Stratford-on-Avon District Development Requirements Supplementary Planning Document (SPD)

Consultation Draft

Part V: Climate Change Adaptation and Mitigation

January 2020

Part V: Climate Change Adaptation and Mitigation

Contents

This part of the Development Requirements SPD provides further detailed guidance on the interpretation of the following Core Strategy policies in relation to climate change mitigation and adaptation, as appropriate:

- CS.2 Climate Change and Sustainable Construction
- CS.3 Sustainable Energy
- CS.4 Water Environment and Flood Risk
- CS.5 Landscape
- CS.6 Natural Environment
- CS.7 Green Infrastructure
- CS.9 Design and Distinctiveness
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- AS.10 Countryside and Villages
- AS.11 Large Rural Brownfield Sites

It will be used by Stratford-on-Avon District Council to help reach decisions on whether to approve or refuse planning applications. Making sure that applications comply with the guidance contained within SPD will make it easier for the Council to grant planning permission.

V1. How to Use this SPD – The 5 Principles and Checklists

Stratford-on-Avon District Council is committed to tackling climate change, and in July 2019 the Council declared a 'Climate Emergency' as a pledge to take local action to contribute to national carbon neutral targets.

The National Planning Policy Framework (NPPF) recognises the role of the planning system in supporting the transition to a low carbon future by helping to shape places that contribute to reductions in greenhouse gas emissions, minimise vulnerability and improve resilience.

In February 2019 the Committee on Climate Change assessed whether homes are adequately prepared for the challenges of climate change. The Committee identified in its report 'UK Housing: Fit for the Future?' a number of actions including the need for new homes to be built to be low-carbon, energy and water efficient and climate resilient.

In a joint report by the Royal Town Planning Institute and Town and Country Planning Association 'Rising to the Climate Crisis: A Guide for Local Authorities on Planning for Climate Change' (Dec. 2018) it is acknowledged that whilst work is needed at an international and national level, local action is also needed as the solutions to many of the adverse impacts of climate change need to be developed locally.

Land use planning can contribute to the transition to a low-carbon future, centred on the following 5 principles based around two key themes:

1. Reducing greenhouse gas emissions
    - Principle 1: Increasing accessibility - reducing the need to travel by private car
    - Principle 2: Improving energy efficiency
2. Implementing adaptation and mitigation measures
    - Principle 3: Adapting to higher temperatures
    - Principle 4: Mitigating flood risk
    - Principle 5: Mitigating biodiversity loss

Checklists for applicants to provide a minimum level of climate change adaptation and mitigation measures, centred around the 5 key principles, are provided within **Appendices 1-3**. Detailed guidelines for how to apply the checklists to new development proposals is provided within **Section V8**.

Case Studies that demonstrate each of the 5 key principles being applied in practice within existing developments in the District and County are provided within **Section V7**.

V2. Principle 1: Increasing accessibility - reducing the need to travel by private car

Private cars contribute towards a large proportion of the UK's total carbon emissions, with transport being the largest contributor to greenhouse gas emissions in Britain. This has primarily been caused by an increase in the length of trips taken and a modal shift towards the car as well as changing land use patterns. There are opportunities for more sustainable transport choices and healthy lifestyles through well planned development and providing practical and sustainable alternatives to private car travel is therefore critical to tackling the climate crisis. A report by the Urban Transport Group 'Making the Connections on Climate' (Nov. 2019) highlights the connections that can be made on climate between transport and energy, and between transport and the decarbonisation and adaptation of the built interventions. This section of the SPD provides details of how interventions can be achieved in new development within the District.

However, Stratford-on-Avon District is an area of relatively small towns and rural settlements and this context needs to be borne very much in mind when considering viable alternatives to the private car and light commercial vehicles.

V.2.1 Density and Mixed Use

Density plays an important part in reducing people's reliance on using a private car. Higher density developments can make destinations easily accessible by walking or cycling and can bring people together to support local public transport, facilities and local services. Due to Stratford District being rural in nature, an appropriate density should be considered for each new development which will help form the context, accessibility, proposed building types, form and character of the area.

Mixed use developments can provide a wide range of services and facilities including employment opportunities, schools, healthcare provision, recreational and leisure facilities, open green spaces and many more. These developments should be encouraged where appropriate and provide facilities which are within 10 minutes (800m) walking distance of dwellings.

Further information on how developments can be designed to incorporate principles of higher density and mixed uses is available in **Part A: Achieving Good Design**.

Case Study

An example of how higher densities can be successfully used order to reduce the need to travel by the private car is in the **Case Study of the Arden Quarter, Stratford-upon-Avon** in Section V7 (Case Study 1)

V.2.2 Walkability/Permeability

New developments should provide active frontages that are directly accessible by foot and overlooked from the street. This can help in reducing crime by providing natural surveillance and ensuring streets are community friendly which in turn encourages walking and social interaction.

Developments should provide permeable networks as these encourage walking and cycling and make places easy to navigate through especially for visitors. Signage should be provided on all new developments to show the main pedestrian and cycling routes to village centres and key facilities and to make it easy for pedestrians and cyclists to find their way through new developments. Signage should be clear and include the distance to key facilities and approximate timings to encourage and promote walking and cycling. Consideration should be given to providing seating/resting places along well used routes to assist less mobile persons to reach key facilities.

Case Study

For an example of how to make developments more pedestrian friendly, please see the **Case Study of Northgate, Warwick** in Section V7 (Case Study 2)

V.2.3 Integrated Active Travel

Development should be directed to areas that minimise the need to travel and maximise the use of sustainable modes of transport, with walking and cycling actively being promoted to and from the development site. All developments should ensure that key facilities such as schools, shops, GP surgeries and bus stops are well connected by walking, cycling or public transport provision.

Cycling and walking provision should provide suitable crossing facilities where necessary as well as appropriate lighting levels and security measures to ensure the safety and security of pedestrians and cyclists. When considering the provision of pedestrian and cycling routes and facilities these should be designed for all users including elderly and disabled residents.

Where there is existing pedestrian/cycling provision, developments should consider whether it is suitable for its proposed use taking into consideration existing and future links to public transport. These should be improved where appropriate.

The National Design Guide (Oct. 2019) identifies 'movement' as one of ten characteristics of well-designed places, and highlights the need for an integrated network for all modes of transport giving people maximum choice in how to make their journeys, prioritizing pedestrians and cyclists.

Case Study

An example of how a residential development can be designed to promote walking, cycling and public transport as realistic modes of travel is in the **Meon Vale Case Study** in Section V7 (Case Study 3)

V.2.4 Cycling

Cycle storage must be provided for each new dwelling at an appropriate level as well as on new employment, leisure, retail and commercial development sites. This should be secured, covered, have good surveillance and be convenient to use. Therefore, consideration should be given to the overall design of cycle storage at an early stage of the planning process and full details of this including the location, type of storage,

spacing, numbers, method of installation and accessibility to the storage should be provided with the planning application.

Cycle storage provision will also be required in householder proposals where additional bedrooms are proposed, and where sufficient site area is available.

Consideration should be given to electric charging points for e-bikes on new developments as well as grouped locations for cycle hire. This would need to be considered on a case by case basis as it will be dependent on the size of development.

Further guidance on cycling and cycle parking can be found in **Part O6: Parking and Travel**

V.2.5 Planning for the Car

Policy CS.15 of the Core Strategy prioritises development firstly within the Main Town of Stratford-upon-Avon and then concurrently through the remaining locations identified in the settlement hierarchy. This remains the principle mechanism for addressing Climate Change in SDC's planning policy through the delivery of sustainable development and the promotion of linked trips and reduced reliance on the private car.

Car free developments should be considered in locations where the following may apply:

- Extension, alteration or re-use of an existing building with no access to parking;
- Reversion of a previously converted property to its original residential use, including flats above shops;
- Where 100% cycling or walking provision is considered to be a viable option;
- Highly sustainable locations within a 10 minute walk (800m) of a full range of services, facilities and frequent public transport services.

Consideration should be given to good design and layout in order to accommodate visitor parking and communal parking. Where there are communal parking areas these should be broken up by planting where possible to improve the design and layout, help to improve biodiversity and assist with surface water drainage.

Developments should aim to create streets that control the speed of vehicles using appropriate traffic calming measures. For residential streets, one of the main objectives should be to achieve a maximum design speed of 20mph.

In conjunction with WCC Highways, 'Idle-free zones' (defined areas where vehicles are banned from running engines whilst stationary) outside of sensitive sites such as schools, hospitals and GP surgeries will be strongly encouraged, so as to reduce air pollution and carbon emissions caused by idling vehicles.

Electric Vehicle Charging

At least one electric vehicle charging point per unit should be provided for residential developments and for commercial, retail and industrial at least 10% of parking spaces. These may be phased with 5% of initial provision and the remainder being provided at an agreed trigger level.

Further information can be found in **Part R: Air Quality**

V3. Principle 2: Improving energy efficiency in buildings

The UK needs to increase its use of renewable energy for a number of reasons. The increasing impact of the climate change emergency means that carbon dioxide emissions and other greenhouse gases must be reduced. There is also likely to be an increase in global demand for energy over the next few decades and this together with a depletion of North Sea oil and gas resource will mean that there will need to be a different approach to sourcing and using energy. By using renewables this will help the UK to recover some of its energy self-sufficiency together with assuring that more imported energy comes from reliable sources. An RTPI Research Paper 'Planning for a Smart Energy Future' (July 2019) sets out the main features of 'smart development' that use smart technologies to minimise their carbon emissions.

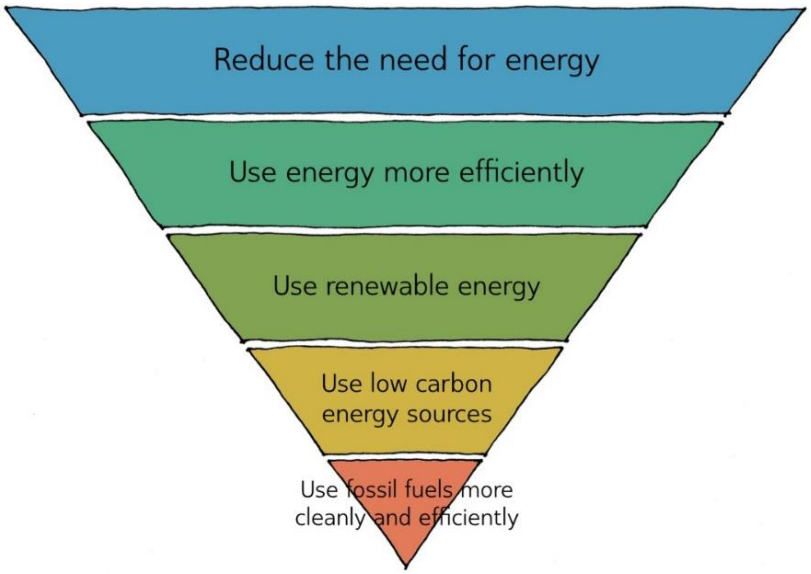
Changes to Part L and Part F of the Building Regulations as part of The Future Homes Standard are currently being consulted on by the Ministry of Housing Communities and Local Government (MHCLG). This will require new build homes to be future-proofed with low carbon heating and high levels of energy efficiency, and will be introduced by 2025. As such, the measures proposed in this SPD accord with the direction of national policy and building regulations.

