

Mulberry House, 1a Eldon Road, Reading

Energy Statement

28th November 2019

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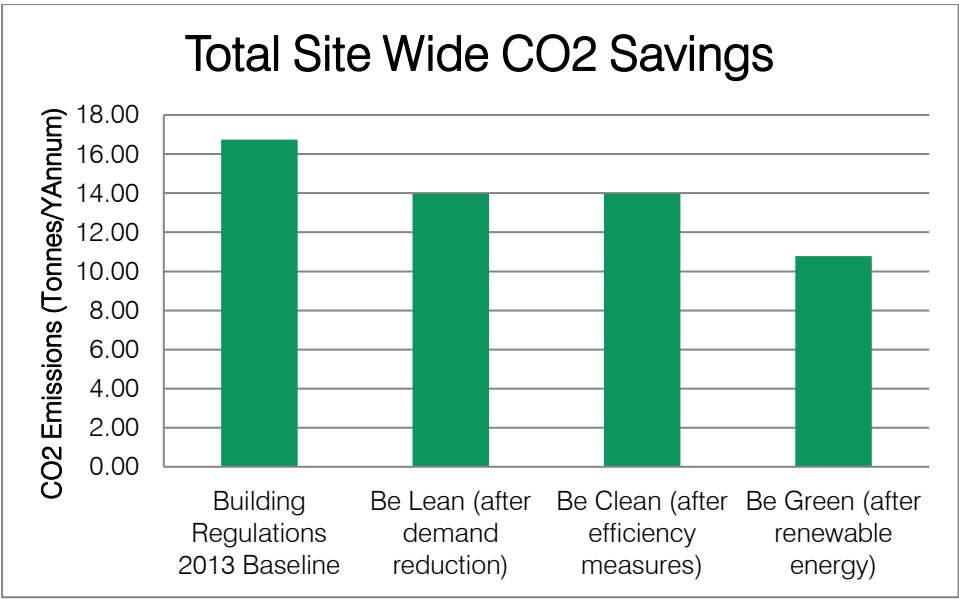
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Executive Summary

The following energy strategy has been prepared for the development of Mulberry House, 1a Eldon Road, Reading. The development consists of 11 residential units comprising a mix of 1, 2, and 3 bedroom flats. In the basement, there is a well-sized refuse store, along with communal cycle storage and ten parking spaces.

This statement summarises the construction measures that have been incorporated into the project in order to meet the energy requirements of the Reading Borough Local Plan, adopted in November 2019.

Following the energy hierarchy, passive design measures, energy efficient equipment have shown an improvement of 35.58% over the Building Regulations Part L 2013 Target Emissions Rate (TER), as shown below.



1 Introduction

The following energy strategy has been prepared for the development of Mulberry House, 1a Eldon Road, Reading, to support application for full planning permission for a residential-use new build. The development consists of five 1 bedroom, three 2 bedroom and three 3 bedroom flats. In the basement, there is a well-sized refuse store, along with communal cycle storage and ten parking spaces.



Figure 1-1 1a Eldon Road © Google Maps

This statement summarises the construction measures that have been incorporated into the project in order to meet the energy requirements of the Reading Borough Local Plan, adopted in November 2019.

The proposed development is contained within a single block, 5 storeys high. There is external space at ground floor level and a well-sized basement. There is limited roof area providing amenity.



Figure 1-2 Proposed Mulberry House Site

1.1 Assessment Approach

This report summarises the work undertaken to support the development of an energy strategy for the new development, following the energy hierarchy 'Be Lean, Be Clean, Be Green'.

Standard Assessment Procedure for the Energy Rating of Dwellings (SAP) calculations have been carried out for the development. This is used to assess the impact on energy demand and CO₂ emissions made by improvements through the hierarchy and to demonstrate the most appropriate solution for the development to meet the relevant planning requirements.

