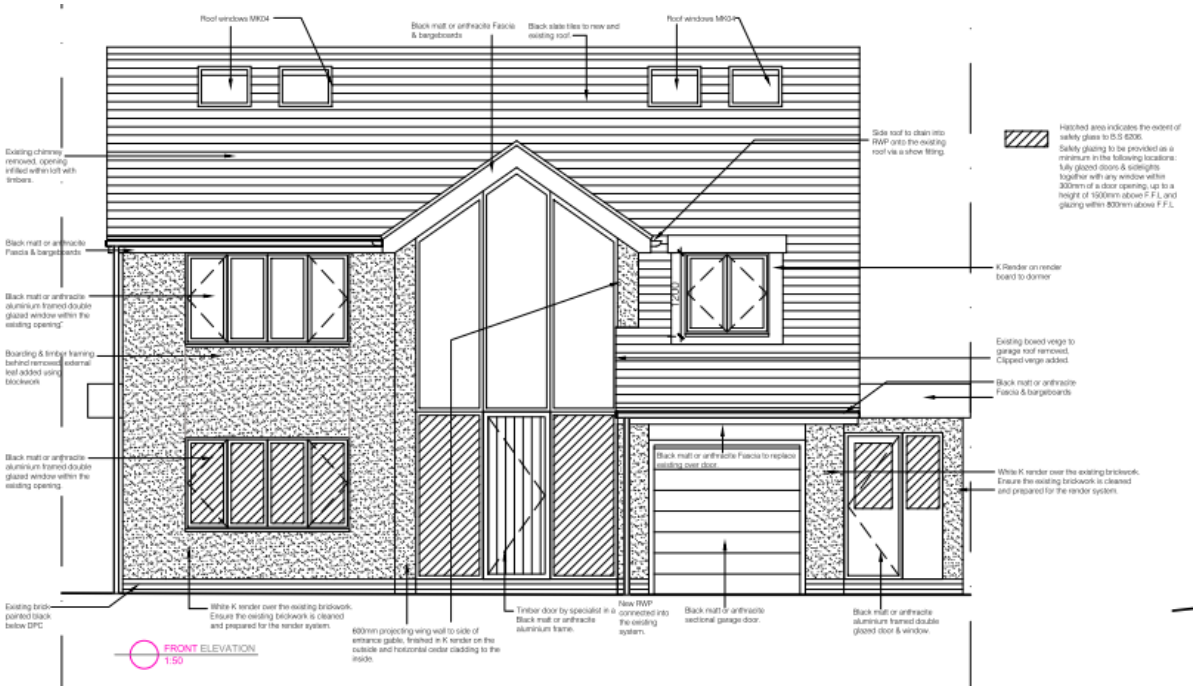
First Floor



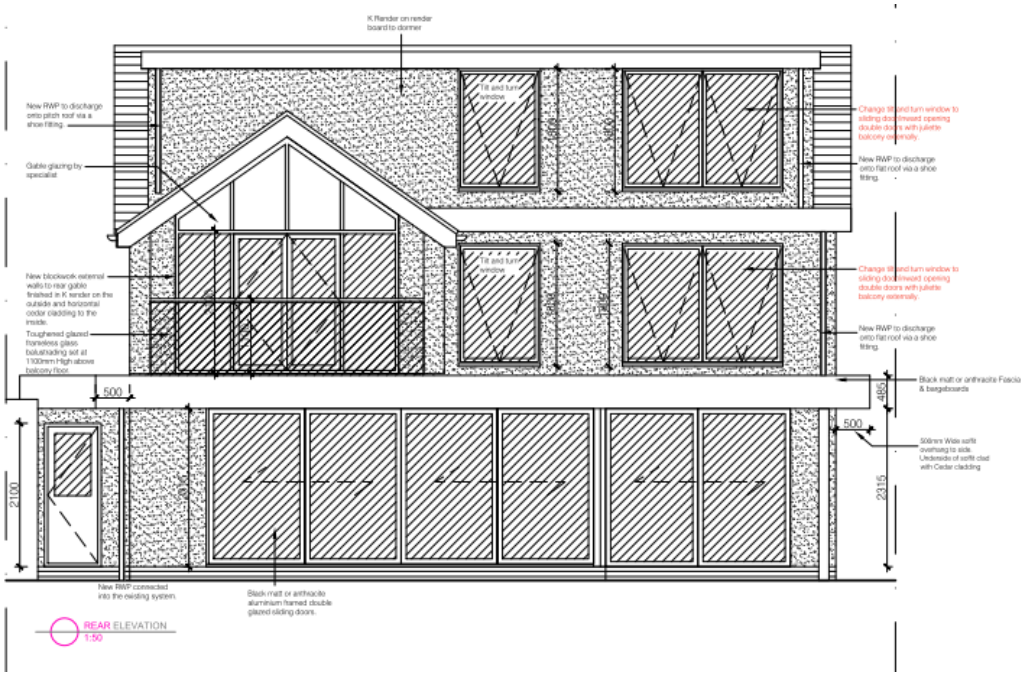
C80 Solutions Ltd
T: 0113 258 8445
E: mail@c80solutions.co.uk
W: www.c80solutions.co.uk
Registered Office: Sanderson House, 22 Station Road, Horsforth, Leeds, West Yorkshire, LS18 5NT

Figure 2; Proposed Elevations

Front Elevation



Rear Elevation



This statement will demonstrate how the predicted CO2 emissions of the proposed development will be reduced by 19% minimum compared with a typical 2013 Building Regulations Part L compliant building, as required by the London Plan.

1.3 Planning Policy

The following Energy/CO2 related planning policies are applicable to this development:

Policy DM 2 Sustainable design

1. New dwellings, where technically feasible and viable, should meet the Building Regulations optional requirement for tighter water efficiency.

2. Non-residential development, where technically feasible and viable, should meet BREEAM Very Good including addressing maximum water efficiencies under the mandatory water credits.

3. In order to maximise carbon efficiency, all homes will be required to meet the strengthened on-site energy performance standards of Building Regulations.

4. Proposals for new non-domestic buildings should achieve BREEAM Very Good for energy credits where technically and financially viable.

5. Should BREEAM be replaced, or any national standards increased, then this requirement will also be replaced by any tighter standard appropriate to the borough.

In addition to the above policies outlined by the Maidstone Local Plan, the planning permission granted for this project has set out the following condition;

APPLICATION REFERENCE: 22/500549/FULL

'(5) The development shall not commence above slab level until details of how decentralised and renewable or low-carbon sources of energy will be incorporated into the development hereby approved have been submitted to and approved in writing by the local planning authority. The approved details shall be installed prior to first occupation and maintained thereafter;

Reason: To ensure an energy efficient form of development.'

As no specific reduction in carbon emissions compared to building regulations Part L has been set, a minimum target of 19% has been assumed as per national planning policy framework..

1.4 Methodology

The methodology that has been applied in this report is as follows:

1) Produce Baseline SAP calculations using SAP2012 software to determine the target CO2 emissions for the proposed development

2) Produce further SAP calculations introducing different forms of LZC technology to determine the feasibility and effect of them on the property's carbon emissions.

3) Identify the carbon emission savings for each set of measures using the SAP calculations to be submitted alongside this statement.

4) Determine the most appropriate strategy to achieve the 19% reduction in CO2 emissions.

2.0 Predicted Annual Carbon Emissions

Baseline SBEM & SAP 2012 calculations were prepared based on the construction specification shown in table 1 below.

