Land West of Trowe's Lane, Swallowfield

Vistry Group

Energy & Sustainability Statement

AES Sustainability Consultants Ltd

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	Author	Date	E-mail address
Produced By:	Eloise Utley	07/11/2025	Eloise.Utley@aessc.co.uk
Reviewed By:	Andrew McManus	10/11/2025	andrew.mcmanus@aessc.co.uk

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0	Eloise Utley	10/11/2025	Initial Issue
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This statement has been commissioned by Vistry Group to detail the proposed approach to energy and CO_2 reduction to be employed in the development of Land West of Trowe's Lane, Swallowfield. It should be noted that the details presented, including the proposed specifications, are subject to change as the detailed design of the dwellings progresses, whilst ensuring that the overall commitments will be achieved.

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1. Introduction

Preface

1.1. This Energy Statement has been prepared by AES Sustainability Consultants on behalf of Vistry Group in support of the application for development of the site know as Land West of Trowe's Lane, Swallowfield.

Development Description

1.2. The development site is located southwest of Swallowfield village centre between Charlton Lane and Trowe's Lane and falls within the Wokingham District.

1.3. Planning permission for the site was granted on appeal for application reference: 230422 in July 2024 for 81 dwellings. These comprise of a mix of a mix of one to four bed houses and maisonettes. The proposed site layout is shown in Figure 1.

Purpose and Scope of the Statement

1.4. The statement has been prepared to address national and local policy relating to sustainable design and construction of dwellings, including relevant policies within the Wokingham Borough Council Adopted Core Strategy Development Plan Document adopted in 2010 and the Managing Development Delivery Local Plan, adopted in February 2014

1.5. The statement will demonstrate that by following a 'fabric first' approach to demand reduction and with the inclusion of low-carbon technologies, the proposed development will deliver a level of energy performance and CO_2 reductions that exceed the current Building Regulation standards whilst addressing a range of additional sustainable design considerations.

1.6. Further sustainability considerations will be addressed, including resource and water efficiency, overheating risk and passive design and electric vehicle charging.

Figure 1. Land West of Trowe's Lane - Proposed site layout

2. Planning Policy and Conditions

Planning Conditions

2.1. Planning permission for the site was granted on appeal for application reference: 230422 in July 2024. Condition 17 relates to energy and sustainability.

> Condition 17 of Appeal Decision
>
> Prior to the occupation of the development hereby permitted, the solar panels and heat pumps detailed in the Energy and Sustainability Statement BO.S.RG7 Rev 3 shall be installed and thereafter retained unless replaced by more efficient and sustainable equipment.

Local Planning Policy

2.2. This Energy Statement addresses local planning policy relating to sustainable design and construction, principally contained within the Wokingham Borough Local Development Framework Core Strategy, adopted in January 2010. Policy CP1 relates to sustainable development and is included below.

> Policy CP1: Sustainable Development
>
> Planning permission will be granted for development proposals that:
>
> 1) Maintain or enhance the high quality of the environment;
> 2) Minimise the emission of pollutants into the wider environment;
> 3) Limit any adverse effects on water quality (including ground water);
> 4) Ensure the provision of adequate drainage;
> 5) Minimise the consumption and use of resources and provide for recycling;
> 6) Incorporate facilities for recycling of water and waste to help reduce per capita water consumption;
> 7) Avoid areas of best and most versatile agricultural land;
> 8) Avoid areas where pollution (including noise) may impact upon the amenity of future occupiers;
> 9) Avoid increasing (and where possible reduce) risks of or from all forms of flooding (including from groundwater);

> Policy CP1: Sustainable Development continued…
>
> 10) Provide attractive, functional, accessible, safe, secure and adaptable schemes;
> 11) Demonstrate how they support opportunities for reducing the need to travel, particularly by private car in line with CP6; and
> 12) Contribute towards the goal of reaching zero-carbon developments as soon as possible by:
>   a) Including appropriate on-site renewable energy features; and
>   b) Minimising energy and water consumption by measures including the use of appropriate layout and orientation, building form, design and construction, and design to take account of microclimate so as to minimise carbon dioxide emissions through giving careful consideration to how all aspects of development form.

2.3. This statement will additionally address requirements set out in the Wokingham Borough Council Adopted Managing Development Delivery Local Plan, adopted in February 2014, relating to sustainable design and construction and contained with Policies CC04 and CC05:

> Policy CC04: Sustainable Design and Construction
>
> Planning permission will only be granted for proposals that seek to deliver high quality sustainably designed and constructed developments by:
>
> 1. In respect of all new homes:
>   a) Seeking to achieve the requirements of the full Code for Sustainable Homes Level 4;
>   b) Meet internal potable water consumption targets of 105 litres or less per person per day (as part of the requirement to meet full Code for Sustainable Homes Level 4).
> 2. All new non-residential proposals of more than 100 sq m gross non-residential floorspace shall at least:
>   a) Achieve the necessary mandatory Building Research Establishment Assessment Method (BREEAM) requirements or any future national equivalent
>   b) Meet or exceed statutory requirements for water resource management.
> 3. All development, including conversions, alterations and extensions shall incorporate suitable waste management facilities, including on-site recycling.

