
Marson Property Limited

**25-27 Perrymount Road, Haywards
Heath**

Sustainability Statement
14th July 2022

SUSTAINABILITY STATEMENT

temple

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Contents

	2
1.0 Executive Summary	4
1.1 General	4
1.2 Key Energy Efficient Design Measures	4
1.3 Key Resource Efficiency Design Measures	5
1.4 Key Water Efficiency Design Measures	6
2.0 Introduction	7
2.1 Site Overview	7
2.2 Planning Context	9
2.3 Objectives	10
3.0 Energy Strategy	11
3.1 Introduction	11
3.2 Application for Passive Design Principles	11
3.3 Energy Efficient Design	13
3.4 Assessment of Low and Zero Carbon Technologies	19
3.5 Site Wide Energy Assessment	26
4.0 Resource Efficiency	28
4.1 Overview	28
4.2 Waste Hierarchy	28
4.3 Construction Waste	29
4.4 Built Fabric Resource Intensity	30
4.5 Recycling and Composting In-use	30
5.0 Water Efficiency	32
5.1 Overview	32
5.2 Rainwater Harvesting	32
5.3 Grey Water Re-Use	33
5.4 Application for Water Management Systems	35
6.0 Conclusions	38

1.0 Executive Summary

1.1 General

- 1.1.1 Ridge & Partners LLP have been appointed to complete a Sustainability Statement for the redevelopment of 25-27 Perrymount Road, Haywards Heath, on behalf of Temple Group Ltd in support of a planning application for the scheme. The Proposed Development is a residential scheme comprising of 28 residential units.
- 1.1.2 When reviewing the energy and sustainability strategy for this development, careful consideration has been given to the context of the Application Site, local and regional planning policy and the 2021 Building Regulations. The energy efficiency, resource efficiency, water efficiency and impact of climate change of the scheme have all been considered in the development of a sustainability strategy for the building in line with the requirements of the Mid Sussex District Plan¹.

1.2 Key Energy Efficient Design Measures

- 1.2.1 The approach taken in developing the energy strategy for the scheme has followed a sequential approach, assessing in turn:
- The feasibility of the integration of passive design measures and energy efficient building services strategies;
 - Determining the viability of a decentralised energy network; and
 - An assessment of the feasibility of a number of Low or Zero Carbon (LZC) Technologies for application to the Site.
 - Passive design and energy efficient design measures are proposed for inclusion in the development as detailed below:
 - Building fabric U-values that exceed the minimum requirements of Part L;
 - Air leakage rate in apartments is to be 60% lower than the maximum permissible under the Building Regulations;
 - Centralised continuous mechanical ventilation with heat recovery (MVHR) to reduce heating loads;
 - Reduction in hot water demand, in part due to higher insulation standards but also due to lower water consumption;

¹ Mid Sussex District Council (2018) District Plan 2014-2031

- Maximise daylighting and consequently passive solar heating (whilst not providing excessive areas of glazing that would cause overheating risk when considering future climate change);
 - Specification of energy efficient light fittings and providing occupancy sensing lighting control in communal corridors;
 - Provision of Air Source Heat Pumps (ASHPs) as a form of LZC for the site to meet the thermal loads of the scheme; and
 - Recommendations to building users regarding energy efficient appliances and operation of systems and equipment.
- 1.2.2 An analysis of the feasibility of adopting a decentralised energy strategy on site has been explored. There is not an established district heating network in the vicinity of the Application Site, but due to the size and density of the residential proposals it has been proposed that a new decentralised community heating network could be a practical solution to meeting the domestic thermal loads of the 28no. dwellings. It is to be determined at detailed design stage if an individual application of ASHP technology/ centralised application would be the most practical and cost effective option for the Site.
- 1.2.3 The preliminary energy performance calculations that have been completed have demonstrated that the proposed energy strategy for the scheme will result in the site proposals meeting the requirements of Part L of the Building Regulations.

1.3 Key Resource Efficiency Design Measures

- 1.3.1 A strategy has been developed for the Application Site to maximise the efficient use of resources, both through the construction process and during future occupation. The waste hierarchy has been referenced throughout this assessment process to prioritise measures that would have the most significant resource saving impacts.
- 1.3.2 A summary of the key resource efficiency proposals are detailed below:
- The production of a Site Waste Management Plan (SWMP) to set good practice target waste benchmarks, set procedures for minimising, measuring, monitoring & reporting various waste streams and identifying potential for re-use to divert potential waste from landfill.
 - Reduce the resource intensity of the detailed design architectural proposals where feasible and maximise end of life potential.
 - Encourage the use of recycling and composting facilities. Provide guidance to future occupants via Home User Guides detailing Local Authority collection schemes, information on local recycling facilities and tips,

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guidance on procedures to discard potentially hazardous waste (i.e. batteries, fridges / freezers etc.) and WRAP sustainable waste disposal principles.

1.4 Key Water Efficiency Design Measures

- 1.4.1 A water efficiency strategy has been developed for the Application Site to meet the water consumption targets set in the Mid Sussex District Plan - 110 litres per person per day (including external water use) for the dwellings.
- 1.4.2 The feasibility of a number of measures have been explored, including the installation of water conservation appliances, rainwater harvesting and greywater harvesting.
- 1.4.3 An analysis has been undertaken of various routes to meet the targeted performance levels. A standard approach is proposed for the scheme to meet the targets - utilising water conservation appliances such as dual flush toilets, low flow taps and baths with a low capacity to overflow.

2.0 Introduction

2.1 Site Overview

- 2.1.1 The Application Site is located on 25-27 Perrymount Road, Haywards Heath. The Application Site location is indicated by the red line boundary on the Site Location Map include as **Figure 2.1**, below.



Figure 2.1: Site Location Map

- 2.1.2 The Application Site is located near the centre of Haywards Heath – in close proximity to Haywards Heath railway station.
- 2.1.3 The Site is currently occupied by an office building and associated car parking facilities. As shown on the Site Location Map, the development site is neighboured to the south by an adjacent office building – 21-23 Perrymount Road.
- 2.1.4 The proposals for the Application Site are illustrated by the site plan included as **Figure 2.2**, on the next page.
- 2.1.5 A new apartment block is proposed to the rear of the site, behind the existing office accommodation – this block is to be 6 storeys and contain 28 residential units.



Figure 2.2: Proposed Site Plan (Original Source: Osel Architect and Development Consultants)

2.2 Planning Context

- 2.2.1 There is increasing awareness and legislation regarding low carbon and sustainable design in the built environment. This Sustainability Statement supplements the planning application for the redevelopment of 25-27 Perrymount Road and seeks to address strategic issues raised by local, regional and national planning policies relating to climate change and sustainability.
- 2.2.2 Against a context of the relevant planning policies, this report focuses on minimising the environmental impact of the Proposed Development during construction, occupation and demolition.
- 2.2.3 The Application Site is located within Mid Sussex. The Mid Sussex District Plan sets out a number of core issues facing the district.
- 2.2.4 The District Council, in conjunction with four other West Sussex local authorities, commissioned the 'West Sussex Sustainable Energy Study' to inform their policies on carbon emission standards for new development. This research and the general context of the current government position on sustainable development has informed **DP39: Sustainable Design and Construction**, included in **Figure 2.3** 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

Figure 2.3: Policy DP39 – Sustainable Design and Construction (Source: Mid Sussex District Plan 2014 - 2031)

- 2.2.5 This policy outlines sustainability measures relating to the efficiency of energy usage, water resource usage, waste minimisation and climate change risk mitigation. **Policy DP42: Water Infrastructure and the Water Environment** further details the District's approach to water conservation. This policy is included in **Figure 2.4**, below.

