

Energy & Sustainability Statement

13-15 Station Road, Reading, RG1 1LG

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Pro Sustainability Ltd

Stow House

Stowhill

Childrey

OX12 9XQ

www.prosustainability.co.uk

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Executive Summary

- Pro Sustainability Ltd has undertaken this Energy & Sustainability Assessment in support of the planning application being submitted by Faye and Yara Limited ('The Applicant') to Reading Borough Council ('the Council') for the proposal at 13-15 Station Road, Reading, RG1 1LG ('The Site').
- The project proposes a part conversion of 13-15 Station Road, converting the offices on the first, second, third and fourth floors to 7 residential flats.
- This report addresses the relevant planning policies with regards to Reading's Local Plan and demonstrates compliance with the latest Part L 2021 of the Building Regulations.
- Sustainable design measures have been incorporated through building fabric improvement, more efficient heating systems and controls, low energy lighting, and a MVHR system.
- In order to minimise the carbon emissions related to heating, electric heating has been proposed, due to the reduced carbon factors of grid supplied electricity.
- The proposed residential units aim to improve upon building regulations CO₂ emissions targets through fabric and building service efficiencies alone by 29% over Part L 2021 notional baseline, exceeding the 19% target reduction for minor developments.
- These results are summarized in the following Table 1 and Figure 1
- A BREEAM Pre-assessment Estimator has been produced, with an indicative score of 62.10% and an indicative rating of BREEAM Very Good.

Table 1 Summary of predicted site regulated CO₂ emissions for the proposed development

	Regulated Emissions (tCO ₂ e/year)	% Reduction
Baseline: Part L 2021 Notional Building for Existing	5.5	-
After energy demand reduction and system improvement	3.9	29%

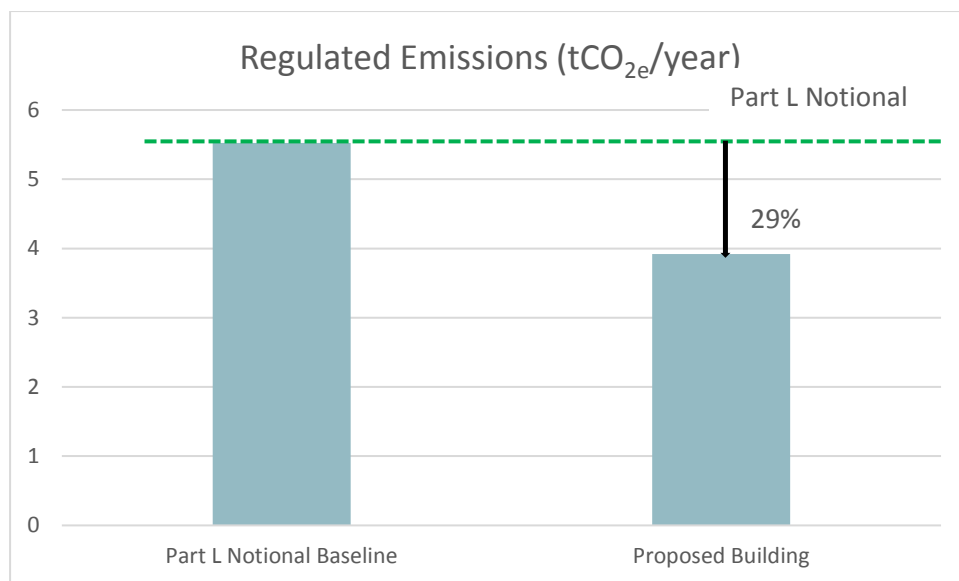


Figure 1 Summary of predicted site regulated CO₂ emissions for the proposed development compared to Part L baseline

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1. Introduction

This document has been prepared by Pro Sustainability Ltd on behalf of the applicant in support of a planning application for the proposed development, consisting of converting offices on 4 levels to 7 residential flats.

