C80 solutions
Straightforward Building Compliance

PROPOSED RESIDENTIAL DEVELOPMENT

CONISTON AVENUE

DARTON

BARNSLEY

SUSTAINABILITY & ENERGY STATEMENT

August 2024

Project no. 19135

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CONISTON AVENUE

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SUSTAINABILITY STATEMENT

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REVISION	DATE	PREPARED BY	REVIEWED BY	COMMENTS
0	30/08/2024	JM	HH	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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Straightforward Building Compliance

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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 a sustainability statement by Ben Bailey Homes to undertake a sustainability & energy statement on the proposed development at Coniston Avenue

The Site plan of the proposed development can be seen in Figure 1 below.

Figure 1: Site Plan

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2.0 Energy

2.1 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 2021 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. **BE LEAN**: 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.

4. **BE CLEAN:** Explore opportunities to improve the building services and increase the efficiency in which energy can be delivered to the dwelling.

5. **BE GREEN**: Carry out a renewable energy feasibility study to ascertain which LZC technologies would be suitable for the development, and ascertain the impact of introducing different technologies.

6. Establish the sizing of suitable renewable technologies to ensure the CO_2 emission reduction target is met.

2.2 Planning Policy

Table 3 – Local Validation Requirements (In Alphabetical Order)

Document type and details of when required	Guidance and details of further information	Policy background
8. Energy/Sustainability Statement including a whole life carbon assessment Required for: • Residential schemes of 10+ units • Non-residential schemes of 1,000m² + floorspace A Whole Life Carbon Assessment will be required for all major developments (10 dwellings or above and 1000m² or above for commercial developments or change of use developments)	An Energy/Sustainability Statement should demonstrate how the proposed development would minimise resource and energy consumption compared to the minimum required under current Building Regulations legislation and how it is located and designed to withstand the longer term impacts of climate change. It should also detail how the proposed development would incorporate decentralised, renewable or low carbon energy sources. All non-residential development will be expected, to achieve a minimum standard of BREEAM 'Very Good' (or any future national equivalent). This should be supported by preliminary assessments at the planning application stage. The whole life carbon assessment will be expected to follow the model set out in the RICS professional statement 'Whole Life Carbon Assessment for the Built Environment, 2017", which RICS members must act in accordance with. https://www.rics.org/globalassets/rics-website/media/news/whole-life-carbon-assessment-for-the--built-environment-november-2017.pdf The professional statement mandates a whole life approach to reducing carbon emissions and sets out specific mandatory principles and supporting guidance for the interpretation and implementation of European standard EN 15978 methodology, which is the European standard that specifies the calculation method, based on Life Cycle Assessment and other quantified environmental information, to assess the environmental performance of a building, and gives the means for the reporting and communication of the outcome of the assessment. The Energy/Sustainability Statement should demonstrate how carbon dioxide emissions have been minimised in the proposed development accordance with the following energy hierarchy: • Using less energy • Supply energy efficiently • Maximising use of renewable and low carbon energy generation systems. The energy statement must clearly outline the applicant's commitments in terms of operational CO_2 savings and measures proposed to reduce energy demand and carbon dioxide emissions. • It should report estimated site-wide regulated CO_2 emissions and reductions (broken down for the domestic and non-domestic elements of the development), expressed in tonnes per annum, after each stage of the energy hierarchy • investigate and commit to maximising the installation of renewable technologies on site demonstrated by tonnes of C02 provided by renewable technologies • include information on how the building's actual energy performance will be monitored post-construction/how the performance gap (the gap between the energy efficiency levels buildings are designed to achieve, and what they actually manage)	NPPF BMBC Local Plan policies CC2 and RE1 Sustainable Construction and Climate Change Adaptation SPD

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2.3 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 **260894.6 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 10 Calculations for the development.

			Total Predicted Energy Requirement (kWh/yr)			Total Predicted Energy Requirement (kWh/yr)
			Space Heating	Water Heating	Lighting, Pumps, Fans	
Plot	No.	Units	Electric	Electric	Electric	
Plot 1		KWH	3818.72	2956.06	214.84	6989.62
Plot 12			3936.51	2954.16	214.84	7105.51
Plot 23			3818.72	2956.06	214.84	6989.62
Plot 26			3536.71	2960.71	214.84	6712.26
Plot 29			3536.71	2960.71	214.84	6712.26
Plot 33			3818.72	2956.06	214.84	6989.62
Plot 5			3536.71	2960.71	214.84	6712.26
Plot 17			5019.31	3058.71	276.24	8354.26
Plot 30			5019.31	3058.71	276.24	8354.26
Plot 31			5019.31	3058.71	276.24	8354.26
Plot 34			5162.56	3056.99	276.24	8495.79
Plot 36			5162.56	3056.99	276.24	8495.79
Plot 38			5019.31	3058.71	276.24	8354.26
Plot 11			3389.55	2848.4	199.31	6437.26
Plot 13			3389.55	2848.4	199.31	6437.26
Plot 15			3389.55	2848.4	199.31	6437.26

