Land to North of Balcombe, Haywards Heath,

Mid Sussex, RH17 6NL

Energy & Sustainability Statement

November 2025

P5104

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1.0 Executive Summary

This energy and sustainability statement has been prepared in support of a proposal for an outline planning application for the erection of up to 125 dwellings, together with the provision of landscaping, open space, and associated development works, with access from Balcombe Road.

It has been designed to achieve the highest of environmental performance standards following the Energy Hierarchy to align with the sustainability requirements of the relevant Mid Sussex District Council District Plan polices – notably the key policy DP39.

The PES Ltd been instructed to achieve a low carbon development and have been working with the team throughout the development of the scheme in order to develop a strategy and advise how the proposed development will meet its low carbon ambitions.

A 'Lean, Clean, Green' approach has been adopted in order to confirm how the proposed development would seek an overall improvement (BER/TER) in regulated emissions approaching 70% + above Part L 2021 standard, through the adoption of high standards of insulation, heat pump driven heating and hot water systems and the installation of roof mounted PV arrays as well as significant smart grid infrastructure to reduce peak loads and provide active demand response.

Construction techniques are to be adopted to deliver a low embodied carbon development, making use of significant low carbon construction materials

2.0 Site & Proposal

The land that is the subject of this sustainability report is a parcel of land to the north side of the Balcombe Road to the north of Haywards Heath.

This report set out the strategic sustainability strategy in support of a proposal for circa 125 residential dwellings landscaping, drainage and infrastructure.

Fig 1: Site Master Plan

2.1 Planning Context

The project sits within the borough boundaries of Mid Sussex District Council.

Statutory Development Plan

The adopted Development Plan for the site comprises:

Mid Sussex District Plan 2014 – 2031 (adopted March 2018) Key policies relevant to this report are noted below:-

DP39: Sustainable Design and Construction Strategic Objectives:

1) 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 layout of the scheme and design of its buildings to ensure its longer term resilience

Also in publication is the Mid Sussex District Plan 2021 – 2039 Submission Draft (Regulation 19). This above draft could be considered to carry weight in the determination of any application at Balcombe Road:-

DPS1: Climate Change

The Council will take an integrated and holistic approach to address the causes of climate change and to increase resilience to the effects of climate change. This will be achieved by:

Reducing carbon emissions

1. Development will be required to demonstrate that measures have been taken to reduce carbon emissions, including improvements in energy efficiency and in the design and construction of buildings. This includes new buildings and the conversions of existing buildings. Detailed requirements are set out in Policies DPS2: Sustainable Design and

Construction, DPS3: Renewable and Low Carbon Energy Schemes, and the Mid Sussex Design Guide SPD.

2. The Council will support renewable and low carbon energy schemes in line with the requirements set out in Policy DPS3: Renewable and Low Carbon Energy Schemes.

3. Development should embed the principles of the 20-minute neighbourhood and local living and prioritise active travel such as walking and cycling and sustainable transport such as public transport to reduce reliance on private modes of transport and to facilitate healthy lifestyles. Detailed requirements are set out in Policies DPT1: Placemaking and Connectivity; DPT3: Active and Sustainable Travel; and DPB1: Character and Design.

4. Development likely to be sources of other greenhouse gas emissions (methane, nitrous oxide and fluorinated gases) will be required to demonstrate that opportunities have been taken to reduce these emissions. This includes proposals that may use these other greenhouse gases in their design and operation, for example, refrigerants and air conditioning systems.

Maximising carbon sequestration

5. Development will be required to protect existing trees, woodland and hedgerows and their soils and seek opportunities to plant appropriate species of trees in appropriate places including street trees. Detailed policy requirements are set out in Policy DPN4: Trees, Woodland and Hedgerows.

6. Development will be required to protect existing carbon sinks and stores and take opportunities to provide nature-based solutions for carbon capture and sequestration.

7. Development will be required to take opportunities to improve soil health and minimise disturbance to soils in order to protect soil biodiversity and carbon storage. Detailed policy requirements are set out in Policy DPN1: Biodiversity, Geodiversity and Nature Recovery.

Climate change adaptation Climate change adaptation and mitigation

8. Development must be designed to minimise vulnerability from the effects of climate change particularly in terms of overheating, food security, flood risk and water supply. Detailed policy requirements are set out in Policies DPS2: Sustainable Design and Construction and DPS4: Flood Risk and Drainage.

9. Development will be required to incorporate green and blue infrastructure and nature-based solutions to moderate surface and air temperatures, increase biodiversity and as part of sustainable drainage systems. Detailed requirements are set out in Policies DPB1: Character and Design; DPS4: Flood Risk and Drainage; and DPN3: Green and Blue Infrastructure.

10. Development will be required to achieve a net gain in biodiversity and contribute to ecological networks and the Local Nature Recovery Strategy. Detailed policy requirements are set out in Policies DPN1: Biodiversity, Geodiversity and Nature Recovery, and DPN2: Biodiversity Net Gain.

11. The Council will seek adaptation and mitigation measures that improve resilience to climate change and allow communities, businesses, buildings, infrastructure and ecology to adapt to the impacts of climate change.

DPS2: Sustainable Design and Construction

All development must submit a proportionate Sustainability Statement to demonstrate how through its design, construction, operation and use it will contribute to the reduction of greenhouse gas emissions, increase resilience to the impacts of climate change and improve sustainability and includes incorporation of measures set out at Principle DG37 of the Mid Sussex Design Guide SPD.

Zero carbon development

Unless it can be demonstrated that doing so is not technically feasible or unviable, using a fabric first approach, all new build development must achieve zero operational GHG emissions by reducing heat and power demand and then supplying all (regulated and unregulated) operational energy through on-site renewables.

Energy Use

The carbon reduction requirements for achieving net zero development must be met by using a fabric first approach following the energy hierarchy:

i. Minimise the demand for energy.
ii. Maximise energy efficiency.
iii. Utilise renewable energy.

All developments must include decentralised, renewable or low carbon energy provision in line with Policy DPS3: Renewable and Low Energy Carbon Schemes.

Heating to all new build developments and major refurbishments shall be provided using renewable energy (not fossil fuels).

