Energy & Sustainability Statement

7 Reddington Gardens, London NW7 3RU

June 2023

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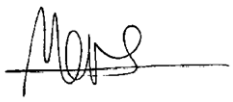
DOCUMENT CONTROL

Prepared By:	Marcus Eves	Signed:	
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Revision History

Revision	Date	Details
-	09/06/2023	First issue
-	15/06/2023	Fixed Grammatical Errors
A	24/01/2024	Scheme revision and planning resubmission

1. EXECUTIVE SUMMARY

1.1. This Energy and Sustainability Statement has been prepared in support of a planning application for 7 Reddington Gardens, London NW3 7RU. The application consists of the demolition and redevelopment of an existing dwelling to provide a new 5 bedroom, 2 storey dwelling with a room in the roof.

1.2. This report outlines the predicted energy demand and resultant carbon emissions from the proposed development. It also shows how the proposal has incorporated energy efficiency measures and given consideration to low carbon and renewable technologies.

1.3. The calculations have been assessed against the new Part L, Volume 1 Dwellings & Volume 2 Buildings other than dwellings (June 2022). The residential SAP calculations have been completed using the Stroma SAP 10 software. The calculations have followed the methodology set out in The Greater London Authorities Energy Assessment Guidance (June 2022). Calculations have been performed using the energy hierarchy, Be Lean, Be Clean and Be Green. All carbon emissions referenced in this report are based on the SAP 10 emissions factors.

1.4. The development exceeds 500m^2 of floor area (but is less than 1000m2) and is classed as 'medium' by the Camden Planning Guidance: Energy efficiency and adaptation (January 2021). Therefore the relevant sustainability targets from the London Plan have been examined. These equate to a 35% improvement over the Building Regulations Target Emission Rate (TER). The Energy Assessment Guidance note introduces an interim target of a 50% improvement over the TER for residential developments, which this proposal will strive to achieve. Furthermore the Camden planning policy requires a 20% reduction in CO_2 emissions through the use of renewables.

1.5. At the be Lean stage the dwelling has achieved a reduction in CO_2 emissions of 6% against the Target Emission Rate (TER) through energy efficiency measures.

1.6. The dwellings fabric energy efficiency (DFEE) has improved upon the target fabric energy efficiency (TFEE) by a margin of 3.0% This improvement demonstrates that the proposed dwelling has a highly efficient building fabric.

1.7. At the Be Clean Stage, the effectiveness of a district heating connection has been evaluated. Following consultation with the London Heat Map it has been identified there are no readily available, current or proposed district heating networks available. In addition, the proposal is for a medium development and single dwelling, for these reasons a heat network connection is not possible.

1.8. At the Be Green Stage consideration has been given to renewable technologies. Air source heat pumps (ASHP) have been established as viable to provide heating and hot water to the dwelling. having potential for energy generation. It is proposed the development uses a Mitsubishi Ecodan CAHV-R450YA-HPB. The ASHP will be MCS certified and has been entered into the SAP Calculation using an efficiency of 170%. The heat pump has been sized to meet the full heat load and hot water demand of the dwelling.

1.9. After the inclusion of the heat pump a 54% improvement over the TER has been achieved. Of this figure there is a 48% improvement directly through renewable technologies in the form of the ASHP.

1.10. This has been deemed adequate to satisfy Part L1 of the Building Regulations, Camden Policy CC1 and the London Plan emissions reduction targets. A summary of the site wide emissions at each stage of the energy hierarchy is shown below.

1.11. Unregulated Energy has been calculated using the BREDEM methodology, This assumes a large electric cooker and a gas hob (See Appendix B).

Carbon dioxide emissions

	Carbon Dioxide Emissions for residential buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2021 of the Building Regulations Compliant Development	4.5	1.0
After energy demand reduction (be lean)	4.2	1.0
After heat network connection (be clean)	4.2	1.0
After renewable energy (be green)	2.1	1.0

Figure 1: Summary of domestic emissions

Regulated carbon dioxide savings

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Be lean: savings from energy demand reduction	0.3	6%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	2.2	45%
Cumulative on site savings	**2.4**	**50%**
Annual savings from off-set payment	2.1	-
(Tonnes CO_2)		
Cumulative savings for off-set payment	**62**	-
Cash in-lieu contribution (£)	**5,848**	-