2 Policy

2.1 National Planning Policy Framework (NPPF)

At the heart of the National Planning Policy Framework is a presumption in favour of sustainable development, which should be seen as a golden thread running through both plan-making and decision-taking.

- To support the move to a low carbon future, local planning authorities should:
- plan for new development in locations and ways which reduce greenhouse gas emissions;
 - actively support energy efficiency improvements to existing buildings; and
 - when setting any local requirement for a building’s sustainability, do so in a way consistent with the Government’s zero carbon buildings policy and adopt nationally described standards.

151. To help increase the use and supply of renewable and low carbon energy and heat, plans should:
- a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
 - b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
 - c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

2.2 Reading Borough Local Plan

Policy 4.4.46 Emissions

The requirement will be that major new housing is built to zero carbon homes standard. A revised Sustainable Design and Construction SPD to be produced in 2019 will contain more detail on achieving this requirement, but in general, where homes are not designed to be carbon neutral, this will mean as a minimum a 35% improvement in the dwelling emission rate over the 2013 Building Regulations plus a contribution of £1,800 per tonne towards carbon offsetting within Reading (calculated as £60 per tonne over a 30 year period).

3 Energy Strategy

An energy strategy has been developed following the energy hierarchy ‘Be Lean, Be Clean, Be Green’. Energy calculations using Building Regulations approved and accredited software have been undertaken at each stage to calculate the savings associated with the measures incorporated.

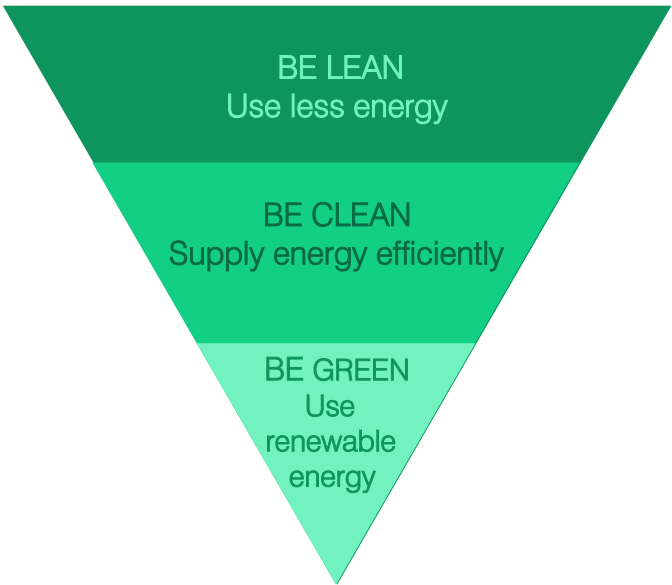


Figure 3-1 The Energy Hierarchy

The energy consumption and carbon emission figures within this report have been calculated using the approved Standard Assessment Procedure for the Energy Rating of Dwellings (SAP).

3.1 Energy Targets

In line with the Reading Borough Local Plan, there is a target of a 35% reduction over Part L 2013. Table 3-1 below details the energy and carbon breakdown of the Part L target emission rate.

Type	Gas (kWh/yr)			Gas CO ₂ (kg/yr)	Electricity (kWh/yr)			Electricity CO ₂ (kgCO ₂ /yr)	Total Energy (kWh/yr)	Total CO ₂ (kg/yr)
	Space Heating	Hot Water	Total		Pumps & Fans	Lighting	Total			
Residential	42,542	24,578	67,121	14,498	825	3,493	4,318	2,241	71,438	16,739

Table 3-1 Target regulated energy demand and carbon emissions per energy source

3.2 Be Lean

As part of the Be Lean approach, passive design measures have been considered throughout the pre-planning stage to reduce initial energy demand.

Solar Gain Control and Daylight

Solar gains are a passive form of heating from the sun's radiation and are beneficial to a building during winter months as they provide an effective source of heat and reduce internal heating requirements. However, summer months they must be controlled in order to mitigate the risk of overheating. They can be controlled through glazing and shading design in order to allow low level winter sun to enter the building and to limit access to high level summer sun.

