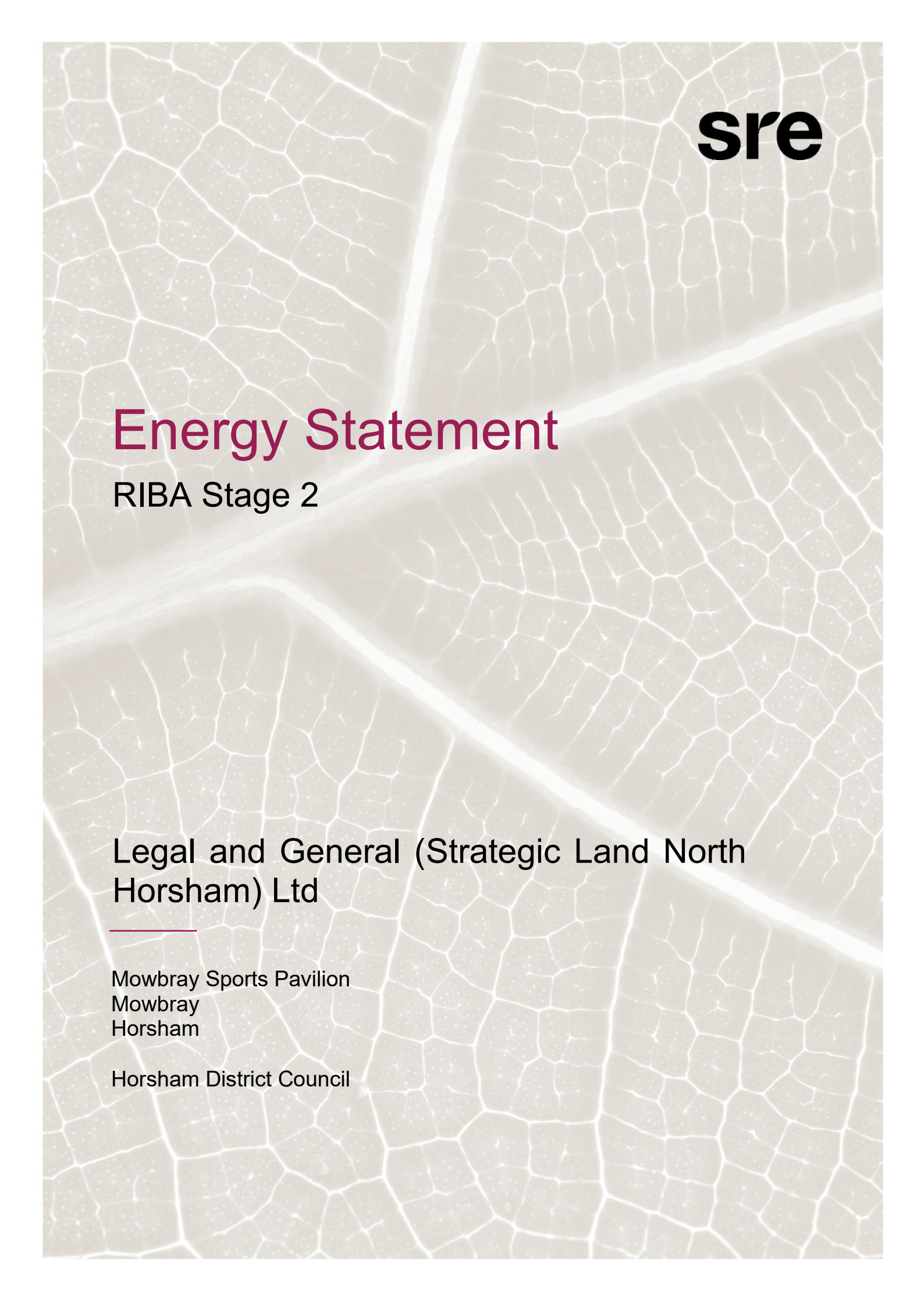




sre

Energy Statement

RIBA Stage 2

Legal and General (Strategic Land North
Horsham) Ltd

Mowbray Sports Pavilion
Mowbray
Horsham

Horsham District Council

Version	Revision	Date	Author	Reviewer	Project Manager
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Executive Summary

This Energy Statement is prepared by SRE on behalf of Legal and General (Strategic Land North Horsham) Ltd (the Client). This statement outlines the energy measures integrated into the design of the new Sports Pavilion, Mowbray, Land North of Horsham (the Proposed Development). SRE's contribution will inform the architecturally led scheme during RIBA Stage 2 Development of Concept Design.

The Proposed Development has been designed incorporating energy strategies, tackling local planning policy and general sustainability ambitions. A Simplified Building Energy Model (SBEM) assessment was completed for the Proposed Development using Integrated Environment Solutions Virtual Environment (IES VE) 2025 software. The assessment was carried out in accordance with the Building Regulations Part L 2021 - Volume 2 (Buildings other than dwellings), to ensure compliance with regulated CO₂ reduction targets and to demonstrate alignment with relevant policies set out by Horsham District Council.

The Proposed Development will deliver lower energy use, lower global warming potential (GWP) and carbon dioxide equivalent (CO₂e) emissions and lower operational costs than a 2021 Building Regulations compliant design, in line with local policy requirements.

The Proposed Development consists of a Sports Pavilion including social spaces, changing facilities and equipment stores.

Proposed Energy Strategy

The energy strategy has been developed by following the national Energy Hierarchy of 'Lean, Clean, Green and Seen'. The chosen energy strategy includes Lean passive and active design measures and Green low and zero carbon (LZC) technologies to reduce the global warming potential (GWP) and CO₂e emissions as far as practical and viable in line with *Building Regulations 2021 Part L V2*.

The proposed energy strategy for the development is summarised below:

- Heating Source: Underfloor via high efficiency gas boiler for space heating.
- Building Fabrics: All thermal fabrics meet Building Regulation Part L standards, exceeding minimum requirements to reduce heating demand.
- Openings: Double glazed units with a glazing g-value of 0.50.
- Lighting Services: 100% LED lighting with average efficacies of 120 lm/W.
- Lighting Controls: Passive Infrared (PIR) automatic control throughout and daylight dimming controls for all daylight spaces.
- Hot Water Services: High-efficiency gas-fired domestic hot water (HW) system for main Shower areas and electric instantaneous hot water for all other spaces.
- Ventilation: Mechanical Ventilation with Heat Recovery for Pitch Changing and associated Shower areas. Zonal extracts for kitchen, WCs, Baby Change and Accessible Changing Area.
- Photovoltaic System: 36 kWp roof-mounted photovoltaic (PV) solar array.
- Waste Water Heat Recovery Systems (WWHRS) connected to all pitch showers.

A number of LZC technologies have been reviewed and assessed in support of the energy strategy to determine the most suitable and cost-effective solutions to reduce CO₂e emissions and integrate LZC technologies that comply with the Horsham District Council policy requirements and 2021 Building Regulations standards.

The Proposed Development is designed to achieve an A-rated energy performance certificate (EPC) with an overall **25.18%** improvement over Baseline CO₂e emissions through the use of a combination of passive and active design measures and LZC technologies in line with Horsham District Council policy requirements, as shown in Table 1.

Table 1 and Figure 1 show site CO₂e emission improvements in line with the Energy Hierarchy.