Table 2: Proposed Flats

Floor	Flat Reference	Bedroom	Area sqm
First Floor	Flat1	1	57.7
	Flat 2	1	43.4
Second Floor	Flat 3	1	57.7
	Flat 4	1	44.0
Third Floor	Flat 5	1	57.7
	Flat 6	1	42.9
Fourth Floor	Flat 7	2	93.0



Figure 2 Proposal Elevation (iB Architects)

2. Reading Borough Local Plan

This Energy statement will address the Reading Borough Local Plan, adopted November 2019, along with Part L of building regulations. Mainly addressing

CC2: Sustainable Design and Construction

This Policy states the following:

Proposals for new development, including the construction of new buildings and the redevelopment and refurbishment of existing building stock, will be acceptable where the design of buildings and site

layouts use energy, water, minerals, materials and other natural resources appropriately, efficiently and with care and take account of the effects of climate change.

To meet these requirements:

- All major non-residential developments or conversions to residential are required to meet the most up-to-date BREEAM 'Excellent' standards, where possible;
- **All minor non-residential developments or conversions to residential are required to meet the most up-to-date BREEAM 'Very Good' standard as a minimum;**
- All non-residential development or conversions to residential should incorporate water conservation measures so that predicted per capita consumption does not exceed the appropriate levels set out in the applicable BREEAM standard. Both residential and nonresidential development should include recycling greywater and rainwater harvesting where systems are energy and cost effective.

CC3: Adaptation to Climate Change

All developments will demonstrate how they have been designed to incorporate measures to adapt to climate change. The following measures shall be incorporated into development:

- Wherever possible, new buildings shall be orientated to maximise the opportunities for both natural heating and ventilation and reducing exposure to wind and other elements;
- Proposals involving both new and existing buildings shall demonstrate how they have been designed to maximise resistance and resilience to climate change for example by including measures such as solar shading, thermal mass, heating and ventilation of the building and appropriately coloured materials in areas exposed to direct sunlight, green and brown roofs, green walls, etc;
- Use of trees and other planting, where appropriate as part of a landscape scheme, to provide shading of amenity areas, buildings and streets and to help to connect habitat, designed with native plants that are carefully selected, managed and adaptable to meet the predicted changed climatic conditions; and
- All development shall minimise the impact of surface water runoff from the development in the design of the drainage system, and where possible incorporate mitigation and resilience measures for any increases in river flooding levels as a result of climate change

Sustainable Design & Construction SPD

This SPD has been adopted in December 2019.

Table 3.1 within the SPD lists the required level of sustainability standard, for a Minor (fewer than 10 dwellings) the requirement is: 19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations. Due to the changes in the Building Regulations, the reductions will be based on Part L 2021.

Building Regulation Part L 2021

Changes to Part L (Conservation of fuel and power) of Building Regulations came into force on 15 June 2022, in the form of two new Approved Documents.

3. Energy & Carbon Emissions

This energy statement will use an energy hierarchy to deliver energy and carbon reductions. The hierarchy will be based on:

Baseline: Notional Building Baseline

Be lean: use less energy (Energy Efficiency Target)

Be clean: (Supply heating efficiently)

Be green: (Use renewable energy)

In order to benchmark the proposed new development, estimated energy demands, and CO₂ emissions data have been calculated. These estimated energy consumptions shown are relevant only to each stage. They demonstrate the percentage of the building's total energy consumption and CO₂ emissions in accordance with the Energy Hierarchy.

The benchmark data for the residential units are derived from approved Standard Assessment Procedure (SAP) software which use government and industry agreed National Calculation Methodology (NCM) room templates containing standard operating conditions, as the proposed is an existing building, the baseline would be based on the Dwelling Emission Rate of the Notional of the base scenario.

3.1 Baseline Case

In order to benchmark the proposed conversion, estimated notional energy demands and resulting CO₂ emissions data, known as the Dwelling Emissions Rate [DER] have been calculated, based on the current Notional. The DER of that is used as the benchmark to assess the percentage of the building's total regulated CO₂ emissions that could be reduced or offset in accordance with the Energy Hierarchy. Standard Assessment Procedure has been used to produce figures representing the Carbon Dioxide Emissions. The Part L 2021 Notional baseline CO₂ data is shown in Table 1.

The carbon factors for gas and electricity used are as per the Part L values in Table 1.