The Energy Hierarchy

If more sustainable buildings are to be built, it is important that energy conservation is considered using the energy hierarchy at the beginning of the design process.

In order to achieve low carbon development, the energy hierarchy provides the most practical and cost effective methodology. Developments should consider how energy use can be minimised and the order in which these energy saving and 'green' energy measures should be prioritised are set out in the Energy Hierarchy below. The National Design Guide (Oct. 2019) identifies the need for new developments to follow the energy hierarchy in order to conserve natural resources.

The Energy Hierarchy



V.3.1 Reducing the Need for Energy

Developments should ensure that they are well designed in order to minimise overheating and achieve internal comfort. The following should be considered:

- Layout and aspect of internal spaces
- Insulation and thermal mass
- Management of solar gain
- Natural ventilation
- Positioning of windows
- Outdoor space for food growing.

Passive solar design should be considered as this exploits free heat and light energy provided by sunlight entering buildings through windows and uses air movement for ventilation. In order for this to be effective, the initial design will need to take into account sun orientation and potential shading by landscape design or other buildings. This should be considered at the earliest stage of planning.

Public and other open spaces should be well designed and incorporate planting, structures and water for comfort. This will ensure there is shade and shelter for users, improve air quality and help to mitigate the effects of pollution. Deciduous trees can help to provide shade to buildings and manage solar gain when needed in the summer months.

New developments should use sustainable materials; for example, using recycled or composite materials, as well as those that have been locally sourced and therefore reduce the carbon footprint of the development over its lifetime.

Proposals for new dwellings and domestic buildings which incorporate renewable energy technology prior to occupation, in a manner which would be Permitted Development if the building or dwelling house had already been lawfully occupied, will be supported.

Proposals which incorporate renewable energy technology in new domestic premises in a manner which exceeds Permitted Development thresholds will be assessed on their merits against the provisions of the Development Plan.

Self-grown food by householders can reduce carbon emissions by reducing food miles as well as the number of car journeys used to visit supermarkets. Allotments should therefore be provided on new developments. They should not be sited on areas that are prone to waterlogging, flooding, or in areas shaded by buildings and trees. Soil should be of good quality and be suitable for food production. A mains water supply is essential, as well as a shed and a connected water butt.

The concept of ‘Edible Planting’ where fruiting trees (such as apple, pear plum etc.), fruiting shrubs (such as raspberry, blackcurrant, gooseberry etc.) and herbs (such as basil, parsley, sage etc.) are planted for both human harvesting and as an animal food source is supported.

The production of compost by householders both encourages the growing of food in gardens, and reduces the amount of food waste sent to landfill. It can also produce a more sustainable form of fertilisation when compared to commercially available

composts, mulches and fertilizers. Developers are encouraged to include composting facilities in residential development rear gardens. If this is not suitable, consideration should be given to providing communal home composting areas on new developments.

V.3.2 Using Energy More Efficiently

Dwellings and other buildings should ensure that the highest level of insulation as possible is provided and that lighting is the most energy efficient – for example, by using LED lightbulbs. Where dwellings include integrated appliances these should be the most energy efficient.

Building Regulations currently set out minimum standards for energy efficiency in new developments, however it is possible to incorporate energy efficiency measures that go beyond these minimum standards and the Council would welcome such approaches.

V.3.3 Using Renewable Energy

There are a range of options available to incorporate renewable energy into new developments, and the best solution will depend upon the individual circumstances of a particular proposal. The main options are set out below.

Photovoltaics (PV)

Solar Panel systems also known as PV, capture the sun's energy using photovoltaic cells. The cells do not necessarily need direct sunlight to work as they can still generate some electricity on cloudy days.

The cells convert sunlight into electricity which can be used to run household appliances and lighting.

The installation of PV panels will need to be sensitive to developments in Conservation Areas and relating to Listed Buildings. In such cases, ground-mounted PV panels may be preferable. Guidance on how Photovoltaics may be installed on historic buildings or within historic sites is available in the following Historic England report: Energy Efficiency and Historic Buildings: Solar Electric (2017)

In order for PV panels to be effective they should be installed on roofs that are as close to south-facing as possible and not obstructed by buildings and trees.

Bishopton, Stratford-on-Avon

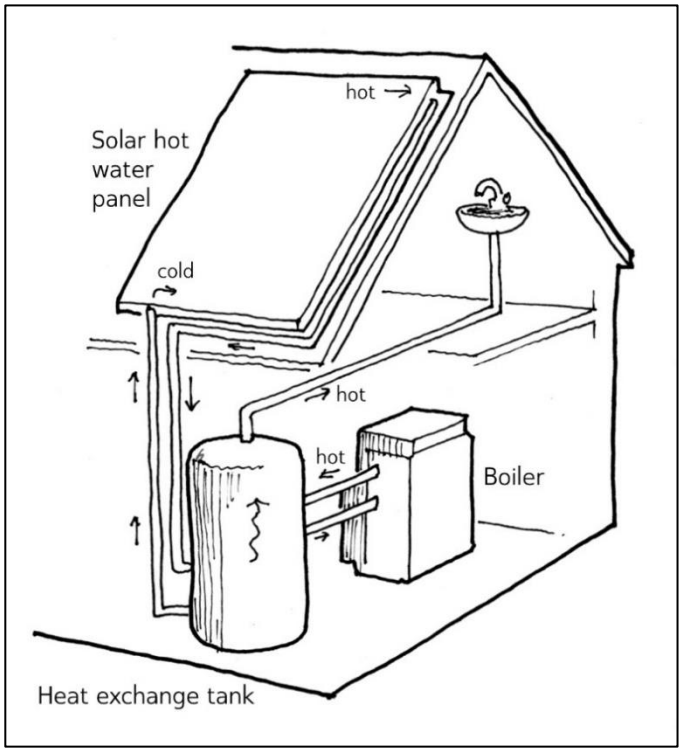
Case Study

For an example of a development in the District where solar panels have been integrated within a small housing development, please see the **Hampton Lucy Case Study** (Case Study 4) in Section V7

Solar Water Heating

These systems or 'solar thermal' systems use free heat from the sun to warm up domestic hot water. If solar energy is unavailable or there is a desire to have hotter water, a back-up conventional boiler or immersion heater can be used.

This system works all year around although in winter months, the water may need to be heated further with a back-up boiler or immersion heater. Once the initial installation has taken place, the hot water costs should be reduced and solar hot water is a green, renewable heating system which can reduce carbon dioxide emissions. Solar collectors are usually installed on roofs, but can also be ground-mounted.



Solar Water Heating System

District Heating

District heating schemes deliver heating and hot water to multiple buildings from a local plant. District heating can use low carbon energy sources, such as renewable energy technology such as water source or ground source heat pumps. In some cases, it can be combined with electricity production in combined heat and power (CHP) or in combined cooling, heat and power (CCHP).

Further information is available within **Part Q: District Heat Networks**

Micro Wind Turbines

These generate electricity which harnesses the power of wind. Wind turbines catch the wind by using large blades and as the wind blows, the blades are forced round, driving a turbine which generates electricity.

Electricity generation is generally around a few hundred watts which would be enough to power energy efficient light bulbs on a windy day throughout a typical home.

Air Source Heat Pumps

These absorb heat from the outside air which can then be used to heat radiators, under flooring systems or warm air convectors and hot water in the home.

Although heat pumps will have some impact on the environment as they require electricity, the heat which is extracted from the air is constantly being renewed naturally.

If replacing conventional electric heating, fuel bills could be lower. Depending on the type of fuel that is being replaced the home could see lower carbon emissions.

Careful consideration should be given to noise issues that may be associated with this technology. To ensure that there are no negative impact on the street scene or character of the area, design and siting must also be given appropriate consideration.

Case Study

For an example of a development in the District where renewable energy has been integrated within housing, please see the **Hereburgh Way Case Study** (Case Study 5) in Section V7

Ground Source Heat Pumps

Ground source heat pumps are used to heat underfloor or warm air heating systems, hot water and radiators.

They use pipes that are buried underground to extract heat from the ground. The ground source heat pump circulates a mixture of water and antifreeze around a pipe, called a ground loop which is buried in the garden. Heat from the ground is absorbed into fluid which passes through a heat exchanger and into the heat pump. The benefits of using a heat pump is that as the ground remains at a fairly constant temperature under the surface, the pump can be used throughout the year.

If these replace conventional electric heating, fuel bills could be lower and depending on which fuel is being replaced there could be lower home carbon emissions. As well as heating the home it will also heat water and minimal maintenance is required.

Water Source Heat Pumps

These work on a similar principle to air source and ground source heat pumps. They take advantage of the consistent temperatures found in a body of water rather than taking advantage of the heat in the air or the ground.

There will be a series of pipes submerged in a body of water, such as a river, stream or lake. A heat pump pushes working fluid through the network of piping, and the fluid absorbs the heat from the surrounding water as it goes.

