



Energy & Sustainability Report

36a Wittering Road,
Hayling Island

14th June 2018

Quality Management



Issue/ Revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks	First Issue			
Date	14/06/2018			
Prepared by	G Davies			
Signed				
Project Number	243			

Contents



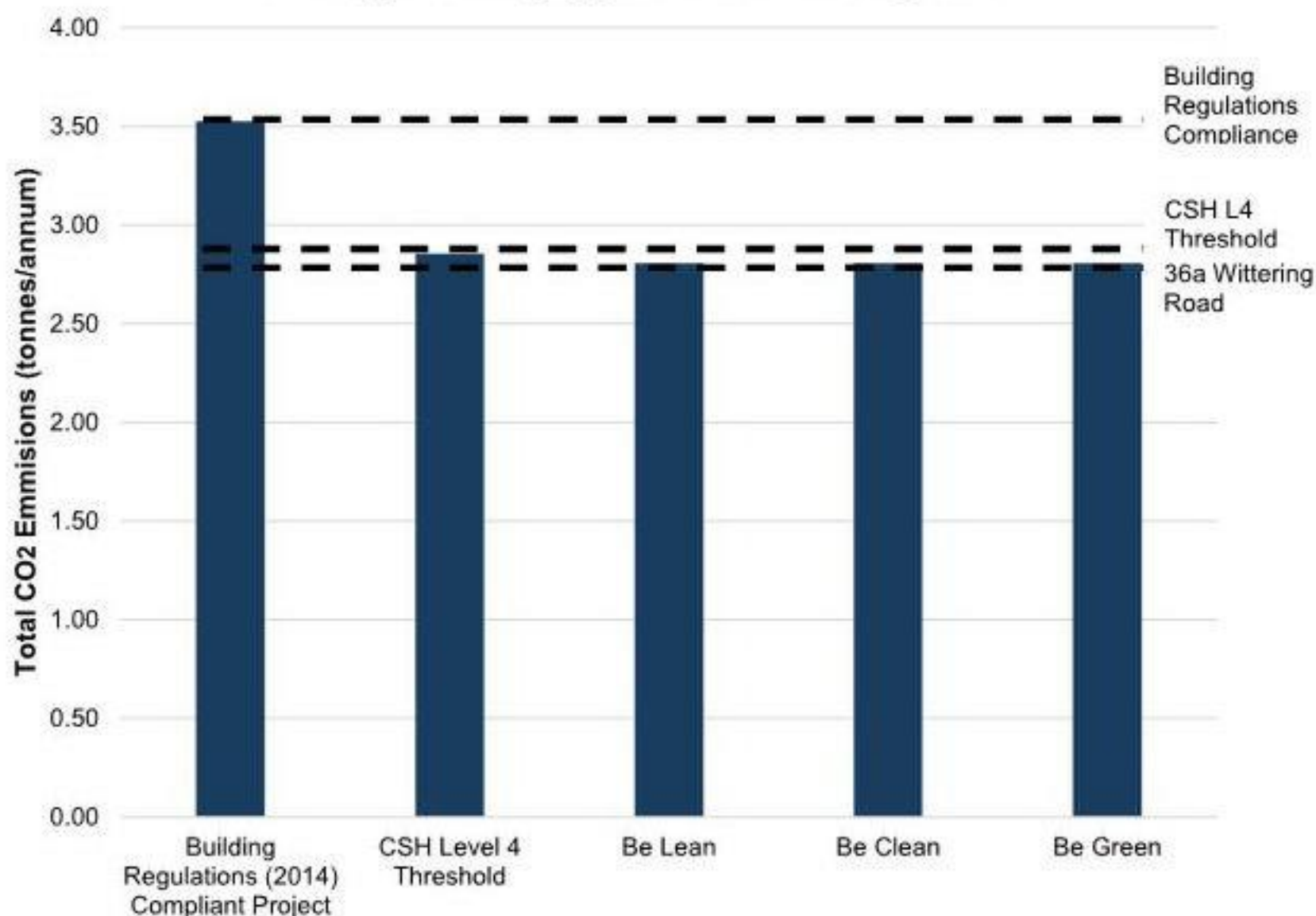
1.0	Executive Summary	1
2.0	Background	3
3.0	Energy Assessment	4
4.0	'Be Lean' – Energy Efficiency Measures	5
5.0	'Be Clean' – Supplying Energy Efficiently	6
6.0	'Be Green' – LZC Technologies Assessment	6
7.0	Sustainability Measures	9
8.0	Conclusion	9

