

Energy and Sustainability Statement

Purton



Prepared for:

June 2026

Lovell Partnerships Ltd



DE-25153	First Issue	First Revision	Second Revision	Third Revision
Date	17 th June 2026	30 th June 2026		
Produced by	Nathan Boyle	Nathan Boyle		
Checked by				
Approved by				
Regulations	Part L 2021			
Revision Notes		Minor Amendments		

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Executive Summary

This Energy and Sustainability Statement has been prepared in support of a planning application for a residential housing development at Purton, Wiltshire.

This Statement includes a carbon dioxide emission assessment showing how selected energy efficiency, low carbon and renewable energy measures have been considered and those which are deemed appropriate for the scheme.

Sample Standard Assessment Procedure (SAP) Calculations using SAP 10.2 have been prepared for the dwellings based upon the construction specification set out within the report, using planning stage drawings. This enables an assessment of the carbon dioxide emissions arising from the site to be undertaken and has allowed a number of different systems and technologies to be tested.

A fabric first approach has been adopted to minimise carbon emissions and reduce energy regulated and unregulated usage by reducing uncontrolled heat loss through high performance insulation, well designed thermal junctions, low airtightness targets, and high-performance glazing. As a result, operational energy and carbon emissions are significantly reduced through the base build, creating a strong foundation for the adoption of renewable technologies to further improve the dwellings performance.

A review of possible low carbon and renewable technologies has been conducted, and the new development site proposes to adopt the use of Air Source Heat Pump (ASHP) across all homes on site.

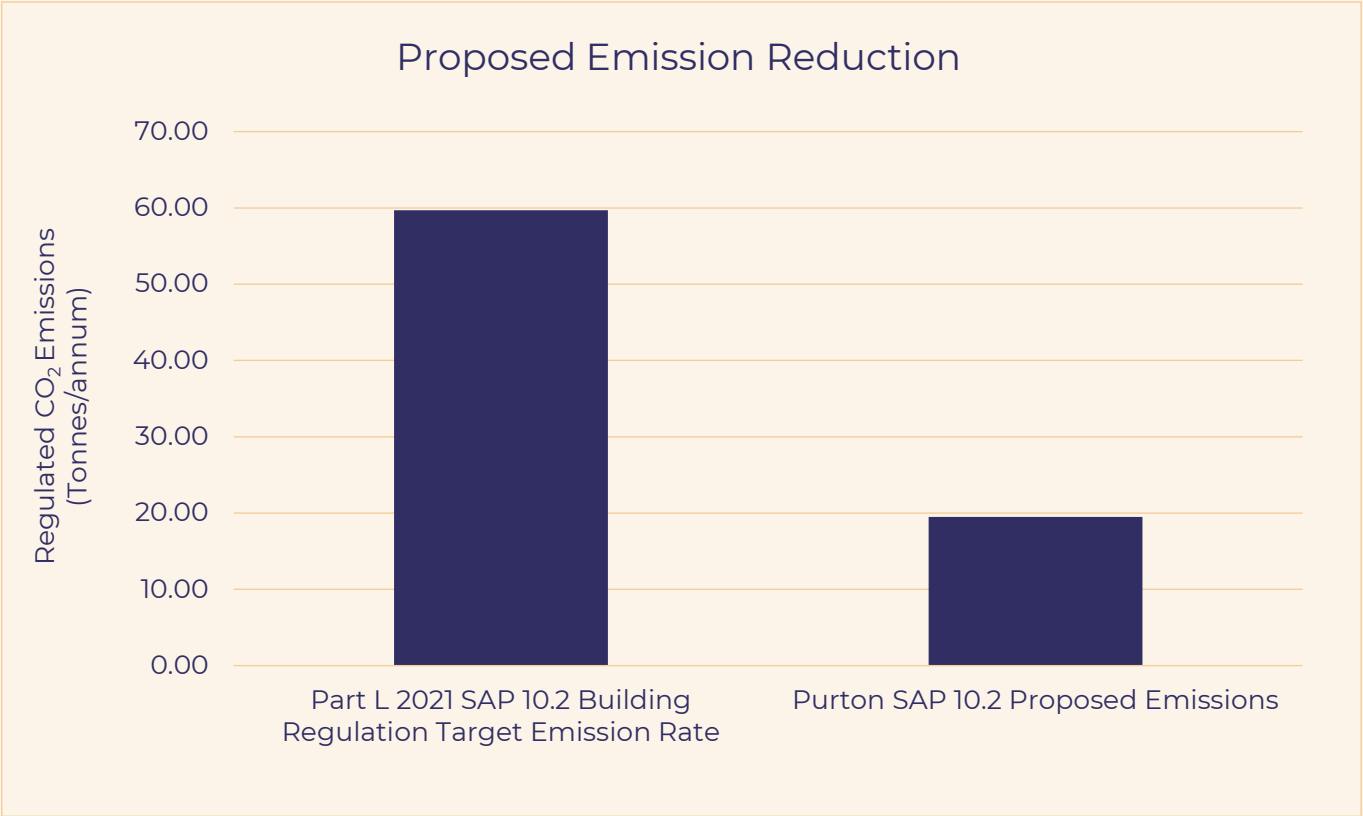
By implementing these attributes the scheme exceeds Part L carbon standards by **67.37%**. This also ensures that the proposed development is Net Zero ready. As the National Grid decarbonises the dwellings will continue to reduce their carbon emissions. Emissions from the grid will reduce meaning that the electricity used to power the dwellings will get cleaner over time. Also, as there are no fossil fuels on site the development is not dependent on a fuel that will naturally increase emissions and potentially require being swapped out for a less carbon intensive source in the future.

Wiltshire Core Strategy (Adopted January 2015) has also been reviewed. As there are no set emission reductions or energy demands reductions to be met, other than meeting National policies the proposed site meets all local planning requirements. The policy does mention meeting Code Level 4 by adhering to Part 2021 10.2 regulations the development already surpasses this standard.

The site also has a transitional agreement in place to ensure that the site will have to meet SAP 10.2 Standards providing that the site has been approved by April 2027

Therefore, the overall energy strategy through a fabric first approach and the installation of air source heat pumps achieves the required reduction in CO₂ against the Part L Target Emissions Rate SAP 10.2. The site also complies with National Planning Policy Frame Work and the Wiltshire County Core Strategy (Adopted January 2015)

Predicted Site Wide Carbon Emissions



Graph 1 – Predicted Annual Site Wide Carbon Emissions

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1. Introduction

This Energy and Sustainability Statement has been prepared in support of a planning application for a residential housing development at Purton, Wiltshire. The proposed development site is comprised of 60 residential open market, affordable rent and shared ownership homes. The proposed development site comprises of the following tenure mix;

- 36No. Open market houses
- 14No. Affordable rent houses
- 10No. Shared ownership houses

The development will consist of the following;

- 4No. One bedroom flats, consisting of 2No. Ground floor and 2No. First floor flats
- 18No. Two bedroom houses
- 22No. Three bedroom houses
- 16No. Four bedroom houses

The following statement seeks to outline how the proposed development site will comply with the relevant national and local policies relating to carbon emission reduction. In particular the following documents have been referred to in this statement to demonstrate compliance:

- The National Planning Policy Framework (2024)
- Wiltshire Core Strategy (Adopted January 2015)
- Part L1 Conservation of Fuel and Power in Dwellings (2021, 2023 Amendments)

This report will ensure the development incorporates sound sustainability principles by:

- Reducing carbon emissions associated with the development redesign by following the Energy Hierarchy and promoting a fabric first construction solution
- Carrying out a Renewable Energy Feasibility Assessment to determine the most viable low carbon and renewable technologies for the development
- Identifying additional solutions outside the scope of renewable energy technologies which will assist in improving the energy efficiency of the proposed development

2. Policy Review

2.1 Policy Context

Anthropogenic climate change can be described as the production of greenhouse gases and associated change in global climate caused by human activity. In response to the increased scientific awareness of the effect of human activities there has been a push in developed economies towards more sustainable development.