Table 3 Carbon Factors

Fuel Type	Fuel Carbon Factors (kgCO ₂ /kWh)
	Part L 2021
Natural Gas	0.210
Grid Electricity	0.136

3.2 Be Lean: Energy Efficiency

In order to deliver an environmentally responsible building, several efficiency measures have been incorporated into the design of this semi conversion proposal, summarised as follows:

- Improving the roof insulation
- Secondary glazing to the front facade
- 100% low energy LED lighting
- Energy efficient MVHR systems
- Efficient and appropriate lighting controls
- Efficient space and water electric heating system with controls

Energy Efficient Building Design

The following table (Table 3) describes the proposed targeted building envelope thermal performance criteria.

Table 4: Building Fabric

Reference	Notional Values	Design Criteria
<i>Solid Brick External Wall- W/m²K</i>	0.3	0.3
<i>Existing Cavity Walls</i>	0.55	0.55
<i>Roof (Flat)- W/m²K</i>	0.16	0.15
<i>Glazing- W/m²K</i>	1.4	1.4
<i>Glazing/ Secondary- W/m²K</i>	1.4	1.3
<i>Exposed floors</i>	0.25	0.25

Daylight:

As a conversion the window sizes will not be altered, nevertheless, the layout and zoning of the flats aim to provide adequate daylight levels to the habitable areas. Not only to insure visual comfort to the occupants, but also to reduce the reliance on artificial lighting.

High Performance Lighting:

It is imperative that the lighting design philosophy provides the correct quality of lighting with minimum energy input and hence reduce internal heat gains. The latest low energy lighting technology will be employed throughout, including LED's, where appropriate. External lighting will be designed with consideration for security requirements and minimising nuisance, glare and light pollution to the surrounding area.

Energy efficient MVHR systems:

It is important that care is taken when specifying a ventilation system to avoid inadvertently increasing the auxiliary energy demand. For this reason, an MVHR system with low specific fan power (SFP) and high heat recovery efficiency will be specified.

Table 5 demonstrates the output of the SAPs and GLA reporting spreadsheet values at the BE LEAN stage.

Table 5 Regulated CO2 Savings from Be Lean

Be Lean	Regulated Domestic CO2 Savings	
	Tonnes CO2 per annum	Reduction %
Savings from energy efficient measures	1.6	29%

3.3 Be Clean: Supply Energy Efficiently

Following the application of energy efficiency measures (Be Lean) the next step is to consider the feasibility of Combined Heat and Power (CHP) systems and/or decentralised heating or cooling networks.

Due to the nature and the size of the proposal, this would not be a feasible option

3.4 Be Green: Appraisal of Renewable Technology

As part of the energy hierarchy, the feasibility of renewable energy technologies has been appraised. This feasibility study (Appendix C) identifies that the most feasible options would be; PV panels and ASHP. With the decarbonisation of the grid and the feasibility and carbon reductions related to each technology, along with the embodied carbon related to those technologies, none of those systems are considered at this stage.

4. Sustainable Design Measures

4.1 Water consumption

All residential units will aim to meet the higher water efficiency standards within the 2013 Building Regulations Part G2 water consumption target of 110 litres per person per day. This will be achieved by:

- Dual flush WCs
- Spray and aerating taps
- Water efficient appliances
- Low flow showers

4.2 Building Materials

Construction materials are selected in a way to reduce the environmental impact, key issues during selection are:

- Use of sustainably sourced materials
- Low embodied energy materials
- The use of recycled and reclaimed materials where possible, as well as materials with high recycled content

4.3 Construction Waste

The aim will be to reduce construction waste by encouraging reuse, recovery and best practice waste management practices to minimise waste going to landfill.

Measures will include:

1. The client will prepare a Resource Management Plan (RMP) covering non-hazardous waste materials, from on-site construction.
2. Sorting of waste materials into separate key waste groups (bricks, concrete, insulation, timber, tiles, etc.), either on site or through a licensed contractor for recovery.
3. Return packaging for reuse
4. Design to use fewer materials

4.4 Operational Waste

The proposal aims to encourage the recycling of operational waste through the provision of dedicated storage facilities and space.