Appendix A: SAP Calculations

1.0 EXECUTIVE SUMMARY

- 1.1 This report outlines the estimated energy/emissions performance of the construction of a new replacement dwelling at 36a Wittering Road, Hayling Island, including features that have been incorporated to the building design and building systems to minimise energy demand, energy use and resultant carbon dioxide emissions.
- 1.2 In addition to demand management and energy efficient equipment, the proposed development has assessed the opportunity to generate energy through on-site low or zero carbon (LZC) technologies in order to achieve an overall carbon reduction of at least 19%, beyond the Part L1a regulatory minimum, equivalent to the minimum requirement prescribed under the now defunct Code for Sustainable Homes Level 4 methodology, measure Ene01: Reduction of CO₂ emissions.
- 1.3 The proposed development at 36a Wittering Road has applied the Energy Hierarchy to prioritise emissions reductions from the building fabric and energy efficiency before the technical consideration of any low and zero carbon technologies.
- 1.5 The proposed development has targeted meeting the energy demand as efficiently as possible as the main component of the energy strategy. This will be done in conjunction with key measures including improved fabric u-values, the use of accredited construction detailing and improved levels of air-tightness.
- 1.6 In addition to building fabric improvements, installed building systems will be fit for purpose, and energy efficient to ensure the minimum amount of energy is required to heat and power the proposed development, which will assist in delivering the required CO₂ reduction target.
- 1.7 The proposed development exceeds the prescribed CSH Level 4 CO₂ reduction benchmark of 19%, with a 20.42% annual CO₂ saving against the baseline Part L (2014) compliance threshold, mainly due to the provision of improved fabric standards beyond Regulatory Minimum (Part L), and energy efficient systems.
- 1.8 In addition to the energy & CO₂ reduction savings achieved, the proposed project will also incorporate several measures which will serve to enhance the sustainability and environmental performance of the project.

The Energy Hierarchy Applied to 36a Wittering Road



Emission Savings for 36a Wittering Road

	Regulated CO ₂ Savings	
	Tonnes CO ₂ /annum	Percentage Savings (%)
'Be Lean'	0.72	20.42
'Be Clean'	0.00	0.00
'Be Green'	0.00	0.00
Overall Savings	0.72	20.42

Annual Regulated Emissions for 36a Wittering Road

	CO ₂ Emissions (tonnes/annum)
Building Regulations 2014 Part L Compliant Project	3.53
CSH Level 4 Threshold	2.86
'Be Lean'	2.81
'Be Clean'	2.81
'Be Green'	2.81

2.0 BACKGROUND

INTRODUCTION

- 2.1 Redsix were commissioned to prepare an Energy & Sustainability report for the proposed development at 36a Wittering Road, Hayling Island in relation to achieving the necessary energy performance threshold defined by the Code for Sustainable Homes 'Level 4' methodology, and the inclusion of additional sustainability measures.
- 2.2 This report presents the outcome of the energy appraisal of the proposed development and details the approach that the applicant and the design team have collectively taken towards achieving a high standard of operational energy and sustainability performance. This report outlines the features that have been incorporated into the design proposals which aim to reduce the energy demand, energy use, resultant carbon dioxide emissions and therefore environmental impact of the scheme. In addition to demand reduction and energy efficient design the report assesses the technical application of potential low or zero carbon technologies (LZCs) to the proposed development.
- 2.3 The purpose of the report is to provide an independent verification that the design of the proposed development is in accordance with objectives of relevant planning policy at all levels and is an example of good practice in low energy design.
- 2.4 The appraisal has been undertaken at an early stage to directly inform building design and ensure that the building can achieve optimal energy performance. The Energy Statement, therefore, also provides a framework for the team to monitor the scheme's performance throughout its development and operation.