In 1992, the UK signed the Kyoto protocol committing itself and other nations to cut emissions of various greenhouse gases, the most significant being carbon dioxide. Since then, different policies and targets have been set at national, regional and local levels to stimulate and regulate more sustainable development. The Climate Change Act 2008 set carbon budgets to ensure that by 2050 there would be at least an 80% reduction in UK carbon emissions from the 1990 baseline. Additionally, the Conference of the Parties COP21 Paris agreement limiting global warming to 1.5 - 2°C above pre-industrial levels came into force in November 2016.

2.2 National Policy

National planning policy framework 2024 aims to make the planning system less complex and easier to understand.

Planning policies and decisions should play an active role in guiding development towards sustainable solutions, but in doing so should take local circumstances into account, to reflect the character, needs and opportunities of each area.

So that sustainable development is pursued in a positive way, at the heart of the Framework is a presumption in favour of sustainable development

Planning for climate change

Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating and drought from rising temperatures⁶¹. Policies should support appropriate measures to ensure the future health and resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

The need to mitigate and adapt to climate change should also be considered in preparing and assessing planning applications, taking into account the full range of potential climate change impacts.

New development should be planned for in ways that:

⁶¹ In line with the objectives and provisions of the Climate Change Act 2008.

Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through incorporating green infrastructure and sustainable drainage systems; and

Help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings in plans should reflect the Government's policy for national technical standards.

To help increase the use and supply of renewable and low carbon energy and heat, plans should:

Provide a positive strategy for energy from these sources, that maximises the potential for suitable development, and their future re-powering and life extension, while ensuring that adverse impacts are addressed appropriately (including cumulative landscape and visual impacts);

Consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

Identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for collocating potential heat customers and suppliers.

In determining planning applications, local planning authorities should expect new development to:

comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

2.3 Local Planning Policy:

Wiltshire Council Core Strategy (Adopted January 2015) has set out strategic objectives and core policies in tackling climate change and wider sustainable issues.

2.3.1 Core Policy 41: Sustainability Construction and Low-Carbon Energy

Climate Change Adaptation

New development, building conversions, refurbishments and extensions will be encouraged to incorporate design measures to reduce energy demand. Development will be well insulated and designed to take advantage of natural light and heat from the sun and use natural air movement for ventilation, whilst maximising cooling in the summer.

Sustainable Construction

New homes (excluding extensions and conversions) will be required to achieve at least Level 4 (in full) of the Code for Sustainable Homes⁸⁶.

Conversions of property to residential use will not be permitted unless BREEAM's Homes "Very Good" standards are achieved⁸⁶.

All non-residential development will be required to achieve the relevant BREEAM "Very Good" standards, rising to the relevant BREEAM "Excellent" standards from 2019⁸⁶.

Existing Buildings

Retrofitting measures to improve the energy performance of existing buildings will be encouraged in accordance with the following hierarchy:

- a. Reduce energy consumption through energy efficiency measures.
- b. Use renewable or low-carbon energy from a local/district source.
- c. Use building-integrated renewable or low-carbon technologies.

Opportunities should be sought to facilitate carbon reduction through retrofitting at whole street or neighbourhood scales to reduce individual costs, improve viability and support coordinated programmes for improvement.

Renewable and Low-Carbon Energy

All proposals for major development⁸⁷ will be required to submit a Sustainable Energy Strategy alongside the planning application outlining the low-carbon strategy for the proposal.

In all cases, including those listed above, proposals relating to historic buildings, listed buildings and buildings within conservation areas and world heritage sites should ensure that appropriate sensitive approaches and materials are used. Safeguarding of the significance of heritage assets should be in accordance with appropriate national policy and established best practice⁸⁸.

In all cases the impact of these requirements on the viability of development will be taken into consideration.

2.3.2 Core Policy 67: Flood Risk

Development proposed in Flood Zones 2 and 3 as identified within the Strategic Flood Risk Assessment will need to refer to the Strategic Housing Land Availability Assessment when providing evidence to the local planning authority in order to apply the sequential test in line with the requirements of national policy and established best practice.

All new development will include measures to reduce the rate of rainwater run-off and improve rainwater infiltration to soil and ground (sustainable urban drainage) unless site or environmental conditions make these measures unsuitable.

3. The Proposed Development

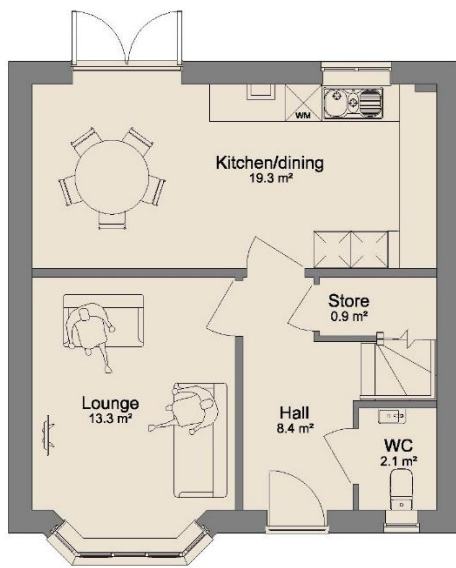
The newly proposed residential site is located west of the Wiltshire village of Purton. The works include the erection of 60 No. new build 1, 2, 3 & 4 bedroom dwellings.



Figure 1: Site Location of Purton Development, Courtesy of Google Maps



Figure 2: Block Plan of Proposed Development at Purton, Wiltshire, Courtesy of Think Urban Design



Ground Floor



First Floor

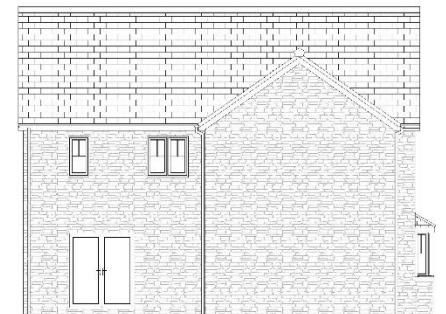
Figure 3: Ground and First Floor Plans of Milford House Type, Courtesy of Lovell Partnerships Ltd