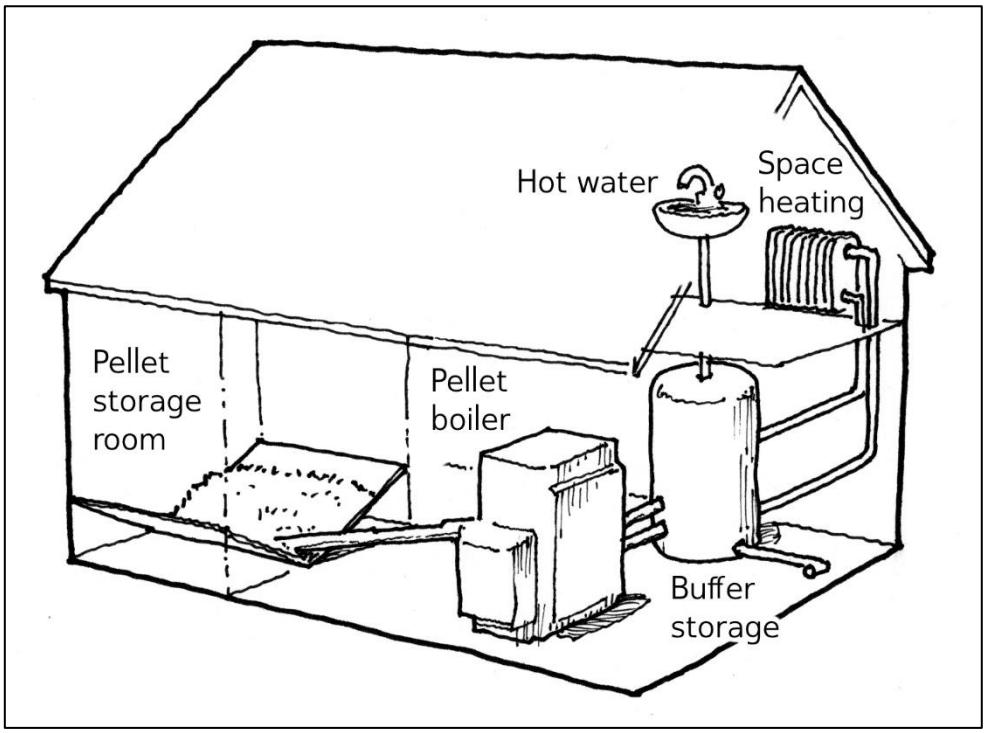
The fluid is then compressed by an electric compressor which raises the temperature. A heat exchanger can be used to remove the heat from the working fluid, providing hot water that can be used for space heating (radiators or under floor heating).

Once the heat is removed from the fluid via the exchanger, it is pumped back through the pipes, completing a continuous cycle.

Biomass Heating

Proposals for Biomass will be considered on a case by case basis and will only be appropriate in certain locations, where there are no unacceptable environmental or amenity impacts.

This is a low-carbon and renewable energy source which burns solid fuels such as wood, chips and logs to provide heating and hot water. A stove burns logs or pellets to heat up a single room and a back boiler to provide water heating as well. The boiler burns logs, pellets and chips and is connected to a hot water system and central heating. A wood fuelled biomass burner can save up to £960 a year compared to an old electric heating system.



A typical biomass system

Please see the following website for further information: https://www.energysavingtrust.org.uk/renewable-energy

Micro Hydro

In small streams or larger rivers, small or micro hydroelectricity systems or just hydro systems (also called hydropower systems) can produce enough electricity for lighting and electrical appliances in an average home.

All streams and rivers flow downhill and before the water flows downhill it has potential energy due to its height. The greater the height and the more water there is that is flowing through the turbine, the more electricity that can be generated.

These systems can generate for 24 hours a day, generating all the electricity that you need and more. Excess heat that is generated can be used to heat up the home and hot water too.

Hydroelectricity is green, renewable energy and doesn't release harmful carbon dioxide or other pollutants into the air.

Thermal Stores

These can be used with individual renewable heating technology or by combining different renewable heating technologies. They can also be used as a renewables technology with a conventional boiler or immersion heater.

Thermal stores have been proven to work well with wood-fuelled biomass boilers, heat pumps, wind energy and solar water heating systems.

These are good ways of storing and managing renewable heat until it is required.

V.3.4 Using Clean and Efficient Fossil Fuels

At least one electric vehicle charging point per unit should be provided for residential developments and for commercial, retail and industrial on at least 10% of parking spaces. These may be phased with 5% of initial provision and the remainder being provided at an agreed trigger level.

Further information on requirements for electric vehicle charging points can be found in **Part R: Air Quality**

Combined Heat and Power (CHP)

This is a technology that is highly efficient, capturing and utilising the heat that is a by-product of the electricity generation process. As CHP generates heat and power simultaneously it can reduce carbon emissions by up to 30% when compared to the separate means of conventional generation via a boiler and power station. Domestic CHP systems are currently powered by LPG or mains gas, however in the future there may be models powered by oil or bio liquids. This technology is still considered to be 'low carbon' even though LPG and gas are fossil fuels as it can be more efficient than just burning a fossil fuel for heat and electricity from the national grid.

Building Research Establishment Environmental Assessment Method (BREEAM)

All non-residential development should achieve as a minimum requirement, a BREEAM 'good' standard. BREEAM ratings for buildings range from Acceptable to Pass, Good, Very Good, Excellent and Outstanding. Exceptions to this requirement will be made where it is considered the BREEAM standards are not appropriate or feasible for the proposed development, on a case by case basis and where the applicant has provided sufficient justification to demonstrate it is not viable.

BREEAM measures sustainable value in a series of categories, ranging from energy to ecology. In order to achieve a particular rating level, the minimum overall percentage score must be achieved through meeting the minimum standards. Further information can be found at www.breeam.com.

Passivhaus

Passivhaus is a standard for energy efficiency in a building and can be applied to both residential and non-residential development. The Council welcomes Passivhaus schemes within the District and further information on the standard can be found at:

http://passivhaustrust.org.uk/

Case Study

An example of a Passivhaus scheme in the District is the **Wootton Wawen Case Study** in Section V7 (Case Study 6)

V4. Principle 3: Adapting to Higher Temperatures

Climate change is anticipated to increase average annual temperatures globally, as well as the occurrence of extreme temperature events, resulting in a more severe threat of heat-related mortality. This is expected to disproportionately affect vulnerable groups such as the elderly and disabled, which due to the District's ageing population, will be an increasingly important issue for Stratford-on-Avon to address. As such, future-proofing the design of new homes and commercial developments to adapt to the effects of higher and more extreme temperatures change is an important component of climate change adaptation in the District.

V.4.1 Shade and Ventilation – The Cooling Hierarchy

The cooling hierarchy is an established method of ensuring that developments are cooled in the most sustainable and energy efficient manner possible.

New development proposals, including both residential and non-residential proposals, must utilise the cooling hierarchy within the design of new development as set out below.

1. **Passive design** - using energy efficient design to reduce the amount of heat entering the building in the warmer months. This can be achieved through appropriate orientation, overhangs and shading, albedo, fenestration, insulation and green roofs. Heat can also be reduced within the building through high ceilings and exposed internal mass; however, provision must be made for night purging of heat through secure ventilation.
2. **Passive/natural cooling** – using outside air to ventilate and cool a building without using a powered system.
3. **Mixed mode cooling** – using a mixture of both passive cooling methods and:
   a. Mechanical cooling, such as fan powered ventilation (preferred option)
   b. Air conditioning (not preferred option due to being energy intensive).
4. **Full building mechanical ventilation/cooling system using the lowest carbon/energy options** – only to be considered after all other elements of the hierarchy have been considered.

Proposals must always utilise the preferred options 1 and 2 of the hierarchy, unless there are exceptional circumstances that make options 3 or 4 the only feasible methods of ventilation. Where a non-preferred option (i.e. options 3 - 4) of the cooling hierarchy have been incorporated within development proposals, robust justification will be required for why the preferred options (1 and 2) have not been used.

Householder applications will be encouraged to demonstrate how they have considered the principles of the cooling hierarchy within the design.

New development proposals should integrate cooling features within their design. Examples of such features include overhangs, external blinds, louvres and shutters. High performance glazing, such as low-e glass and smart glass will be encouraged in new developments where large area of glazing are proposed, so that the level of solar heat gain can be managed. The appropriateness of different types of cooling features will depend on the type, scale and location of the development proposed. It should be noted that the above list of potential cooling features is not exhaustive, and other forms of cooling measures are also available.

V.4.2 Use of Cool Materials

Roofs and Paving

Where local site constraints (including conservation and historic considerations) allow, new or replacement roofs, pavements and hardstanding will be encouraged to be constructed using cool materials.

Cool roof materials are light in colour or have reflective properties, and can significantly reduce the solar heat gain produced by roofs by minimising the amount of light converted into heat and increasing the amount of heat that is radiated away from buildings. Whilst this can result in increased heating requirements for buildings in winter, the overall net outcome is positive as cool roofs reduce the need for artificial cooling in summer. In comparison, solar heat gain in winter is usually less of a consideration as hours of direct sunlight are reduced, and residential heating requirements are not usually during the day when solar heat gain occurs.
Cool roof materials include primarily the use of clay, ceramic or concrete tiles, asphalt shingles or metal roofs. Cool roof reflective coatings include the use of white, pigmented or aluminium coatings, as well as roofing membranes made from felt, fibreglass or polyester, or alternatively, single-ply thermoplastic. Whilst white roofs provide the best cooling outcome, more traditional roof colours can also be produced to reflect more sunlight. Curved tiles also provide greater cooling affects than flat tiles, by allowing air to circulate below the surface.

Cool pavements and hardstanding can be achieved by using permeable surfaces and light coloured materials.

V.4.3 Green Infrastructure

Green/Brown Roofs

A Green Roof (or Biodiverse Roof) has seeds or plants introduced into the substrate of the roof at the time of construction. A Brown Roof is where the roof surface is left to self-vegetate. Green and brown roofs can provide evaporative cooling, reducing the 'heat island' effect of built-up areas. They can also extend the life of the roof by shielding it from the harmful impact of UV rays. In addition, they can provide a more suitable surface for solar panels by providing a more consistent ambient temperature.

Both green/brown roofs and cool roofs lower surface and surrounding air temperatures, and decrease energy demand. However, green/brown roofs also offer additional benefits such as filtering and reducing storm water run-off, enhancing biodiversity and reducing air pollution.

All proposals for green and brown roofs must demonstrate that sufficient and ongoing maintenance is available, as well as access to the roof to undertake the maintenance requirements.

Green Walls

Green walls can provide multiple benefits including providing a natural cooling affect and enhancing biodiversity, particularly on sites without sufficient space for traditional green infrastructure (for example, town centre apartment blocks). Green walls will be encouraged in all new developments, where appropriate and where sufficient maintenance can be provided.

Green walls at Fordham House, Stratford-upon-Avon

Further information on green roofs and walls is available in **Part E - Architectural Style, Construction and Materials**

Trees and Landscaping

Research undertaken by the Forestry Commission indicates that areas with many trees can be as much as 4 degrees cooler than places in the same city without vegetation (Forestry Commission, 2019).

Trees should be integrated into layouts to provide natural cooling to surrounding buildings, ensuring that trees are of appropriate size, location and orientation to provide maximum cooling benefits to buildings. Trees should be incorporated into all new development sites unless site constraints prevent this, and existing trees should be retained on site where feasible.

