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Energy & Sustainability Statement

Ref: Z69776

2No. Dwellings

at

Woodside Grange,
Hassocks,
West Sussex,
BN6 8EX

for

Neil Pike Architects



Energy Counsel
Viridor House
No.3 Bolholt Terrace
Bury/Gtr Manchester
BL8 1PP
Tel: +44 (0)161-762 1055
Fax: +44 (0)161-761 1094
Matthew.Gibson@energycounsel.co.uk
www.energycounsel.co.uk

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Checked by:		Paul Ahern BEng (Hons) LCC OCDEA	19th August 2025
Approved by:		Matthew Gibson CEng CEnv BEng(Hons) MIET MEI SocEnv	19th August 2025

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Executive Summary

This Energy & Sustainability Statement has been developed in support of the planning application for the proposed 2No. new build apartments Woodside Grange, Hassocks. This Energy Statement will evaluate the technical and economic feasibility of using both passive and low and zero carbon technologies and will assess the practical levels of CO_2 reduction possible for this development to comply with the following Mid Sussex Council planning requirements:

- Mid Sussex District Plan 2014 – 2031
- Hassocks Parish Council Neighbourhood Plan
- National Planning Policy Framework (2025)

The following low and zero carbon technologies have been evaluated:

- Biomass
- Wind
- Biogas
- Air Source Heat Pumps & Exhaust Air Heat Pumps
- Geothermal
- Combined Heat & Power (CHP)
- Solar Hot Water
- Solar Photovoltaic

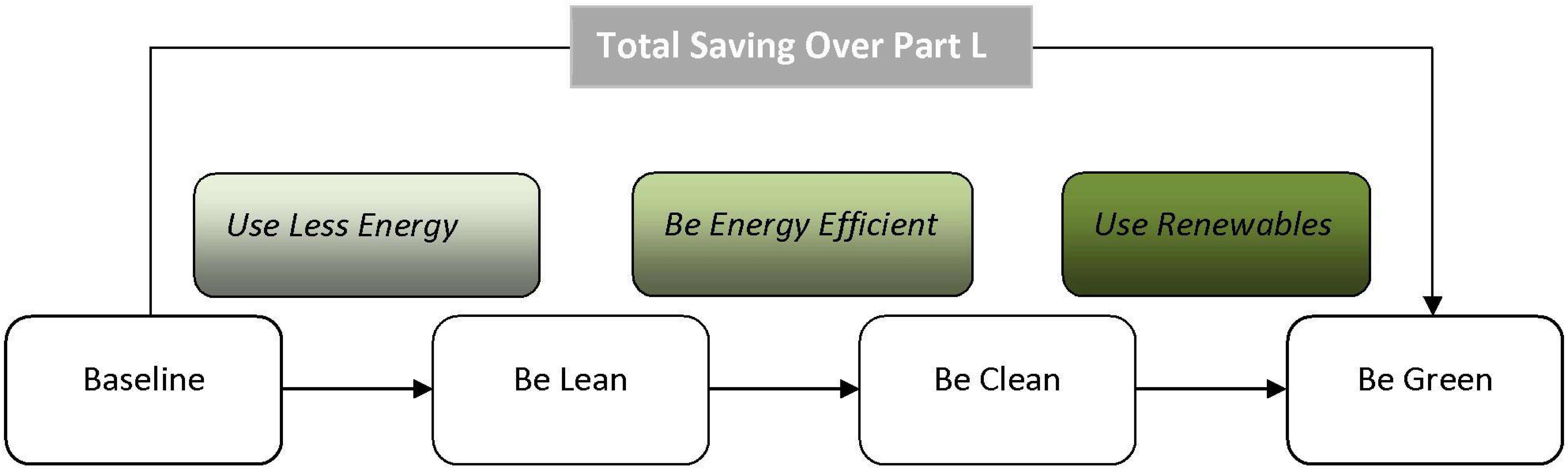
The approach for the development is to embed sustainability into the heart of the development through a range of design measures based on the 'Be Lean, Be Clean, Be Green' design hierarchy. Measures will include:

1. Enhanced building fabric to meet Building Regulation ADL1A 2021.
2. Enhanced air tightness and thermal bridging
3. All dwellings to have efficient mechanical extraction ventilation system (MEV)
4. Heating and hot water will be provided by highly efficient air source heat pumps
5. Efficient lighting strategy primarily using CFL or LED type fittings.

For the purpose of the assessment, we have evaluated the dwelling types in ADL1A 2021 (Standard Assessment Procedure SAP 10) to provide an accurate estimate of predicted energy consumption/CO_2 emissions.

Summary

The development has been provided with energy savings through the use of passive improvement measures such as improved energy efficiency. This passive approach to compliance will complement the integrated approach to the sustainable energy objectives of the national and local policies.



The principles of a Be Lean, Be Clean, Be Green design philosophy have been applied, which results in a 52.21% improvement and a 5.54% primary energy improvement over Building Regulations Part L1A 2021, as indicated in Table 1. A full design specification that confirms inputs used within the SAP calculations is provided within the Appendices of this report.

Table 1 - Proposed development emissions against Building Regulations Part L1A 2021

	Total CO_2 Emissions ($kgCO_2$/yr)	Total Primary Energy (kWh/yr)
Target Dwelling Performance	**7,709**	**40,813**
Proposed Dwelling Performance	**3,684**	**38,553**
Total Reduction	**4,025**	**2,260**
Percentage Improvement (above ADL1 2021)	**52.21%**	**5.54%**

1. Introduction

The proposed new build development is for 2No. dwellings at Woodside Grange Hassocks, West Sussex. The dwellings will be assessed under Building Regulations Approved Document Part L1A (2021).

Supporting information is provided within this report for the proposed energy strategy to be considered on site in accordance with the following planning policies:

- Mid Sussex District Plan 2014 – 2031
- Hassocks Parish Council Neighbourhood Plan
- National Planning Policy Framework (2025)

Throughout this report, passive design techniques, energy efficient equipment and appropriate low carbon technologies will be appraised in line with the 'Be Lean, Be Clean, Be Green' philosophy of relevant planning documents and the Energy Hierarchy.

An assessment of CO_2 emissions will be made based on the calculation methodology dictated by the Standard Assessment Procedure (SAP) and in line with the requirements of Mid Sussex planning policy.

1.1. Location

The area of land for the proposed development at Woodside Grange, Hassocks is highlighted by the red line boundary shown in the image below.

Figure 1 - Location and surrounding area of proposed residential development

The site is to be accessed by a private road off Oak Tree Drive. The area surrounding the proposed site is rural, with housing estates off Oak Tree Drive to the south of the development.