Site-Wide	CO ₂ e emissions (t/yr)	Improvement over Baseline (%)
Baseline	47.2	-
Lean	36.3	23.16
Clean	36.3	23.16
Green	35.3	25.18

Table 1 – Summary of regulated site-wide CO₂e savings

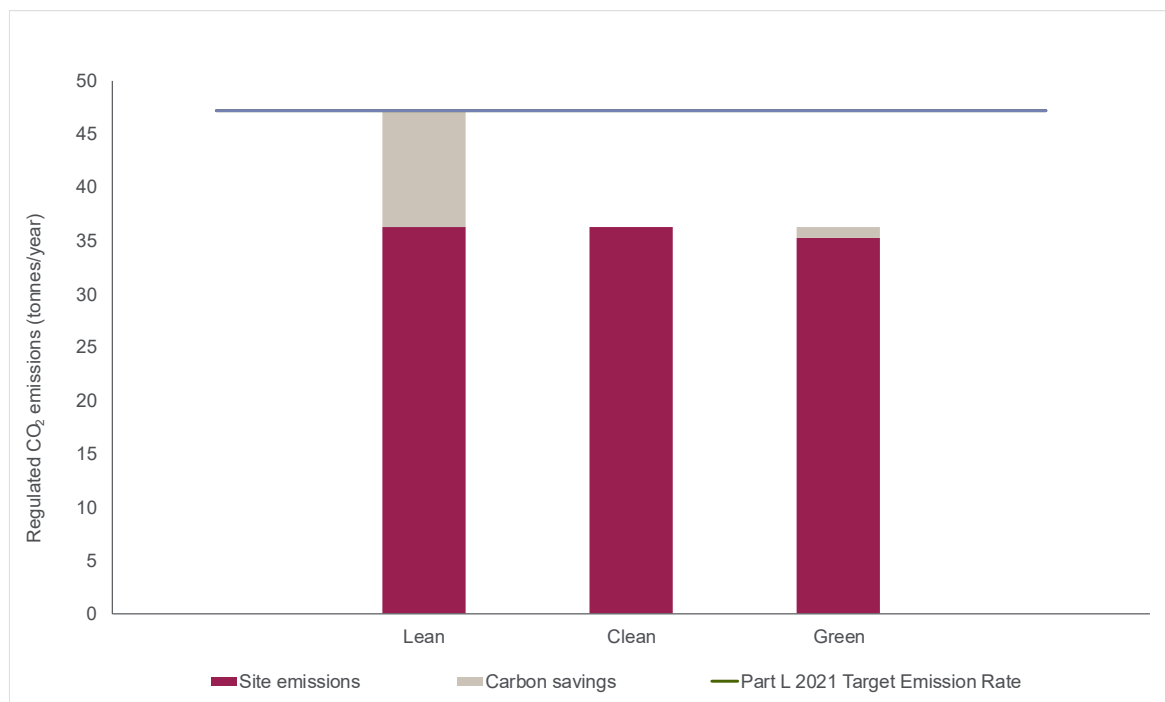


Figure 1 - Energy Hierarchy site-wide CO₂e emissions reduction graph.

The background of the slide is a microscopic image of plant tissue. The upper portion shows a layer of cells with irregular, hexagonal shapes, typical of an epidermis. Below this, the cells transition into a more organized, grid-like pattern of rectangular cells, characteristic of the mesophyll tissue. The overall color is a light, warm beige.

Introduction

1.0 Introduction

This Energy Statement has been written by SRE for Legal and General (Strategic Land North Horsham) Ltd (the Client), to demonstrate the measures incorporated into the design of the new Sports Pavilion at Mowbray, Land North of Horsham (the Proposed Development). SRE's input will support and inform the planning application to Horsham District Council.

The scope of the report covers the following aspects of the Energy assessment:

- Examine the energy strategy proposed by the design team and the feasibility of concept energy measures for the Proposed Development.
- Part L Pre-assessment for building services and proposed building fabric and addressing planning/potential Building Control requirements.
- Analytical review of the passive design measures considered at RIBA Stage 2 Development of Concept Design.

The statement compares the predicted actual building energy requirement with a Building Regulations compliant design, outlines passive and active design measures, and assesses the suitability of low and zero carbon (LZC) technologies specific to this site to address the relevant planning policy requirements.

All results described herein are based on the output from Integrated Environment Solutions Virtual Environment (IES VE) 2025, but these conditions cannot be guaranteed to be an indication of the final situation. The results herein are to be read in the context of Part L compliance purposes only and should not be used for design sizing or any other purpose.

It is important to note that with any modelling exercise, there are assumptions and approximations that must be made. Details of assumptions made, and approximations used are provided as part of the report. All results and strategies are directly affected by the inputs listed in this document; any deviation from these may produce different results.

1.1 Proposed Development

In March 2018 planning permission (reference DC/16/1677) was granted for a site north of Horsham (known as the 'Land North of Horsham') for:

"A mixed-use strategic development to include housing (up to 2,750 dwellings), business park (up to 46,450m²), retail, community centre, leisure facilities, education facilities, public open spaces, landscaping and related infrastructure".

Reserved matters approval (DC/22/1026) has been approved for the new sports hub:

"Reserved Matters Application for the provision of a Sports Hub including access, a substation, landscaping, foot/cycle paths, car and cycle parking, and drainage basins, realignment of Chennells Brooks and a foul pump station".

The Proposed Development addressed in this report consists of a new Sports Pavilion comprising of social spaces, kitchen, changing facilities, showers, toilets and equipment stores.

The Proposed Development will be located on greenfield land to the east of Rusper Road and to the south of the Bohunt Horsham primary and secondary school. The Pavilion is located

centrally within the Sports Hub with sports pitches directly to the north, a skate park to the west and car parking to the south. The site plan of the Proposed Development is presented in Figure 2.

Please refer to Appendix A for further architectural drawings of the Proposed Development.