Residential new build: Development must achieve sufficient credits in the “Energy performance” and “Towards carbon negative” categories of HQM (or equivalent) to demonstrate that the development produces net zero regulated and unregulated emissions.

An alternative route to compliance is to provide evidence by full Passivhaus Planning Package outputs demonstrating that Passivhaus certification is achievable and that 100% of operational energy use will be met via on-site renewables.

Non-residential new build: Major development must achieve maximum credits in the “Energy performance”, and “Prediction of operational energy consumption” and “Beyond zero net regulated carbon” categories of BREEAM (or equivalent) to demonstrate that the development has surpassed net zero regulated emissions.

All minor new build developments have the option to demonstrate achievement of zero operational GHG emissions through the Part L of Building Regulations rather than a BREEAM assessment.

Evidence must be provided to demonstrate every feasible and viable option has been explored to fully achieve the net zero target on-site. Only in exceptional circumstances, where any shortfall is identified, appropriate mitigation should be formally agreed with the Council.

2.2 Strategic Approach

This report recognises the need to make early stage consideration of key design matters via following the methodology set down in the energy hierarchy – passive design, fabric energy efficiency, renewable technologies, centralised energy systems, embodied carbon, internal potable water use, smart infrastructure and flood risk/drainage; thus bringing the application up to the current approach toward a truly sustainable development.

One of the first bodies to instigate a change were the Low Energy Transformation Initiative (LETI) and their climate emergency design guide, which has now been followed up by the RIBA2030 challenge The RIBA2030 is based upon the LETI Guide established in late 2019/early 2020 to influence design/planning for new building; focusing more on the issue of whole life carbon and reduced operation energy consumption & emissions, all very much aligning with the sustainability requirements of Mid Sussex District Council policy.

3.0 Energy Strategy & Baseline Energy Consumption

3.1 Assessment Methodology

In order to assess the overall development strategy in terms of energy efficiency and carbon emission reduction, this report will adopt the methodology set out in the “energy hierarchy” as per emerging Mid Sussex policy.

This methodology ensures that development proposals make the fullest contribution to minimising carbon dioxide emission by following energy hierarchy as a commonly adopted approach in many local authorities:

1 Be lean: use less energy through passive design measures including the maximisation of solar heating and reducing heat loss.

2 Be clean: supply energy efficiently; considering the potential for CHP or district heating.

3 Be green: use renewable and low carbon energies.

Accordingly, this energy and sustainability statement has been prepared to meet the requirements of Mid Sussex policies in line with the energy hierarchy, all in line with the recently released Part L 2021.

The first stage of the energy hierarchy is to establish the baseline energy model.

The following section details the baseline energy requirements for the development –
the starting point when considering the energy hierarchy.

3.2 New Build Dwellings

The baseline emission levels – the Target Emission Rate (TER) - is obtained by applying the design to a reference ‘notional’ building the characteristics of which are set by regulations – SAP10.2; The new Part L Building Regulations 2022 introduced a completely new notional dwelling as detailed below:-

Table 1.1 Summary of notional dwelling specification for new dwelling(1)

Element or system	Reference value for target setting
Opening areas (windows, roof windows, rooflights and doors)	Same as for actual dwelling not exceeding a total area of openings of 25% of total floor area(2)
External walls including semi-exposed walls	U = 0.18 W/(m²·K)
Party walls	U = 0
Floors	U = 0.13 W/(m²·K)
Roofs	U = 0.11 W/(m²·K)
Opaque door (less than 30% glazed area)	U = 1.0 W/(m²·K)
Semi-glazed door (30–60% glazed area)	U = 1.0 W/(m²·K)
Windows and glazed doors with greater than 60% glazed area	U = 1.2 W/(m²·K) Frame factor = 0.7
Roof windows	U = 1.2 W/(m²·K), when in vertical position (for correction due to angle, see specification in SAP 10 Appendix R)
Rooflights	U = 1.7 W/(m²·K), when in horizontal position (for correction due to angle, see specification in SAP 10 Appendix R)
Ventilation system	Natural ventilation with intermittent extract fans
Air permeability	5 m³/(h·m²) at 50 Pa
Main heating fuel (space and water)	Mains gas
Heating system	Boiler and radiators Central heating pump 2013 or later, in heated space Design flow temperature = 55 °C
Boiler	Efficiency, SEDBUK 2009 = 89.5%
Heating system controls	Boiler interlock, ErP Class V Either: – single storey dwelling in which the living area is greater than 70% of the total floor area: programmer and room thermostat – any other dwelling: time and temperature zone control, thermostatic radiator valves
Hot water system	Heated by boiler (regular or combi as above) Separate time control for space and water heating
Wastewater heat recovery (WWHR)	All showers connected to WWHR, including showers over baths Instantaneous WWHR with 36% recovery efficiency utilisation of 0.98
Hot water cylinder	If cylinder, declared loss factor = $0.85 \times (0.2 + 0.051 V^{2/3})$ kWh/day where V is the volume of the cylinder in litres
Lighting	Fixed lighting capacity (lm) = 185 × total floor area Efficacy of all fixed lighting = 80 lm/W
Air conditioning	None
Photovoltaic (PV) system	For houses: kWp = 40% of ground floor area, including unheated spaces / 6.5 For flats: kWp = 40% of dwelling floor area / (6.5 × number of storeys in block) System facing south-east or south-west

NOTE:
1. For a dwelling connected to an existing district heat network, an alternative notional building is used. See paragraph 1.8 and SAP 10.
2. See SAP 10 for details.

SAP first creates the notional reference building, based upon the same shape and form as the proposed dwelling and applies the above the characteristics as defined in SAP10.2.

Once all of the baseline emission rates from SAP have been calculated in line with the above Government approved methodologies, they are considered as stage 'zero' of the energy hierarchy as described earlier and Target Emission Rate sets the benchmark for the worst performing, but legally permissible, development.

4.0 Design for Energy Efficiency - "Be Lean"

The first step in the energy hierarchy requires that buildings be designed to use improved energy efficiency measures – Be Lean. This will reduce demand for heating, cooling, and lighting, and therefore reduce operational costs while also minimising associated carbon dioxide emissions.