The glazing strategy design has carefully considered orientation and window size in order to maximise daylight while controlling excessive solar gains. Glazing will incorporate low emissivity coatings to limit overheating without compromising light transmittance.

Overheating

The impact of solar gains has been analysed as part of the SAP calculations taking into account the ventilation strategies, and the risk of solar overheating has been concluded to be slight for most flats, when measured against the Part L1A criteria.

Following the overheating checklist, and results of the SAP assessment, the risk of solar overheating is minimised. Whilst Mechanical Ventilation with Heat Recovery is provided to allow for ventilation during times when windows need to remain closed due to external elements such as noise or air quality, there is also a natural ventilation strategy possible and the majority of units have dual aspect to allow for cross ventilation.

Windows are specified to incorporate low emissivity coatings to limit overheating while ensuring adequate daylight.

Section 1 – Site features affecting vulnerability to overheating		Yes or No
Site location	Urban – within central London or in a high density conurbation	Yes
	Peri-urban - on the suburban fringes of London	No
Air quality and/or Noise sensitivity - are any of the following in the vicinity of buildings?	Busy roads / A roads	Yes
	Railways / Overground / DLR	No
	Airport / Flight path	No
	Industrial uses / waste facility	No
Proposed building use	Will any buildings be occupied by vulnerable people (e.g. elderly, disabled, young children)?	Yes
	Are residents likely to be at home during the day (e.g. students)?	No
Dwelling aspect	Are there any single aspect units?	Yes
Glazing ratio	Is the glazing ratio (glazing : internal floor area) greater than 25%?	No
	If yes, is this to allow acceptable levels of daylighting?	N/A
Security - Are there any security issues that could limit opening of windows for ventilation?	Single storey ground floor units	Yes
	Vulnerable areas identified by the Police Architectural Liaison Officer	No
	Other	N/A

Section 2 – Design features implemented to mitigate overheating risk		Yes or No
Landscaping	Will deciduous trees be provided for summer shading (to windows and pedestrian routes)?	Yes
	Will green roofs be provided?	No
	Will other green or blue infrastructure be provided around buildings for evaporative cooling?	No
Materials	Have high albedo (light colour) materials been specified?	Yes
Dwelling aspect	% of total units that are single aspect	18%
	% single aspect with N orientation	0
	% single aspect with E orientation	18%
	% single aspect with S orientation	0
	% single aspect with W orientation	0
Glazing ratio - What is the glazing ratio (glazing : internal floor area) on each facade?	N	2.0%
	E	5.4%
	S	7.6%
	W	9.7%
Daylighting	What is the average daylight factor range?	
Window opening	Are windows openable?	Yes
Window opening	What is the average percentage of openable area for the windows?	50%
Window opening - What is the extent of the opening?	Fully openable	Yes
	Limited (e.g. for security, safety, wind loading reasons)	No
Security	Where there are security issues (e.g. ground floor flats) has an alternative night time natural ventilation method been provided (e.g. ventilation grates)?	Yes
Shading	Is there any external shading?	Yes – some overhanging balconies and trees
	Is there any internal shading?	No
Glazing specification	Is there any solar control glazing?	Yes - low emissivity glazing is specified
Ventilation - What is the ventilation strategy?	Natural – background	Yes
	Natural – purge	No
	Mechanical – background (e.g. MVHR)	Yes
	Mechanical – purge	Yes
	What is the average design air change rate	5.3
Heating system	Is communal heating present?	No
	What is the flow/return temperature?	
	Have horizontal pipe runs been minimised?	
	Do the specifications include insulation levels in line with the London Heat Network Manual ³¹	N/A

Building Fabric

Designing an efficient thermal envelope will greatly reduce the need for space heating and cooling as heat transmittance through the thermal elements is reduced.