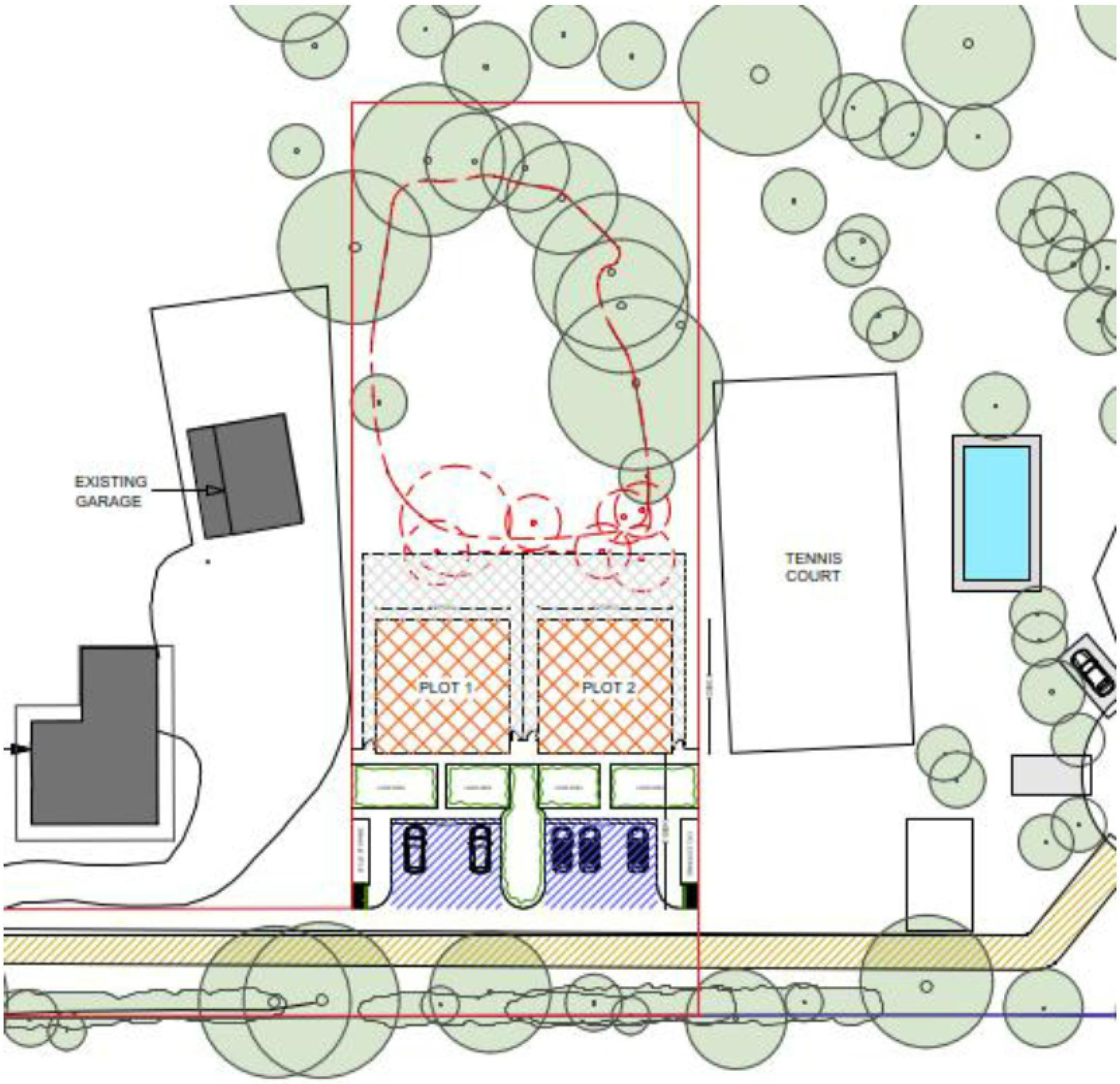


Figure 2 - Site plan for the proposed development

The proposed development is as shown within the red line boundary defined in Figure 2 above.

1.2. Floor Plans

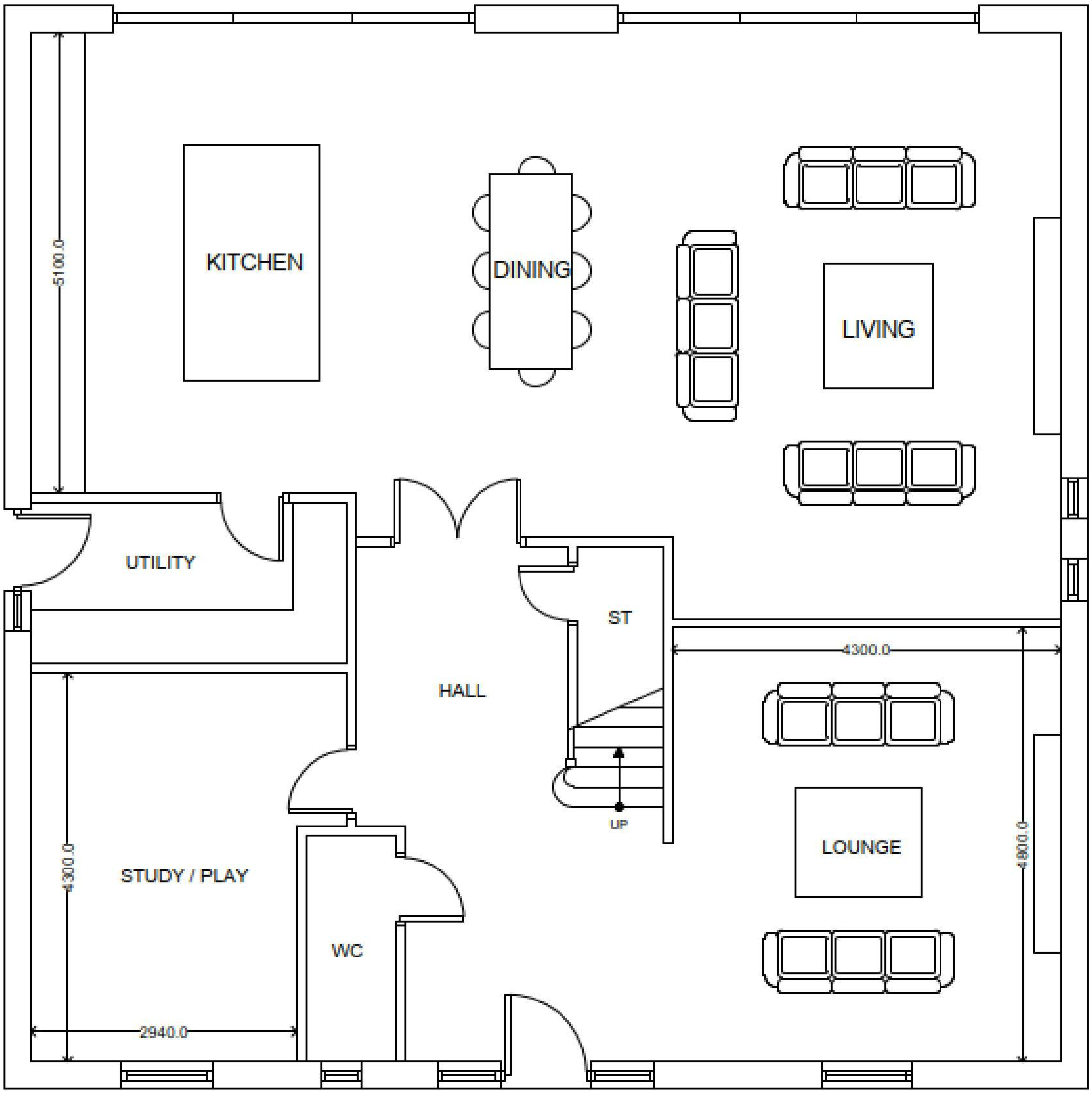


Figure 3 - Ground Floor Plan

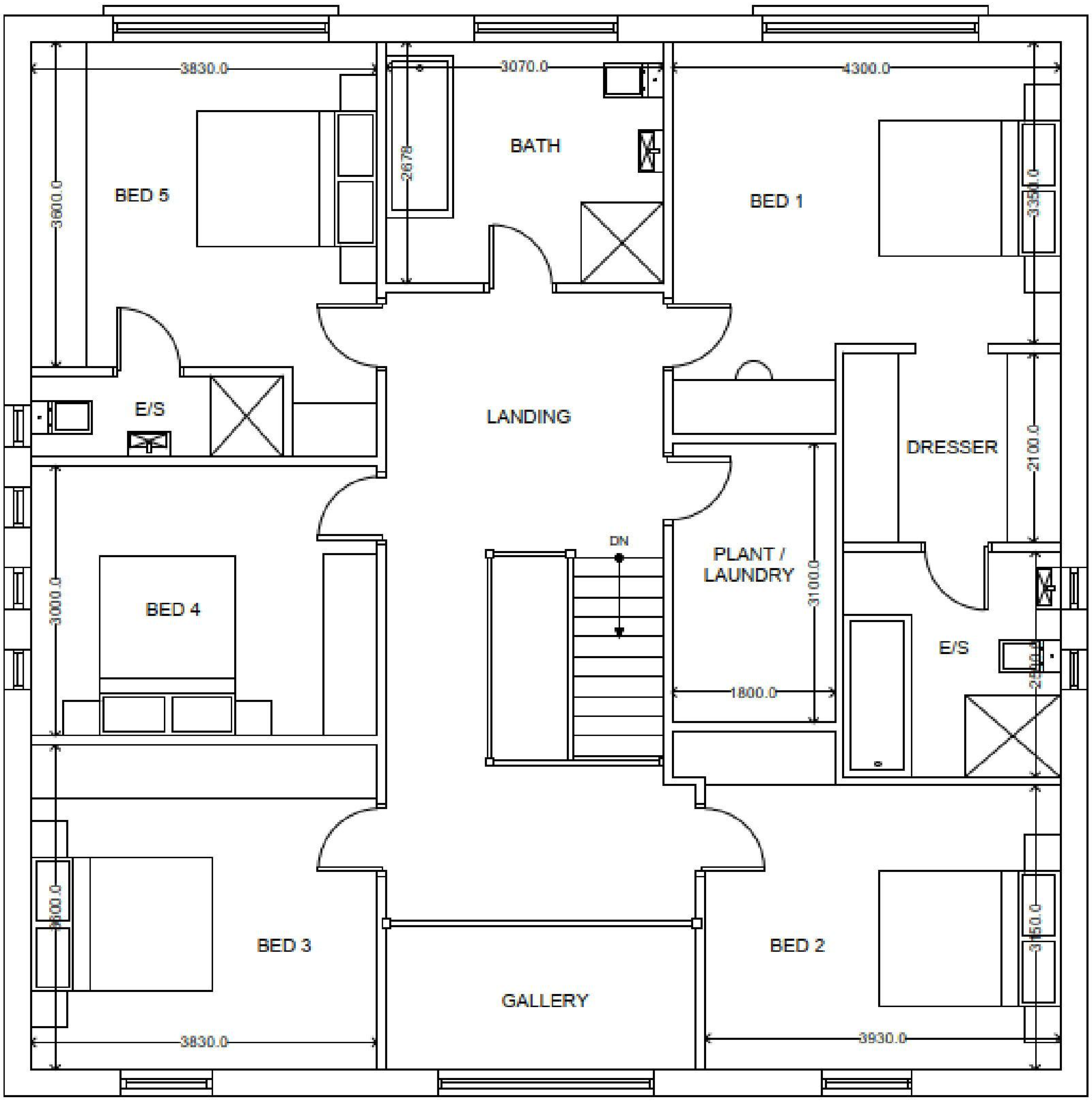


Figure 4 - 1st Floor plan

2. Policy Drivers for Energy Efficiency and Renewable Energy

This section presents a range of planning policy that is applicable to the proposed development, at both a national and a local level.