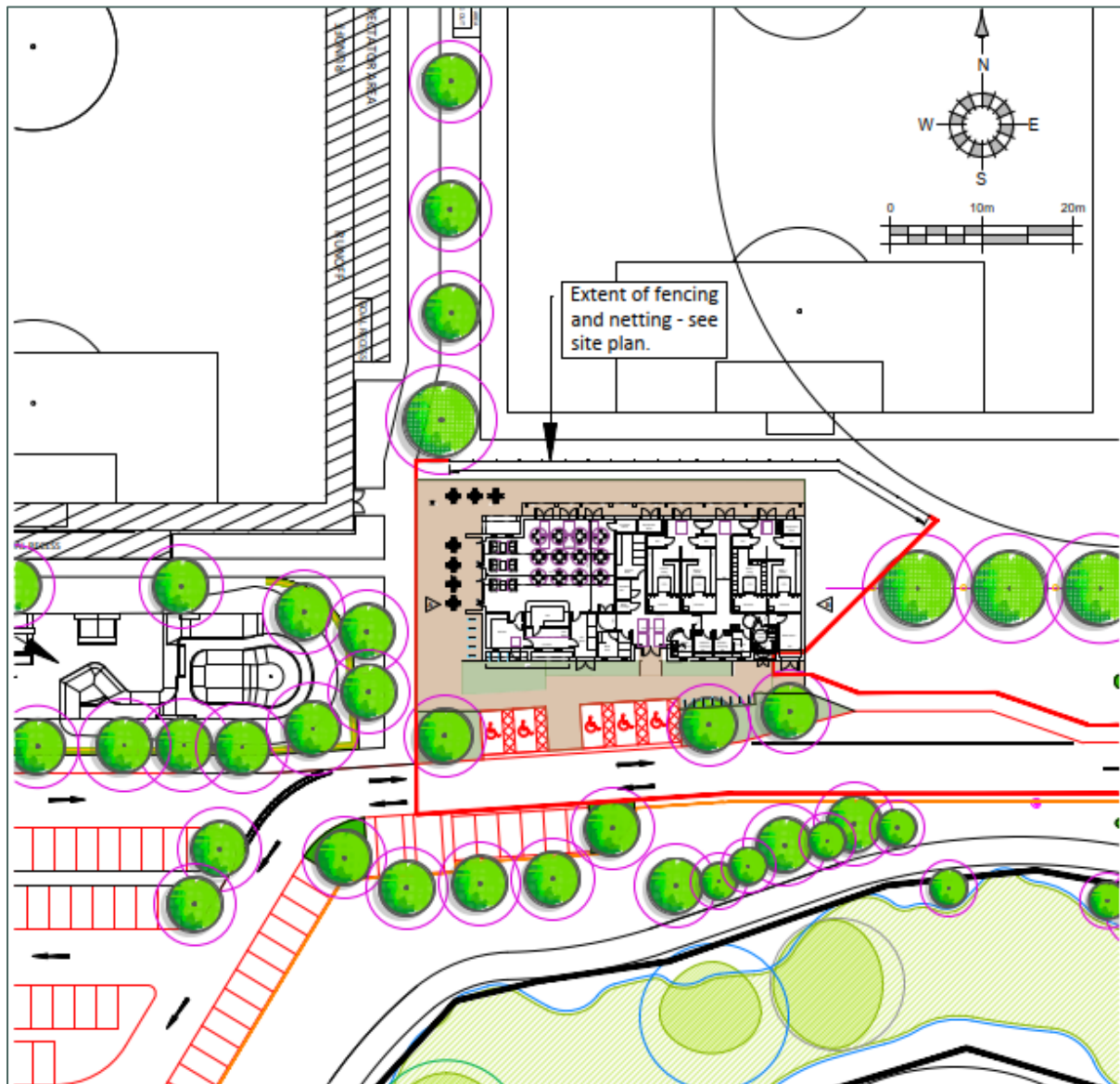


Figure 2 - Site plan of the Proposed Development (OSP Architecture)

1.2 Planning Policies

The planning policy requirements relevant to the Proposed Development has been reviewed with reference to the *Horsham District Planning Framework (excluding South Downs National Park) November 2015 and the Horsham District Local Plan 2023-2040 Regulation 19 (January 2024)*.

A summary of the planning policies are outlined in Table 2.

Planning Policy	Requirement
Horsham District Planning Framework (excluding South Downs National Park) November 2015	<u>Policy 35: Climate Change</u> Development will be supported where it makes a clear contribution to mitigating and adapting to the impacts of climate change and to meeting the district's carbon reduction targets as set out in the Council's Acting Together on Climate Change Strategy, 2009. Measures which should be used to mitigate the effects of climate change include; • Reduced energy use in construction; • Improved energy efficiency in new developments, including influencing the behaviour of occupants to reduce energy use; and • The use of decentralised, renewable and low carbon energy supply systems. • The use of patterns of development which reduce the need to travel, encourage walking and cycling and include good accessibility to public transport and other forms of sustainable transport; and • Measures which reduce the amount of biodegradable waste sent to landfill. Development must be designed so that it can adapt to the impacts of climate change, reducing vulnerability, particularly in terms of flood risk, water supply and changes to the district's landscape. Developments should adapt to climate change using the following measures: 1) Provision of appropriate flood storage capacity in new building development; 2) Use of green infrastructure and dual use SuDS to help absorb heat, reduce surface water runoff, provide flood storage capacity and assist habitat migration; 3) Use of measures which promote the conservation of water and/or grey water recycling; and 4) Use of site layout, design measures and construction techniques that provide resilience to climate change (opportunities for natural ventilation and solar gain). If it is not possible to incorporate the adaption and mitigation measures proposed, an explanation should be provided as to why this is the case.

Planning Policy	Requirement
	<u>Policy 36: Appropriate Energy Use – Energy Hierarchy</u> All developments will be required to contribute to clean, efficient energy in Horsham based on the following hierarchy: 1. Lean – use less energy – e.g. through demand reduction 2. Clean – supply energy efficiently – e.g. through heat networks 3. Green – use renewable energy sources. <u>Policy 36: Appropriate Energy Use – District Heating and Cooling</u> Commercial and residential developments in Heat Priority Areas or the strategic development locations will be expected to connect to district heating networks where they exist using the following hierarchy or incorporate the necessary infrastructure for connection to future network. Development should demonstrate that the heating and cooling systems have been selected in accordance with the following heating and cooling hierarchy. 1. Connection to existing (C)CHP distribution networks 2. Site wide renewable (C)CHP 3. Site wide gas-fired (C)CHP 4. Site wide renewable community heating/cooling 5. Site wide gas-fired community heating/cooling 6. Individual building renewable heating 7. Individual building heating, with the exception of electric heating All (C)CHP must be of a scale and operated to maximise the potential for carbon reduction. Where site-wide (C)CHP is proposed, consideration must be given to extending the network to adjacent sites.
	<u>Policy 37: Sustainable Construction</u> Proposals must seek to improve the sustainability of development. To deliver sustainable design, development should incorporate the following measures where appropriate according to the type of development and location: • Maximise energy efficiency and integrate the use of decentralised, renewable and low carbon energy; • Limit water use to 110 litres/person/day; • Use design measures to minimise vulnerability to flooding and heatwave events; • Be designed to encourage the use of natural lighting and ventilation;

Planning Policy	Requirement
	• Be designed to encourage walking, cycling, cycle storage and accessibility to sustainable forms of transport; • Minimise construction and demolition waste and utilise recycled and low-impact materials; • Be flexible to allow future modification of use or layout, facilitating future adaptation, refurbishment and retrofitting; • Incorporate measures which enhance the biodiversity value of development. All new development will be required to provide satisfactory arrangements for the storage of refuse and recyclable materials as an integral part of design.
Horsham District Local Plan 2023- 2040 Regulation 19 January 2024 (Emerging)	<u>Policy 6: Climate Change – Carbon Reduction</u> Development proposals will only be supported where they include measures which contribute to achieving net zero carbon emissions across the District by 2050 at the latest. The Council will be supportive of a range of measures to achieve this target, including but not limited to: • Design which incorporates high standards of energy efficiency including optimal levels of thermal insulation, ventilation and cooling and passive solar design; • The use of renewable and low carbon energy supply systems and connection to renewable and low carbon heat networks; • The efficient use of natural resources used in new buildings to reduce the environmental impacts of construction; • Design that influences the behaviour of occupants to reduce energy use; • Using patterns of development and providing sustainable transport infrastructure which reduce the need to travel, encourage walking and cycling and include good accessibility to public transport and other forms of sustainable transport and ensure residents have access to services and facilities that are within walking distance; • Reduce whole life carbon emissions by retaining and reusing existing buildings, components or materials, including on-site where possible. <u>Policy 6: Climate Change – Adaptation</u> Development will only be supported if it includes site and building level measures to adapt to the future impacts of climate change and reduce vulnerability, particularly in terms of the comfort, health and wellbeing of current and future occupiers. Flood risk, water supply, overheating and changes to the District's landscape

Planning Policy	Requirement
	should also be considered. Measures should include but are not limited to: • Use of site and interior building layout: new buildings should be orientated to maximise the opportunities for both natural heating and ventilation and to reduce the exposure to wind and other elements, and the potential for overheating; • The conservation of water supplies to minimise the risk and impact of drought and flooding; • The use of green/blue infrastructure and dual use Sustainable Drainage Systems (SuDS) to provide multifunctional benefits such as helping to absorb heat, reduce surface water runoff, provide flood storage capacity and assist habitat migration; and • Moderating external temperatures through the use of green walls and roofs, tree planting or other nature-based solutions and landscaping for shade and drainage design. Development will be supported providing it avoids responses to climate impacts which lead to increases in energy use and carbon dioxide emissions. In considering the likely impact of climate change over the lifetime of the development reference should be made to the most recent climate change projections. <u>Policy 6: Climate Change – Sustainability Statement</u> Development will be supported provided a Sustainability Statement is submitted which demonstrates how the development has taken measures to mitigate and adapt to the effects of climate change.
	<u>Policy 7: Appropriate Energy Use – Energy Hierarchy</u> Development will be supported provided that it contributes to clean, efficient energy in Horsham based on the following cascade: • Be Lean – use less energy – for example, by minimising energy demand through energy efficiency measures such as fabric performance and passive design; • Be Clean – supply energy efficiently and exploit local energy resources such as secondary heat and district energy networks where available. Preference must be given to technologies with greater efficiencies and fuels with lower carbon emissions to achieve the highest total lifecycle carbon emission savings, in accordance with Part 2 of this policy;