Front Elevation



Front Elevation 2



Rear Elevation

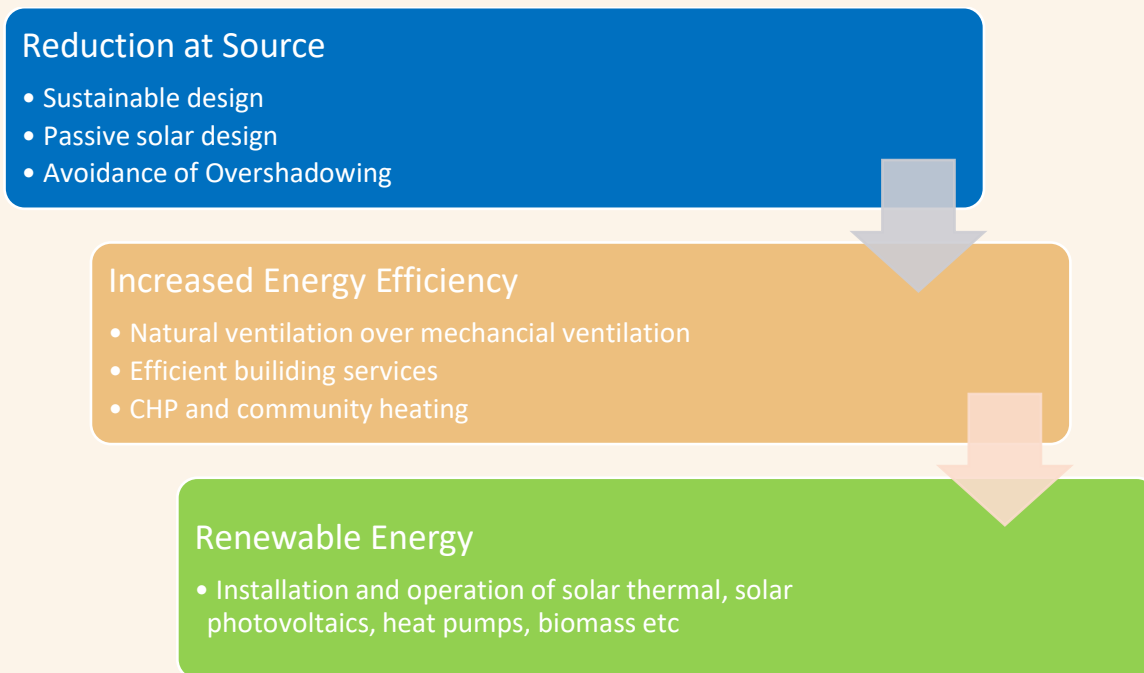


Side Elevation

Figure 4: Elevations of Ashdown House Type, Courtesy of Lovell Partnerships Ltd

4. The Energy Hierarchy

The Energy Hierarchy is a widely adopted and recognised set of principles to guide design, planning and development decisions to optimise energy provision. The Hierarchy prioritises minimising the need for energy consumption through firstly design and energy efficiency and then through generating the reduced energy demand via renewables. The Hierarchy can also help to balance the economic and environmental dimensions of sustainability, supporting choices which are both environmentally and economically sustainable.



Graph 2 – Energy Hierarchy

It is considered that the above principles carbon reduction forms the most appropriate approach from both the practical and financial perspective. The industry is broadly in agreement that the energy efficiency and low carbon technologies have the greatest impact offsetting CO₂ emissions. Therefore, it is logical to encourage enhanced mitigation through energy efficiency and low carbon technologies in the first instance, as opposed to applying renewables as the first option at a significantly greater cost.

5. Fabric Performance

The energy performance of a building is affected by its design, construction and use and whilst occupant behaviour is beyond the remit of this statement, better design and construction methods can significantly reduce the life cycle emissions of a building and assist the occupant to reduce consumption.

Sustainable design is not just about incorporating renewable technologies; buildings should be designed at the outset to provide suitable environmental conditions for the occupants whilst also consuming as little energy as practically possible.

5.1 Passive design

Passive design is a key principle of sustainable design and can be used to reduce the building’s energy demand. Passive design responds to local climate and site conditions to maximise the building user’s comfort and health while minimising energy use.

At the earliest stage the homes have been designed using a fabric first approach as to initially minimise energy and resulting CO₂ emissions. Particular attention will be paid to thermal envelope, and a high level of insulation will be specified to all thermal elements to minimise heat losses.

The development has been designed to improve daylighting in all habitable spaces, as a way of improving the health and wellbeing of its occupants. The majority of the habitable rooms, such as living rooms, will benefit from large windows to increase the amount of daylight within the internal spaces.

A portion of the buildings heat loss will occur due to air infiltration. Good construction detailing and the use of best practice construction techniques will minimise the amount of air infiltration. Extra attention to detail will be paid, with adequate sealing to all junctions in the thermal envelope, service penetrations and window casements.

Decentralised mechanical extract will be used to provide fresh air to the dwelling along with operable windows in order to prevent overheating during hottest summer months.

The following table provides a summary of the energy efficient and carbon reducing design characteristics incorporated across the development.

Table 1: Energy Efficient Measures of SAP Calculations

Design Stage SAP Data Input Table			
Element		Details	Comments
Floor U-Values	Ground Floors	0.11 W/m²K	Proposed Construction 75mm Screed, 150mm Topsheet Insulation, 150mm EPS Grey Insulation Between Concrete Beams – U-Value Calculation to be Confirmed

Design Stage SAP Data Input Table			
Element		Details	Comments
Wall U-Values	Party Floors	0.00 W/m ² K	Screed on Insulation, Precast Concrete Plank Floor – Kappa Value 40KJ/m ² K
	External Walls – Brick	0.17 W/m ² K	12.5mm Plasterboard on Plaster Dabs, 100mm Medium Density Concrete Block ($\lambda = 0.57$), 100mm Unilin Thin-R XT/CW Partial Fill Wall Insulation ($\lambda = 0.022$), 50mm LowE High Resistance Cavity, 102.5mm Brick Outer Leaf
Roof U-Values	Party Walls	0.00 W/m ² K	Walls Must be Fully Filled to Achieve 0.00W/m ² K U-Value - Wall Built to Robust Detail E-WM-20
	Roof – Insulation at Joists	0.09 W/m ² K	12.5mm Plasterboard, 100mm Mineral Wool Quilt ($\lambda = 0.044$) Between Timber Joists @ 400mm Centres, 400mm Mineral Wool Quilt ($\lambda = 0.044$) Above Joists, Laid Counter Direction to Unheated Roof Void
Thermal Mass	Party Roof	0.00 W/m ² K	Screed on Insulation, Precast Concrete Plank Floor – Kappa Value 30KJ/m ² K
	Internal Walls – Stud	0.00 W/m ² K	Internal Stud Walls with Plasterboard – Kappa Value 9KJ/m ² K
	Internal Walls – Block	0.00 W/m ² K	Block Walls with Plasterboard on Dabs – Kappa Value 75KJ/m ² K
	Internal Ceiling	0.00 W/m ² K	Plasterboard Ceiling to Timber Joists – Kappa Value 9KJ/m ² K
Opening U-Values	Internal Floor	0.00 W/m ² K	Timber Floor to Timber Floor Joists – Kappa Value 18KJ/m ² K
	Windows	1.20 W/m ² K	Double Glazed, Argon Filled, Low-E Coated Glazing G Value: 0.63
	French Doors	1.40 W/m ² K	Double Glazed, Argon Filled, Low-E Coated Glazing G Value: 0.63
Thermal Bridging	Solid Door	1.20 W/m ² K	Solid Composite Door
	y-value	Various	Bespoke Psi Junctions used Throughout
Ventilation	Air Tightness	4.00 m ³ /hm ²	All New Build Dwellings to be Air Tested
	Mechanical Ventilation	dMEV	Vent Axia Lo-Carbon NBR dMEV C 125 Decentralised Mechanical Extract Ventilation (dMEV) System (PCDB No 500778) Installed to 1 x Kitchen and Addition Wet Rooms (Utility Room/Toilet/Bathroom/Ensuites) Only
Lighting		100% Low Energy Lighting	Lights Rated at 15W with an Efficacy of 100Lumens/Watt
Tariff and Metering		Electricity Tariff	Standard Electricity Tariff Assumed
		Gas Meter	No Gas Meter Installed, No Gas on Site
		Electricity Meter	Smart Electricity Meter Installed

5.2 Lovells Design Approach

At Lovell, we ground every scheme in the Energy Hierarchy - Be Lean, Be Clean, Be Green, Be Seen, so homes are efficient by design, simple to run and comfortable to live in.