DP42: Water Infrastructure and the Water Environment

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; 6) To ensure that development is accompanied by the necessary infrastructure in the right place at the right time that supports development and sustainable communities. This includes the provision of efficient and sustainable transport networks.

Evidence Base: Building Regulations (Approved Document G); Gatwick Sub Region Water Cycle Study; DCLG Housing Standards Review: Technical Consultation, September 2014; South East Water - Water Resources Management Plan 2014, Strategic Flood Risk Assessment.

New development proposals must be in accordance with the objectives of the Water Framework Directive, and accord with the findings of the Gatwick Sub Region Water Cycle Study with respect to water quality, water supply and wastewater treatment and consequently the optional requirement under Building Regulations – Part G applies to all new residential development in the district. Development must meet the following water consumption standards:

- Residential units should meet a water consumption standard of 110 litres per person per day (including external water use);
- Non-residential buildings should meet the equivalent of a 'Good' standard, as a minimum, with regard to the BREEAM water consumption targets for the development type.

Development proposals which increase the demand for off-site service infrastructure will be permitted where the applicant can demonstrate;

- that sufficient capacity already exists off-site for foul and surface water provision. Where capacity off-site is not available, plans must set out how appropriate infrastructure improvements approved by the statutory undertaker will be completed ahead of the development's occupation; and
- that there is adequate water supply to serve the development.

Planning conditions will be used to secure necessary infrastructure provision.

Development should connect to a public sewage treatment works. If this is not feasible, proposals should be supported by sufficient information to understand the potential implications for the water environment.

The development or expansion of water supply or sewerage/sewage treatment facilities will normally be permitted, either where needed to serve existing or proposed new development, or in the interests of long term water supply and waste water management, provided that the need for such facilities outweighs any adverse land use or environmental impacts and that any such adverse impact is minimised.

Figure 2.4: Policy DP42 – Water Infrastructure and the Water Environment (Source: Mid Sussex District Plan)

- 2.2.6 Policy DP42 confirms that residential units should meet a water consumption standard of 110 l/p/day, inclusive of external water usage.

2.3 Objectives

- 2.3.1 The objectives of this report are to:

- demonstrate to the Planning Authority, Mid Sussex District Council, that the Proposed Development will comply with the relevant policies in the Mid Sussex District Plan;
- provide an initial assessment of the measures required to comply with Part L of the Building Regulations; and
- contribute to the development of a low carbon and sustainable strategy for the site which will be carried through to detailed design, construction, operation and ultimate demolition.

3.0 Energy Strategy

3.1 Introduction

- 3.1.1 This section of the report looks at areas where the buildings' energy demand can be reduced in order to create an energy efficient design solution.
- 3.1.2 The implications of the Building Regulations and the local policy are explored, with reference to the technical, functional and economic feasibility of various energy efficiency measures.
- 3.1.3 In line with the Energy Hierarchy, a passive first approach will be considered for the scheme. The Energy Hierarchy is summarised below:
1. Be lean: Use less energy;
 2. Be clean: Supply energy efficiently; and
 3. Be green: Use renewable energy.

3.2 Application for Passive Design Principles Overview

- 3.2.1 Passive design uses local climatic conditions to reduce the amount of applied energy required to heat, cool or light a building. For example, passive solar gain via south facing windows can reduce the heating requirements of a space, although this must be balanced against the risk of excessive solar gains in summer, especially when considering the increased overheating risks associated with climate change. Passive design centres around the building envelope and its relationship with its surroundings.
- 3.2.2 One of the major design issues with the development at this stage was to ensure that compliance with Part L of the UK Building Regulations was possible. The current version of Part L - Part L 2021 - came into force on the 15th of June 2022.
- 3.2.3 Part L of the Building Regulations sets out elemental minimum performance standards for each building fabric element respectively, in addition to requiring the overall energy performance of the new homes to meet the performance of a comparable notional building when assessed as a whole. The holistic targets for new residential developments set by Part L 2021 are as below:
- Target Emission Rate (TER). In order to comply, the calculated Dwelling Emission Rate (DER) for a new home will need to be less than the TER.
 - Target Primary Energy Rate (TPER). In order to comply, the calculated Dwelling Primary Energy Rate (DPER) for a new home will need to be less than the TPER.

- Target Fabric Energy Efficiency (TFEE). In order to comply, the calculated Dwelling Fabric Energy Efficiency (DFEE) will need to be less than the TFEE.

- 3.2.4 The TFEE performance metric notably only applies to domestic developments, not non-domestic developments. The TFEE requirements for a dwelling are based solely on design elements that relate to the building fabric of the dwelling – such as U values, G values, thermal mass, air tightness and thermal bridging properties.
- 3.2.5 Compliance with the TER, TPER and TFEE can be tested using Simplified Assessment Procedure (SAP) calculations.
- 3.2.6 In addition to the drivers set by Building Regulations, 'Be lean' measures have been prioritised as a means of reducing the energy demand of the scheme on occupation and minimising the environmental impact of the scheme. However, the proposals for the building envelope need to be technically feasible as well as economic.

Building Design Principles

- 3.2.7 The Proposed Development includes materials and a construction methodology that aims to meet the following requirements:
- minimise energy use;
 - maximise daylighting to main living spaces within dwellings;
 - utilise natural ventilation where feasible; and
 - minimise summertime overheating risk.

Building Envelope Thermal Performance

- 3.2.8 At this early stage, the proposed building envelope properties outlined in **Table 3.1**, below, are proposed for the scheme.

Table 3.1: Proposed Building Fabric Properties

Element	Limiting Fabric Parameters Set out by Part L 2021	Proposed Properties	% Improvement
Walls	0.26 W/m ² K	0.15 W/m ² K	42 %
Party Walls	0.20 W/m ² K	0.00 W/m ² K*	100 %
Corridor Walls**	-	0.3 W/m ² K	-
Exposed Floor	0.18 W/m ² K	0.13 W/m ² K	28 %
Roof	0.16 W/m ² K	0.12 W/m ² K	25 %
Windows	1.6 W/m ² K	1.2 W/m ² K	25 %
Doors	1.6 W/m ² K	1.0 W/m ² K	38 %
Air Permeability	8 m ³ /h/m ²	3.0 m ³ /h/m ²	63 %

*In order to qualify for the value of 0.00W/m²K in the SAP calculations these walls would need to either be solid or have a fully filled cavity with effective edge sealing at all exposed edges (i.e. no U value calculation is required, but one of these definitions needs to be met).

**It is assumed at this stage that circulation corridors within the block of flats will be unheated.

- 3.2.9 It can be seen that the building fabric of the proposed homes will exceed the performance limiting standards set by Part L 2021.
- 3.2.10 Further to these building fabric properties, an enhanced level of thermal bridging design is proposed as part of the design strategy to meet the TFEF performance metric. It is proposed for the PSI values of the thermal bridges to meet/ exceed the properties of the Part L notional dwelling.
- 3.2.11 A degree of solar control glazing is also proposed for the scheme. The solar control glazing will aid in mitigating overheating risk in the dwellings.

3.3 Energy Efficient Design

Overview

- 3.3.1 Further to the application of passive design measures to reduce the energy demand of the scheme, it is proposed to optimise the efficiency of the building services systems meeting the energy demand of the Proposed Development.
- 3.3.2 In the first instance, this section of the report will explore the feasibility of connecting the scheme to an existing district heating scheme / the development of an on-site community heating scheme.
- 3.3.3 At this stage – an initial appraisal of servicing strategies for the scheme will assume, due to the central location of the development, that there will be access to both mains gas and electricity.
- 3.3.4 Additionally, this section of the report will address the energy efficiency of other regulated building energy uses within the scheme and how they may be reduced.

