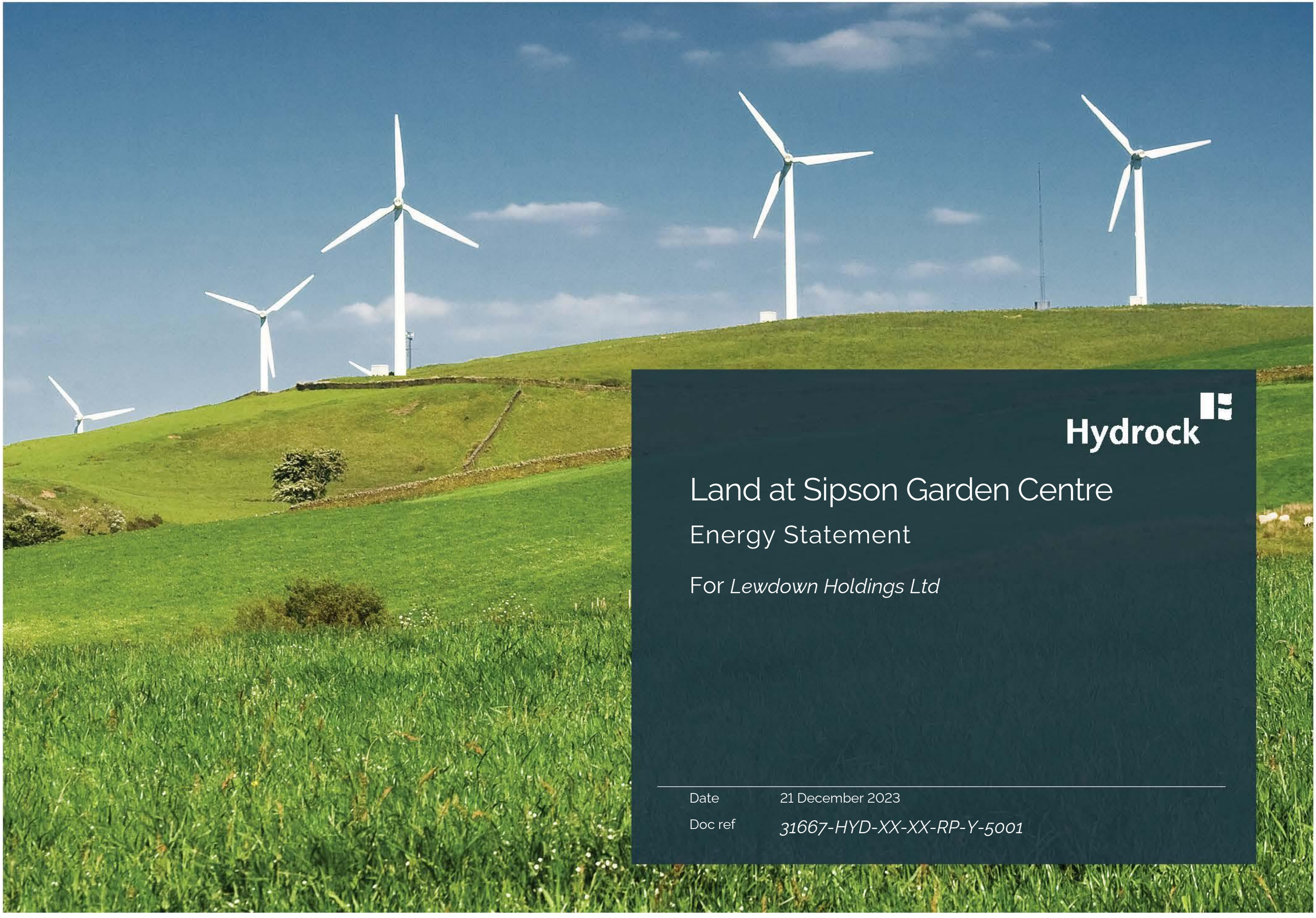

Hydrock

Land at Sipson Garden Centre

Energy Statement

For *Lewdown Holdings Ltd*

Date	21 December 2023
Doc ref	*31667-HYD-XX-XX-RP-Y-5001*

Document control sheet

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Contents

Executive Summary

This Energy Statement has been prepared by Hydrock Consultants, on behalf of Lewdown Holdings Ltd in relation to the planning application for proposed development at the former Sipson Garden centre site in Hillingdon. This statement has been written to set out the energy efficiency and renewable energy strategy for the proposed development.

The proposed development site at Sipson Road, UB7 0HW, includes the demolition of the former Sipson Garden Centre, associated with the previous use for redevelopment of the site. to provide a vehicle service building and a two-storey office building for the maintenance of airside support vehicles

The scheme seeks to deliver a proposed design that is sustainable from first principles and throughout design and construction. The overall strategy follows the energy hierarchy methodology within the London Plan and has resulted in the following carbon reductions or measures for each stage:

- Be Lean – **17% reduction** from passive design features
- Be Clean – The development will be designed to be able to **connect to a future Decentralised Energy Network**
- Be Green – **482% reduction** from renewable energy generation

The GLA also requires the fulfilment of the 'Be Seen' policy, which requires monitoring and reporting of the actual operational energy performance of major developments for at least five years post construction, via the mayor's 'Be Seen' monitoring portal.

The Building Regulations Part L (2021) energy assessment of the proposed development based on regulated energy use illustrates that the development goes above the required national, regional and local policy requirements.

The results following our Part L 2021 compliance calculations for the scheme show the regulated energy consumption for the site will be zero. This meets national and local policy requirements.

Due to the proposed development's large renewable energy generation, net zero regulated energy consumption will be achieved, and thus no off-setting is required

Table 1 - Total carbon emissions for the proposed development

Energy Hierarchy Stage	Carbon Emissions (kgCO2)	Energy consumption (kWh/year)	Carbon Emission reductions per stage (%)	Carbon Emission reductions Cumulative (%)
Notional Building/TER	2557	18801	-	-
After Be Lean	2122	15596	17	17
After Be Clean	2122	15596	0	17
After Be Green	-8093	-59500	482	416
Total On-Site	-8093	-59500	-	416

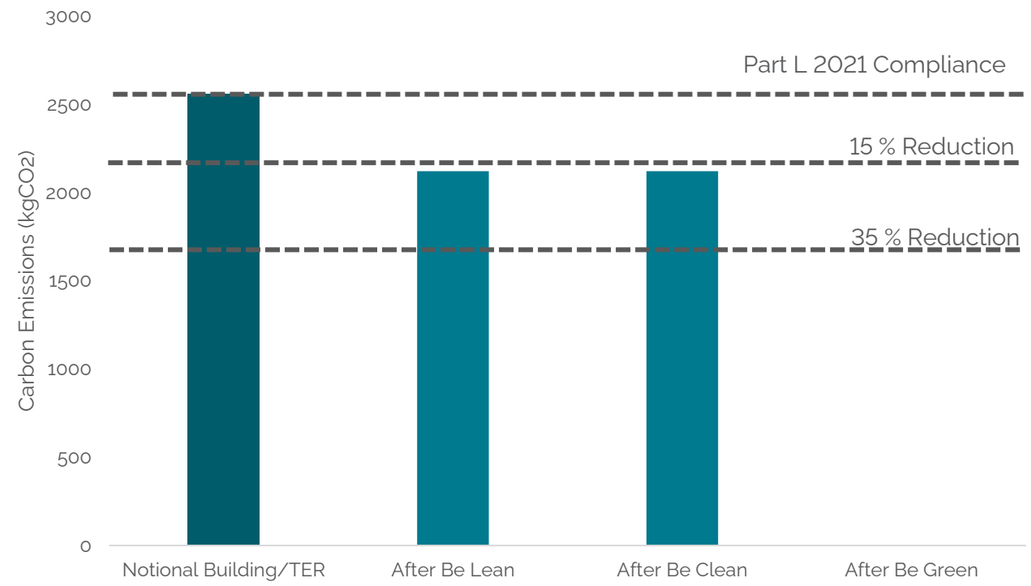


Figure 1 -Carbon Emissions at each hierarchy stage

Energy Statement

These sections outline the site and development proposals, set out the National and Local regulations and planning policy context that must be addressed, and the methodology for the energy assessment in line with the London Plan.