In practice this means a fabric-first focus (optimised U-values and glazing g-values, tighter air-permeability, thoughtful orientation, and efficient form and components) to minimise heat loss while safeguarding daylight and comfort. Where appropriate, efficient electric heating (e.g., air-source heat pumps) further reduce operational energy and bills. We also support residents with clear inductions and smart metering so households can understand and manage energy in use. This hierarchy led approach delivers lower running costs for occupants, healthier indoor environments, and a transparent route to compliance with evolving standards.

Our sustainability approach addresses water, embodied carbon and nature alongside energy. We integrate SuDS and resilient blue-green infrastructure, permeable surfaces, rain gardens, green roofs and native, drought-tolerant planting, together with water-efficiency measures, rainwater harvesting, and practical details such as well-insulated, shortened hot-water pipe runs to reduce wastage at the tap. During construction, we cut embodied and site emissions through measures such as renewable site power, eco cabins, high waste diversion rates, lower carbon fuels for plant, EV charging for site traffic, and a localised supply chain. For residents, that results in homes and places that better manage flood risk, use less water and support biodiversity; for the planning authority, it demonstrates a forward-looking, proportionate pathway to compliance and net zero-aligned outcomes across both operational and whole life carbon.

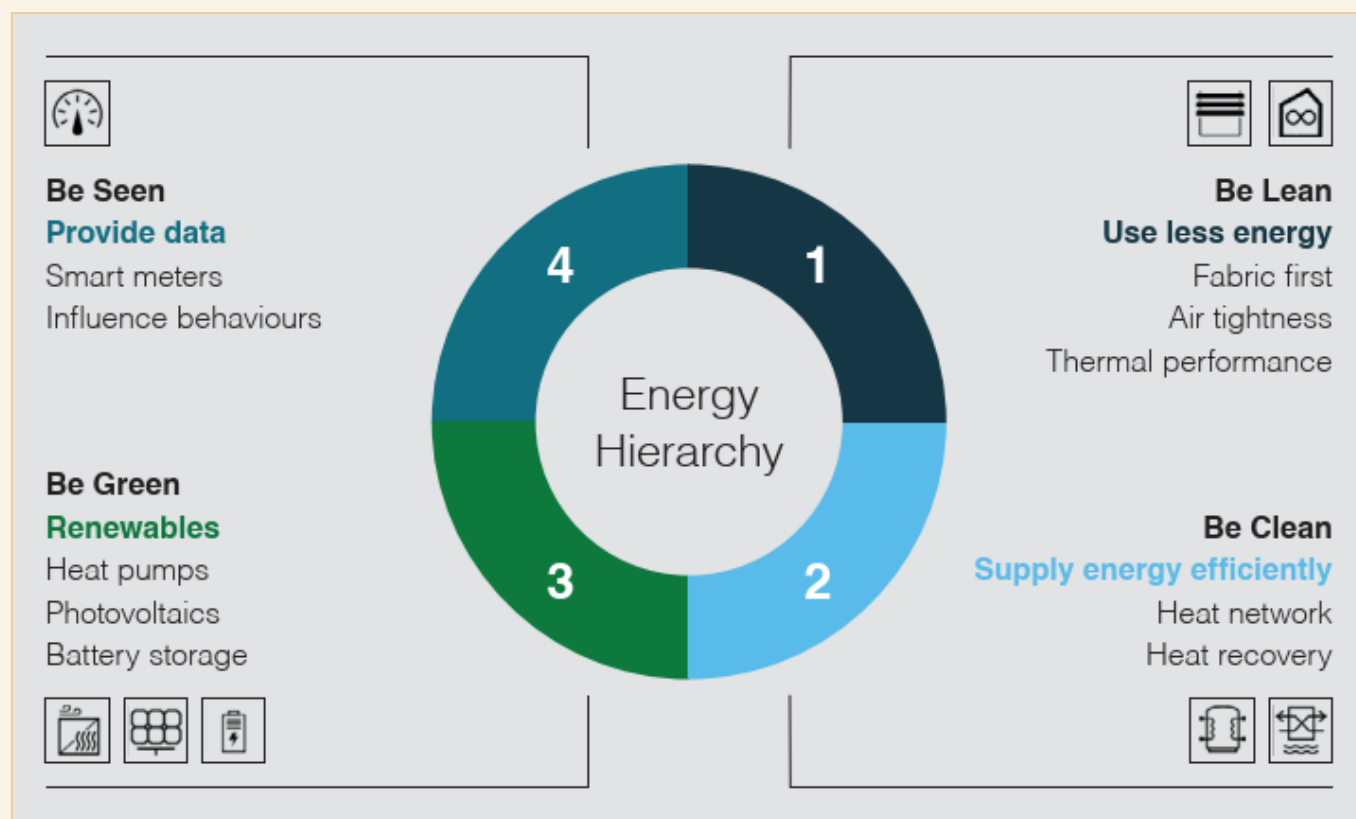


Figure 5: An illustration of Lovells Energy Hierarchy Approach

6. Renewable Technologies

This section reviews the suitability of various renewable technologies for this site redesign.

6.1 Heat Pumps

6.1.1 General Overview

In the same way that a fridge uses a refrigerant gas to extract heat from the inside, keeping your food cool, an air source heat pump extracts heat from the outside air, and uses it to heat your home and sometimes your hot water too.

An air-source heat pump has three main parts:

- The evaporator coil absorbs heat from the outside air
- The compressor pumps the refrigerant through the heat pump and compresses the gaseous refrigerant to the temperature needed for the heat distribution circuit
- The heat exchanger transfers the heat from the refrigerant to air or water

Typically, the first of the two parts of the heat pump system are situated outside of the property, and the final part, the heat exchanger is fitted inside the building.

In an air-to-water heat pump system, the heat produced is used to heat water, which can be used to preheat water in a storage tank or circulate through under floor heating pipes or radiators. Heat pumps produce hot water that is a lower temperature (typically 35-45C) than standard boiler systems, which makes the choice of under floor heating the most effective option. In an air-to-air system, this heat is used to produce warm air, which is circulated by fans to heat a building directly.

Ground source heating takes advantage of the stable ground temperature of 12°C to heat either air or water to provide energy efficient heating (and optional comfort cooling) to a building. The energy flow is driven by the temperature difference between the ground and the circulating fluid which can then be used to deliver heating (and optional cooling) to the building.

The direct bore hole type of installation requires a number of boreholes with a depth of up to 100m and a minimum centreline distance of 6m separating each bore hole.