District Heating

- 3.3.5 The Association for Decentralised Energy online district heating installation map has been accessed to determine if there is an established district heating network in the vicinity of the Application Site. It has been determined that the nearest established network is in Haywards Heath at the Princess Royal Hospital. This network is over a mile away from the Application Site and there are significant obstructions that would need to be negotiated between this network and the 25-27 Perrymount Road scheme – such as roads and existing infrastructure. A connection to this network in this instance is therefore not considered feasible for the Application Site.

Dwelling Service Option 1: Centralised Heating Plant

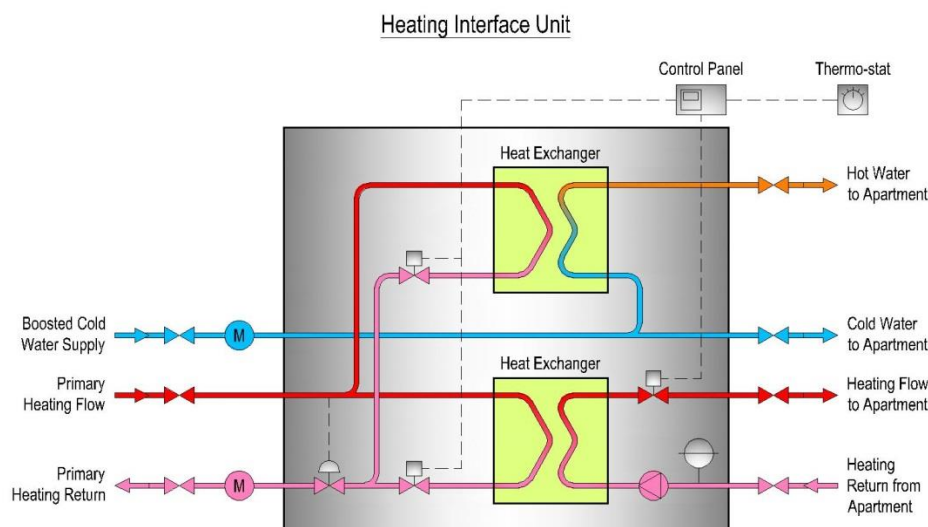
General

- 3.3.6 A community scheme may be appropriate for large scale developments where there is a high density of heating loads that need to be served.
- 3.3.7 Were a new community heating system to be proposed to serve the 28no. proposed apartments, the plant room installation for a base scheme would include efficient gas fired condensing boilers (efficiency >95%) and inverter driven pumps. Alternative fuel sources could be incorporated in order for the scheme to benefit from a renewable or low carbon energy source. All the major plant would be accommodated in an energy centre which would need to be easily accessible to facilitate maintenance.
- 3.3.8 Distribution pipework would be selected to exceed minimum standards required by Building Regulations and design temperatures optimised to minimise distribution losses.
- 3.3.9 A Building Energy Management System (BEMS) would control the centralised plant, commissioned to maximise efficiency to best utilise the energy sources available and to closely match the building load. The BEMS would also collect the data from the various sub-meters installed throughout the buildings, allowing billing (see sections below), and targeting and monitoring.
- 3.3.10 The BEMS would also alert the appointed management company of any system faults and generate reminders that maintenance is due.

Heating of Dwellings

- 3.3.11 Individual properties would be served by the following:
 - 1. Heating Interface Unit (HIU).
 - 2. A HIU will replace a conventional boiler, comprising a heat exchanger and valve arrangement, plus a heat meter. Heat will be drawn from the central distribution system to satisfy the requirements of the dwelling.
 - 3. Distribution Pipework.
 - 4. Hot water for heating and domestic water purposes will be pumped to the heat emitters and hot water draw-offs.
 - 5. Heat Emitters – radiators and / or underfloor heating.
 - 6. Automatic and Thermostatic Controls - including a 24-hour / 7-day programmer for the heating.

Figure 3.1: HIU Configuration



- 3.3.12 Thermostatic radiator valves (TRVs) will be included on each heat emitter to provide local room control and to avoid overheating when casual and solar gains are significant.

Billing of Dwellings

- 3.3.13 The data from the sub-metered water and energy supplies would be automatically collected via a data retrieval device in each dwelling and processed remotely using a dedicated piece of software except where there will be direct billing from statutory authorities. This software would automatically generate bills.
- 3.3.14 In a similar manner to ordinary utilities accounts, all relevant information would be contained on the bill and would include latest and previous readings, the number of pulses (method of measurement), conversion to volume or units of energy, plant efficiency factors and unit costs.

Additional Considerations

- 3.3.15 At detailed design stage, distribution routes from the centralised plant to the apartments should be rationalised to ensure the lengths of pipework are minimised to reduce system heat losses and enhance heating system efficiencies.
- 3.3.16 Standing charges – incorporating management charges, cost of maintenance and funding of plant replacement, will also need to be taken into consideration should this strategy be adopted at detailed design stage.

Dwelling Service Option 2: Individual Heating Plant

General

- 3.3.17 Providing heating plant to the apartments on an individual basis would be an alternative servicing strategy for this scheme. This would negate the requirement for a central energy centre and the standing charges residents would be liable to pay associated with the management of the community heating system.
- 3.3.18 However, this would require individual heat generation plant installations within each dwelling – which would require careful planning and co-ordination. For example, should individual gas fired boilers be opted for – individual, ventilated gas supply pipework supplies will be required for each unit and multiple façade penetrations will be required for the termination of the flues. Alternatively, if electrically driven air source heat pumps are opted for – external locations would need to be allocated for the units which would likely have a negative visual impact on the development.

Gas Boilers

- 3.3.19 Should this strategy be opted for, SEDBUK 'A' rated condensing boilers will be required, with an annual efficiency in excess of 89%. Optimum start and / or weather compensated controls would also be incorporated. The specification will also ensure that the flue gas emissions from boilers will reflect the most stringent criteria for NO_x (nitrous oxide). Typical NO_x levels for individual boilers are in the range 35 to 40mg/kWh.
- 3.3.20 To minimise loads and therefore supplementary energy sources, the fabric would be enhanced in line with the U-values outlined in section 3.2.8.
- 3.3.21 To reduce carbon emissions further there are a number of options that could potentially supplement and complement individual gas fired boilers. These technologies are considered further in section 3.4.

Heat Pump Systems

- 3.3.22 Ground or air source heat pumps may be feasible substitutes for individual gas fired condensing boilers. The operation of these technologies is described in section 3.4.

Reduction of Mechanical Cooling and Ventilation Loads

- 3.3.23 Appropriate analysis will be undertaken at design stage to ensure that the dwellings are adequately provided for by natural ventilation in summer, so that the introduction of comfort cooling at a future date is avoided.
- 3.3.24 For an airtight building with an air permeability equal to or less than 3.0m³/m².hr it would be appropriate for a whole house mechanical ventilation

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system with heat recovery (MVHR) to be installed. This system type supplies and extracts air – routing both air streams through a high efficiency heat exchanger where the heat can be transferred from the exhausted air to the incoming fresh air – as illustrated in **Figure 3.2**, below.

Figure 3.2: MVHR Diagram (Source: www.nfan.co.uk)



- 3.3.25 SAP Appendix Q listed mechanical ventilation systems have been tested and certified as being more energy efficient and the best performing units will be considered in the SAP calculations, i.e. those with the lowest specific fan power (electrical energy consumption).