Planning Policy	Requirement
	• Be Green – maximise the use of renewable energy sources. • Be Seen – monitor, verify and report on energy performance. <u>Policy 7: Appropriate Energy Use – Zero and Low Carbon Heating</u> Development proposals must demonstrate how they will provide zero and low carbon heating in accordance with the following hierarchy. Evidence must be provided that opportunities to meet each level of the hierarchy have been exhausted before cascading to the next level: a) Connect to local existing or planned heat networks, in combination with on-site renewable energy generation; b) Maximise use of on-site renewable energy generation; c) Use of the optimum means of low or zero-carbon heat supply is demonstrated, based on the in order of preference below: i. Use of waste heat sources; ii. Electrically-driven ground, water or air source heat pumps; iii. Direct Electric Heating. <i>Where a local heat network is planned but not yet in existence or connection is not currently viable, but may become viable in the future, the development should be designed to allow for the cost-effective connection and supply at a later date. In this case the heat should be supplied according to steps b and c of the above hierarchy.</i> <i>Electric heat pumps and direct electric heating are assumed to become zero-carbon when the national grid decarbonises.</i> <u>Policy 7: Appropriate Energy Use – Energy Statements</u> Residential or commercial development will be supported provided that it includes an Energy Statement, (which may be incorporated into the Sustainability Statement), demonstrating how compliance with this policy has been achieved. <u>Policy 7: Appropriate Energy Use – Renewable Energy Schemes</u>

Planning Policy	Requirement
	Stand-alone renewable energy schemes will be supported where they do not conflict with other policies in this Plan. Renewable and low carbon energy generation developments that are led by, or meet the needs of, local communities will carry significant weight.
	<u>Policy 8: Sustainable Design and Construction</u> Development will be supported where it is demonstrated that sustainable design, including its construction and operation, is integrated into the development from the design stage onwards. To deliver sustainable design, development will only be supported where it meets all of the following requirements that are relevant: a) New-build homes to deliver, as a minimum, carbon emissions reduction as set out in the 2021 Edition (or any future update) of the 2010 Building Regulations (Part L); b) New non-domestic buildings to achieve a BREEAM rating of 'Excellent', unless it can be demonstrated that this would make the scheme unviable; c) Incorporate a Fabric First Approach, maximising the performance of the components and materials that form the building fabric itself, before consideration of the use of mechanical or electrical building service systems; d) Minimise construction and demolition waste, utilise recycled and low-impact materials and incorporate measures that reduce the amount of biodegradable waste sent to landfill; e) Be designed flexibly to enable future modification of use or layout, facilitating future adaption, refurbishment and retrofitting; f) Include the provision of gigabit capable broadband access and enable provision of future communication technologies. Where permission is required to retrofit energy efficiency measures into existing development, schemes will be supported in principle. Development that involves the retrofitting of an existing historic building (heritage asset) will be supported provided that the following criteria are met: a) It does not result in detriment to the significance of the asset or damage to its fabric; b) A whole building approach to improving energy efficiency is taken as advocated by Historic England; c) Micro-renewable technologies do not result in harm to the heritage asset or their setting; d) Where the proposal involves major development, it is demonstrated that opportunities for the retention and

Planning Policy	Requirement
	retrofitting of existing historic buildings within the site boundary have been included within the scheme. In order to demonstrate compliance, proposals should be accompanied by a Sustainability Statement to demonstrate how these measures will be incorporated into development design.

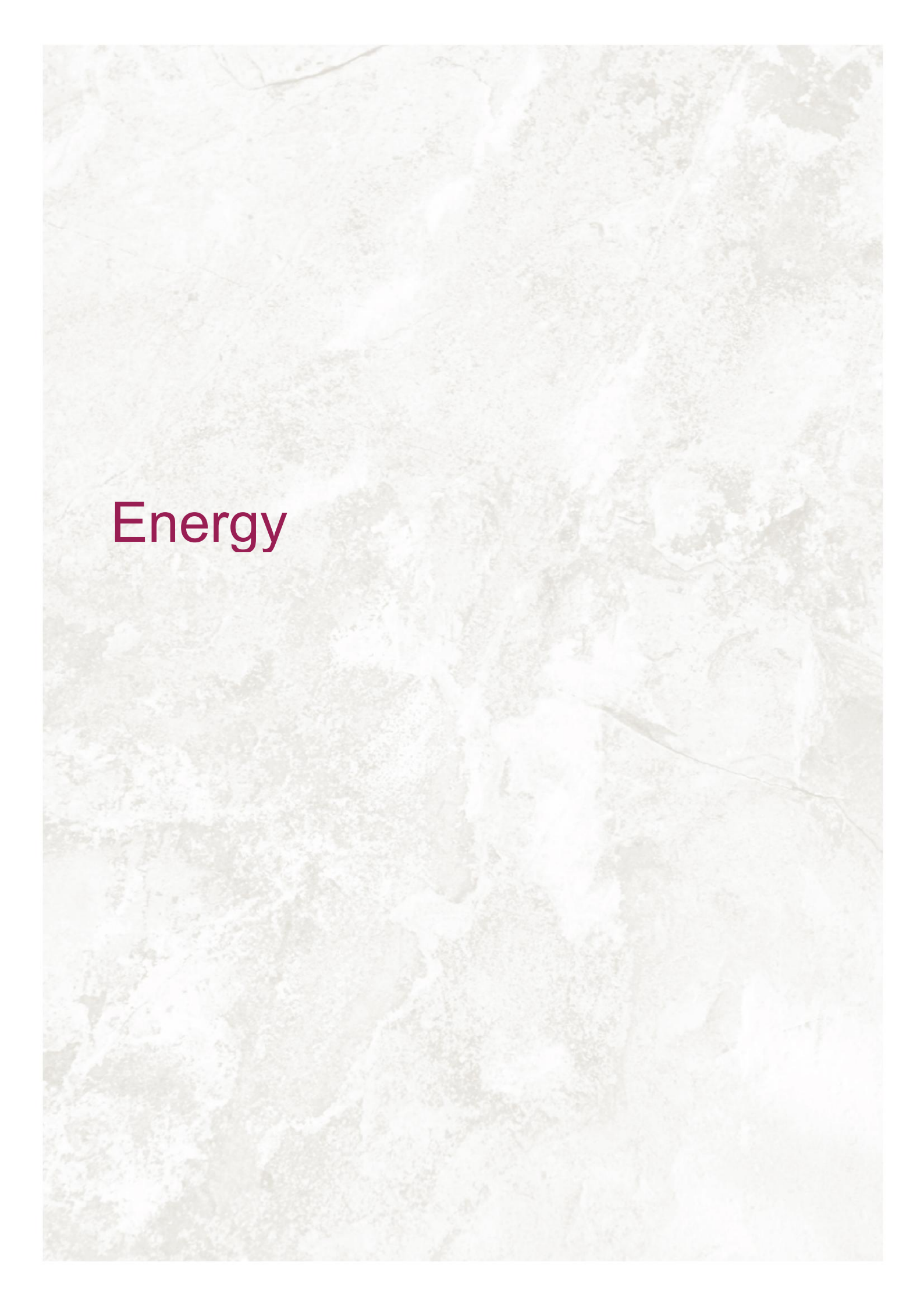
Table 2 – Summary of local planning policy requirements

1.3 Applicability to Proposed Development

In accordance with the existing Horsham District Council Planning Framework 2015 policy requirements, the following standards are proposed to be met for the Proposed Development:

- Follow the national Energy Hierarchy - Lean, Clean, Green and Seen.
- Incorporate passive design principles.
- The use of technologies to influence occupants minimising resource usage.
- Demonstration of emissions rate (ER), primary energy rating (PER) and fabric energy efficiency (FEE) over Building Regulations.
- Design heating and cooling system design in accordance with the policy hierarchy outlined in Policy 36 of the existing Horsham District Planning Framework. This includes consideration for district and/or communal heating systems where they exist or futureproofing for later infrastructure development.

