Energy & Sustainability Statement

42 High Street, Teddington, TW11 8ES

9TH of April 2024

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DOCUMENT REVISION HISTORY		**Ref:**	**Teddington**
Rev	**Author**	**Date**	**Comments/ Status**
-	Halla Huws	28/02/2024	Planning Submission V1
1	Halla Huws	18/03/2024	Addition of PV V2
2	Halla Huws	9/04/2024	Updating ASHP location

Executive Summary

- Pro Sustainability Ltd has undertaken this Energy Assessment in support of the planning application being submitted by Unico Development ('The Applicant') to the London Borough of Richmond upon Thames, in relation to the proposal at 42 High Street Teddington TW11 8ES ('The Site').
- The development proposal seeks permission for the erection of a new mix use development, consisting of commercial areas on the ground floor and basement level, and 8 residential units across the first, second and third floor.
- This report addresses the relevant planning policies with regards to the London Borough of Richmond, and London Plan, 2021. Moreover, it demonstrates compliance with Part L 2021 of the Building Regulations.
- Opportunities to connect the planned development to existing decentralised heat distribution networks have been investigated with reference to the London Heat Map. No networks exist or are proposed within 500m of the site. Due to that, it is unfeasible for the site to cater for a connection for decentralised future district heating network.
- Passive strategies have been implemented within the design to reduce the risk of overheating.
- Fabric improvements & energy efficiency measures in the 'be lean' stage, resulted in reducing the carbon emissions of the site by 45% compared to the Part L 2021 notional baseline. Employing an ASHP for heating and hot water along with 11kWp of PV panels reduce CO_2 emissions by a further 23% within the site. The development overall reduction is 68% saving 6.1 Tonnes of CO_2.

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Part L 2021 baseline	9.0		
Be lean	5.0	4.1	45%
Be clean	5.0	0.0	0%
Be green	2.9	2.1	23%
Total Savings	-	6.1	68%
	-	**CO_2 savings off-set (Tonnes CO_2)**	-
Off-set	-	**87.2**	-