Figure 2: Summary of domestic emissions savings

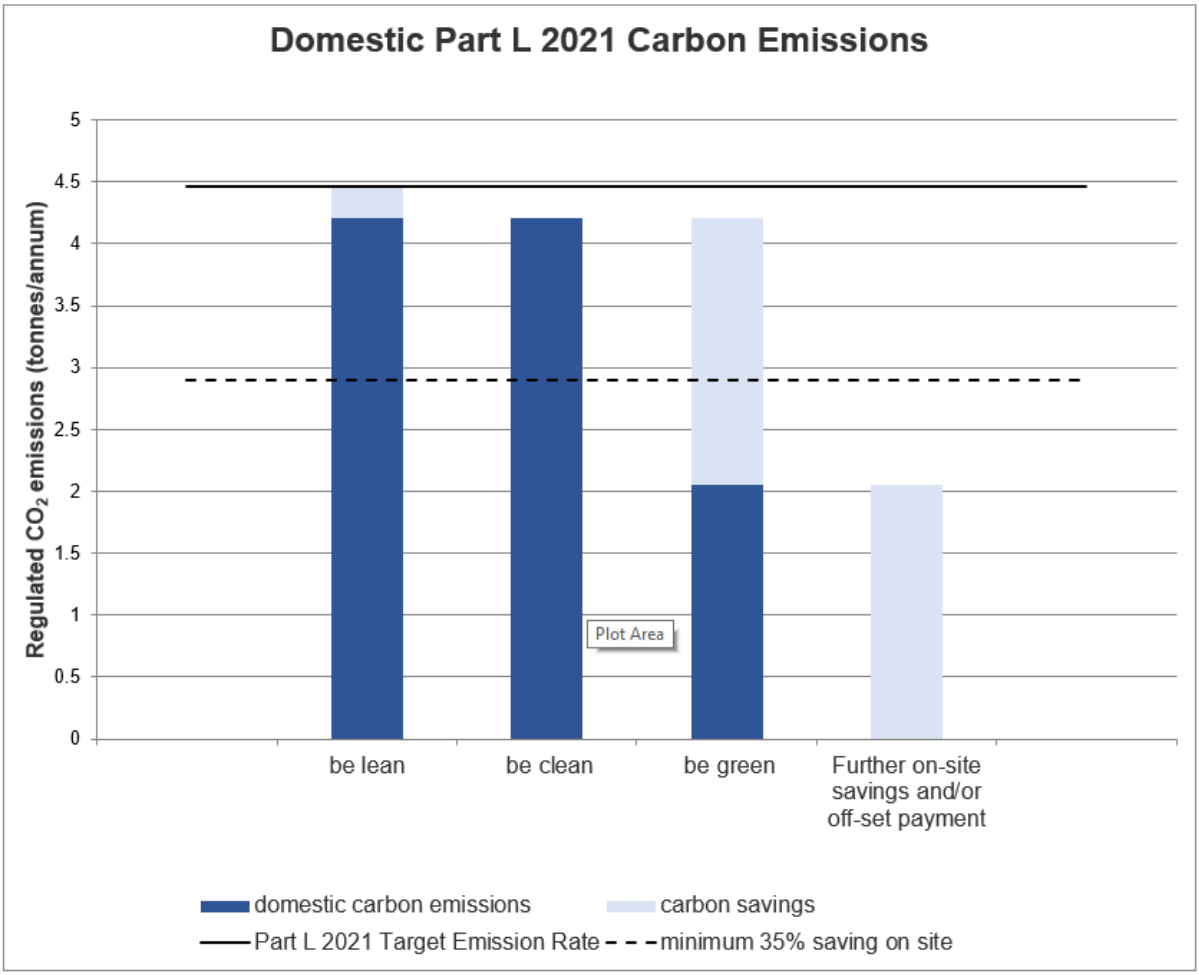

Figure 3: Summary of domestic emissions

2. INTRODUCTION

2.1. E & S Bristol have prepared this energy statement on behalf of Carnell Warren Associates in support of a planning application at 7 Reddington Gardens. The application consists of the demolition of an existing dwelling, and replacement with a 5 bedroom, 2 story dwelling with rooms in the roof.

2.2. The following statement outlines how the proposed development complies with the National Planning Policy Framework with regards to achieving a sustainable development. The objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own need.

2.3. This statement sets out the approach to satisfying the environmental objectives of planning policy. This will be achieved by contributing to protecting and enhancing our natural, built, and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change.

2.4. The following documents have been used and referred to in this statement in order to deliver compliance with National, Regional and Local Policy;

- The National Planning Policy Framework (2021)
- The London Plan (2021)
- The Greater London Authorities (GLA) Energy Assessment Guidance Cover Note (June 2022)
- The Greater London Authorities (GLA) Carbon Emissions Reporting Spreadsheet
- Camden Local Plan (2017)
- Camden Panning Guidance: Energy Efficiency and Adaptation (January 2021)
- Approved Document L Conservation of Fuel and Power, Volume 1: Dwellings (2021)

2.5. Consideration has been given to the current and future intentions of the building regulations and planning policy for sustainable development.

3. POLICY REVIEW

London Plan Chapter 9 Sustainable Infrastructure

3.1. This report has been designed to show compliance with the relevant policies of Sustainable Infrastructure contained within Chapter 9 of the London Plan 2021. This report has been produced following the London Plan Energy Assessment Guidance June 2022.

3.2. The core policy which this document relates to is Policy SI 2 Minimising greenhouse gas emissions which is detailed below;

A *Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:*

1) be lean: use less energy and manage demand during operation

2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly

3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site

4) be seen: monitor, verify and report on energy performance.

B *Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.*

C *A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures*. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:*

1) through a cash in lieu contribution to the borough's carbon offset fund, or

2) off-site provided that an alternative proposal is identified and delivery is certain.

D *Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.*

E *Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.*

F *Development proposals referable to the Mayor should calculate whole lifecycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.*

Camden Local Plan Policy CC1 Climate Change Mitigation

3.3. Camden Local Plan Policy CC1 is outlined below;

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

We will:

a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;

b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;

c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;

d. support and encourage sensitive energy efficiency improvements to existing buildings;

e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and

f. expect all developments to optimise resource efficiency.

For decentralised energy networks, we will promote decentralised energy by:

g. working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them;

h. protecting existing decentralised energy networks (e.g. at Gower Street, Bloomsbury, King's Cross, Gospel Oak and Somers Town) and safeguarding potential network routes; and

i. requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.

Camden Planning Guidance: Energy Efficiency and Adaptation

3.4. The requirements as outlined in the Camden Planning guidance are detailed below;

Energy reduction

KEY MESSAGES

- *All development in Camden is expected to reduce carbon dioxide emissions through the application of the energy hierarchy.*
- *All new build major development to demonstrate compliance with London Plan targets for carbon dioxide emissions.*
- *Deep refurbishments (i.e. refurbishments assessed under Building Regulations Part L1A/L2A) should also meet the London Plan carbon reduction targets for new buildings.*
- *All new build residential development (of 1 – 9 dwellings) must meet 19% carbon dioxide reduction; and*
- *Developments of five or more dwellings and/or more than 500sqm of any gross internal floorspace to achieve 20% reduction in carbon dioxide emissions from on-site renewable energy generation*

Table 1a: Energy statement information, residential

Development should comply with these standards/provide this information	***Residential New Build (assessed under L1A)***		
	Major (10+ units or >1,000 sqm new floor space)	*Medium (5-9 units, >500sq.m and <1,000 sqm new floor space)*	*Minor All new dwellings (up to 4 units and <500 sqm new floor space)*
Energy and carbon reduction targets			
Overall carbon reduction targets:	*Zero Carbon, minimum 35% reduction beyond Part L Building Regulations on site, with 10% reduction through on-site energy efficiency measures). (London Plan, Local Plan CC1)*	*19% below Part L of 2013 Building Regulations (Local Plan CC1)*	*19% below Part L of 2013 Building Regulations (Local Plan CC1)*
Reduction in CO_2 from onsite renewables (after all other energy efficiency measures have been incorporated)	*20% (London Plan, Local Plan CC1)*	*20% (London Plan, Local Plan CC1)*	*Incorporate renewables where feasible*

Table 2a Energy reduction targets, domestic

Key ***✓Development should comply with these standards/provide this information***	***Residential New Build (assessed under L1A)***		
	Major (10+ units or >1,000 sqm new floor space)	*Medium (5-9 units, >500sq.m and <1,000 sqm new floor space)*	*Minor All new dwellings (up to 4 units and <500 sqm new floor space)*
Energy and carbon reduction targets			
Energy Statement required (Local Plan CC1, London Plan 5.2, 5.3) follow GLA Guidance on Preparing Energy Assessments.	✓	✓	*Not required – however, performance against carbon reduction targets should be included in a Sustainability Statement following the methodology below*
Reduction in CO_2 from onsite renewables (after all other energy efficiency measures have been incorporated)	*Calculated through the Part L 2013 of the Building Regulations methodology Standard Assessment Procedure (SAP) 2012 Non regulated emissions (i.e. cooking, appliances) should also be included in the report but included in the overall carbon reduction figures. The total non-regulated emissions can be established by using BREDEM (BRE Domestic Energy Model) or similar methodology*		
Baseline calculation	*Notional Building Target Emissions Rate (TER) set by Building Regulations.*		

Policy Summary

3.5. The Camden Energy Efficiency and adaptation planning guidance document has been consulted; Table 1A suggests the development is medium and is required to meet a 19% improvement over the

Part L 2013 regulations. Furthermore it should achieve a 20% reduction in emissions through renewable technologies.

