C80 solutions
Straightforward Building Compliance

PROPOSED EXTENSION
MAYBERRY CAR SHOWROOM
OLD SHOREHAM ROAD
PORTSLADE

ENERGY STATEMENT

For:

Folkes Architecture & Design Ltd

September 2020

Project no. 10871

C80 Solutions Ltd
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ENERGY ASSESSMENT

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REVISION	DATE	PREPARED BY	REVIEWED BY	COMMENTS
0	10/09/2020	Tracey Walsh	M Heptonstall	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.

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1.0 Introduction

1.1 About C80 Solutions

C80 Solutions are independent Sustainability and Energy Consultants providing carbon reduction solutions to help the UK achieve its carbon emission reduction target of 80% by 2050 - as set out in the Government's Climate Change Act 2008.

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, Thermal Comfort Calculations, BREEAM assessments, Air Tightness Testing and Sound Insulation 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 Development

C80 Solutions have been instructed by Folkes Architecture & Design Ltd to prepare an Energy Statement for the proposed non-residential new build development at Mayberry Car Showroom, Old Shoreham Road, Portslade.

The project anticipates the development of a new build car showroom.

The site is located in a highly commercial area of Portslade.

The plan of the proposed development can be seen in Figures 1 - 3 below:

Figure 1: Floor Plan

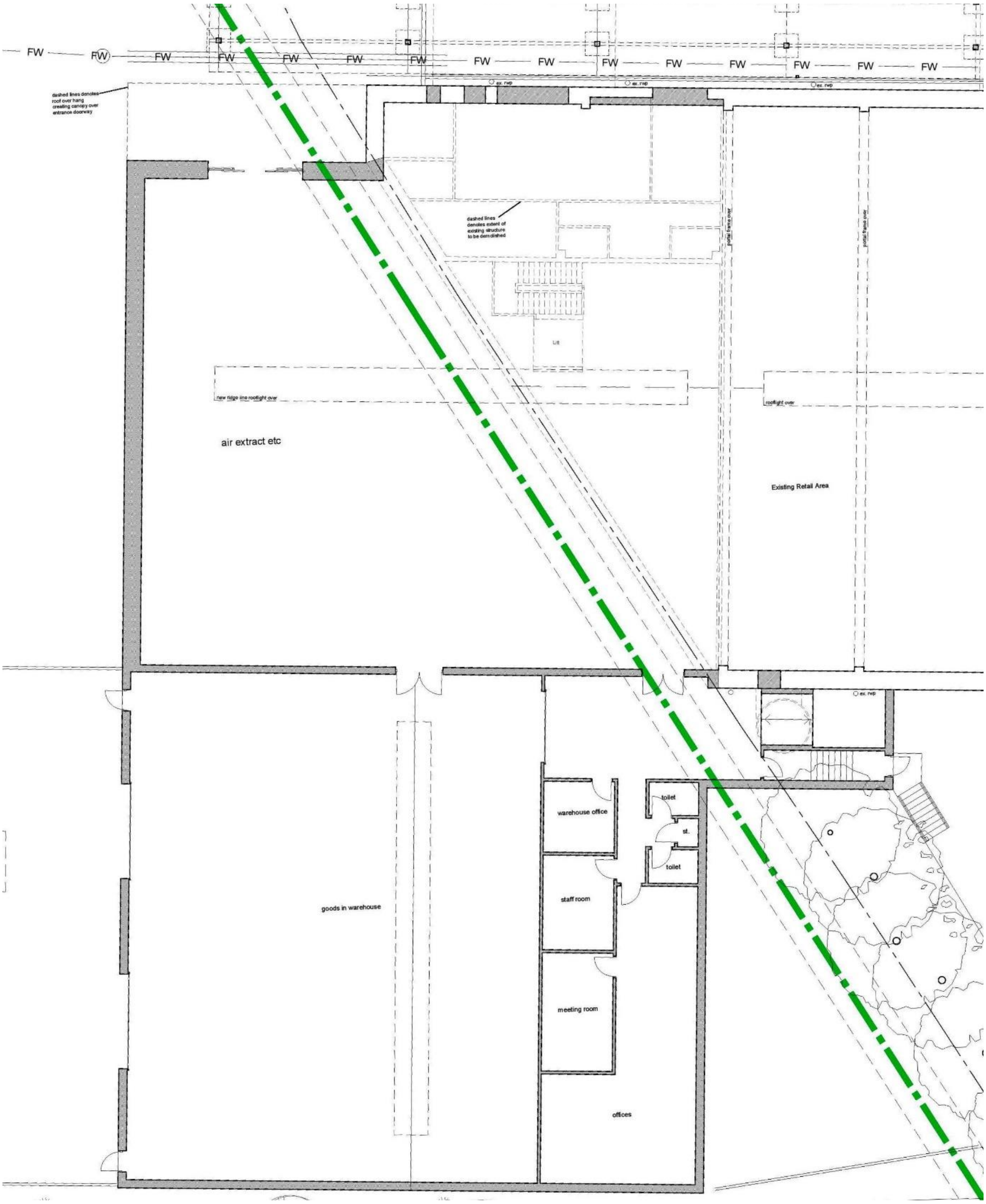
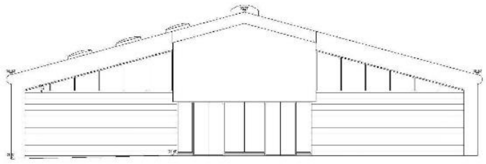
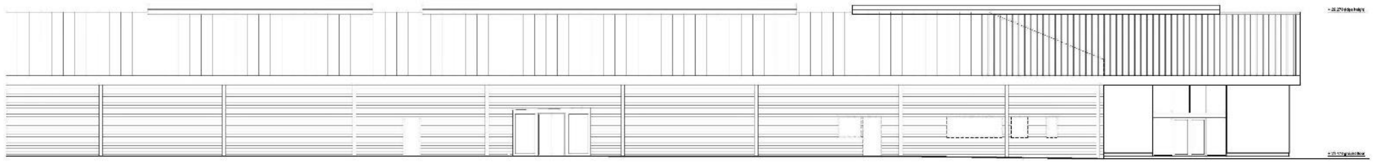