Policy CC05: Renewable energy and decentralised energy networks

1. Local opportunities to contribute towards decentralised energy supply from renewable and low-carbon technologies will be encouraged
2. Planning permission will only be granted for proposals that deliver a minimum 10% reduction in carbon emissions through renewable energy or low carbon technology where the development is for:
    a) Schemes of more than 10 dwellings (gross), or
    b) Non-residential proposals of more than 1,000 sq m gross floorspace
3. Proposals for renewable energy and decentralised energy works, including wind turbines, must demonstrate that:
    a) They are appropriate in scale, location and technology type;
    b) Are compatible with the surrounding area, including the impact of noise and odour;
    c) Do not have a damaging impact on the local topography and landscape;
    d) There is no significant impact upon heritage assets, including views important to their setting;
    e) In the case of wind turbines, take account of their cumulative effect and properly reflect their increasing impact on the landscape and on local amenity

Code for Sustainable Homes

2.4. The Code for Sustainable Homes, as referenced in Policy CC04, was a scheme sponsored by the government, intended to promote and support the transition to more sustainable homes. Following updates to the Building Regulations, the CSH was withdrawn following the conclusion of the Housing Standards Review on 25th March 2015.

National Planning Policy Framework

2.5. In February 2025, the Government published the updated National Planning Policy Framework (NPPF), which sets out the Government's planning policies for England and how these are expected to be applied.

2.6. The planning process has been identified as a system to support the transition to a low carbon future in response to climate change by assisting in the reduction of greenhouse gas emissions and supporting renewable and low carbon energy.

2.7. Paragraph 164 sets out what is expected from new developments when considering strategies to mitigate and adapt to climate change:

> 164. New development should be planned for in ways that:
>
> a) 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 adaption measures, including through the planning of green infrastructure; and
>
> b) help to reduce greenhouse gas emissions, such as through its location, orientation, and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

National Policy Standards – Energy performance

2.8. The government introduced the current revision in Building Regulations, known as Part L 2021 in December 2021, which came into effect for buildings where construction commenced after 15th June 2023. The new standards require a 31% reduction in CO_2 emissions compared with the previous Building Regulations standard.

2.9. In December 2023 the government launched a consultation on the next uplift to Building Regulations, to be known as the 'Future Homes Standard'. Details of the standard are still awaiting a government response to the consultation and publication of the final required specification, however it is likely that it will require at least a 75% reduction in CO_2 emissions compared with Part L 2013 and a move towards electrified heating systems.

Proposed Approach

2.10. The development will be designed to meet national standards with respect to Building Regulations Part L 2021 requirements, while delivering a minimum 10% additional reduction in carbon dioxide emissions in line with Policy CC05.

2.11. This statement will therefore detail the proposed approach to delivering a low carbon development through a 'fabric first' approach and the implementation low carbon and renewable energy systems. A range of potential technologies will be assessed for their suitability at this site.

2.12. Condition 17 requires the implementation of both heat pumps and solar PV in line with the previously submitted energy strategy. This requirement is however far in exceedance of the requirements of local policy and of the requirements applied to similar developments in the local vicinity. As such this statement will propose a scaled back strategy which is still fully in keeping with adopted local policies, and far exceeds the requirements of the current building regulations.

2.13. The development also considers the changing future climate and seeks to build in resilience through appropriate construction techniques and materials to reduce future risks of overheating, sustainable and responsible material usage and water consumption of the dwellings. All dwellings will adhere to Policy CC04 by limiting internal water consumption to 105 litres/person/day.

3. Energy and CO_2 Reduction Strategy

3.1. As one of the key areas of ongoing impact of any development, the energy demand of the dwellings to be constructed is a key consideration in the overall sustainability strategy.

3.2. As set out within the policy review section of this statement, it is considered that Building Regulations form the minimum requirement for new dwellings in terms of energy performance.

3.3. As shown in Table 1, the CO_2 standards contained within Part L were increased in 2010 and 2013, reducing the 'Target Emission Rate' (TER) by approximately 25% and a further 6% (9% for non-residential) respectively, requiring substantial improvements to thermal insulation and heating services, or a significant increase in on-site renewable energy provision.

3.4. Part L 2021, mandatory from June 2023, constitutes a much larger step change of a 31% reduction in emissions over previous regulatory standards.

Table 1. CO_2 Emissions improvements from successive Part L editions

Building Regulations	CO_2 emissions improvements
L1A 2006	-
L1A 2010	25%
L1A 2013	6%
L1 2021	31%

Energy Reduction Strategy – Fabric First

3.5. It is proposed that the energy demand reduction strategy for the development incorporates further improvements beyond a Part L compliant specification and initially concentrates finance and efforts on reducing energy demand as the first stage of the Energy Hierarchy (Figure 2).