3.6. Table 2a identifies that an energy statement should be provided following GLA Guidance on Preparing Energy Assessments. As the London plan, GLA Guidance and building regulations have all been updated since the production of the Camden Planning Policy Guidance, these shall be followed, which results in a building going beyond the Camden CC1 targets.

3.7. Compliance with the London Plan Energy Assessment Guidance requires a minimum onsite improvement of 35% improvement over Part L 2021, this far exceeds the minimum targets set at Camden Borough level.

4. THE ENERGY HIERARCHY

4.1. As required by Policy CC2 of the Local Plan and Policy SI2 of the London Plan the development has been designed in line with the principles of the energy hierarchy. The energy assessment will first establish the regulated CO_2 emissions assuming the development complied with Part L 2021 of the Building Regulations. Subsequently the regulated emissions and energy demand will be calculated at the Be Lean, Be Clean, Be Green stages of the Energy Hierarchy following the outcome of investigation at these stages.

4.2. At the Be Lean stage sustainable design principles will be implemented to go beyond the Part L Building Regulations. This aims to encourage developers to design in a way that reduces the energy demand of the development. Achieving compliance with Part L at the Be Lean stages requires an uplift in fabric standards, including glazing specifications, lower air permeability targets and improved building services efficiencies.

4.3. At the Be Clean stage the feasibility of decentralised energy supply will be examined. Developers must consider the provision of heat and energy – either by connecting into an existing district heating network where possible or providing an on-site communal heat network, with central plant such as gas fired CHP.

4.4. Finally, at the Be Green stage a feasibility study for renewable technologies will be undertaken. This will seek to maximise opportunities for renewable energy by producing and using renewable energy on site. Depending upon the results of the technical feasibility and the performance of the development following the Be Clean stage, renewable technologies will be considered for implementation.

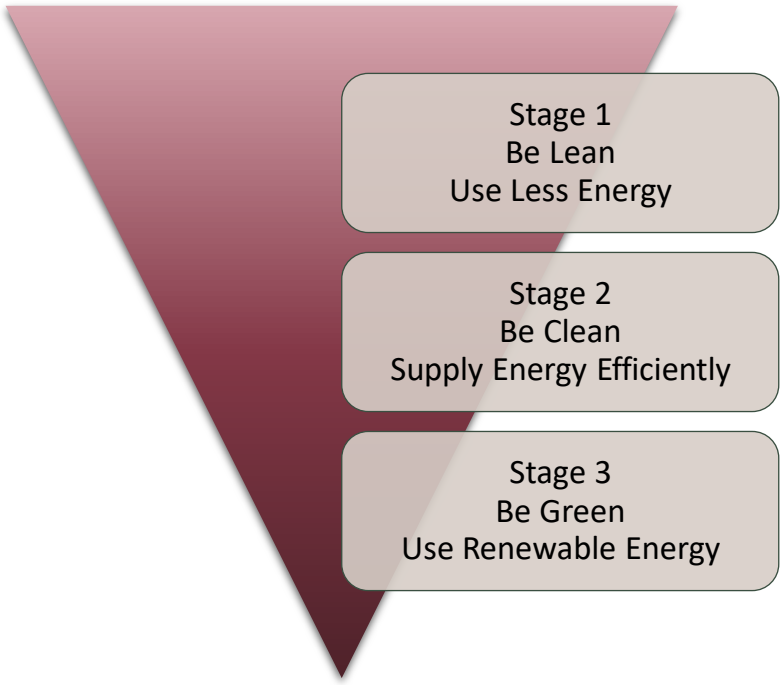

Figure 4: The Energy Hierarchy

5. BASELINE

5.1. This energy assessment will first establish the sites baseline energy demand and subsequent CO_2 emissions.

5.2. SAP calculations will be carried out on the dwelling, The TER will be used as the baseline energy demand and CO_2 Emissions.

5.3. The Target CO_2 emission rate (TER) sets a minimum allowable standard for the energy performance of a building to comply with Part L of the Building Regulations and is defined by the annual CO_2 emissions of a notional building of same type, size and shape to the proposed building. TER is expressed in annual kg of CO_2 per m^2.

5.4. The Target summary for the domestic CO_2 emissions and energy demand is shown in Tables 1 and 2 below.

Total Floor Area (m^2)	Target Emission Rate (TER) $kgCO_2/m^2/Year$	Total Emissions $kgCO_2/Year$
512.86	8.69	4,456.75

Table 1: Summary of domestic emissions (regulated) Building Regulations Target assessment

Space Heating (kWh/Year)	Hot Water (kWh/Year)	Lighting (kWh/Year)	Auxiliary (kWh/Year)	Notional PV Generation (kWh/Year)	Total (kWh/Year)
24,113.47	3,471.11	519.40	86.00	-11,022.33	17,167.65

Table 2: Summary of domestic energy demand

5.1. The baseline emissions are predicted to be 4,456.75 $kgCO_2$ per year.

5.2. The dwellings baseline energy demand is predicted to be 17,167.65 kWh/year.

6. BE LEAN (USE LESS ENERGY)

6.1. From the outset a high standard of sustainable design and construction has been incorporated into the design of the proposal. To reduce CO_2 emissions high levels and high-performance insulation will be specified. At this early design stage some target U values will be used with the final specification to be confirmed at a later date. Through increased thickness and an improved thermal conductivity of the insulation the U-Values for the thermal elements will meet exceed Building Regulations Part L standards. These high levels of insulation will help to contain heat within the dwelling therefore reducing demand on the heating and associated CO_2 emissions.

6.2. During construction, efforts will be taken to overlap all insulation and effectually seal joints where air leakage and thermal bridging could occur. At this stage a mix of the Keystone Lintel, Kingspan K106, ACD and the Scotland ACD Calculated psi values have been implemented alongside some target PSI values. Bespoke PSI value calculations will be completed, upon construction details becoming finalised.