Reduction of Domestic Hot Water Loads

- 3.3.26 The dwellings will be designed to meet a maximum domestic water consumption of 110 l/p/day; this compares with the UK average of 150 l/p/day. The route to achieving these performance levels is detailed further within Section 5 of this report. Therefore, the hot water (DHWS) for dwellings will be reduced and a saving in DHWS energy requirements will therefore be achievable.
- 3.3.27 The strategy to achieve a daily water consumption of 110l/p/day will include the provision of showers with a flow rate <8l/min.
- 3.3.28 Domestic hot water heat losses will be minimised throughout via factory applied thermal insulation to cylinders or thermal stores.

Energy Consumption Monitoring

- 3.3.29 It is anticipated that each dwelling will be provided with smart meters and a display device by the energy supplier, incorporating separate data collection and displays for the following:
- Electricity supplied.
 - Heating / gas supplied.
- 3.3.30 The device will provide both a simple means for real time observation of energy consumed and cost consumption together with the facility to view / print out historic records for energy consumption for the associated dwelling.

Artificial Lighting

- 3.3.31 LED lighting is proposed throughout the development. The efficacy of all main internal lighting systems will incorporate energy efficient lamps ($\geq 80\text{lm/W}$).
- 3.3.32 In communal areas within the block of flats, it is proposed that occupancy sensing lighting controls are provided – in order to reduce the usage of electricity by these systems when unoccupied.
- 3.3.33 Should balcony lighting be opted for – the following criteria shall be met for these external light fittings:
 - a. Automatic controls which switch luminaires off in response to daylight; and
 - b. If luminous efficacy is 75 light source lumens or less, automatic controls which switch luminaires off after the area lit becomes unoccupied. If luminous efficacy is greater than 75 light source lumens, manual control will be acceptable.

Home User Guides

- 3.3.34 It is anticipated that a Home User Guide will be supplied by the Developer to each dwelling. The guide will include recommendations on energy efficient operation of the dwelling, including buying A-rated appliances (if not fitted) and instructions on operation of systems.

Services Strategy: Summary

- 3.3.35 As outlined earlier in this section there are two major servicing options for heating provision for the dwellings; individual dwellings or community wide.
- 3.3.36 However, in part due to the number of proposed dwellings and the relative high density of the site proposals, the proposed approach at this stage in the design process is for heating to be applied on a community heating basis. A base strategy would be for the heating load to be met by gas fired boilers – but alternative forms of renewable technology will be addressed in Section 3.4.
- 3.3.37 Domestic hot water loads are to be reduced by opting for sanitaryware and fixtures to reduce the dwelling's overall water usage to 110l/p/day. Heat losses will also be minimised via factory applied thermal insulation to cylinders/ thermal stores.
- 3.3.38 Heat recovery systems are proposed within the mechanical ventilation systems to reduce heat losses and associated heating loads.
- 3.3.39 All internal and external lighting systems will be designed to be energy efficient – incorporating LED fittings throughout and occupancy sensing controls in communal circulation areas.

3.4 Assessment of Low and Zero Carbon Technologies

Overview

3.4.1 There are a number of renewable and low carbon energy technologies which may be suitable for multi-residential developments of the scale of the design proposals for 25-27 Perrymount Road. The Low or Zero Carbon (LZC) technologies listed below have been assessed for their applicability to this development:

- Solar Thermal for hot water;
- Photovoltaic arrays (PV);
- Wind Energy;
- Biomass;
- Combined Heat and Power;
- Ground source heat pumps (GSHP); and
- Air source heat pumps (ASHP).

Solar Thermal

3.4.2 Solar thermal is a system for generating hot water from the sun. Typical systems consist of a circulation loop filled with glycol that runs from a solar collector into a hot water storage tank. Within the solar collector, the sun heats the glycol coil – which is then circulated to the hot water tank to effectively act as an immersion heater, heating the water held within the tank. This type of system can act alone as a water heater or as a pre-heat, bringing the mains water up in temperature before it is heated to LTHW temperatures (for heating) or domestic hot water temperatures.

3.4.3 Flat panel collectors can be integrated into the roof and are complementary to photovoltaic systems. The more efficient evacuated tube system has more versatility and orientation is less of an issue, although these arrays are more expensive than flat panel.

3.4.4 Solar thermal technology is well suited to schemes where there is a consistent thermal load – this can make it applicable to domestic developments where there is a domestic hot water base load. Solar thermal systems can be applied to community heating systems – with the circulation loop serving a calorifier in the centralised energy centre.

3.4.5 The available roof area, pitch and orientation are critical. There is available flat roof area on the apartment block which could be used to site an array – pitch and orientation could therefore be optimised.

- 3.4.6 Increasing the area of solar thermal panels so that they contribute to the space heating incurs considerable cost with little energy benefit as the panels operate far below maximum efficiency during winter when they would be most required.
- 3.4.7 Additionally, there are significant issues in summer if an installation is over capacity; this may result in system stagnation, where there is insufficient demand for the energy produced, with separation of the glycol anti-freeze from the circulation medium, with major maintenance implications.
- 3.4.8 It should be noted that solar thermal's contribution to Building Regulations compliance and reduction of CO₂ emissions is typically quite small, especially when accounting for all energy requirements in modern, well insulated dwellings, which comprise less of thermal loads and more of appliance and other electrical demands. Due to this, this form of technology is not considered to be the most applicable form of renewable technology for the site.

Photovoltaic Arrays

- 3.4.9 Photovoltaics are semiconductor devices that convert sunlight into direct current (DC) electricity. Groups of panels can be electrically configured into arrays which can be used to power a building's electrical load. A photovoltaic (PV) installation generally consists of panels, inverters, controls and wiring for integration into a building's main electrical distribution system.
- 3.4.10 A number of PV systems including monocrystalline, polycrystalline and thin film are available, generally made up into arrays using multiple panels or roof slate "substitutes", PV panels can also replace vertical cladding systems.
- 3.4.11 One of the obvious benefits of a PV installation is that it is purely an electrical system, without the need for pipework distribution systems and storage vessels. The array can be sized to suit sustainability and renewables targets and could conceivably be increased in size at a later date. Additionally, PV systems are very low maintenance and are supplied with guarantees of between 20-25 years, although they should normally produce a high percentage of their original rating for some time afterwards.
- 3.4.12 PV systems have a relatively low efficiency, and therefore require a large area in order to generate sufficient electricity to have an impact on a building's CO₂ emissions and contribute towards meeting energy performance targets.
- 3.4.13 Overshadowing may significantly reduce the output of a solar photovoltaic system. In this instance, overshadowing is not deemed to pose a significant issue given the locality of the Application Site and height of the neighbouring buildings.

- 3.4.14 The orientation and mounting angles of the panels are critical in order to maximise their output. There is available flat roof area on the apartment block which could be used to site an array that could be installed at an optimal pitch and orientation. The application of PV may therefore be explored further as the detailed design proposals for the scheme develop, as there may be competing requirements for the roof space.

Wind

- 3.4.15 Wind turbines have the capability of harnessing the power of the wind in order to produce electricity through the circular motion of the turbine's blades. The electricity produced has zero associated carbon dioxide emissions. This technology therefore qualifies for the FiT initiative.
- 3.4.16 Wind turbines are normally mounted on columns remote from the main structures on site. However, they could also be building mounted and spaced at intervals to avoid interference with each other. However, the method of support and mounting height would need to be carefully considered to avoid vibration transmission and to maximise output, respectively. Small turbines usually need to be mounted at least twice as high as any local obstructions to work effectively.
- 3.4.17 Wind turbines may be considered to be an eye-sore. This could potentially cause a planning issue as the inclusion of wind turbines in the development may be viewed to be changing the landscape character. There would also be the risk that the future inhabitants of the Application Site, and the owners of the neighbouring properties, may complain about the visual impact the inclusion of wind turbines on the development would make.
- 3.4.18 Wind turbines, whether roof or pole mounted, can also be noisy. Their inclusion may cause disturbance to the future residents/ occupants of the site, in addition to potential vibration issues if the turbines are to be roof mounted.
- 3.4.19 There is also a high capital cost associated with the installation of wind turbines, whether column or roof mounted, so this is unlikely to be the most financially viable solution.
- 3.4.20 The viability of wind turbines is largely determined by the site location, including average wind speed and the presence of obstructions (which produce undesired turbulence). The NOABL Wind Map has been accessed to obtain data for average wind speed in the area.
- 3.4.21 The following wind speeds were reported:
- at 10 metres: 4.8m/s;
 - at 25 metres: 5.6m/s; and
 - at 45 metres: 6.2m/s.