This section sets out the measures included within the design of the development, to reduce the demand for energy, both gas and electricity (not including energy from renewable sources). The table at the end of this section details the amount of energy used and CO2 produced by the subject building after the energy efficiency measures have been included.

To achieve reductions in energy, demand the following measures have been included within the design and specification of the building:

4.1 Orientation & Passive Design

The National Planning Policy Framework 2021 emphasises the need to take account of climate change over the longer term and plan new developments to avoid increased vulnerability to the range of impacts arising from climate change. The UK Climate Impacts Programme 2009 projections suggest that by the 2080's the UK is likely to experience summer temperatures that are up to 4.2°C higher than they are today.

Accordingly, designers are to ensure buildings are designed and constructed to be comfortable in higher temperatures, without resorting to energy intensive air conditioning.

The design team have considered the issues of solar heat gain in conjunction with protecting the dwelling from overheating with key points noted below:-

4.1.1 Residential Accommodation

Key design principles will be incorporated into the detailed design of the residential accommodation. The scale of development will dictate that not all of these principles would be able to be applied to all units, but the principled below optimised where feasible:-

- The project will be designed to best practice thermal insulation levels as noted, full details of which are noted under 3.3 below. Not only does good insulation assist in reducing heat losses in the winter, but it also has a significant impact on preventing heat travelling through the build fabric during the summer.

- The project is based on a relatively open site with ample opportunity to enable the harvesting of useful solar gain.
- The main living areas will be orientated to the southerly aspect where possible and have larger glazed areas to ensure good levels of natural daylight and sunlight.
- Southern orientated glazing to receive topographical shading via the proposed planting regime.
- Bedroom and bathroom areas have reduced glazed areas to reduce heat losses from these secondary spaces.
- As part of the same strategy, any northern facing windows are reduced in size to reduce the potential heat losses where appropriate.
- To further reduce any overheating risk, solar control glazing that will be specified, whilst still enabling the above noted useful solar gains to reduce heating loads.
- The construction will be of slab floors to offer high thermal mass to absorb heat during the day and purge it overnight during the summer or release it back into the dwelling during winter. - further reducing energy needs
- The new dwellings will have large opening areas of glazing to enhance purge ventilation.
- Dwellings will be designed to provide the opportunity to cross ventilate.
- Finally, the significant green spaces and play areas will enable an element of local evaporative cooling.
- The above strategy enabling a low energy natural ventilation strategy to be employed whilst still able to maintain an acceptable indoor environment. (see comments under 3.4 Ventilation)

4.2 Heating system

For the “notional” energy efficient model, the primary heating system for the buildings as set out within Part L 2021 will consist of a high efficiency condensing gas boiler and highly insulted unvented DHW cylinder which will provide domestic heating and hot water;

- A Rated Boilers – (90% + seasonal efficiency)
- Flue gas heat recovery

To increase the efficiency in the use of the heating system, the following controls will be used in a ‘boiler interlock’ system to eliminate needless firing of the boiler.

- Time and temperature zone control
- Boiler controls fitted with weather/load compensator

4.3 Fabric heat loss

Fabric

Insulation measures will be utilised to ensure the calculated u values exceed the Building Regulations minima, with specific guidance taken from the design team:-

New residential wall constructions will be highly insulated to achieve a u value at 0.14/15W/m2k.

The ground floor builds will use PIR insulation sufficient to achieve a u value at 0.12W/m2k.

Any horizontal ceilings will have 400mm of mineral wool insulation and meets a u value at 0.10W/m2k, whilst any pitched of flat roofs will achieve 0.12W/m2k, through the use of PIR insulation within warm roof constructions.

Glazing

New glazing for windows and doors within the residential development will be high specification triple glazing and have area weighted average U-Values of 1.1W/m2 K or better.

Air Tightness

The project will be tested for air tightness with a target value of 4m3/hr/m2 for the new residential units, in line with best practice for naturally ventilated dwellings.

Construction Details

Heat loss via non-repeating thermal bridging will be minimised by the use of approved construction details for these new build units. An overall y value <0.05 is targeted to ensure compliance with the minimum standards for dwelling fabric energy efficiency under Part L of Building Regulations 2021.

4.4 Ventilation

The design team are proposing air tight dwellings utilising natural ventilation. AD part F system 1 - background/trickle ventilation, opening windows and wet room extraction for the residential units.

4.5 Lighting

A 100% of internal light fittings throughout the development will be dedicated low- energy LED fittings.

External lights will have daylight controls to ensure not used during daylight hours.

4.6 Equipment

The reduction in the use of unregulated energy is critical in achieving demand reduction against the background of reducing regulated energy demand in high performance building fabric.

Strategies will include:-

All white goods, TVs and similar electrical equipment to be selected for their energy efficiency via the EU ratings, a copy of the EU rating will be supplied to each dwelling to facilitate informed buying decisions.

Smart meters will be installed to each dwelling to enable occupants to manage their energy consumption and associated costs.

Internal drying facilities will be provided in order to avoid the use tumble dryers.

The home user guides will provided advice on additional ways to reduce energy demand and/or smooth the demand curve:-

- Utilising off-peak/over night tariff for dishwashers and tumble dryers (when required).
- Using delayed start electrical equipment that would operate during the peak PV output periods.
- Tips on the use of part filled kettles, microwaves, air fryers et al, as opposed to high energy consuming items such as electric ovens and hobs.

3.7 Energy efficiency targets

Overall, the above passive design and energy efficiency measures are designed to ensure that annual heating demand is reduced to a minimum, with targets at around, or less than 20kWh/m2/annum – aligning with LETI and RIBA2030 targets.

5.0 Supplying Energy Efficiently - "Be Clean"

The second stage in the energy hierarchy is to ensure efficient and low carbon energy supply – Be Clean. In particular, this concerns provision of decentralised energy and/or the use of CHP where practical and appropriate.

Given that the project involves the development currently green field land and the periphery of a small conurbation – clearly there is no access to existing heat networks, but the scale of the master plan proposals clearly give rise to the potential to develop such a heat network for the Balcombe Road project.

Clearly, this report must consider an onsite provision.

5.1 On-site CHP/District Heating

The heat production facility for a district heating scheme is generally considered to include heat only boilers (HOB) and/or the production of both electricity and heat i.e. CHP.