6.3. The glazing to facade area ratio for the residential scheme has been calculated to be 35% (155m^2 Glazing to 423m^2 of façade). The orientation of the proposed building has been dictated by the existing street scene. With the front of the building facing South East, the majority of glazing occurs on the rear elevation which faces North West.

6.4. The ventilation strategy consists of decentralised mechanical extract fans (dMEV). Mechanical extract fans are installed in the kitchen and wet rooms with fresh air supplied via background ventilation in the habitable spaces. The low specific fan power of the unit means specified means that fans require low energy to run effectively.

6.5. In addition to the extract fans, passive measures will be implemented to assist with cooling in the summer months, these include openable windows, external and internal shading. Active cooling has been included at the Be Lean stage (Accounting for 0.43% of the total energy demand). Although at the Be Green stage, this cooling will be supplied from the reversible air source heat pumps at a high efficiency.

6.6. A separate in-depth overheating assessment has been untaken in line with Part O and CIBSE TM59 and the cooling hierarchy, this has demonstrated the building meets the requirements without cooling.

6.7. The lighting used will be low energy through defined as having an efficiency greater than 75 Lumens/circuit Watt. The large area of windows to the living rooms and bedrooms will also improve levels of natural daylighting reducing electrical demand from light fittings.

6.8. Due to the early stage of this assessment, the detailed design has not been finalised. Target U-Values have been used for the thermal elements and will be achieved on site upon completion.

6.9. Table 3 below overleaf a summary of the energy efficient and carbon reducing design characteristics incorporated within the dwelling.

Thermal Element	Specification	U-Value
Ground Floor	75mm Screed, 120mm Kingspan K103 over Beam and Block	0.12 W/m²k
New External Walls	80mm KOOLTHERM K108 partial fill cavity wall insulation	0.17 W/m²k
New Bay External Walls	125mm Rockwool NyRock Cavity slab full fill cavity insulation with 50mm Rockwool RWA45 internal lining	0.17 W/m²k
Dormer Walls	100mm Kooltherm K112 between studs. 52.5mm Kooltherm K118 internal lining.	0.18 W/m²k
New External Walls	80mm KOOLTHERM K108 partial fill cavity wall insulation	0.17 W/m²k
New Bay External Walls	125mm Rockwool NyRock Cavity slab full fill cavity insulation with 50mm Rockwool RWA45 internal lining	0.17 W/m²k
Pitched Roofs	80mm Kingspan K107 over Rafters, 90mm Kingspan K107 between Rafters	0.12 W/m²k
Main Flat Roof	160mm Bauder FA-TE PIR insula(on	0.13 W/m²k
Dormer Roofs	100mm Thermaroof TR6 over 18mm Deck, 80mm Thermapitch TP10 Between joists	0.12 W/m²k
Terrace Roofs	160mm Bauder FA-TE PIR insulation	0.14 W/m²k
Main Roof – Gutter Edges	160mm Bauder FA-TE PIR insulation	0.14 W/m²k
Sash Windows	Lomax and Wood - Double glazed Argon filled LowE coated glass (G-Value 0.40)	1.10 W/m²k
Glazed Doors	Double glazed Argon filled LowE coated glass (G-Value 0.40)	1.20 W/m²k
Bi Fold Doors	Double glazed Argon filled LowE coated glass (G-Value 0.40)	1.40 W/m²k
Solid Doors	Insulated composite doors	1.20 W/m²k
Roof Lights	Double Glazed (G-Value 0.40)	1.30 W/m²k
Controlled Service	**Details**	
Air Permeability	Target air pressure test score of 3.0 m^3/hm^2	
Thermal Bridging	Keystone Hi-Therm Independent lintels, Mix of Kingspan K106, Scotland ACDs and Default PSI Values (To be calculated upon construction)	
Thermal Mass	Calculated	
Ventilation	Natural Ventilation - dMEV fans in wet rooms – Nu-Aire MEV ECO	
Heating System*	Mains gas regular boiler. Efficiency, SEDBUK(2009) = 89.5% For mains gas boiler, this translates into; Winter efficiency = 88.8% Summer efficiency = 80.3%	
Heating Controls	Time and Temperature Zone Controls	
Hot Water	400L storage with cylinder loss factor no greater than 2.5 kWh/day. Cylinder in heated space with thermostat, fully insulated pipework & on separate timer to heating. Includes single back up immersion heater	
Showers	Mixer showers supplied from unvented cylinder with flow rate of 9L/min	
Lighting	100% Low Energy LED lighting throughout Minimum 75 Lm/cW, Maximum 5W per bulb	

Table 3: Be Lean Specification

*Gas Boiler has been used at this stage as per the London Plan Energy Assessment Guidance. Efficiency is Based on Appendix R: Reference values contained within SAP 10.2

6.10. Incorporating the energy efficient design features results in the emissions and energy demand outlined in Table 3, the resulting CO_2 emissions and energy demand are shown in Tables 4 & 5.

6.11. The proposed emissions are based on the GLA spreadsheet, where the DER is adjusted, removing the energy generated by the PV.

Total Floor Area (m^2)	Target Emission Rate $kgCO_2/m^2$/Year	Target Emissions $kgCO_2$/Year	Dwelling Emission Rate (DER)	Proposed CO_2 Emissions $kgCO_2$/Year
512.86	8.69	**4,457**	8.20	**4,203**

Table 4: Summary of regulated emissions at the Be Lean Stage

Space Heating (kWh/Year)	Hot Water (kWh/Year)	Lighting (kWh/Year)	Auxiliary (kWh/Year)	Cooling (kWh/Year)	Total (kWh/Year)
25,365.3	43,12.1	637.2	908.4	59.5	**31,282**

Table 5: Summary of dwelling energy demand at the Be Lean Stage

6.12. The total dwelling emissions are summarised below:

Target CO_2 emissions (TER x Floor Area) 4,457 $KgCO_2$/Year

Be Lean CO_2 emissions (DER x Floor area) 4,203 $KgCO_2$/Year

6.13. The dwelling Be Lean emissions improve upon the Target Emission Rate by 6%. This has been achieved through energy efficient design and specification of high efficiency services.

6.14. The dwelling Be Lean energy demand is predicted to be 31,282 kWh/year.

6.15. Table 6 below outlines the average dwellings fabric energy efficiency (DFEE) against the target fabric energy efficiency (TFEE). This shows a 3.0% improvement showcasing that the designed dwelling has a highly efficient building fabric.