- 3.4.22 Normally, a wind speed threshold of 5.0m/s is used to determine whether a site may be suitable for wind turbines. Another rule of thumb is that the rotor is located at twice the height of the nearest building. The height from the roof level of the apartment block to the ground is over 30m – as the site slopes down to the rear of the site. Therefore, a rotor would need to be mounted at a very high level in order to be exposed to higher wind speeds and minimise the impacts of turbulence.
- 3.4.23 Due to the potential environmental impact of wind turbines on the Application Site, the turbulence associated with neighbouring buildings and the financial viability of this technology, wind turbines have not been considered in any greater detail.

Biomass

- 3.4.24 Wood fuelled heating systems burn wood pellets, chips or logs to provide warmth in a single room or to power central heating and hot water boilers. Fully automated and user-friendly systems operated and controlled in a similar manner to a gas boiler are available minimising additional maintenance due to the use of a solid fuel. The CO₂ released to the atmosphere during the burning of the material is offset against the CO₂ absorbed during the growth of the fuel, so biomass is considered to be carbon neutral.
- 3.4.25 One of the major drawbacks of the utilisation of biomass boiler technology is the space requirements for the biomass boilers and the fuel stores. A space allocation for back up boilers would also be necessary. There is limited space available in the proximity of the proposed buildings for the siting of all of these spatial requirements. The total plant area would need to be (approximately) treble that of a standard boiler room containing equivalent gas fired boilers only.
- 3.4.26 There may also be issues with the reliability of the biomass fuel supply, and delivery vehicles may have access issues.
- 3.4.27 There are also air quality concerns associated with the burning of biomass fuels. They produce much higher levels of particulate matter than gas or oil fired boiler systems.
- 3.4.28 The application of biomass heating is likely to contribute to achieving Part L compliance and the reduction of site CO₂ emissions. However, considering space limitations on site, air quality concerns and the unreliability of fuel supply, the use of biomass would be quite unpractical in this instance.

Combined Heat and Power

- 3.4.29 Combined Heat and Power (CHP) is the simultaneous generation of both electrical power and heat from the same source. Design and sizing of CHP

installations is usually driven by the presence of a heating base load; selection based on an electrical base load is likely to result in large quantities of heat being dumped due to there being no use for it.

- 3.4.30 The adoption of CHP requires significant investment, so it is essential that CHP plant are not sat idle – providing no benefits. CHP units are often selected so that they are operating for 17 hours per day, 11 months a year and therefore it is critical that the plant is operating at maximum efficiency, utilising all the heat available. This can be aided by the presence of a reliable and continuous heating and/ or hot water demand.
- 3.4.31 In a typical installation, a packaged CHP unit will replace one of the proposed or existing heating boilers. In such a configuration, it is important that the CHP unit is run as the lead boiler to maximise its running hours. Balancing of water flows through the boilers and CHP unit must be carefully addressed, as the latter has a considerably higher hydraulic resistance.
- 3.4.32 Notably, the carbon savings from CHP are declining as a result of the national grid electricity decarbonising, and there is increasing evidence of adverse air quality impacts. CHP installations are also more economically viable for large scale residential developments versus small-medium scale developments. Due to these reasons, CHP is not proposed for this scheme.

Ground Source Heat Pump

- 3.4.33 Ground source heat pumps (GSHPs) extract heat from the ground and upgrade it to a more useful temperature. The heat pump consists of a closed loop ground heat exchanger, a heat pump and a distribution system. The ground heat exchanger is a sealed loop of pipe buried either vertically or horizontally in the ground.
- 3.4.34 Horizontal arrays tend not to be feasible on restricted sites, as the length of the loops can include multiples of pipework up to 50m in length. There is not adequate available area for a horizontal array on the Application Site.
- 3.4.35 Vertical arrays require a series of boreholes which accommodate the pipework and are infilled with a heat conducting grout. Environment Agency licences are not required, because it is a sealed, closed loop system. However, a ground investigation would be required as part of a detailed feasibility study.
- 3.4.36 Heat pumps use electrical energy, usually grid supplied, to upgrade the energy collected by the ground loop; typically one unit of electricity will be produce 3 to 4 units of useful heat. However, the output temperature is normally limited to between 40 and 45oC, or the unit efficiency will drop considerably. Performance monitoring of GSHP has indicated that the claimed efficiency of GSHP installations are not being achieved in practice, resulting in higher energy consumption and running costs.

- 3.4.37 GSHP is best suited to applications where the building heat load is small and the heat delivery system is either underfloor heating or air heating with coils sized to suit.
- 3.4.38 Factors to be considered on this project would be coordination with other buried services (drainage, tanks etc), available free ground area (horizontal loop arrays) and the geology in the area (borehole drilling).
- 3.4.39 The capital cost of a GSHP installation is also notably higher than an alternative ASHP installation.
- 3.4.40 Overall, we believe that GSHP is not the most appropriate solution for this type of development, due to the number of boreholes that would be required and the associated capital and running costs.

Air Source Heat Pumps

- 3.4.41 Air source heat pumps have, in general, been developed using existing air conditioning technology. However, instead of cooling, the refrigerant cycle is reversed so that heating is supplied to the building.
- 3.4.42 An air source heat pump has much smaller space requirements than a ground source heat pump and has lower associated installation costs. The units tend to be located externally, and therefore consideration needs to be given to their placement and appropriate screening as they may pose a noise issue when operational. Quieter units are available on the market to aid in addressing this constraint.
- 3.4.43 This form of technology lends itself to adoption on either a centralised or individual application basis. Given the scale of the proposed development – it is envisaged that at detailed design stage a centralised strategy would be considered more appropriate.
- 3.4.44 The seasonal coefficient of performance of an ASHP may achieve around 3.2 if serving a domestic hot water cylinder, noting that the storage temperature needs to be raised either by elevating the heat pump output or via an immersion heater.
- 3.4.45 A design challenge with ASHPs is the drop in efficiency of the units at low external ambient temperatures, especially when relatively high flow temperatures are required. One approach to optimising system performance would be to provide supplementary gas fired boiler plant that could be brought online to meet the thermal load of the development when external temperatures fall below a specified threshold. This would likely result in additional capital cost – however, may aid in reducing operational costs of the system.

3.4.46 As with GSHP, the heating distribution system for ASHP applications is generally underfloor heating or a convector designed for low temperatures.