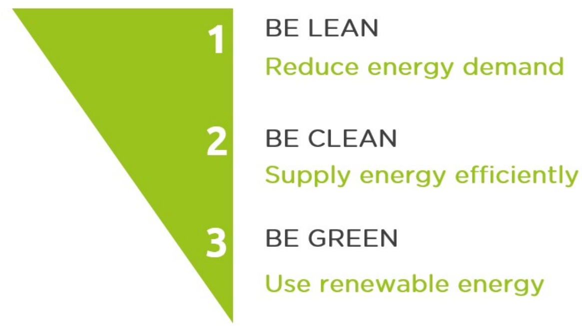

Figure 2. The Energy Hierarchy

Be Lean – reduce energy demand

3.6. The design of a development - from the masterplan to individual building design - will assist in reducing energy demand in a variety of ways, with a focus on minimising heating, cooling and lighting loads. Key considerations include:

- Building orientation – maximise passive solar gain and daylight
- Building placement – control overshading and wind sheltering
- Landscaping – control daylight, glare and mitigate heat island effects
- Building design – minimise energy demand through fabric specification

Be Clean – supply energy efficiently

3.7. The design and specification of building services to utilise energy efficiently is the next stage of the hierarchy, considering:

- High efficiency heating and cooling systems
- Ventilation systems (with heat recovery where applicable)
- Low energy lighting
- High efficiency appliances and ancillary equipment

Be Green – use low carbon / renewable energy

3.8. Low carbon and renewable energy systems form the final stage of the energy hierarchy and can be used to directly supply energy to buildings, or offset energy carbon emissions arising from unavoidable demand. This may be in the form of:

- Low carbon fuel sources – e.g., biomass
- Heat pump technologies
- Building scale renewable energy systems
- Small-scale heat networks
- Development-scale heat networks

3.9. As this hierarchy demonstrates, designing out energy use is weighted more highly than the generation of low-carbon or renewable energy to offset unnecessary demand. Applied to the development, this approach is referred to as 'fabric first' and concentrates finance and efforts on improving U-values, reducing thermal bridging, improving airtightness, and installing energy efficient ventilation and heating services.

3.10. This approach has been widely supported by industry and government for some time, particularly in the residential sector, with the Zero Carbon Hub[1] and the Energy Savings Trust[2] having both stressed the importance of prioritising energy demand as a key factor in delivering resilient, low energy buildings.

3.11. The benefits to prospective homeowners of following the 'Fabric First' approach are summarised in Table 2.

Table 2. Benefits of the Fabric First approach

	Fabric energy efficiency measures	Bolt-on renewable energy technologies
Energy/CO_2/fuel bill savings applied to all dwellings	✓	×
Savings built-in for life of dwelling	✓	×
Highly cost-effective	✓	×
Increases thermal comfort	✓	×
Potential to promote energy conservation	✓	✓
Minimal ongoing maintenance / replacement costs	✓	×
Significant disruption to retrofit post occupation	✓	×

Building Regulations Standards – Fabric Energy Efficiency

3.12. In addition to the CO_2 reduction targets, the importance of energy demand reduction was further supported by the introduction of a minimum fabric standard into Part L1A 2013, based on energy use for heating and cooling a dwelling. This is referred to as the 'Target Fabric Energy Efficiency' (TFEE), and is expressed in kWh/m^2/year.

3.13. This standard enables the decoupling of energy use from CO_2 emissions and serves as an acknowledgement of the importance of reducing demand, rather than simply offsetting CO_2 emissions through low carbon or renewable energy technologies.

3.14. The TFEE is calculated based on the specific dwelling being assessed with reference values for the fabric elements contained within Approved Document L1. These reference values are described as 'statutory guidance' as opposed to mandatory requirements, allowing full flexibility in design approach and balances between different aspects of dwelling energy performance to be struck so that the ultimate goal of achieving the TFEE is met.

[1] Zero Carbon Hub, Zero Carbon Strategies for tomorrow's new homes, Feb 2013

[2] Energy Savings Trust, Fabric first: Focus on fabric and services improvements to increase energy performance in new homes, 2010

3.15. These standards have been tightened under Part L 2021. The proposed approach and construction specifications are set out in the following sections of this Strategy.

Proposed Fabric Specification

3.16. In order to ensure that the energy demand of the development is reduced, the dwellings have been designed to minimise heat loss through the fabric wherever possible. Table 3 details the proposed fabric specification of the major building elements, with the first column in this table setting out the Part L1 limiting fabric parameters in order to demonstrate the potential improvements.