Target Fabric Energy Efficiency	Dwelling Fabric Energy Efficiency	Percentage Improvement
48.36	46.90	3.02%

Table 6: Summary of fabric efficiency at the Be Lean Stage

7. BE CLEAN STAGE (USE ENERGY EFFICIENTLY)

District Heating

7.1. Policy SI 3 of the London Plan encourage developments to move to decentralised generation of heat and power seeking to reduce the losses and inefficiencies of reliance upon a centralised system. The mayor has set a target of 25% to be generated through localised decentralised energy systems by 2025.

7.2. The London heat map has been consulted to establish if there are any existing or proposed heating networks in the vicinity of the development. With the results shown in Figure 6 below.

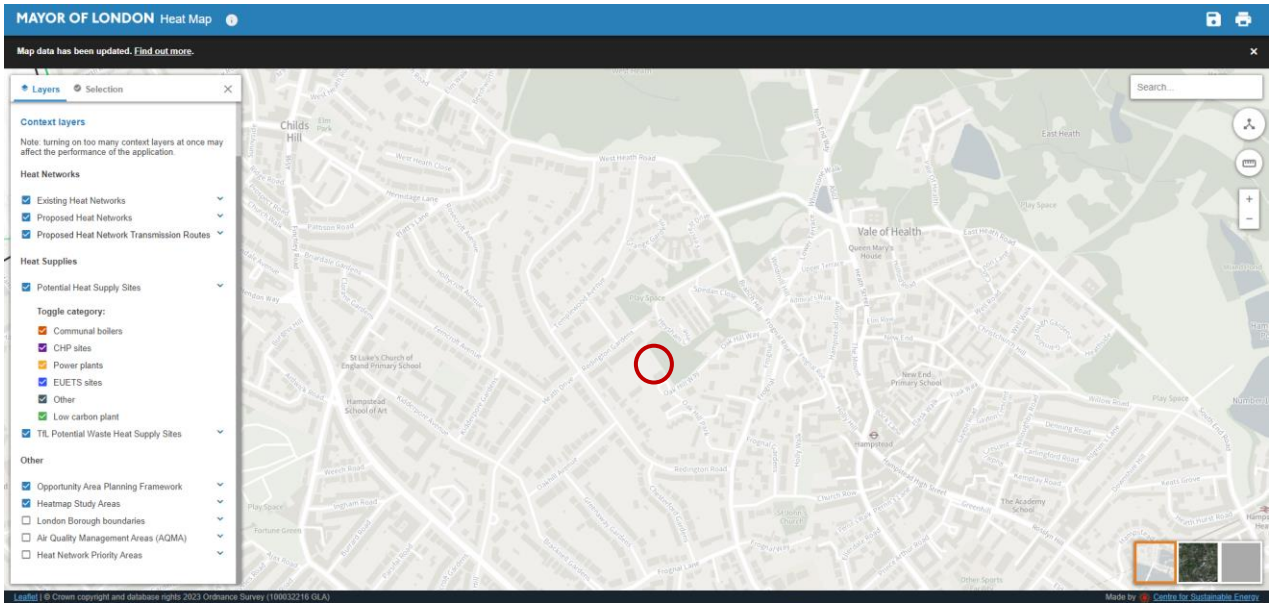

Figure 5: London Heat Map

7.3. After consulting the London heat map its evident that the proposal falls under scenario 2 In the GLA energy statement guidance. This is development in areas where an area wide heat network is not proposed, however is within a heat network priority area. The development is approximately 0.5km from a proposed network.

7.4. There are exceptions within scenario 2 that state it is not always appropriate to connect individual dwelling to heat networks due to heat losses which occur during supply.

Combined Heat and Power

7.5. Following the release of the new Carbon Emission Factors for SAP 10, in the new energy Statement guidance in June 2022, The Greater London Authority have made it clear there is a required shift away from gas fired CHP in favour of other low zero carbon technologies.

7.6. As the electricity grid decarbonises from increased local renewable energy generation the carbon savings achieved from gas-engine CHP will decrease which for future proofing provides opportunity for other low carbon technologies.

7.7. For small-medium residential developments it is generally not economic to install CHP, as the installed plant tends to have lower electrical efficiencies and therefore higher carbon emissions. In addition, due to the small landlord electricity demand, CHP installed to meet the base heat load would require the export of electricity to the grid.

7.8. There are also growing concerns about the air quality impacts of gas-engine CHP at this scale. The development falls within an air quality management area (AQMA). The installation of a gas fired CHP could exacerbate the problem.

7.9. Considering all the above CHP will not be proposed for this development.

8. BE GREEN (USING RENEWABLE ENERGY)

8.1. The following sections discuss the renewable energy generation measures that have been considered, and those which will be implemented at the development. Renewable technologies harness energy from the environment and convert this to a useful form. Many renewable technologies are available. However, not all of these are commercially viable and suitable for all proposals.

8.2. Technologies considered for the development include:

- Photovoltaics
- Solar Thermal
- Wind turbines
- Heat Pumps (ground-source / air-source)
- Biomass boilers

Photovoltaics
The development has an area of flat roof which could accommodate a solar PV system. The panels can be located either horizontally or at a low inclination. The panels would supply electricity to the dwelling with any excess being exported to the grid. As PV systems have no moving parts, generate no noise or pollution, this is an attractive option. If designed and properly installed, they require minimal maintenance and have long service lifetimes.
Recommended Technology: Yes

Solar Thermal
Solar thermal systems would not be a feasible technology for use in the development, although there is a flat roof area space is limited. Solar thermal provides limited emissions savings as they can only cover a proportion of the hot water load. For higher emissions savings they would need to be linked with other low carbon or renewable systems to meet the emission reduction targets.
Recommended Technology: No

Wind turbines
For a wind turbine to be feasible the average wind speed needs to be at least 6m/s. According to Rensmart[1] Postcode NW3 7RU has a windspeed of 5.3 m/s at 10m above ground level, 6.0 m/s at 25m above ground level and 6.5 m/s at 45m above ground level. Based on this data, the wind turbine would need a hub height in excess of 25m above ground. A turbine of this size will require a substantial amount of consultation and planning as it will have a significant visual impact on the local environment. The costs associated with a 25m turbine would be disproportionate to the cost of the development. The risk of noise, light flicker to adjacent areas and threat to wildlife alongside cost, contribute to turbines not being feasible. [1] https://www.rensmart.com/Maps
Recommended Technology: No