Although the emerging Horsham District Local Plan 2023-2040 is still in the review stage, and therefore carries very limited weight, the Proposed Development will aim to incorporate the Fabric First Approach and strive to minimize the carbon emissions during construction and operation to contribute to achieving net zero carbon emissions across the District by 2050.

The background of the entire page is a light beige or cream-colored paper with a marbled texture. The marbling consists of irregular, swirling patterns of slightly darker beige and light tan colors, creating a subtle, organic look. The texture appears slightly grainy, typical of old or handmade paper.

Energy

2.0 Energy

2.1 Method

The energy strategy design follows national policy guidance¹ and seeks to be Lean, Clean, Green, and Seen, as shown in Figure 3.

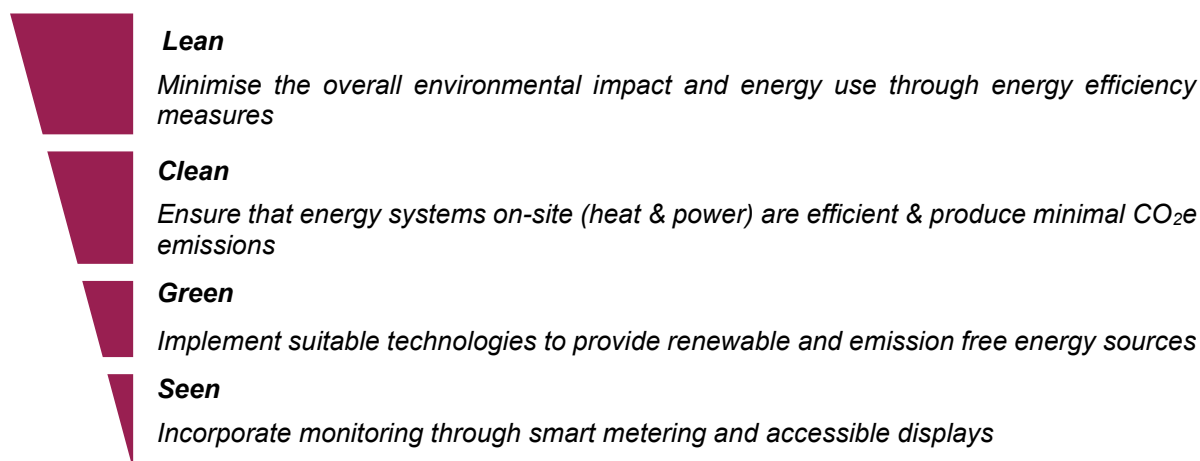


Figure 3 - The Energy Hierarchy

The CO₂e Conversion Factors shown in Table 3 are from the new 2021 Building Regulations. However, within the IES VE 2025 dynamic modelling, the CO₂e conversion factor for electricity varies over the course of the year due to the changing mix of inputs to the electricity grid, i.e., increased PV generation in the summer months.

Energy Source	CO ₂ e Conversion Factor (kgCO ₂ e/kWh)
Electricity (mains)	0.136 ²
Electricity (offset)	-0.136 ²
Gas (mains)	0.210

Table 3 – CO₂e conversion factors by energy source

The Proposed Development was assessed under Building Regulations 2021 Part LV2 using Dynamic Simulation Model (IES VE 2025 Compliance), under the building use class as outlined below:

¹ [Energy Assessment Guidance 2022](#)

² This value is not directly used but rather represents the average of the month-to-month values used.

- D2: General assembly and Leisure (Sports Centre)

The Target Emission Rate (TER) from the Lean scenario provides the energy baseline and is the exact size and shape of the Proposed Development. The Baseline uses notional U-values and heating specifications outlined in the *2021 Building Regulations Approved Document Part L*. The Baseline CO₂e emissions are shown in Table 4.

Energy Hierarchy Category	CO ₂ e emissions (t/yr)
Baseline	47.2

Table 4 – Baseline values for CO₂e emissions

2.2 LEAN – Demand Reduction

Through passive and active design measures, the Proposed Development can achieve the following carbon reduction and meet the Fabric Energy Efficiency (FEE) requirements in *2021 Building Regulations Approved Document Part L V1 and V2* as shown in Table 5. All the systems within the LEAN model have been modelled with the notional system specifications in line with the Part L 2021 and the Energy Assessment Guidance 2022 FAQ Document, along with WWHR for the pitch showers.

Energy Hierarchy Category	Sitewide Average CO ₂ e emissions (t/yr)	Sitewide Improvement (%)
Baseline	47.2	
Lean	36.3	23.16

Table 5 - Lean CO₂e emissions and improvement over Baseline

2.2.1 Passive Design Measures

Passive design measures have been enhanced where possible throughout the site to maximise building efficiency within the confines of the site constraints and budget requirements. This section presents a detailed outline of the passive design measures considered in the design.

Building Envelope

The Proposed Development follows a fabric-first approach, creating a high-performance building envelope. The exact construction method is yet to be determined but is likely to be traditional cavity brick construction with a filled cavity. A fabric-first approach will ensure high levels of insulation throughout the external elements, with a high air tightness, aiming to reduce heat loss through infiltration.

The U-values proposed are provided in Table 6 and will meet and exceed Building Regulations Part L V2 requirements and further details are outlined in the summary specification sheet in Appendix B.

Element	Notional Compliance (W/m ² K)	Proposed (W/m ² K)
Ground Floor	0.18	0.10
External Walls	0.26	0.14
Pitched Roof	0.16	0.10
Windows	1.60	1.20 (G-value = 0.50)
Glazed Doors	1.60	1.60 (G-value = 0.50)
Rooflights	2.2	1.20 (G-value = 0.50)
Solid Doors	1.60	1.6
Air Tightness @ 50 N/m ²	8 (m ³ /hr/m ²)	5 (m ³ /hr/m ²)

Table 6 – Fabric energy efficiencies for conditioned spaces

The high-quality design of the Proposed Development will help reduce the overall energy demand of the building, thus reducing the associated CO₂e emissions and the operational costs to the building occupants.

Building Fenestration

The fenestration design maximises natural daylight and passive solar gains while limiting overheating. Glazed areas have been strategically located to maximise passive solar benefits and daylight availability, supported by an integrated shading strategy to mitigate overheating risk. Shading is achieved through a combination of overhanging eaves and the building's architectural form.

High-performance double glazing with a low glazing g-value of 0.5 has been specified to ensure a balanced thermal performance, managing solar heat gains during summer while retaining beneficial gains in winter.

Ventilation

Natural purge ventilation will be provided in the whole development through openable windows and doors, which will help address any potential overheating risks.

2.2.2 Active Design Measures

This section details the Active measures incorporated in the design. Details of the systems used in the modelling are specified in the specification sheet in Appendix B.