1. Introduction

Hydrock has been appointed by Lewdown Holdings Ltd to prepare an Energy Statement to support the full planning application for the proposed Sipson development.

The proposed development at Sipson Road, UB7 0HW, will see the demolition of the former Sipson Garden Centre, including the hardstanding and dilapidated structures associated with the previous use. The site will be redeveloped to provide a vehicle service building, a two-storey office building and use of site for maintenance of airside support vehicles.

The proposal considers national planning policy, the relevant sustainability considerations of the 'London Plan (2021)' and the local Hillingdon planning policies (Local Plan, 2012 and Local Plan Part 2, 2020) and strives for designs that embed sustainability as a first principle.

This statement applies the energy hierarchy (Figure 3) provided by the London Plan to first reduce energy demand and consumption before improving efficiency and seeking to generate renewable energy on-site.

Figure 2 - Pre-Application Site Plan

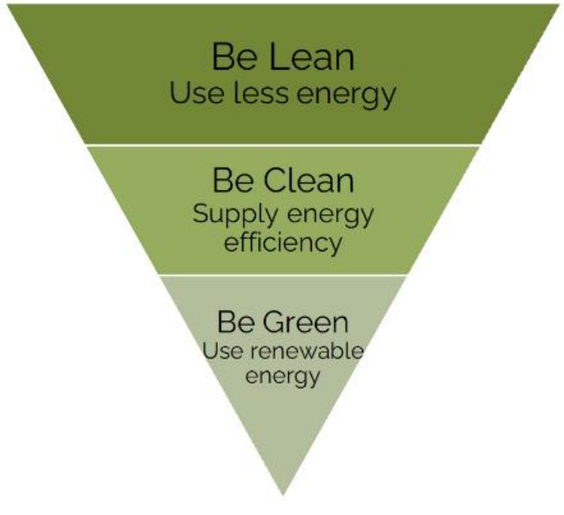


Figure 3 - The Energy Hierarchy

2. Planning Policy Regulations & Guidance

This section of the report summarises the relevant national regulations, regional/local policies, and guidance that are applicable to the Sipson development.

All full list of the polices can be found in Appendix A.

Table 2 - Summary of legislative and planning policy

National Planning Policy		Proposed Development
Part L 2021	The development must adhere to Building Regulations Approved Document Part L: Volume 2: Buildings other than dwellings standards. Part L was updated to Part L 2021 in June 2022. This includes changes to carbon factors which will greatly benefit fully electrified sites' carbon emissions. It has also improved the efficiency of the fabric for the Notional Building, which the development will be assessed against.	
Part S	At least one electric vehicle charging point must be provided if at least 10 parking spaces will be made available for the use of building users. A minimum of 1 in 5 parking spaces in addition to the charging points must have access to cable routes.	
Regional Planning Policy – The London Plan 2021		
Policy SI 1 Improving Air Quality	Due to the development's location in the green belt, and its' classification as a major development, it must be at least air quality neutral.	The site will therefore ensure that fossil fuels are not used for energy supply.
Policy SI 2 Minimising greenhouse gas emissions	The proposal includes a detailed energy strategy (this document) that demonstrates how the development will be net-zero carbon. This is required to be in accordance to an 'energy hierarchy', see Appendix A for further details. This policy also states that all major developments must achieve at least a 35% reduction in carbon emissions beyond the Part L 2021 regulations.	This will be achieved through energy efficiency measures such as improving the efficiency of building fabric and meeting the building's energy requirements from renewable sources

National Planning Policy		Proposed Development
Policy SI 3 Energy Infrastructure	Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system. The heat source selection must follow the hierarchy displayed in part 4.1.3 of Appendix A.	
Policy SI 4 Managing Heat Risk	Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy: 1. Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure 2. Minimise internal heat generation through energy efficient design 3. Manage the heat within the building through exposed internal thermal mass and high ceilings 4. Provide passive ventilation 5. Provide mechanical ventilation 6. Provide active cooling systems	The proposed development reduces the demand for cooling, but cannot exclude cooling due to the location of the site. For further details please see Section 8 and Appendix B.
Policy SI 5 Water Infrastructure	The Sipson development proposal will achieve at least the BREEAM excellent standard for the 'Wat 01' water category/over 12.5% improvement over defined baseline performance standard or equivalent (commercial development). To achieve this the development will specify low flow fittings.	The development will specify low flow fittings to achieve a 12.5% improvement over baseline performance.
Policy SI 7 Reducing Waste and the Circular Economy	A circular economy statement has been submitted alongside this report that demonstrates how all materials arising from demolition and remediation will be re-used or recycled.	A Circular Economy Statement will be submitted to demonstrate how materials will be reused & recycled.

Local Planning Policy – Hillingdon Local Plan, Strategic Policies 2012.		Proposed Development
Policy EM1: Climate Change Adaption and Mitigation	This policy states how sustainable techniques are encouraged for land remediation to reduce the need to transport waste to landfill. The policy makes particular reference to development plans including bioremediation as part of their planning proposals. It is expected that for major applications, 20% of energy needs are met from renewable sources.	The proposed development reduces waste to landfill by re-using or recycling over 95% of demolition, construction and excavation waste. The proposed development meets 100% of its regulated energy consumption through renewable sources
Policy EM6: Flood Risk Management **Policy EM7: Biodiversity and Geological Conservation** **Policy EM8: Land, Water, Air and Noise**	This is not required to be in included in this statement, and will be covered by other documents in the proposal.	
Policy EM11: Sustainable Waste Management	The council requires all new development to address waste management at all stages throughout the development's life.	Hydrock have assisted with this by providing a whole life carbon and circular economy assessment. An operational waste management plan is provided by others alongside this report.

Hillingdon Local Plan Part 2, Development Management Policies 2020		Proposed Development
Policy DMEI 1: Living Walls and Roofs and on-site vegetation. **Policy DMEI 2: Reducing Carbon Emissions** **Policy DMEI 7: Biodiversity protection and Enhancement**	No major requirements that have not been previously covered in strategic policies. See Appendix A for more details.	
Policy DMEI 3: Decentralised Energy	Sipson is required to be designed to be able to connect to a Decentralised Energy Network (DEN). Major developments located within 500 metres of a planned future DEN, which is considered by the Council likely to be operational within 3 years of a grant of planning permission, will be required to provide a means to connect to that network and developers shall provide a reasonable financial contribution for the future cost of connection.	The proposed development is not within 500m of an existing DEN, nor is a network planned to be built with 500m (See Figure 6 and Section 5). Due to this the development will be designed to connect to any potential future DEN.
Policy DMEI4: Development in the Green Belt or on Metropolitan Open Land.	Extensions and redevelopment on sites in the Green Belt and Metropolitan Open Land will be permitted only where the proposal would not have a greater impact on the openness of the Green Belt and Metropolitan Open Land.	The proposed development is two storeys and will replace buildings already on site.

3. Methodology

The energy assessment undertaken follows the detailed methodology set out within the GLA guidance document "*Energy Planning – GLA guidance on preparing energy assessments (2022)*".