2.1. National Policy

The National Planning Policy Framework was published in February 2025 and sets out the governments' planning policies for England and they should be applied. Table 2 sets out the relevant energy standards for new developments and provides an indication of the design response to be provided.

Table 2 – Key National Planning Policy Requirements and Design Responses

Section	Policy Requirements	Design Response
14. Meeting the challenge of climate change, flooding and coastal change	The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: Shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.	This development will follow the principles set out in Mid Sussex District Plan 2014 – 2031 using a 'Be Lean, Be Clean, Be Green' approach in reducing operational carbon emissions. An overview of current decentralised energy schemes in Sussex and an assessment on the potential for future schemes in relation to this development is provided in Section 6 of this report. This energy & sustainability statement appraises site specific information to determine the most appropriate approach to minimise energy consumption.

2.2. Local Policy

The Mid Sussex District Plan 2014 – 2031 provides a set of guidelines for new development. All relevant energy policy within these documents is provided within this section together with a design response.

Table 3 – Key Local Planning Policy Requirements and Design Responses

Mid Sussex District Plan 2014 – 2031		
Section	**Policy Requirements**	**Design Response**
DP39: Sustainable Design and Construction	Strategic Objectives: To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change. Evidence Base: Gatwick Sub Region Water Cycle Study; West Sussex Sustainable Energy Study, Mid Sussex Sustainable Energy Study. All development proposals must seek to improve the sustainability of development and should where appropriate and feasible according to the type and size of development and location, incorporate the following measures: • Minimise energy use through the design and layout of the scheme including through the use of natural lighting and ventilation; • Explore opportunities for efficient energy supply through the use of communal heating networks where viable and feasible; • Use renewable sources of energy; • Maximise efficient use of resources, including minimising waste and maximising recycling/ re-use of materials through both construction and occupation; • Limit water use to 110 litres/person/day in accordance with Policy DP42: Water Infrastructure and the Water Environment; • Demonstrate how the risks associated with future climate change have been planned for as part of the lay	The proposed energy strategy will adopt the 'Be Lean, Be Clean, Be Green' approach, which prioritises passive fabric first and energy efficiency measures prior to the introduction of renewable energy. An overview of the energy strategy is provided in Section 8.
DP40: Renewable Energy Schemes	Renewable Energy Schemes Strategic Objectives: To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change. Evidence Base: Gatwick Sub Region Water Cycle Study; Capacity of Mid Sussex District to Accommodate Development Study; Mid Sussex Landscape Capacity Study; Mid Sussex Sustainable Energy Study; West Sussex Sustainable Energy Study. Proposals for new renewable and low carbon energy projects	The energy strategy principles are provided in Section 8 of this report, following an appraisal of a range of site-specific measures in line with the Energy

	(other than wind energy development – see below), including community-led schemes, will be permitted provided that any adverse local impacts can be made acceptable, with particular regard to: • Landscape and visual impacts, including cumulative impacts, such as on the setting of the South Downs National Park and High Weald Area of Outstanding Natural Beauty, and the appearance of existing buildings; • Ecology and biodiversity, including protected species, and designated and non-designated wildlife sites; • Residential amenity including visual intrusion, air, dust, noise, odour, traffic generation, recreation and access. Assessment of impacts will need to be based on the best available evidence, including landscape capacity studies. Proposals for wind energy development involving one or more wind turbines will only be granted if: • the development site is in an area identified as suitable for wind energy development in a Neighbourhood Plan; and 4 Policies Adopted District Plan 96 • following consultation, it can be demonstrated that the planning impacts identified by affected local communities have been fully addressed and therefore the proposal has their backing	Hierarchy 'Be Lean, Be Clean, Be Green' approach. The energy strategy proposed within this report aims to meet all requirements of the Mid Sussex District Plan 2014 – 2031, without the need for carbon offsetting.
DP41: Flood Risk and Drainage	To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change; and 2) To support sustainable communities which are safe, healthy and inclusive. Proposals for development will need to follow a sequential risk-based approach, ensure development is safe across its lifetime and not increase the risk of flooding elsewhere. The District Council's Strategic Flood Risk Assessment (SFRA) should be used to identify areas at present and future flood risk from a range of sources including fluvial (rivers and streams), surface water (pluvial), groundwater, infrastructure and reservoirs. Particular attention will be paid to those areas of the District that have experienced flooding in the past and proposals for development should seek to reduce the risk of flooding by achieving a reduction from existing run-off rates. 4 Policies Adopted District Plan 97 Sustainable Drainage Systems (SuDS) should be implemented in all new developments of 10 dwellings or more, or equivalent non-residential or mixed development unless	"The proposed development can address climate change issues by incorporating sustainable drainage systems (SuDS) and flood-resilient design. All dwellings are designed with efficiency in mind, ensuring effective surface water management, reduced flood risk, and long-term resilience to changing

	demonstrated to be inappropriate, to avoid any increase in flood risk and protect surface and ground water quality. Arrangements for the long term maintenance and management of SuDS should also be identified. For the redevelopment of brownfield sites, any surface water draining to the foul sewer must be disconnected and managed through SuDS following the remediation of any previously contaminated land.	weather patterns.”.

3. Methodology

The first step of the full energy strategy assessment has been to undertake a baseline energy & sustainability assessment. The baseline energy assessment consists of calculating the total CO_2 emissions of the development to meet Building Regulations and then compare the proposed improvement measures against this baseline. Building Regulations Part L1A 2021 (SAP) applies to the proposed dwelling and provides carbon emissions from regulated energy.

The building can then be benchmarked/thermally modelled using the energy hierarchy:

1. Be Lean *A reduction in energy use as a result of passive design and energy efficiency*
Thermal performance of the new build envelope (U-values) Glazing design Airtight construction Efficient mechanical ventilation using system 3 extract Variable speed fans and pumps Energy Efficient lighting
2. Be Clean *A focus on supplying energy to the development through efficient means*
Connect to low carbon heat networks Develop site wide heat network from single energy centre incl. potential CHP Provide energy efficient individual heating
3. Be Green *The installation of renewable technologies to meet energy demand where possible*
Consider the feasibility of renewable energy technologies Assess the integration of renewable technologies based on the above measures

The development must be provided with energy savings through the use of thermal improvements to fabric (a 'fabric first' approach), followed by other clean energy solutions (energy efficiency improvements, district heating, etc...) and finally the use of renewable energy technologies, where practical. This hierarchy complements the integrated approach to the sustainable energy objectives of the Mid Sussex District Plan 2014 – 2031

The planning policies require a full review of the technical and economic feasibility of the following renewable technologies:

- Biomass heating
- Biomass combined heat and power
- Solar hot water
- Solar photovoltaic
- Ground source heat pumps
- Air source heat pumps / exhaust air heat pumps
- Wind power

To achieve the targets set the development must achieve a balance between fabric, heating and control, ventilation and air leakage improvements, the amount of zero or low carbon technology installed and the capital, life cycle and running costs, maintenance and operation, etc...

Feasible renewable energy technologies have been considered during the assessment to ensure the most suitable renewable energy is chosen for the demands of this scheme. The pros and cons of each technology with respect to this site are considered as part of this statement.

4. Baseline Energy Assessment

Energy Counsel have based the analysis on current Building regulations ADL1A 2021 (SAP 10), taking into account solutions that must not only be energy efficient but also practical, reliable and user friendly.

Energy Counsel have carried out preliminary SAP 10 calculations for the dwellings. Under Building Regulations Part L1 2021, dwellings must comply with all three metrics set by the notional building shown below.

- Dwelling Emissions Rate (DER) must be lower than or equal to the Target Emissions Rate (TER)
- Dwelling Primary Energy Rate (DPER) must be lower than or equal to the Target Primary Energy Rate (TPER)
- Dwelling Fabric Energy Efficiency Rate (DFEE) must be lower or equal to the Target Fabric Energy Efficiency Rate (TFEE)

SAP 10 is the Governments Standard Assessment Procedure (SAP) for calculating the energy aspects of a dwelling. SAP is a measure of fuel costs for heating, hot water and lighting for a dwelling. SAP 10 can also be used to ascertain the energy requirements of a development.