In considering the relationship between trees and buildings, the design of site layouts will be expected to ensure that trees are given adequate space, including sufficient allowance for future growth.

Trees should also be included within street design to provide shading and temperature reduction to the surrounding area.

Where feasible, new car parks should include trees, landscaping and/or areas of grass/greenery to provide a natural cooling effect. The implementation of car park shading structures will be supported where appropriate.

The following considerations for trees should be adhered to when deciding how to incorporate trees into site layouts:

- Health and condition of the tree;
- Age and species of tree;
- Size of the tree when mature; and
- Location (to avoid future conflicts and maximise cooling benefits).

The Good Homes Alliance (July 2019) states that the level of blue/green infrastructure considered to have a beneficial effect on reducing temperatures is at least 50% cover, within a 100m radius from the site. As such, new developments which meet this standard will be considered favourably, although it will be most easily achieved within a rural context and in low-density developments. Green walls/roofs can also be included towards meeting this figure.

Proposed landscaping should utilise appropriate native plants to the site.

Guidelines on suitable planting can be found within the Tree and Design Action Group Guide for Specifiers, available at the following webpage: http://www.tdag.org.uk/species-selection-for-green-infrastructure.html.

Further information on trees can be found in **Part M - Landscape Design and Trees**

Case Study

For an example of where adaptation to higher temperatures has been designed into a development in the District, please see the **Jaguar Land Rover Case Study** in Section V7 (Case Study 7)

Maintenance of Green Infrastructure

Green Infrastructure plays an important role in mitigating the higher temperatures that are predicted to occur as a result of climate change, and as such will be encouraged in all new developments. However, the management of green infrastructure and landscaped areas requires careful consideration, and therefore it is strongly recommended that the design of these spaces is discussed at the pre-application stage of all proposed major developments.

Example of a grass swale in a Harbury housing development.
Swales are a type of SuDS consisting of a wide, shallow grass covered depression, leading surface water from a drained surface to a storage or discharge system.

V5. Principle 4: Mitigating Flood Risk

Climate change is anticipated to increase the occurrence of extreme weather events, including both flooding and drought events. As such, adapting development to efficiently manage the use and storage of water is considered to be a critical component of effectively mitigating the effects of climate change.

V.5.1 Sustainable Urban Drainage Systems (SuDS)

SuDS can provide biodiversity benefits by mimicking natural drainage on sites, minimising the impact of development through filtering sediment and contaminants out of surface water runoff.

> Further information on SuDS can be found in **Part N - Biodiversity and Green Infrastructure**

New development proposals should integrate SuDS at the design stage of site layouts, ensuring that they are incorporated into the proposals at the earliest stage. Types of SuDS that may be implemented include:

- Rainwater gardens
- Infiltration basins and trenches
- Soakaways
- Filter drains
- Swales
- Detention basins
- Retention ponds
- Filter strips.

Sufficient SuDS maintenance for the lifetime of the development should be incorporated within all SuDS proposals.

Rain Gardens

Rain gardens are a form of SuDS that can be implemented in small areas where other SuDS methods are not appropriate or feasible. They consist of small depressions in the ground that act as infiltration points for roof water and other surface water that is low in contamination. Rain gardens are easy to maintain, provided that they are incorporated as part of an appropriately designed and managed landscaping scheme. All minor and householder developments with sufficient outdoor space should integrate rain gardens into development, where soil conditions allow for infiltration unless another form of SuDs is being proposed.

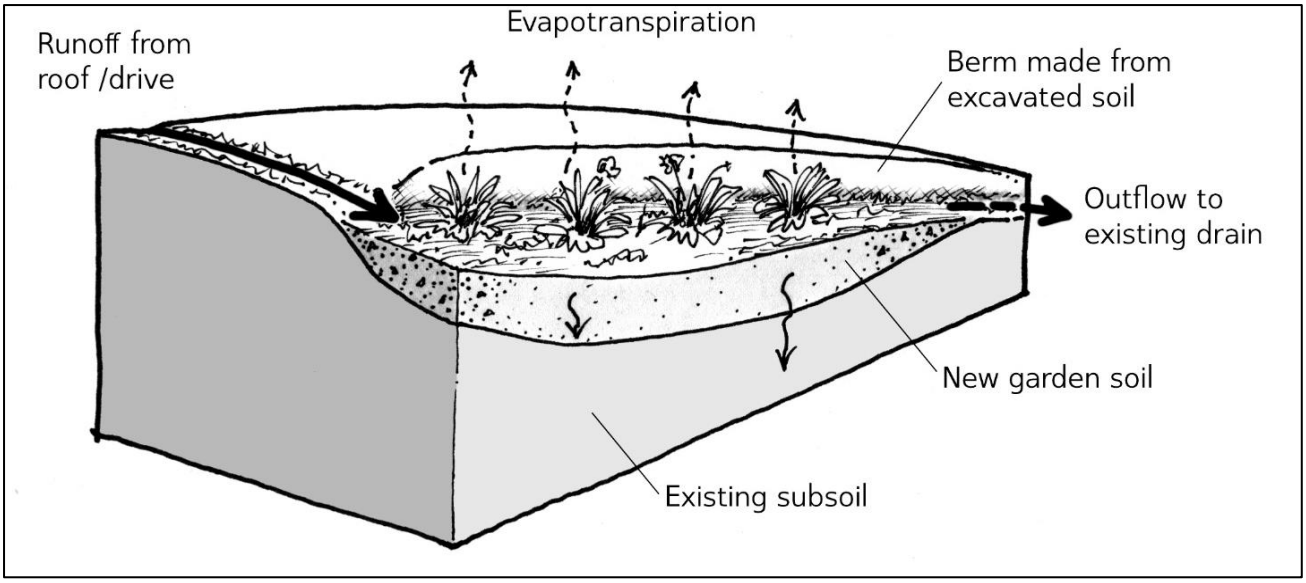


Diagram of a typical raingarden

Case Study

Examples of developments within the District which have successfully incorporated SuDs are provided within the **Meon Vale and Hereburgh Way Case Studies** in Section V7 (Case Studies 3 and 5).

V.5.2 Water Efficiency and Rainwater Harvesting

Retrofitting water efficient measures into buildings can often be costly, time consuming and difficult to implement. As such, water efficient measures should be integrated at the design stage of new developments.

Water butts should be installed in all residential developments and householder developments where appropriate.

In accordance with the requirements of Core Strategy Policy CS.4 (Water Environment and Flood Risk), non-residential developments will be expected to achieve a minimum 'good' BREEAM standard.

Further information on BREEAM can be found at: https://www.breeam.com/

Low carbon rainwater harvesting and/or greywater recycling systems will be supported within new developments as a method to increase water efficiency. These options need to be properly considered at the planning stage to determine whether a dual pipework system is required.

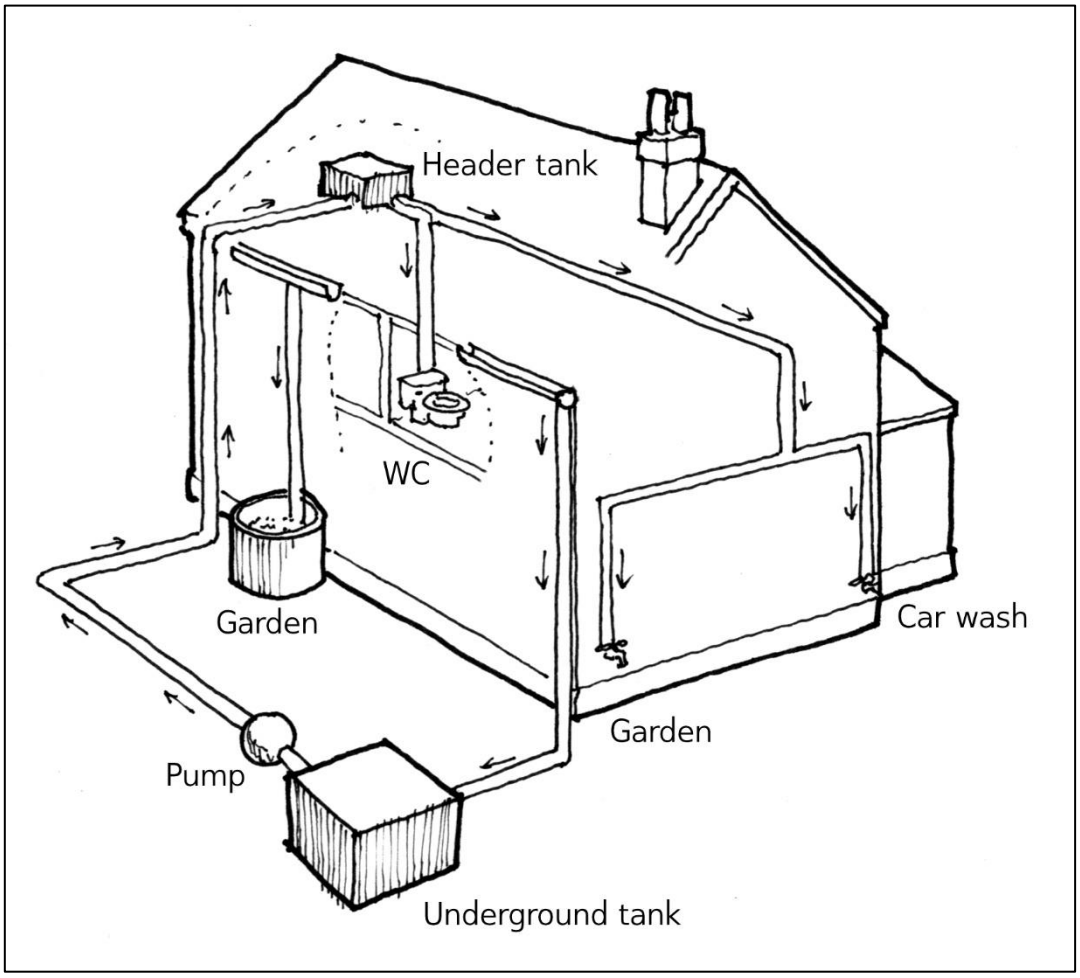
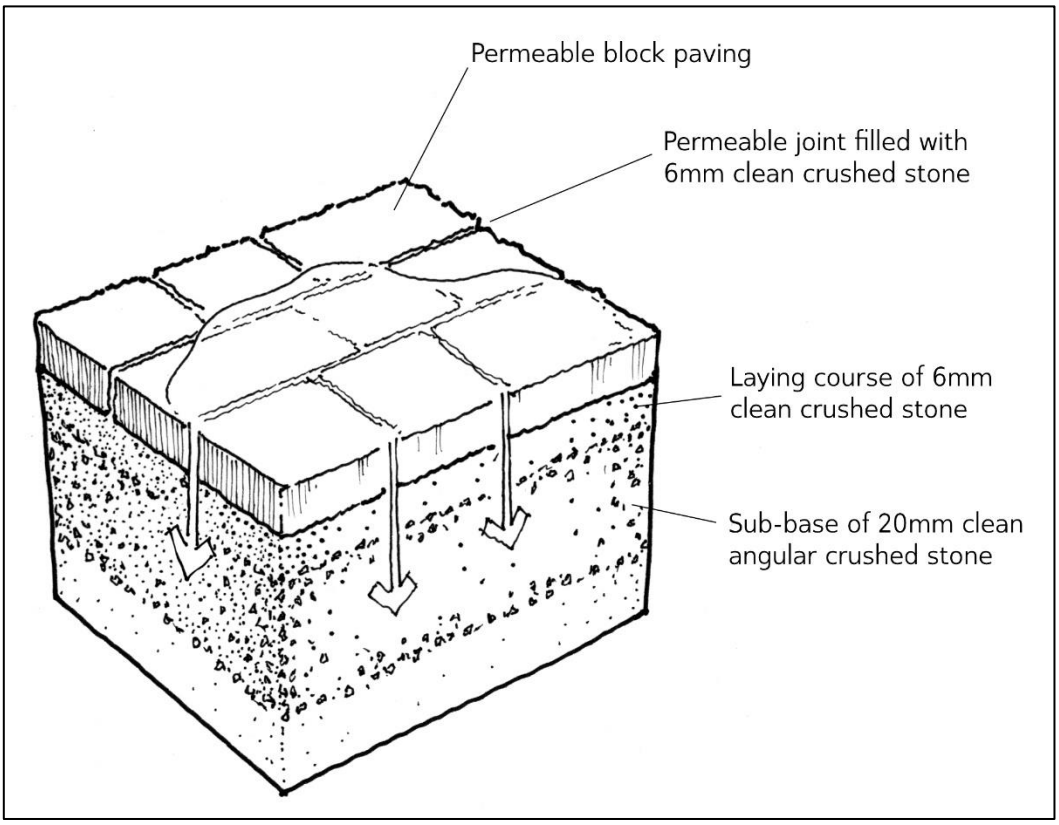