Table 3. Proposed Construction Specification – Main Elements

	Part L1 Limiting Fabric Parameters	Proposed Specification
External wall – u-value	0.26 W/m²K	0.24 W/m²K
Party wall – u-value	0.20 W/m²K	0.00 W/m²K
Plane roof – u-value	0.16 W/m²K	0.09 W/m²K
Ground floor – u-value	0.18 W/m²K	≤ 0.12 W/m²K
Windows – u-value	1.60 W/m²K	1.30 W/m²K
Doors – u-value	1.60 W/m²K	1.40 W/m²K
Air Permeability	8 m³/h.m² at 50 Pa	4.5 m³/h.m² at 50 Pa
Thermal Bridging	Y = 0.150 (default)	Calculated

Thermal Bridging

3.17. The significance of thermal bridging as a potentially major source of fabric heat losses is increasingly understood. Improving the U-values for the main building fabric without accurately addressing the thermal bridging will not achieve the desired energy and CO_2 reduction targets.

3.18. The specification seeks to minimise unnecessary bridging of the insulation layers, with avoidable heat loss therefore being reduced wherever possible. Accurate calculation of these heat losses forms an integral part of the SAP calculations undertaken to establish energy demand of the dwellings, and as such thermal modelling will be undertaken to assess the performance of all main building junctions.

Air leakage

3.19. After conductive heat losses through building elements are reduced, convective losses through draughts are the next major source of energy wastage. The proposal adopts an airtightness standard of 4.50m³/h.m² at 50Pa, with pressure testing of all dwellings to be undertaken on completion to confirm that the design figure has been met.

Energy Efficient Lighting

3.20. Internal lighting will be low energy with LED lightbulbs wherever possible. External security and space lighting should be low energy and fitted with PIR and daylight sensors where appropriate.

Passive Design Measures and Overheating Risk Mitigation

3.21. Glazing will be specified with a solar transmittance value (g-value) to strike the balance between useful solar gain in the winter and unwanted solar gain in the summer. Windows will be sized appropriately to ensure adequate levels of daylight and reduce the requirement for lighting, whilst ensuring that excessive solar gains will not become an issue in summer.

3.22. Due to these measures to reduce internal heat gain, natural ventilation provided through window openings and the opportunity for cross ventilation will allow sufficient air exchange rates to purge any heat build-up. Active cooling systems are therefore not proposed.

3.23. By following these principles, the development will be designed to build in resilience to a potentially changing climate over the lifetime of the buildings and minimise overheating risk, which can be exacerbated by the drive to build better insulated, more airtight homes if not considered within the design and construction process.

Provisions for Energy-Efficient Operation of the Dwelling

3.24. The occupant of the dwelling should be provided with all necessary literature and guidance relating to the energy efficient operation of fixed building services. Currently it is assumed that houses will be provided with air source heat pumps (ASHP), fully insulated primary pipework, and time and temperature zone controls to avoid unnecessary heating of spaces when not required.

4. Low Carbon and Renewable Energy

4.1. The next stage of the energy hierarchy is to incorporate renewable and low carbon energy to help meet or offset the remaining energy demand.

4.2. A range of technologies have been assessed for potential incorporation into the scheme in line with Regulation 25A of the Building Regulations and in order to meet the requirement of Policy CC05 which requires a minimum of 10% of energy to come from renewable sources.

Combined Heat and Power (CHP) and District Energy Networks

4.3. A CHP unit is capable of generating heat and electricity from a single fuel source. The electricity generated by the CHP unit is used to displace electricity that would otherwise be supplied from the national grid, with the heat generated as effectively a by-product utilised for space and water heating.

4.4. CHP units most often rely on mains gas as a fuel source, meaning that they are still reliant on fossil fuels. Biomass CHP systems are possible, however these still have issues with on-site combustion potentially increasing local levels of NO_x and particulates. In both cases, despite their efficiencies of over 100%, better efficiencies are now obtainable from other technologies such as heat pumps.

4.5. The economic and technical viability of a communal system is largely reliant on a consistent demand for heat throughout the day to ensure that it operates for over 5000 hours per year. Heat demand from mainly residential schemes is not conducive to efficient system operation, with a defined heating season and intermittent daily profile, with peaks in the morning and the evening. For these reasons, the use of a community CHP system is considered unfeasible for this development.

4.6. There are currently no heat networks which extend near the proposed development. High network heat losses associated with distribution to individual houses, as opposed to large high-rise apartment blocks and commercial developments mean that a new heat network to serve the area is not considered viable or an environmentally preferred option.

Wind Power

4.7. Locating wind turbines adjacent to areas with buildings presents a number of potential obstacles to deployment. These include the area of land onsite required for effective operation, installation and maintenance access, environmental impact from noise and vibration, visual impact on landscape amenity and potential turbulence caused by adjacent obstacles, including the significant amount of woodland on and around the development.