3.4.47 **These units are considered an appropriate form of technology for the scheme.**

Summary of LZO Technologies

3.4.48 The findings of the low and zero carbon (LZO) assessment are summarised in **Table 3.4** below.

Table 3.4: Summary of LZO Technology Assessments

Technology	Preliminary Assessment	Applicable to Scheme?
Solar Thermal	Potentially available roof area on the block of apartments Maintenance and stagnation risk to be considered Marginal payback	Potentially appropriate – to be explored further at detailed design stage
Photovoltaic Array	Potentially available roof area on the block of apartments All electrical system with limited maintenance implications	Potentially appropriate – to be explored further at detailed design stage
Wind Turbines	Potential negative environmental impacts Turbulence from adjacent buildings Risk of vibration or acoustic disturbance Potentially detrimental to local amenity	No
Biomass	Significant spatial requirements for fuel store Backup boiler plant required Fuel reliability concerns Air quality impact	No
CHP	Requires consistent thermal base load – this would be available from the proposed dwellings Decreasing carbon savings due to decarbonisation of the grid More economically viable in large scale residential developments	No
Ground Source Heat Pump	Number and length of boreholes to serve site considerable High capital cost Requires electricity to operate Efficiencies can be lower than predicted in reality, impacting on running costs and consumer bills	No
Air Source Heat Pump	Competitive capital cost Available roof area for siting of external units Requires electricity to operate Can be applied to a centralised/ individual heating plant strategy	Yes

3.5 Site Wide Energy Assessment

General

- 3.5.1 This section details a methodology in establishing the energy strategy for the Application Site.
- 3.5.2 A number of sources have been used in producing this statement, including:
- Standard Assessment Method for Dwellings (Elmhurst SAP 10 Beta);
 - Building Regulations Approved Document Part L 2021

Part L Compliance

- 3.5.3 To demonstrate Building Regulations Part L 2021 compliance for the residential proposals for the Application Site, the energy performance of a sample of representative dwellings have been modelled using Elmhurst Design SAP 10 Beta, which tests compliance against Part L 2021.
- 3.5.4 At this stage, it is assumed that the apartments will be served by centralised ASHP plant, with HIUs installed in each apartment. For the centralised ASHP installation, it is assumed conservatively at this stage that the plant will have a SCOP of 2.6.
- 3.5.5 Preliminary results for the design proposals are set out in **Table 3.5**, on the next page. It is demonstrated that the design proposals will achieve block compliance.
- 3.5.6 At present, the calculations have been undertaken using a Beta software package – prior to access being available to a full non-beta SAP software package.
- 3.5.7 The SAP compliance strategy will need to be revisited by the design team using the finalised SAP 10 compliance tool and updated in line with the finalised site proposals at detailed design stage for submission to the Building Control officer.

Table 3.5: Site Wide Energy Assessment

Unit Type	Multiplier	Floor Area (m²)	Representational Proportion	TER (kgCO ₂ /yr/m²)	DER (kgCO ₂ /yr/m²)	TPER (kWh/m²/yr)	DPER (kWh/m²/yr)	TFEE (kWh/yr/m²)	DFEE (kWh/yr/m²)
Type 1 - 2 Bed End Terrace (Ground Floor)	2	77.6	8.5%	24.2	5.7	93.0	62.9	51.5	47.6
Type 1a - 2 Bed End Terrace (Mid Floor)	8	77.6	34.0%	19.7	4.9	75.4	54.3	37.0	37.7
Type 2 - 1 Bed Mid Terrace (Ground Floor)	2	55.2	6.1%	21.4	4.9	82.5	54.6	34.2	29.8
Type 2a - 1 Bed Mid Terrace (Mid Floor)	8	55.2	24.2%	17.5	4.4	67.4	48.2	21.5	20.9
Type 3 - 1 Bed Mid Terrace (Ground Floor)	1	58.2	3.2%	22.4	5.3	86.2	58.8	39.0	36.8
Type 3a - 1 Bed Mid Terrace (Mid Floor)	4	58.2	12.8%	18.3	4.8	70.2	52.5	25.8	28.9
Type 4 - 2 Bed End Terrace (Top Floor)	2	67.2	7.4%	25.5	6.0	98.2	66.6	52.6	48.9
Type 5 - 1 Bed Mid Terrace (Top Floor)	1	70.2	3.8%	21.3	5.4	81.8	59.4	39.3	42.2

	Average TER (kgCO ₂ /yr/m²)	Average DER (kgCO ₂ /yr/m²)	Average TPER (kWh/m²/yr)	Average DPER (kWh/m²/yr)	Average TFEE (kWh/yr/m²)	Average DFEE (kWh/yr/m²)
Block Performance	20.0	4.9	77.0	54.6	34.2	33.8
Compliant?	Yes		Yes		Yes	

4.0 Resource Efficiency

4.1 Overview

- 4.1.1 Resource efficiency means utilising the earth's limited natural resources in a sustainable manner and in turn mitigating negative environmental impacts. The management of waste is increasingly recognised by local authorities as an area that should be addressed in the development of design proposals. Policy DP39 dictates that efforts should be demonstrated to minimise waste and maximise recycling and reuse of materials through both the construction process and future occupation. This section of the report will outline a strategy for a resource efficient development for the 25-27 Perrymount Road scheme.

4.2 Waste Hierarchy

- 4.2.1 The Waste Hierarchy aids in identifying actions that can improve resource efficiency by prioritising waste management options in line with their relative impact.

Figure 4.1: The Waste Hierarchy (Original Source: BRE website)



- 4.2.2 The Building Research Establishment (BRE) outline the following steps in identifying a route to resource efficiency:
- Where is waste being produced?
 - What is the cause of this and is it avoidable?
 - If not avoidable, what opportunities are there for this material to be used internally, or by another business through recycling or refurbishing?
 - Can improvements be made to the way waste is currently handled?

4.3 Construction Waste

- 4.3.1 Construction waste can be minimised during the construction process via the effective and appropriate management of construction site waste.
- 4.3.2 It is proposed that this is implemented on the Application Site through the production of a SWMP outlining procedures and good practice measures that can be adopted on Site.
- 4.3.3 It is proposed that a SWMP will be developed for the site in accordance with guidance from:
- DEFRA (Department for Environment, Food and Rural Affairs);
 - BRE (Building Research Establishment);
 - Envirowise;
 - WRAP (Waste & Resources Action Programme); and
 - Environmental performance indicators and / or key performance indicators (KPI) from Envirowise or Constructing Excellence.
- 4.3.4 The SWMP will outline the following:
- Target benchmarks for resource efficiency, i.e. m³ of waste per 100m² or tonnes of waste per 100m² set in accordance with best practice.
 - Procedures and commitments to minimize non-hazardous construction waste at design stage. Specify waste minimisation actions relating to at least 3 waste groups and support them by appropriate monitoring of waste.
 - Procedures for minimising hazardous waste.
 - Monitoring, measuring and reporting of hazardous and non-hazardous site waste production according to the defined waste groups.
 - Procedures to divert waste from landfill through re-use on site, re-use on other sites, reclaim for re-use, return to the supplier via a 'take-back' scheme, recovery and recycling using an approved waste management contractor or composting according the defined waste groups.
- 4.3.5 The defined waste groups referenced in the SWMP will include the following materials as defined in the European Waste Catalogue: bricks, concrete, insulation, packaging, timber, electrical and electronic equipment, canteen / office / ad hoc, asphalt & tar, tiles and ceramics, inert materials, metals, gypsum, plastics, floor coverings, soils, hazardous materials, architectural features and other / mixed materials.
- 4.3.6 The target benchmarks for resource efficiency will be set using best practice and will be reviewed throughout the construction process.