Figure 1 Proposed Site Wide Carbon Reductions – GLA Reporting Spreadsheet

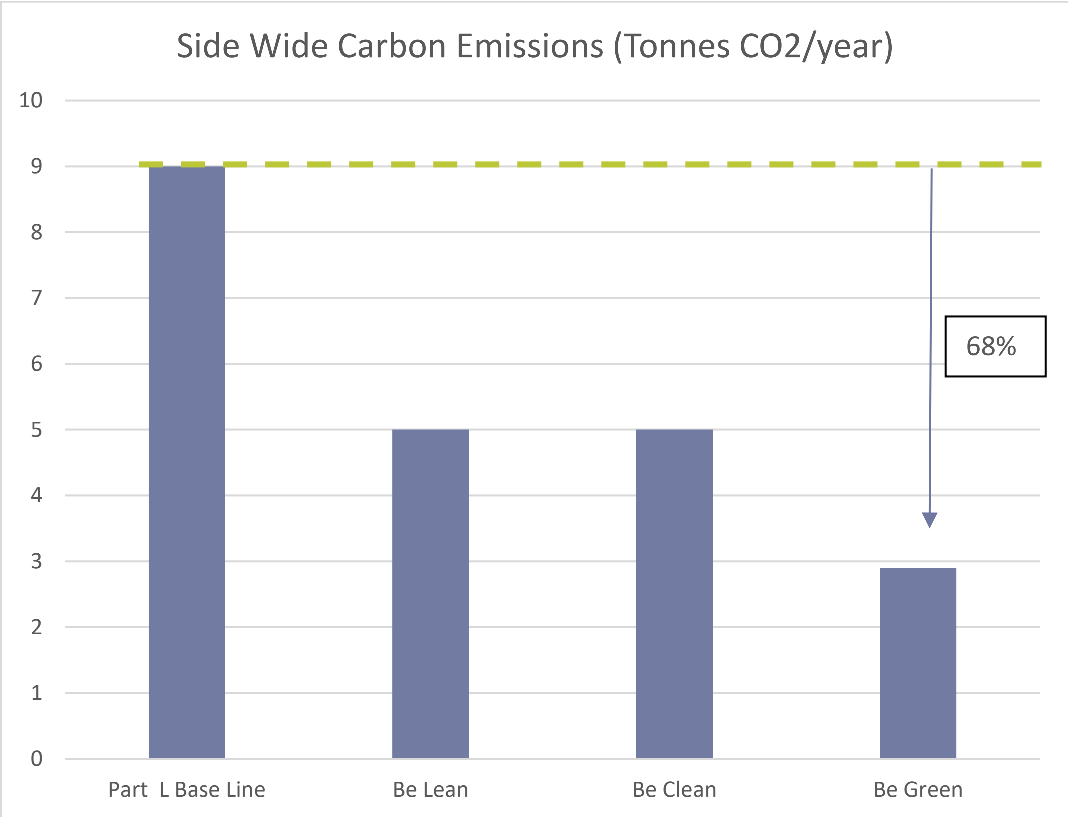

Figure 2 Proposed Site Regulated Carbon Reductions

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1. Introduction

This document has been prepared by Pro Sustainability Ltd on behalf of the applicant in support of a full planning application for the proposed new mix use development at 42 High Street, Teddington.

Figure 3 Site

Location- Google Maps

Figure 4: Proposed High Street Elevation (Chandler Browne Architects)

2. Policy Context

This Energy statement will address the following documents:

Part L of the Building Regulations

To pass Part L, the proposed building DER (Dwelling Emission Rate kgCO2/m2/year) must be equal or less than the TER (Target Emission Rate kgCO2/m2/year) which is the calculated emission rate based on the regulated energy usage of a notional building with the same geometric properties, orientation and façades, but with the notional standards for building fabrics, controlled fittings and controlled services, as set out in Approved Document Part L 2021.

It is important to highlight that Part L 2021 adopts a 30% uplift in CO2 emission standards compared with Part L 2013.

Local Plan- London Borough of Richmond upon Thames

adopted in July 2018.

Policy LP 20

Climate Change Adaption

A. The Council will promote and encourage development to be fully resilient to the future impacts of climate change in order to minimise vulnerability of people and property.

B. New development, in their layout, design, construction, materials, landscaping and operation, should minimise the effects of overheating as well as minimise energy consumption in accordance with the following cooling hierarchy:

1. minimise internal heat generation through energy efficient design

2. reduce the amount of heat entering a building in summer through shading, reducing solar reflectance, fenestration, insulation and green roofs and walls

3. manage the heat within the building through exposed internal thermal mass and high ceilings 4. passive ventilation

5. mechanical ventilation

6. active cooling systems (ensuring they are the lowest carbon options).

C. Opportunities to adapt existing buildings, places and spaces to the likely effects of climate change should be maximised and will be supported.

Policy LP 22

Sustainable Design and Construction

Policy LP 22 Sustainable Design and Construction A. Developments will be required to achieve the highest standards of sustainable design and construction to mitigate the likely effects of climate change. Applicants will be required to complete the following:

1. Development of 1 dwelling unit or more, or 100sqm or more of non-residential floor space (including extensions) will be required to complete the Sustainable Construction Checklist SPD. A completed Checklist has to be submitted as part of the planning application.

2. Development that results in a new residential dwelling, including conversions, change of use, and extensions that result in a new dwelling unit, will be required to incorporate water conservation

measures to achieve maximum water consumption of 110 litres per person per day for homes (including an allowance of 5 litres or less per person per day for external water consumption).

3. New non-residential buildings over 100sqm will be required to meet BREEAM ‘Excellent’ standard.

4. Proposals for change of use to residential will be required to meet BREEAM Domestic Refurbishment 'Excellent' standard (where feasible)

Reducing Carbon Dioxide Emissions

B. Developers are required to incorporate measures to improve energy conservation and efficiency as well as contributions to renewable and low carbon energy generation.

Proposed developments are required to meet the following minimum reductions in carbon dioxide emissions:

1. All new major residential developments (10 units or more) should achieve zero carbon standards in line with London Plan policy.

2. All other new residential buildings should achieve a 35% reduction.

3. All non-residential buildings over 100sqm should achieve a 35% reduction. From 2019 all major non-residential buildings should achieve zero carbon standards in line with London Plan policy.

Decentralised Energy Networks

D. The Council requires developments to contribute towards the Mayor of London target of 25% of heat and power to be generated through localised decentralised energy (DE) systems by 2025. All new development will be required to connect to existing DE networks where feasible. This also applies where a DE network is planned and expected to be operational within 5 years of the development being completed.

London Plan, Policy SI.2, Published March 2021

The main emphasis within all policies has been given to the Energy Hierarchy for reducing carbon dioxide emissions as shown in Figure 5.

The energy hierarchy should inform the design, construction and operation of new buildings. The priority is to minimise energy demand, and then address how energy will be supplied and renewable technologies incorporated. An important aspect of managing demand will be to reduce peak energy loadings.