Alternatively, closed loops can be installed along with the piles and or pad foundations of the building to take advantage of the foundation excavations to maximise the earth-connectivity of the system

6.1.2 Technical Viability and Feasibility

The development at Purton could benefit from heat pumps, whether this being an air source heat pump or a ground source heat pump. The gardens could house horizontal collectors or bore holes could be drilled when laying the foundations for ground source heat pumps. Besides ground and air source heat pumps, there are other options where heat pumps are concerned;

There is the potential for a heat pump to just heat water for hot water generation in the form of a heat pump hot water cylinder. For this it involves a heat pump unit installed on top of the cylinder and uses the surrounding air around the cylinder and drawing air from outside to heat the water in a cylinder. As most house's energy demand will be coming from hot water generation as insulation and fabric standards improves it may become more pragmatic to heat dwellings from electric panel heaters and have the hot water supplied from a heat pump cylinder. This would need a more in-depth assessment

With regards to emissions and energy performance within dwelling heat pumps work incredibly well at lowering a dwelling's emissions and increasing its energy rating. This is down to the heat pumps operating efficiency. A heat pump typically operates at efficiencies of over 300%. This means that for every 1kW of electricity being provided to a heat pump, it will generate 3kW of heat. As it requires less energy to generate the same amount of heat it subsequently requires less electrical energy, which therefore reduces emissions.

As it stands the development is already proposing to heat and provide hot water from air source heat pumps. This is the most feasible option to comply with Future Home Standards

Heat pumps are considered to be a recommended technology for this site

6.2 WWHRS

6.2.1 General Overview

Waste Water Heat Recovery Systems (WWHRS) capture heat from warm wastewater, usually from showers, and transfer it to the incoming cold mains via a sealed heat exchanger. As hot wastewater runs to drain, it preheats the cold feed to the shower mixer (and / or hot water appliance), so less energy is needed to reach set temperature. Systems are closed loop (potable and waste streams never mix), have no moving parts, and operate automatically whenever a shower is used. WWHRS can be installed as gravity-fed vertical units on the shower waste stack, or as low-profile, under-tray / under bath horizontal units where headroom is limited, both options deliver reductions in hot water energy demand without using roof space or altering

6.2.2 Technical Viability and Feasibility

In low-rise housing, WWHRS is a practical, low-complexity measure, particularly in new build, where layout allows simple inline connection and short pipe reroutes. Vertical, gravity-fed configurations suit upper-floor showers with sufficient fall, offering higher recovery performance; under-tray / under-bath units fit bathrooms with minimal drop (e.g., ground floors or tight joist zones) and maintain standard gravity drainage with modestly lower efficiency.

WWHRS is a feasible technology, but is not recommended for this site.

6.3 Photovoltaics

6.3.1 General Overview

Photovoltaic (PV) panels are installed on the roof or elsewhere to convert sunlight into electricity. Ideally this type of system would be installed south-facing with a location that is not shaded by local obstructions.

This power from the panels, generated as D.C. (Direct Current), is sent to a device called an inverter. The inverter converts the D.C. (Direct Current), from the solar panels into A.C. (Alternating Current), which is what our appliances use.

There are different types of photovoltaic technology - Amorphous, Monocrystalline, Polycrystalline and Hybrid (combines monocrystalline and amorphous technology).

Table 2: Types of PV

Technology	Characteristics	Power Output & Density
Amorphous	Efficient in low light conditions and cheap but needs a large installation area.	Power output: 1000 units/kWp/year Power density: 62Wm/m ²
Monocrystalline	High efficiency and fairly expensive. Prefers high-light conditions.	Power output 850-1000 units/kWp/year Power density = 120 Wp/m ²
Polycrystalline	Lower efficiency and less expensive. Prefers high-light conditions.	Power output 850-1000 units/kWp/year Power density = 120 Wp/m ²

6.3.2 Technical Viability and Feasibility

The site has large areas of pitched roof where photovoltaic panels could be installed. The main benefit to the system is having onsite generation of electrical energy that can be used within a dwelling. Most PV installation are fitted with meters that are export ready, essentially meaning that the electrical energy generated by the PV panels can be exported and sold to the National Grid. This would be dependent on the dwelling's energy provider.

Another aspect of PV arrays that is beneficial is the potential to store the electrical energy that is generated by the panels. Battery storage technology has come on in leaps and bounds over the last decade. Depending on how sophisticated the PV installation is, there is the capability to charge a battery with a PV array, store this electrical energy and use it as and when there is an electrical demand. This reduces the need for imported electricity from the National Grid

PV panels can also be used to heat hot water. Unlike with solar thermal where this a wet system heating a body of water, PV panels can still be used to heat hot water. Most cylinder come with electrical immersion heater that typically only gets used if the main heat source for the cylinder is not

working or the hot water demand is greater than main heat source can cope with. A PV array could be used to power the immersion heater in the cylinder to keep the cylinder up to temperature. This would reduce the demand on the main heating system.

With the use of electric or hybrid cars becoming more prevalent as we look to diversify ourselves away from fossil fuels, photovoltaic panels can assist with the powering of electric cars. Having part of that energy required for powering these cars coming from PV panels would be very beneficial for the end users.

From an emissions and energy perspective as the panels are generating electricity on-site it significantly reduces the emissions and improves the dwelling's energy performance. By having electrical generation on-site this reduces the demand for National Grid Electricity, this therefore reduces the emissions as energy is being generated at source. This is more efficient method of delivery of energy, which is why it has a very positive impact on a dwelling's energy rating. In Part L the notional calculation has PV embedded into the calculation, therefore including PV assists in meeting Part L compliance.

Solar photovoltaics are considered to be a technically, economically and functionally feasible technology. However, as it likely that the site will easily exceed all the requirements of Part L and the local policies with air source heat pumps, this technology is not being considered.

6.4 Solar Thermal

6.4.1 General Overview

The most common solar thermal system uses a twin coil cylinder that is heated by both a boiler (or another heat source) and the solar panels. The solar system and the regular heating system do not come into direct contact with each other, and the only shared part is the cylinder.

The free energy in the sun's rays is absorbed by the solar thermal panel and the heat is transferred into the pipe work. The pipe work is filled with a ready mixed liquid containing an antifreeze (glycol) and water, which is pumped gently through a secondary coil inside a twin coil solar cylinder. The heat is deposited in the storage cylinder and the glycol returns to the panel to absorb more free solar energy. The result is a reduction in demand for hot water from the main heating system.

6.4.2 Technical Viability and Feasibility

There are available areas of pitched roofs on the dwellings which can accommodate the installation of solar thermal panels. This could be a feasible option. However, this would entail the installation of a solar rated hot water cylinder. If the heating and hot water design included a hot water cylinder, the cylinder would need to be upgraded to accommodate a solar thermal system. By generating heat at source this would reduce the development's emissions as this would reduce dependence on National Grid electricity, or a potential fossil fuel from increasing sitewide emissions.

Solar thermal is considered to be a technically, economically or functionally feasible technology and no further investigation will be carried out to assess its impact and validity.

6.5 Wind

6.5.1 General Overview

A wind turbine works the opposite of a fan. Instead of using electricity to make wind, like a fan, wind turbines use wind to make electricity. The wind turns the blades, which spin a shaft, which connects to a generator and makes electricity.

Small wind systems known as "microwind" or "small-wind" turbines can produce electricity to help power the lights and electrical appliances in a typical home and also generate you income from the feed in tariff scheme. Forty percent of all the wind energy in Europe blows over the UK, making it an ideal country for small domestic turbines.

There are two types of domestic-sized wind turbine:

- Mast mounted: these are free standing and are erected in a suitably exposed position, often rated at around 2.5kW to 6kW, larger commercial installations are in excess of this size
- Roof mounted units: these are smaller than mast mounted systems and can be installed on the roof of a home where there is a suitable wind resource. Often these are around 1kW to 2kW in size

There is considerable agreement that wind has huge potential for affordable, large-scale generation through onshore and off shore wind farms.

At a domestic level, things are less clear. Whether wind is right for your development will depend on the location and circumstances. If you have a clear site for the turbine, away from obstructions, with high average wind speeds, it is worth investigating.

