## APPENDIX 1: DRAFT SUSTAINABLE DESIGN AND CONSTRUCTION SUPPLEMENTARY PLANNING DOCUMENT

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# Appendix 5 RESOURCES FOR APPLICANTS

# 1 INTRODUCTION

## Background

1.1 As a result of increasing atmospheric concentrations of carbon dioxide and other greenhouse gases from the burning of fossil fuels and land use changes, the Earth's climate is changing and is expected to continue to change over this century and beyond.

1.2 The Earth's cities are becoming the dominant population centres. Greater Reading hosts approximately 4% of the UK population. The design and construction of the built environment is highly significant in the determining impact that the residents of Reading will have on the local and global environment.

1.3 Reading has set out its commitment to become a zero carbon city by 2050. It also needs to consider carefully how it adapts to a changing climate, the impact that its built space has on its own natural resources and habitats as well as pollution of its ground, water and air.

1.4 The National Planning Policy Framework (NPPF) states in Paragraph 148:

> "The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure".[1]

1.5 It is vital that residential and non-residential schemes are built in a way that minimises their use of energy and harmful emissions, reducing and mitigating other environment impacts.

1.6 Everyone has a role to play in achieving the objectives of minimising pollution. This includes reducing carbon dioxide emissions, other greenhouse gases and ensuring our lifestyles are as sustainable as possible. The design of the built environment has a significant role to play in the impact that individuals have.

1.7 There is a clear role, and indeed expectation, within national planning policy for planning to contribute towards achieving environmental objectives.

1.8 This SPD therefore explains planning requirements with regard to energy, climate change, water management and waste reduction. It is intended to supplement the policies of the Local Plan, particularly:

- CC2: Sustainable Design and Construction
- CC3: Adaptation to Climate Change
- CC4: Decentralised Energy
- CC5: Waste Minimisation and Storage
- EN18: Flooding and Drainage

[1] National Planning Policy Framework, Ministry of Housing, Communities and Local Government (July 2018). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

- H5: Housing Standards

**Reading Borough Council's Sustainability Aims**

1.9 Reading Borough Council is committed to working with the local community and businesses to respond to the challenges of climate change by reducing greenhouse gas emissions and preparing for the changes that climate change will bring.

1.10 Reading Borough Council's Climate Change Strategy entitled 'Reading Means Business on Climate Change – Reading's Climate Change Strategy 2013 – 2020' sets out a vision that

> '*Reading's thriving network of businesses and organisations will be at the forefront of developing solutions for reducing carbon emissions and preparing for climate change. Low carbon living will be the norm in 2050.'*

The strategy sets a target of reducing the Borough's carbon footprint in 2020 by 34% compared with 2005 levels. Reading is a signatory to UK100 'aiming to have 100% clean energy by 2050'. Reading's next climate change strategy is due in 2020. Two core elements will be incorporated: 1. a zero carbon Reading (reducing the emissions of green-house gases to net zero), and 2. adapting to the future climate.

**Aim of this SPD**

1.11 This SPD is intended to guide developers and decision-makers on the implementation of key sustainability policies set out in the Reading Local Plan, namely CC2-CC5, EN18 and H5. It will be a material consideration in the determination of planning applications.

1.12 This document also brings together relevant national guidance. It provides practical advice on forms of sustainable design and construction, as well as waste minimisation that will meet these policy requirements. It also details how policies will be applied. This should assist applicants in ensuring that the relevant information is submitted at the appropriate stage of the application and development process.

**Context within Reading Borough**

1.13 Reading's vision is to be a dynamic and inclusive community of the 21st Century and an internationally recognised economic centre. The town as a whole will be clean and healthy, with a strongly sustainable approach to development including innovative approaches to energy provision.

1.14 Reading is an area of high growth and high demand for development. The Reading Local Plan proposes a significant amount of new development but on the basis that it is sustainable and that it mitigates any impacts, including additional $CO_2$ emissions arising from such development. Achieving high standards of sustainable design and construction is therefore an essential component of new development in the Borough.

**Weight of this SPD**

1.15 As an adopted supplementary planning document (SPD) which supplements policies in the Local Plan, this document is a material consideration in the determination of

planning applications. This guidance replaces the previous Sustainable Design and Construction Supplementary Planning Document adopted on 11th July 2011.

**Consultation**

1.16 This Draft Sustainable Design and Construction SPD has been published for public consultation. This consultation will include statutory bodies, business organisations, community and voluntary groups, adjoining authorities, infrastructure providers and interested individuals. The policies supported by this SPD were consulted upon extensively during the production of the Local Plan. As the Local Plan is not yet adopted, we are consulting on the basis that it will adopted as to include the sustainability policies listed in section 1.8 above. Any changes required as a result of the Inspector's report on the Local Plan will be made, as needed.

1.17 Your representations on the Draft Sustainable Design and Construction SPD are welcomed. Please send any comments by 5 pm on Friday 3rd May to

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## 2 POLICY BACKGROUND

### National Planning Policy Framework

2.1 National planning policy is giving increasing emphasis and weight to addressing sustainability, carbon reductions, climate change and waste reduction. The National Planning Policy Framework (NPPF)[2] states that the planning system plays an important environmental role by helping to use natural resources prudently, minimising waste and pollution and mitigating and adapting to climate change through moving to a low carbon economy.

2.2 Paragraphs 148 to 165 detail measures that local planning authorities should take to support a move to a low carbon future. These include planning for new development in locations and ways which reduce greenhouse gas emissions and actively supporting energy efficiency improvements to existing buildings. In determining planning applications, local planning authorities should expect new development to:

- comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
- take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

2.3 To help increase the use and supply of renewable and low carbon energy, local planning authorities should have a positive strategy to promote energy from renewable and low carbon sources. Policies should be designed to maximise renewable and low carbon energy development, while ensuring that adverse impacts (including visual impacts) are addressed satisfactorily.

2.4 When determining planning applications, local planning authorities should not require applicants for energy development to demonstrate the overall need for renewable or low carbon energy. Local planning authorities should approve applications where impacts are or can be made acceptable.

2.5 National planning policy reflects the Climate Change Act 2008[3] which sets legally binding reduction targets for greenhouse gas emissions (at least 34% by 2020 and at least 80% by 2050).

### Planning Practice Guidance

2.6 The Government's planning guidance on renewable and low carbon energy[4] identifies specific planning considerations:

- Local planning authorities are responsible for renewable or low carbon energy development of 50 megawatts or less installed capacity.
- Microgeneration is often permitted development and therefore may not require planning permission.