4.4 Built Fabric Resource Intensity

- 4.4.1 The resource intensity of the building fabric of the proposed building can be addressed through the specification of 'resource light' construction and consideration of the end of life of the building.
- 4.4.2 Resource-light construction refers to the appropriate use of construction materials and building techniques to provide the most efficient response to the particular building requirements. 'Eco' materials will be considered for their applicability to the scheme as the architectural design progresses. Eco-materials are less resource intensive than alternative materials, and have a lower level of embodied carbon as a result of their sourcing, production process, delivery requirements etc. Examples of these materials are locally sourced eco-cement, wood, straw, clay etc. The application of these materials in the Proposed Development will be within the Site, economic and thermal performance constraints of the scheme.
- 4.4.3 The design of the scheme will also consider the end of life of the buildings. The following options will be explored as the scheme develops to maximise the end of life potential:
- The use of prefabricated components may make them easier to dismantle on demolition and therefore more appropriate for re-use.
 - Utilising simple connections and avoiding non-standard connection details will allow for efficient deconstruction and will reduce the need for multiple tools.
 - Designing with reusable and adaptable materials. Materials such as bricks, steel beams / columns and wood can be easily re-used / repurposed to avoid them going to landfill on demolition.
 - Resilience to climate change may extend the lifetime of the dwellings and therefore the economic life of the dwellings.

4.5 Recycling and Composting In-use

- 4.5.1 Encouraging the occupants of the development to recycle and compost biodegradable waste will aid in reducing the amount of waste being sent to landfill through the lifetime of the Application Site.
- 4.5.2 It is proposed that the Home User Guide supplied to the future occupants of the dwellings will include a section on Recycling and Waste to provide guidance on good practices.
- 4.5.3 It is proposed that this section of the Home User Guide will include the following:
- Information about the Local Authority collection scheme;

- Information on the Waste and Resource Action Programme (WRAP) which can offer guidance on recycling and sustainable waste disposal;
- Information on the procedure to follow with items of waste not covered by the standard weekly Local Authority collection scheme – for example fridges / freezers, computer equipment, batteries and other potentially hazardous equipment; and
- Information and location of local recycling facilities and waste tips.

5.0 Water Efficiency

5.1 Overview

5.1.1 With climate change and the consequential predicted reduction in rainfall for Southern England, water use and conservation are issues that should be considered in providing sustainable development. Methods and technologies that may be utilised include:

- Rainwater harvesting;
- Grey water re-use;
- Composting toilets; and
- Waste water treatment via reed beds.

5.1.2 Composting toilets and reed beds are not considered suitable for most multi-residential and large commercial developments, given site space constraints and the general availability of mains sewerage.

5.2 Rainwater Harvesting

5.2.1 Rainwater is relatively clean and is generally defined as 'soft' water and therefore it is relatively straightforward to treat and use in buildings.

5.2.2 Rainwater harvesting is a simple and effective method of reducing the consumption of mains water on a site. It is usually put to use where water of drinking water quality is unnecessary. For instance, rainwater can be utilised to provide supplies for the following:

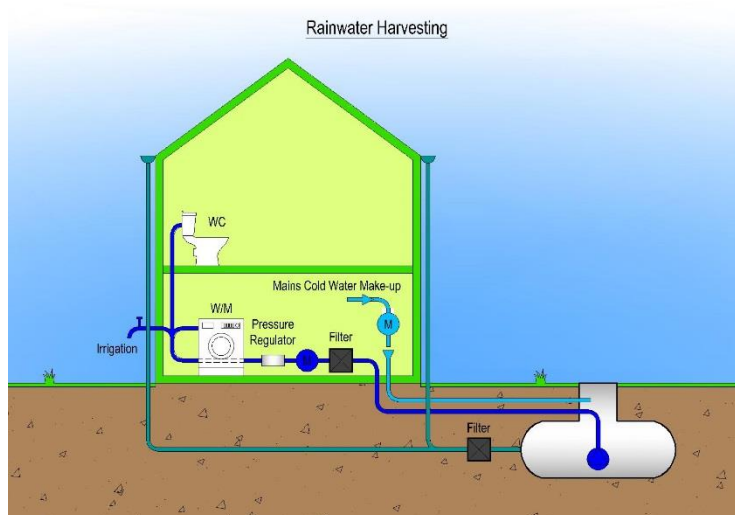
- Irrigation systems;
- WC flushing;
- Laundry facilities, i.e. washing machines; and
- Vehicle washing.

5.2.3 A rainwater harvesting system would normally consist of the following:

- Pre-filters located in the downpipes or integrated into the below ground pipework;
- Underground storage tank with calmed, filtered inlet and overflow;
- Submersible pump with integral filter;
- Control panel with pump pressure regulator;
- Mains water make-up (into main or header tank);

- Fine filter(s) in main distribution pipework (optional); and
- Ultra-violet disinfection unit (optional).

Figure 5.1: Typical Rainwater Harvesting System Configuration



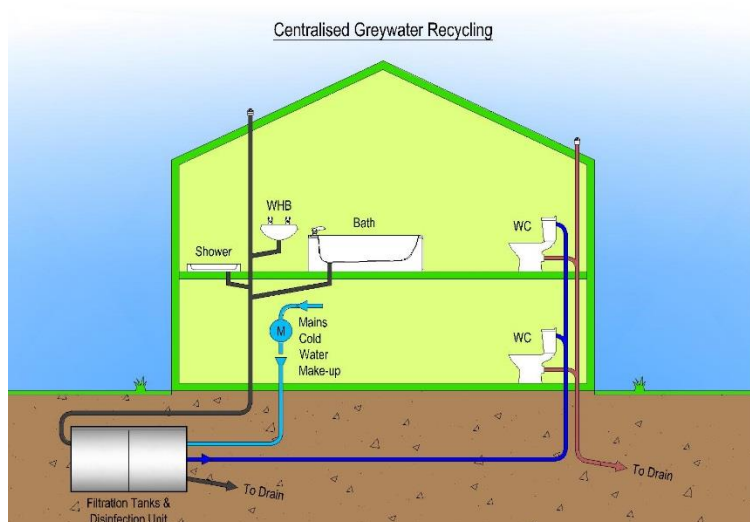
- 5.2.4 It is recommended that sanitary appliances are selected to be as efficient as possible, so that the use of rainwater can be maximised. Rainwater can be filtered and disinfected to provide water of drinking quality, but this is rare in the United Kingdom given the availability and quality of mains water.
- 5.2.5 Management of storm water is increasingly becoming an issue and rainwater harvesting can be utilised as part of an attenuation strategy.
- 5.2.6 Particular factors that need to be addressed when considering a rainwater harvesting system include:
- The supply of rainwater is unlikely to coincide with demand and therefore large volumes of storage may be necessary to compensate;
 - Compliance with the Water Regulations, including avoidance of backflow and cross connection into the mains water supply; and
 - The additional expense of a centralised system and also of maintenance, although the works necessary are relatively straightforward.

5.3 Grey Water Re-Use

- 5.3.1 Grey water is defined as waste water collected from sources with relatively low levels of contaminants, i.e. basins, baths, sinks, showers and, in some cases, washing machines. When filtered and disinfected it is primarily used in WC flushing.

- 5.3.2 Grey water is collected via a dedicated waste water pipework system and stored in tanks. Screen filtering and settlement takes place in the tank, after which the water is filtered and disinfected.
- 5.3.3 Packaged systems are now available, but filtration and disinfection methods vary between manufacturers. Reverse osmosis, sand and cartridge filters may be utilised; ultra-violet lamps, bromine and chlorination may be used for disinfection purposes.
- 5.3.4 Storage of 'raw' grey water for long periods is not recommended and a grey water installation should address all the possible health and safety issues, i.e. labelling of outlets and pipework, avoidance of cross contamination with mains water, regular maintenance.