4.5 Flood Risk

The Environment Agency has developed a flood risk map, which shows the relative risk of flooding for different return periods. Flood zones assume that no defences are present and so where these do exist they are only indicative of the potential for flooding.

The whole development lies within flood zone 1 of the Environment Agency's flood risk map as seen in Figure 4. Land located within flood zone 1 is at very low risk of flooding having an associated annual probability of flooding of less than 1 in 1000 (0.1%).

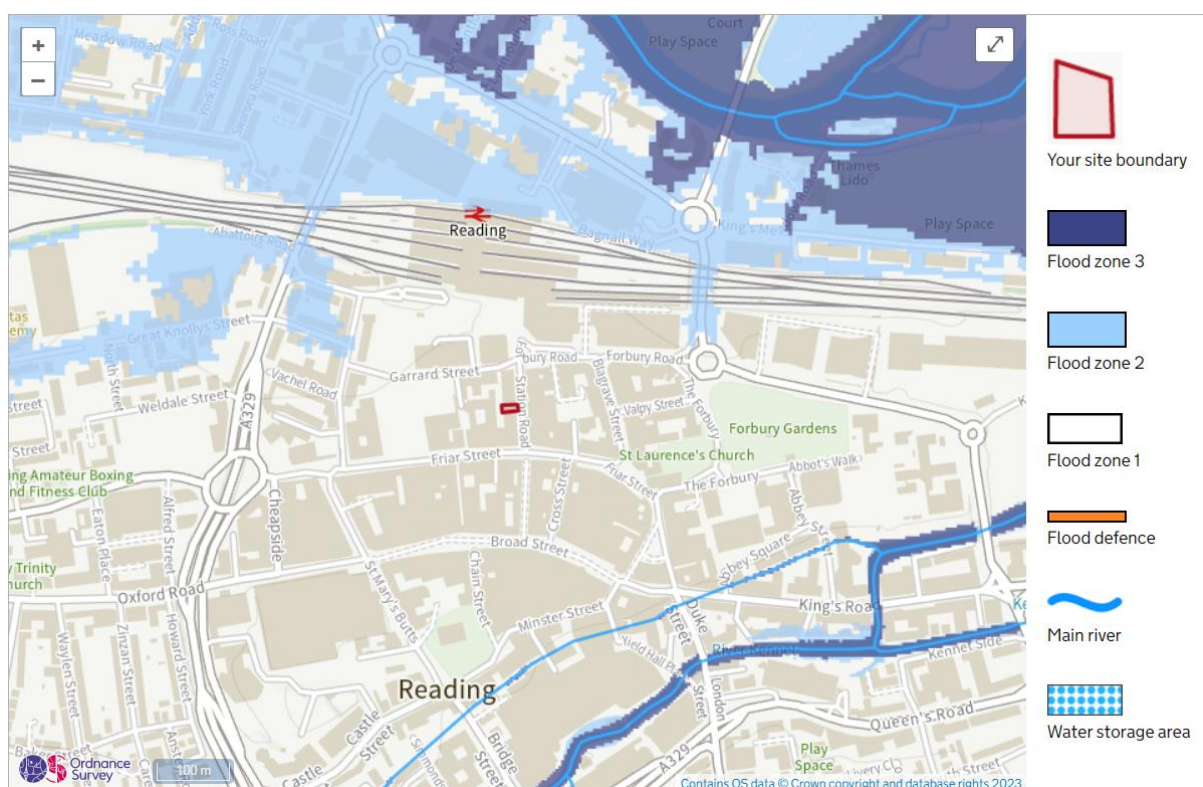


Figure 3: Flood Map (Source: Gov.uk)

4.6 Managing Heat Risk

With climate change already meaning that the country is experiencing higher than average temperatures and more severe hot weather events it is imperative that developments are designed to minimise overheating.

Implemented design strategies to reduce risk of overheating:

1. Manage the heat within the building through exposed internal thermal mass
2. Provide passive ventilation
3. Provide mechanical ventilation
4. Internal heat gains will be minimised through the use of energy efficient appliances and lighting.