The success of wind power depends totally on the suitability of the site. The key factors are:

- An average wind speed of at least 5 or 6 m/s (metres per second)
- No obstacles nearby which might reduce the wind speed or create turbulence. These include buildings, trees or hills. An ideal site is a smooth hill top with a clear, open stretch to the prevailing wind
- You are able to connect the turbine to the property and to the national grid

6.5.2 Technical Viability and Feasibility

An indication of wind speed in the area of the development can be obtained from the UK wind speed database. Speed is given in metres per second at 10m high. However, this should be viewed as a starting point only, as the figure is an average for the square kilometre of interest.

Average Wind Speed for this area

The predicted wind speed for the development is 5.39 metres per second at 10m above ground level. Data has been sourced from the NOABL Wind Map which can be found at:

<https://www.rensmart.com/RenSMARTWindReport>

As the site is relatively rural there is a scope to find a location where a wind turbine could be installed. This would require a significant amount of planning and assessment. A large scale wind turbine

cannot be installed wherever, they produce noise, create air turbulence, aerodynamic drag and would need to be sited to ensure they cannot be easily accessible. The other issue would be how to distribute the energy generated to the occupants.

The proposed development does not meet the site constraints for wind turbines to work effectively. A specialist assessment would need to be carried out taking in to account all factors that affect the air flow and efficiency of a proposed turbine. Without this information wind turbines are not considered to be feasible on the site.

Wind Turbines are therefore not considered to be a recommended technology, and no further investigation will be carried out.

6.6 Biomass

6.6.1 General Overview

Biomass is produced from organic materials, either directly from plants or indirectly from industrial, commercial, domestic or agricultural products. It is often called 'bioenergy' or 'biofuels'. For small-scale, domestic or commercial use, the fuel usually takes the form of wood pellets, wood chips or wood logs.

Producing energy from biomass has both environmental and economic advantages. It is a carbon neutral process as the CO₂ released when energy is generated from biomass is balanced by that absorbed during the fuel's production. Biomass can also contribute to waste management by harnessing energy from products that are often disposed of at landfill sites.

There are two main ways of using biomass to heat a property:

- Stand-alone stoves providing space heating for a room. These can be fuelled by logs or pellets but only pellets are suitable for automatic feed. Generally, they are 6-12 kW in output, and some models can be fitted with a back boiler to provide water heating.
- Boilers connected to central heating and hot water systems. These are suitable for pellets, logs or chips, and are generally larger than 15 kW.

6.6.2 Technical Viability and Feasibility

Combustion of wood biomass releases higher quantities of NO_x, SO_x and particulates (PM₁₀ and PM_{2.5}) compared to a comparable system fuelled by natural gas. This would have a negative impact upon the air quality in the vicinity of the area.

There are associated logistical issues associated with Biomass Boilers. The system requires significant space for both the Biomass boiler and fuel storage required.

Biomass Boilers are therefore not considered to be a recommended technology, and no further investigation will be carried out.

6.7 Renewable Summary

Following a review of renewable and low carbon technologies, this proposed scheme will adopt a fabric first approach as the foundation for reducing carbon emissions and energy demand. This ensures that all dwellings achieve high levels of thermal efficiency before the integration of renewable technologies.

To build upon this approach, air source heat pumps will be incorporated and adopted across the site for all heating and hot water requirements. This technology reduces reliance on traditional systems and delivers significant emissions reductions, while aligning with future decarbonisation of the electricity grid.

Other technologies do hold merit, such as solar thermal panels, photovoltaic panels and Waste Water Heat Recovery System (WWHRS). Solar thermal panels could be installed; the main drawback is that hot water is at its lowest demand when the panels are in their peak window of performance. With waste water heat recovery systems, these have a greater impact with fossil fuelled boilers. They will save energy, but with a highly efficient heat pump the energy saved is less than with a conventional fossil fuel boiler. With photovoltaic panels, as the dwellings will easily meet the emissions and energy targets within Part L these are not required to assist in meet required regulations.

The installation of air source heat pump is the perfect candidate to assist in meeting all the required regulations. The table below details what air source heat pumps and hot water cylinders will be used in the Sample SAP Calculations. As well as Table 3 shows how these systems will be programmed and what emitters will be used to heat the dwellings. The makes and model of the heat pumps and cylinder may change once planning is approved and the site evolves. However, this should give a reasonable representation as to how the site will perform in relation to predicting sitewide emissions and energy demand.

Table 3: Low Carbon & Renewable Technologies proposed for adoption

Low Carbon & Renewable Technologies to be adopted			
Element		Details	Comments
Heating and Hot Water	Heating System	Air Source Heat Pumps (ASHP)	2, 3 & 4 Bedroom Dwellings – Ideal Heating 8.0 kW HP290 Monobloc Air Source Heat Pump – ID No. 107984 1 Bedroom Dwellings - Ideal Heating 4.5 kW HP290 Monobloc Air Source Heat Pump – ID No. 107968 Pump 2013 or Later and Installed in Heated Space, Design Flow Temperature <45°C, MCS Installation Assumed
	Heating Controls	Programmer	Programmer with Room Thermostat and TRVs
	Heat Distribution	Radiators	Oversized Radiators Installed Throughout

Low Carbon & Renewable Technologies to be adopted		
Element	Details	Comments
	Hot Water Heating	From Ideal Source Heat Pump 4 Bedroom Dwellings - 300litre Ideal HP300DHW Heat Pump Rated Hot Water Cylinder – Declared Heat Loss 1.74 kWh/day 2 & 3 Bedroom Dwellings - 250litre Ideal HP250DHW Heat Pump Rated Hot Water Cylinder – Declared Heat Loss 1.52 kWh/day 1 Bedroom Dwellings - 180litre Ideal HP180DHW Heat Pump Rated Hot Water Cylinder – Declared Heat Loss 1.18 kWh/day Cylinder to be Installed with a Cylinderstat, All Primary Pipework Fully Insulated and Cylinder on Independent Timer from Main Heating. Cylinder Installed in Heated Space with Electric Immersion Heat Transfer Area 2.5m² for 180litre Cylinder, 3.0m² for 250/300litre Cylinder

7. Site Wide CO₂ Emissions

Sample SAP calculations have been produced for the proposed development site as a means of determining the carbon emissions of the site.

These have been completed using the approved modelling software Elmhurst Design SAP 10.2. Each house type within the proposed site redesign has been assessed to provide an overview of the predicted carbon emissions from the site compared with Part L 2021 baseline.

The predicted development performance is outlined below in tables 4 and 5.