THE PROPOSED DEVELOPMENT

- 2.6 The development site is found at 36a Wittering Road, Hayling Island and the proposed development comprises the demolition of an existing house and the construction of a new detached dwelling.

3.0 ENERGY ASSESSMENT

- 3.1 In order to assess the likely energy demands of the proposed development, the emissions have been calculated using the following drawings produced by Yeates Design LLP of the proposed development:
- Drawing no 590/P/101, entitled Location Plan, Revision A, dated 11/06/2018.
 - Drawing no 590/P/105, entitled Proposed Block Plan, Revision A, dated 11/06/2018.
 - Drawing no 590/P/106, entitled Proposed Ground Floor Plan, dated June 2017.
 - Drawing no 590/P/107, entitled Proposed First Floor Plan, dated June 2017.
 - Drawing no 590/P/108, entitled Proposed Section, dated June 2017.
 - Drawing no 590/P/109, entitled Proposed Elevation N-E, S-W, dated June 2017.
 - Drawing no 590/P/110, entitled Proposed Elevation N-W, S-E, dated June 2017.
- 3.2 An energy modelling exercise has been undertaken to determine the anticipated Building Regulations baseline, which indicates the minimum regulatory performance for the regulated emissions of the proposed development, along with the CSH Level 4 threshold, which is set at a 19% improvement beyond the regulatory baseline.
- 3.3 The methodology used to estimate the energy demand from the building has been informed by the National Calculation Methodology (NCM) modelling guide, and the software used to generate the Regulation baseline is approved by the DCLG as being compliant with the NCM.

REGULATED EMISSIONS BASELINES

- 3.4 The regulated emissions baselines for the proposed development are taken as the baseline compliance figures generated by the calculation software to achieve regulatory (Part L) and CSH Level 4 compliance respectively.

CO ₂ Baselines	CO ₂ Emissions (kgCO ₂ /m ² /yr)	CO ₂ Emissions (tonnesCO ₂ /yr)
Part L (2014)	15.33	3.53
CSH Level 4	12.42	2.86

REGULATED & UNREGULATED EMISSIONS

- 3.5 In addition to the resultant carbon dioxide emissions from the regulated emissions, there are additional uses of energy which are unregulated, examples of which include energy for small power and building type specific processes, such as IT or plug in equipment. Process energy used in buildings is described as unregulated energy use (emissions) as it is not directly covered by the standard compliance calculation and is not considered within the scope of this study and report.

4.0 'BE LEAN' - ENERGY EFFICIENCY MEASURES

THE ENERGY HIERARCHY

- 4.1 The Energy Hierarchy adopts a set of principles to guide design development and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. This can be summarized into three key stages:
- Using less energy, in particular by adopting sustainable design and construction measures ('Be Lean');
 - Supplying energy efficiently, in particular by prioritising decentralised energy generation ('Be Clean'); and
 - Using renewable energy ('Be Green').
- 4.2 Consequently, the first stage in the energy strategy for the proposed development is the consideration of energy efficiency measures to ensure that the base energy demand is minimized as far as practically possible.