Diagram of a rainwater harvesting system

V.5.3 Green Infrastructure and Permeable Surfaces

The landscaping of new developments should be designed to respond to both the increased likelihood of drought and flooding as a result of climate change.

Permeable surfaces should be used for all hardstanding, driveways and paved areas in new development to allow for enhanced drainage of surface water.



Typical structure of permeable paving

Green roofs will be encouraged as an appropriate method of reducing and filtering storm water run-off from buildings; blue roofs are also an effective method of storing excess water.

Further information on green roofs is available in **Part E - Architectural Style, Construction and Materials**

Case Study

An examples of a non-residential development within the District which has successfully incorporated water efficiency is the **Jaguar Land Rover Case Study** in Section V7 (Case Study 7)

V6. Principle 5: Mitigating Biodiversity loss

The effects of climate change are predicted to have particularly negative impacts on biodiversity and wildlife habitats, thereby affecting oxygen production, carbon storage and the natural filtering of toxins. Additionally, The Environment Bill, announced in October 2019, proposes to make provision for biodiversity net gain a condition of planning permissions in England. As such, providing opportunity to mitigate against biodiversity loss and enable local plant and animal species to thrive is therefore considered to be a key goal for new development in the District.

V.6.1 Bio-Enhancing Existing Green Space

Opportunities to enhance biodiversity are available across all scales of development, with a need to minimise impacts on and provide net gains for biodiversity.

In order to enhance and mitigate against the loss of existing biodiversity, development proposals will be expected to provide wildlife friendly planting and landscaping within proposed green infrastructure. A variety of native species should be used to enhance local biodiversity.

Proposed landscaping in major developments should incorporate informal areas of planting to encourage wildlife and biodiverse habitats.

V.6.2 Improving Background Wildlife Capacity

Measures to improve the background wildlife capacity of an area should be incorporated into all new developments. These can include enhancements at a range of scales and can therefore be included in a variety of development types from householder applications to major developments.

Wildlife habitat enhancements such as bird/bat nesting boxes, hibernacula (places for animals to hibernate), amphibian kerbs and hedgehog homes should be incorporated within all new developments wherever appropriate.

Innovative methods to encourage biodiversity will be encouraged where sites are constrained by scale, topography or other considerations. For example, green walls can be incorporated into many different types of development including large scale commercial and residential buildings. These can be planted with native species of ferns and wildflower to enhance the biodiversity of the development, without requiring any additional site area to implement. Green/brown roofs are another alternative where flat roofs are proposed, and can be retrofitted to existing buildings.

In major developments, proposals should aspire for less than 50% of the wider site (excluding buildings) to consist of paved/hardsurfaced areas. Lawns, planting beds, trees, allotments, gardens, ponds and other landscaping features can all contribute to enhancing local biodiversity, as well as providing a natural cooling affect and enhance drainage. Green roofs and walls can also contribute towards the 50% target.

Trees should be incorporated into all major developments and also into minor developments where feasible. As a guideline, 10 large native trees per hectare should be included in high density developments (over 40 dwellings per ha.), increasing to 25 per hectare in medium density developments (25-40 dwellings per ha.) and 50 per hectare in low density developments (under 25 dwellings per ha.). Tree planting should take

account of the considerations detailed in Section V5 to maximise cooling benefits to buildings, as well as the guidelines provided within Part M of this SPD.
The retention and planting of native species hedging within and surrounding sites will also be encouraged as a method to enhance biodiversity and background wildlife capacity. The LPA will not support proposals for close board fencing where hedgerows between properties and at the boundaries of sites would be appropriate. Such hedgerows should use wildlife friendly, and where appropriate, native plant species.

V.6.3 Local Wildlife Nodes and Green Corridors

Green corridors are strips of green infrastructure which link green spaces in developments to the surrounding biodiversity network, enabling the bridging of habitats where they have been separated by human development. The provision of these will be encouraged in all major developments, and also in minor developments where appropriate. They can be either land or water corridors, and can be designed to incorporate walking and cycling routes, thereby reducing reliance on the car by promoting active travel, as well as enhancing biodiversity and encouraging wildlife in the area.

The creation of local wildlife nodes, utilising underused land such as verges at block junctions and street corners for wildlife friendly planting and wildlife habitats will be encouraged in new and existing developments.

Further information on enhancing biodiversity in developments can be found in **Part N – Biodiversity and Green Infrastructure**

Case Study

Examples of residential developments that have incorporated biodiversity are the **Meon Vale, Hampton Lucy and Wootton Wawen Case Studies** in Section V7 (Case Studies 3, 4 and 6)

V7. Case Studies

This section contains a number of case studies which address different aspects of climate change mitigation and adaptation and are considered to be examples of good practice.

Case Study 1: The Arden Quarter, Stratford-upon-Avon

The Arden Quarter lies on the edge of Stratford-upon-Avon town centre consisting of 198 homes in a range of types and scales. Designed at a higher density, the site is in close proximity to a range of facilities such as the town centre, train station and bus interchange. As such, the development promotes the use of sustainable travel through its central location, reducing the need for travel by private car.

Principle 1: Reducing the need to travel by private car

The Arden Quarter, Stratford-upon-Avon

Case Study 2: Northgate, Warwick

This scheme in Warwick Town Centre was undertaken by Warwickshire County Council in order to make the area more pedestrian and cyclist friendly. This area was heavily congested and very car dominant, making it extremely unsafe for pedestrians to cross and access the town centre.

For pedestrians, there have been improvements by way of wider pavements, increased lighting, landscaping and a small pedestrian square with seating area together with improved accessibility into the town centre. In order to make it safer for pedestrians and cyclists, informal crossing points have been constructed as well as a raised table and narrow carriageways for cars encouraging them to slow down.

Principle 1: Reducing the need to travel by the private car

Before and after photographs of Northgate. Warwick
(Source: Warwickshire County Council)

Case Study 3: Meon Vale, Long Marston

Meon Vale is a large residential development which includes up to 1,050 new homes, a community centre, leisure centre, sports pitches and convenience store as well as a business park on a 190 hectare site.

This site has been designed to promote walking, cycling and public transport as realistic modes of travel but has also recognised the need to use the private car. The site provides direct cycle and pedestrian connections and parts of the site will link to the Greenway extension that runs through the site. This development has seen a 1 mile extension to the existing Greenway into Stratford upon Avon which allows connectivity to employment and leisure by walking and cycling.

There will be direct bus connections with the surrounding network which includes a 2 ½ hourly peak service between Moreton in Marsh and Stratford upon Avon. This is an increase in frequency of the current service.

The development has been sensitively designed to minimise the impact on local wildlife by retaining important habitats and maintaining or improving pathways to enable species to move freely within the site. There is public access to 35 acres of woodland which is provided as part of the development and an attractive lake and lakeside area as part of the Sustainable Urban Drainage System (SuDS).

Principle 1: Reducing the need to travel by private car

Principle 4: Mitigating Flood Risk

Principle 5: Mitigating Biodiversity Loss

Before and after photographs of Northgate. Warwick
(Source: Warwickshire County Council)

Case Study 4: Replacement dwelling and additional new dwelling in Hampton Lucy

This development incorporates a number of features that contribute to climate change adaptation and mitigation:

Energy Efficiency
The dwellings have been orientated to maximise solar gain and incorporates high quality walling and roofing materials to optimise insulation internally, along with triple glazed windows.

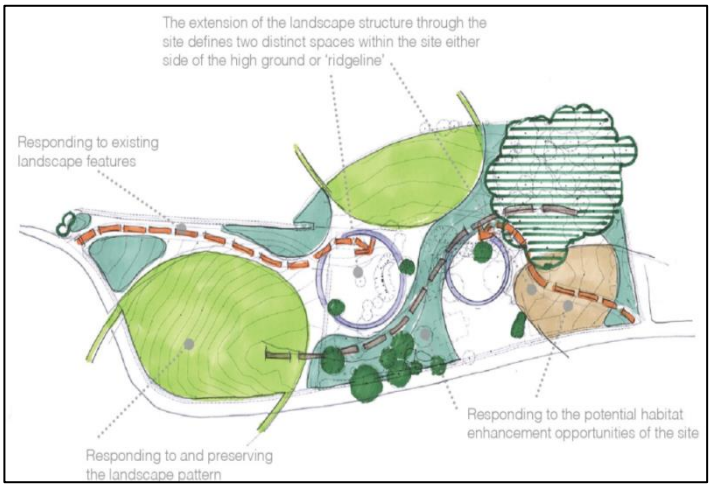
A powerwall home battery has been incorporated which charges using the energy from solar panels and a back-up storage solution. A Mechanical Heat Recovery System which can recover 90% of the heat from 'stale are' on extraction, in addition to a Heat Pump and Earth Energy Bank are also incorporated.