Aspect		L1A
	External Walls	0.24
	Communal Walls	0
	Insulated Roof	0.15
	Ground floors	0.18
	Windows (All)	1.4
	Communal Doors	N/A
	ACDs?	Yes
Ventilation	**Airtightness m3/(hr.m²)**	5
Heating	**Heating**	Gas combi boiler (min 90% efficiency)
	Hot Water	As Per Heating
	Controls	TTZC
Low energy lighting		100%
Ventilation		Natural ventilation with extracts
Renewables / LZC	**None**	N/A

Table 1: Part L compliant construction specifications

The conducted SAP and SBEM calculations have shown the proposed development will generate **7,064 kgCO2/year**. In order to satisfy the planning policies on CO2 reduction, the developer is committed to reduce predicted site wide CO2 emissions by the minimum 19% required for residential assessments.

Therefore, since the development's predicted CO2 emissions is **7,064 kgCO2/yr**, this would equate to a reduction target of **1,342 kgCO2/yr**. In other words, providing the total site emissions comes to **4,530 kgCO2/yr** is achieved once improvements have been made to the calculations, this would prove that the 19% reduction target has been met.

3.0 Predicted Annual Energy Demand

Based on using the specification outlined in table 1 above, this would create a total predicted energy demand for the development of **31,603 kWh/year**. The breakdown of this predicted energy demand can be seen in table 2 below. The figures quoted have been derived from the Design Stage SAP 2012 Calculations for the development.

			Total Predicted Energy Requirement (kWh/yr)			
			Space Heating	Water Heating	Lighting, Pumps, Fans	Total Predicted Energy Requirement (kWh/yr)
Plot	No.	Units	Gas	Gas	Electric	
Plot 1	1	kWh/yr	27960.05	2853.88	789.11	31,603
Total			**27,960.05**	**2,853.88**	**789.11**	**31,603**

Table 2: Baseline Predicated Annual Energy Demand

4.0 Reducing Carbon Emissions through Energy Reduction

The Energy Hierarchy sets out the most effective way to reduce a dwelling's CO_2 emissions. Firstly by reducing energy demand, then by using energy efficiently and lastly by incorporating LZC/Renewable technologies.

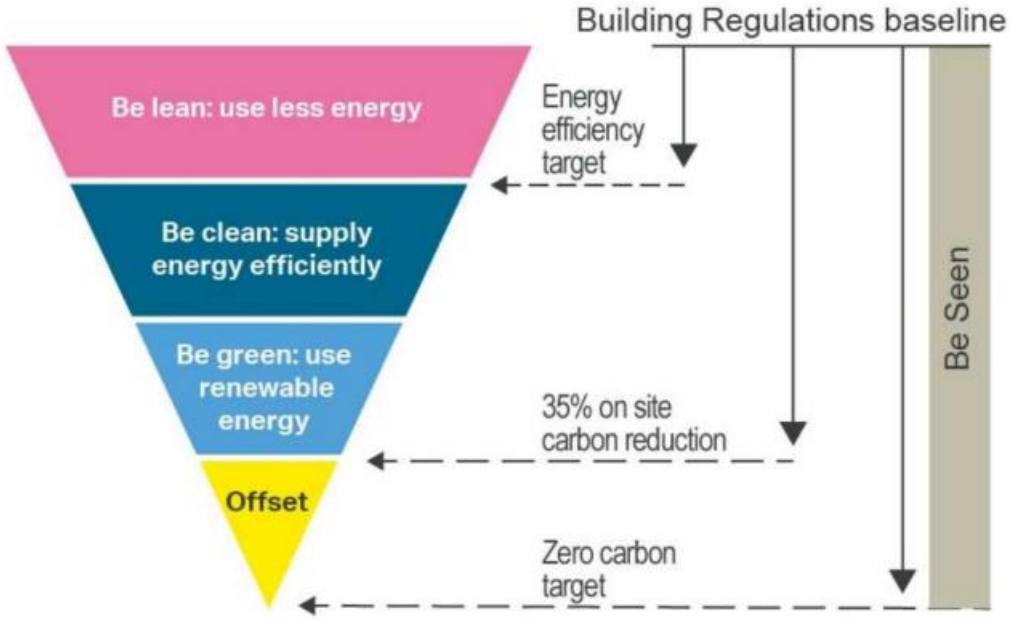


Figure 3: The London Plan Energy Hierarchy

Reducing the need for energy usage in the dwelling's design:

The first and most cost beneficial action is to reduce the amount of energy needed by the occupants of the dwelling whilst still maintaining or even improving the comfort conditions. A lot can be achieved through passive design, improving the dwelling's external fabric and following principles to reduce air infiltration.