ENERGY EFFICIENCY MEASURES

- 4.3 In order to ensure the proposed development complies with 2014 Building Regulations and improves upon the baseline compliance threshold in order to meet the CSH Level 4 requirement, specific measures to make the building energy efficient must be incorporated within the scheme design and construction.
- 4.4 The following key energy efficiency design measures to reduce emissions have been incorporated in the design of the project:

New Fabric Elements	
External walls	0.18 W/m ² k
Ground Floor	0.13 W/m ² k
Roof	0.12 W/m ² k
Solid Doors	1.2 W/m ² k
Windows	1.2 W/m ² k

Other, active design measures included are also summarised below:

- Design Air Permeability of 3m³/h/m² @ 50Pa
- 100% low energy LED light fittings.
- Wood burning fire/stove
- Accredited construction details

'BE LEAN' EMISSIONS PERFORMANCE

- 4.5 The energy modelling of the proposed development indicates that by incorporating the features described in Section 4.4, an annual CO₂ saving of 0.72 tonnes can be achieved. This is equivalent to a CO₂ reduction of 20.42% over the regulatory (Part L) compliance baseline.

5.0 'BE CLEAN' - SUPPLYING ENERGY EFFICIENTLY

DECENTRALISED ENERGY NETWORK

- 5.1 In response to the second tier of the Energy Hierarchy a preliminary investigation into the adjacent heat loads and infrastructure has been undertaken. The proposed development is located in an area of low heat demand, with no proposed or existing heat networks in the area. It is therefore currently not feasible to consider connection to an existing district heating network.

COMBINED HEAT & POWER OPTION

- 5.2 The Energy Hierarchy identifies combined heat and power (CHP) as a method of producing heat and electricity with much lower emissions than separate heat and power. However, CHP, although highly desirable, does have practical limitations. The principle requirement is that to be effective, all of the energy produced must be utilised, with annual operating hours of at least 5000hrs/yr. This means that all the electricity must be used in a financially sound manner and all the waste heat must be put to good use –preferably to meet a heat demand –and not dumped.

It is expected the simultaneous demand for heat and power for the development will be less than 5,000 hours per annum, therefore CHP has not been considered a viable option.

6.0 'BE GREEN' - LZC TECHNOLOGIES ASSESSMENT

- 6.1 An initial outline technical assessment of feasible renewable energy sources has been carried out and the results are detailed below. The renewable energy feasibility study for the proposed development has assessed the use of solar thermal collectors, biomass heating, ground/air source heat pumps and photovoltaic modules.

SOLAR WATER

- 6.2 Solar thermal panels are used to produce hot water and consist of roof mounted collector panels that make use of heat energy from the sun to heat water circulating in a closed loop. Usually this heat is then transferred via a heat exchanger into a hot water storage tank that is also heated by a gas or other boiler.
- 6.3 Two main types of solar water heating system are used in the UK; flat plate collectors and evacuated glass heat tubes. Flat plate collectors circulate water around a black coloured receiver plate that is heated by direct sunlight and to some extent by indirect light; heat being retained by a thermally glazed panel above. Evacuated glass heat tubes are more efficient, particularly in the UK, as they can work more effectively at low solar radiation levels. They are however, more expensive than flat plate collectors. They consist of rows of parallel transparent glass tubes, each containing an absorber tube which converts the sunlight into heat energy.

- 6.4 At the proposed development solar hot water systems could be technically feasible; however, this will be subject to a separate independent detailed study. For this reason, a solar hot system is not currently considered for as part of this assessment.

GROUND SOURCE HEATING

- 6.5 Ground source heat pumps (GSHP) extract heat from the ground. GSHPs work on the principle that the below ground temperature is more constant compared to above ground. In the winter months, the below-ground temperature is warmer than above ground and the heat carrier fluid circulating within the absorber pipes absorbs the heat. This heat energy is then raised by a compressor (using the compression cycle) and through a heat exchanger, distributed via a low temperature distribution system such as under floor heating, to satisfy a proportion of space heating requirements. GSHP systems are not suitable for satisfying high temperature hot water demands.
- 6.6 In the summer months, the below-ground temperature is colder than above ground and heat carrier fluid circulating within the buried pipes rejects building heat. This heat rejecting capacity is then raised by a compressor (using the compression cycle), and through a heat exchanger, is then distributed via a chilled water distribution system to satisfy a proportion of space cooling requirements.
- 6.7 There are a number of configurations for GSHP systems, however the installation of a vertical collector system or horizontal collector system is not considered financially feasible for the project, particularly considering the cost of potential CO₂ reductions when compared with an ASHP system (see 6.9).
- 6.8 It is expected that a GSHP system could be technically feasible; however, this will be subject to a separate independent detailed study. For this reason, a GSHP system will not be considered for as part of this assessment.