Heating and Hot water services

For this development, high efficiency gas fired boilers are proposed for space heating via underfloor and DHW for the main shower areas. Electric instantaneous water heaters are proposed for all other spaces. The 'Lean' scenario is in line with the 'notional' building specification in *2021 Building Regulations Approved Document Part L V2* and *Energy Assessment Guidance 2022*.

Lighting

The Proposed Development aims to utilise 100% LED lighting, with average efficacies of 120 lm/W, improving upon the requirements of *Building Regulations Part L V2*. External lighting, where installed, will also be energy efficient, and will be positioned to avoid excessive light pollution and be supported by PIR/daylight sensor and time controls to reduce operation times and subsequent energy use and emissions. Internal lighting will have PIR auto-on-off sensors in all areas and daylight dimming in daylight spaces.

Mechanical Ventilation

In modern air-tight buildings, careful consideration needs to be given to ensure moisture is removed and ventilation standards are met to ensure a healthy standard of internal air is maintained. A combination of passive and active measures has been used in the development for ventilation.

Ventilation to the Pitch Changing and Showers will be provided through a MVHR system with summer bypass. The MVHR systems will be coupled with natural ventilation through openable windows to provide additional ventilation and reduce the reliance on active strategies to mitigate the risk of overheating. This will also ensure high standards of air quality and moisture removal. Occupancy sensors will be incorporated to the MVHR system to maintain good ventilation levels.

Zonal mechanical extracts are proposed for the WC's, Kitchen, Baby Change and Accessible Changing.

Wastewater Heat Recovery System

The Proposed Development will have a significant hot water demand from the showers in the changing rooms. WWHR Systems are proposed to recover some of the heat held in the wastewater from showers and reduce the HW demand and associated CO₂e emissions. They rely on the wastewater flowing through a counter flow heat exchanger that pre-warms the cold water feed to a shower mixer, heating source or an unvented hot water cylinder.

A WWHR system with a minimum 35.2% efficiency has been proposed for the development.

2.2.3 Cooling

The cooling hierarchy has been used to ensure that passive building design has been optimised to reduce the cooling load for the Proposed Development, as shown in Table 7.

Cooling Hierarchy	Potential Design Measures
Minimising internal heat generation through energy efficient design	All primary pipework to be insulated, therefore low system losses. High efficacy low energy lighting throughout with minimal heat output. High specification hot water cylinder installed with low heat loss..
Reducing the amount of heat entering the building in summer	Low E glass windows and glazed doors with low g-values to minimise solar gain. All external walls are to be well insulated with a high level of air tightness to reduce heat entering the building.
Use of thermal mass and high ceilings to manage the heat within the building	The impact of thermal massing from the envelope is expected to help ensure temperature mediation due to thermal lag.
Passive Ventilation	Openable doors to the social space will provide purge ventilation.
Mechanical Ventilation	Mechanical Ventilation with Heat Recovery (MVHR) with summer bypass is proposed in the building which will reduce overheating potential.
Active Cooling	Active cooling is not proposed for this development.

Table 7 – Design measures following the Cooling Hierarchy

2.3 CLEAN – Heating Infrastructure

In accordance with Policy 36 of the Horsham District Planning Framework, the first priority for heating and cooling systems is connection to existing combined heat and power (CHP) district networks particularly in heat priority areas, followed by using a site-wide heating and cooling system.

The design decisions surrounding the heating and power of the Proposed Development have been determined in accordance with Policy 36 as shown in Table 7.

Policy 36 CHP Hierarchy	Potential Design Measures
Connection to existing CHP distribution networks	This is not a possibility due to a lack of existing CHP infrastructure in the area.
Site wide renewable or gas-fired CHPs	A site wide CHP system is not deemed optimally compatible given the development scale, space requirements for a plant room and building management requisite implications.
Site wide renewable or gas-fired heating/cooling	This is deemed the most suitable heating methodology for the development offering the ability to connect to future district heating networks. Several heating technologies have been considered and are discussed in Appendix C, with a gas-fired site-wide system proposed.
Individual building renewable heating	Not applicable as a higher-priority system already implemented.
Individual building heating, with the exception of electric heating	Not applicable as a higher-priority system already implemented.

Table 8 – Design measures following the proposed heating and power hierarchy

In summary, a site-wide gas fired heating system has been proposed. Gas heating has been selected in order to not overload and require extensive upgrade to the electrical infrastructure of the area. Site-wide has been chosen as it offers superior performance over use of multiple systems each sized and linked to the different spaces and their occupancies within the Proposed Development.

2.4 GREEN – Low Carbon and Renewable Energy

The addition of Green technologies can provide a significant reduction in CO₂e emissions and Primary Energy Rate (PER). A number of LZC technologies have been reviewed and assessed in support of the energy strategy and are outlined in this section. A summary of the unfeasible technologies for this scheme is provided in Appendix C.

Photovoltaic panels have been proposed to reduce CO₂e emissions in line with Horsham District Council planning policy. The addition of 'Green' technologies can provide a significant reduction in CO₂e emissions, as shown Table 9.

Scenario	CO ₂ e emissions (t/yr)	Improvement (%)
Baseline	47.2	-
Green	35.3	25.18

Table 9 – Green CO₂e emissions and improvement over Baseline

2.4.1 Photovoltaics

PV panels convert energy from daylight into direct (DC) electrical current that is then converted to alternating electrical current (AC) via an inverter, or a series of inverters subject to the size of the array. The panels are generally roof mounted and provide electrical generation which can either be utilised directly on-site (or nearby) by lighting and other electrical equipment, stored in batteries, or exported back to the National Grid.

Noise will not be an issue – A PV system does not feature moving parts and is silent during operation.

The installation of PV is proposed in order to offset electrical demand within the Proposed Development, with any excess being fed back into the electrical grid.

The current proposal is to maximise the PV on the south-facing pitched roof. While a wide range of panel sizes is available on the market, these typically share a common normalised output. Therefore, the calculation has been based on a 450Wp (circa 2.0m² in area) of monocrystalline PV panel with a nominal efficiency of 22.5%. Refer to Table 10 for the summary of the proposed PV array.

Proposed Array (kWp)	Active Area (m ²)	Approximate no. Panels (Assuming 450Wp)	Pitch (degrees)	Orientation
36	160	80	35	South

Table 10 – Proposed PV Array Summary

Please refer to the SBEM specification sheet within the Appendix B for more information.

2.5 Energy Conclusion

The Proposed Development will deliver energy demand reduction measures along with LZC technologies in order to reduce energy demand and associated CO₂e emissions resulting from the Proposed Development's operation.

The energy strategy has been developed by following the national Energy Hierarchy of Lean, Clean, Green and Seen. The chosen energy strategy includes Lean passive and active design measures and Green LZC technologies, as shown below:

- Heating Source: Underfloor via high efficiency gas boiler for space heating.
- Building Fabrics: All thermal fabrics meet Building Regulation Part L standards, exceeding minimum requirements to reduce heating demand.
- Openings: Double glazed units with a glazing g-value of 0.50.
- Lighting Services: 100% LED lighting with average efficacies of 120 lm/W.
- Lighting Controls: PIR automatic control throughout and daylight dimming controls for all daylit spaces.
- Hot Water Services: High-efficiency gas-fired domestic hot water system for Pitch Changing Shower areas and electric instantaneous hot water for all other spaces.
- Ventilation: Mechanical Ventilation with Heat Recovery for Pitch Changing and associated Shower areas. Zonal extracts for kitchen, WCs, Baby Change and Accessible Changing Area.
- Photovoltaic System: 36 kWp roof-mounted PV array.
- WWHRS connected to all showers

The calculations undertaken demonstrate that the Proposed Development will demonstrate an improvement over Building Regulations Part L V2 as shown in Table 11 and Figure 4.