Air Source Heat Pump
An ASHP would be suitable for the proposal as there is external space required for the outdoor units, and a separate plant room within the basement for any indoor units. The heat pump could also supply the hot water demand throughout the dwelling and depending on the model specified could also supply cooling to the dwelling. This type of low temperature heat also lends itself to the proposed underfloor heating and high levels of insulation specified. ASHP has become more viable as higher coefficients of performance are achievable throughout the year. As the dwelling is well insulated, the ASHP can operate with a low temperature underfloor heating system to maximise efficiency. Furthermore, with the decarbonisation of the grid the emissions associated with ASHPS is continually decreasing. The heat pump would also supply the hot water to the dwelling.
Recommended Technology: Yes

Ground Source Heat Pump
The building is situated in a suburban, primarily residential area and there is inadequate space available to locate horizontal ground loop systems to serve the site. Vertical ground loops can be combined with foundation piling; however, this technique is not being used here. A borehole will typically need to reach depths of 100m for sufficient performance. For a heating system this would require very deep bore pipework, which will incur excessive infrastructure and excavation costs.
Recommended Technology: No

Biomass
Biomass boilers could be considered as an alternative to mains gas, but biomass heating has a number of significant disadvantages. The combustion in small scale biomass boilers and associated fuel transport are likely to have significant adverse impacts on air quality in an area which is exposed to elevated NOx and particulate emissions and already exceeds the current legislative targets. The need for a solid fuel store also increases the space requirements, further basement excavation would be required at a significant carbon and financial cost. Biomass pellets are also expensive compared to other fuels.
Recommended Technology: No

8.3. Based on the above, there are two solutions which have emerged as technically feasible to assist with the development achieving compliance with the Local and London Plan. These are through the installation of either solar PV panels and or air source heat pumps.

8.4. Following consultation with the applicant and M&E design team, it is proposed air source heat pumps are installed to provide heating and hot water to the dwelling.

8.5. Proposing air source heat pumps is in line with the recently implemented Building Regulations, National and Local policy and the Future Homes Standard, whereby the grid is becoming decarbonised, and the emissions associated with electricity are considerably reduced. The Future Homes Standard underpins the policies that complement the Building Regulations.

8.6. Calculations will be carried out incorporating air source heat pumps as the primary heat and hot water source for the development.

8.7. An update to the Be Lean Building services from Table 5, following the renewable feasibility study is included below. The full building specification is contained in the appendices.

Controlled Service	Details
Heating System	Mitsubishi Ecodan Air Source Heat Pump CAHV-R450YA-HPB MCS Certified Linked to underfloor heating & radiators
Heating Controls	Time and temperature zone controls through suitable arrangement of plumbing
Cooling	Supplied from ASHP (A++ rated) to bedrooms and living spaces.
Hot Water (from ASHP)	400L cylinder heated from boiler. Standing losses maximum 2.50 kWh/day. Cylinder in heated space with thermostats, fully insulated pipework & on separate timer to heating

Table 7: Revised building services following renewable feasibility study

8.8. The resultant CO_2 emissions and energy demand after the incorporation of the air source heat pump are shown in Tables 8 & 9.

Total Floor Area (m^2)	Target Emission Rate $kgCO_2/m^2/Year$	Target Emissions $kgCO_2/Year$	Dwelling Emission Rate $kgCO_2/m^2/Year$	Proposed CO_2 Emissions $kgCO_2/Year$
512.86	8.69	4,457	4.00	2,051

Table 8: Summary of regulated dwelling emissions at the Be Green Stage

Space Heating kWh/Year	Hot Water kWh/Year	Lighting kWh/Year	Auxiliary kWh/Year	Cooling kWh/Year	Total kWh/Year
10,217	1,816	637	822	59	13,552

Table 9: Summary of dwelling energy demand at the Be Green Stage

8.9. The total emissions are summarised below:

Target CO_2 emissions (TER x Floor Area) 4,457 $KgCO_2/Year$

Be Green CO_2 emissions (DER x Floor area) 2,051 $KgCO_2/Year$

8.10. The Be Green emissions improve upon the Be Lean stage by 48%. This has been achieved through the inclusion of the air source heat pump. This reduction in CO_2 emissions has been achieved directly through the use of renewable technologies.

8.11. When compared with the Target Emission Rate the dwelling has improved upon CO_2 emissions by a margin of 54%. This is adequate to satisfy policy SI 2 of the London Plan as a reduction in CO_2 emissions of greater than 35% has been achieved.

8.12. The site wide Be Green energy demand is predicted to be 13,552 kWh/year.

9. SUSTAINABLE DESIGN

Water Conservation

9.1. Policy SI 5 Water Infrastructure requires new residential developments to meet the higher water efficiency standards within the 2013 Building Regulations Part G2 water consumption target of 110 litres per person per day (including o five litres for external water consumption).

9.2. In order to minimise internal potable water consumption, consideration will be given to the flow rates of the fixtures and fittings. Water fittings will be specified to give a balance between low water consumption, performance, aesthetics and cost.

9.3. A full set of Part G water use calculations will be provided as part of the building regulations submission demonstrating that the internal water consumption meets the targets of 110 litres per person per day. A summary below is included below with target fixtures and flow rates.

Installation Type	Unit of Measure	Capacity / Flow Rate
WC's Full Flush	Average flushing volume (Litres)	4
WC's Part Flush	Average flushing volume (Litres)	2.6
Bathroom Taps	Flow Rate (Litres/minute)	5
Kitchen Taps	Flow Rate (Litres/minute)	7
Bath	Capacity to overflow (Litres)	160
Shower	Flow Rate (Litres/minute)	9
Washing Machine*	Litres / kg dry load	8.17
Dishwasher*	Litres / place setting	1.25

Table 10: Target capacity/flow rates to meet 110 litres per person per day

*Default Value – Not specified

Waste and Recycling

9.4. The successful site contractors will be encouraged to operate an environmental management policy and incorporate a Site Waste Management Plan (SWMP) detailing the strategy of avoiding the use of landfill and recycling by sorting waste streams.

9.5. Whilst on site contractors will be encouraged to manage recycling and waste efficiently. The principles of the waste hierarchy will be followed, by that, emphasis is placed on re-use followed by recycling and composting before energy recovery and disposal is considered. The aim is to reduce the waste arising from the start and encouraging waste to be diverted from landfill.

9.6. Waste minimisation targets should be set out and details of waste minimisation actions undertaken, with procedures followed for estimation, monitoring and measuring of any site waste arising.

Using recycled and recyclable materials and sourcing them responsibly

9.7. The contractor will be encouraged to operate an environmental materials policy for sourcing of construction products. Wherever possible all materials will be locally sourced, this will help minimise the environmental impact of transport to the site

9.8. For all materials used in the scheme, consideration will be given in respect of the Green Guide rating and responsible sourcing certification level they achieve. An effort shall be made to ensure all timber used in the project is locally sourced. All timber specified will be sourced in line with the UK governments timber procurement policy and be specified from sustainable sources such as FSC- or PEFC-certified whenever possible.