As such, the regulated energy consumption and emissions have been calculated using the dynamic simulation modelling (DSM) method. This is a government approved method for assessing regulated carbon emissions from non-dwellings and is used to demonstrate compliance with the building regulations Part L2: Conservation of fuel and power.

The 'Baseline' case for emissions was determined using the notional TER rate. These figures provide an emission rate for the 'notional' target building, and hence a figure for acceptable total regulated emissions. The emissions saving from energy efficiency proposals (Be Lean) was determined by comparing the total emissions from the TER figures, with the predicted building emission rate (BER), based on the proposed specification. The emission savings from decentralised energy (Be Clean) and renewable energy (Be Green) proposals were then calculated separately, in line with the GLA requirements.

The dynamic simulation modelling has been completed using IESVE 2023 software. NCM thermal templates were used for internal conditions including equipment and occupancy gains, and heating and cooling set points.

The units that are proposed for construction are 'Shell & Core', with only the main office areas (GF reception, first & second floor offices and plant-deck) being fitted with services at the base build stage. As there is no end-user involved at the project design stage, the energy calculations have made assumptions as to the fit-out of the service area, modelling it as an unheated space but allowing for high efficiency LED lighting. The lighting efficiencies will form part of a 'Green Lease Agreement' between the developer and future incoming tenant to be adhered to. Should heating be installed within the service area by a future incoming tenant, they will be required to update the energy assessment and make any meet any necessary compliance requirements.

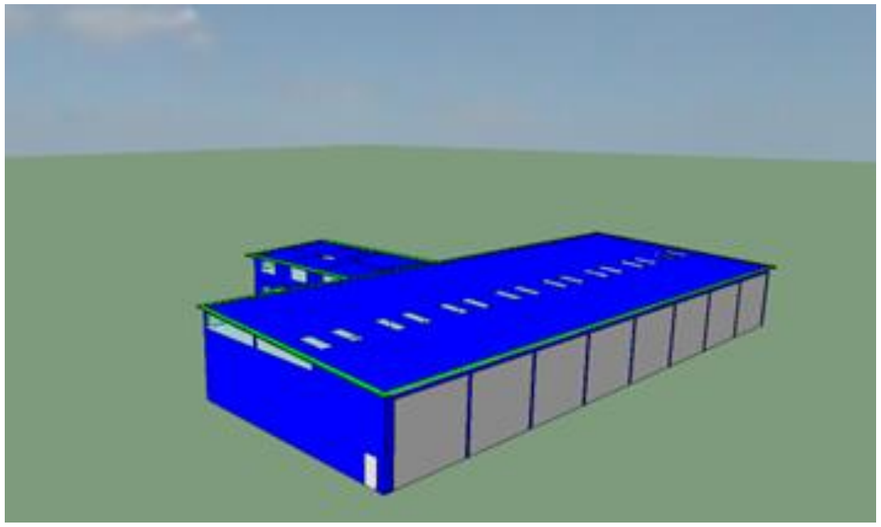


Figure 4 - The proposed development, service building side

Figure 5 - The proposed development, office building side

Be Lean - Energy Demand Reduction

This section looks at measures to reduce the energy demand of the new development against the notional building baseline through passive design and energy efficiency measures.

4. Be Lean - Use less Energy

At an early stage, the design team have explored a range of energy efficiency measures including enhanced U-values, enhanced construction details to minimise thermal bridging, and the use of efficient mechanical ventilation systems. The London Plan target under the 'Be Lean' policy is to report an improvement on the baseline case of 15% with energy efficiency measures alone.

So that the improvements from energy efficiency alone can be properly understood, aspects of the proposals that relate to efficient supply of energy i.e. renewable energy generation, have not been included at this stage.

4.1 Passive Design

This section looks at options which utilise building form, orientation and fabric to exploit the natural surroundings of the site to help reduce energy demand.

4.1.1 Building fabric and air permeability

A 'fabric first' approach to building design involves maximising the performance of the components and materials that make up the building fabric itself, before considering the use of mechanical or electrical building services systems.

U-values have been chosen based on best practice to reduce energy demand through high thermal performance, taking into practicality and viability. U-values have been optimised to balance both overheating and heat retention, and can be seen in Table 3. Please note that as the service area is unheated and excluded from the thermal line of the building, it therefore does not meet the values stated below.

Table 3 - Proposed Building fabric U-values

Building Element	Part L 2021 U-Values	Proposed U-Values
External Walls*	0.26 W/ m^2K	0.12-0.18 W/ m^2K
Roof	0.18 W/ m^2K	0.12 W/ m^2K
Floor	0.22 W/ m^2K	0.11 W/ m^2K
Glazing	1.20 W/ m^2K	1.4 W/ m^2K
Doors	1.6 W/ m^2K	1.4 W/ m^2K

**This includes the wall between the service building and the office.*

The proposed design shall be designed to have good air tightness throughout, and air leakage and infiltration shall be minimised to reduce energy demand.

The current target is set at 3 $m^3/h.m^2$ @ 50 Pa.

4.1.2 Solar shading

As part of the overall façade design, the use of the passive internal and external shading devices has been integrated to reduce solar gains and glare, and thus cooling requirements.

These include:

- Internal Blinds
- Low g-value glazing (0.4)
- Recesses
- External shading

4.1.3 Daylighting

The glazing areas have been optimised depending on the orientation of the facade to increase daylighting, whist reducing the need for active cooling.

Initial modelling indicated that artificial lighting energy usage in the Service Area was high. To reduce energy consumption, roof lighting has been included in the design. This maximises natural daylight in the service areas, which will allow energy saving through the control of the artificial lighting installation by turning off, or dimming when sufficient daylight is present.

4.2 Active design

4.2.1 Heating and cooling

All areas in the office are heated and cooled by an air source reverse cycle heat pump VRF/VRV (Variable Refrigerant Flow/Volume) heat recovery system comprising external condensers and indoor ceiling cassette units with system SCOP (Seasonal Co-Efficient of Performance) of 2.64 for heating & SEER (Seasonal Energy Efficiency Ratio) of 5.5 for cooling.

The building design reduces cooling demand, however active cooling is still required. Please see section 8 for a detailed analysis of the cooling hierarchy.

4.2.2 Hot water

To reduce and carbon emissions, all hot water will be provided by an ASHP with a SCOP of 2.86.

4.2.3 Lighting

All open office lighting taken as occupied office area's is to be LED type with daylight dimming control in zones with external windows & PIR in other zones at 110lm/cw @ 450lux. Toilet/break room/shower areas & circulation corridors are taken as LED type with PIR control at 110lm/cw @ 300lux, stairwells are taken as LED type with PIR control at 110lm/cw @ 150lux, Service Area are taken as LED type at 120lm/cw @ 300lux, constant illuminance control has also been allowed for in the Service Area & occupied office areas. The reception area will have display lighting with an efficacy of 80lm.

4.3 Be Lean Carbon Emissions Reductions

After applying the Be Lean measures, a 17% reduction in energy consumption and carbon emissions occurs, as reported in the table below.

EUI for the proposed development is 10.56kWh/m^2.

See appendix C for a detailed assessment (BRUKL report) of the impact of the Be Lean measures on the proposed development

Table 4 - Be Lean Carbon Reductions

Energy Hierarchy Stage	Energy Consumption (kWh/year)	Reduction (%)
Building regulations Part L 2021 Baseline	18801	-
Be Lean (After reducing energy demand)	15596	17

Be Clean – Supply energy efficiently

This section of the report considers decentralised energy in development proposals, whereby the developments of heating, cooling and power systems have been designed to minimise CO_2 emissions.