Site-Wide	CO ₂ e emissions (t/yr)	Improvement over Baseline (%)
Baseline	47.2	-
Lean	36.3	23.16
Clean	36.3	23.16
Green	35.3	25.18

Table 11 – Summary of the site-wide CO₂e emissions and improvement over Baseline

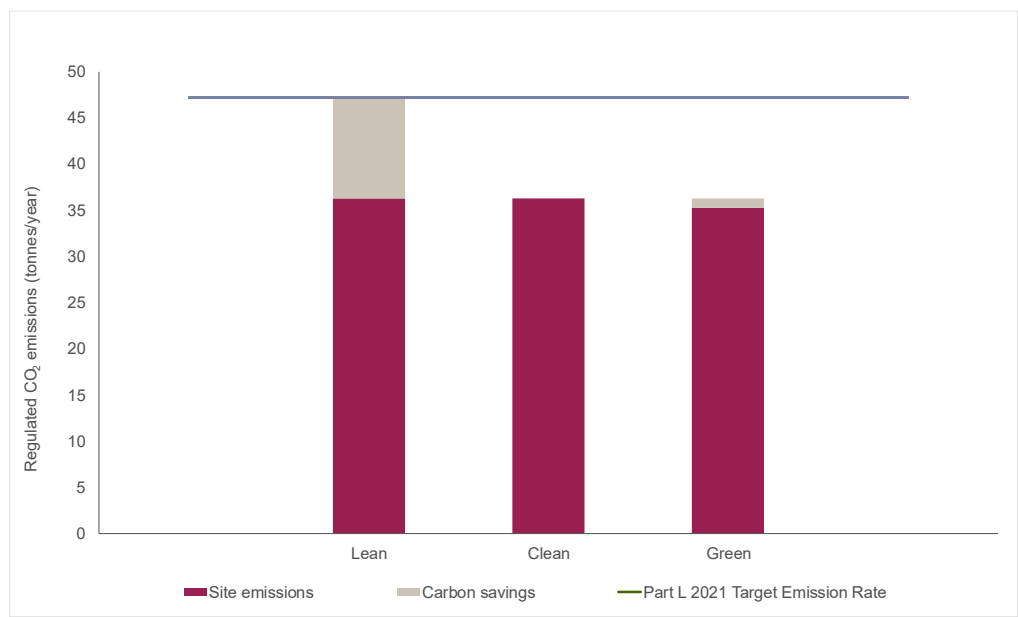


Figure 4 - Summary of regulated CO₂e savings

Appendices

Appendix A – Site Plan



Appendix B – Specification Sheets

Mowbray Sports Pavilion											sre	
Building Regulations 2021 L2A												
Building Type	Address			As-Designed/ As-Built Drawings	SEEW Level	EPC	BER	TER	Improvement (%)	SPER	TPER	Improvement (%)
D2: General Assembly and Leisure (Sports Centre)	Sports Pavilion, Mowbray, Horsham			Stage 1-3	5	A (21)	71.13	95.07	25.18%	586.51	542.61	23.77%
Construction Element	U-Value	Description										
Ground Floor	0.10	65mm Screed, 150mm Kooltherm K103 (Conductivity 0.019), Damp Proof Membrane, 100mm Concrete Beam and Block (As per Architect's Specification)										
External Wall	0.14	Outer Brickwork, 200mm Nirock Cavity Slab 032 (Conductivity 0.032), Inner Brickwork, 15mm Plasterboard (As per Architect's Specification)										
Pitched Roof - Rafter Insulation	0.10	Ties, 38mm Air Layer with Counter Battens, Breather Membrane, 150mm Kooltherm K107 (Conductivity 0.019) between Timber Rafters, 92.5mm Kooltherm K118 Insulated Plasterboard (Conductivity 0.019) (As per Architect's Specification)										
Pitched Roof - Ceiling Insulation	0.10	12mm Plasterboard, 150mm Knauf Loft Roll 44 (Conductivity 0.044), 300mm Knauf Loft Roll 44 (As per Architect's Specification)										
Internal Partition - Cold Roof	0.26	Insulated Plasterboard to meet the Proposed U value										
Construction Element	U-Value	G Value	Frame Factor	Description (manufacturer, make and model)								
External Window	1.20	6.5	10%	Double Glazed with Whole Window U-value								
Glazed Door	1.60	6.5	10%	Double Glazed with Whole Window U-value								
Rooflights	1.20	6.5	10%	Double Glazed with Whole Window U-value								
Solid Door	1.80	n/a	n/a	Solid Door								
Construction Notes	Description (manufacturer, make and model)											
Air-permeability	5 m³/m²/s											
Heating and Cooling	System Details			Emitter	Location			Controls				
Heating System	Gas Boiler with 95% efficiency			Underfloor	Heating throughout except: Plant Rooms, Store Rooms and Roof Void.			Local time and Temperature Control				
Hot Water	System Details			Secondary Circulation	Circulation Losses (W/m)	Pump Power (kW)	Loop Length (m)	Storage Tank (l)	Storage Losses (kWh/day)		Delivery Efficiency	
Domestic Hot Water System 1	Gas Boiler (SCOP 0.95) with Waste Water Heat Recovery (Modelled as Recoup Easyfit+ Type B - 35.2% Efficiency) (Pitch Changing Showers)			N	N/A	N/A	N/A	1250	0.004		0.95	
Domestic Hot Water System 2	Instantaneous Point of Use Hot Water (SCOP 1) (WCs, Kitchen, Baby Change and Accessible Changing)			N	N/A	N/A	N/A	N/A	N/A		N/A	
Mechanical Ventilation	System Details			Specific Fan Power (W/l/s)	Location		Heat Recovery	Heat Recovery efficiency (%)	Heat exchanger type		Variable Heat Recovery	
Mechanical Extract 1	Kitchen Extract			0.50	Kitchen		N	N/A	N/A		N/A	
Mechanical Extract 2	Zonal Extract Fan with Remote Fan			0.30	WCs, Kitchen, Baby Change and Accessible Changing		N	N/A	N/A		N/A	
Mechanical Ventilation	MVHR			1.10	Occupancy Sensor with Speed Control only in Pitch Changing and Associated Showers		Y	80.00%	Plate Heat Exchanger		N/A	
Electrical Flow Control	Description											
Power Correction Factor	N	<0.95										
Separate Metering	N	N/A										
Renewables	Description											
Photovoltaics	160 m² South Facing PV Array (2 m² per panel, 22.5% Module Efficacy, 35 Deg Inclination) - 36kWp											
Solar Water Heating	N											
Wind Turbine	N											
Lighting	Description											
Lighting	Efficacy 120 Lm/W, LOR 1.0											
Lighting Controls	PIR Sensors - Throughout, Daylight dimming - Daylit Spaces (Corridors to Pitch, Entrance Lobby, Social Space) - 0.1 W/m²											
Sign Off Details	Name	Alicha Pinheiro	Date	25.11.2025	By signing this document, I declare that the aforementioned details are all correct as per the final "as build" specifications:		Name			Date		
							Signature					

Appendix C – Unfeasible Low and Zero Carbon Technologies

Biomass Boiler

Biomass boilers generate heat from the burning of renewable or ‘waste’ fuels. They require a regular feed of fuel and regular heat demand to operate efficiently. A flue taller than the surrounding buildings must be incorporated into the design to minimise air pollution impacts at ground level from particulate emissions.

The use of a biomass boiler system to supply space heating and domestic hot water (DHW) has been deemed unsuitable due to the high level of particulates emitted from their use including particulate matter (PM) and nitrogen oxides. The use of such a biomass boiler would negatively impact the air quality of the surrounding area and open spaces notably the new secondary school and sports fields to the north of the site, skate to the west and surrounding residential development. While the Proposed Development is not within an Air Quality Management Areas (AQMAs), the Horsham Local Plan has declared the whole District an ‘Emission Reduction Area’ and emphasises that development should not give rise to unacceptable amounts of pollution³. Therefore, a biomass boiler has not been further considered at this site.