To assess the baseline carbon emissions, we must make an estimation of the energy demands through Building Regulations in order to set a target upon which the actual development can be compared.

4.1. Predicted Baseline Energy Requirements

The predicted baseline CO_2 emission demands for the development:

Table 4 - Baseline dwelling emissions

Our Ref	Dwelling Type	No. of Type	Floor Area m2	TER (Kg CO2 / yr/m2)	TPER (kWh /yr/m2)	Total Target Carbon Emissions (Kg CO2/yr)	Total Target Primary Energy (kWh/yr)
Z69776	House	2	515.97	7.47	39.55	7,709	40,813
Total		**2**				**7,709**	**40,813**

The baseline carbon emissions rate for the development is **7,709 $KgCO_2$/yr** and the baseline primary energy rate is **40,813 kWh/yr.**

5. Passive Design and Energy Efficiency

The approach of the development is to embed sustainability into the heart of the design from the outset of the project design process. The design will be developed with sustainable solutions, taking into account the relevant policies and strategies of the Mid Sussex District Plan 2014 – 2031.

The development will seek to consider all aspects and principles of sustainable development, taking into account environmental, social and economic impacts.

5.1. Passive Design Measures

The philosophy for the site is to achieve as much of the necessary reduction in carbon emissions through the use of passive design techniques and energy efficient measures as possible, before resorting to the use of LZCs. This ensures that the highest standards of building fabric and energy efficiency are achieved, rather than offsetting a poorer performance with LZC contributions.

This will be undertaken through a fabric first energy efficient design approach with high levels of thermal efficiency and a reduction in energy demand through efficient lighting design

5.2. Energy Efficient Systems

Options have been reviewed for improving the energy efficiency of the development by installing an efficient heating system. The scheme will utilise high efficiency Air source Heat Pump.

A high efficiency mechanical extract ventilation system will serve the dwellings, in line with the requirements of Building Regulations Part F (2021).

6. District & Communal Heating Networks

This section outlines how consideration of energy supplied efficiently from a district heating network can be provided to the dwellings in line with the Energy Hierarchy.

6.1. Decentralised Heating Networks

The energy policy reaffirms the view that energy generated by centralised power stations and transmitted through the national grid is highly inefficient and wasteful.

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

De-centralised plant generally means any heating and hot water and/or electricity generation provided on a district wide (DHN) or site wide (CHN) basis. DHN and CHN can typically include combined heat and power equipment (CHP). CHP is an engine which, when running, generates electricity and heats water which can then be distributed around a development.

Benefits of district heating networks can include:

- Provision of low carbon / lower cost heat to domestic and commercial customers
- Diversification of the energy mix
- Reductions in region-wide carbon emissions
- Targeting and reduction of fuel poverty
- Potential long term revenue streams for local authorities
- Alignment with regeneration programmes
- Driving the growth of the low carbon services sector

There are currently no existing district heating networks within proximity to the site, and the development of a decentralised system would not be feasible for a project of this scale. With the closest being Princess Royal Hospital, Haywards Heath over 5 miles away.

7. Renewable Energy Technologies

Energy Counsel have reviewed options for the use of on-site renewable energy/Low or Zero Carbon Technology (LZT) in line with the policy aspirations of Mid Sussex District Plan 2014 – 2031

This renewable energy statement/strategy reviews the technical and economic feasibility of the following technologies –

- Solar Photo-voltaic
- Solar Hot Water
- Ground Source Heat Pumps
- Air Source Heat Pumps / Exhaust Air Heat Pumps
- Micro Wind Power
- Biomass

7.1. Photovoltaics (PV)

Photovoltaic panels convert sunlight into electricity to run lights and appliances. Photovoltaic panels use cells to convert light into electricity. A PV cell normally consists of 1 or 2 layers of a semi conducting material such as silicon. When light shines on a cell it generates energy causing electricity to flow, the higher the light intensity is, the more electricity flows.

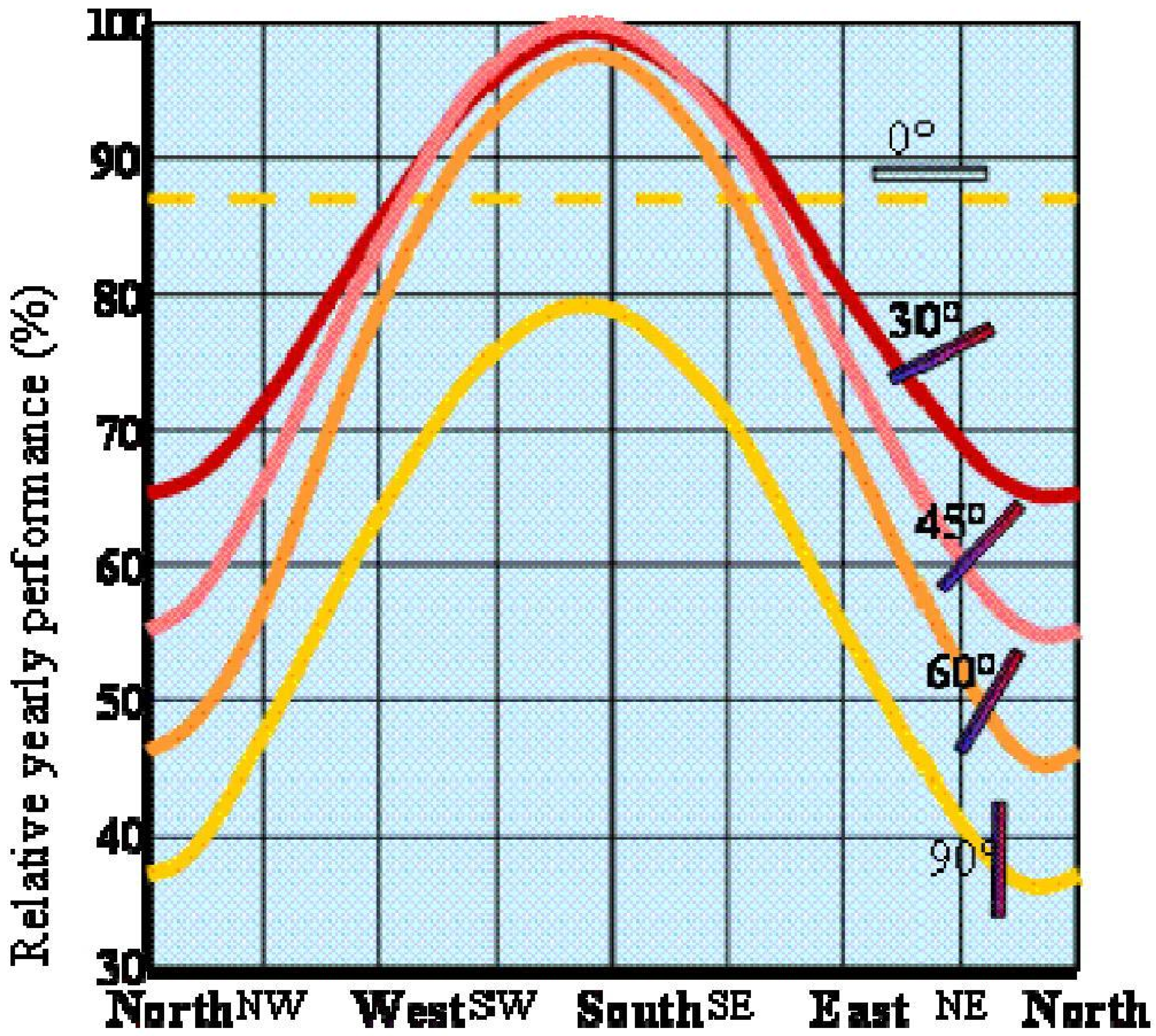


Figure 5 - Performance of photovoltaic panel orientation

The amount of energy PV cells generate is referred to as Kilowatt Peak (KWp). PV arrays now come in a variety of shapes and colours, ranging from grey 'solar tiles' that look like roof tiles to panels and transparent cells that you can use on conservatories and glass to provide shading as well as generating electricity. Solar panels are not light and the roof must be strong enough to take their weight, especially if the panel is placed on top of existing tiles. For flat roofs the panels can be mounted on A-frames to give the optimum angle.

The optimum panel inclination for solar collection is 35°, oriented due south; however panels that are inclined between 35° and 45° and oriented south of west or east are generally suitable. If solar collectors are oriented away from due south then a larger surface area will be required to generate a set amount of energy. The effect of non-optimal orientation is illustrated by the graph to the right:

The cost to install PV is typically £1,000 - £1,500 per kWp for 'on-roof' panel systems.