5. Be Clean - Supply Energy Efficiency

One of GLA's top priorities for reducing London's CO_2 emissions is to reduce the capitals' reliance on centralised power stations. This means increasing the use of local, low-carbon energy supplies through de-centralised energy systems.

The London and Hillingdon local plans require all major developments to connect to an existing Decentralised Energy Network (DEN), if the development is within 500m or otherwise be designed to be able to connect in the future.

The proposed development is not within 500m of an existing DEN, nor is a network planned to be built with 500m (See Figure 6). The site is also not near any major heat sources, which reduces the opportunities for potential heat networks. Due to this the development will be designed to connect to any potential future DEN.

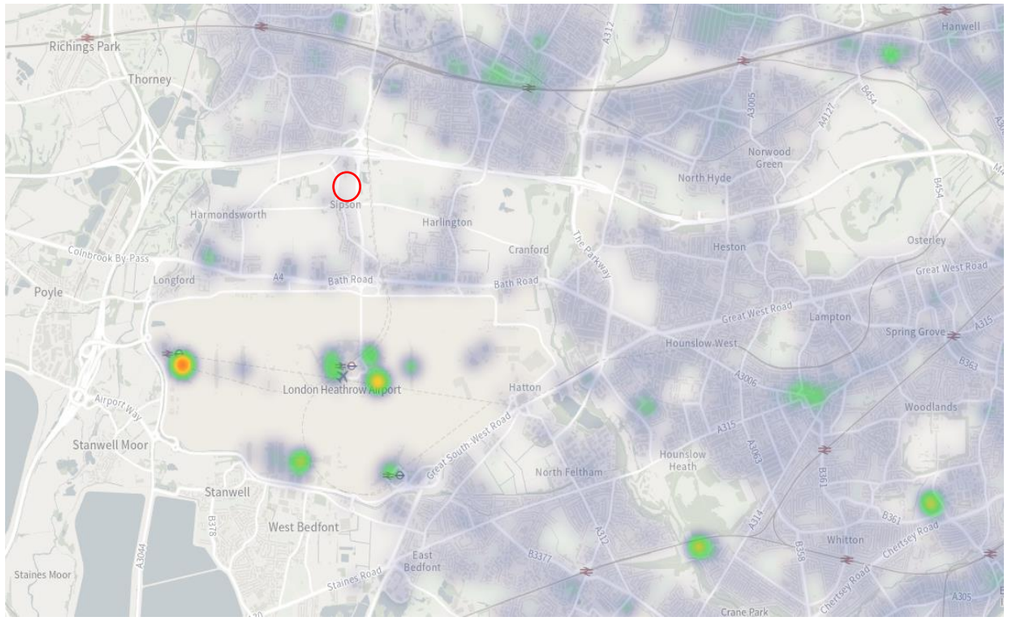


Figure 6 – DENs in the surrounding area (Source: GLA Heat Map) – Area of proposed development site shown in red

5.1 Be Clean Carbon Emissions Reductions

Since 'Be Clean' measures were not applied at this stage, there are no carbon reductions to report.

Be Green – Use renewable energy

This section of the report discusses the potential low carbon and renewable technologies that could be utilised and those included within the proposed development.

6. Be Green - Use Renewable Energy

With the UK aiming to reach net zero by 2050, using electricity that comes from low carbon and renewable sources is essential to help reduce our carbon emissions.

The renewable and low carbon energy sources that have been assessed and will be included in this development are:

» Photovoltaic Panels (PVs)

» Air source heat pumps in heating mode

For a summary of the other low or zero carbon technologies options, please see Appendix B.

6.1 Photovoltaics

Photovoltaic (PV) panels generate DC (Direct Current) electricity from sunlight which is fed through an inverter to convert it into AC (Alternating Current) electricity.

PV panels' outputs vary depending upon orientation, inclination, solar radiation levels. cloud cover and temperature. The PV panels on the office building will be oriented to the south, and on the service building panels will be mounted towards the east and west.

500m^2 of PV is proposed for this development, (Figure 7). The estimated kWp is 100.4.

The amount of PV may vary as the development design progresses and depending on the PV model and roof design.

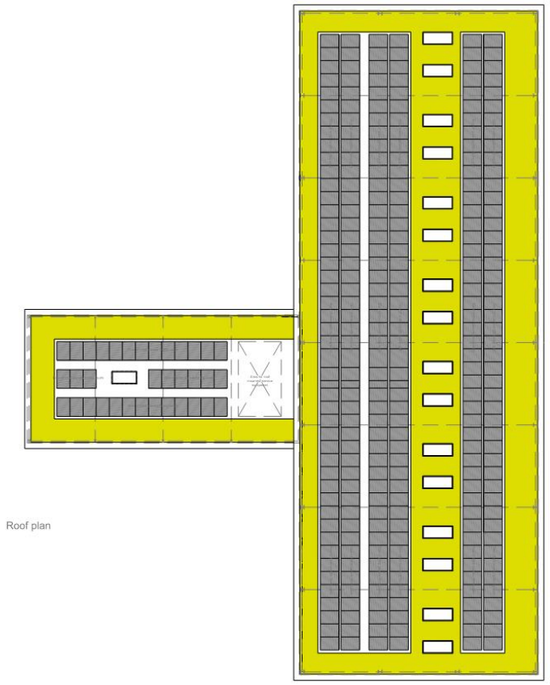


Figure 7- - Roof plan, with proposed PVs

6.2 Air Source Heat Pumps

Air-source heat pumps work by extracting heat from outside (ambient air) and transferring it to the heating system of the building. For cooling purposes, this cycle is reversed and the heat is transferred back to the heat pump and ejected.

Manufacturers of air source heat pump systems differ with their SCOP & SEER ratings, actual manufacturers will be chosen by the mechanical contractor once appointed but the likely system would be a VRF type system or equal with an assumed Heating SCOP of 3.1 and cooling SEER of 5.5, which should be easily achievable with the new VRF/VRV technologies on the market.

This system has been deemed as suitable for the proposed development, as the client wishes to only install heating/cooling in the offices at this stage. An ASHP system would provide flexibility for future tenant demands, allowing them to add or move fan coil units to meet their requirements.

Noise from air-source heat pumps can be significant, but can be attenuated by utilising acoustic screens. This is a common practice and deals with any residual noise complaints effectively. The external units are normally contained in locations which are not sensitive to noise and can be visually screened.

Finally, from a climate adaptation perspective, it is highly beneficial to install ASHPs as they can incorporate cooling as well as heating, increasing the resilience of buildings to future climates scenarios.

ASHP systems have been proposed to provide heating, cooling and domestic hot water throughout the development. A VRF paired system is deemed appropriate for office and meeting spaces, while a radiator-based system is proposed for other spaces within the office block. No heating system is proposed for the vehicle service area.

6.3 Be Green Carbon Emissions Reductions

After the application of the Be Green measures, a 482% carbon emission reduction has been achieved for the

proposed development over the notional baseline.

Table 5 - Be Green Carbon Reductions

Energy Hierarchy Stage	Energy consumption (kWh/year)	Carbon Emission reductions per stage (%)	Carbon Emission reductions Cumulative (%)
Building regulations Part L 2021 Baseline	18801	-	-
Be Lean (After reducing energy demand)	15596	17	17
Be Clean (After energy efficient supply)	15596	0	17
Be Green (After low/zero carbon technologies)	-59500	482	416

Be Seen - Energy Monitoring

This section of the report details how the proposed development will monitor, verify and report on energy-performance.

7. Be Seen - Energy Monitoring

To truly achieve net-zero buildings, we must have a better understanding of their actual operational energy performance. Although Part L calculations and Energy Performance Certificates (EPCs) give an indication of the theoretical performance of buildings, it is well established that there is a 'performance gap' between design theory and measured reality.