Wind Power

Wind power is a developed and productive method of renewable energy generation, however, the main limiting factor to its implementation is opposition at a local public and local government level. To generate a meaningful amount of electricity, large-scale turbines are required which have noise and visual impacts for the local area including the sports fields and school to the north of the site. Furthermore, the Proposed Development has specified an high-performing building fabric to reduce the heating demand, WWHR systems to reduce the DHW demand and the low-energy lighting along with daylight and PIR sensors which means that the electricity demand at the site will be low. Although the use of wind power has the potential to supply electricity at this site, it has been deemed unsuitable at this stage.

Solar Water Heating

Solar Water Heating (SWH) can be used to offset a proportion of the hot water (HW) demand within a building from the showers and social space. Solar thermal panels could be installed on the south-facing pitched roof however, PV panels rather than solar thermal panels are the preferred strategy for the Proposed Development as solar thermal panels rely on heat/temperature rather than light so don’t work as efficiently in the UK particularly in October to May. Furthermore, WWHR has been proposed in all the showers which will reduce the DHW demand by recovering heat from HW water that would otherwise be lost down the drain. This therefore will reduce the impact of SWH to offset the HW demand.

³ Horsham District Planning Framework (excluding South Downs National Park), November 2015

Heat Pumps

All Heat Pump (HP) systems consume electricity to operate. These systems are recognised as low carbon technology as they have an excellent Coefficient of Performance (CoP) resulting in high levels of heating output at a low rate of electricity consumption. The Coefficient of Performance (CoP) of the system is the ratio of electrical energy consumed, to heat energy emitted. Generally, a CoP of 3 or 4 can be achieved, meaning 3 or 4 units of thermal energy are produced for each unit of electricity consumed.

However, HP systems will only deliver low grade heat (up to ~50°C) efficiently, and therefore HP systems alone are generally relatively inefficient in providing hot water, as this requires additional electrical input (immersion or increased compressor use). It has been reported that for DHW the CoP drops on average to 2.06⁴. With DHW for showering a large part of the demand in the Proposed Development a HP will not operate at its maximum efficiency and instead the Proposed Development has focused on reducing the DHW demand through the use of WWHR systems in the showers.

Air Source Heat Pump (ASHP)

ASHPs efficiently extract energy from the external air and transfer it to internal air/water for heating. A variable refrigerant volume/flow ASHP has been considered to provide space heating and hot. However, the Proposed Development has a 69kVA electric supply and the installation of an ASHP would require an increase in capacity which will significantly increase the costs and, therefore, is not considered financially viable for the Proposed Development.

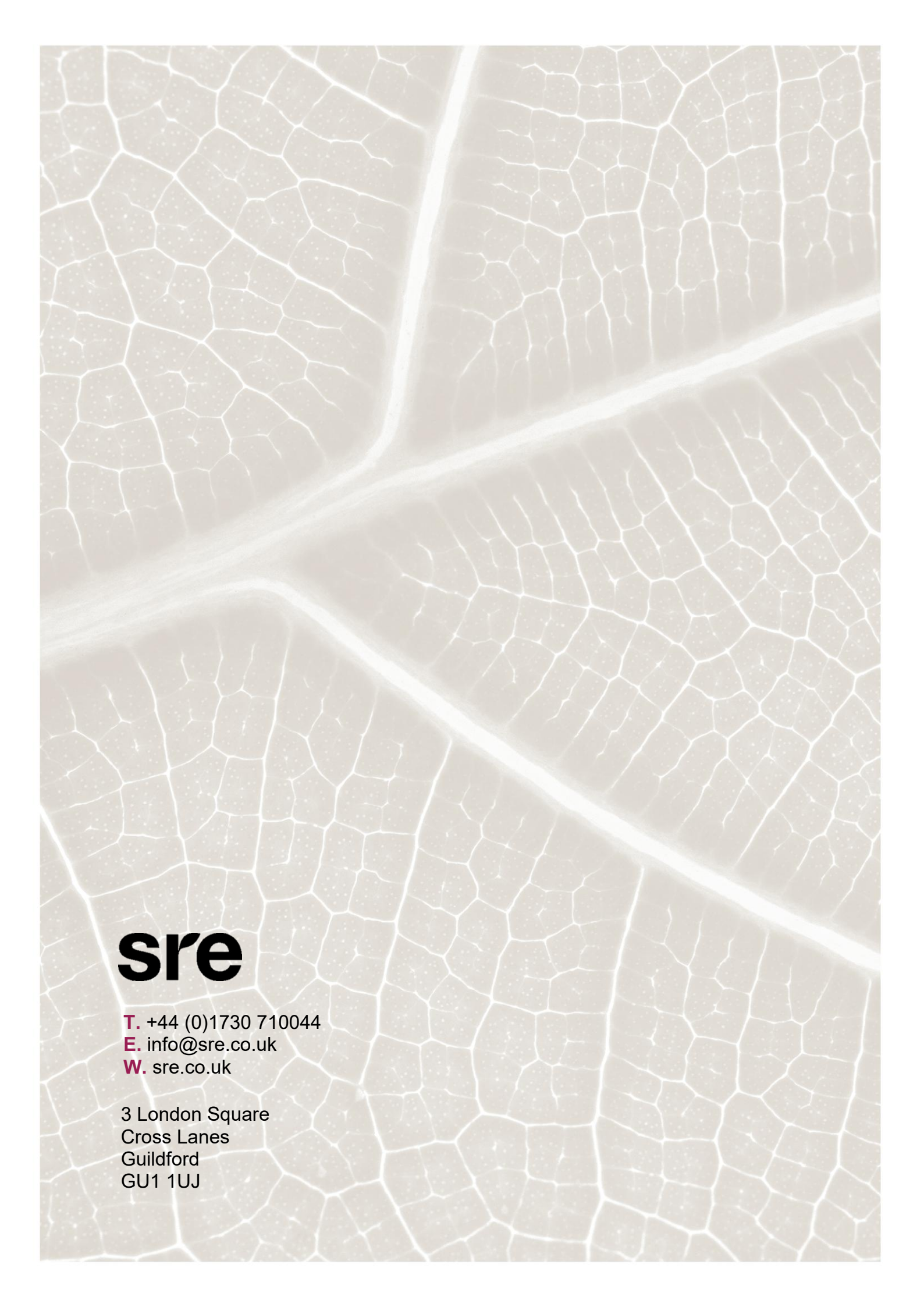
Ground Source Heat Pump (GSHP)

GSHP systems consume electricity in order to operate. Beyond 1m below ground level, an average temperature of 10°C is maintained throughout the year. Because of the ground's high thermal mass, it stores heat from the sun during the summer. GSHP can transfer this heat from the ground into a building to provide space heating by a similar process to an air source system.

Although GSHP can provide a greater efficiency performance than ASHP, it comes at a significantly higher capital cost, due to the extensive groundworks needed to install either 'slinky' ground loops or 50-100m deep boreholes.

Given the significantly higher capital costs of installing a GSHP system and the increased electrical capacity required, GSHPs are not considered to be financially viable for the Proposed Development.

⁴ UK Green Building Council (UKGBC), Building the Case for Net Zero, Sept 2020, p24

The background of the entire page is a grayscale, high-magnification microscopic image of plant tissue, likely a leaf. It shows a complex network of cells with prominent, thick cell walls forming a honeycomb-like pattern. Several larger, more elongated cells are visible, possibly representing vascular bundles or larger parenchyma cells. The overall texture is organic and detailed.

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