Low air permeability rates will also reduce heating and cooling energy demand by reducing the volume of air that can penetrate the building.

As part of a ‘fabric first’ approach, the building fabric has been carefully considered and specified to meet or exceed current Building Regulations minimum requirements, as detailed in Table 3-2 below.

Fabric Component	Flat Specification
External Walls (inc. walls to unheated spaces)	0.14 W/m ² K
Roof	0.13 W/m ² K
Exposed Floor	0.13 W/m ² K
Party Walls	Fully filled cavity with edge sealing
Windows (including glazed wall)	1.4 W/m ² K G-value: 0.5
Doors	1.0 W/m ² K
Air Tightness	4.0 m ³ /m ² /hr
Party walls	Fully filled cavity with edge sealing
Thermal Bridging	Y = 0.08, requires calculation at detailed design stage

Table 3-2 Proposed Be Lean passive design measures

With regards to party walls, to reach the required standards, these must be fully filled. Partially filled cavities will not comply.

Thermal Bridging

Non-repeating thermal bridges at junctions will be designed carefully in order to ensure that they perform better than typical constructions. Approved Thermal Bridging values have been used in calculations rather than default values. In order to achieve the values required, either Accredited Construction Details (ACDs) must be used or the designs should be independently assessed by a qualified energy modeller at the appropriate stage. If using ACD checklists, they should be used by the Designer, Constructor and Building Control Body to demonstrate compliance.

Building Services

Individual systems have been identified as being the most appropriate for the site. These have been specified to maximise efficiency therefore reducing energy used to deliver services.

Table 3-3 shows the proposed services strategy and energy efficiency measures for the development.

Services Component	Flat Specification
Space Heating & hot water	Combi Gas boilers, 91% efficient, (Regular Gas boiler, 91% efficient, with 210l cylinder for flats with 3 beds) Radiators and Underfloor Heating Delayed start stat, Boiler interlock
Heating Controls	Time and temperature zone control
Ventilation	MVHR, SFP 0.5, Heat recovery efficiency of 91%
Lighting & Controls	100% low energy lighting

Table 3-3 Proposed energy efficient design measures

The breakdown of carbon and energy use has been identified for the site. Table 3-4 shows the breakdown of carbon and energy use once the strategies proposed at the Be Lean stage are incorporated.

Use Type	Gas (kWh/yr)			Gas CO ₂ (kg/yr)	Electricity (kWh/yr)			Electricity CO ₂ (kg/yr)	Total Energy	Total CO ₂
	Space Heating	Hot Water	Total		Pumps & Fans	Lighting	Total			
Residential	26,760	23,117	49,878	10,774	2,678	3,490	6,168	3,201	56,046	13,975

Table 3-4 Estimated regulated energy demand and carbon emissions per energy source

Carbon Savings

Table 3-5 demonstrates the percentage improvement over the notional baseline levels for the Be Lean stage.

Energy Hierarchy stage	CO ₂ Emissions (T /yr)	CO ₂ Savings (T /yr)	% Saving
Building Regulations 2013 Baseline	16.74		
Be Lean	13.97	2.76	17%