To address this gap, the 'Be Seen' policy requires monitoring and reporting of the actual operational energy performance of major developments for at least five years post construction, via the mayor's 'Be Seen' monitoring portal.

7.1 Monitoring

Post construction, monitoring of the energy use, consumption and PV performance of the proposed development will occur. This will help ensure the development continues to be energy efficient.

7.2 Unregulated energy calculation

In order to have a better understanding of the building's actual operational energy performance, the unregulated energy performance has been estimated, please see table 6 .

External EV Charging has not been included as per the GLA Energy Assessment Guidance Document.

The total unregulated electrical energy consumption has been calculated to be 191,795kWh/year.

7.3 Flexibility and adaptability

The London Plan Policies SI2 and SI3 states that developments should minimise peak energy demand where possible for the purpose of reducing pressure on the local electricity supply during peak periods of operation.

Through the process of maximising the passive design elements of the development such as high levels of insulation the anticipated peak energy demand of the property has been reduced where possible.

Additionally, the use of air source heat pumps improves the efficiency greatly of the heating system and therefore reduces the required energy in peak heating season.

Onsite generation of electricity through the photovoltaic array will help to protect the local infrastructure through a reduction on the reliance of grid supplied electricity.

The proposed design will contain energy meters which automatically monitor all major items of plant, energy/water consumption from meters and other building performance data highlighting alarms or faults in operation.

Table 6 - Proposed development unregulated energy consumption estimation

Energy Consumer	Power Rating (kW)	No.	Annualised energy consumption (kWh/year)
Office Lift Power	5.4	1	199
Office Small Power People	0.5	35	72,072
Office Small Power Other	0.5	29	29,858
Office Hand Dryers	0.0044	5	515
Service Building Small Power	0.5	64	65,894
Service Building Door Power	4	8	14497
External Lighting	2	1	8760
Total	-	-	**191795**

8. Overheating and Cooling

Alongside this report for the energy and CO_2 emissions appraisal, an assessment has been completed to determine the risk of summertime overheating and consider measures for the minimisation of cooling demand.

The following cooling hierarchy, provided by the London Plan, policy Si 4, has been considered;

1. Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
2. Minimise internal heat generation through energy efficient design
3. Manage the heat within the building through exposed internal thermal mass and high ceilings
4. Provide passive ventilation
5. Provide mechanical ventilation
6. Provide active cooling systems

8.1 Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure.

The proposed site layout and orientation of the proposed development has been dictated by local context, external layout and daylighting optimisation. As a result, the office building has a higher amount of glazing on the southern façade. Heat entering the building as a result will be minimised by employing the following measures;

- Local shading has been provided on all buildings via a wraparound shade at roof level. Further local shading in the form of overhangs is proposed for glazed doorways on the southern orientation of the office building.
- Windows have been recessed by 100mm to provide additional shading.
- High performance thermal glazing has been specified to minimise solar gain.
- Building fabric and air permeability shall be designed to achieve significant improvements against Part L2 2021.

8.2 Minimise internal heat generation through energy efficient design

The energy efficiency of lighting will be optimised via the use of high efficiency LEDs, PIR & daylight dimming controls.

Equipment (where within the developer's control) will be selected in accordance with the Energy Rating as per the EU product Energy Labelling scheme, with preference given to 'A' rated goods and above.

The proposed VRF and radiator systems shall aim to reduce distribution pipework where possible. In line with best practice, all pipework will be insulated to minimise gains and losses and maintain peak efficiency.

8.3 Manage the heat within the building through exposed internal thermal mass and high ceilings

Increasing exposed internal mass was explored within the constraints of the design requirements, but heat management benefits were found to be minimal.

8.4 Provide passive ventilation

Natural ventilation via openable windows was considered for the proposed development. However, due to the proximity to Heathrow Airport, the M4 and the service area, potential acoustic and air quality issues were foreseen with the implementation of this cooling method.

8.5 Provide mechanical ventilation

High efficiency supply and extract ventilation shall be provided to offices and meeting areas, kitchens and bathrooms.

Night-time purging could also be considered to provide free cooling in the summer months.

8.6 Provide active cooling systems

In projects with cooling, the GLA requires the actual predicted cooling demand is no higher than the notional building cooling demand, within the Part L compliance calculations. This is intended to ensure that passive measures (which should not degrade) are prioritised over system efficiency (which shall fluctuate).

- A high efficiency VRF system is proposed for office and meeting areas within the development. The number of rooms with active cooling has been minimised to reduce energy demand. A plate heat exchanger will also allow for heat recovery.

BRUKL calculations demonstrate that the included passive measures have reduced the actual cooling demand by 2% compared to the notional target.

8.7 Solar gain

All occupied office and service areas pass the solar gain check. Outputs from BRUKL documents can be found in Appendix C.

8.8 Building overheating and cooling modelling

As per GLA guidance, a thermal comfort analysis calculation has been conducted to show the thermal comfort of the office and meeting spaces for different weather scenarios. IESVE and Apache simulation software and CIBSE TM52 guidance were used to complete this assessment.

The overheating analysis indicated that without the proposed VRF active cooling system, office and meeting spaces within the development would be at risk of overheating for each of the three TM52 design years. As such, the VRF system has been proposed to ensure this risk is minimised.

For the full overheating analysis methodology and results, see Appendices D & E.

Energy and Carbon Performance Summary

This report has detailed the energy efficiency and renewable energy strategy for the proposed development.

9. Conclusion

This report has provided a detailed assessment of the anticipated carbon performance for the proposed development at the Former Sipson Garden Centre.

The regulated energy strategy adopts a hierarchical approach, using passive and low energy design technologies to reduce baseline energy consumption and CO_2 emissions, followed by the application of low and zero carbon technologies.

It is predicted that the proposed development will achieve a 416% site-wide reduction in carbon emissions, compared to the notional building. Table 7 and Figure 8 summarise energy performance and carbon reduction at the proposed development site.

Table 7 – Summary of energy performance and carbon reductions

Energy Hierarchy Stage	Carbon Emissions ($kgCO_2$)	Energy consumption (kWh/year)*	Carbon Emission reductions per stage (%)	Carbon Emission reductions Cumulative (%)
Notional Building/TER	2557	18801	-	-
After Be Lean	2122	15596	17	17
After Be Clean	2122	15596	0	17
After Be Green	-8093	-59500	482	416
Total On-Site	**-8093**	-59500	-	**416**