4.8. A preliminary examination of the BERR wind speed database indicates that average wind speeds at 10m above ground level are around 4.70m/s[3]. Wind turbines at this site are therefore unlikely to generate sufficient quantities of electrical energy to be cost effective[4]. For these reasons wind power is not considered feasible.

Building Scale Systems

4.9. The remaining renewable or low carbon energy systems considered potentially feasible are at a building scale. These are as follows;

- Individual biomass heating
- Solar thermal
- Solar photo-voltaic (PV)
- Air Source Heat Pumps (ASHPs)
- Hot Water Heat Pumps (HWHPs)
- Ground Source Heat Pump (GSHPs)

4.10. The advantages and disadvantages of these technologies are evaluated in Tables 4-9.

[3] NOABL Wind Map (http://www.rensmart.com/Weather/BERR)

[4] CIBSE TM38:2006. Renewable energy sources for buildings.

Table 4. Individual biomass heating feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Potential to significantly reduce CO_2 emissions as the majority of space and water heating will be supplied by a renewable fuel • Decreased dependence on fossil fuel supply	• A local fuel supply is required to avoid increased transport emissions • Fuel delivery, management and security of supply are critical • Space is required to store fuel, a thermal store and plant • A maintenance regime would be required even though modern systems are relatively low maintenance • Building users or a management company must be able to ensure fuel is supplied to the boiler as required. • Local environmental impacts potentially include increased NO_x and particulate emissions
Estimated costs and benefits	
• Cost £4,000 - £18,000[5] [6] for a wood-pellet boiler, not including cost of fuel	
Conclusions	
Biomass heating is considered technically feasible in large dwellings provided sufficient space can be accommodated for fuel supply, delivery and management however air quality concerns mean that it is not considered a preferable technology.	

Table 5. Solar thermal systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Mature and reliable technology offsetting the fuel required for heating water (typically gas) • Solar thermal systems require relatively low maintenance • Typically, ~50% of hot water demand in dwellings can be met annually	• Installation is restricted to favourable orientations on an individual building basis • The benefit of installation is limited to the water heating demand of the building • Safe access must be considered for maintenance and service checks • Buildings need to be able to accommodate a large solar hot water cylinder • Distribution losses can be high if long runs of hot water pipes are required • Visual impact may be a concern in special landscape designations (e.g. AONB)
Estimated costs and benefits	
• Cost £5,000 – 8,000 for standard installation[7] • Ongoing offset of heating fuel, minimal maintenance requirements	
Conclusions	
Solar thermal systems are considered technically feasible on all buildings with suitable roof orientations. However the contribution to carbon reduction is expected to be low and therefore it is not a preferred technology.	

[5] Boiler Guide https://www.boilerguide.co.uk/biomass-boiler
[6] Energy Saving Trust https://energysavingtrust.org.uk/advice/biomass/
[7] Energy Saving Trust https://energysavingtrust.org.uk/advice/solar-water-heating/

Table 6. Solar photovoltaic systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• The technology offsets the high carbon content of grid supplied electricity used for lighting, pumps and fans, appliances and equipment • Mature and well proven technology that is relatively easily integrated into building fabric • Adaptable to future system expansion • Solar resource is not limited by energy loads of the dwelling as any excess generation can be transferred to the national grid • PV systems generally require very little maintenance • Service and maintenance requirement minimal, and 2-3 storey buildings should not require significant additional safety measures (mansafe systems etc) for roof access	• Poor design and installation can lead to lower-than-expected yields (e.g., from shaded locations) • Installation is restricted to favourable orientations • Safe access must be considered for maintenance and service checks • Visual impact may be a concern in special landscape designations (e.g. AONB) or conservation areas • Reflected light may be a concern in some locations
Estimated costs and benefits	
• Cost circa £1,300 - £1,900 (per kWp)[8] and scalable • Ongoing offset of electricity fuel costs, minimal maintenance requirements • Potential for residents to benefit from Smart Export Guarantee payments	
Conclusions	
PV panels are considered technically feasible for all buildings with suitable roof orientations. The relatively low cost, carbon saving potential and limited additional impacts mean that PV is considered a potentially feasible option for this development.	

Table 7. Air Source Heat Pump systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Heat pumps are relatively mature technology providing heat using the reverse vapor compression refrigeration cycle • Heat pumps are a highly efficient way of providing heat using electricity, with manufacturers reporting efficiencies from 250% • Can be of increased benefit where cooling is also required, therefore particularly relevant to commercial buildings	• Air source heat pumps are powered by electricity, with a significantly higher unit price than gas, leading to potentially increased running costs • It is critical that heat pump systems are designed and installed correctly to ensure efficient operation can be achieved. Users must be educated in how heat pump systems should be operated for optimal efficiency • Air source heat pump plant should be integrated into the building design to mitigate concerns regarding the visual impact of bolt-on technology • Noise in operation may be an issue particularly when operating at high output
Estimated costs and benefits	
• Cost circa £11,000[9] • Running cost linked to COP of heat pump, due to current electricity prices this can potentially be higher than mains gas.	
Conclusions	
Air source heat pumps are technically feasible for the buildings in this scheme and are considered a preferred low carbon technology at this stage.	