9.9. The contractor will be encouraged to operate an environmental materials policy for sourcing of construction products.

9.10. Where feasible any existing materials will be reused. All new materials on site will be considered for re-use and future recycling. The level of new aggregates used shall be minimised through use of recycled aggregates and waste minimisation.

Air Quality and Pollution

9.11. The presence of VOCs in paint is significant both in terms of environmental impact and to health. Volatile Organic Compounds, VOCs, are organic compounds that have high enough vapour pressures to enable them to vaporise into the atmosphere, solvents are of particular concern within buildings. To help create a healthy internal environment all internal finishes and fittings will be specified with low solvent and emissions of volatile organic compounds.

9.12. Good construction site practice will help to control and prevent pollution, all endeavours will be made to reduce any negative air quality impact of the construction activities. Those which can contribute to air pollution include: land clearing, operation of diesel engines, demolition, toxic materials and creation of dust (typically from concrete, cement, wood, stone).

9.13. A number of measures will be encouraged on site to minimise pollution, these will include. Controlling dust on site through fine water sprays used to dampen down the site. Regular inspections for spillages and avoiding washing into waterways or drainage areas.

9.14. Skips with construction waste should be covered when leaving the site. No burning of materials will be carried out on site. Noise pollution can be reduced through careful handling of materials; using modern equipment and generators.

Be Seen Energy Monitoring

9.15. Next generation digital Smart Meters shall be used to provide accurate information to the users to identify patterns and trends of use and seasonal fluctuations, this will aid the user to make adjustments in order to reduce energy use.

9.16. Smart Meters will enable the network operators and energy suppliers to be ready for future Smart Grid.

10. CONCLUSIONS

10.1. E & S Bristol has explored the options for reducing the energy demands and CO_2 emissions for the proposed development at 7 Reddington Gardens. This Energy Statement has identified a set of deliverable energy strategy solutions that when adopted would ensure the development complied with relevant national planning policy, the London Plan and the London Borough of Camden policies relating to energy and climate change.

10.2. Energy strategy options were assessed according to the Mayor's Energy Hierarchy and the resulting savings calculated against a Building Regulations target assessment following the GLA guidelines. The strategy set out meets CO_2 emission savings targets and other related policies applicable to the site and enable each step of the Mayor of London's energy hierarchy to be addressed. This statement has shown the proposal is fully compliant with the Camden Local Plan Policy CC1 and the London Plan Chapter 9 Policy SI 2.

10.3. The energy hierarchy has been followed, improving upon the Baseline requirements at the Be Lean stage through high levels of insulation and energy efficient services and fixings. It has been demonstrated that the site has achieved a 6% reduction in CO_2 emissions.

10.4. At the Be Clean stage district heating was not found to be favourable for this proposal as a single dwelling outside of the heat network priority area and due the lack of existing and proposed future networks.

10.5. For the third stage, Be Green, a feasibility study evaluating the suitability of various renewable technologies was undertaken. The decision was to proceed with air source heat pumps to provide heating and hot water to the dwelling. It is proposed to use a Mitsubishi Ecodan CAHV-R450YA-HPB ASHP.

10.6. Complying with policy SI 2 of the London Plan a site wide reduction in CO_2 emissions of 54% has been achieved against the Baseline Emission Rate. Of this figure there is a 48% improvement in emissions directly through the use of on-site renewable technologies in the form of the heat pump.

10.7. This sustainability statement concludes that the proposed development at 7 Reddington Gardens has met the requirements of Part L 2021 of the Building Regulations, the relevant parts of the London Plan and Policy CC1.

10.8. Further Details are shown in the summary tables and graph overleaf.

11. SUMMARY TABLES

Carbon dioxide emissions

	Carbon Dioxide Emissions for residential buildings (Tonnes CO_2 per annum)	
	Regulated	**Unregulated**
Baseline: Part L 2021 of the Building Regulations Compliant Development	4.5	1.0
After energy demand reduction (be lean)	4.2	1.0
After heat network connection (be clean)	4.2	1.0
After renewable energy (be green)	2.1	1.0

Figure 6: Summary of domestic emissions

Regulated carbon dioxide savings

	Regulated residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	**(%)**
Be lean: savings from energy demand reduction	0.3	6%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	2.2	48%
Cumulative on site savings	**2.4**	**54%**
Annual savings from off-set payment	2.1	-
(Tonnes CO_2)		
Cumulative savings for off-set payment	**62**	-
Cash in-lieu contribution (£)	**5,848**	-