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[2]National Planning Policy Framework, Ministry of Housing, Communities and Local Government (July 2018). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/740441/National_Planning_Policy_Framework_web_accessible_version.pdf

[3] https://www.legislation.gov.uk/ukpga/2008/27/contents

[4] https://www.gov.uk/guidance/renewable-and-low-carbon-energy

- Although the NPPF explains that communities must increase the use and supply of low carbon energy, this does not mean that the need for this development overrides environmental protections and the planning concerns of local residents.
- Local planning authorities should consider
    - A range of technologies and the policies needed to encourage their development in the right places;
    - The falling costs of these technologies, increasing their attractiveness;
    - The impacts of different technologies on the places in which they would be located; and
    - There is no specific quota of renewable and low carbon energy that must be delivered by the Local Plan.
- Local planning authorities may wish to establish policies which give positive weight to those projects led by the local community.
- Particular renewable energy technologies have different site considerations. For example:
    - For biomass, appropriate transport links;
    - For hydro-electric power, sources of water;
    - For wind turbines, predicted wind resource.
- Cumulative impacts of development require particular attention, for example that of wind turbines or solar farms on landscape and local amenity. Protecting local amenity should be given proper weight in planning decisions.

2.7 The suitability of particular sites should be considered in terms of their ability to provide local clean energy. This should consider national grid constraints, transmission losses and other environmental and technical constraints. Local energy is always preferred over remotely generated energy.

**Reading Climate Change Strategy**

2.8 Reading's Climate Change Strategy 2013 – 2020, "Reading Means Business on Climate Change"[5] sets a target of reducing the carbon footprint of the borough by 34% in 2020 compared with levels in 2005. This will require a reduction of around 7% annually. Of the strategic priorities identified, the following are relevant to planning policy:

- Energy supply – reduce electricity consumption, develop heat supply networks to deliver low carbon heat in Reading and increase the amount of energy generated locally using renewable technologies;
- Low carbon development – buildings in Reading to be built to high standards of energy efficiency incorporating on-site renewable energy where possible, retrofit energy efficiency measures into Reading's buildings, minimise the 'embodied carbon' incorporated in construction projects and continue to develop planning policies that support the reduction of greenhouse gas emissions directly and indirectly from the Borough and reduce the risks of climate change to the communities of Reading;
- Natural environment – improve the quality and connectivity of natural habitats;
- Water supply and flooding – Manage demand for and supply of water to reduce the expected impact of water shortages on consumers and on wildlife and reduce the risk of damage due to flooding;

[5] http://www.reading.gov.uk/media/1232/Climate-Change-Strategy/pdf/Climate-Change-Strategy.pdf

- Transport – develop a transport infrastructure which supports more low carbon travel options for people in Reading and encourage non-car travel for all sectors of the population; and
- Purchasing, supply and consumption – reduce waste by supporting the re-use and repair of products and materials.

**Reading Local Plan**

2.9 The Submission Draft Local Plan was submitted to the Secretary of State in March 2018 and is expected to be adopted in 2019. One of the main objectives of the new Local Plan is to ensure new development and existing areas are sustainable, including reducing its effects on and adapting to climate change. The Local Plan requires development to both adapt to a changing climate and mitigate the worsening effects of climate change.

2.10 The following policies are the main policies supplemented by this document (full policy text is included in Appendix 3):

- CC2: Sustainable Design and Construction

  This policy seeks improved sustainability performance of buildings by setting out BREEAM requirements for non-residential developments conversions to residential. It also sets out the general principles of sustainability in new development that applies to both residential and non-residential uses. Requiring the specified BREEAM levels will significantly contribute to achieving Reading's emissions targets, as well as mitigating the effects of climate change.

- CC3: Adaptation to Climate Change

  This identifies measures including building orientation, shading, heating, ventilation, green or brown roofs and walls, planting and surface water run-off to deal with the effects of climate change. Where these measures are not appropriately incorporated, planners will consider whether or not this is a reason for refusal. This policy will ensure that development within the Borough is resilient in the face of climate change.

- CC4: Decentralised Energy

  This policy requires developers to consider inclusion of decentralised energy infrastructure, increasing the amount of decentralised energy provision in the Borough. This will help to achieve a shift to sustainable energy consumption and production and covers a wide range of technologies that reduce dependence on a centralised network or grid.

- CC5: Waste Minimisation and Storage

  This policy requires developers to identify measures to minimise the generation of waste and to handle waste appropriately during the lifetime of a development. It will help to achieve the aims of the Council's Waste

Minimisation Strategy[6], as well as to comply with national policy, such as the Landfill Directive[7].

- EN18: Flooding and Sustainable Drainage Systems

  This policy directs development away from areas that are liable to flood. In areas of lower risk, development may move forward if it passes the exception test in the NPPF. It also requires major developments to incorporate Sustainable Drainage Systems (SuDS). This policy will help to protect people and property from flooding.

- H5: Standards for New Housing

  This policy outlines standards for new-build housing, including those for sustainable design and construction. All new-build housing must be built to the higher water efficiency standard under the Building Regulations. All major new-build residential should achieve zero carbon homes and all other new-build housing must achieve a minimum 19% improvement over the 2013 Building Regulations target. This policy will help to deliver high-quality new homes and achieve Reading's emissions targets, as well as mitigate the effects of climate change.

2.11 The following policies provide further guidance to sustainable design and construction, but are not considered to be directly supplemented by this document:

- CC1: Presumption in Favour of Sustainable Development

  This policy ensures that planning decisions are taken in line with the Government's presumption in favour of sustainable development as articulated in the NPPF. It ensures that a positive approach is taken when considering development proposals in order to improve the economic, social and environmental conditions in the area.

- CC9: Securing Infrastructure

  This policy ensures that development proposals mitigate all relevant impacts in order to ensure that they are sustainable. It will help to infrastructure, services and facilities according to the priorities stated in the policy.

- EN16: Pollution and Water Resources

  This policy prevents harmful development and mitigates the impacts of potentially polluting developments. It will ensure that damage to Reading's environment is avoided.

2.12 Applicants will be expected to adapt design and construction in order to make sustainability measures viable. If compliance cannot be achieved, applicants will need to demonstrate why not and will be expected to install the proportion of

[6] http://www.reading.gov.uk/media/4418/Waste-Minimisation-Strategy-2015---2020/pdf/HNL_15th_March_WMStrategy_Revision_Appendix_B.pdf
[7] http://ec.europa.eu/environment/waste/landfill_index.htm

measures that are viable. Applicants must demonstrate that all options have been explored. In many cases, whole-life considerations may justify capital costs at the time of construction. For example, installation of energy-efficient technologies will likely decrease the electricity and gas costs for users over of the lifetime of the development.