Figure 5.2: Typical Greywater Harvesting System Configuration



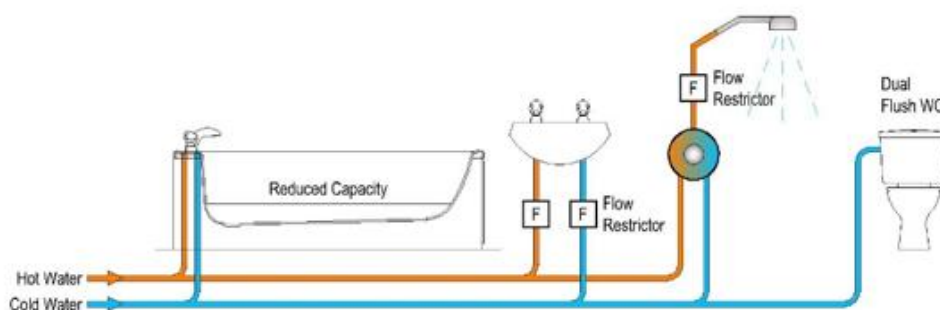
- 5.3.5 Factors that need to be addressed when considering a grey water system include:
- Compliance with the Water Regulations, including avoidance of backflow and cross connection into the mains water supply;
 - The additional capital expense of a centralised system;
 - Ongoing maintenance, which is invariably expensive; and
 - Possibility of more concentrated effluent returned to the sewerage system.
- 5.3.6 Measures associated with the Water Regulations include clear identification of pipework and even a different pipework material to prevent confusion and to reduce the chance of connections to a potable water system.
- 5.3.7 One major advantage with grey water is that availability and supply closely match demand, i.e. the volume of grey water produced correlates with the WC flushing water demanded.

- 5.3.8 The overall cost of local grey water re-use systems can be significant once the IPS, equipment and controls, and waste water pump are all accounted for.

5.4 Application for Water Management Systems

- 5.4.1 In line with the requirements of **DP42: Water Infrastructure and the Water Environment**, it is proposed for the proposed residential development to achieve a water consumption standard of 110 l/p/day (including external water use).
- 5.4.2 For residential developments achieving this required reduction in the consumption of potable water can be addressed in several different ways which are recognised within the Water Efficiency Calculator for New Dwellings used for Part G of the Building Regulations. This calculation methodology takes a whole house approach; manufacturer's data for each appliance is inputted and the theoretical amount of water that the average person would use in a house fitted with those appliances is calculated.
- 5.4.3 One of the most straightforward approaches to reducing water consumption would be to specify water conservation appliances such as dual flush toilets, low flow taps and baths with a low capacity to overflow although this has the potential to conflict with user preferences.

Figure 5.3: Standard Approach to Reducing Water Consumption



- 5.4.4 An alternative approach is to consider integrating technology that reuses water onsite such as using rainwater or grey water recycling. It is important to note however that in isolation the use of rainwater or grey water recycling is unlikely to reduce water consumption sufficiently to achieve the minimum standards, although in combination with low flow appliances these levels should be achievable, as shown in the table below:

Table 5.1: Summary of Routes to 105 l/p/day Residential Water Consumption (Internal Usage Only)

	Appliance Only	Rainwater	Greywater
Toilet	Dual flush – 4.5 litres capacity full flush, 3 litres capacity half flush	Dual flush – 4.5 litres capacity full flush, 3 litres capacity half flush	Dual flush – 6 litres capacity full flush, 4 litres

			capacity half flush
Wash Hand Basin Taps	2.4l /min	2.4l /min	2.4l /min
Shower	8l/min	9 l/min	10 l/min
Bath	Capacity to overflow - 130 litres	Capacity to overflow - 130 litres	Capacity to overflow - 150 litres
Kitchen Taps	Flow – 4 l/min	Flow – 4 l/min	Flow – 6 l/min
Washing Machine	49 litres / cycle	49 litres / cycle	49 litres / cycle
Dishwasher	13 litres / cycle	13 litres / cycle	13 litres / cycle
Water Consumption	104.37 l/p/day	102.46 l/p/day	104.20 l/p/day

5.4.5 **Table 5.1** is based on a two-bedroom dwelling and illustrates three different routes to achieving the 105l/p/day internal water usage target. It should be noted that this example makes several assumptions that may affect the overall water consumption such as the amount of rainwater that is i) collected and ii) reused in the dwelling.

5.4.6 This example is based on 9.9m² collection area per dwelling which receives 0.64 m/yr of rainfall and collects 33% of the rainwater that falls; the table above gives an indication of the likely impact on the types of appliances that can be specified to be used in conjunction with this technology to achieve the indoor water usage target of 105 l/p/day. Notably, given this strategy could not be applied to every apartment due to the limited available roof area. An estimated 5 l/p/day external water usage estimate takes the usage to the total of 110 l/p/day overall usage.

5.4.7 In terms of costing, it is very difficult to establish how much achieving the overall water usage target of 110 l/p/day will cost in total as this will depend on the approach that is employed and the type of dwelling that it is used in. The table below gives an indication of how much the various routes may cost a developer, but should be used for guidance purposes only.

Table 5.2: Indicative Cost Comparison of Routes to 105 l/p/day Water Consumption (Internal Usage Only)

Water Consumption	Potential Routes	Potential Additional Cost per Unit
≤120 l/p/day	Appliance only	£0
≤105 l/p/day	Appliance only	£140
	Appliance & Greywater	£2,700
	Appliance & Rainwater	£2,500

- 5.4.8 The cost of rainwater harvesting when applied to individual dwellings is relatively high, although connecting to a communal system may reduce the cost per dwelling. Drawbacks with this type of solution include rights of access for maintenance, metering and management of the installation.
- 5.4.9 It can be seen from **Table 5.2** that an appliance only route to meeting the 105 l/p/day internal water usage target is likely to be a substantially more cost-effective route than integrating a rainwater or greywater harvesting system.

6.0 Conclusions

- 6.1.1 A sustainability strategy for the Application Site has been developed to optimise the use of resources during design, construction and end use.
- 6.1.2 A sequential approach has been taken for the scheme energy strategy to minimise the potential carbon dioxide (CO₂) emissions from the site, firstly by passive measures and secondly by more active means. We believe that this has been achieved without unduly compromising the external appeal of the buildings and comfort of the occupants. The occupants will receive direct benefits in the provision of energy efficient buildings. Demand for heating and mechanical cooling will be significantly reduced, with a resultant decrease in carbon emissions. In terms of running costs, the residents and users will see the benefit through financial savings.
- 6.1.3 Detailed calculations regarding the predicted energy demand and carbon dioxide emissions will be undertaken at detailed design development stage. However, based on the preliminary calculation exercises carried out for this report, the Building Regulations energy targets will be met and exceeded through a combination of passive measures, energy efficient fixed services and low and zero carbon (LZC) technologies.
- 6.1.4 Energy savings and subsequent reduction in CO₂ emissions have been targeted through implementation of the following:
- Exceeding good or best practice standards for thermal insulation of opaque and glazed elements;
 - Achieving air permeability of 3.0 m³/h.m² at 50Pa;
 - Enhanced natural daylighting to primary living areas;
 - LED lighting throughout with enhanced controls where relevant;
 - High efficiency heat recovery ventilation systems; and
 - Air source heat pump technology to meet the thermal loads of the new homes.
- 6.1.5 Other areas which will contribute to the water and resource efficiency of the site have been targeted through the implementation of the following:
- Integration of water conservation appliances such as low flow fittings to reach water consumption targets set by the local authority;
 - Production of a SWMP to set good practice target waste benchmarks, set procedures for minimising, measuring, monitoring & reporting various waste streams and identifying potential for re-use to divert potential waste from landfill.

- At detailed design stage, opportunities to reduce the resource intensity and maximise end of life potential of the architectural proposals will be explored; and
- Recommendations to residents in the form of Home User Guides covering guidance on waste disposal.

6.1.6 This report has set out a route map for the future design development of the Application Site to meet the sustainability guidelines outlined in the Mid Sussex District Plan.

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