CHP is, as a rule of thumb, only operated as a base load as, depending on the technology, it may be difficult and/or inefficient to operate according to daily variations in demand. In a well-designed district heating network heat from CHP will provide between 60% and 80% of the annual baseline heat (heating and hot water) requirement with heat-only boiler plants providing the peak load and back-up. To maximise efficiency of the engine it needs to run for at least 17 hours a day; therefore, the heat load needs to be present for this period.

The key benefit from running a CHP engine is that it produces electricity, which can displace grid supplied electricity, which has significant carbon savings. It is for this reason that CHP is designed to run for as many hours of the year as possible.

A high quality CHP installation requires demand for heat and power for the majority of hours in the year (5,000 hours per annum) and the heat to power ratio is low (e.g. 1:1), clearly, as a medium scale residential development, where the only demand for hot water for several months of the year is generally limited morning and evening demand, an on- site CHP installation would be difficult to justify.

We must also consider the net carbon benefits from such a system as the de- carbonisation of national grid dilutes the benefits obtained from the higher efficiency of larger-scale CHP led system.

A key document on this issue is CIBSE Symposium on the topic; “An operational lifetime assessment of the carbon performance of gas fired CHP led district heating” was published in 2016.

This paper set out a calculation methodology to determine the greenhouse gas emissions associated with district heat networks which use gas fired CHP as a heat source.

At the time, Part L calculations and CHP emissions savings are based on the grid based emission rate taken from the SAP 2012 3-year average - 519g/kWhCO2; SAP 2012 introduced a 15-year average at 381g/kWhCO2 to assist designers considering the longer term impacts.

Such a difference will markedly affect the relative calculated performance of a gas CHP engine versus a gas boiler, particularly if any local heat network losses are removed from the equation through the use of localised boilers.

The CIBSE paper further advises that “Using a typical good practice assumption of 40% thermal efficiency of the CHP, the threshold for net benefit is a grid carbon factor of around 338 gCO2/kWh. Below that threshold, CHP is found to be worse than a gas boiler and grid electricity.”

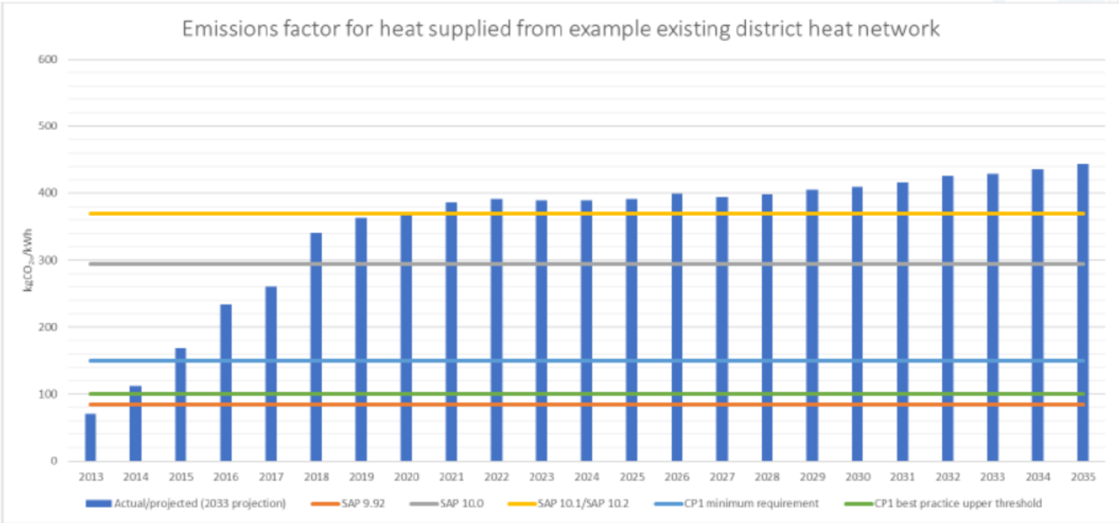
The current SAP10.2 figure for grid based emissions are at 136 gCO2/kWh.

So, it can be surmised, that by the time an CHP led heat network at the Balcombe Road site project has reached maturity in the latter part of this decade, the carbon benefits will already have been lost and accordingly, is not considered appropriate for the site.

5.2 Grid Decarbonisation

Given the issues set out above, the principle of using LTHW district heat networks, at circa 70oC flow and 30-40oC return, with the associated heat losses – which can readily run at 15% plus, even for energy networks on a large scale – would appear difficult to justify as opposed to localised, low carbon options that would decarbonise to “net zero” in line with the UK grid.

Additionally, the decarbonisation of the UK electricity grid (see further commentary below is having a detrimental impact on the carbon efficiency of heat networks, with the current grid based CO2 emissions rending the emission factors for networks some 3 times that of electrical only heat pump systems.



DEN Emission Factors Over Time

So, we consider an alternative solution in order to still enable delivery of low carbon energy utilising renewable energy solutions, which will further decarbonise with the UK grid, whilst also reducing energy demands.

6.0 Renewable Energy Options - "Be Green"

The final stage of the energy hierarchy requires development proposals to provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible – Be Green.

Renewable energy can be defined as energy taken from naturally occurring or renewable sources, such as sunlight, wind, waves/tides, geothermal etc. Harnessing these energy sources can involve a direct use of natural energy, such as solar water heating panels, or it can be a more indirect process, such as the use of Biofuels produced from plants, which have harnessed and embodied the suns energy through photosynthesis.

It should be noted that the cost of electrical energy is rapidly rising to the extent that it is now some 5 times the cost of mains gas, emphasis will be placed upon "off-setting" grid based electricity in order to achieve the optimum use of renewable technologies.
This section then sets out the feasibility of implementing different energy technologies in consideration of: -

- Potential for Carbon savings

- Capital costs
- Running costs
- Payback period as a result of energy saved/Government incentives
- Maturity/availability of technology
- Reliability of the technology and need for back up or alternative systems.

6.1 Government incentives

6.1.1 Smart Export Guarantee (SEG)

Introduced in 2020, the SEG will enable solar photovoltaic (PV), wind, hydro and anaerobic digestion (AD) installations up to 5MW and micro-combined heat and power (micro-CHP) up to 50kW will be able to receive an export tariff under the policy.