2.13 Planning practice guidance emphasises whole-plan viability testing rather than the testing of development schemes individuals:

> "Where up-to-date policies have set out the contributions expected from development, planning applications that comply with them should be assumed to be viable. It is up to the applicant to demonstrate whether particular circumstances justify the need for a viability assessment at the applications stage".[8]

2.14 The Local Plan was subject to a whole plan viability test which concluded that all of the requirements in the Local Plan (including sustainable design and construction and housing standards) do not present a burden to developers that will stifle development.

**Recent Changes to National Policy**

2.15 The Secretary of State for Communities and Local Government used a Ministerial Statement in March 2015 that changed and rationalised the way planning policies should seek specific standards in new housing. It removed the Code for Sustainable Homes and introduced new additional optional Building Regulations on water and access, and a new national space standard.

2.16 The Revised National Planning Policy Framework[9] was published in July 2018 along with a Government response[10] to accompany the revised NPPF. The Revised NPPF continues a commitment that Local Plans will support the transition to a low carbon future by planning for new development which reduces greenhouse gases.

2.17 The Government's Response to the Draft Revised NPPF consultation states[11]:

> "To clarify, the Framework does not prevent local authorities from using their existing powers under the Planning and Energy Act 2008 or other legislation where applicable to set higher ambition. In particular, local authorities are not restricted in their ability to require energy efficiency standards above Building Regulations. The Government remains committed to delivering the clean growth mission to halve the energy usage of new buildings by 2030." (pp 48)

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[8] Paragraph 57, National Planning Policy Framework, Ministry of Housing, Communities and Local Government (July 2018). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/740441/National_Planning_Policy_Framework_web_accessible_version.pdf

[9] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/740441/National_Planning_Policy_Framework_web_accessible_version.pdf

[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/728498/180724_NPPF_Gov_response.pdf

[11] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/728498/180724_NPPF_Gov_response.pdf

## 3 SUBMISSION REQUIREMENTS

3.1 Applicants need to demonstrate how they will comply with the relevant policies in the Local Plan. This section outlines what information is required to be submitted at the pre-application stage, at application stage, and what aspects might be considered later by condition.

3.2 To comply with the relevant policies and standards on energy, a combination of measures including those for energy efficiency, energy conservation and inclusion of renewable or low carbon sources should be considered.

3.3 Sustainability Statements typically require the developer to take consideration of all aspects of development form which can contribute to securing high standards of sustainable development, including but not limited to:

- Energy efficiency of the building;
- Water conservation;
- Flood risk and drainage strategy;
- Community impacts;
- Transport;
- Health and Wellbeing including day-lighting analysis and thermal comfort;
- Material usage, responsible sourcing and environmental impact;
- Pollution issues, low $NO_x$, low global warming potential (GWP), reducing need for mechanical cooling;
- Ecological aspects to enhance the proposed developments for flora and fauna; and
- Best practice management of the site[12].

3.4 Energy Statements demonstrate how the energy related aspects of the proposed development actually meets the requirements of local planning policy and BREEAM energy and emissions standards. An energy statement would typically include the following information:

- Energy efficiency of the building;
- Baseline annual predicted energy demand of the development (regulated and unregulated);
- Baseline annual predicted carbon emissions of the development (regulated and unregulated), the Target Emission Rate (TER);
- The contribution of each proposed renewable energy technology;
- Cost information of technically feasible low or zero carbon renewable technologies, including combined heat and power;
- Feasibility of district or community heating;
- Summary of the benefits of various energy technologies;
- The total estimated reduction in the development's baseline carbon and/or energy emissions[13].

[12] https://www.energycouncil.co.uk/energy-sustainability-statements.html
[13] https://www.energycouncil.co.uk/energy-sustainability-statements.html

**Table 3.1: Required level of sustainability standard**

| | Size of Development | Required Standard |
|---|---|---|
| **New build residential** | Minor (fewer than 10 dwellings) | 19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations |
| | Major (10 dwellings or more) | Zero Carbon (or if unachievable, a minimum 35% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations and planning contribution to offset remaining carbon emissions to zero) |
| **Creation of new residential units through conversion from other uses and/or major refurbishment** | Minor (fewer than 10 dwellings) | BREEAM 'Very Good' |
| | Major (10 dwellings or more) | BREEAM 'Excellent' |
| **Non-residential development (including development for non-C3 residential)** | Minor (less than 1,000 sq. m of floorspace) | BREEAM 'Very Good' |
| | Major (1,000 sq. m of floorspace or more) | BREEAM 'Excellent' |
| **Non-residential refurbishment (including refurbishment for non-C3 residential)** | Minor (less than 1,000 sq. m of floorspace) | BREEAM 'Very Good' |
| | Major (1,000 sq. m of floorspace or more) | BREEAM 'Excellent' |

Additional information:

- For mixed-use development, depending on the specific mix, a combination of standards may be sought.

- Applications for change of use may fall to be considered as refurbishment depending on the level of internal alterations proposed. The appropriate approach with regards to sustainability will be considered on a case by case basis.

**Non-Residential Development**

3.5 The Building Research Establishment's Environmental Assessment Method is known as BREEAM Standards and is the most widely recognised method of assessing the environmental quality of building design. The Local Plan requires BREEAM standards to be achieved for non-residential development, non-C3 forms of development such as student accommodation or residential care, and conversion to residential.

3.6 Experience has shown that once the final details of a scheme are established, in virtually all cases credits will be dropped during the process of design and construction. This could mean that the proposal fails to comply with the policy requirements and is therefore important to incorporate a 'buffer' into the pre-assessment estimator. A 'buffer' is an over allowance of credits or contingency. This is designed in at the pre-assessment stage to ensure that if some aspects of the design cannot be achieved and credits are dropped once progression is made to later stages of the design and construction of the development, the BREEAM level set out initially is achieved. The 'buffer' is important to ensure the development as built complies with local plan policies. A 3% buffer should be included in the pre-assessment estimator.