Table 4: Summary of Emissions (Regulated) of Proposed Assessment

Dwelling	Floor Area m ²	No. Dwellings	Target Emission Rate KgCO ₂ /m ² /year	Dwelling Emission Rate KgCO ₂ /m ² /year	Improvement	Annual Sitewide Target Emissions KgCO ₂ /year	Annual Sitewide Dwelling Emissions KgCO ₂ /year
Plot 006 – Fairhaven	61.54	18	12.60	3.83	69.90%	13,957.27	4,242.57
Plot 009 – Ramsey	114.02	1	10.50	3.19	69.62%	1,197.21	363.72
Plot 021 – Lansdown	87.10	17	10.83	3.34	69.12%	16,035.98	4,945.54
Plot 025 – Milford	91.04	3	11.63	3.48	70.08%	3,176.39	950.46
Plot 031 – Elseham FF	64.30	2	11.83	3.65	69.15%	1,521.34	469.39
Plot 032 – Elseham GF	50.26	2	13.29	3.80	71.41%	1,335.91	381.98
Plot 035 – Newbury	94.04	2	11.08	3.34	69.86%	2,083.93	628.19
Plot 044 – Redbourne	117.52	6	10.40	3.86	62.88%	7,333.25	2,721.76
Plot 050 - Ashdown	155.56	5	9.88	3.57	63.87%	7,684.66	2,776.75
Plot 059 - Tattenhoe	142.12	4	9.43	3.51	62.78%	5,360.77	1,995.36
					Total	59,686.70	19,475.71

Table 5: Summary of Energy Demand (Regulated) of Proposed Assessment

Dwelling	No. Dwellings	Main Heating Demand kWh/year	Hot Water Demand kWh/year	Pumps and Fans kWh/year	Lighting kWh/year	Proposed Dwelling Energy Demand kWh/Year	Annual Sitewide Target Energy Demand kWh/Year	Annual Sitewide Dwelling Energy Demand kWh/Year
Plot 006 – Fairhaven	18	604.35	820.94	28.76	146.79	1,600.84	84,729.24	28,815.12
Plot 009 – Ramsey	1	1,188.25	977.14	48.44	237.42	2,451.25	7,544.22	2,451.25
Plot 021 – Lansdown	17	810.69	925.60	38.45	194.87	1,969.61	100,543.95	33,483.37
Plot 025 – Milford	3	967.37	934.56	40.09	198.23	2,140.25	19,613.85	6,420.75
Plot 031 – Elseham FF	2	622.20	786.38	31.34	151.53	1,591.45	9,364.50	3,182.90
Plot 032 – Elseham GF	2	429.72	732.09	24.21	116.40	1,302.42	8,027.98	2,604.84
Plot 035 – Newbury	2	944.09	942.15	41.52	195.02	2,122.78	12,973.86	4,245.56
Plot 044 – Redbourne	6	1,218.69	1,575.04	49.93	243.10	3,086.76	46,310.52	18,520.56
Plot 050 - Ashdown	5	1,776.70	1,649.21	64.27	262.58	3,752.76	49,078.15	18,763.80
Plot 059 - Tattenhoe	4	1,436.67	1,620.54	58.73	274.71	3,390.65	34,667.80	13,562.60
Total						23,408.77	372,854.07	132,050.75

The development's emissions have been predicted at **19,475.71KgCO₂/year** and the regulated energy demand has been calculated to be **132,050.75kWh/year**. This is an improvement in Part L 2021 SAP 10.2 regulations emissions by **67.37%** and an improvement on the baseline regulated energy demand by **64.58%**

$$\frac{(\text{Annual Target Emissions} - \text{Annual Proposed Emissions})}{\text{Annual Proposed Emissions}} \times 100 = \% \text{ Improvement}$$

$$\frac{(59,686.70 - 19,475.71)}{19,475.71} \times 100 = \mathbf{67.37\%}$$

$$\frac{(\text{Annual Target Energy Demand} - \text{Annual Proposed Energy Demand})}{\text{Annual Target Energy Demand}} \times 100 = \% \text{ Improvement}$$

$$\frac{(372,854.07 - 132,050.75)}{372,854.07} \times 100 = \mathbf{64.58\%}$$

Predicted Sitewide Target Emissions – **59,686.70 KgCO₂/year**
Predicted Sitewide Proposed Emissions – **19,475.71 KgCO₂/year**
Saving in Sitewide emissions – **40,210.99 KgCO₂/year**
Improvement in Sitewide Emissions – **67.37%**

Predicted Sitewide Target Energy Demand – **372,854.07 kWh/year**
Predicted Sitewide Proposed Energy Demand – **132,050.75 kWh/year**
Saving in Sitewide Energy Demand – **240,803.32 kWh/year**
Improvement in Sitewide Energy Demand – **64.68%**

The Sample SAP Calculations have been assessed under Part L 2021 to SAP 10.2 standards. This is due to having transitional agreement in place with the local planning authority provided that the site has been approved by April 2027 and significant works, such as laying the foundations and having the concrete pads for the dwellings being laid.

As the sample SAP better the requirements of Part L 2021 regulations the development also meet Core Policy 41 of the Wiltshire Council Core strategy (Adopted January 2015). This policy intends the site to meet Code Level 4 which equates to a 19% reduction in emissions from Part L 2013 regulations. The uplift between these regulations is a 31% reduction in CO₂ emissions, meaning that just by adhering to Part L 2021 regulations the development automatically meets this policy. With the site using heat pumps as a oppose to fossil fuelled boilers the development meets this policy in the region of 75-80%.

8. Water Management

8.1 Flood Risk Assessment

According to the Flood map for planning available from the Environment Agency the development lies within Flood Risk Zone 1. This is defined as comprising land assessed as having less than 1 in 1000 annual probability of river or sea flooding in a year. The site is approximately 5.21 hectares. As the site is large than one hectare, despite being in flood zone 1, additional flood risk assessments will be required.