The SEG is a market-led initiative, requiring electricity supply licensees to offer export tariffs to eligible generators. Suppliers are free to set their own SEG compliant tariff price (provided it is above zero pence at all times) and decide how their tariffs work.

Installation owners are able to shop around and select the Licensee of their choice based upon an offer of the most appropriate tariff.

Payment are made against metered exports only.

6.2 Wind turbines

Wind turbines come in two main types'- horizontal axis and vertical axis. The more traditional horizontally axis systems rotate around the central pivot to face into the wind, whilst vertical axis systems work with wind from all directions.

The potential application of wind energy technologies at a particular site is dependent upon a variety of factors. But mainly these are: -

- Wind speed
- Wind turbulence
- Visual impact
- Noise impact
- Impact upon ecology

The availability and consistency of wind in urban environments is largely dependent upon the proximity, scale and orientation of surrounding obstructions. The site is relatively open and the use of wind power could be a solution toward meeting the zero carbon requirement.

However, it is now recognised that wind power is best harvested on a much larger scale and that smaller “domestic scale” installations are somewhat less efficient when compared to other options to achieve zero carbon.

It is also highly probable that due to landscape sensitivities, wind turbines would not be appropriate and that any application for a wind turbine is this location would not be acceptable within local plan policy.

6.3 Solar Energy

6.3.1 Solar water heating

Solar water heating panels come in two main types; flat plate collectors and evacuated tubes. Flat plate collectors feed water, or other types of fluid used specifically to carry heat, through a roof mounted collector and into a hot water storage tank. Evacuated tube collectors are slightly more advanced as they employ sealed vacuum tubes, which capture and harness the heat more effectively.

Solar energy can be delivered in 2 formats as noted above, each system requiring an appropriate area in which to install panels.

The new dwellings at Balcombe Road will have areas of pitched roof appropriate for the installation of panels.

However, for any roof space available in ratio to net floor areas, and the strategy to off- set the electrical use, solar PV would be a stronger candidate (see below) and offer a greater return in terms of carbon savings.

Accordingly, this technology is dismissed as being inappropriate for the development.

6.3.2 Photovoltaics (PV)

Solar panel electricity systems, also known as solar photovoltaics (PV), capture the sun's energy using photovoltaic cells. These cells will be accumulated on a PV panel, usually about 1.6m x 1.0m. These panels are then wall, roof or floor mounted and are connected directly to the electricity grid via the properties meter. In this way, the electrical generation can be fully exported and is not related to the consumption of the dwellings.

PV panels offer a highly efficient manner to offset carbon emission from the proposed properties on the path to zero carbon as well as offering a significant return in terms of the saving on electrical consumption. Returns can be in excess of 7/8%.

Given the “low rise” nature of the outline proposals, it is clearly feasible to install PV to the proposed dwellings and this would be a reserved matters issue for the detailed design.

6.4 Biomass heating

Biomass is a term given to fuel derived directly from biological sources for example rapeseed oil, wood chip/pellets or gas from anaerobic digestion. It can only be considered as a renewable energy source if the carbon dioxide emitted from burning the fuel is later recaptured in reproducing the fuel source (i.e. trees that are grown to become wood fuel, capture carbon as they grow).

Biomass heating systems require space to site a boiler and fuel hopper along with a supply of fuel. There also needs to be a local source of biomass fuel that can be delivered on a regular basis.

However, in more recent time, the use of primary product for biomass, the transport miles associated has called it to question just how truly sustainable the material is. It also releases high levels of NOx emissions and would therefore have to be considered carefully against the standard of local air quality within the new development in the area.
Biomass will not be considered further.

6.5 Ground source heat pump

All heat pump technologies utilise electricity as the primary fuel source – in this case displacing gas, as such, the overall reduction in emissions when using this technology can be less effective when opposed to a technology that is actually displacing electricity.

Ground source heating or cooling requires a source of consistent ground temperature, which could be a vertical borehole or a spread of pipework loops and a ‘heat pump’. The system uses a loop of fluid to collect the more constant temperature in the ground and transport it to a heat pump. In a cooling system this principle works in reverse and the heat is distributed into the ground.

The heat pump then generates increased temperatures by ‘condensing’ the heat taken from the ground, producing hot water temperatures in the region of 45oC. This water can then be used as pre-heated water for a conventional boiler or to provide space heating with an under floor heating system.

The use of a ground source heating/cooling system will therefore require:

Clearly, there is sufficient land area to install deep bore heat collectors to potentially provide the new developments heating requirements.

Normally the boreholes would need to be 6 to 8 metres apart and a 100 metre deep borehole will only provide about 5kW of heat. The borehole should also be formed around 3m away from the perimeter of the building and most specialists don’t recommend using the structural boreholes.

So clearly there are further engineering considerations for any such ground source solution, including an assessment of the local geology and the impact on collector efficiency, and it may well be that the cost and technical issues associated may render more conventional solutions more appropriate.

6.6 Air source heat pump

Air source heating or cooling also employs the principle of a heat pump. This time either, upgrading the ambient external air temperature to provide higher temperatures for water and space heating, or taking warmth from within the building and dissipating it to the outdoor air.

Assuming a seasonal system efficiency of 320% (Coefficient of Performance of 3.2) and that the air source heat pump will replace 100% of the space heating/hot water demand, then the system would reduce the overall CO2 emissions by approximately 75%. The table below demonstrates, on the assumption of a demand of 10,000Kwh/year for heating and hot water.

Type of Array	Energy Consumption (kWh/yr.)	Emission factor ($kgCO_2/h$)	Total CO_2 emissions (kg/annum)
90% efficient gas boiler	11111	0.210	2333
320% efficient ASHP	2813	0.136	383
100% efficient immersion (back-up)	1000	0.136	136

Table 2 – Air Source Heat Pump Performance

A theoretical carbon saving of 77%.

With the above data in mind, clearly an ASHP would offer a solution for delivering heat directly to individual dwellings themselves.

Accordingly, the design team are proposing the use of air source heating for the project, providing the required heating and DHW to the dwellings.
This effectively removes fossil fuels from the development and all electrical solution is then able to track the ever reducing carbon footprint of the UK electricity grid – currently projected to be net zero by 2035.