AIR SOURCE HEATING

- 6.9 Air source heat pumps (ASHPs) utilise the outside air as a heat source or heat sink. Heat can be used to warm water for radiators or underfloor heating systems, or to warm the air within a dwelling. ASHPs work on a similar principle to a fridge, which extracts heat from its inside. An evaporator coil, mounted outside absorbs or expels the heat; a compressor unit then drives refrigerant through the heat pump and compresses it to the right level to suit the heat distribution system. Finally, a heat exchanger transfers the heat from the refrigerant for use, depending on which of the two main types of systems (identified below) is installed:
- 6.11 It is expected that an ASHP system could be technically feasible; however, this will be subject to a separate independent detailed study. For this reason, an ASHP system will not be considered for as part of this assessment.

BIOMASS

- 6.12 Biomass boilers replace conventionally powered boilers with an almost carbon neutral fuel such as wood pellets or wood chips. The fuel is classed as almost carbon neutral because the CO₂ released during the burning of biomass is balanced by that absorbed by the plants during their growth.
- 6.13 The existing site layout does allow for the adequate biomass fuel storage and safe delivery.
- 6.14 Although many biomass burners will meet Clean Air Act requirements, combustion of wood biomass releases higher quantities of NO_x, SO_x and particulates (PM₁₀ and PM_{2.5}) compared to a comparable system fuelled by natural gas, which can adversely affect local air quality.
- 6.15 Biomass could technically be burned at the application site but is not preferred given the management burden of fuel deliveries and removal of ash and the potential impact on local air quality given the proximity of existing residential dwellings. For these reasons Biomass has been deemed unfeasible for the project.

PHOTOVOLTAIC CELLS

- 6.16 Solar Photovoltaics (PVs) are solar panels which generate electricity through photon-to-electron energy transfer, which takes place in the dielectric materials that make up the cells. The cells are made up from layers of semi-conducting silicon material which, when illuminated by the sun, produces an electrical field which generates an electrical current. PVs can generate electricity even on overcast days, requiring daylight, rather than direct sunlight. This makes them viable even in the UK, although peak output is obtained at midday on a sunny summer's day.
- 6.17 The main types of commercially available PV panels on offer in the UK are constructed from cells as described below:
- Monocrystalline silicon cells are the most efficient of the PV technologies with a conversion efficiency of between 15-18% (available solar energy to electricity produced). They are cut from single ingots of silicon, have an unbroken crystal lattice and are the most expensive of PVs;
 - Polycrystalline silicon cells have a conversion efficiency of between 13-16%. They are less expensive than monocrystalline cells, are constructed of a number of smaller crystals and are recognisable from a visible 'grain' on the panel; and
- 6.18 A PV system could be technically feasible for the proposed project; however this will be subject to a separate independent detailed study. For this reason, a solar PV system is not currently considered as part of this assessment.

7.0 ADDITIONAL SUSTAINABILITY MEASURES

- 7.1 Carbon emissions aside, the proposed development will also incorporate a number of additional measures in order to further enhance its sustainability credentials. These include:

The responsible sourcing of construction materials.

Where possible, all major construction materials will be sourced from suppliers who themselves have a third party certificated environmental standard in place. This ensures sustainability is transferred throughout the project supply chain.

Sustainable Timber

All timber used (temporary or permanent) will be sourced in accordance with the UK Government's Timber Procurement Policy and all timber suppliers and products will be FSC (Forest Stewardship Council) or PEFC (Programme for the Endorsement of Forest Certification) certified.

Waste Recycling

All waste generated on site will be segregated, sorted and collected for recycling off site. This will include all food and garden waste.