To meet the zero-carbon target, an on-site reduction of at least 35 per cent beyond the baseline of Part L of the current Building Regulations is required. The minimum improvement over the Target Emission Rate (TER) will increase over a period of time in order to achieve the zero-carbon London ambition and reflect the costs of more efficient construction methods. This will be reflected in future updates to the London Plan.

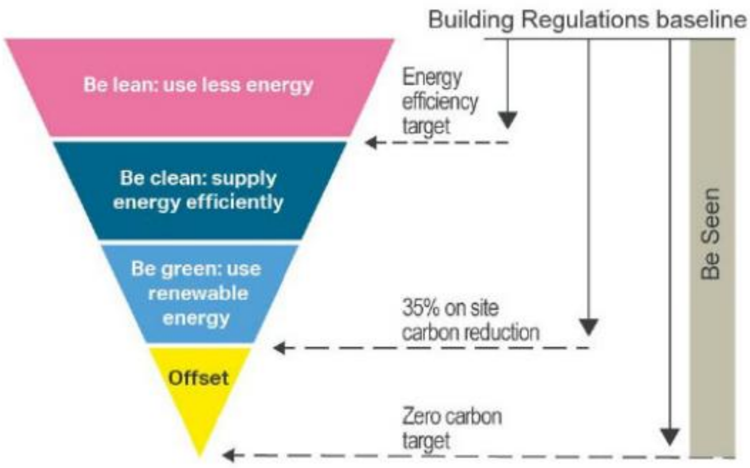

Figure 5 Energy Hierarchy

3. Energy Benchmarking

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

In accordance with London Plan guidance, it is prudent for this report to reflect the benchmark data derived from approved Standard Assessment Procedure (SAP) software, the Simplified Building Energy Model (SBEM), and the GLA carbon emissions reporting spreadsheet.

Part L Baseline Case

The overall aim is to improve the building fabric and energy efficiency, provide the highest standards within the build elements and building services, with a target to achieve the greatest possible reduction in carbon.

Therefore, in order to benchmark the proposed development, the estimated notional energy demand and resulting CO2 emissions data (known as the Target Emissions Rate [TER] have been calculated. The TER 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 (SAP 10.2) software, along with the IES-ve software have been used to produce figures representing the Carbon Dioxide Emissions after each stage of the Energy Hierarchy in order to see the savings procured from changes to the MEP strategies.

According to the London Plan guidance, the baseline for the development will be based on the Target Emission Rates (TER) within the baseline calculations. The results are outputs extracted through the use of the GLA carbon emissions reporting spreadsheet, submitted separately as part of this application. Results shown are the total of the domestic and non domestic figures, based onon the GLA spreadsheet.

The carbon factors for gas and electricity used are as per the SAP 10.2 & SBEM values in Table 1.

Table 1 Carbon Factors

Fuel Type	Fuel Carbon Factors (kgCO2/kWh)
	SAP 10.2
Natural Gas	0.210
Grid Electricity	0.136

Table 2 Baseline Predicted CO_2 Emissions for the Proposed Development (Domestic and Non-domestic)

	Baseline: Part L 2021	
	Regulated Emissions tCO_2/Yr	Unregulated Emissions tCO_2/Yr
Proposed Site	9	8.8

4. Be Lean: Energy Efficiency

In order to deliver an environmentally responsible building, an exemplar approach is being proposed based on low energy design principles. In summary, this approach involves energy demand minimisation through effective floor layout and zonal orientation, good envelope design and proficient use of services; such that the building itself is being used as the primary environmental modifier.

Long term energy benefits are best realised by reducing the inherent energy demand of the development in the first instance before introducing Low and Zero Carbon (LZC) technology solutions to decarbonise the energy supply.

Energy Efficient Building Design

Several efficiency measures have been incorporated into the proposed design, those are summarised as follows:

- High performance insulating materials
- Thermally efficient glazing
- Improved air tightness
- 100% low energy LED lighting
- Energy efficient Mechanical Ventilation with Heat Recovery
- Efficient and appropriate lighting controls
- Efficient space and water heating controls
- ‘Low Flow’ shower fittings

The new building elements are targeting new fabric requirements as per Part L 2021 enhanced U-values. The following table (Table 3) describes the proposed targeted building envelope thermal performance criteria.