[8] Gov.uk https://www.gov.uk/government/statistics/solar-pv-cost-data

[9] Energy Saving Trust https://energysavingtrust.org.uk/advice/air-source-heat-pumps/

Table 8. Ground Source Heat Pump systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Heat pumps are relatively mature technology providing heat using the reverse vapor compression refrigeration cycle • Heat pumps are a highly efficient way of providing heat using electricity, with manufacturers reporting efficiencies from 320% • Can be of increased benefit where cooling is also required, therefore particularly relevant to commercial buildings	• Low temperature heating circuits (underfloor heating) would be required to maximise the efficiency of heat pumps • A hot water cylinder would also be required for both space and water heating • Ground source heat pumps are powered by electricity with a significantly higher unit price than gas, leading to potentially increased running costs • It is critical that heat pump systems are designed and installed correctly to ensure efficient operation can be achieved • Ground source heat pumps either require significant land to incorporate a horizontal looped system or significant expense to drill a bore hole for a vertical looped system
Estimated costs and benefits	
• Cost circa £29,000+[10] • Costs for boreholes can be significantly more • Running cost linked to COP of heat pump, due to current electricity prices this can potentially be higher than mains gas.	
Conclusions	
Ground source heat pumps are considered technically feasible for buildings in this scheme. However, the cost and difficulty associated with vertical boreholes at this site means that they are not considered a preferred low carbon technology at this stage.	

Table 9. Hot Water Heat Pump Feasibility Appraisal

Potential Advantages	Risks & Disadvantages
• Hot water demand met through grid electricity with low effective emissions factor • Heat pump element increases efficiency over immersion heater, circa 200%+ • No external heat exchanger requirement, only intake and exhaust duct runs • Low noise levels • Compact solution in same footprint as hot water cylinder	• Maximum length of duct runs means that cylinder positioning needs to be considered within the dwelling • Less appropriate for larger dwellings with higher hot water demands due to potentially slower recharge rate • Some noise, however likely to be easily suppressed with appropriate cylinder location • Space heating must be met through separate system
Estimated costs and benefits	
• Cost circa £1,500 - £4,000 for the cylinder • Due to current electricity prices the running cost could potentially be higher than mains gas.	
Conclusions	
Hot water heat pumps are considered feasible for dwellings with a low number of wetrooms and appropriate cylinder location to allow for duct runs to building façade.	

[10] Energy Saving Trust https://energysavingtrust.org.uk/advice/ground-source-heat-pumps/

Summary

4.11. Following this feasibility assessment, it is considered that there are a range of technically feasible low carbon or renewable energy systems, however a number of these may be discounted on the grounds of increased running costs for residents or other adverse effects.

4.12. There are three remaining technologies with significant potential for the development:

- Solar photovoltaics
- Air Source Heat Pumps
- Hot Water Heat Pumps

4.13. Due to the ongoing decarbonisation of the national grid, electricity now has a much lower carbon factor in comparison to mains gas. In combination with the increased efficiencies of a heat pump, an ASHP should be capable of delivering heat with greater than 75% reduction in CO_2 emissions in comparison to a gas boiler.

4.14. It is currently proposed that all dwellings will incorporate air source heat pumps (ASHP) to deliver low carbon heat across the development. For the maisonettes, Hot Water Heat Pumps may also be considered in place of standard ASHPs where space constraints for an outdoor unit exist. This will ensure that all units are additionally ready for the introduction of the future homes standard and that the development will be fossil fuel free on site.

4.15. When positioning heat pumps, a number of considerations will be made with regard to the running and maintenance of the systems, as well as the impacts they will have on the aesthetics of the dwellings and potential noise implications for the dwellings occupants.

4.16. It is considered that solar PV panels could be an appropriate additional technology to further reduce CO_2 emissions if required by the implementation of the future homes standard.

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5. Energy and CO_2 Emissions Reduction

5.1. The development is to be designed and constructed to meet the requirements of Part L1 of the Building Regulations 2021, therefore compliance with this standard forms the first stage in the sustainable construction approach.

5.2. Part L1 compliance is assessed through the Standard Assessment Procedure (SAP), which uses the 'Target Emission Rate' (TER) – expressed in kilograms CO_2 per meter squared of total useful floor area, per annum – as the benchmark. The calculated performance of the dwelling as designed - the Dwelling Emission Rate (DER) – is required to be lower than this benchmark level.

5.3. Calculations have been undertaken to a sample of dwellings proposed to assess the carbon emissions of the development. Following the implementation of the measures described in this report, including improved building fabric, energy efficient systems, and renewable energy the carbon dioxide emissions of the development have been reduced well below the maximum Part L 2021 compliant level.