Mitigating Flood Risk and Biodiversity Loss
Enhancements to the site includes native species rich hedgerows, semi-improved grassland, a swale, species rich meadow, bird boxes and bat lofts.

Principle 2: Improving Energy Efficiency

Principle 4: Mitigating Flood Risk

Principle 5: Mitigating Biodiversity Loss



Case Study 5: Hereburgh Way, Harbury

Consisting of 22 homes, including 13 affordable, this scheme incorporated SuDS, involving a swale and an infiltration basin, which provides for surface water run-off as well as creating a natural habitat area. Air source heat pumps were also incorporated in order to reduce the predicted carbon dioxide emission from the development by a minimum of 10%.

Principle 2: Improving Energy Efficiency

Principle 4: Mitigating Flood Risk

The swale leading to the infiltration basin at Hereburgh Way, Harbury

Case Study 6: Passivhaus Scheme, Wootton Wawen

This is a development of 14 dwellings comprising a mixture of houses and bungalows built to a passivhaus standard.

Space heating costs will be 70% less than a standard house construction, achieved through levels of insulation, air tightness and orientation to max solar gain:

- Wrought iron canopy porches
- Brick corbel detailing
- Significant levels of insulation
- Triple glazing
- Ecological zones to promote wildlife and amenity value
- Community woodland belt

There is a 12 metre wide planted native tree buffer zone, which will act as an eco-soakaway for surface water and mitigate visual impact on the surrounding area.

Principle 2: Improving Energy Efficiency

Principle 4: Mitigating Flood Risk

Principle 5: Mitigating Biodiversity Loss

Photographs of the passivhaus houses and bungalows at Wootton Wawen.

Case Study 7: Jaguar Land Rover, Advanced Product Creation Centre

The proposal was designed for the research, design and development of motor vehicles and to provide a new gateway and parking. These new offices are rated in the top 10 per cent of most sustainable non-domestic buildings in the UK and it is intended that this development will reach BREEAM 'excellent' rating.

Energy – This building has followed the energy hierarchy approach with up to 20% of its energy coming from almost 3,000 m² of photovoltaic solar panels on the roof, and the remainder from 100% renewable sources.

Biodiversity –A natural landscape is at the heart of the site, creating an ecologically diverse area reusing 80,000 m³ of natural soil excavated during the construction process, which is the equivalent of 30 Olympic sized pools. Introduction of large lakes and water features also contribute to improving local biodiversity whilst providing new receptor sites for wildlife. There is also a protected species master plan for the site.

Temperature Control – The development has been designed to reduce overheating through the careful selection of glazing and appropriate shading and glazing/solid ratio in order to minimize the internal solar gains. The same glazing as the Eden Project has been used to bring natural light in to the building wherever possible and make it more energy efficient. The roof overhangs also provide shading to the facades and roof lights have high performance glazing, external fixed solar shading and internal blind system.

Water Management – The landscape integrates the SuDS. Roof and surface water run-off feed feature water channels that discharge into a system of lakes. Lakes provide attenuation during heavy rain period and mitigate the risk of flooding.

Principle 2: Improving Energy Efficiency

Principle 3: Adapting to higher temperatures

Principle 4: Mitigating Flood Risk

Principle 5: Mitigating Biodiversity

V8. Climate Change Checklist

It is important that the principles of climate change mitigation and adaptation are considered from the outset of a development proposal to help shape the design.

It is the aim of the District Council to work with developers to maximise the opportunities for climate change mitigation and adaptation and the purpose of the checklist is to help developers consider the potential measures possible and thus encourage appropriate design solutions.

The checklist is required to be completed and submitted with planning applications for certain householder, new build and conversion / change of use applications. It is acknowledged that proposals affecting Listed Buildings may not be able to comply and in these Case Officer discretion will be used as to what is feasible on a case-by-case basis. Guidance on how Part L (Energy Efficiency) of the Building Regulations can be applied to historic buildings is provided by Historic England in the following report: Energy Efficiency and Historic Buildings: Application of Part L of Building Regulations (2017)

To assist applicants in the completion of the checklist, there are 3 separate checklists which identify the main mitigation and adaptation measures considered appropriate for that type of development.

The Checklists are set out in appendices to this SPD as follows:

- Appendix 1: Climate Change Checklist for new build developments
- Appendix 2: Climate Change Checklist for conversion and change of use developments
- Appendix 3: Climate Change Checklist for householder developments

As a minimum proposals must incorporate at least one suitable mitigation and adaptation measure from each of the 5 principle areas:

- For non-householder new build developments over 20 square metres, at least 15 measures in total must be provided of which one measure will be the incorporation of renewable energy unless it is satisfactorily justified to be not possible
- For conversion and change of use proposals at least 10 measures must be provided
- For householder applications over 20 square metres at least 5 measures are expected

Where measures have been provided across multiple categories, this will only count as one measure overall (i.e. it cannot be counted as more than one category).

The Council welcomes innovative and emerging technological solutions to help developments adapt and mitigate to climate change and an 'other' category has been added to each objective for this reason to enable suitable and appropriate alternative measures to be considered.

Measures that are incorporated into developments are required to be appropriately managed and maintained and may be controlled through the use of planning conditions and / or S106 Agreements.

Further information can be found in **Part U – Section 106 Planning Obligations**

Appendix 1: Climate Change Checklist for New Build (Non-Householder) Developments where over 20 Square Metres of Additional Floorspace is proposed

NB: Highlighted categories MUST be provided for all new build developments

Principle	Relevant Core Strategy Policies	Objective	Measures expected based on type and scale of new build minor and major development	Has this been addressed in the planning application submission? (Yes/No/ Not Applicable)	If Yes please signpost to relevant information within planning application submission (e.g. Design and Access Statement, Layout Plans, Planning Statement with paragraph/page/plan reference) If No or Not Applicable (N/A) please state justification for this.
Increasing accessibility - Reducing the need to travel by private car	CS.2 (Climate Change and Sustainable Construction) CS.9 (Design and Distinctiveness) CS.22 (Economic Development) AS.1-9 (Area Strategies) AS.10 (Countryside and Villages) AS.11 (Large Rural Brownfield Sites) CS.19 (Housing Mix and Type) CS.25 (Healthy Communities) CS.26 (Transport and Communications)	V.2.1 Density and Mixed Uses	Higher densities and mixed uses in sustainable locations and at key transport nodes		
			Design standards to allow for future building adaptation including technological adaptation		
			Horizontal and vertical mix of uses within blocks where appropriate		
			Other- please state		
		V.2.2 Permeability/ Walkability	Active frontages/edges with opportunities for natural surveillance		
			Use of sensory features and opportunities to stand and stay, places to sit and stand utilising views and sun		
			Pedestrian friendly – no obstacles, good surface, access for all, crossings, good sightlines, appropriate lighting, interesting facades		
			Signposting to local facilities		
			Appropriate block sizes to location		
			Local facilities accessible through walking/cycling (within 800m of new developments)		
			Maximising the number of internal pedestrian routes through the site		
			Maximising the number of pedestrian external routes in and out of the site linking to the wider area		
			Other- please state		
		V.2.3 Integrated Active Travel	Easy access to a range of transport modes		
			Signposting of active travel routes and facilities		
			Easy transition from cycling and walking to public transport		
			Education/promotion campaigns to residents		
			Well lit travel facilities and appropriate crossings for pedestrians and cyclists		
			Other- please state		
		V.2.4 Cycling	Covered and well-located cycle storage facilities		
			Cycle routes linking to wider area		
			Shower facilities provided in non-residential developments		
			Off-road cycle routes		
			Short cuts for cyclists		
			Cyclist priority at junctions		
			Clearly marked or segregated cycle lanes		
			Other- please state		
		V.2.5 Planning for the car	Car-free, limited and tamed zones at certain times and/or locations		

Principle	Relevant Core Strategy Policies	Objective	Measures expected based on type and scale of new build minor and major development	Has this been addressed in the planning application submission? (Yes/No/ Not Applicable)	If Yes please signpost to relevant information within planning application submission (e.g. Design and Access Statement, Layout Plans, Planning Statement with paragraph/page/plan reference) If No or Not Applicable (N/A) please state justification for this.
			Co-ordinated traffic calming approaches		
			Other- please state:		
Improving energy efficiency	CS.2 (Climate Change and Sustainable Construction) CS.3 (Sustainable Energy) CS.7 (Green Infrastructure) CS.9 (Design and Distinctiveness) CS.19 (Housing Mix and Type) AS.1-9 (Area Strategies) AS.10 (Countryside and Villages) AS.11 (Large Rural Brownfield Sites) CS.25 (Healthy Communities)	V.3.1 Reducing the need for energy	Plot and block orientation to maximise solar gain		
			Window positioning to maximise solar gain		
			Use of vegetation for shade in summer		
			Natural ventilation		
			Private outdoor space for food growing		
			Community Food Growing opportunities (such as allotments, orchards and 'Edible Planting')		
			Other- please state:		
		V.3.2 Using energy more efficiently	Solar/low energy internal and external lighting		
			Using a higher level of insulation than required by Building Regulations		
			Other- please state:		
		V.3.3 Using renewable energy	Composting and Community composting		
			Renewable energy sources	REQUIRED	This measure is required unless it can suitable justified and evidenced that it is not possible to be provided as part of the development proposal
			Other- please state:		
		V.3.4 Any fossil fuel use to be clean and efficient	Use of electric vehicle/cycle charging points	REQUIRED	
			Other- please state:		
Adapting to higher temperatures	CS.2 (Climate Change and Sustainable Construction) CS.6 (Natural Environment) CS.7 (Green Infrastructure) CS.9 (Design and Distinctiveness) AS.1-9 (Area Strategies) AS.10 (Countryside and Villages) AS.11 (Large Rural Brownfield Sites) CS.25 (Healthy Communities)	V.4.1 Shade and Ventilation – The Cooling Hierarchy	Adherence to the Cooling Hierarchy with either option 1(passive design) or option 2 (passive/natural cooling) utilised within the proposal		
			Other- please state:		
		V.4.2 Use of Cool Materials	Use of roof and paving materials that minimise heat gain in summer		
			Other- please state:		
		V.4.3 Green Infrastructure	Trees and landscaping in parking areas and open space areas to provide shade		
			Relationship between vegetation and building to maximise natural ventilation		
			Green & blue infrastructure in private outdoor space – e.g. trees, hedges, water, green/brown roofs, vertical climbers and landscaping		
			Other- please state:		
Mitigating flood risk	CS.2 (Climate Change and Sustainable Construction) CS.4 (Water Environment and Flood Risk) CS.6 (Natural Environment) CS.7 (Green Infrastructure)	V.5.1 Sustainable Urban Drainage Systems (SUDS)	SUDs such as raingardens, swales, natural water courses, communal soakaways, filter strips		
			Other- please state:		