**Assuming electricity carbon factor of 0.136 (SAP10.2)*

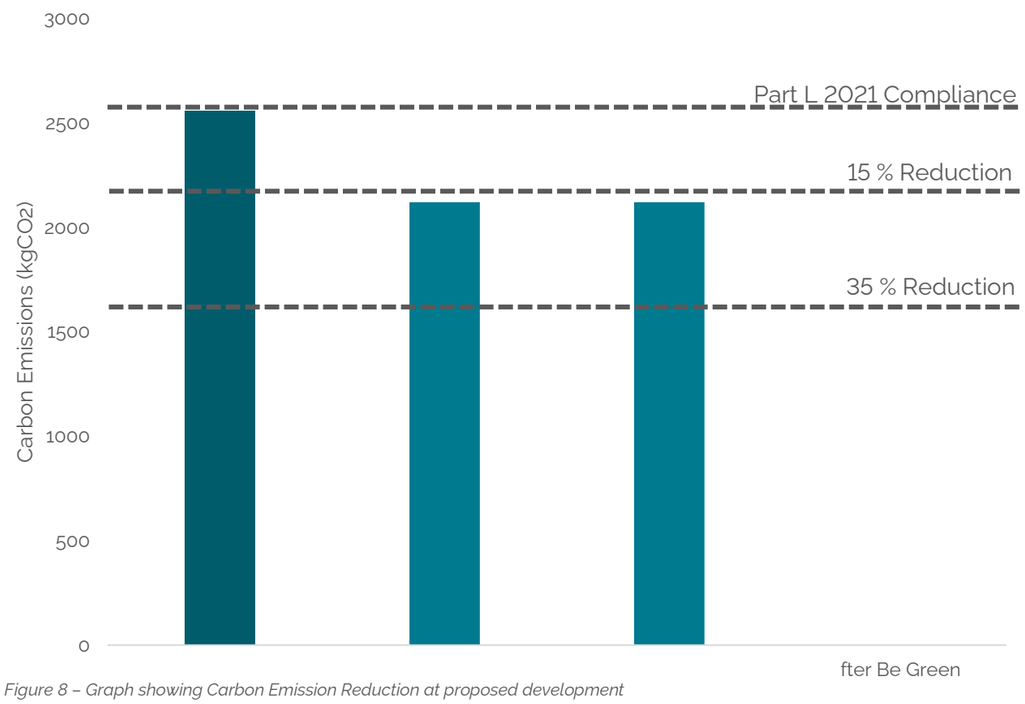


Figure 8 – Graph showing Carbon Emission Reduction at proposed development

Appendix A Full Legislative and Planning Policy

10. National Planning Policy

10.1 Building Regulations Part L - Volume 2: Buildings other than dwellings

All new non-dwelling developments will need to meet the standards set by Building Regulations 'Approved Document Part L1 – Conservation of Fuel and Power, Volume 2: Buildings other than dwellings. These standards specify the minimum efficiencies that need to be achieved in order for the new development to meet regulations.

These standards include a minimum level for regulated carbon emissions defined by the Target Emission Rate (TER) which relate to a 'Notional Building'. In addition, there are minimum levels of fabric efficiency set by the Target Fabric Energy Efficiency rating (TFEE) and minimum levels of primary energy rates (TER) that are calculated by a Simplified Building Energy Model (SBEM).

The resulting Building Emission Rate (BER), must be less than the relevant TER in order to comply.

The Part L Building Regulations were last updated in 2021. See below the key changes that are now required to meet or better the 2021 Part L Building Regulations:

Table 8 - Part L Carbon factors 2013-2021

Building Element	Part L2 2013 Notional Building Fabric	Part L2 2021 Notional Building Fabric
Roof	0.18 W/m²k	0.15 W/m²k
Wall	0.26 W/m²k	0.18 W/m²k
Glazing	1.6 W/m²k	1.4 W/m²k
Floor	0.22 W/m²k (0.65)	0.13 W/m²k (0.65)
Air Permeability	5 m³/m²/hr @ 50 Pa	3 m³/m²/hr @ 50 Pa

- Non-domestic buildings require a 27% improvement over Part L 2013 in carbon emission to meet Part L 2021 compliance.
- The notional non-domestic building will have a Photovoltaic (PVs) array, where the PV array size is dependent on the conditioned floor area.
- Carbon factors of utilities have been updated to better reflect their current intensity. Due to the decarbonisation of the electrical grid, all electric proposals will now perform much better.

The notional u-values used by the Part L notional model have been upgraded to provide a better performance in thermal performance.

Table 9- Part L2 2013 and Part L2 2021 Notional Fabric Comparison

Fuel	SAP 2012 (Part L 2013)	SAP 10.2 (Part L 2021)
Gas	0.216	0.210
Electricity	0.519	0.136

10.2 Part S, Infrastructure for the charging of electric vehicles

10.2.1 Section 4: Major Renovations of buildings which are not residential or mixed-use buildings

At least one electric vehicle charging point must be provided if at least 10 parking spaces will be made available for the use of building users. A minimum of 1 in 5 parking spaces in addition to the charging points must have access to cable routes

11. Regional Planning policy

11.1 The London Plan, The Spatial Development Strategy For Greater London 2021

The London Spatial Development Strategy provides a framework and blueprint for the future development and sustainable, inclusive growth of London. It includes the policies that are required to meet the city's target of being net zero carbon by 2030.

11.1.1 Policy SI 1 Improving Air quality

In order to meet the requirements in Part 1, as a minimum, development proposals must be at least Air Quality Neutral. Major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will not lead to the further deterioration of existing poor air quality or create unacceptable risk of high levels of exposure to poor air quality.

Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach. To achieve this a statement should be submitted demonstrating

1. How proposals have considered ways to maximise benefits to local air quality
2. What measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this.

11.1.2 Policy SI 2 Minimising greenhouse gas emissions

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

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:

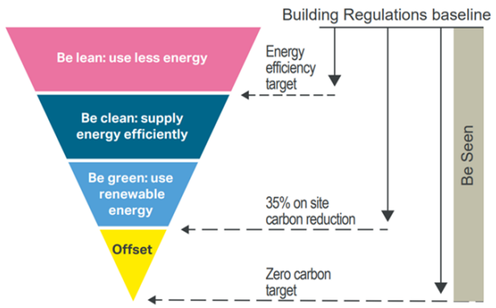
1) Be lean: use less energy and manage demand during operation.

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.

Figure 9 - The energy hierarchy and associated targets



A minimum on-site reduction of at least 35% beyond Building Regulations 2013 is required for major development and non-residential development should achieve 15% through energy efficiency measures.

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

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.

11.1.3 Policy SI 3 Energy infrastructure

Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system:

The heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

a) Connect to local existing or planned heat networks

b) Use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)

c) Use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)

d) Use ultra-low NOx gas boilers

CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the requirements in Part B of Policy SI 1 Improving air quality.

11.1.4 Policy SI 4 Managing heat risk

Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

1. Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
2. Minimise internal heat generation through energy efficient design
3. Manage the heat within the building through exposed internal thermal mass and high ceilings
4. Provide passive ventilation
5. Provide mechanical ventilation
6. Provide active cooling systems

The Chartered Institution of Building Services Engineers (CIBSE) has produced guidance on assessing and mitigating overheating risk in new developments, which can also be applied to refurbishment projects. The TM 52 guidance should be used for non-domestic developments. TM 49 guidance and datasets should also be used to ensure that all new development is designed for the climate it will experience over its design life.

11.1.5 Policy SI 5 Water infrastructure

Development proposals should achieve at least the BREEAM excellent standard for the 'Wat 01' water category/over 12.5% improvement over defined baseline performance standard or equivalent (commercial development).

11.1.6 Policy SI 7 Reducing waste and supporting the circular economy

A Circular Economy Statement should be submitted, to demonstrate how all materials arising from demolition and remediation works will be re-used and/or recycled.

The London Environment Strategy sets out a pathway to achieving a municipal recycling target of 65% by 2030.

All construction and demolition projects must reuse/recycle/recover 95% of waste and material.

Referable applications should promote circular economy outcomes and aim to be net zero-waste. A Circular Economy Statement should be submitted, to demonstrate:

1. How all materials arising from demolition and remediation works will be re-used and/or recycled.
2. How the proposal's design and construction will reduce material demands and enable building materials, components and products to be disassembled and re-used at the end of their useful life.
3. Opportunities for managing as much waste as possible on site.
4. Adequate and easily accessible storage space and collection systems to support recycling and re-use.
5. How much waste the proposal is expected to generate, and how and where the waste will be managed in accordance with the waste hierarchy.
6. How performance will be monitored and reported.

12. Local Planning Policy

12.1 Hillingdon Local Plan, Strategic Policies 2012

The Hillingdon Local Plan provides details on the planning and strategy for the Borough. It identifies how the Borough will guide future development and ensures that the impacts of climate change are successfully tackled and managed locally. *Chapter 8: Core Policies, Environmental Improvement* covers the councils' policies for environmental protection and climate change management. The chapter makes reference to the Government's legally binding target of reducing CO^2 emissions by 80% by 2050 and the Mayor of London's regional target of 60% for London by 2025.