MVHR has been proposed, 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 3: Building Fabric

Reference	Design Criteria
External Wall	0.18 W/m²K
Roof	0.11 W/m²K
Ground Floor	0.13 W/m²K
Glazing- Triple Glazed	1.2 W/m²K- g value 0.4
Air Permeability	4m³/h.m² @ 50Pa

Daylight:

A full detailed Sunlight & Daylight assessment has been carried out by Pro Sustainability confirming that all habitable areas achieve and exceed the required targets.

High levels of natural daylight will be provided, wherever possible, through effective window design. The glazing specification for the proposed development will be optimised to ensure that the glazed elements provide excellent thermal performance combined with optimum solar reflectance to minimise summer solar heat gains along with high daylight transmittance factors to maximise daylight factors. Encouraging the correct quality and quantity of daylight to penetrate the building is key to reducing the amount of light required from artificial sources and hence energy requirements.

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. The private residential entrance will have good quality, low energy wall lighting surface mounted to the soffits of the covered entrances. This in order to improve visibility and way-finding at night, as well as increase perception and experience of safety and security, whilst avoiding glare and light spill beyond the development.

Table 4 demonstrates the output of the SAPs and SBEMs, derived from the GLA reporting spreadsheet values at the BE LEAN stage for the proposed development.

Table 4 Regulated CO2 Savings from Be Lean

	Base Regulated Emissions tCO_2 /Yr	Be Lean Regulated Emissions tCO_2 /Yr	Regulated Emissions Savings
Proposed Site	9	5	**45%**

	Target Fabric Energy Efficiency (kWh/m²)	Dwelling Fabric Energy Efficiency (kWh/m²)	Improvement (%)
Development total	29.81	25.78	14%

Figure 6 GLA Sheet- Fabric Efficiency Improvement

5. Be Clean: Decentralised Energy

Opportunities to connect the proposed to existing decentralised heat distribution networks, including those featuring Combined Heat and Power (CHP) plant, have been investigated with reference to the London Heat Map.

There are no close existing heat networks within the site area, and the nearest future proposed network is 2252m away, therefore no proposal is made for a connection at this time (Figure 7).

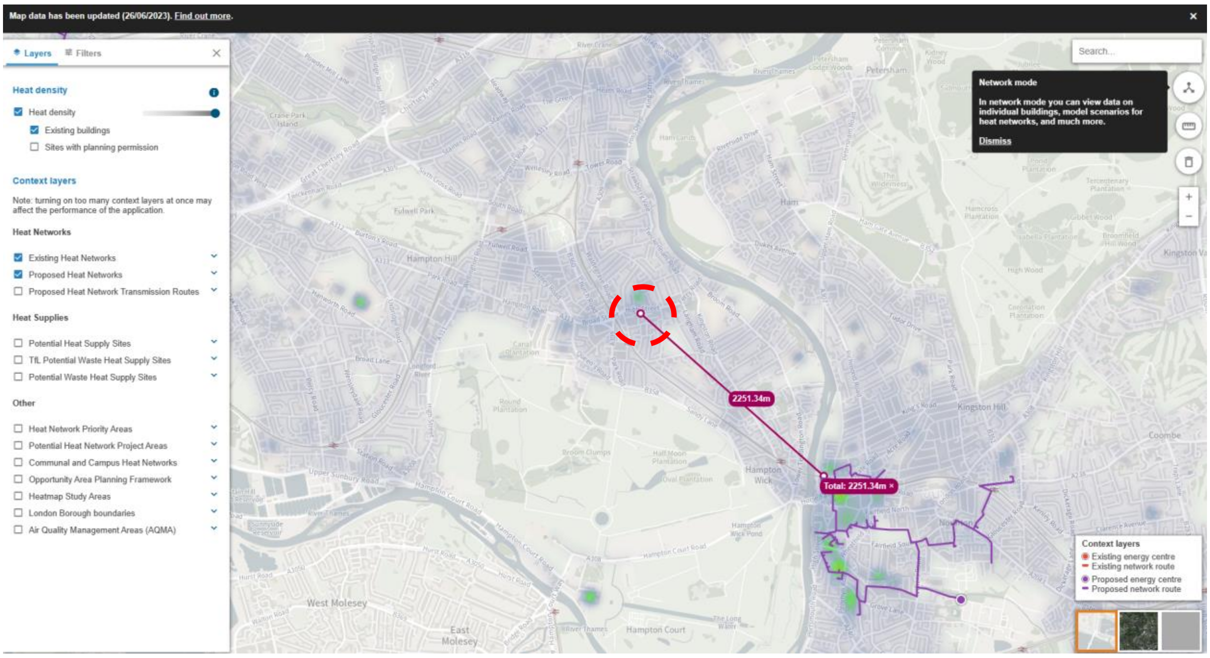

Figure 7 London Heat Map of the site showing Nearest Proposed Heat Networks

Table 5: Regulated CO2 Savings from Be Clean

	Be Lean Regulated Emissions tCO_2 /Yr	Be Clean Regulated Emissions tCO_2 /Yr	Regulated Emissions Savings
Proposed Dwelling	5	5	0