The developer is attempting to reduce the energy demand and CO2 emissions of the development by making the following fabric and energy efficiency improvements to their standard Part L 2013 building specification:

Energy reduction strategies can include:

- Adopting enhanced fabric specifications
- Installing high efficiency gas boiler
- Incorporating energy-efficient lighting: 100% of all new lighting to be energy efficient
- Adopting principles of airtight construction
- All new windows will be double -glazed
- Passive Solar Design – Solar gain, solar shading, thermal mass
- Natural / Passive Ventilation strategy

5.0 Feasibility Study of Renewable Technologies

This section will assess the technical viability of the following renewable energy technologies for the site in order to rule out unfeasible options:

- Mast mounted wind turbines
- Roof mounted wind turbines
- Solar PV (Photovoltaic) Panels
- Solar Thermal Panels
- ASHP (Air Source Heat Pump)
- GSHP (Ground Source Heat Pump)
- Biomass
- CHP

The following observations have been made with regard to the technical feasibility of integrating renewable energy technologies into this development.

Renewable Technology	Feasible	Reasons
Mast Mounted Wind Turbine	No	There is no sufficient open land for a mast mounted wind turbine to be installed on site.
		The site is situated in a densely populated area. Surrounding properties aren't far enough away to be unaffected by turbine noise, reflected light and shadow flicker.
		The site area is surrounded by buildings and other obstructions that could cause uneven and turbulent wind patterns. Turbulent air conditions may reduce lifespan of components.
		Currently the BWEA suggests a large wind turbine to be viable where wind speed is 7m/s or above. According to the NOABL database the average wind speeds for the site is: 5 m/s at 10m, 5.7 m/s at 25m and 6.2 m/s at 45m height for the property. Therefore, the wind speeds are not sufficient for a mast mounted wind turbine to be viable.
Roof Mounted Wind Turbine	No	The site area is surrounded by buildings and other structures that could cause uneven and turbulent wind patterns. Turbulent air conditions may reduce lifespan of components.
		Roof mounted wind turbines are not yet a proven technology and a number of technical problems have been identified by manufacturers which are being investigated to rectify these issues. Vibration that can be transmitted to the building structure. Noise from a turbine may cause irritation to

		occupants of the dwelling and adjacent buildings. Noise may also adversely affect ventilation strategy.
		Currently the BWEA suggests a large wind turbine to be viable where wind speed is 7m/s or above. According to the NOABL database the average wind speeds for the site is: 5 m/s at 10m, 5.7 m/s at 25m and 6.2 m/s at 45m height for the property. Therefore, the wind speeds are not sufficient for a roof mounted wind turbine to be viable
Solar PV (Photovoltaic) Panels/Tiles	Yes	The proposed development does have sufficient flat roof area for solar panels accommodation.
		Designs of the proposed roof show an area where a 5.0 kWp array can be installed.
		The site is located in the region with high level of global horizontal irradiation (1,000-1050 kWh/m2/year)
Solar Thermal Collectors	No	The proposed development has sufficient flat roof area that can accommodate solar thermal panels.
		Most of the roofs should be free from overshadowing for most of the day from other buildings, structures or trees.
		The site is located in the region with high level of global horizontal irradiation (1,000-1050 kWh/m2/year)
		Solar thermal collectors would be compatible with the planned heating system.
		There will be a year round hot water demand.
		In practical domestic solar hot water systems, the solar hot water system is usually run in conjunction with, rather than instead of, a backup conventional boiler and as a result the carbon intensity of the combined system is high relative to other renewables. Moreover the high efficiency of modern condensing boilers, which can convert over 90% of means that the carbon intensity of these heat sources is relatively low at 200-300 gCO2/kWhth. As a result domestic solar water heating systems are a relatively expensive way of mitigating carbon emissions when they replace heat from efficient modern boilers. For this reason they are not recommended.
ASHP (Air Source Heat Pump)	No	The proposed development has not been designed to accommodate the space for a hot water cylinder.