Plot 19			3267.68	2850.52	199.31	6317.51
Plot 28			3267.68	2850.52	199.31	6317.51
Plot 4			3267.68	2850.52	199.31	6317.51
Plot 21			2543.99	2788.63	182.9	5515.52
Plot 22			2543.99	2788.63	182.9	5515.52
Plot 24			2460.34	2790.51	182.9	5433.75
Plot 25			2460.34	2790.51	182.9	5433.75
Plot 32			4422.82	3048.3	260.45	7731.57
Plot 35			4478.26	3047.47	260.45	7786.18
Plot 37			4422.82	3048.3	260.45	7731.57
Plot 39			4422.82	3048.3	260.45	7731.57
Plot 10			1997.3	2610.41	151.61	4759.32
Plot 6			1997.3	2610.41	151.61	4759.32
Plot 7			1816.76	2611.5	154.1	4582.36
Plot 8			1997.3	2610.41	151.61	4759.32
Plot 9			1997.3	2610.41	151.61	4759.32
Plot 14			3684.82	2990.02	229.02	6903.86
Plot 16			3684.82	2990.02	229.02	6903.86
Plot 18			3507.24	2993.16	229.02	6729.42
Plot 2			3507.24	2993.16	229.02	6729.42
Plot 20			3507.24	2993.16	229.02	6729.42
Plot 27			3536.06	2992.64	229.02	6757.72
Plot 3			3536.06	2992.64	229.02	6757.72
Total						260894.6

Baseline Predicated Annual Energy Demand

2.4 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.

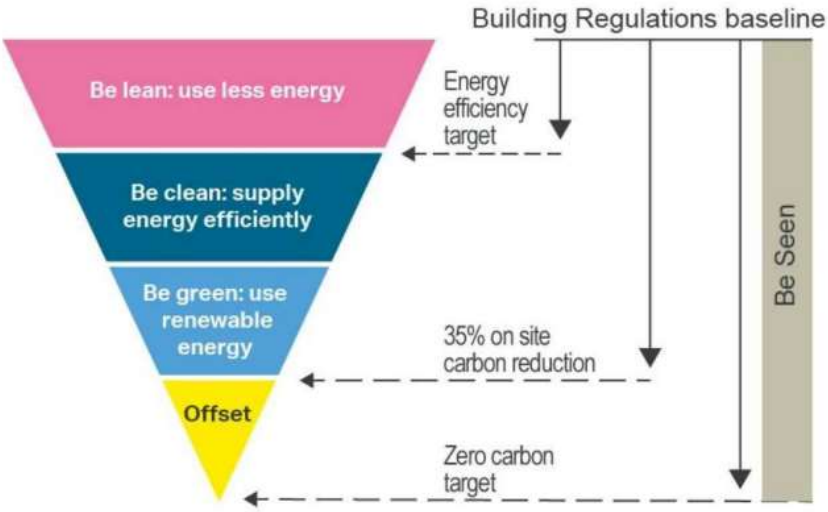

Figure 3: The Energy Hierarchy

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 2021 building specification:

Energy reduction strategies include:

- Adopting enhanced fabric specifications
- Installing high efficiency heating systems
- 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

2.5 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 postcode. 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 postcode. 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 roof area for solar panels accommodation.
		Most of the roof 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)	No	The proposed development has been designed to accommodate the space for a hot water cylinder.

		The building is 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. Furthermore the noise generated could cause disruption, as plant equipment will need to be fitted to external walls near bedroom and windows.
		There is not sufficient outdoor space to locate a condenser away from bedroom spaces
GSHP (Ground Source Heat Pump)	No	It will not 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 the proposed plant room that can service the main dwelling and all outbuildings/annexes.
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.
Hot Water Heat Pump	No	Dwelling has been designed to include space for a water immersion cylinder.
		The is sufficient external wall area to provide intake and exhaust vents to the external air.
		There is a too high of a predicted hot water demand to allow a system of this nature to run efficiently.
		Cost of these systems are a fraction of traditional heat pumps and they provide the same level of efficient delivery to all dwellings.

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

2.6 Improvements to Provide CO2 Reduction

The developer is proposing the following measures to improve the energy performance of the building:

Be Lean;
Improved Fabric U-values to-

- Walls: 0.19 W/m²K
- Roofs: 0.16 W/m²K
- Floors: 0.11 W/m²K
- Double Glazed Windows: 1.2 W/m²K

Be Clean;
Improved Space & DHW Heating System-

Be Green
Renewable Energy Sources-

- Installation of Solar PV on all houses to achieve Compliance

Table 5 below shows the percentage reduction in energy usage following the proposed heating and fabric improvements. This has been extracted from the SAP results and will be submitted along with this report.

	Carbon Emissions (kgCO2/m²/yr)	Reduction (kg/CO2/yr)
Baseline	458.16	
Renewables	427.97	**-13.42**
Total		**6.5%**

As can be seen from the results above, the proposed development exceeds the requirements for a reduction in CO2 emissions, by achieving a 6.5% reduction with introduction of PV. With its fabric first approach and use of LZC technologies, in its ability to reduce heat demand, and then meet that demand by the most efficient means. The concentration on improving the fabric of the design to exceed best practice for the current times will not only help in the short term by reducing energy demands and CO2 emissions now, but also allows the building to be future proofed and net-zero ready to meet further targets and needs that may be required in years to come.