**Table 3.2: Summary of BREEAM submission requirements at each stage of application process**

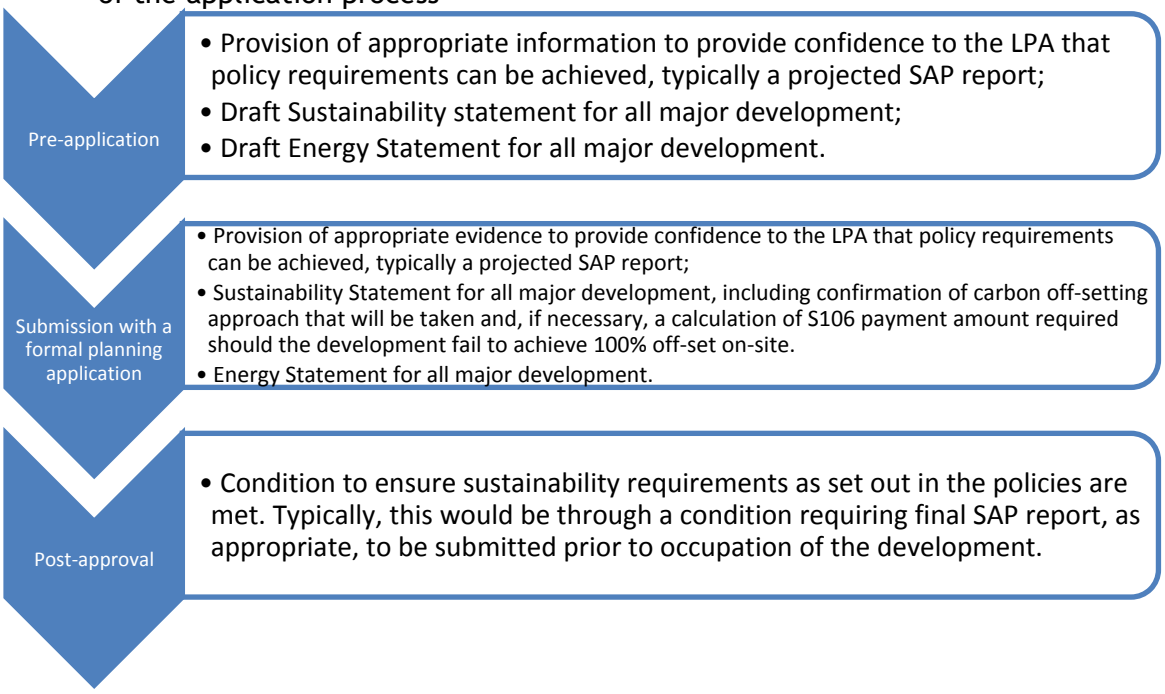
| | |
|---|---|
| Pre-application | • Pre-assessment estimator incorporating a 3% buffer and provision of other appropriate information to provide confidence to the LPA that policy requirements can be achieved;<br>• Draft Sustainability statement for all major development;<br>• Draft Energy Statement for all major development. |
| Submission with a formal planning application | • A pre-assessment estimator incorporating a 3% buffer and provision of other appropriate information to provide confidence to the LPA that policy requirements can be achieved;<br>• Sustainability Statement for all major development;<br>• Energy Statement for all major development. |
| Post-approval | • Condition to ensure sustainability requirements as set out in the policies are met. Typically, this would be through a condition requiring an interim BREEAM certificate as appropriate to be submitted prior to commencement of development and a final BREEAM certificate, as appropriate, to be submitted prior to occupation of the development. |

**Residential Development**

3.7 For residential development of ten dwellings or more, the Local Plan requires Zero Carbon development. If carbon neutral development is not achievable, this will mean a minimum 35% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations, and financial

contributions through a Section 106 agreement to offset remaining carbon emissions to zero.

Table 3.3: Summary of Zero Carbon Homes submission requirements at each stage of the application process




3.8 All major new-build residential development (10 dwellings or more) should be designed to achieve zero carbon homes. All other new building housing will achieve at a minimum a 19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations. Zero carbon homes is an achievable standard that, until recently, was intended to be a national requirement in the Building Regulations. It is RBC's policy to continue applying these requirements through planning policy until such time as the Government updates the Building Regulations to require equivalent sustainability standards.

3.9 Where possible, new build residential of ten or more dwellings will achieve true carbon neutral development on-site. If this is not possible, it must achieve a minimum of 35% improvement over the Target Emissions Rate over the 2013 Building Regulations, plus a Section 106 contribution of £1,800 per remaining tonne towards carbon offsetting within the Borough (calculated as £60/tonne over a 30 year period). £60 per tonne of carbon is a nationally-recognised price of carbon and reflects the amount established by the Zero Carbon Hub[14]. Based on a review of other Local Planning Authorities (LPA) carbon pricing[15], £60 is the amount used by a majority of LPAs and is lower than the £95/tonne proposed in the new draft London Plan[16]. The following calculation should be used to determine contribution:

(Target Emissions Rate) – (35% $CO_{2/m^2}$/yr.) = (65% $CO_2/m^2$/yr.)

[14] Next Steps to Zero Carbon, DCLG, 2013. https://www.gov.uk/government/consultations/next-steps-to-zero-carbon-homes-allowable-solutions

[15] https://www.london.gov.uk/sites/default/files/london_carbon_offset_price_-_aecom_.pdf

[16] https://www.london.gov.uk/what-we-do/planning/london-plan/new-london-plan/download-draft-london-plan-0

| As detailed in the 2013 Building Regulations | Required on-site improvement over the 2013 Building Regulations | Offset through Section 106 contribution |
|---|---|---|

For example:

For a recent example of a 68m$^2$ mid-floor flat:

| | |
|---|---|
| TER as defined in the Building Regulations 2013 (fuel factor = 1.0) | 16.10 kg $CO_2/m^2/yr.$ |
| 35% of TER improvement required on-site | 5.635 kg $CO_2/m^2/yr.$ |
| 65% of TER to be offset through S106 contribution | 10.465 kg $CO_2/m^2/yr.$ |
| (65% of TER) x total square metres = total excess $CO_2$ emissions annually | 711.62 kg $CO_2/yr.$ = 0.71162 tonnes $CO_2/yr.$ |
| Annual excess $CO_2$ emissions x £1800 = S106 contribution | **£ 1280.916** |

3.10 This means that in most cases, the assessment required to satisfy the Part L of the Building Regulations will need to be carried out at the application stage, rather than afterwards. Contributions will be secured through a S106 agreement and will be due upon first occupation.

3.11 Contributions will be ring-fenced for energy-efficiency improvements or renewables projects within the Borough. This may include (but is not limited to):

- Visits from energy advice officers;
- Free energy-efficient lightbulbs;
- Subsidised loft and cavity wall insulation;
- Boiler cash-back scheme for replacement of inefficient boilers with higher rated boilers; and
- Draught proofing.

3.12 Projects funded through the offset fund cannot also be listed on the CIL 123 List, as they are not 'infrastructure' in the sense covered by CIL[17]. Projects funded by the offset fund should emphasise energy efficiency improvements and should maximise co-benefits, such as alleviating fuel poverty, reducing energy bills, improving air quality, providing heat for vulnerable residents, increasing the efficiency of public sector buildings and reducing operations costs.