Principle	Relevant Core Strategy Policies	Objective	Measures expected based on type and scale of new build minor and major development	Has this been addressed in the planning application submission? (Yes/No/ Not Applicable)	If Yes please signpost to relevant information within planning application submission (e.g. Design and Access Statement, Layout Plans, Planning Statement with paragraph/page/plan reference) If No or Not Applicable (N/A) please state justification for this.
	CS.9 (Design and Distinctiveness) AS.1-9 (Area Strategies) AS.10 (Countryside and Villages) AS.11 (Large Rural Brownfield Sites) CS.25 (Healthy Communities)	V.5.2 Water Efficiency and Rainwater harvesting	Rainwater collection		
			Co-ordinated greywater recycling and reuse systems in apartments and mixed uses		
			Communal rainwater collection and reuse points		
			Other- please state:		
		V.5.3 Green Infrastructure and Permeable surfaces	Use of permeable surfaces for roads, car parking areas, hard surfacing and pavements		
			Natural vegetation e.g. green/brown roofs, communal basins and ponds, green spaces within blocks, green verges		
			Other- please state:		
Mitigating biodiversity loss	CS.2 (Climate Change and Sustainable Construction) CS.6 (Natural Environment) CS.7 (Green Infrastructure) CS.9 (Design and Distinctiveness) AS.1-9 (Area Strategies) AS.10 (Countryside and Villages) AS.11 (Large Rural Brownfield Sites) CS.25 (Healthy Communities)	V.6.1 Bio-enhancing existing green space	Using different varieties of native species for landscaping		
			Other- please state:		
		V.6.2 Background wildlife capacity	Plan for 10 large native trees per ha in high density areas (over 40 dwellings per ha.), increasing to 25 in medium density areas (25-40 dwellings per ha.) and 50 in low density areas (less than 25 dwellings per ha.)		
			Restore old hedgerows or plant new hedges and other new planting		
			Green/brown roofs and wall climbers		
			At least one of the following: bird/bat boxes/ amphibian kerbs/ hibernacula/ hedgehog homes/garden ponds.		
			Other- please state:		
		V.6.3 Local wildlife nodes and green corridors	Green/brown roofs/walls		
			Private outdoor space		
			Green buffers		
			Wildlife nodes at junctions & street corners		
			Pocket parks		
			Other- please state:		

Appendix 2: Climate Change Checklist for Conversion and Change of Use developments

Principle	Relevant Core Strategy Policies	Objective	Measures expected based on type and scale of conversion and change of use development	Has this been addressed in the planning application submission? (Yes/No/ Not Applicable)	If Yes please signpost to relevant information within planning application submission (e.g. Design and Access Statement, Layout Plans, Planning Statement with paragraph/page/plan reference) If No or Not Applicable (N/A) please state justification for this.
Increasing accessibility - Reducing the need to travel by private car	CS.2 (Climate Change and Sustainable Construction) CS.9 (Design and Distinctiveness) CS.22 (Economic Development) AS.1-9 (Area Strategies) AS.10 (Countryside and Villages) AS.11 (Large Rural Brownfield Sites) CS.19 (Housing Mix and Type) CS.25 (Healthy Communities) CS.26 (Transport and Communications)	V.2.1 Density and Mixed Uses	Higher densities and mixed uses in sustainable locations and at key transport nodes		
			Design standards to allow for future building adaptation including technological adaptation		
			Horizontal and vertical mix of uses within blocks where appropriate		
			Other- please state:		
		V.2.2 Permeability / Walkability	Active frontages/edges with opportunities for natural surveillance		
			Other- please state:		
		V.2.3 Integrated Active Travel	Education/promotion campaigns to residents		
			Other- please state:		
		V.2.4 Cycling	Covered and well-located cycle storage facilities		
			Shower facilities provided in non-residential developments		
			Other- please state:		
		V.2.5 Planning for the car	*Not applicable*		
Improving energy efficiency	CS.2 (Climate Change and Sustainable Construction) CS.3 (Sustainable Energy) CS.7 (Green Infrastructure) CS.9 (Design and Distinctiveness) CS.19 (Housing Mix and Type) AS.1-9 (Area Strategies) AS.10 (Countryside and Villages) AS.11 (Large Rural Brownfield Sites) CS.25 (Healthy Communities)	V.3.1 Reducing the need for energy	Window positioning to maximise solar gain		
			Natural ventilation		
			Private outdoor space for food growing		
			Other- please state:		
		V.3.2 Using energy more efficiently	Solar/low energy internal and external lighting		
			Using a higher level of insulation than required by Building Regulations		
			Other- please state:		
		V.3.3 Using renewable energy	Renewable energy sources		
			Other- please state:		
		V.3.4 Any fossil fuel use to be clean and efficient	Use of electric vehicle/cycle charging points		
			Other- please state:		
Adapting to higher temperatures	CS.2 (Climate Change and Sustainable Construction) CS.6 (Natural Environment) CS.7 (Green Infrastructure)	V.4.1 Shade and Ventilation – The Cooling Hierarchy	Adherence to the Cooling Hierarchy with either option 1(passive design) or option 2 (passive/natural cooling) utilised within the proposal		
			Other- please state:		

Principle	Relevant Core Strategy Policies	Objective	Measures expected based on type and scale of conversion and change of use development	Has this been addressed in the planning application submission? (Yes/No/ Not Applicable)	If Yes please signpost to relevant information within planning application submission (e.g. Design and Access Statement, Layout Plans, Planning Statement with paragraph/page/plan reference) If No or Not Applicable (N/A) please state justification for this.
	CS.9 (Design and Distinctiveness) AS.1-9 (Area Strategies) AS.10 (Countryside and Villages) AS.11 (Large Rural Brownfield Sites) CS.25 (Healthy Communities)	V.4.2 Use of Cool Materials	Use of roof and paving materials that minimise heat gain in summer		
			Other- please state:		
		V.4.3 Green Infrastructure	Trees and landscaping in parking areas and open space areas to provide shade		
			Relationship between vegetation and building to maximise natural ventilation		
			Green & blue infrastructure in private outdoor space – e.g. trees, hedges, water, green/brown roofs, vertical climbers and landscaping		
			Other- please state:		
Mitigating flood risk	CS.2 (Climate Change and Sustainable Construction) CS.4 (Water Environment and Flood Risk) CS.6 (Natural Environment) CS.7 (Green Infrastructure) CS.9 (Design and Distinctiveness) AS.1-9 (Area Strategies) AS.10 (Countryside and Villages) AS.11 (Large Rural Brownfield Sites) CS.25 (Healthy Communities)	V.5.1 Sustainable Urban Drainage Systems (SUDS)	SUDs such as raingardens, swales, natural water courses, communal soakaways, filter strips		
			Other- please state:		
		V.5.2 Water Efficiency and Rainwater harvesting	Rainwater collection		
			Co-ordinated greywater recycling and reuse systems in apartments and mixed uses		
			Communal rainwater collection and reuse points		
			Other- please state:		
		V.5.3 Green Infrastructure and Permeable surfaces	Use of permeable surfaces for roads, car parking areas, hard surfacing and pavements		
			Natural vegetation e.g. green/brown roofs, communal basins and ponds, green spaces within blocks, green verges		
			Other- please state:		
Mitigating biodiversity loss	CS.2 (Climate Change and Sustainable Construction) CS.6 (Natural Environment) CS.7 (Green Infrastructure) CS.9 (Design and Distinctiveness) AS.1-9 (Area Strategies) AS.10 (Countryside and Villages) AS.11 (Large Rural Brownfield Sites) CS.25 (Healthy Communities)	V.6.1 Bio-enhancing existing green space	Using different varieties of native species for landscaping		
			Other- please state:		
		V.6.2 Background wildlife capacity	Green/brown roofs and wall climbers		
			At least one of the following: bird/bat boxes/ amphibian kerbs/ hibernacula/ hedgehog homes/garden ponds.		
			Other- please state:		
		V.6.3 Local wildlife nodes and green corridors	Green/brown roofs or walls		
			Private outdoor space		
			Other- please state:		

Appendix 3: Climate Change Checklist for Householder Developments where over 20 square metres of Additional Floorspace is Proposed

Principle	Relevant Core Strategy Policies	Objective	Expected Measures	Has this been considered in the planning application submission? (Yes/No/ Not Applicable)	If Yes please signpost to relevant information within planning application submission (e.g. Layout Plans, Planning Statement with paragraph/page/plan reference) If No or Not Applicable (N/A) please state justification for this
Increasing accessibility - Reducing the need to travel by private car	CS.2 (Climate Change and Sustainable Construction) CS.9 (Design and Distinctiveness) AS.1-9 (Area Strategies) AS.10 (Countryside & Villages) CS.19 (Housing Mix and Type) CS.25 (Healthy Communities) CS.26 (Transport & Communications)	V.2.1 Density and Mixed Uses	Design to allow for future adaptation of buildings / extensions including technological adaptation		
		V.2.2 Permeability / Walkability	Provision of habitable rooms facing the street at ground floor level with appropriate windows and doors to provide activity and allow for natural surveillance		
		V.2.3 Integrated Active Travel	*Not applicable*		
		V.2.4 Cycling	*Cycle parking / storage*		
		V.2.5 Planning for the car	Not applicable		
Improving energy efficiency	CS.2 (Climate Change and Sustainable Construction) CS.3 (Sustainable Energy) CS.7 (Green Infrastructure) CS.9 (Design and Distinctiveness) CS.19 (Housing Mix and Type) AS.1-9 (Area Strategies) AS.10 (Countryside and Villages) CS.25 (Healthy Communities)	V.3.1 Reducing the need for energy	Window positioning		
			Use of planting to provide shade in summer		
			Natural ventilation		
			Private outdoor space for food growing		
		V.3.2 Using energy more efficiently	Using a higher level of insulation than required by Building Regulations		
			Solar/low energy internal and external lighting		
		V.3.3 Using renewable energy	Renewable energy sources such as solar panels or heat pumps		
		V.3.4 Any fossil fuel use to be clean and efficient	Use of electric vehicle/cycle charging points		
Adapting to higher temperatures	CS.2 (Climate Change and Sustainable Construction) CS.6 (Natural Environment) CS.7 (Green Infrastructure) CS.9 (Design and Distinctiveness) AS.1-9 (Area Strategies) AS.10 (Countryside and Villages) CS.25 (Healthy Communities)	V.4.1 Shade and Ventilation – The Cooling Hierarchy	Glazing designed for natural ventilation		
		V.4.2 Use of Cool Materials	Exterior materials that minimise heat gain in summer		
		V.4.3 Greenspace Infrastructure	Relationship between landscaping and building to maximise natural ventilation		
			Planting and water features in private outdoor space – e.g. trees, hedges, ponds, green/brown roofs, vertical climbers and landscaping		
Mitigating flooding	CS.2 (Climate Change and Sustainable Construction) CS.4 (Water Environment & Flood Risk) CS.6 (Natural Environment) CS.7 (Green Infrastructure) CS.9 (Design and Distinctiveness) AS.1-9 (Area Strategies) AS.10 (Countryside & Villages) CS.25 (Healthy Communities)	V.5.1 Sustainable Urban Drainage Systems (SUDS)	SUDs such as raingardens		
		V.5.2 Water Efficiency and Rainwater harvesting	Rainwater collection such as water butts		
		V.5.3 Green Infrastructure and Permeable surfaces	Use of permeable surfaces for hard surfacing and car parking areas		
			Planting e.g. green roofs, walls and green verges		