Electrical only system also have the other significant advantage of not emitting any local pollution in the form of NOx or particulate matter.

6.7 Renewable Energy Input

This report also considers the actual renewable energy delivered by heat pump systems; the official calculation as set down under RHI regulations is:-

Eligible Heat Demand = Total Heat Demand x (1 – 1/SPF)

So, should the system be designed to operate at 340% efficiency (SCOP at 3.4), 70% of heating energy provided to the buildings via this proposed heat pump system can be considered renewable energy.

6.8 Final Emissions Calculation

The results of the assessment of suitable technologies relative to the nature, locations and type of development suggest that the use of air source heat pumps to provide the heating, cooling and majority of the domestic hot water to the new development.

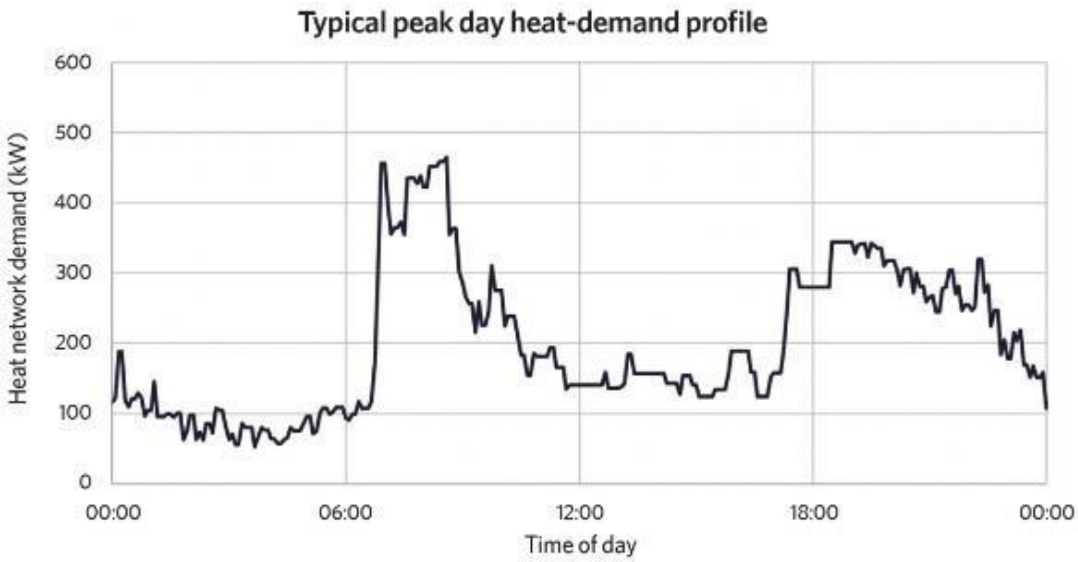
In addition, roofs of the proposed building will be optimised, to deliver as mush southerly facing roof as possible to maximise PV installations, and thereby, maximise local electrical generation.

The overall target for the finalised "Be Green" designs is to achieve an energy consumption for both regulated and unregulated energy (energy use intensity) at less than 40kWh/m2/annum for residential accommodation.

7.0 Smart Energy Grid

7.1 Peak Load Reduction & Active Demand Response

Peak loads are considered to be those that have the greatest impact of the local and district electricity grid. Traditionally, they are considered to be the morning peak "warm up" of residential properties – it is clear that the 06.00hrs – 09.00hrs period will be the critical peak load.



The development features 100% new construction able to be insulated to the high standards which will have a clear linear impact on the time and energy consumed in the warm up process.

This same fabric and passive design measures are also intended to reduce the overnight “cool down” in the first instance, again reducing the initial impact.

The above noted passive design and energy efficiency measures will contribute the peak load reduction, but more significantly, the HVAC strategy is key to the control of not only peak demand reduction but also demand response.

8.0 Sustainable Design & Construction

Further sustainability requirements for the development are set out in within specialist reports dealing with the likes of transport, arboriculture, ecology, flood risk, sustainable drainage and air quality

However, this report is able to confirm the sustainability credentials of the proposed development to align with Mid Sussex’ sustainability policies, and can be summarised as follows:-

8.1 Sustainable Design and Construction

Energy efficiency; vacant & underused land and buildings

For matters of Passive Design, Solar gain control & daylighting, Ventilation, Thermal Performance, Services Strategy, Low or zero carbon technologies and overall Energy Performance, all these matters have been dealt within the Energy Statement; Sections 2 to 5 above.

The land could be considered as underused and this report supports the applicants ambitions to bring the site forward for sustainable development.

Materials & Embodied Carbon

The design team are putting a strong focus on sustainability and durability when considering construction profiles and building materials for the development. High Green Guide ratings will be achieved wherever possible and materials will be assessed for suitability with regards to Whole Life Costs.

Clearly, the fact that the project is to be 100% new build and against the background of a decarbonising grid and the reducing carbon impact of building operation, the principal issue when considering the environmental impact of new construction materials is the embodied carbon – i.e. the carbon cost extraction of raw material, transport to factory, manufacturing, transport to site and erection on site.

Additional carbon costs are occurred through maintenance and repairs as well as end of life (deconstruction/demolition).

Embodied carbon is measured in kgCO2(equivalent)/m2.

The fact that the project is 100% new build all but irradicates the ability to “re-use” materials on site, but the design team will explore the potential to import re-use materials from other sites via materials exchanges.

The design team will also seek out construction techniques with a lower embodied carbon contents with extensive use of timber, light steel work and lightweight concrete floor slabs, and materials with a high recycled content such as plasterboard and rebar.

It is recognised that concrete utilised to form floor slabs has a significant embodied CO2e content, the majority of which comes from the cement, which makes up about 10% of concrete by volume, but accounts for around 75-90% of its embodied impact.
The team will aspire to utilise concrete with a significant recyclable content; concrete with a minim 30% GGBS content; higher if such product can be sourced at the time.
Emissions of CO2 associated with calcium carbonate decomposition during concrete production are partly reversible through carbonation.