5.4. The Part L1 2021 compliant target emission rate for the site versus the predicted emission rate are reported in Table 10.

Table 10. Part L compliant and Predicted CO_2 emissions for the site

	CO_2 emissions ($kgCO_2$/year)
Part L Compliant Baseline	84,578
As-Designed Emissions	26,233
Saving	58,345
Percentage Reduction	69%

5.5. As demonstrated above the site is predicted to achieve a 69% emissions rate reduction through the reduction of energy demand and the inclusion of ASHPs. The reduction far improves upon the minimum requirements for a 10% reduction in emissions as set out in Policy CC05.

5.6. The proportion of energy supplied by renewables is demonstrated in Table 11.

Table 11. Proportion of energy from renewables

	Energy Demand (kWh/year)
Energy Demand before Renewables	444,953
Energy Demand after Renewables	177,016
Energy from Renewables	267,936
Percentage Reduction	60%

5.7. As demonstrated, 60% of the total regulated energy demand of the development is expected to be met by renewables, substantially reducing the impact of the development.

5.8. The above calculations have been carried out on a sample of dwellings with full design SAP calculations to be undertaken at detailed design stage to ensure that the overall targets are maintained.

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6. Overheating Risk and Passive Design

6.1. Dwellings constructed today may be operating in a substantially different climate over the coming decades, and therefore should be designed to ensure that they are able to adapt and reduce the risk of overheating with potentially higher summer temperatures and longer hot spells. Therefore, Passive design measures will be considered and incorporated to enhance resilience to climate change impacts throughout the lifetime of the development.

6.2. Key design decisions can affect the potential risk of overheating:

- Poor consideration of orientation of large glazed facades
- High density development contributing to urban heat island effects
- High glazing ratios contributing to excessive unwanted solar gain
- Inadequate ventilation strategies
- Very high levels of thermal insulation without considering heat build-up

6.3. Other factors which additionally contribute to heat build-up within homes and should be addressed where possible include:

- High levels of occupation
- Appliance use contributing to internal gains

Cooling hierarchy

6.4. In common with sustainable heating strategies, it is possible to apply a sustainable 'cooling hierarchy' which sets out the priorities to ensure overheating risk is minimised:

- Minimise internal heat gain
- Manage heat through internal thermal mass and design of spaces
- Passive ventilation strategies
- Mechanical ventilation systems
- Active cooling systems

Addressing overheating risk

6.5. The cooling hierarchy described has been considered, with passive measures of reducing overheating risk given priority. Key measures which will be taken within the development include:

- A layout which incorporates significant green space, as well as sustainable urban drainage features such as leaps, around the site and in rear gardens reducing the potential for heat build-up in enclosed and low albedo external areas such as tarmac and dark roofs
- Glazing specification which has been considered to balance the requirements for useful solar gain with unwanted summer gain
- Consideration of thermal mass of construction materials to smooth internal temperature profiles, storing excess heat during the day and releasing at night

6.6. The development is proposed to use traditional masonry construction, which has a relatively high thermal mass, compared with timber or steel construction. A construction with a high thermal mass can help to reduce overheating risk as it absorbs heat during the day and slowly releases it during cooler nighttime hours, effectively smoothing out temperature fluctuations within the property.

6.7. Within the development layout, orientation and massing has been considered to maximise useful passive solar gain. Glazing will be specified with a solar transmittance value (g-value) to strike the balance between useful solar gain in the winter and unwanted solar gain in the summer.

6.8. All houses will be able to benefit from cross-ventilation to effectively purge warm air from the properties during periods of hot weather. Window opening areas will be considered and guided by the Part O assessment, with increased opening areas being designed in as required.

Approved Document O

6.9. In order to address overheating risk more robustly, the Government has introduced a new Approved Document, 'Part O', into the Building Regulations.

6.10. This document requires a more in-depth assessment of the risk of overheating, taking into account site location, dwelling orientation, glazing proportions and openable window areas for natural ventilation. (This assessment will be undertaken at the start of detailed design and any mitigation measures that may be required will be built in).

7. Resource Efficiency

7.1. This section sets out details of additional resource efficiency and sustainable design principles to be applied at the development.

Materials

7.2. The impacts of construction materials range from the depletion of natural resources to the greenhouse gas emissions and water use associated with their manufacture and installation.

7.3. Within the development choices will be made in order to reduce the consumption of primary resources and using materials with fewer negative impacts on the environment, including but not limited to the following;

- Use fewer resources and less energy through designing buildings more efficiently.
- Specify and select materials and products that strike a responsible balance between social, economic and environmental factors.
- Incorporate recycled content, use resource-efficient products and give due consideration to end-of-life uses
- Influence, specify and source increasing amounts of materials which can be reused and consider future deconstruction and recovery.

Waste

7.4. Sending waste to landfill has various environmental impacts, such as the release of local pollution, ecological degradation and methane emissions, in addition to exacerbating resource depletion. Waste in housing comes from two main streams; construction waste and domestic waste during occupation.