Photovoltaic panels have not been installed on the dwellings in this instance, however the use of Air source heat pumps for heating and hot water ensure that carbon emission reductions are provided in line with Mid Sussex District Plans 2014 – 2031.

Figure 6 - Photovoltaic array on a pitched roof

7.2. Solar Thermal HW Panels

Solar panel heating uses the radiant energy from the sun to heat hot water, most commonly for domestic hot water needs. There are two types of collectors used for solar water heating – flat plate collectors and evacuated tubes collectors. The systems function successfully in all parts of the UK, as they can work in diffuse light conditions. The collector should be mounted on a 10-60 degrees pitch facing south, although other variations can be used, south is the most efficient.

The cost of installing the system is dependent on the distance between the solar collector and the hot water storage and therefore costs vary. The closer the collectors are to the hot water storage, the less pipe work is required. Annual maintenance checks are recommended. The solar collectors are connected to a condensing boiler via a HW cylinder with twin coil.

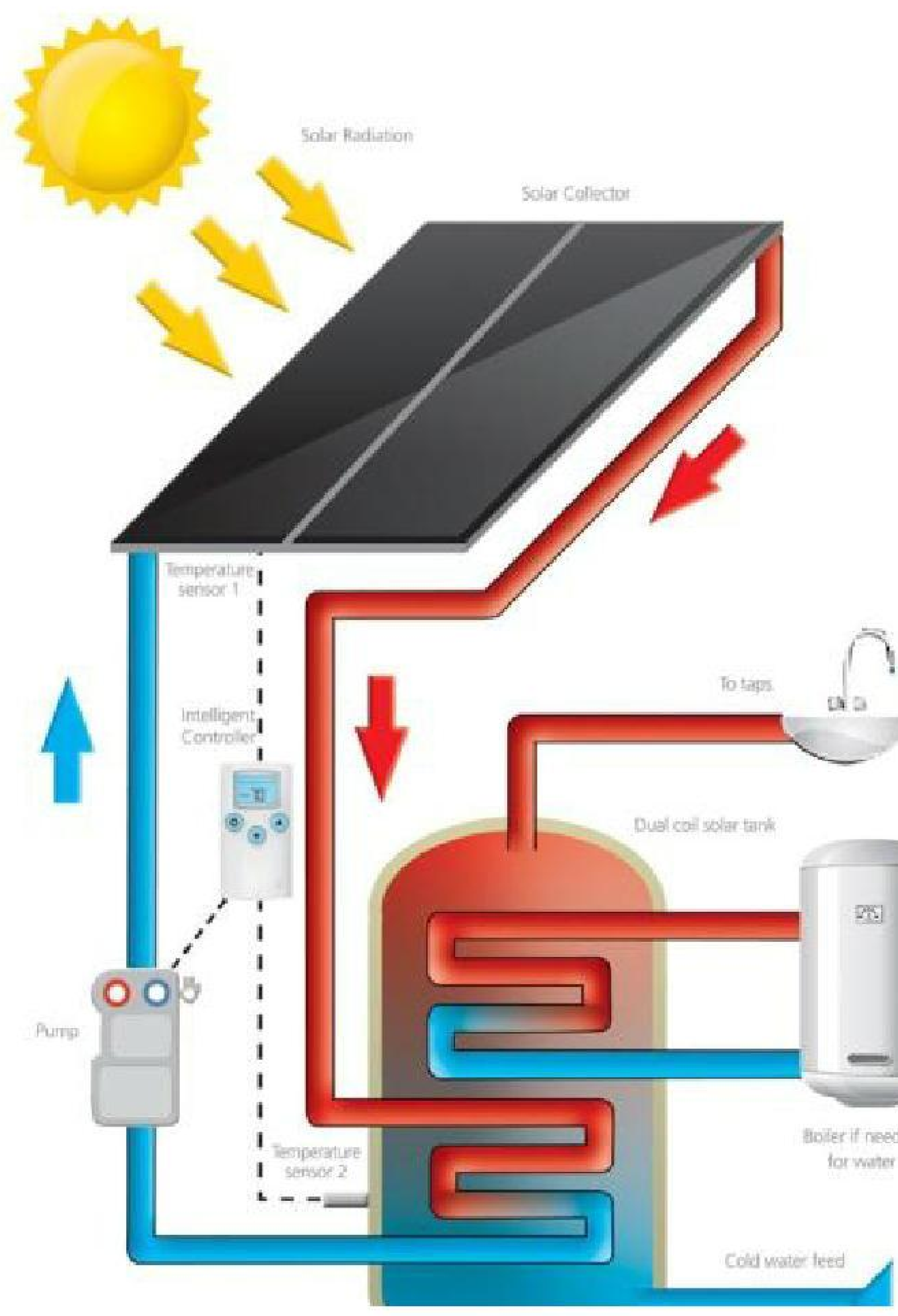


Figure 7 - The principles of a solar thermal system

A typical installation in the UK has a panel size of 3-5m^2 which is used in conjunction with a HW storage tank of 180-300litres, of which a minimum of 90-150 litres must be dedicated to solar hot water storage.

They are a 'simple' and guaranteed technology which will act as a pre-heat for the Hot Water and Heating usage. Payback between capital cost and energy saving can normally be achieved within 12 – 20 years, subject to usage and dwelling type.

The use of solar thermal panels, work best in conjunction with individual heating systems for each dwelling. The orientation of the development is fine for the utilisation of solar water heating to provide domestic hot water however it will not achieve significant carbon savings. Carbon savings of approximately 4-5% are achievable with this technology. The dwellings are unlikely to require sufficient hot water storage to deem solar thermal a feasible technology for this site. For the reasons aforementioned this is not an appropriate option for this scheme.

7.3. Ground Source Heat Pump (GSHP)

GSHPs have been developed specifically for the housing market and are now considered to be an established reliable technology. The GSHP would be sized to cater for the heating and domestic hot water requirements. Typically, they are more suited to apartments as a centralised system would be installed with multiple bore holes to a depth of up to 125 metres depending on the ground conditions. GSHPs use a heat exchanger to extract heat from the earth.