Table 6: RESIDENTIAL DEVELOPMENT – SUSTAINABLE DESIGN CHECKLIST

Category	Criteria	Comments
Energy/ CO2	How has the development been designed to optimise the use of the energy from the sun and limit heat losses?	Window opening maintained- no reduction of solar gains. Introducing secondary glazing to the front windows to reduce heat losses. Improvements to the roof by adding insulation and reducing the heat losses and gains.
	How has the development been designed to optimise natural daylighting, energy efficient lighting, external lighting and natural ventilation?	Maintaining window sizes 75% LED Lighting to reduce energy demand Natural ventilation encouraged by appropriate window design
	How will the design of the building make efficient use of energy?	Insulating the roof Addition of secondary glazing
	Has local energy generation from renewables and/or decentralised energy been considered as part of the scheme?	The 19% reduction target has been achieved and exceeded, by achieving 29% reduction compared to the Notional, with energy efficiency measures. No renewable technology is proposed. As a minor development decentralised energy would not be a feasible option
	How have cycle storage facilities been considered?	Yes
	Does the development meet the requirements of policies H5? Is this clearly illustrated?	N/A
	Is a Section 106 contribution required? If so, what amount?	No
Water	How will the development incorporate the use of water saving devices to achieve the higher water efficiency standard under Regulation 36(3) of the Building Regulations?	Dual flush WCs Spray and aerating taps Water efficient appliances Low flow showers
	How will the development incorporate recycling rainwater and reduce the use of potable water?	N/A
	Has the collection, treatment and re-use of grey water been	No

	considered? If so, how will these facilities be incorporated within the development?	
Materials	How will the selected materials help retain local character, ensure long life and ensure a low environmental impact, including consideration of embodied energy?	The character of the building will be maintained by insuring that any upgrade work will be done internally; roof and secondary glazing. Sourcing of relatively local, environmental and low impact materials will be a high consideration, to reduce the embodied carbon where possible.
Waste	How will the development minimise waste sent to landfill? How will the development make the maximum use of construction and demolition waste? How will the development make maximum use of re-used and recycled materials? How will provision be made for the storage and recycling of waste for all users of the site?	The aim will be to reduce construction waste by encouraging reuse, recovery and best practice waste management practices to minimise waste going to landfill. Measures will include: 1. The client will prepare a Resource Management Plan (RMP) covering non-hazardous waste materials, from on-site construction. 2. Sorting of waste materials into separate key waste groups (bricks, concrete, insulation, timber, tiles, etc.), either on site or through a licensed contractor for recovery. 3. Return packaging for reuse 4. Design to use fewer materials Operational Waste The proposal aims to encourage the recycling of operational waste through the provision of dedicated storage facilities and space.
Pollution	What measures have been incorporated to ensure that noise and light pollution will be minimised through the development? What measures have been incorporated to reduce nitrogen oxide emissions and reduce the global warming potential of insulants? What measures have been incorporated to reduce the release of pollution into the atmosphere?	External lighting will be designed with consideration for security requirements and minimising nuisance, glare and light pollution to the surrounding area. Heating and hot water will be provided by electrical heaters and boilers eliminating nitrogen oxide emissions.
Health and wellbeing	How has the development been designed to maximise natural lighting, reduce the likelihood of noise	The zoning and layouts of the flats insure sufficient daylight in habitable rooms. Soundproofing by installing acoustic insulation to reduce noise between flats.

	complaints, incorporate private outdoor space and ensure the layout of the development can be easily adapted to meet the needs of future occupants?	The MVHR system would enable occupants to rely on the Mechanical ventilation in the case of external noise impacting opening the windows.
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6. Summary and Conclusions

Pro Sustainability Ltd has undertaken an Energy & Sustainability Assessment for the proposed conversion at 13-15 Station Road, Reading. This report addresses the requirements of Reading Local Plan, mainly Policies; CC2 and CC3.

By incorporating energy efficiency measures and electric space and water heating, along with a MVHR system carbon emissions are reduced by 29% compared to the notional existing baseline of Part L 2021 Building Regulations.