Household Waste

7.5. In this respect regard has been given to the policy advice contained in the NPPF together with the Council's current strategy in terms of waste and recycling to ensure that the new dwellings are provided with adequate storage facilities for both waste and recyclable materials.

7.6. Wokingham Borough Council currently operate a household collection service through which households are able to recycle materials including paper and cardboard, plastic bottles, tins, and metal foils, along with a separate collections for food waste and garden waste. Future occupiers of the dwellings will be provided with an information pack detailing the Council's current collection arrangements for waste and recycling and advising of the nearest recycling centres to the Application site.

Construction Waste

7.7. The development will additionally be designed to monitor and manage construction site waste effectively and appropriately. Target benchmarks for resource efficiency will be set in accordance with best practice – e.g., $5m^3$ of waste per $100m^2$ / tonnes waste per m^2.

7.8. Wherever possible materials will be diverted from landfill through re-use on site, reclamation for re-use, returned to the supplier where a 'take-back' scheme is in place or recovered and recycled using an approved waste management contractor. A target to divert 85% by weight/volume of non-hazardous construction waste will be applied.

Electric Vehicle Charging

7.9. It is recognised that there is a need to ensure that the development is adaptable to accommodate a future shift in personal transportation to electric vehicles, to promote sustainable transport and to minimise air pollution. As Electric Vehicle (EV) ownership increases, developers have an increasing responsibility to provide EV charging points for occupants.

7.10. The Government has additionally introduced a new Approved Document, Part S, which sets out requirements for EV charging infrastructure within new development. This specifies that EV charge points must be provided for each dwelling (or where the total number of parking spaces is less than each dwelling, all spaces should be provided with an active EV charging point). Any remaining spaces must have cable routes for charge points to be installed.

7.11. EV charging units will be installed in line with Approved Document S of Building Regulations 2021 and provided to all dwellings. Each charge point will have a minimum nominal rated output of 7kW.

8. Water Efficiency

8.1. The UK Climate Change Risk Assessment 2017 identified risks of shortages in water supply as a future climate change impact. Therefore, the efficient use of water is an important factor when considering future resilience to climate change.

8.2. In line with Policy CC04, water use will be managed effectively throughout the development through the incorporation of appropriate efficiency measures to achieve a maximum internal water consumption of 105 litres/person/day. Table 12 demonstrates how this could be achieved.

8.3. Water efficiency measures including the use of efficient dual flush WCs, low flow showers and taps and appropriately sized baths will be installed with the aim to limit the use of water during the operation of the development to limit water use.

Table 12. Typical Water Demand Calculation

Installation Type	Unit of measure	Capacity/ flow rate	Litres/occupier/ day
WC (dual flush)	Full flush (l)	4	5.84
	Part flush (l)	2.6	7.696
Taps (excluding kitchen taps)	flow rate (l/min)	5	9.48
Bath	Capacity to overflow (l)	181	19.91
Shower	Flow rate (l/min)	6	26.22
Kitchen sink taps	Flow rate (l/min)	6	13.00
Washing Machine	Litres/kg dry load	8.17	17.157
Dishwasher	Litres/place setting	1.25	4.50
Calculated Use			103.80
Normalisation Factor			0.91
Total Internal Consumption (L)			94.46

9. Conclusions

9.1. This Energy and Sustainability Statement has been prepared by AES Sustainability Consultants Ltd on behalf of Vistry Group to detail the proposed approach to sustainable construction to be employed at the development of Land West of Trowe's Lane, Swallowfield

9.2. The statement has been prepared to address national and local policy relating to sustainable design and construction of dwellings, including relevant policies within the Wokingham Borough Council Adopted Core Strategy Development Plan Document adopted in 2010 and the Managing Development Delivery Local Plan, adopted in February 2014.

9.3. This statement details the proposed approach to delivering a low carbon development through a 'fabric first' approach and the implementation low carbon and renewable energy systems. A range of renewable energy technologies have been assessed for their suitability concluding that ASHPs are the most feasible for inclusion and will have the greatest impact on reducing CO_2 emissions.

9.4. All dwellings are proposed to incorporate air source heat pumps ensuring a fossil fuel free development and achieving a circa. 69% reduction in carbon dioxide emissions using current carbon factors, and ensuring that the development will continue to decarbonise in tandem with the national grid.

9.5. The calculations demonstrate that the development is expected to deliver a reduction in carbon dioxide emissions which significantly improves upon Part L 2021 compliance and the requirements of Policy CC05 to achieve a minimum 10% reduction.

9.6. The statement additionally details the proposed approach to addressing overheating risk and climate resilience, sustainable and responsible materials usage, electric vehicle charging and water consumption of the dwellings. All units will limit internal water consumption to less than 105 litres/person/day in line with Policy CC04.