Table 3-5 improvements over Part L

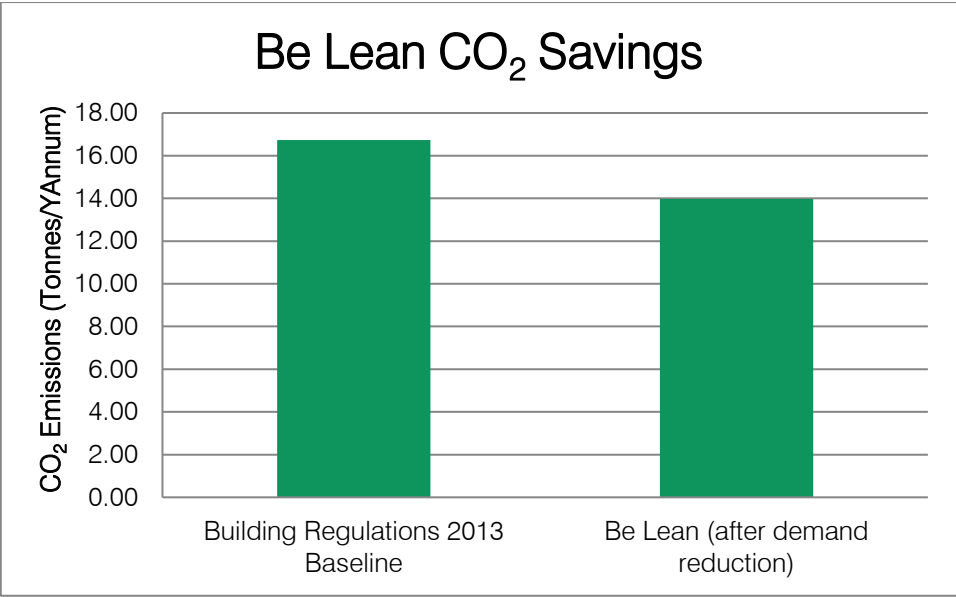


Figure 3-2 Be Lean Improvement over Building Regulations Part L 2013

3.3 Be Clean

As part of the Be Clean approach, the use of energy efficient equipment, heat networks and community heating have been considered.

District Energy Systems

There are no potential heat networks running in the vicinity of the site. Due to the lower energy requirements in the area, it is unlikely there will be a heat network here in the future.

Community Heating

Efficient systems for energy delivery have also been investigated. At the scale of this development, Community Heat and Power (CHP) systems are not viable. CHP requires a high base energy demand load in order to operate efficiently. It is usually more suited to hotel or hospital schemes which have a high hot water demand, or very large residential schemes incorporating hundreds of units.

Delivery of heating on site has been investigated. As this development is relatively small, the installation of a community energy system would not be cost effective. It is therefore proposed that highly efficient individual gas boilers are utilised for the scheme.

Carbon Savings

As the district heating and CHP are not viable options for a project of this scale, there are no further savings to be made at the be clean stage.

3.4 Be Green

At the Be Green stage, renewable technologies are investigated. Table 3-6 considers the feasibility of renewable energy technologies for the scheme.

LZC Technologies	Description	Noise	Visual impact	Internal Space	External Space	Capital Cost	Maintenance	Feasibility	
Solar Thermal Collectors 	Solar thermal collectors can be used to provide hot water using the irradiation from the sun. They can generally provide approx. 50% of the hot water demand	●	●	●	●	●	●	There are areas of flat roof that can incorporate solar technologies. However, carbon savings are quite low, and it is quite a high cost technology.	✗
Solar Photovoltaic Panels 	Solar PV panels generate electricity from the sun's energy. They should be installed within 90° of due south ideally at a 30° angle. The electricity can be used to supply the landlords load.	●	●	●	●	●	●	There are areas of flat roof that can incorporate solar technologies. Solar PV is ideal for making carbon savings while being a simple technology.	✓
Biomass Heating 	Solid, liquid or gaseous fuels derived from plant material can provide boiler heat for space and water heating A biomass boiler would supplement a standard gas heating system so some of the cost may be offset through money saved on using smaller traditional boilers reliability of fuel access/supply can be a problem	●	●	●	●	●	●	Biomass is not considered feasible for this development due to issues with fuel storage, access for delivery vehicles and local NO _x emissions	✗