12.1.1 *Policy EM1: Climate Change Adaption and Mitigation*

Sustainable techniques are encouraged for land remediation to reduce the need to transport waste to landfill, In particular, developers should consider including bioremediation as part of their planning proposals.

The use of living walls and roofs, alongside sustainable forms of drainage to manage surface water run-off and increase the amount of carbon sinks is encouraged.

E3 (Core) Indicator: Renewable energy generation. For larger applications, 20% of energy needs to be from renewable sources.

12.1.2 *Policy EM6: Flood Risk Management*

The Council requires all development across the borough to use sustainable urban drainage systems (SUDS) unless demonstrated that it is not viable. The Council will encourage SUDS to be linked to water efficiency methods.

12.1.3 *Policy EM7: Biodiversity and Geological Conservation*

The protection and enhancement of all Sites of Importance for Nature Conservation. Sites with Metropolitan and Borough Grade 1 importance will be protected from any adverse impacts and loss. Borough Grade 2 and Sites of Local Importance will be protected from loss with harmful impacts mitigated through appropriate compensation.

The council will support proposals that improve and manage biodiversity interests and local geological sites through the planning process.

12.1.4 *Policy EM8: Land, Water, Air and Noise*

All major development within the Air Quality Management Area should demonstrate air quality neutrality (no worsening of impacts) where appropriate; actively contribute to the promotion of sustainable transport measures such as vehicle charging points and the increased provision for vehicles with cleaner transport fuels; deliver increased planting through soft landscaping and living walls and roofs; and provide a management plan for ensuring air quality impacts can be kept to a minimum.

All new development associated with Heathrow Airport should be challenged to minimise its impacts on air quality as far as possible.

12.1.5 *Policy EM11: Sustainable Waste Management*

The Council will require all new development to address waste management at all stages of a development's life from design and construction through to the end use and activity on site.

12.2 Hillingdon Local Plan Part 2, Development Management Policies 2020

Part 2 of the local plan comprises of The Development Management Policies and the Site Allocations and Designations document. The Development Management Policies document provides detailed policies that will form the basis of the Council's decision on planning applications. Chapter 6; Environmental Protection and Enhancement covers the Borough's sustainability policies.

12.2.1 *Policy DMEI 1: Living Walls and Roofs and on-site vegetation.*

All major development should incorporate living roofs and/or walls into the development. Suitable justification should be provided where living walls and roofs cannot be provided.

Major development in Air Quality Management Areas must provide onsite provision of living roofs and/or walls. A suitable offsite contribution may be required where onsite provision is not appropriate.

12.2.2 *Policy DMEI 2: Reducing Carbon Emissions*

All major development proposals must be accompanied by an energy assessment showing how reductions will be achieved in accordance to the London Plan targets.

12.2.3 *Policy DMEI 3: Decentralised Energy*

All major developments are required to be designed to be able to connect to a Decentralised Energy Network (DEN). Major developments located within 500 metres of a planned future DEN, which is considered by the Council likely to be operational within 3 years of a grant of planning permission, will be required to provide a means to connect to that network and developers shall provide a reasonable financial contribution for the future cost of connection. [Note, the land at Sipson is within 500m of a proposed DEN].

12.2.4 *Policy DMEI 4: Development in the Green Belt or on Metropolitan Open Land*

Extensions and redevelopment on sites in the Green Belt and Metropolitan Open Land will be permitted only where the proposal would not have a greater impact on the openness of the Green Belt and Metropolitan Open Land

12.2.5 *Policy DMEI 7: Biodiversity Protection and Enhancement*

The design and layout of new development should retain and

enhance any existing features of biodiversity or geological value within the site.

Appendix B - Summary of low or zero carbon technology options.

Table 10 - Summary of low or zero carbon technology

Technology	Requirements	Uses	Scale	Considerations	Viability
Photovoltaic Panels	A roof facing east to west (through south) and not overshadowed, flat roof or pitched around 30˚.	All uses, especially suitable for where buildings with extensive energy use	All scales	To maximise potential, orientation needs to be considered	*Viable*
Solar Thermal	A roof facing east to west (through sour) and a hot water tank is needed (not compatible with combi boilers.)	All uses	All scales	Needs a certain demand for hot eater to be beneficial, for large developments with a large eater demand	*Potential*
Air Source Heat Pumps	Sited on external walls	Any	All scales, but more likely to be appropriate at a small scale	Careful siting is needed to reduce aesthetic impact. Potential noise impact Powered by electricity, so lower carbon reduction than other technologies.	*Viable*
Biomass	Space needed for plant, fuel storage and deliveries	Mixed-use, schools, offices, commercial, residential-especially multi-residential – best where constant energy demand.	Medium to large, viable where heat demand is above 15 kW	Air quality impact Impact of deliveries on residents and distance transported. Fuel source	*Not Viable*
Ground Source Heat Pumps	External space for horizontal trench or vertical borehole	Any	Medium to large	Archaeology Usually combined with underfloor heating, so slow to respond Can combine with landscaping	*Not Viable*
Combined Heat and Power (CHP)	Single energy centre providing heat and power – needs space for access and servicing	Hospitals, leisure centres, educational building, large scale residential and mixed-use	Large	Need substantial heat demand to be viable. They are also typically gas-fired which would be burning more fossil fuels, which are not in alignment with the National Grid's goals on carbon reduction.	*Not Viable*
Battery Energy Storage Systems (BESS)	Sited on external walls	Plant space	Any, but more likely to be more appropriate at small scale	Given the energy production from PVs, there will be good potential to generate renewable energy for storage. This can be continually assessed as the design moves to the construction stage.	*Potential*

Appendix C – BRUKL reports for Be Lean & Be Green measures

Be Lean building BER result is 1.51kgCO^2/m^2/pa as shown in the BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Land at former sipson garden centre As designed

Date: Wed Dec 20 14:50:24 2023

Administrative information

Building Details

Address: Sipson Road, London, UB7 0HW

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.23

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.23

BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m^2]: 199.89

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	1.82	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	1.51	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	19.3	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	16.04	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

Be Green building BER result is -5.76kgCO_2/m^2/pa as shown in the BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Land at former sipson garden centre As designed

Date: Wed Dec 20 15:20:16 2023

Administrative information

Building Details

Address: Sipson Road, London, UB7 0HW

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.23

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.23

BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m^2]: 199.89

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	1.82	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	-5.76	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	19.3	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	-68.31	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

Appendix D – Overheating Assessment Process and Assumptions

This section will outline the process of, and assumptions made for, the Overheating Assessment.

Dynamic overheating analysis software

The development has been assessed using IES Virtual Environment (2023) v2.1.0 & Apache thermal simulation software. All modelling has been carried out in accordance with the guidance provided in CIBSE TM52 Building performance modelling (2013), which provides practical strategies for assessing and improving buildings' environmental performance and energy efficiency.

IES complies with the requirements of CIBSE TM52.

Site Location

The location for the proposed development site was used. Sipson Road, Sipson, West Drayton, UB7 0HW.

Weather Files

The overheating calculation uses the CIBSE DSY (Design Summer Year) weather files which represent a single continuous year, rather than a composite year made up of 'average' monthly values, and is used for overheating analysis.

Given the site's proximity to London Heathrow, the nearest weather file location based on CIBSE's weather file database is London Heathrow. Therefore, the "London_LHR_DSY1_2020_High50.epw " weather file has been used. The equivalent DSY2 and DSY3 files were also tested.