**Explanation of Detail Required at Each Stage of the Application Process**

Pre-application

*Pre-assessment estimator*

3.13 The purpose of a pre-assessment estimator is the help provide confidence to the LPA that the requirements of the Local Plan have been considered and can be met. Pre-assessment estimators are typically completed prior to the final details of the

[17] http://www.reading.gov.uk/media/6385/Community-Infrastructure-Levy-Regulation-123-List/pdf/Approved_Regulation_123_List_March_2017.pdf

scheme being established. Where an applicant for minor development does not feel they would be in a position to submit a pre-assessment estimator, it would be the applicant's responsibility to provide alternative information to the LPA so the decision-maker can be confident that the requirements will be met. However, a pre-assessment estimator is the recommended approach for all applications which require a BREEAM assessment as specified in table 3.2.

3.14 The response to any pre-application enquiry will be made on the basis of the information provided and if this changes then those comments may not still be relevant.

3.15 It will not be sufficient to submit a pre-assessment estimator achieving the bare minimum, then compliance subsequently being lost before occupation with applicants relying on the fact that they have tried and then found that costs exceed previous expectations. Full compliance with the policy requirements is expected in all cases.

*Draft Sustainability Statement at pre-application stage*

3.16 Draft Sustainability Statements typically require the developer to consider all aspects of development form which can contribute to securing high standards of sustainable development. Planning applications should be accompanied by the Sustainability Statement based on the sustainability checklist. In Reading the requirements of the Sustainability Statements should follow as appropriate one or both of the sustainability checklists included in Appendix 1 of this document. These checklists have their requirements based on the BREEAM standards but are not a complete repetition of these requirements. They are intended to help provide pointers as to the types of considerations that the development should be taking into account in order to achieve the relevant standards to comply with policies in the Local Plan.

3.17 The Sustainability Statement should focus on the questions posed in the relevant checklist. Completion of a Sustainability Statement helps to demonstrate the applicant's commitment to sustainable design and construction.

3.18 This should be submitted, preferably at the pre-application stage to help applications focus on and highlight the main sustainability achievements of their proposal. Consideration at the pre-application stage will help applicants focus on the fact that sustainability measures should not be 'bolted on' or incorporated retrospectively to an existing design, but in order to be as successful as possible, must emerge as part of the design process.

3.19 This will also help ensure that sustainability measures are as cost effective as possible. By retrofitting such measures, there is a significant risk that the cost could substantially increase, raising the likelihood of not being able to achieve proposed measures.[18]

[18] Unless it can be demonstrated that sustainability measures have been incorporated into the design of the building from the outset, substantially less weight will be given to any viability information submitted, attempting to justify a development's failure to comply with policies CC2 or H5 of the Local Plan and other relevant policy. However, the expectation will be that the requirements of CC2 or H5 are non-negotiable.

3.20 Whilst pre-application enquiries will be considered without a Sustainability Statement accompanying the submission, it is very much in the applicant's interest to submit a statement and ensure it is considered at this stage.

*Draft Energy Statement*

3.21 An Energy Statement should be submitted with all major developments. The Energy Statement demonstrates how the energy related aspects of the proposed development actually meets the requirement of policies CC2, CC4 and H5. The Energy Statement provides the specification for meeting the required energy targets including a calculation of the carbon emissions for a development. These shall be calculated as detailed in part L of the building regulations and the relevant BREEAM Standard or Zero Carbon Homes, where required. The Energy Statement should explain how the carbon dioxide reductions will be achieved and importantly, which renewable energy technologies/low carbon energy sources have been considered and dismissed, clearly explaining the reasons for this. The Energy Statement should also state the S106 contribution required to achieve zero carbon homes according to the calculations in the next section.

3.22 The Energy Statement will help demonstrate to the Council that thought has been given to how the energy reductions required to meet the BREEAM requirements will be achieved. Clear consideration of these details at the stage can help ensure the applicant can build the proposal in the way intended without issues over sustainability aspects arising later. This could result in the design having to be reconsidered, which would have clear cost implications.

3.23 A draft Energy Statement should be submitted at the pre-application stage to demonstrate how energy will be considered and incorporated as part of the proposal. Omission of a draft Energy Statement will decrease the likelihood that a planning application will be approved at application stage.

**Submission with a formal planning application (including outline applications)**

*Pre-assessment estimator*

3.24 At the formal planning application stage, the LPA needs to be confident and have the evidence to demonstrate that any proposal being approved can actually meet the policy requirements of the Local Plan. As at the pre-application stage, a pre-assessment estimator is the recommended approach for all sizes of applications to accord with policies CC2 and H5 of the Local Plan. Again, where an applicant for minor development does not feel they would be in a position to submit a pre-assessment estimator or as-proposed SAP assessment, it would be the applicant's responsibility to provide alternative information to the LPA, in order to ensure that the LPA is confident that the requirements of CC2 and H5 can be met.

*Sustainability Statement at application stage*

3.25 For major applications, a Sustainability Statement based on a sustainability checklist should be submitted at the submission stage. Where no Sustainability Statement was submitted at the pre-application stage, it should still be submitted at the submission stage. Applicants should note that where a Sustainability Statement is produced only at the submission stage, it will be substantially harder to demonstrate that relevant sustainability measures have been incorporated into the design from the outset, given that by the time an application reaches formal

submission stage, considerable work has often already gone into the design of the application stage.

*Energy Statement at application stage*

3.26 The Energy Statement should be finalised by the application stage. As outlined above, the comments made in response to any pre-application enquiry will be given on the basis of the information provided at the pre-application stage, and if this changes, those comments may no longer be relevant. Pre-applicants may therefore wish to finalise their Energy Statement at the pre-application stage to avoid issues arising at the submission stage.

3.27 As with the Sustainability Statement, applicants should note that where an Energy Statement is not submitted at the pre-application stage, it will be substantially harder to demonstrate that relevant sustainability measures have been incorporated in to the design from the outset.[19]

*Post Approval Stage*

3.28 A condition/s will be attached to any permission granted requiring a BREEAM sustainability assessment and/or Final/As-Built Building Regulations Compliance Report. Typically this would be a condition requiring an Interim BREEAM Certificate or design stage SAP assessment to be submitted prior to commencement of development demonstrating that the development will be built in accordance with the pre-assessment estimator and meet the requirements of CC2 or H5. Additionally, it will require that a Final BREEAM Certificate and/or Regulations Compliance Report or as built SAP assessment is submitted prior to occupation of the development. This information will include final data on predicted carbon emissions from the building.

3.29 Development that fails to comply with a condition may not be considered to be lawful development and risks enforcement action.

[19] Unless an appropriately completed Energy Statement has been completed and submitted with an application, it is unlikely to be possible to put forward a viability justification for failing to comply with relevant policy. The expectation will be that the requirements of policies CC2 and H5 are non-negotiable.

## 4 ENERGY EFFICIENCY

4.1 This section outlines some of the methods that may be used to meet the requirements of policies CC2-CC5, EN18 and H5. The elements listed below are not absolute requirements, but should nonetheless be considered by applicants.