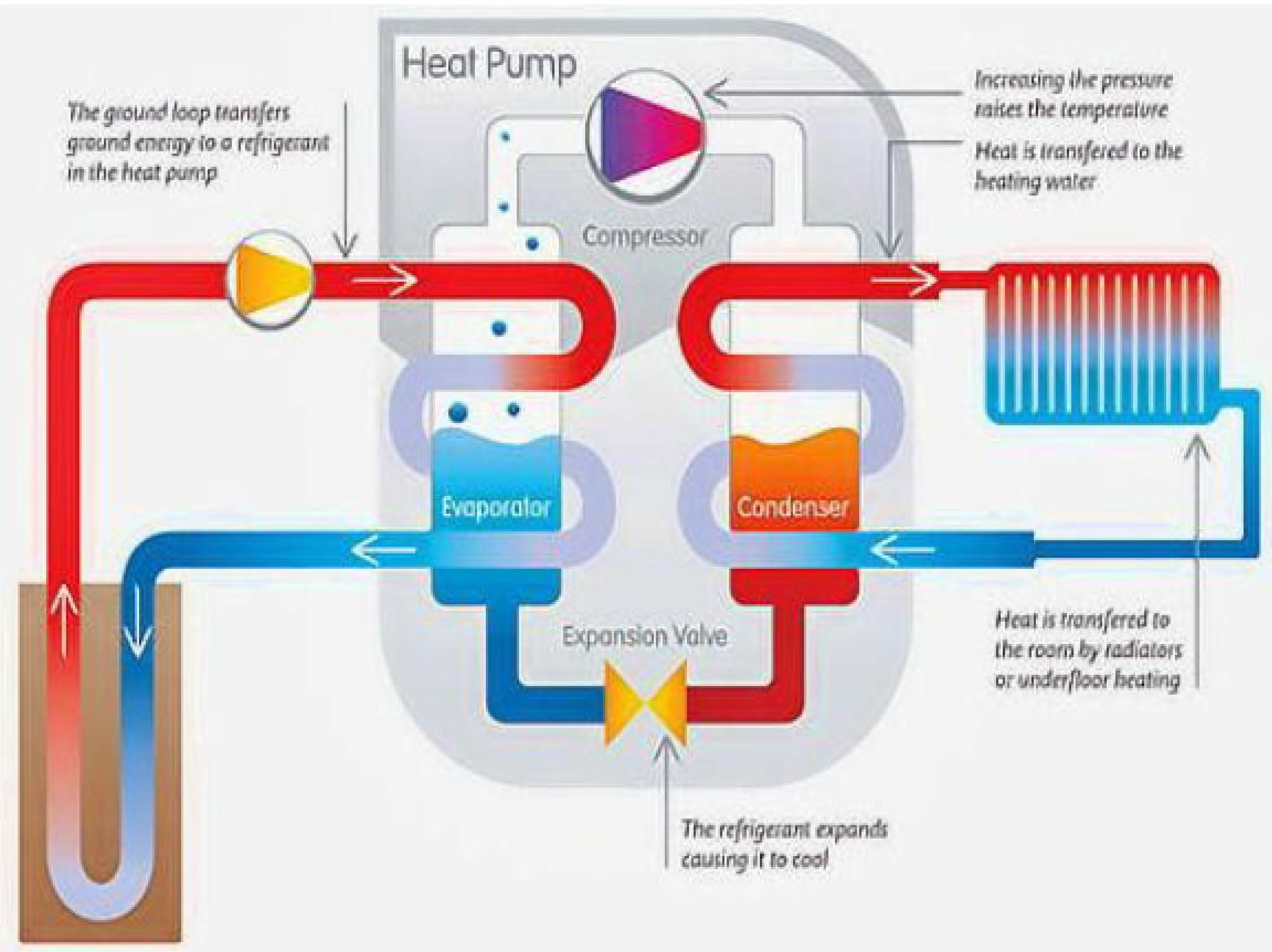


Figure 8 - Principles of a GSHP system

The efficiency of ground source heat pumps is measured by Co-efficient of Performance (CoP), this is the ratio of units of heat output for each unit of electricity used to drive the compressor and pump for the ground loop. Average CoP is around 2-4 although some systems may produce a greater rate of efficiency. This means that for every unit of electricity used to pump the heat, 2-4 units of heat are produced, making it an efficient way of heating a building. If grid electricity is used for the compressor and pump, then there is the opportunity to consider a range of energy suppliers to benefit from the lowest running costs, for example by choosing an economy 10 or economy 7 tariff.

Due to the relatively small scale of this development, GSHPs are not considered an appropriate design solution.

7.4. Air Source Heat Pump/Exhaust Air Heat Pump/ Hot Water Heat Pump

Air source heat pumps (ASHP) and exhaust air heat pumps (EAHP) work in a similar way to GSHP. Air source heat pumps can be fitted on the external façade or in the roof space. An air source heat pump uses small amounts of electricity to take in large quantities of air and extract heat. The efficiency of ASHP is measured by Coefficient of Performance (CoP); this is the ratio of units of heat output for each unit of electricity used to drive the system. Average CoP is around 2-4 although some systems may produce a greater rate of efficiency.

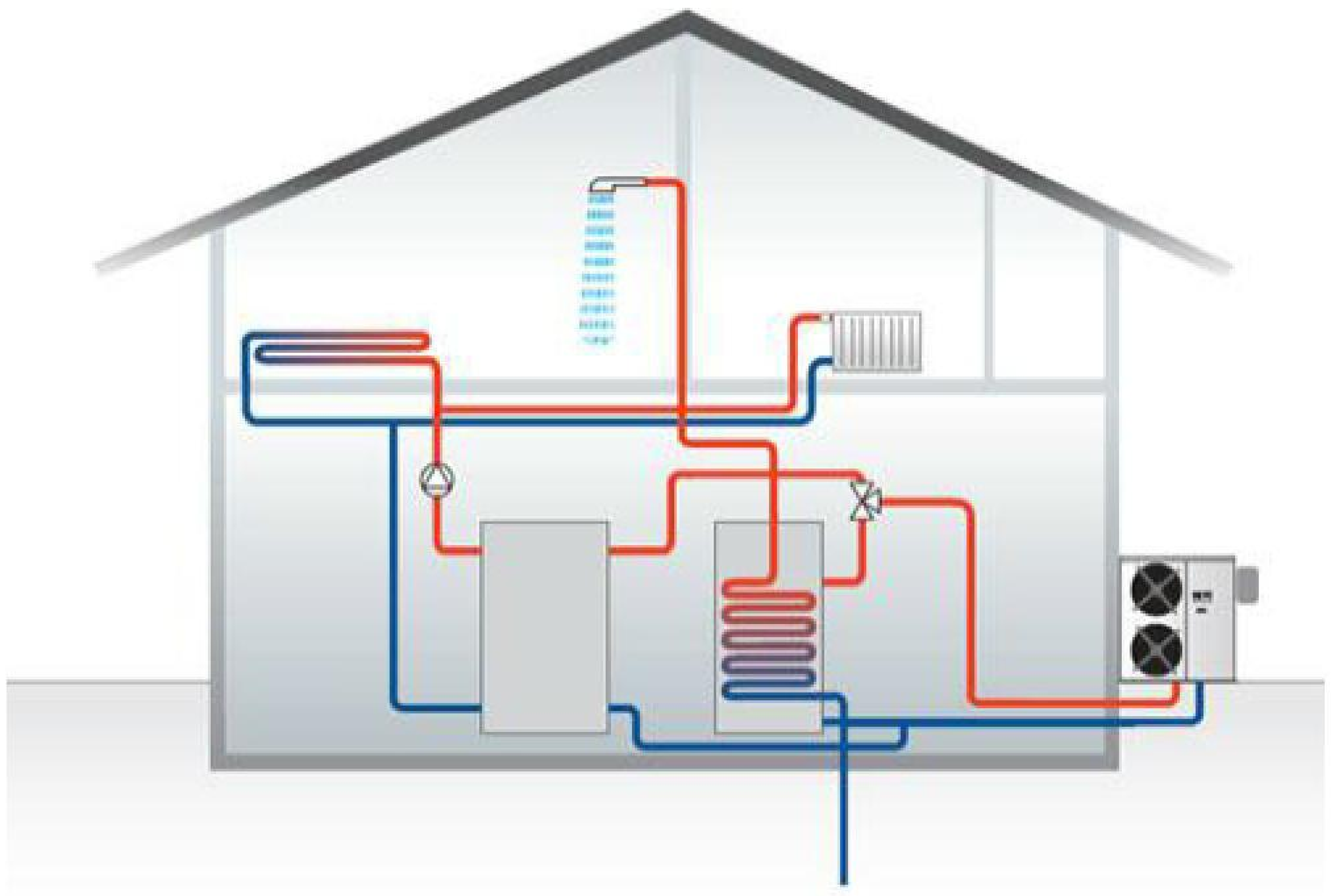


Figure 9 - Principles of an ASHP system

Exhaust air heat pumps such as the NIBE F370 work in a similar manner to ASHP units but have only indoor units (no outdoor compressors) and in addition they also recover heat from their integral exhaust air ventilation system. These units work well on apartment blocks and dwellings where mains gas is unavailable or unsuitable for a development. They are expensive in terms of capital cost of the equipment, installation and the enhanced structural requirements.

ASHPs are considered the most appropriate technology for this scheme and can be utilised for heating and hot water throughout the dwellings. The introduction of this technology ensures that carbon emissions reductions can be provided in line with the Mid Sussex District Plan 2014 – 2031

7.5. Micro Wind Power

Wind power is one of the cleanest and safest methods of generating electricity. However, wind power is unfeasible due to the fact the development is in an urban area and local wind conditions would not be sufficient to provide enough power. Most small wind turbines generate Direct Current (DC) electricity. Systems that are not connected to the national grid require battery storage and an inverter to convert DC electricity into Alternating Current (AC) which is mains electricity.

There are two types of wind turbine available:

- Roof mounted – These are mounted on the roof of dwellings
- Mast mounted – Which are free standing

Figure 10 - Mounted wind turbine

Important issues to consider when using wind turbines are:

- Wind speed increases with height so it's best to have the turbine high on a mast or tower.
- Generally speaking the ideal site is a smooth top hill with a flat, clear exposure, free from excessive turbulence and obstructions such as large trees, dwellings or other buildings.
- Small scale wind power is particularly suitable for remote off grid locations where conventional methods of supply are expensive or impractical.
- Where the local annual average wind speed is 6 m/s or more.
- Where there are no significant nearby obstacles such as buildings, trees or hills that are likely to reduce the wind speed or increase turbulence

As this development is in an urban area there will be obstacles which reduce wind speed. The average wind speed in this area is 4.7 m/s at a height of 10 metres, which is less than the 6 m/s required. Therefore, micro wind is not a viable technology for this development.

7.6. Biomass

Biomass is a generic name for any fuel produced from organic sources and falls into mainly two categories:

- Woody biomass- forest products, untreated wood products, energy crops and wood pellets
- Non-wood biomass – liquid biofuels (such as biodiesel, bioethanol) or animal waste industrial municipal products and high energy crops such as rape seed, sugar cane and maize.

For domestic properties the fuel used is normally wood pellets, wood chips or wood logs. For larger applications, biomass boilers replace conventional fossil fuel boilers and come with an automated feed by screw drives from hoppers.