6. Be Green: Appraisal of Renewable and Low Carbon Technology

The technical feasibility and economic viability of installing LZC technologies at the proposed development has been assessed in order to discount any unsuitable options at an early stage and aid in deciding the most appropriate technology to proceed with on the proposed development. Details are shown in Appendix A.

The first chosen viable technology is an Air Source Heat Pump (ASHP), with 5 ASHPs, feeding to the 8 residential units, to be located along the side alley, protected & screened by grillage, the grilles and the enclosing walls will have acoustic treatment to deal with any noise issues. The commercial unit will benefit from a Mitsubishi VRF system to provide heating and cooling.

Employing an ASHP system achieves a large carbon reduction and more. ASHP's take full advantage of the new carbon emission factors as they are powered by electricity, this technology has assisted the energy performance of the building and is required to comply with the Planning Policy set out by the

London Plan. Not only would it provide an electric heat source, it will also supply the domestic hot water demand.

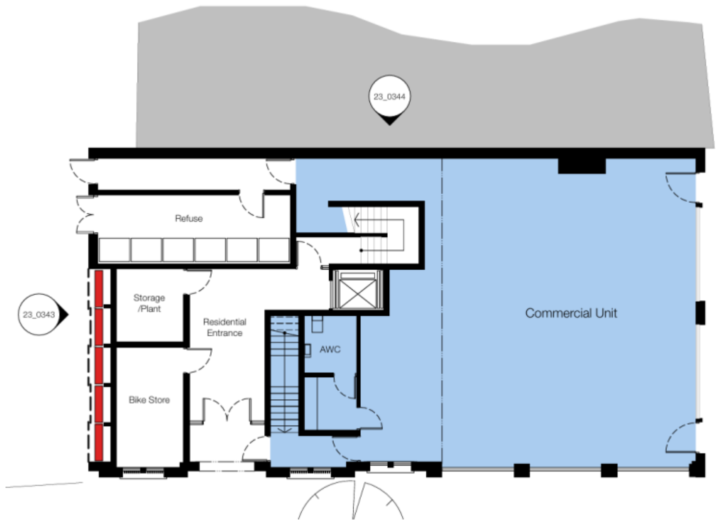

Figure 8: Proposed Ground Floor showing ASHP in Red (Chandler Browne Architects)

In addition to the ASHPs, Photovoltaic panels would be fitted on the roof top, supplying each residential flat with 1kWp, and the commercial units with 3kWp. The total of 11kWp of PV for the whole development would require around 30 PV panels, south-east facing with an inclination of 30 degrees. Estimated area required is 48m^2.

Table 6 demonstrates the output from the GLA reporting spreadsheet values at the BE GREEN stage for the whole development. The carbon reduction from applying the ASHPs and PV panels to the site is 23%, compared to the BE LEAN/ BE CLEAN stage.

Table 6 Regulated CO2 Savings from Be Green

	Be Clean Regulated Emissions tCO_2 /Yr	Be Green Regulated Emissions tCO_2 /Yr	Regulated Emissions Savings
Proposed Dwelling	5	3.6	23%

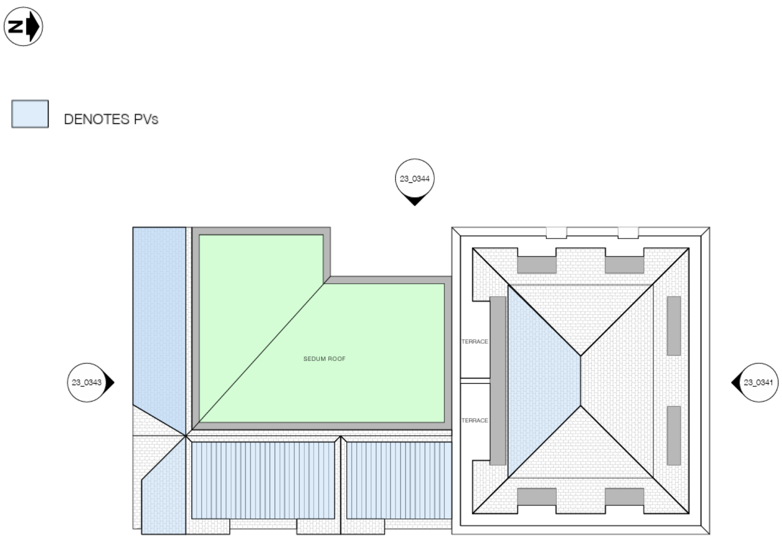

Figure 9: Proposed Roof Plan and PV Layout (Chandler Browne Architects)