4.2 Fabric improvements are much more likely to ensure long-term carbon reductions and are generally achieved at lower cost than on-site generation. Therefore, applicants should seek to improve fabric efficiency in the first instance.

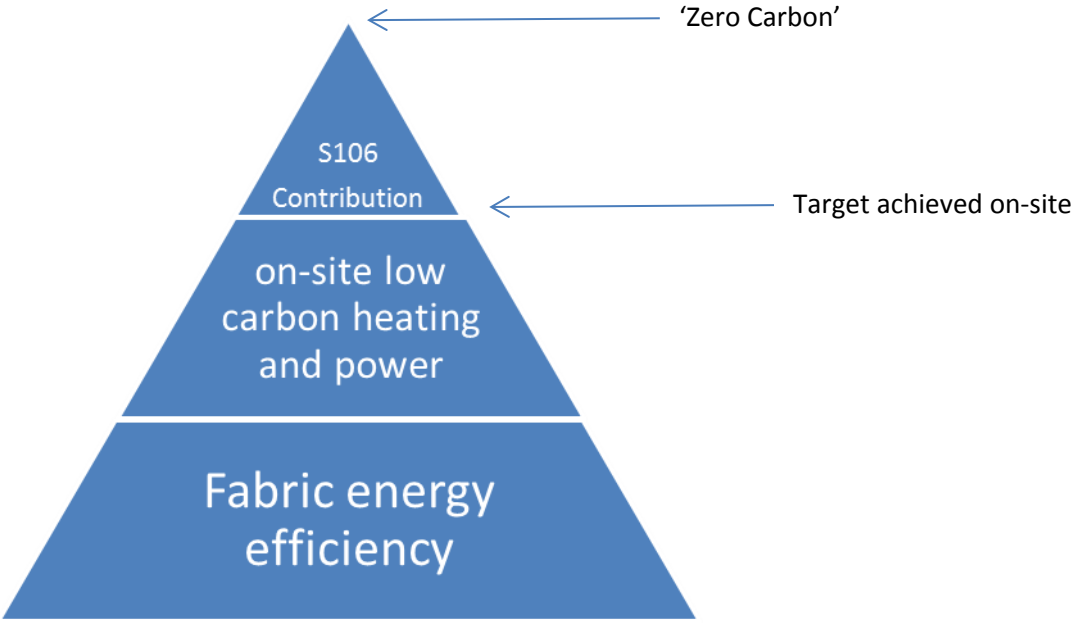



Figure 4.1

**Solar Gain**

4.3 Passive and active solar gain can make a significant contribution towards the lighting and heating of a building. Different approaches to maximising passive and active solar gain are needed depending on the size and use of buildings. To maximise access to the sun, buildings should have their main elevations facing within 30° of due south (either to the east to maximise morning sunlight or to the west to maximise evening sunlight). A slight easterly orientation has advantages over a south-westerly position due to the fact that it maximises early morning light and heat gains while reducing the possibility of overheating on a summer afternoon. Main living or working spaces with maximum occupancy should be located on southerly facing elevations to make the best use of solar gain. Rooms with lower occupancy, such as toilets, cloakrooms and storage space that require less heating should be located on the northern side of the building. Rooms that contain machinery or equipment that generate heat should also be located on the northern sides of buildings. To minimise the requirements for additional space heating, elevations to the south should have increased areas of glazing compared to those facing north. Care must however be taken to prevent excessive solar gain with a building requiring the unnecessary use of energy to cool the internal environment. Carefully designed natural ventilation is important. Landscaping also has a role in energy efficiency.

**Natural Day Lighting**

4.4 Coupled with solar gain, natural day lighting can reduce the energy demand for new buildings through the controlled entry of natural light through windows, skylights, atria, sun pipes and other building envelope components. The day lighting benefits of large areas of glazing need to be considered against the thermal and other properties of glazing.

**Natural Ventilation**

4.5 Maximum use of natural ventilation is appropriate in most circumstances and is a more sustainable option than air conditioning systems. The simplest method is to create opportunities for cross ventilation. Openings on opposite walls (or even adjacent walls) can draw air through a space. Windows should be openable, if possible, and trickle vents or other such devices should be installed to provide controllable background ventilation. Mechanical ventilation may be required to supplement natural ventilation but this can be very energy efficient, requiring only small levels of energy to run, yet achieve significant benefits in a development. Natural ventilation can also be achieved through the use of 'passive stack effect' and pressure differentials to bring cool fresh air form outside the building without the use of mechanical systems. Design should ensure that cool air is introduced in summer and warm air in winter in order to reduce heating and cooling loads.

**Thermal Mass**

4.6 The use of internally exposed thermally massive materials with a high specific heat capacity can have beneficial effects through their ability to absorb solar radiation received during the winter months and to store cool air absorbed during the night in the summer months. Generally, heavy materials such as stone and concrete have a high specific heat capacity whilst more lightweight materials such as wood have a lower specific heat capacity. Thermally massive materials should be internally located (i.e. inside the insulated layer) so that the internal air temperatures can benefit from the diurnal and inter-seasonal stabilising effects. Thermal mass located externally could be utilised to precondition incoming ventilation.

**Insulation**

4.7 To maximise energy efficiency the heat losses from the building envelope must be kept to a minimum with maximum air tightness. Heat loss can be prevented by applying high levels of insulation to the roof, walls and floors. Heat loss from windows can be further reduced through double or triple glazing, however, adequate ventilation without draughts is essential to avoid condensation problems.

**Green and Brown Roofs**

4.8 A green roof is a roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane. It may also include additional layers such as a root barrier and drainage and irrigation systems. Brown roofs work on the same concept but with a broken substrate, e.g. broken bricks replacing the organic growing medium. Green and brown roofs can also provide buildings with greater thermal mass, i.e. prevent heat loss in winter as well as keeping buildings cool in summer. They are therefore an important example of the kind of technique that can help with adaptation to climate change. They also provide important habitats for wildlife and reduce the speed at which rain water runs off buildings as the vegetation absorbs some rainwater.

**Green walls and living walls**

4.9 A green wall is a wall, either free-standing or part of a building that is partially or completely covered with vegetation and, in some cases, soil or an inorganic growing medium. The vegetation for a green façade is always attached on outside walls; with living walls this is also usually the case, although some living walls can also be green walls for interior use.

4.10 Living walls may also be a means for water re-use. The plants may purify slightly polluted water (such as greywater) by absorbing the dissolved nutrients. Bacteria mineralise the organic components to make them available to the plants. Living walls are particularly suitable for cities, as they allow good use of available vertical surface areas. They are also suitable in arid areas, as the circulating water on a vertical wall is less likely to evaporate than in horizontal gardens. The living wall could also function for urban agriculture, urban gardening, or for its beauty. It is sometimes built indoors to help alleviate poor indoor air quality.