Water Efficiency

Only water efficient fittings will be installed to ensure the total water consumption of the completed dwelling does not exceed 125l/per person/day.

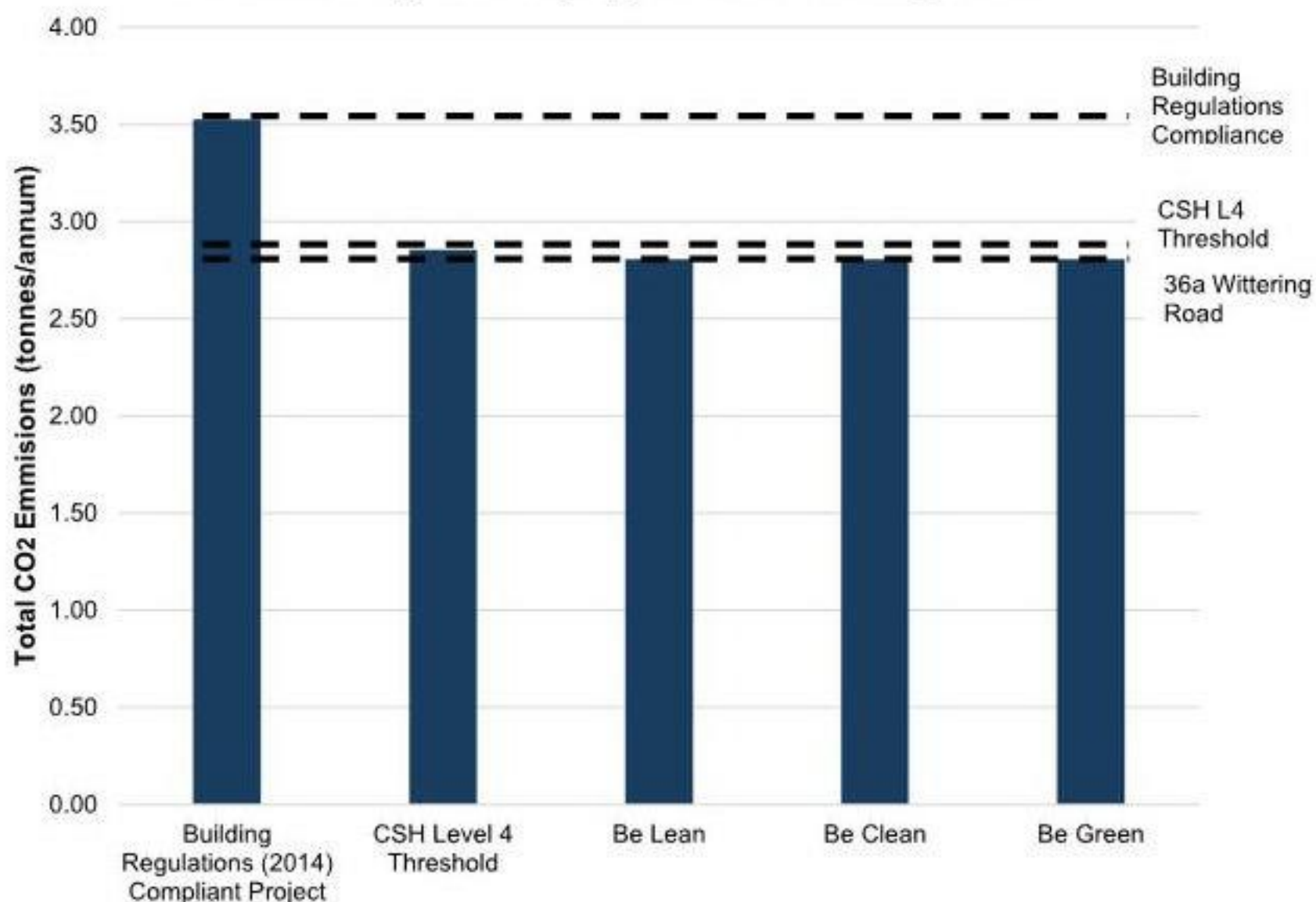
Energy Efficient Equipment

All white goods (dishwashers, washing machines, fridge freezers) will be A+ rated under the EU Energy Efficiency Labelling Scheme. This measure will further reduce the overall energy demand of the units, by reducing any unregulated energy demand.