		The building is not suitable for a low-grade heat distribution system (e.g. underfloor water system, oversized radiators).
		There is not sufficient exterior space on the designed dwelling to allow for a heat pump to be fitted without any risk of causing noise issues for occupants.
		There are reported performance issues with this technology. During the heating season the outside air temperature is often less than the ground temperature. This lower temperature has the effect of reducing the COP. For an air-to-water heat pump the standard specifies test conditions of 70C outdoor air temperature (source temperature). At external air temperatures lower than this, the COP will fall, as will the heating output of the heat pump. Depending on the application this reduction may be significant, such as during a cold winter morning when building pre-heat is needed.
GSHP (Ground Source Heat Pump)	No	It may be possible to drill a limited number of vertical or horizontal boreholes for GSHP on the site.
		It is possible for developments to accommodate a low-grade heat distribution system (e.g. underfloor water system, oversized radiators).
		The site and neighbourhood contain mature trees. Drilling boreholes on the site create the risk of damaging their roots.
		There is not sufficient space inside all the proposed dwellings for the heat pump equipment.
Biomass Boiler	No	There is an established fuel supply chain for the area.
		There isn't sufficient space for a delivery vehicle (vehicular access to fuel storage, turning circle etc)
		There isn't sufficient space in the proposed buildings for a wood-fuel boiler and associated auxiliary equipment.
		There isn't sufficient space for fuel storage to allow a reasonable number of deliveries.
		Biomass systems are management intensive (fuel sourcing, transport, storage) and require adequate expertise from users.
CHP	No	Given the proposed building use there won't be a high demand for heat for most of the year, therefore CHP won't be suitable.

		A CHP unit only generates economic and environmental savings when it is running at least 4,500 hours per year. This equates to an average heat demand of about 17 hours a day for five days a week throughout the year. The proposed development energy and heat demand profile does not match this requirement.
		CHP is typically utilized on buildings with high electricity and heating demand for most of the year such as local authority buildings, leisure centres, universities, hotels, and district heating schemes where CHP is used to provide electricity, space and water heating.
		CHP should be considered wherever there is demand for electricity and an appropriate demand for heat in the near vicinity.

Table 4: Feasibility Study of Renewable Technologies

Based on the feasibility study in table 4 above, the following technologies have been identified as being feasible for the proposed development:

- Solar PV

6.0 Improvements to Provide 19% CO2 Reduction

The developer is proposing the following improvements to achieve the 19% minimum reduction in CO2 emissions:

- Installation of 3.00 kWp solar photovoltaic array

Table 5 below shows the percentage reduction in CO2 emissions following the proposed heating and fabric improvements, and is taken from the SAP calculations that are to be submitted alongside this report:

	Carbon Emissions (kgCO2/yr)
	Option 1
Baseline	7065.36
After Improvements	5720.7
Total Reduction	1344.66
Percentage Reduction	19.03%

Table 5: Percentage Reduction in Carbon Emissions following the above improvements

As can be seen from the results shown in table 5, the proposed installation of a 3.0 kWp solar PV array on the south elevation, results in a 19% reduction in CO2 emissions when compared to the baseline of the proposed extension to the home.

This enhanced performance not only meets the requirements of policy DM2, but also acts in the spirit of the Maidstone Local Plan by emphasising best practice and a concentration on the goals of reducing CO2 emissions of housing stock in the borough.