7. Sustainability Standards

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

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

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:

- The client will prepare a Resource Management Plan (RMP) covering non-hazardous waste materials, from on-site construction.
- 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.
- Return packaging for reuse
- 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.

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.

Passive strategies to reduce the risk of overheat has been implemented within the design, such as high performance fabric with reduced conductivity, high spec windows with low g-value to reduce the solar gains, along with a medium thermal mass construction to modulate the summer temperatures. Additionally, a MVHR system is proposed which will assist during heat waves in providing additional air flow.

Detailed thermal modelling will be carried out at the design stage to insure that there is no risk of overheat and to meet Part O compliance requirements.

8. Summary and Conclusions

Pro Sustainability Ltd has undertaken this Energy & Sustainability Assessment in support of the planning application being submitted in relation to the proposal at 42 High Street Teddington.

This report addresses the relevant planning policies with regards to London Borough of Richmond and London Plan. Moreover, it demonstrates compliance with Part L 2021 of the Building Regulations. All calculations were carried out under Part L 2021.

Fabric improvements & energy efficiency measures with a MVHR system in the 'be lean' stage, resulted in reducing the carbon emissions by 45% compared to the notional baseline. Employing an ASHP for heating and hot water along with 11kWp of PV panels reduces CO2 emissions by 23%. Achieving an overall reduction of 68% saving 6.1 Tonnes of CO_2.

There are no close existing heat networks within the site area, therefore no proposal is made for a connection at this time.

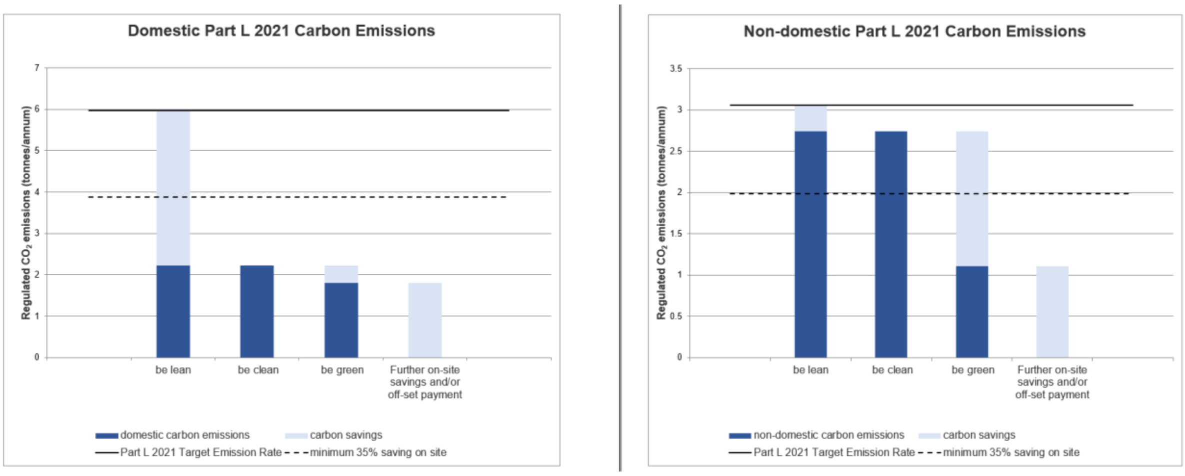

Figure 10 Carbon Dioxide Emissions after each stage of the Energy Hierarchy

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
- Sufficient area on roof

Limitations:

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

Feasibility for site: YES

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

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

- Flat roof area will be utilized for PV panels, as they would result in a greater reduction than Solar thermal.

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
- Income generated from Renewable Heat Incentive scheme (RHI)

Limitations:

- Specialist maintenance
- More beneficial when cooling is required

Feasibility for site: Yes

- Available space
- Carbon reduction achieved

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 center/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: Part L reports

Evidence submitted under separate cover

Appendix C: Development Information- GLA Spreadsheet

Evidence submitted under separate cover