Internal Gains

Internal gains are the heat produced inside a building from people, lighting, and equipment, affecting indoor temperature and energy use.

To provide a fair assessment of the thermal comfort of non-domestic buildings, internal gains for lighting, occupancy and equipment have been based on the NCM (National Calculation Methodology) profiles.

Adjustments have been made where required by CIBSE guide A (2015).

Occupancy Profiles

NCM occupancy profiles were used for Office_Workshop and Office_Office where office profiles were more appropriate.

Thermal Elements Performance

U and g values used within the overheating assessment can be seen in the table 11 below.

Fabric performance in the Service Area has been selected on the basis of it being an unheated space.

Table 11 - Proposed U-values for the development

Building Element	Proposed U-Values (W/m²K)	
	Office	Service Area
External Walls	0.18	0.26
Internal Walls	1.79	-
Roof	0.12	0.18
Ground Floor	0.11	0.22
Internal Floor/Ceiling	1.4	-
Glazing – Windows	1.4	1.4
Glazing - rooflight	1.64	1.64
Doors - pedestrian	1.6	1.6

The g-values for the glazing of the windows and rooflights, in the office and service area, has been proposed as 0.4.

Shading Features

Overhangs were modelled as per the architect's drawings. Wraparound overhangs have been included at roof level for both service area and office sections of the development (0.4 and 0.85m projection respectively), and 2 more substantial overhangs (1.85m and 1.15m projection) on the south facing office façade have also been incorporated over glazed entrance doors.

All windows have been recessed by 100mm.

Thermal Mass Details

As all building fabric was 'built' within the modelling software, all thermal mass attributes were calculated and applied accordingly.

Ventilation & Cooling Strategy

Adhering to GLA guidance and the Cooling Hierarchy, the following process was conducted to ascertain a suitable cooling and ventilation strategy for office spaces within the proposed development;

- Due to acoustic and air quality considerations borne from proximity to Heathrow Airport, M4, and M25, natural ventilation via openable windows was deemed inappropriate for the proposed development and not modelled.
- Mechanical ventilation was explored by modelling the office spaces with varying levels of mechanical air supply, from a base level of 10l/s/per up to 100l/s/per. This was combined with wraparound solar shading on the roofs of both sections of the development, overhangs on glazed south-facing doors, and all windows recessed 100mm. Even with these measures, the office spaces did not meet overheating requirements.
- Finally, active cooling was modelled alongside solar shading measures and achieved sufficient

cooling in office areas with a maximum supply rate of 10l/s/pp. Tables showing the Predicted Mean Vote (PMV) and Predicted Percentage Dissatisfied (PPD) table can be seen below.

The Predicted Mean Vote (PMV) predicts how a group of people would rate their thermal comfort on a scale ranging from feeling too hot (+3) to feeling cold (-3). We targeted a score lower than 0.5 to avoid occupants feeling excessively hot.

The Predicted Percentage Dissatisfied (PPD) supplements the Predicted Mean Vote (PMV) by quantitatively predicting the percentage of people expected to feel too warm or too cool in the same environment. Here we have aimed for fewer than 10% of hours where <10% of the occupants are dissatisfied.

Table 12: Summer PMV Assessment

Room	% hours in range below 0.5
FF_S_Office_Space	100
FF_S2_Office_Space	100
FF_SE_Office_Space	100
FF_SW_Office_Space	100
FF_NW_Office_Space	100
FF_NE_Office_Space	100
FF_N_Office	100
GF_S_Office	100
GF_N_ Office	100

Table 13: Summer PPD Assessment

Room	PPD (% hours <10% occupants dissatisfied)
FF_S_Office_Space	100
FF_S2_Office_Space	100
FF_SE_Office_Space	100
FF_SW_Office_Space	100
FF_NW_Office_Space	100
FF_NE_Office_Space	100
FF_N_Office	100
GF_S_Office	100
GF_N_ Office	100

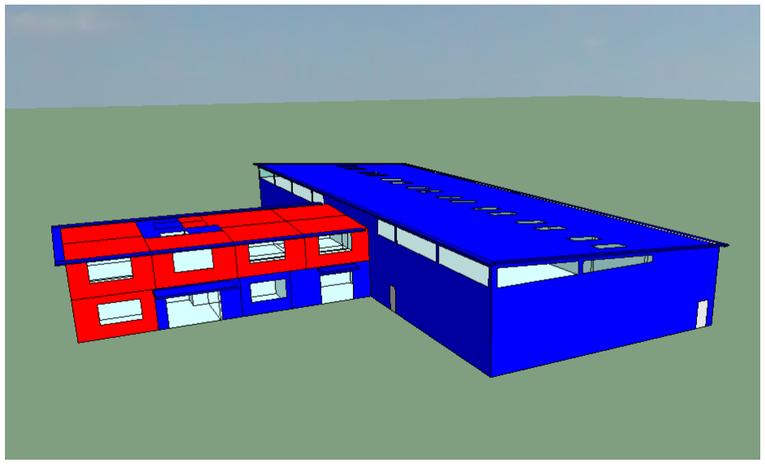
As shown, all spaces achieve summer overheating requirements. When the DSY2 and DSY3 files were used, peak cooling increased, but comfort metrics remained the same. The additional peak cooling requirements will be allowed for in system design.

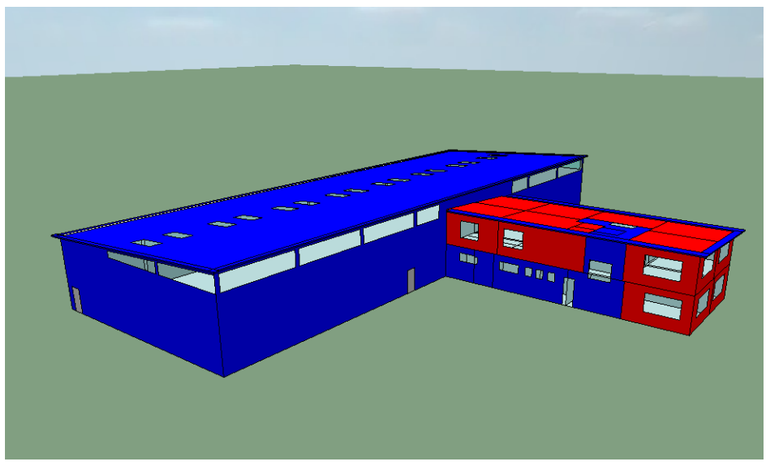
The final ventilation and cooling strategy for the proposed development is as follows;

- Ventilation alongside air conditioning is proposed for office and meeting spaces with a max supply rate of 10l/s/person.
- Mechanical ventilation with local extract will be included in WC, shower and Kitchen Areas, with max supply rates of 12, 10 and 25l/s/person respectively.
- Natural permeability-based infiltration ventilation is proposed for all other areas of the development.

Model Images & Unit Layout

The following images display the office and meeting areas modelled (red) in the Overheating Assessment.





Appendix E

BRUKL results for Solar Gain Check

All occupied areas and Service Area pass the Solar Gain check.

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Service Area	NO (-33.5%)	NO
FF S2 Office Space	NO (-72.2%)	NO
FF NW Office Space	NO (-61.5%)	NO
FF SW Office Space	NO (-61.1%)	NO
FF S Office Space	NO (-74.3%)	NO
FF NE Office Space	NO (-83.4%)	NO
FF SE Office Space	NO (-75%)	NO
GF Training Room	NO (-62%)	NO
GF Reception - desk area	NO (-68%)	NO
GF Drivers Room	NO (-64.4%)	NO
GF Office	NO (-51.8%)	NO
FF N Office	NO (-86.5%)	NO