The mix design of structural concrete purposefully limits carbonation of the surface layer, preventing corrosion of any embedded steel reinforcement, which might otherwise be affected during the building's life. There is, however, a greater degree of carbonation during the end-of-life stage, when concrete is crushed for reuse as an aggregate. The crushing process substantially increases the material's surface area, allowing CO2 to be more readily absorbed.

It is generally acknowledged that the concrete carbonisation process will remove up to 30% of the up-front embodied CO2e during the buildings lifespan, including end of life.
Considering the in-use carbon costs, the general approach to the proposed structures is that of a robust buildings with a long lifespan, reducing the energy and materials use associated with repairs, replacement and maintenance.

Building elements and components with different lifespans will form independent layers. This will ensure those layers with shorter lifespans can be replaced without damage to layers which have longer lifespans.

In addition to the above low carbon strategy, the development will source all materials form supplier that can demonstrate that materials are sourced responsibly in line with recognised Environmental Management Systems (FCS, BES6001 etc.)

Insulating materials will be specified to maximise thermal performance whilst still paying attention to the environmental impact of the materials used. The use of recycled products will be pursued wherever feasible and the use of other low embodied energy products will be further investigated. Non-toxic materials will be used wherever possible, including the specification of products with low VOC content in line with European testing standards.

A Site Waste Management Plan (SWMP) will be produced for the site, which will determine how to maximise the recovery of materials from the enabling works for subsequent high-grade/value applications.

Air pollution

Construction site impacts

The construction site will be managed in such a way that the environmental impact is minimised. This includes following best practice policies for dust pollution by using dust sheets, covering skips and damping down where appropriate.

An formal air quality assessment is to be undertaken to consider the impact of development on local sensitive receptors, as well as the quality of the environment for residents and builders users alike.

Plant and machinery.

All plant and equipment installed in the building will be appropriately sized and selected for efficiency in order to reduce greenhouse gas emissions. All equipment will be frequently maintained to ensure it continues to run efficiently and cleanly.
Air quality impacts of the buildings.

The proposals utilise zero emission electrical HVAC systems emitting zero local emissions.
The dwellings are to be provided with electrical car charging points to encourage occupiers to adopt zero emission transport solutions.
Noise pollution

Construction site impacts

The construction site will be managed in such a way that the environmental impact is minimised. This includes following best practice policies to minimise noise pollution, including the use of quieter machinery where possible. Site working hours will be managed to mitigate the possibility that they will cause a nuisance to the surrounding properties.

Noise impact of the buildings

The development will comply with current Building Regulations Part E, providing a good level of sound insulation between the proposed development and surrounding buildings.

External plant that could cause a noise nuisance - such as the heat pump systems - will be housed in a suitable acoustic enclosure.

Contaminated land

It is not thought that the site is contaminated.

The proposed building uses will not involve the storage, processing or transfer of hazardous substances.

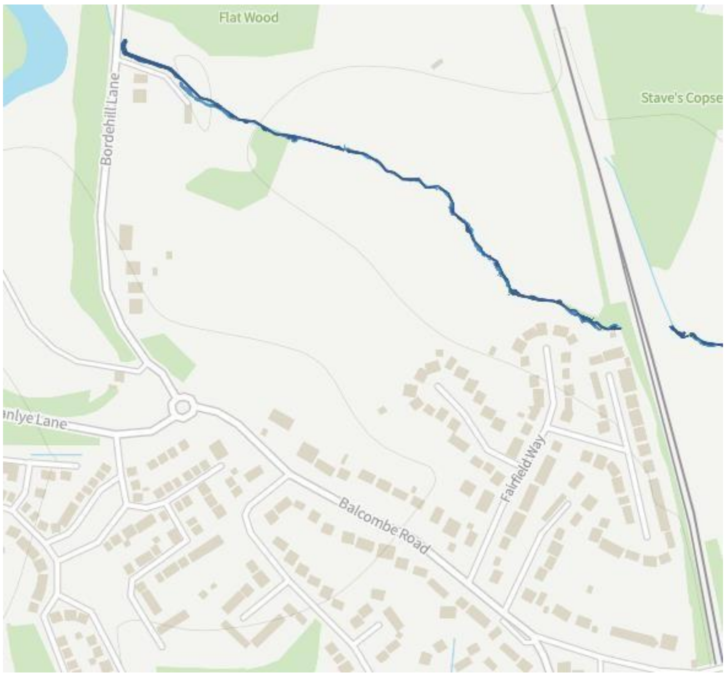
Water quality, saving and drainage

Flood risk and surface water drainage

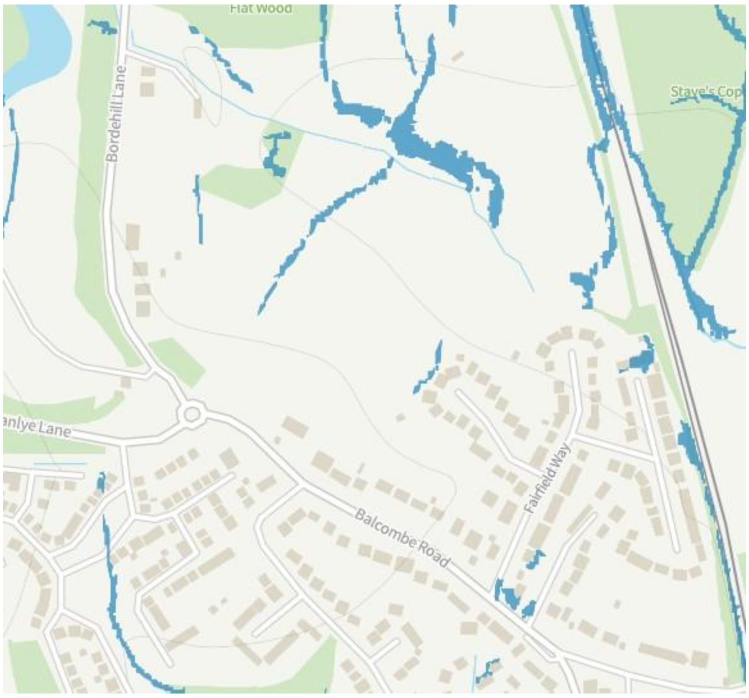
The applicant has checked the status of the proposed development site in regard to flood risk and surface water management

It has been confirmed that the site is in an area that is currently in an area of very low risk from flooding from flooding from rivers, but there is a potential impact of flood risk to parts of the site when taking into account climate change.