A BREEAM Pre-assessment Estimator has been produced, with an indicative score of 62.10% and an indicative rating of BREEAM Very Good.

Table 7: CO2 Emissions after each Stage of the Energy Hierarchy

	Total Unregulated Emissions (tCO2e/year)	Total Regulated Emissions (tCO2e/year)	CO2 Savings (tCO2e/year)	Percentage savings of Regulated Carbon
Part L 2021 Notional Baseline	12.8	5.5	-	-
Be Lean	12.8	3.9	1.6	29

Appendix A: Renewable and Low Carbon Technology Energy Options Appraisal

1. *Solar Photovoltaic*

Solar photovoltaic panels convert solar radiation into electrical energy through semi conductor cells

Benefits:

- Low maintenance/ no moving parts
- Ability to integrate into the building design

Limitations:

- Overshadowing reduces panel performance
- Panels ideally need to be inclined at 30° to the horizontal facing a southerly direction
- Roof space

Feasibility for site: Yes- Medium

2. *Solar Thermal*

Solar thermal energy can be used to contribute towards space heating and hot water requirements. The two common forms of collector are panel and evacuated tube.

Benefits:

- Low maintenance/ no moving parts
- Income generated from Renewable Heat Incentive scheme (RHI)

Limitations:

- Must be sized for the building hot water requirements
- Panels ideally need to be inclined at 30° to the horizontal facing a southerly direction

Feasibility for site: No

3. *Ground Source Heat Pump (GSHP)*

GSHP systems tap into the earth's considerable energy store to provide both heating and cooling to buildings. A number of installation methods are possible including horizontal trench, vertical boreholes, piled foundations (energy piles) or plates/pipe work submerged in a large body of water. The design, installation and operation of GSHPs is well established.

Benefits:

- Minimal maintenance
- Unobtrusive technology
- Flexible installation options
- Income generated from Renewable Heat Incentive scheme (RHI)

Limitations:

- Large area required for horizontal pipes
- Full ground survey required to determine geology
- More beneficial when cooling is required

Feasibility for site: No

- Prohibitively expensive installation costs
- Intrusive to adjacent area
- Space limitations

4. Air Source Heat Pump (ASHP)

Electric or gas driven ASHP's extract thermal energy from the surrounding air and transfer it to the working fluid (air or water).

Benefits:

- Efficient use of fuel
- Relatively low capital costs

Limitations:

- Specialist maintenance
- More beneficial when cooling is required

Feasibility for site: Yes- Medium

5. Wind Turbine (Stand-alone)

Wind generation equipment operates on the basis of wind turning a propeller, which is used to drive an alternator to generate electricity. Small scale (1kW – 15kW) wind turbines can be pole or roof mounted.

Benefits:

- Low maintenance
- Minimum wind speed available
- Excess electricity can be exported to grid

Limitations:

- Planning issues
- Aesthetic impact and background noise
- Space limitations on site
- Wind survey to be undertaken to verify 'local' viability

Feasibility for site: No

- Not suitable on this site

6. Wind Turbine (Roof mounted)

Benefits:

- Low maintenance
- Minimum wind speed available
- Excess electricity can be exported to grid

Limitations:

- Planning issues

- Aesthetic impact and background noise
- Structural/ vibration impact on building to be assessed
- Proximity of other buildings raises issues with downstream turbulence
- Wind survey to be undertaken to verify 'local' viability

Feasibility for site: No

- Not suitable on this site

7. Combined Heat and Power

A Combined Heat and Power (CHP) installation is effectively a mini on-site power plant providing both electrical power and useful heat. CHP is strictly an energy efficiency measure rather than a renewable energy technology.

Benefits:

- Potential high CO2 saving available
- Efficient use of fuel
- Excess electricity can be exported to the grid
- Benefits from being part of an energy centre/district heating scheme

Limitations:

- Maintenance intensive
- Sufficient base thermal and electrical demand required
- Some additional plant space required
- In case of biomass, large area needed for fuel delivery and storage

Feasibility for site: No

- Not viable for this site

Appendix B: SAP Calculations

Separate submission

Appendix C: BREEAM Pre Assessment Estimator

Separate Submission