Figure 2: Elevation Plan

proposed section - 1:100 @ A1





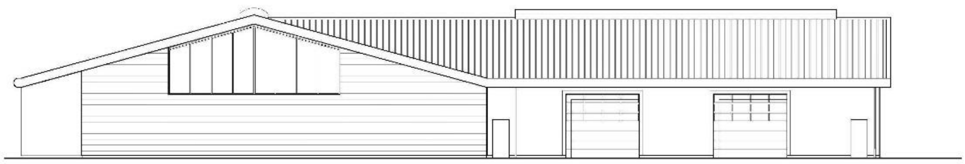
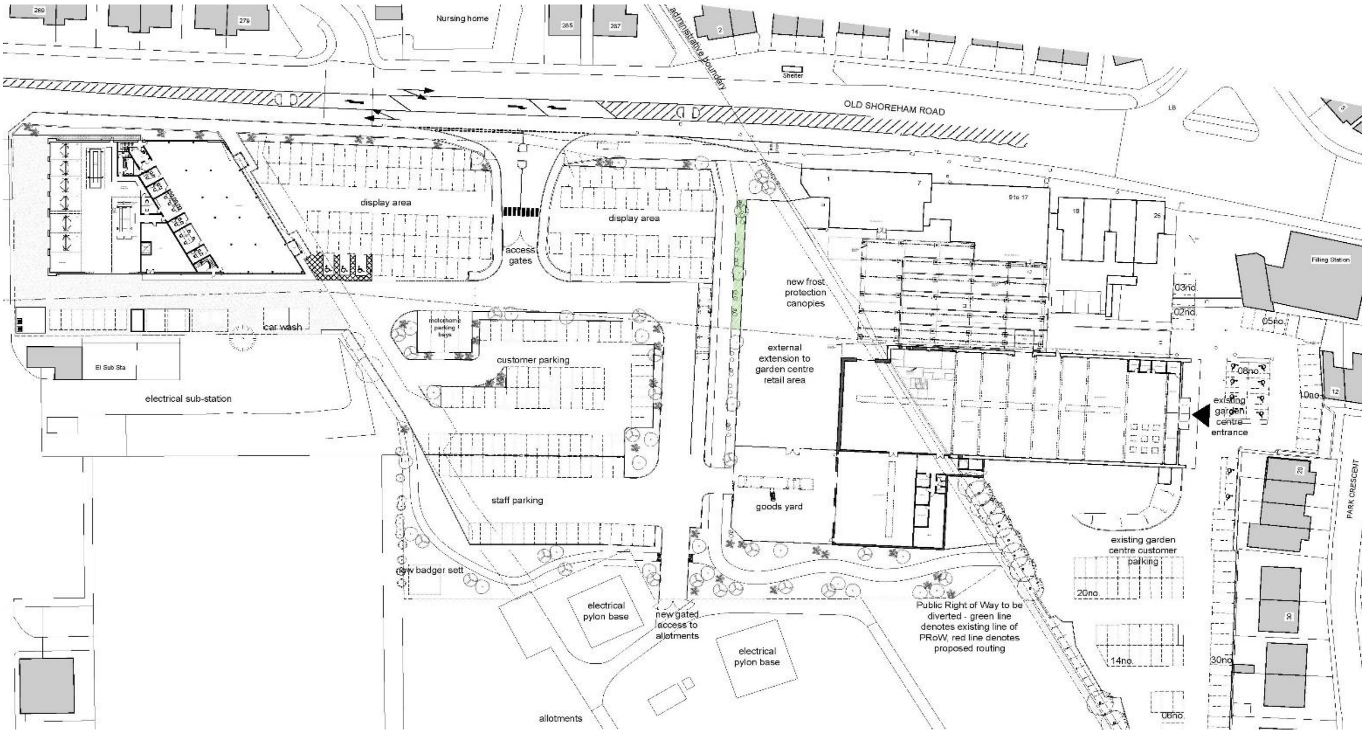