Figure 7: Summary of domestic emissions savings

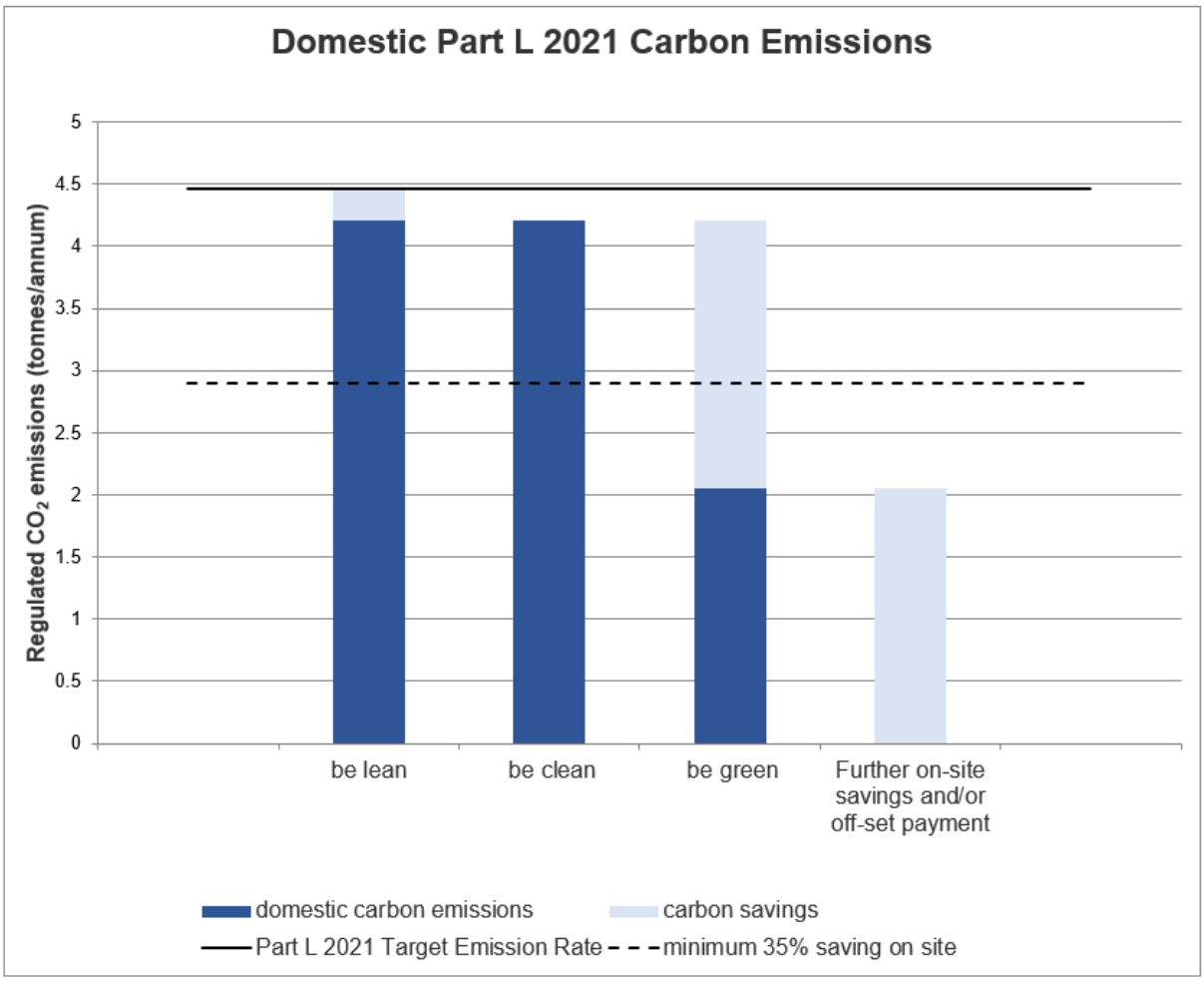

Figure 8: Summary of domestic emissions

APPENDIX A

Full Building Specification

Building Fabric		
Element	**Specification**	**U-Value**
Ground Floor	75mm Screed, 120mm Kingspan K103 over Beam and Block	0.12 W/m²k
New External Walls	80mm Kooltherm K108 partial fill cavity wall insulation	0.17 W/m²k
New Bay External Walls	125mm Rockwool NyRock Cavity slab full fill cavity insulation with 50mm Rockwool RWA45 internal lining	0.17 W/m²k
Dormer Walls	100mm Kooltherm K112 between studs. 52.5mm Kooltherm K118 internal lining.	0.18 W/m²k
Pitched Roofs	80mm Kingspan K107 over Rafters, 90mm Kingspan K107 between Rafters	0.12 W/m²k
Main Flat Roof	160mm Bauder FA-TE PIR insula(on	0.13 W/m²k
Dormer Roofs	100mm Thermaroof TR6 over 18mm Deck, 80mm Thermapitch TP10 Between joists	0.12 W/m²k
Terrace Roofs	160mm Bauder FA-TE PIR insulation	0.14 W/m²k
Main Roof – Gutter Edges	160mm Bauder FA-TE PIR insulation	0.14 W/m²k
Sash Windows	Lomax and Wood - Double glazed Argon filled LowE coated glass (G-Value 0.40)	1.10 W/m²k
Glazed Doors	Double glazed Argon filled LowE coated glass (G-Value 0.40)	1.20 W/m²k
Bi Fold Doors	Double glazed Argon filled LowE coated glass (G-Value 0.40)	1.40 W/m²k
Solid Doors	Insulated composite doors	1.20 W/m²k
Roof Lights	Double Glazed (G-Value 0.40)	1.30 W/m²k

Element	**Details**
Air Permeability	Target score of 3.00 m^3/hm^2 air test required
Thermal Bridging	Keystone Hi-Therm Independent lintels, Mix of Kingspan K106, Scotland ACDs and Default PSI Value

Building Services	
Element	**Specification**
Ventilation	Natural Ventilation dMEV fans in wet rooms – Nu-Aire MEV eco
Heating System	Mitsubishi Ecodan - CAHV-R450YA-HPB - MCS Certified Linked to underfloor heating
Heating Controls	Time and temperature zone controls through suitable arrangement of plumbing.
Secondary Heating	No secondary heating included within the calculations
Cooling	Cooling included, cooled area assumed at 300m2, energy class A+++
Hot Water	400L cylinder heated from boiler. Standing losses maximum 2.50 kWh/day. Cylinder in heated space with thermostats, fully insulated pipework & on separate timer to heating
Showers	Supplied from unvented cylinder, flow rate 9L/min
Lighting	Low Energy LED Lighting throughout. 5W Bulbs Minimum efficacy 75 Lm/cW,
Renewables	None

APPENDIX B

BREDEM Calculator

BREDEM Calculation		
BREDEM Method for Dwelling Unregulated Energy Consumption		
Dwelling Name/Number		Reddington
Treated Floor Area (m2)		513.00
No. Occupants		3.4
User input (if no. occupants known)		0
No. Occupants		3.4
Appliance Energy Consumption		
Initial annual appliance energy, E_A' (kWh/yr)		6242
Month	Days Of Month	Energy Consumption (kWh)
1	31	607
2	28	554
3	31	597
4	30	545
5	31	521
6	30	465
7	31	454
8	31	447
9	30	448
10	31	497
11	30	522
12	31	580
Annual Energy Consumption (kWh/yr)		6236
Cooking Energy Consumption		
Type of cooker		Large cooker (>4 hobs): electric / gas
Cooker Type		No
E_C1A		181
E_C1B		39
E_C2A		316
E_C2B		68
E_C1		314
E_C2		548
Range power consumption (W)		
Month	Days Of Month	E_C,m (kWh)
1	31	26.7
2	28	24.1
3	31	26.7
4	30	25.8
5	31	26.7
6	30	25.8
7	31	26.7
8	31	26.7
9	30	25.8
10	31	26.7
11	30	25.8
12	31	26.7
Annual Energy Consumption (kWh/yr)		**314**
Total Cooking Energy (kWh/yr)		**862**
Total Unregulated Energy Electricity		6550
Total Unregulated Energy Gas		548
Total Unregulated Energy Consumption (kWh)		**7,098**
Total Carbon Emissions Electricity		**891**
Total Carbon Emissions Gas		**115**
Total Carbon Emissions - SAP 10		**1,006**
Total Carbon Emissions Tonnes		**1.006**
Total Unregulated Energy Consumption (Site)		**1,006**
Total Unregulated Energy Consumption (Tonnes)		**1.006**