Biomass systems require more cleaning than gas or oil boilers and they must be capable of being taken out of service for cooling and cleaning whilst maintaining the building heating supply particularly in communal heating systems. Centralised gas boilers are therefore still required to support the biomass boiler, which would be the lead boiler. The size of the dedicated plant rooms is substantial. Fuel availability, delivery and storage are also important issues to consider.

Air quality issues are also an important factor when looking to install biomass. The cost of the fuel depends on the type, delivery distances and whether it is obtained as simple waste product or from another organisation. The cost of wood pellets is currently a little more expensive than mains gas, and woodchip is approx. 30% cheaper, however prices are fluctuating rapidly in the bio-fuel market at the present time creating uncertainty over their take up.

Figure 11 - Biomass boiler and hopper

Biomass CHP is still relatively new to the UK market and is more suitable to large developments where energy demand does not require significant modulation. There are technical issues with small scale Biomass CHP and until these can be resolved and proven the take up of these systems in the UK and Europe has been slow.

Overall carbon savings of 40%+ are achievable with biomass technology. Biomass is more suited to a communal heating system; there is insufficient space to accommodate the equipment and fuel storage to facilitate a biomass boiler. Furthermore, there are noise and air quality issues associated with this type of technology. For this reason biomass is discounted.

8. Energy Assessment of Proposed Scheme

The proposed development has adopted the principles of the 'Be Lean, Be Clean, Be Green' approach.

The most practical and economically feasible solution for the development is a good quality thermally insulated fabric, airtight envelope, passive improvements and the use of highly efficient air source heat pump, supported by efficient mechanical extraction ventilation system

Table 5 - Proposed emissions from the development

Ref	Dwelling Type	No.	TER	DER	TPER	DPER	Total Carbon Emissions (Kg CO2/yr)	Total Primary Energy (kWh/yr)
Z69776	House	2	7.47	3.57	39.55	37.36	3,684	38,553
			52.21%		5.54%			
Total		**2**	**52.21%**		**5.54%**		**3,684**	**38,553**

The carbon emissions for the new build dwellings are predicted to emit **3,684** KgCO_2/yr. This is a total carbon reduction of **4,025** KgCO_2/yr from the baseline emissions of **7,709** KgCO_2/yr this equates to a **52.21**% carbon reduction.

The primary energy rate is **38,553** kWh/yr. This is a primary energy reduction of **2,260** kWh/yr from the baseline primary energy rate of **40,813** kWh/yr. This equates to a **5.54**% primary energy reduction.

The development proposal meets local policy including energy efficient lighting, efficient ventilation, improved thermal bridging, low air leakage with highly efficient space and water heating delivered via air source heat pump.

9. Sustainable Design and Construction

The design currently includes a number of components that gives the scheme a solid grounding in relation to sustainability. The list below is not exhaustive but spans a range of areas as follows:

9.1. Energy

- The development will be designed and constructed to achieve low energy and carbon dioxide emissions, improving upon current Building Regulations Part L 2021 using the Be Lean, Be Clean, Be Green energy hierarchy.
- Dedicated energy efficient lighting will be installed internally and externally. The efficacy and colour rendering index ratings will be considered.
- Unregulated energy demand will be assessed and minimised where possible through the selection of energy-efficient appliances and systems.

9.2. Water

- The proposed development can be be fitted with a water meter and units will incorporate water saving and efficiency measures that comply with Regulation 36(2)(b) of Part G2 of the Building Regulations to ensure that a maximum of 110 litres of water is consumed per person per day. Suggested water appliance details are shown in Table 6.
- Internal water consumption will be reduced using low flush/ flow appliances. This will include appliances such as aerated and flow regulated taps, low-flow showers and dual flush toilets, where practicable.

Table 6 – Recommended water consumption for residential appliances

Sanitary fittings	Flow rate or capacity		Consumption (L/person/day)
WC (Full Flush)	4	L/flush	13.53
WC (Half Flush)	2.6	L/flush	
Hand Basin Tap	3	L/min	6.32
Shower	6	L/min	43.7
Bath	140	L/capacity	15.40
Kitchen Tap	4	L/min	12.12
Washing Machine	8.17	L/kg dry load	17.16
Dishwasher	1.25	L/place setting	4.50
Total	Incl. normalization factor 0.91		**104.18**

9.3. Drainage

- The proposed development can incorporate Sustainable Drainage Systems (SuDS) to ensure that surface water is managed in line with best practice guidance and local planning policy requirements. These systems can be designed to control runoff at source, reduce flood risk, and promote water quality improvements.
- The development can use a range of SuDS features, such as permeable paving, swales, and attenuation storage, where practicable. These measures will help to mimic natural drainage processes and reduce pressure on the existing sewer networks.
- The proposed dwelling is located within Flood Zone 1, which represents a low risk of flooding from rivers and the sea. The mapping indicates a limited risk of surface water, as shown in Figure 13, which is confined to the garden areas of the dwellings. (https://floodmapforplanning.service.gov.uk/map?seg=sw,hr&cz=531022.3,116460,17.75584)

The proposed development is as shown within the red line boundary defined in 12 & 13 below.

Figure 12 – Flood level mapping of proposed dwellings

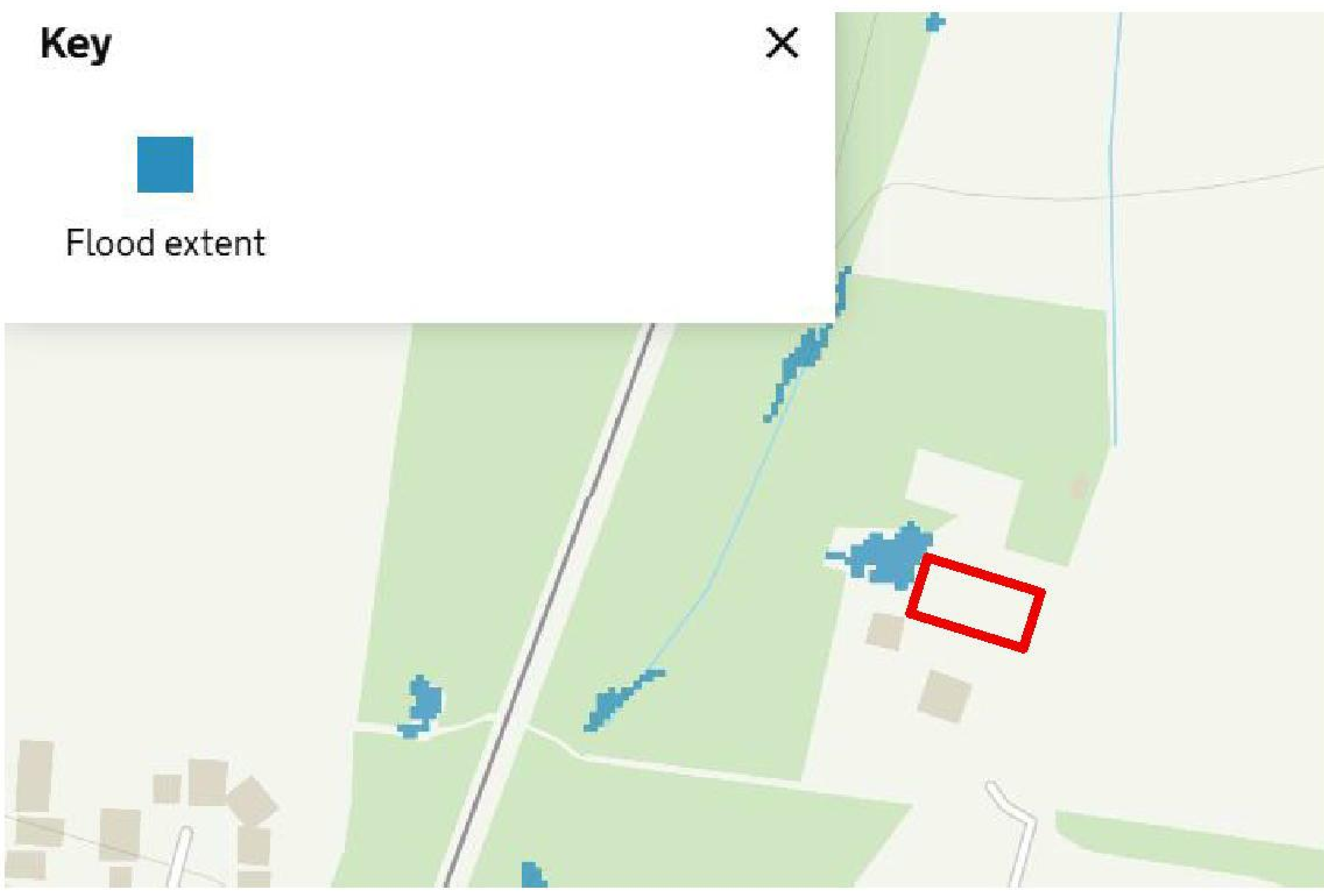


Figure 13 – Surface water level map of proposed dwellings

10. Conclusion

Following the 'Be Lean, Be Clean, Be Green' hierarchy, the proposed design solutions are predicted to:

1) Reduces the total carbon emissions by 52.21% compared to new building regulations ADL 2021. Refer to item 8.0.
2) The heat pumps are the renewables/ low carbon technology. Their contribution to the overall energy reduction under the 'be green' energy hierarchy is approx. 50%.
3) Reduces the total primary energy by 5.54% compared to new building regulations ADL 2021. This is a new metric under Part L.
4) In accordance with Policy DP41: Flood Risk and Drainage, the proposed development addresses climate change issues by incorporating sustainable drainage systems (SuDS) and flood-resilient design. All dwellings will be designed with efficiency in mind, ensuring effective surface water management, reduced flood risk, and long-term resilience to changing weather patterns. Refer to item 9.3.
5) In accordance with DP39 : Sustainable Design and Construction & DP42: Water Infrastructure and the Water Environment - The dwellings have been designed to limit potable water consumption of 110 litres/person/day. Refer to item 9.2.