**Landscaping and Energy Efficiency**

4.11 Landscaping should be carefully considered in the design of garden space. If solar gain is needed, any trees that need to be retained as part of the development should ideally be sited in relation to the development so that they are not overshadowing the new development.. However, planting can also help avoid overheating in the afternoon. If solar gain is not needed, trees can provide important cooling benefits and help a building to adapt to a warming climate. A careful balance must be struck between shading and solar gain.

**Energy Efficient Appliances**

4.12 Appliances provide heat, light and other essential services and are major consumers of energy. The careful choice of appliances can reduce energy demand, and therefore costs, significantly. Domestic properties should as far as possible use the most energy efficient appliances, in particular energy and water efficient white goods.

## 5 CLIMATE CHANGE ADAPTATION

5.1 In the UK the main impacts of climate change have been identified as:

- Warmer, wetter winters;
- Hotter, drier summers;
- Extreme rainfall events possibly happening more often;
- An increase in the frequency and intensity of extreme weather events;
- Rising sea levels;
- Possible intensification of the urban heat island effect; and
- Higher wind speeds.

In Reading, many residents already experience difficulty heating and cooling their homes. These issues may worsen with climate change. Adaptation measures will help to achieve Reading Borough Council's Corporate Plan aim of improving access to decent housing to meet local needs. This SPD will help to improve Reading's housing stock and make it fit for the future.

5.2 It is vital that the effects of climate change are considered over the lifetime of a development, especially with regard to its location and design. If they are not, then the long term sustainability and fitness for purpose of the development could be compromised.

5.3 Adaptation means altering lifestyles, communities, physical environment and infrastructure to respond to climate change. Adaptation often includes building up the capacity to adapt as well as minimising, adjusting to and taking advantage of the consequences of climatic change.

**Contribution of Trees and Landscaping**

5.4 Trees and woodlands can provide a significant contribution to helping adapt to and minimise the impacts of climate change, through helping to reduce flood risk, improving air quality through absorption of vehicle emissions and providing wildlife corridors. They can help to dissipate the impact of heavy rainfall, reduce urban temperatures, and provide shade and protection against the detrimental effects of sunlight. The preference will be to, where possible, use large canopy species that provide more benefits for climate adaptation. There will also be a need to use tree species that can themselves adapt to changing climate conditions particularly the higher temperatures and potential drought conditions in summer.

5.5 Deciduous trees in particular are very beneficial. They allow sunlight to reach buildings during the cooler winter months and protect from sunlight (UV) and overheating during the warmer summer months. Species selection and siting should be carefully considered to maximise the ecosystem benefits of trees on a development site.

5.6 When combined with other measures, or integral, as part of sustainable urban drainage schemes, trees have a major role to play in both the development of green infrastructure and reduction of flood risk relating to new development, alongside other landscaping, such as green roofs.

5.7 A two pronged approach will be required. Firstly, applicants will be expected to demonstrate how their landscaping plan has taken into consideration the impacts of climate change with regards to their species selection, location of planting and in terms of the management of the landscaping. Secondly, applicants should ensure that trees and landscaping play a role in helping to mitigate the impacts of climate

change through integration of planting within SuDS provision as opposed to a separate provision, i.e. tree pits and landscape areas as attenuation features. This will require, for example, specific tree pit design, linked tree pits where feasible and linking of green roof runoff into tree pits. This will be expected as the default position and non-green SuDS provision only accepted where justified.

5.8 Development will not be permitted which would undermine current levels of soft landscape provision, particularly tree cover as this is likely to be damaging to climate change adaptation strategies. Conversely, the introduction of well-planned and well maintained urban tree cover can greatly increase the adaptive capacity and resilience of urban areas.

## 6 WATER MANAGEMENT

### Reducing consumption

6.1 Water consumption in the South East has grown significantly in recent years and has the highest per capita consumption rate in the UK. The reasons for this growth in consumption include the greater use of water intensive white goods such as washing machines and the growth in the number of households. Furthermore, a significant part of the Reading area is at risk of flooding, being located within the floodplain. As such, it is important to improve efficiency in the use of water, conserve water supplies and minimise the risk of flooding.

6.2 The Government has set a small number of 'optional' national standards over and above the Building Regulations minima, which include water efficiency. Local Planning authorities can choose to apply the higher 'optional' standard in their area through incorporating a policy in a Local Plan. RBC has chosen to include the optional water efficiency standard in policy H5. For clarity, the higher water efficiency standard set out in the Building Regulations is 110 litres per person per day.[20]

6.2 Provision of water butts or community storage facilities to collect rainwater is a simple low cost measure. Where possible, roof areas should drain to a single down pipe supported by a water butt. Green roofs can help retain up to 60% of rainwater which is returned to the atmosphere via plants (evapotranspiration reducing the amount of water filling sewers and being processed). The remainder gently trickles off buildings and helps to prevent flash flooding. Untreated rainwater can be used for watering plants, gardens and topping up garden ponds. Rainwater should be treated using filtration if the water is used for toilet flushing or cleaning.

6.3 Buildings can be designed to allow recycling of grey water for purposes that do not require mains supplies such as flushing toilets and gardens/green space irrigation. It should be noted that the use of grey water for some non-potable uses such as washing up will normally require physical and chemical processes to ensure that they remove pathogenic micro-organisms.

6.4 Installing water saving devices can reduce consumption levels considerably. These include low flush toilets, aerating taps and low flow shower heads. Developers are encouraged to engage with water utility companies at the earliest opportunity in order to ensure that water and waste water provision is considered at an early stage in the design of development.

### Sustainable Drainage Systems (SuDS)

6.5 Implementation of the SuDS approach, as opposed to conventional drainage systems, provides several benefits, and is a requirement for major development. Appropriately designed, constructed and maintained SuDS can improve the sustainable management of water for a site by reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream, improve water quality by removing pollutants from diffuse sources and reducing potable water demand through rainwater harvesting.

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[20] Where references to the Building Regulations in the policy change, the requirement shall be taken to refer to the most up-to-date standard.

6.6 In the past, traditional drainage has contributed to habitat disruption and pollution. SuDS are made up of one or more structures built to manage surface water runoff and are a mandatory requirement for major development according to national guidance. Used in conjunction with good site management, these systems prevent flooding and pollution. SuDS should ensure that development does not result in any additional surface water run-off when compared to the site pre-development. SuDS improve water quality and can provide other social, environmental and economic benefits for residents and developers.