Wind Turbines 	Vertical and horizontal axis wind turbines enable electricity to be generated using the power within the wind Not suitable for urban environments due to low wind conditions and obstructions								This development is in an urban environment and so a wind turbine will not generate a significant amount of energy	✖
Ground Source Heat Pumps (GSHP) 	Utilising horizontal loops or vertical boreholes, GSHP make use of the grounds almost constant temperature to provide heating and/or cooling using a heat exchanger connected to a space/water heating delivery system Optimum efficiency with underfloor heating systems								GSHP are not a feasible technology for the site since there is a limited external space available for installation of boreholes	✖
Air Source Heat Pumps (ASHP) 	Air Source Heat Pumps extract latent energy from the external air in a manner similar to ground source heat pumps Optimum efficiency with underfloor heating systems								The use of ASHP is technically feasible for the development but is discounted due to noise issues and locating the unsightly units	✖

Table 3-6 Feasibility of LZC technologies for the development

PV System

The feasibility study has identified solar PV as the most appropriate technology for the site. This will serve the landlord loads for the communal areas. The following system is proposed:

- Peak Power – 8.0 kWp
- Orientation – Horizontal
- Panel specification – Min 18% efficiency
- Approx. no. of panels – 25

Carbon Savings

The carbon savings at the Be Green Stage are shown in Figure 3-3.

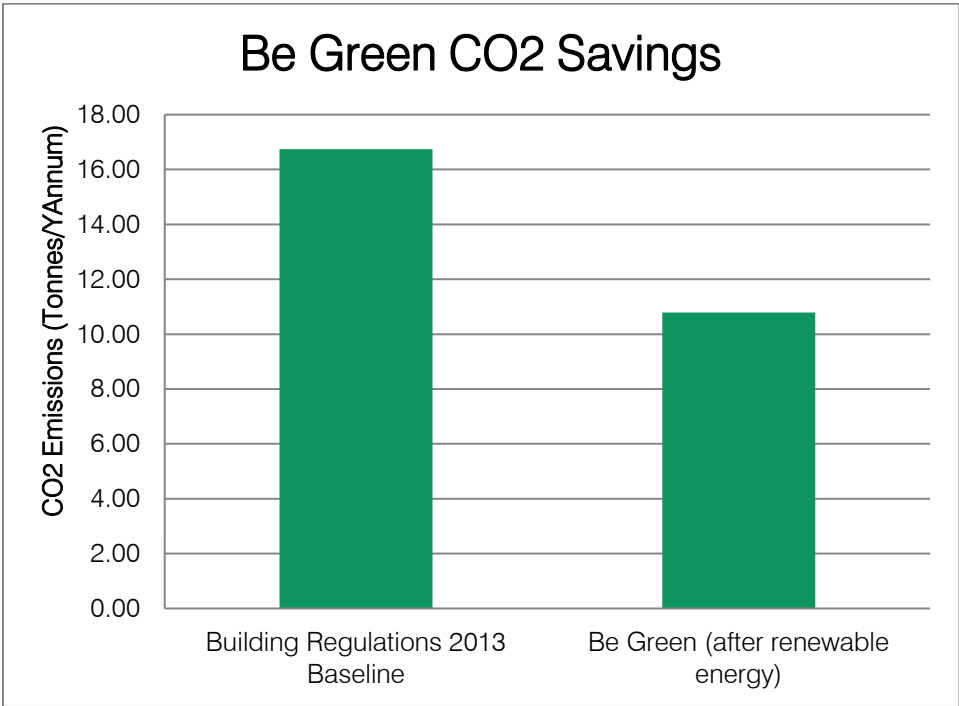


Figure 3-3 Be Green Improvement over Building Regulations Part L 2013

3.5 Energy and Carbon Savings

Energy Use

The breakdown of carbon and energy use has been identified for the site. Table 3-7 shows the breakdown of carbon and energy use once the strategies proposed in this report are incorporated.

Type	Gas (kWh/yr)			Gas CO ₂ (kg/yr)	Electricity (kWh/yr)				Electricity CO ₂ (kgCO ₂ /yr)	Total Energy (kWh/yr)	Total CO ₂ (kg/yr)
	Space Heating	Hot Water	Total		Pumps & Fans	Lighting	PV	Total			
Residential	26,760	23,117	49,878	10,774	2,678	3,490	-6,15	18	9	49,896	10,783

Table 3-7 Estimated regulated energy demand and carbon emissions per energy source

Carbon Savings

Table 3-8 and Figure 3-4 demonstrate the percentage improvement over the notional baseline levels for the development.