Figure 3: Site plan



This statement will demonstrate how the predicted CO2 emissions of the proposed development will be reduced compared with a typical 2013 Building Regulations Part L compliant building, as required by the Adur District Council.

1.3 Planning Policy

The following Energy/CO_2 related planning policies are applicable to this development:

SUSTAINABLE DESIGN POLICIES

Sustainable Design

4.15 Building-related energy consumption is a significant contributor to greenhouse gas emissions. The need to achieve higher levels of energy efficiency and locally produced clean, low carbon and renewable energy related to new development is an important aspect of sustainable construction. However, sustainable construction for new and refurbished buildings incorporates more than just aspects of energy use. It also relates to other environmental impacts that buildings and inhabitants cause, for example, on water drainage and usage, waste generation, and the use of unsustainable construction materials. Improved design of buildings and developments can also lead to benefits in terms of ecology and quality of life for residents.

4.16 As part of the Housing Standards Review, the Government have withdrawn the Code for Sustainable Homes and confirmed that energy efficiency in new homes will be dealt with via a "Building Regulations only" approach, with no optional additional local standards in excess of the provisions set out in Part L of the Regulations. This approach will be implemented through an amendment to the Planning and Energy Act 2008 which is anticipated in late 2016. The energy efficiency requirements under Building Regulations are currently set at a level equivalent to Level 3 of the Code for Sustainable Homes.

4.17 Given that the South East is an area of serious water stress,[6] it is important that new development has a specific focus on water efficiency measures. Again, as part of the Housing Standards Review, the Government has confirmed the introduction of a new, optional water efficiency standard into the Building Regulations to be set at 110 litres/person/day (lpd), (which is lower than the current standard of 125 lpd). However, this optional standard can only be applied in areas with specific local needs (such as water stress).

4.22 The Planning and Energy Act 2008 allow local planning authorities to impose reasonable requirements for:

(a) a proportion of energy used in development in their area to be energy from renewable sources in the locality of the development;

(b) a proportion of energy used in development in their area to be low carbon energy from sources in the locality of the development;

(c) development in their area to comply with energy efficiency standards that exceeds the energy requirements of building regulations.