The site also has the potential for surface water issues arising from the impacts of climate change.



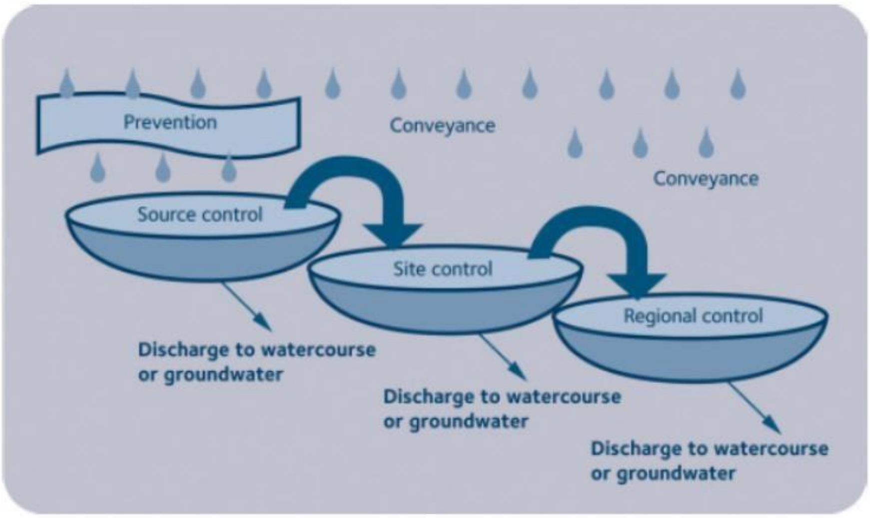
Flood Zone Map



Surface Water Map – 1 :1000 year

The project team have formally commissioned a FRA and SuDs report and strategy in order to ensure that the project has a neutral impact on surface water; i.e. run-off rates will be no greater than that prior to development, with a view to putting mitigation in place to maintain green field run-off rates.

The solution will follow the SuDs management train, and the project will investigate infiltration and attenuation measures to provide the required level of site control.



SuDs Management Train

The FRA/SuDs strategy will be submitted with the formal application under separate cover.

Water consumption

Internal potable water use will be limited through the specification of low flow fittings and dual flush toilets. All white goods provided will have maximum water efficiency ratings.

The following specifications will be considered in order to meet the water consumption target:

- Basin Taps - 6l/min
- WCs – 5.2/4 litre flush
- Kitchen taps – 7l/min
- Baths – 140l capacity
- Showers 9l/min

The overall target will be to limit internal water use to 110litres/person in line with best practice under the Building Regulations Part G.

The project will also utilise rainwater harvesting techniques for the upkeep of soft landscaping, whilst greywater harvesting will be investigated for use in the flushing of WCs to offer further reductions in wholesome water use.

Construction site impacts

The construction site will be managed in such a way that the environmental impact is controlled and minimised. Best practice guidelines for preventing water pollution will be followed on site.

Light pollution

The development is in a semi-rural location, and therefore will be sensitive to increasing the effects of light pollution.

The design team will follow the appropriate ILE design guidance with a view to achieving compliance for location and it will include daylight controls and an appropriate design to minimise the development’s impact.

Waste and recycling

Site waste management

A construction site resource management plan will be developed and implemented to ensure that construction site waste is effectively reduced and recycled, including designing waste out from the initial stages. Material ordering control and modern construction methods will be employed to minimise the potential for waste on site.

Waste will either be segregated on site into at least 5 different streams for recycling or collected, sorted and recycled by an external recycling contractor. Re-use of construction waste will also be encouraged. The site waste management plan will also ensure that hazardous waste is properly managed.

At least 99% of waste from excavation works associated with groundworks and landscaping will be diverted from landfill and put to beneficial use, in particular example, topsoil will be given special attention due to its high value.

Overall Targets

- Less than 5% non-hazardous construction waste to landfill
- Whole site construction waste target at 6.5t/100m2/GFA
- 99% beneficial use of excavation waste

Operational waste management

The project will provide ample space (and opportunity) to recycle operational waste, which, in combination with the mixed use nature of the scheme, should engender a strong response and achieve a high level of recycling.
There will be space within the bin stores which is dedicated and clearly labelled for recycling. Waste segregation will be carried out by the residents and tenants through provision of kitchen bins and appropriate storage space.
Segregation of food waste and appropriate management will also be put place

Overall Targets

- Zero biodegradable or recyclable waste to landfill by 2026
- 75% recycled by 2030.

Habitats and wildlife

A suitably qualified ecologist/landscape architect will be employed to assess the site as existing and to report on opportunities for a general enhancement of site ecology in conjunction with a long term strategy for maintenance with appropriate landscaping proposals, based upon indigenous species where possible.

9.0 Conclusions

In terms of energy strategy, this report has detailed the calculation methos for the baseline energy requirements for the proposed development at Balcombe Road, the reduction in energy demand as a result of energy efficiency measures and the potential to approach zero carbon status using renewable energy technologies.

The projects design includes the introduction of passive energy efficiency measures into the development, as detailed in section 3, to minimise energy consumptions and dwelling heating consumption.

There is also a requirement to reduce CO2 regulated emissions across the development using renewable or low-carbon energy sources, where practical and feasible, to meet the Net Zero target. Therefore, the report has considered the feasibility of the following technologies:

- Wind turbines
- Solar hot water
- Photovoltaic systems
- Biomass heating
- CHP (Combined heat and power)
- Ground & Air source heating

The results of the assessment of suitable technologies relative to the nature, locations and type of development suggest that the use of electrical only HVAC systems, with:-

- Heat pump driven heating and DHW systems as appropriate
- PV arrays to be used on appropriate roof spaces

In combination with the passive design and energy efficiency measures will create a very efficient development meeting near PassivHaus energy consumption standards, thus very low carbon and zero pollution development.

Carbon emission reduction targets have been set at 70%.
In addition, the embodied carbon of the construction techniques will be kept to a minimum via the use of re-used and recycled materials where practical.

Overall the project will be delivered in a manner that is compliant with Mid Sussex District Plan Policy DP39.