Principle	Relevant Core Strategy Policies	Objective	Expected Measures	Has this been considered in the planning application submission? (Yes/No/ Not Applicable)	If Yes please signpost to relevant information within planning application submission (e.g. Layout Plans, Planning Statement with paragraph/page/plan reference) If No or Not Applicable (N/A) please state justification for this
Mitigating biodiversity loss	CS.2 (Climate Change and Sustainable Construction) CS.6 (Natural Environment) CS.7 (Green Infrastructure) CS.9 (Design and Distinctiveness) AS.1-9 (Area Strategies) AS.10 (Countryside & Villages) CS.25 (Healthy Communities)	V.6.1 Bio-enhancing existing green space	Using different varieties of native species for landscaping		
		V.6.2 Background wildlife capacity	Green roofs and wall climbers		
			At least one of the following: bird/bat boxes/ amphibian kerbs/ hibernacula/ hedgehog homes/garden ponds.		
		V.6.3 Local wildlife nodes and green corridors	Green/brown roofs or walls		
			Private outdoor space		

Appendix 4: Glossary

Word	Definition
Albedo	The amount of solar radiation that is reflected from an object or surface. It is usually expressed as a percentage, and the higher the albedo, the more solar radiation is reflected back into the atmosphere. Light surfaces have a higher albedo than dark surfaces.
Amphibian Kerbs	Small grooves in the curb that allow amphibians to go around drains rather than in them. They work on the basis that amphibians like to travel alongside vertical surfaces, and by creating an indent in the curb it acts as a bypass around the drain.
Attenuation	Attenuation, in the context of lakes and rainwater, is the collection and storage of water after a heavy rain period. Lakes can mitigate flooding by collecting the water after storms and then releasing it slowly over a period of time. They minimize the risk of flash floods.
Biodiversity	A term commonly used to describe the variety of life on earth. It encompasses the whole of the natural world and all living things including plants, animals, and other organisms which, together, interact in complex ways with the inanimate environment to create living ecosystems.
Bio-liquids	Bio liquids are a type of fuel derived from organic matter (such as vegetable and seed oils) that are used for energy purposes other than transport.
BREEAM	Building Research Establishment Environmental Assessment Method: An assessment method used to improve measure and certify the social, environmental and economic sustainability of new buildings, particularly non-domestic buildings.
Carbon Neutral Targets	In June 2019 a pledge was made by the UK government to cut greenhouse gas emissions to almost zero. The UK is the first country to propose such a target.
Carbon Storage	Carbon Dioxide is naturally captured from the atmosphere through a number of biological, chemical and physical processes. Many habitat areas contain large amounts of stored carbon dioxide in the form of plants, and the removal of these habitats would release the carbon dioxide back into the atmosphere.
CCHP/Combined Cooling Heat and Power	CCHP also sometimes known as Trigeneration, is when a power plant simultaneously creates heat and electricity, as well as chilled water for air conditioning and refrigeration.
CHP/ Combined heat and Power	CHP is the generation of both usable heat and power (electricity) in a single, highly efficient process. CHP can use renewables or fossil fuels.
Decentralised Energy	The term broadly refers to energy that is generated off the main grid, including micro (small scale) renewables, heating and cooling. It can refer to energy from waste plants, combined heat and power, district heating and cooling, as well as geothermal, biomass and solar energy. Schemes can serve a single building or a while settlement.

Word	Definition
Detention Basins	Detention Basins are large surface depressions that are usually dry, but following heavy rain periods can collect and store water, before slowly filtering it on to other areas. By collecting water they reduce the risk of flooding. Whilst not being used to store water they can be used for recreational or wildlife purposes.
Energy Hierarchy	The Energy Hierarchy is a classification of energy options that prioritises a sustainable approach. The top of the energy hierarchy aims to reduce the need for energy, and the bottom falls back on using conventional fossil fuels. The middle tiers look at using renewable energy sources and being efficient with the energy created to reduce waste.
Fenestration	The arrangement, proportioning, and design of windows, vents and doors in a building that allows for the correct amount of light and ventilation into a building.
Filter Drains	Gravel filled trenches that collect water after heavy rain periods. The presence of gravel acts as a filtering system that slows down the water flow, as well as removing sediment and other particulates. Once collected, the water flows to another point where appropriate measures are in place to deal with excess water. They are often used on roads and in car parks to reduce the risks of flooding.
Filter Strips	Gently sloping areas of vegetated land that are designed to accept runoff following heavy rain periods. They generally sit between a hard-surfaced area (such as a road) and a small stream that is able to carry the water to a more suitable location.
Good Homes Alliance	A body that aims to promote and encourage the building of quality sustainable homes and communities.
Green Infrastructure	A network of high quality, multi-functional green spaces and other environmental features, urban and rural. The greatest benefits will be gained when it is designed and managed as a multifunctional resource which is capable of delivering a wide range of environmental and quality of life benefits for local communities.
Green Walls	A vertical surface that is partially or completely covered in plants and other vegetation. Supported by an irrigation and drainage system they work to reduce air pollution and to increase biodiversity.
'Heat Island' effect	A term often used when discussing the high temperatures of built up areas in comparison to the surrounding rural areas.
Infiltration Basins and Trenches	Vegetated depressions that hold water after heavy rain periods and slowly release it into the below soil and ground water
Local Wildlife Nodes	Areas where underutilised land is developed to encourage biodiversity.
Louvres	A window blind or shutter that consists of angled horizontal slats that let in light and air, but prevent direct sunlight and rain entering. They can be used to keep rooms cool.
Low-e Glass	A type of glass that reduces the amount of heat that can escape through the window. For this reason it is very energy efficient.

Word	Definition
LPG/ Liquefied Petroleum Gas	Liquefied mixes of hydrocarbon gas that can be used as fuel. It is highly efficient and usually stored in pressurised steel canisters.
Natural Filtering	Toxins can be taken out of the atmosphere and removed from water sources, in a number of natural ways. One such way is through photosynthesis, where carbon dioxide is removed from the atmosphere by plants and turned into oxygen.
Night Purging	At night the air cools, and night purging is the passive movement of this cool air into buildings to replace any stale hot air.
Passivhaus	A standard for energy efficiency that focuses on air quality and comfort. It aims to reduce the requirements for space heating by looking at insulation, window sizes and orientations, and junction details.
Passive Solar Design	Passive Solar Design aims to utilise the suns energy for both heating and cooling effects. When designing the buildings architects look at the orientation, materials and any nearby buildings that may block sunlight. They take into consideration the suns changes throughout the year and aim to provide comfortable environments that require less generated energy for heating and cooling.
Permeable Surfaces	Surfaces that allow water to penetrate through.
Permeability	The level of permeability refers to the ease in which something can travel through.
Photovoltaic	Otherwise known as solar panels, photovoltaic systems convert solar energy into electrical energy.
Rainwater Gardens	Small depressions that collect rainwater run-off. They are planted up with species that can handle occasional flooding.
Receptor Sites	New sites that allow wildlife to spread and biodiversity to increase.
Renewable Energy	Includes energy for heating and cooling as well as generating electricity. Renewable energy covers those energy flows that occur naturally and repeatedly in the environment – from the wind, the fall of water, the movement of the oceans, from the sun and also from biomass and deep geothermal heat.
Retention Ponds	Permanent ponds or pools of water that are designed to act as additional storage following a heavy rainfall period. They do not transport the water elsewhere and instead naturally treat the water and remove pollutants, therefore improving the water quality.
Sedum Blanket	A layer of living plants on top of a waterproof roof surface.
Smart Glass	Glass that alters its light transmission properties if voltage, light or heat are applied. The glass can change from transparent to translucent and can block certain wavelengths.
Soakaways	A hole in the ground that has been filled with rubble which allows water to seep down. It is an efficient way to deal with surface water in a way that has little environmental impact.
Solar Water Heating	Systems that use solar energy to heat up water. The energy is converted using a solar collector
Sun Orientation	The alignment of a building in relation to the movement of the sun across the sky.

Word	Definition
Sustainable Urban Drainage System (SuDS)	Seeks to minimise wastage of water, including the use of appropriate groundcover to enable maximum penetration of clean water run-off into the ground, promote the filtration and evaporation of water as close to the source as possible and break down pollutants and, where appropriate, recycle grey water within the development. Designed to minimise the impact of development on the natural water environment, they are an alternative to drainage through pipes directly to a water course and help enhance water quality and biodiversity, maintain groundwater levels and reduce the risk of flooding.
Sustainable modes of transport	Any efficient, safe and accessible means of transport, other than the private car, which has an overall low impact on the environment, including walking and cycling, low and ultra-low emission vehicles, car sharing and public transport.
Swales	Broad vegetated channels that can store and transport water following heavy rain periods.
Topography	The arrangement of the visible natural and artificial features of an area.
Thermal Stores	A way of storing heat until required, often in the form or well insulated water tanks.
Wildlife Capacity	The amount of wildlife that an area can sustainably withstand.