Energy Hierarchy stage	CO ₂ Emissions (T/yr)	CO ₂ Savings (T/yr)	% Saving
Building Regulations 2013 Baseline	16.74		
Be Lean	13.97	2.76	16.51%
Be Clean	13.97	0.00	0.0%
Be Green	10.78	3.19	19.07%
Total Cumulative Savings		5.96	35.58%

Table 3-8 Improvements over Part L

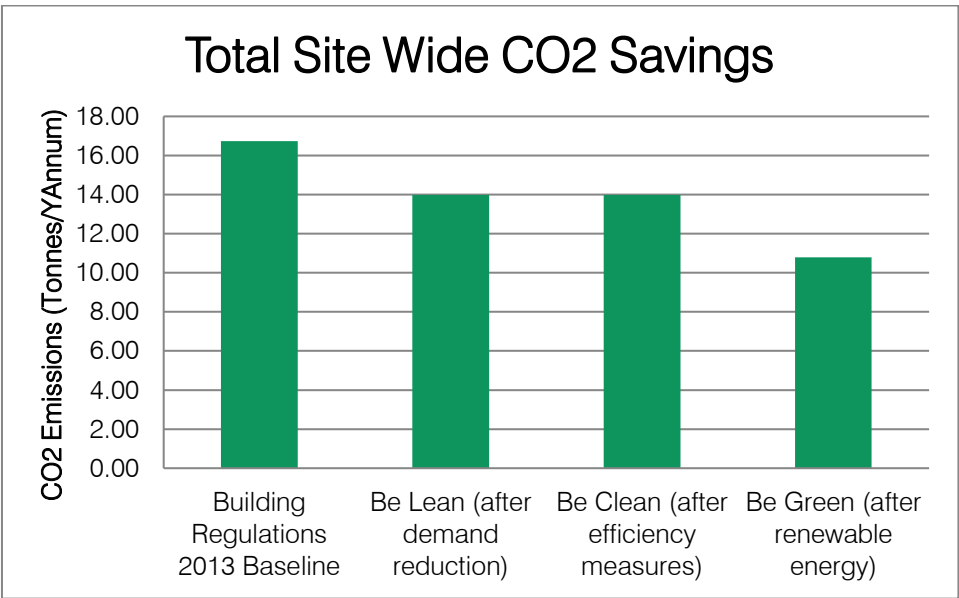


Figure 3-4 Site Wide Improvement over Building Regulations Part L 2013

Residential Carbon Offset Payment

The development has achieved a 35.58% improvement over Part L. There is a target of “Zero Carbon”, which can be achieved through an offset payment when there is a shortfall in site. This calculation is detailed below in Table 3-9.

	Shortfall on zero carbon for Residential		
	Carbon emissions (tonnes / annum)	30 year carbon emissions	Offset payment (£60/tonne)
Residential emissions	10.76		
Offset		323	£19,409

Table 3-9 Carbon offset payment calculation

4 Conclusion

The development consists of 11 residential units comprising a mix of 1, 2, and 3 bedroom flats. In the basement, there is a well-sized refuse store, along with communal cycle storage and ten parking spaces.

The development follows the energy hierarchy, incorporating passive design measures and renewable energy.

The development employs an efficient building fabric, including well insulated walls and highly efficient glazing, efficient systems and PV Panels are specified to maximise carbon savings for the site, exceeding the required 35% reduction on site. The development will further achieve 'zero carbon' through an offset payment in line with the Reading Borough Local Plan guidance.

The figures within this report are based on preliminary analysis only and further detailed studies will be required at the detailed design stage before specifying any of the proposed systems.