The approach for the development at Woodside Grange, Hassocks is to embed sustainability into the heart of the development through a range of design measures based on the 'Be Lean, Be Clean, Be Green' design hierarchy. Measures will include:

1. Enhanced building fabric to meet Building Regulation ADL1A 2021 (15/06/2021)
2. Enhanced air tightness and thermal bridging.
3. Dwelling to have efficient mechanical extract ventilation system
4. Heating and hot water will be provided by highly efficient air source heat pump (ASHP)
5. Efficient lighting strategy primarily using LED type fittings.

10.1. Low/ Zero Carbon Technologies (LZT) Review

- Solar Thermal Hot Water is a feasible option but not considered efficient as hot water will be provided by heat pumps.
- Biomass has been discounted as it poses problems in terms of air quality, delivery of fuel, storage and transportation for deliveries etc. It would require a centralised larger plant space for storing fuel, which on this constrained site is not viable.
- Micro-wind turbines do not work on this type of development due to problems with wind turbulence and mounting of the units. The wind speeds in the area are not conducive to wind power electricity generation and there would be issues with turbulence, wind shading, noise and air traffic.
- GSHPs are potentially feasible subject to further investigation of ground conditions. Suitability of site conditions, spatial and excessive financial costs could be difficult.
- Air to Water ASHP units have been proposed for the space heating and hot water delivery on this development due to their high COPs providing carbon savings in addition to the future proofing of the dwellings ready for the next building regs ADL updates.
- Photovoltaic panels (PV) – PV panels are feasible for each house, ideally facing South orientation.

A more detailed overview of LZT technologies is provided in the appendices of this report.

10.2. Summary Headlines

- A passive fabric-first approach has been taken to reduce the energy demand of the proposed development. By focusing on passive design measures and energy efficiency through the energy hierarchy, the project offers an efficient and sustainable solution for the life of the building.

Table 7 - Proposed development emissions against Building Regulations Part L1A 2021

	Total CO_2 Emissions ($kgCO_2/yr$)	Total Primary Energy (kWh/yr)
Target Dwelling Performance	**7,709**	**40,813**
Proposed Dwelling Performance	**3,684**	**38,553**
Total Reduction	**4,025**	**2,260**
Percentage Improvement (above ADL1 2021)	**52.21%**	**5.54%**

11. Appendices

11.1. LZT Feasibility Table

Technology	Technical Feasibility	Carbon Savings	Estimated Costs	Financial Viability
Solar photovoltaics	A photovoltaic array is Considered viable, however has not been considered for this development as the use of ASHP for heating and hot water provides the relevant carbon reduction to meet local policies.	A 8kWp system could save around 2,480 kg of CO_2 per year per dwelling, although	Average cost for such a system is around £1.5K per dwelling.	Current potential income generation is around £230 per annum per dwelling, with a fuel cost saving of around £60 per year per dwelling.
Wind	Average wind speeds on the site according to the NOABL Wind Speed Database are 4.7m/s. To be technically feasible a minimum of 6m/s is required, therefore this site is not considered feasible.	N/A	N/A	N/A
Micro Hydro	There is no capacity for micro hydro on this site since there are no local water courses available.	N/A	N/A	N/A
District Heating	There are currently no existing or planned district heating networks to facilitate connection at this stage.	N/A	N/A	N/A
Solar Hot Water	This technology has been discounted as the level of hot water usage in each dwelling does not merit a storage system, which poses space issues.	Around 270 kg of CO_2 per year per dwelling.	£3-5K per dwelling	Income generation from RHI in a 4 person household would be in the region of £340 / year (per dwelling) with a fuel saving of around £65 per year per dwelling
Heat Pumps	GSHP: Ground conditions on site are unknown, and installation of coils are likely not economically viable for this project. ASHP: An ASHP for heating and hot water is the preferred option due to the high efficiency and energy savings	GSHP: 2,100 to 3,300 kg CO_2 per year per dwelling ASHP: 1,700 to 2,700 kg CO_2 per year per dwelling.	GSHP @ £13-20K per dwelling ASHP: £7-11K per dwelling	GSHP: £2,590 minimum annual RHI income generation per dwelling with fuel saving of £440 per year minimum per dwelling ASHP: £920 minimum annual RHI income generation per dwelling with fuel saving of £335 per year minimum per dwelling
Biomass	The small scale of this development would not facilitate the installation of biomass boilers due to the space required for pellet storage.	N/A	N/A	N/A

11.2. Specification for New Build Dwelling Assessments (ADL1A 2021 - SAP)

Item	Brief Description	Notes	Confirm
	The following information is required for the design submission (as per requirements of approved doc L1A).	Please note submission is now in two stages. A) **Design**, B) As installed	
1. Dwelling Type			
1.1	Building Regulations Part L1A 2021 apply.		
1.2	Post code of site is	Woodside Grange, Hassocks, BN6 8EX	
1.3	Electricity is supplied by standard tariff rather than economy 7, 10 or 24.	*Assumed Standard tariff*	
1.4	It is assumed that the dwellings have a medium thermal mass parameter.	*Masonry construction assumed*	
2. Floor Construction Details			
2.1	Ground floor is to achieve the U-value stated opposite.	U-Value = 0.12 W/m²K	
3. Wall Construction Details			
3.1	Main external walls are to achieve the U-value stated opposite.	U-Value = 0.15 W/m²K	
4. Roof Construction Details			
4.1	Cold conventional roofs are to achieve the U-value indicated opposite.	U-Value = 0.09 W/m²K	
5. Openings			
5.2	All double-glazed windows and patio type doors/windows with Low-e glass soft coating to achieve the U-Value stated	U-value = 1.2 W/m²K. double glazed window argon fill g-value = 0.45	
6. Ventilation			
6.1	Design stage SAP calculation assumes an air permeability of 4m3/m2/hr at 50pa will be achieved.		
6.2	Mechanical extract ventilation (MEV) system installed in all wet rooms.	Vent Axia Lo-Carbon NBR dMEV C 100 or equal and approved	
6.3	No open flues or fireplaces or flue-less gas fires are present anywhere.		
7. Space Heating			
7.1	There is one main heating system installed.	No secondary heating.	
7.2	Heating is provided by air source heat pumps. HP kW Size to be determined by Contractor	Mitsubishi Ecodan 14.0kW or equal and approved	
7.3	Heat emitters are assumed to be radiators but could be underfloor heating. HP system operating at 45C.		
7.4	The heating controls are to be time and temperature zone control.		
8. Water Heating			
8.1	Hot water connected to air source heat pump via hot water cylinder.	300L pre-plumbed cylinder Heat loss 2 kWh/day used for calculation. *To be sized by a specialist*	

8.2	Showers – All showers will be supplied from the hot water cylinder via a pump.	All showers to be flow regulated to <8litres/minute@3bar.	
8.3	Independent time control is provided to the hot water cylinder.		
8.4	Water usage per person per day is ≤110 Litres.	To meet Part G and planning policy	
9. Renewables			
9.1	There are no renewable technologies on the development.	PV could be added later to improve dwelling running costs if required.	
10. Other			
10.1	The Contractor will be responsible for undertaking thermal bridging calculations for each detail to provide a comprehensive set of calculations to meet building regs compliance ADL1 2021. They will be responsible for meeting a overall Y value of 0.04W/mK (summation of all the junctions).	Specialist thermal bridging to be reviewed by Contractor and their design team. We have assumed masonry construction but other constructions could be used.	
10.2	Thermally broken lintels will be installed to achieve improved thermal bridging for SAP ref: E2 (if masonry construction)	Psi value of 0.05W/mK.	
10.3	Low energy (LE) lights are installed throughout.	All lighting to meet a min efficacy of 75lumens/circuit watt. The Contractor will provide a drawing schedule of all proposed light fittings with efficacies detailed.	

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