Although the Government have stated their intention to repeal part (c); part (a) and (b) will remain. Therefore, in order help reduce carbon emissions all major development should incorporate renewable and low carbon energy production equipment to meet at least 10% of predicted energy requirements. Such energy generation could take the form of photovoltaic energy, solar-powered and geo-thermal water heating and energy crops and biomass.

1.4 Methodology

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

1. Prepare baseline energy calculations for the site based on a Part L 2013 compliant construction specification designed for the development.

2. From the baseline energy calculations, the predicted energy demand for the development in kWh/year and the predicted CO_2 emissions in $kgCO_2$/year for the site can be established.

3. Multiplying the site wide predicted CO_2 emissions figure by % will provide the CO_2 reduction target required.

4. Apply energy efficient design principles (improved fabric spec) in order to reduce the energy demand and CO_2 emissions of the site. Prepare energy calculations using the improved fabric specification.

5. From these improved calculations, the reduced energy demand for the development in kWh/year and the predicted CO_2 emissions in $kgCO_2$/year for the site can be established.

6. Carry out a renewable energy feasibility study to ascertain which LZC technologies would be suitable for the development.

Establish the sizing of suitable renewable technologies to ensure a minimum 10% CO_2 emission reduction is met.

2.0 Predicted Annual Carbon Emissions

SBEM calculations were prepared based on the improved construction specification shown in table 1 below.

Aspect		New Build
Fabric U-values W/m²K	**Ground Floor**	0.25
	External Walls	0.35
	New Flat Roof	0.25
	Windows	2.2
	Vehicle Access Doors	1.5
	Party Walls	n/a
Ventilation	**Airtightness m3/(hr.m²)**	5
Heating	**Heating**	ASHP & Air Conditioning throughout
	Compensator	None
	Hot Water	Electric Water Heater
	Controls	Time and temperature zone controls
	Secondary Heating	n/a
Low Energy Lighting		4W/m2
Ventilation		Natural ventilation with extracts
Renewables / LZC		None

Table 1: Part L compliant construction specifications

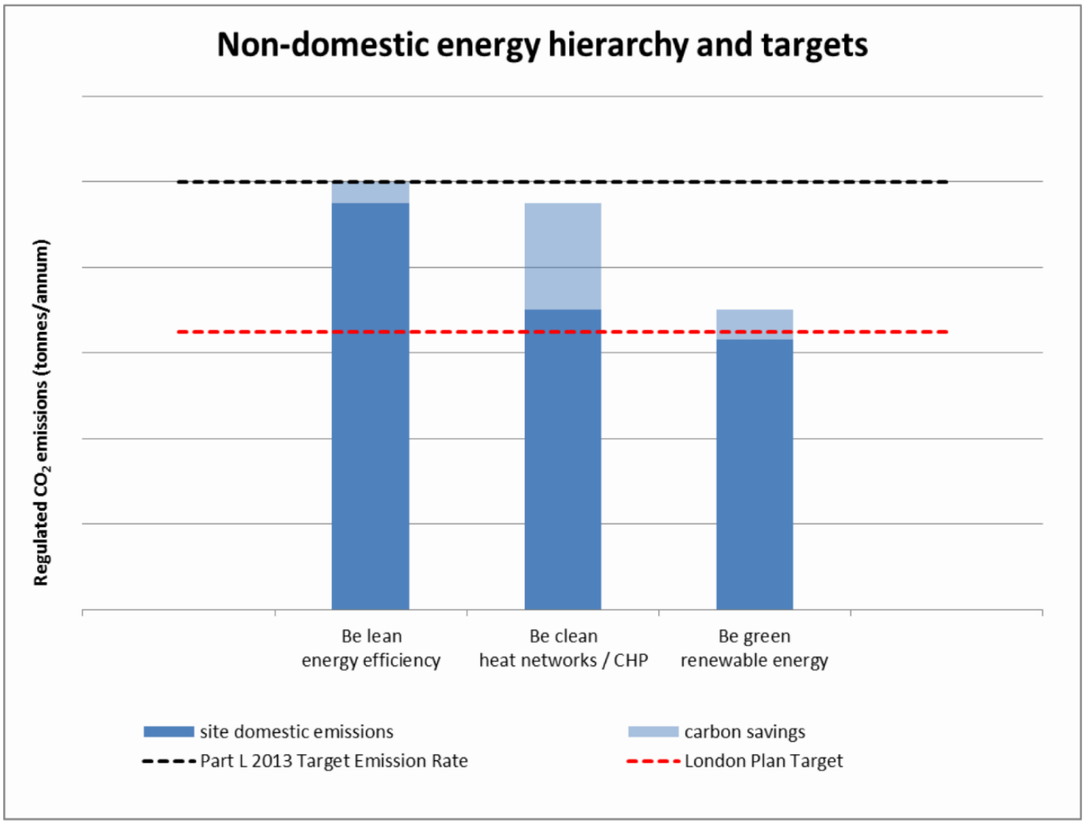
The conducted SBEM Part L 2013 calculations have shown the proposed development will generate a TER (Target Emission Rating) of **34,385 kgCO2/year**. In order to satisfy the planning policies on CO2 reduction, the developer is committed to reduce predicted site wide CO2 emissions.