8.0 CONCLUSION

- 8.1 This report has shown how the proposed new dwelling at 36a Wittering Road will be designed using the Energy Hierarchy and will deliver significant carbon dioxide and energy demand savings, as compared to a Part L 2014 compliant, 'business as usual' building, and relevant CSH Level 4 CO₂ reduction criteria.
- 8.2 Following the energy hierarchy has enabled significant CO₂ reductions to be calculated for the proposed development. A total overall site-wide carbon reduction of 20.42% can be achieved purely through a 'fabric-first' strategy demonstrated in this report.
- 8.4 The result tables below provide a summary of the site-wide CO₂ emissions, and overall carbon reductions for the modelled baselines of the proposed development. The building fabric and plant specified have been taken to their practical limits far exceeding the minimum requirements of Building Regulations and ensuring maximum reductions in carbon emissions. As a result, the current proposals exceed the compliance requirements of the Building Regulations (Part L 2014), and the CO₂ reduction target (19%) set by the CSH Level 4 methodology.

Site-Wide Energy Hierarchy Applied to 36a Wittering Road:



Site-Wide Emission Savings for 36a Wittering Road

	Regulated CO ₂ Savings	
	Tonnes CO ₂ /annum	Percentage Savings (%)
'Be Lean'	0.72	20.42
'Be Clean'	0.00	0.00
'Be Green'	0.00	0.00
Overall Savings	0.72	20.42

Site Wide Annual Regulated Emissions for 36a Wittering Road

	CO ₂ Emissions (tonnes/annum)
Building Regulations 2014 Part L Compliant Project	3.53
CSH Level 4 Threshold	2.86
'Be Lean'	2.81
'Be Clean'	2.81
'Be Green'	2.81



Appendix A

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Property Reference	000089	Issued on Date	14/06/2018
Survey Reference	001	Prop Type Ref	
Property	36a, Wittering Road, HAYLING ISLAND, Hampshire, PO11 9SP		
SAP Rating	87 B	DER	12.20
Environmental	87 B	TER	15.33
CO ₂ Emissions (t/year)	2.62	% DER<TER	20.43
General Requirements Compliance	Pass	DFEE	48.74
		TFEE	64.12
		% DFEE<TFEE	23.98
Surveyor	Gareth Davies, Tel: 07866628167	Surveyor ID	K036-0001
Client			

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	15.33	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	12.20	kgCO ₂ /m ²	Pass
	-3.13 (-20.4%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	64.12	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	48.74	kWh/m ² /yr	
	-15.4 (-24.0%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	3.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from database Worcester Greenstar Cdi 30 Cdi System Efficiency: 89.5% SEDBUK2009 Minimum: 88.0%	Pass
---------------------	---	------

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Secondary heating system

Room heaters - Wood Logs
Data from manufacturer, tested to BS EN 1266
TBC
Efficiency: 88%
Minimum: 65%

Pass

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 1.20 kWh/day
Permitted by DBSCG 2.86

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North East

49.09 m², No overhang

Windows facing South East

10.88 m², No overhang

Windows facing South West

11.59 m², No overhang

Windows facing North West

11.87 m², No overhang

Air change rate

8.00 ach

Blinds/curtains

Light-coloured curtain or roller blind, closed 0% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

3.00 (design value)

Maximum

10.0

Pass

10 Key features

Roof U-value

0.12 W/m²K

Floor U-value

0.12 W/m²K

Thermal bridging γ -value

0.038 W/m²K

Air permeability

3.0 m³/m²h

Secondary heating (wood logs)

N/A

Secondary heating fuel:

wood logs