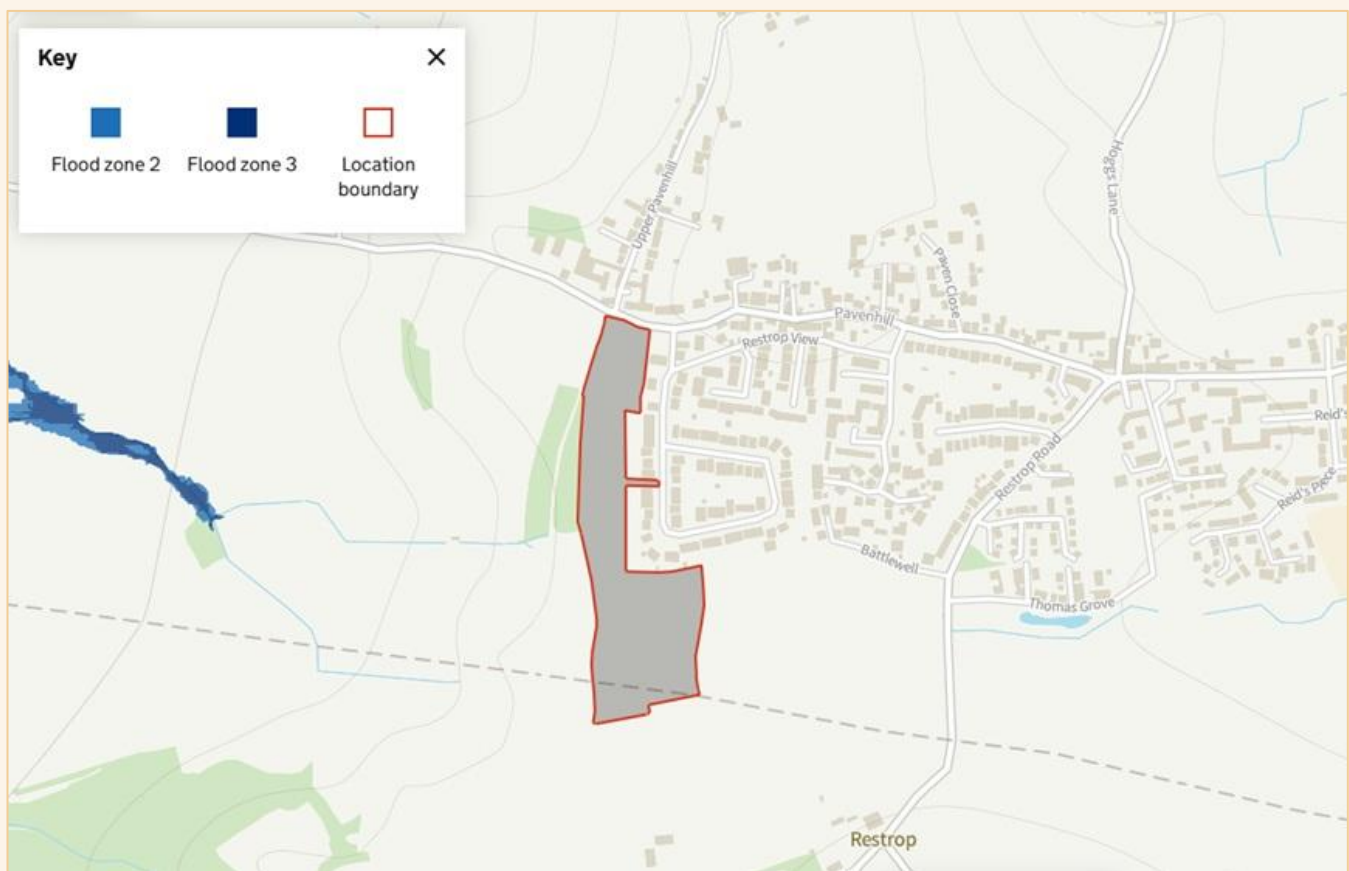


Figure 6: Flood Risk Map (<https://flood-map-for-planning.service.gov.uk/map>)

The above show that there is no or minimal flood risk, therefore Core Policy 67 of Wiltshire Core Strategy (Adopted January 2015) has been met.

9. Conclusion

The proposed development Purton has been assessed against national and local energy and sustainability requirements through detailed SAP calculations and consideration of a range of energy efficiency and low carbon measures.

The proposed strategy follows a fabric-first approach, delivering significant reductions in operational energy use and carbon emissions through high-performance insulation, airtightness, thermal detailing, and glazing.

A review of the possible low carbon or renewable energy strategies for the development has been carried out and it has been concluded that air source heat pumps is the most pragmatic methods to achieve and better Part L compliance Other technologies such as photovoltaic panels, solar thermal panels and Waste Water Heat Recovery Systems (WWHRS) potentially hold merit. By Installing air source heat pumps, the dwellings are Net Zero ready as no fossil fuels will be on site and the electricity supplying power to the heat pumps will decarbonise over time, as the nation strives to reduce emissions in the National Grid

Through the installation of air source heat pumps, it is calculated that the development will lower its emissions by **67.37%** when compared to Part L SAP 10.2 Target Emission Rate (TER). It is estimated that the site will save in the region of **40,210.99 KgCO₂** per year. The energy demand for the site will also be reduced by **64.58%** against the Part L SAP 10.2 TER and will save the site **240,803.32 kWh/Year** in energy demand.

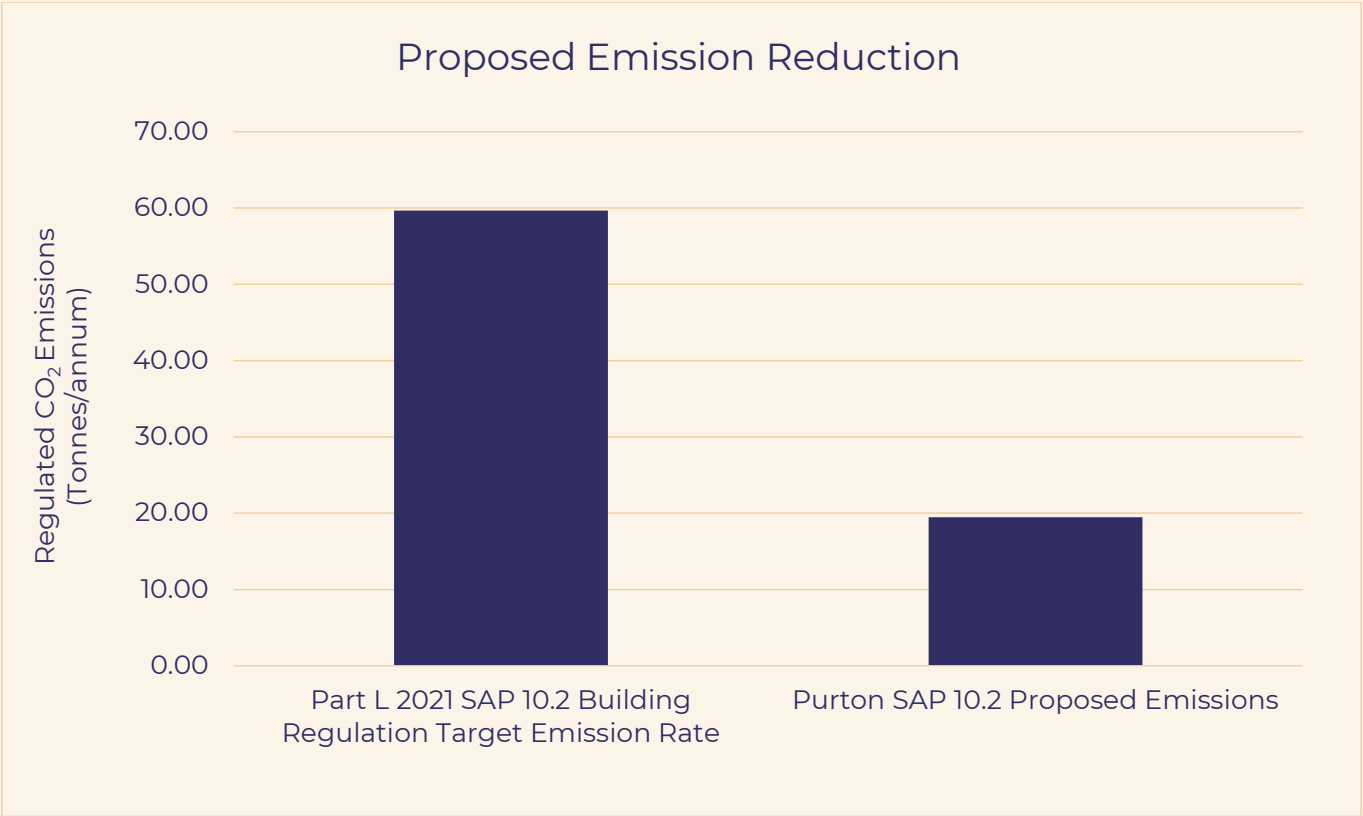
The site also conforms to Core Policy 41 of the Wiltshire Core Strategy (adopted January 2015) as just by the site complying with Part L 2021, SAP 10.2 regulations the development exceed the minimum requirements of meeting Code Level 4 for new developments

Core Policy 67: Flood Risk has also been assessed, with the site falling into Zone 1, there is minimal risk to flooding. However, a more in-depth assessment may be required

As the site has a transitional agreement in place, provided that planning is approved and significant works have occurred the site will have to meet Part L 2021, SAP 10.2 Standards.

Therefore, the overall energy strategy through a fabric first approach coupled with air source heat pump the proposed achieves the required reduction in CO₂ against Building regulations Part L 2021 and also complies with National Planning Policy Frame Work and the Wiltshire Core Strategy (Adopted January 2015).

Predicted Site Wide Carbon Emissions



Graph 3 – Predicted Annual Site Wide Carbon Emissions

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