Therefore, since the development's predicted CO2 emissions is 34,385 kgCO2/yr, providing the total site emissions comes to equal to or less than **30,946 kgCO2/yr**, this would prove that a 10% reduction in Co2 emissions has been achieved.

3.0 Reducing Carbon Emissions through Energy Reduction

The Energy Hierarchy sets out the most effective way to reduce CO_2 emissions for a development. Firstly, by reducing energy demand, then by using energy efficiently and lastly by incorporating LZC/Renewable technologies, reducing the need for energy usage in the project design:

Figure 3: The Energy Hierarchy



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

The developer is attempting to reduce the energy demand and CO_2 emissions of the development by making the following fabric and energy efficiency improvements to their standard Part L 2013 building specification:

Energy reduction strategies include:

- Adopting enhanced fabric specifications
- Installing high efficiency air conditioning units
- 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

4.0 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: 4.9 m/s at 10m, 5.8 m/s at 25m and 6.3 m/s at 45m height for the property postcode (BN41 1SP). 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: 4.9 m/s at 10m, 5.8 m/s at 25m and 6.3 m/s at 45m height for the property postcode (BN41 1SP). 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 has sufficient flat roof area for solar panels accommodation. 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	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)	Yes	The proposed development has not been designed to accommodate the space for a hot water cylinder.
		The buildings are suitable for a low-grade heat distribution system (e.g. underfloor water system, oversized radiators).
		Condenser units can be noisy and also blow out colder air to the immediate environment causing nuisance to the residents.
		An external ASHP will have to be installed close to the bedrooms, causing noise issues.
		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 7oC 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 additional technologies have been identified as being feasible for the proposed development.

- Photovoltaic Panels

5.0 System to Provide CO2 Reduction

The developer is proposing to install Photovoltaic panels to ensure a minimum 10% reduction in CO2 is achieved, via the use of renewable energy only.

The initial calculations have taken into account an installation of 2.5 Kwp solar PV array in order to reach the required reduction.

Table 5 below shows the percentage reduction in CO2 emissions following the proposed improvements.

	Associated Total CO² (kgCO²/yr)
Baseline (2)	33,154
With PV	29,755
Reduction in CO2 (1)	3,399
% Reduction (1) / (2) x 100	**10.2%**

Table 5: Percentage Reduction in Carbon Emissions from 2.5 Kwp PV installation

Therefore, the installation of the specified Photovoltaic system will allow the development to achieve a 10% reduction in the total CO2 emissions over Building Regulations 2013. This achievement therefore satisfies the requirements of Adur District Council.

6.0 Clean, Lean, Green

Percentage Savings

	Total Regulated Emissions	CO2 Savings (Tonnes CO2/Year)	Percentage Saving
Part L 2013 compliance	33,154		
Be Lean	33,154	0	
Be Clean	33,154	0	
Be Green	29,755	3,399	**10%**
Total CO2 Savings		**3,399**	**10%**

Area Weighted Average Building Cooling Demand (MJ/m2)

	Area Weighted Average Building Cooling Demand (MJ/m2)
Actual	**63.8**
Notional	**138.3**