6.7 This SPD is not intended as a detailed design guide. Applicants should refer to the CIRIA SuDS Manual C753[21].

6.8 All major developments must incorporate SuDS as appropriate (as outlined in Policy EN18: Flooding and Sustainable Drainage Systems of the Local Plan) and in line with the Government's Technical Standards[22]. Smaller schemes are encouraged to incorporate SuDS, where possible. SuDS must be integrated into designs from the beginning and early discussions with the Local Planning Authority are highly encouraged, as this can prevent issues during the application stage especially on large sites.

6.9 The Government's Technical Standards state minimum technical standards in terms of peak flow control, volume control and flood risk. SuDS should also contribute to biodiversity and create habitats that can be included as part of wider green infrastructure. Integrating SuDS should improve the visual quality of the area and increase amenity value. Opportunities to retro-fit SuDS into redevelopment of existing sites should be considered.

**Permeable Surfaces**

6.10 In most types of concrete and paving, the stability of the surface is maintained by excluding water from the underlying soil. The vast area of impermeable surfaces created by modern development increases the water runoff and risk of surface water flooding. It may also add to problems of pollution downstream from urban areas. Permeable surfaces can resolve this issue. These are surfaces that water can pass through, such as gravel, reinforced glass and concrete that has been designed with a system of voids.

6.11 Permeable pavement is an alternative to conventional paving in which water filters through the paved structure rather than running off it. Both the surface and the subgrade need to be designed with this function in mind. Water may be allowed to infiltrate directly into the subsoil where conditions are suitable. Alternatively, it can be held in a reservoir structure under the paving for re-use, infiltration or delayed discharge.

[21] A free copy of the manual is available for download at https://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx

[22] https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards

## 7 WASTE REDUCTION

7.1 Policy CC5 of the Local Plan requires that development should demonstrate measures to minimise the generation of waste in the construction, use and life of buildings. Development should also promote more sustainable approaches to waste management, including re-use and recycling of construction waste and promotion of layouts and designs that provide adequate space to facilitate waste storage, re-use, recycling and composting.

7.2 The Council's Waste Minimisation Strategy 2015 – 2020[23] sets out how Reading will improve the way it manages waste with a growing population, an increase in the number of households and limited resources. The strategy was developed under the re3 joint waste partnership and reflects the re3 Joint Waste Strategy with the aim of slowing the projected growth in waste in the Borough.

7.3 Waste reduction, however, is not solely a planning issue, but planning has an important role to play in helping the Borough achieve the waste reduction targets. As identified in policy CC5 of the Local Plan, there are two aspects to minimising the generation of waste; firstly reducing waste during construction to include re-use and recycling of construction waste, and secondly minimising the generation of waste during the use and life of buildings to include the provision of adequate facilities for waste storage.

7.4 Examples of low-impact building materials include timber, earth, straw, secondary aggregates and recycled products. Plastic, steel and aluminium, for example, are higher-impact materials. If possible, materials should be produced locally and from sustainable or certified sources (e.g. timber certified by the Forest Stewardship Council.)

### Waste Hierarchy

7.5 There are three basic strategies for dealing with waste: reduce, re-use, recycle, and only as a last resort, dispose. This hierarchy is outline below[24].




[23] http://www.reading.gov.uk/media/2525/WM-Strategy/pdf/WM_Strategy.pdf

[24] Guidance on Applying the Waste Hierarchy, DEFRA, 2011.

7.6 Waste minimisation sits at the top of the hierarchy, making it the primary objective in any waste strategy.

7.7 The UK Government has introduced a landfill tax, aggregate levy and other waste management regulations to encourage the diversion of waste from landfill, promote re-use and recycle strategies and emphasis environmental responsibilities [25].

**Measures that Applicants Should Consider**

7.8 Measures that applicants should consider to achieve the aims of policy CC5 could include:

*Reducing waste during construction*

- A Site Waste Management Plan (SWMP) should be developed at the pre-application stage to inform the adoption of good practice waste minimisation in design. The SWMP sets targets for waste reduction and recovery based on an assessment of the likely composition and quantity of waste arising and identification of the most significant cost-effective options for improvements. This should be supplemented by information on how the targets would be achieved during construction activities and how the actual levels of waste reduction and recovery would be monitored for comparison with the targets set.
- Re-use and refurbish buildings where possible and appropriate, rather than demolishing existing buildings and redeveloping them.
- Re-use building materials where possible. This is already often done when works are carried out to historic buildings to ensure materials match and the character and appearance is conserved. This can reduce the environmental impact of new development through a reduced demand for new materials and reduced levels of waste to be disposed of in landfill sites.
- Where demolition is appropriate, a strategy should be devised for the handling and re-use or disposal of demolition waste. This should include an audit of the materials present on site and an assessment as to the extent to which they could be put to use in the new development or in other developments elsewhere. By re-using demolition waste, the environmental impact of new development can be reduced and savings can be made on the costs of landfill.
- Developers should outline where they will be transporting waste to in order to ensure they are considering the most appropriate option and transporting waste the minimum journey possible.
- Developers should be encouraged to use recycled and secondary aggregates in construction, thereby reducing the demand for virgin material. This could help to secure a credit under the BREEAM standard.
- New building materials should not be over-ordered. Better communication between building professionals should be developed to ensure exact calculations of required materials are made to help ensure waste is prevented.
- Just-in-time delivery strategies can further reduce waste that is developed by improper storage and damage of materials. Materials that can be re-used or recycled need to be identified early on in the build process and segregated for easy storage, collection and transfer.

[25] https://www.gov.uk/green-taxes-and-reliefs/landfill-tax

*Minimising waste during the use and life of buildings*

- Submission of plans illustrating adequate space to facilitate waste storage, re-use, recycling and composting. This forms a mandatory element of the BREEAM standards. Residents must be provided with adequate storage for residential waste.
- Appropriate development (e.g. residential, education, etc) should seek to incorporate facilities to compost household waste, reducing the amount of household waste sent to landfill.
- Adequate provision for both internal and external storage of waste should be provided. This space should be an integral part of the design of the proposal and not merely added on at the end of the process.
- Development should consider the incorporation of the following strategies within the developments to help reduce waste:
    - Greywater recycling
    - Composting toilets
    - On site food composting
    - Off-site recycling facilities

7.9 Although some aspects of water consumption are dealt with elsewhere in this document, some parts overlap with this waste section and are therefore referred to here. As mentioned above, the BREEAM standards have waste categories, helping applicants achieve the requirements of policy CC5 of the Local Plan.

7.10 The Government has recently published the Resources and Waste Strategy Policy Paper for England[26]. Applicants should review these policy intentions in order to future-proof plans for development.

[26] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/765914/resources-waste-strategy-dec-2018.pdf

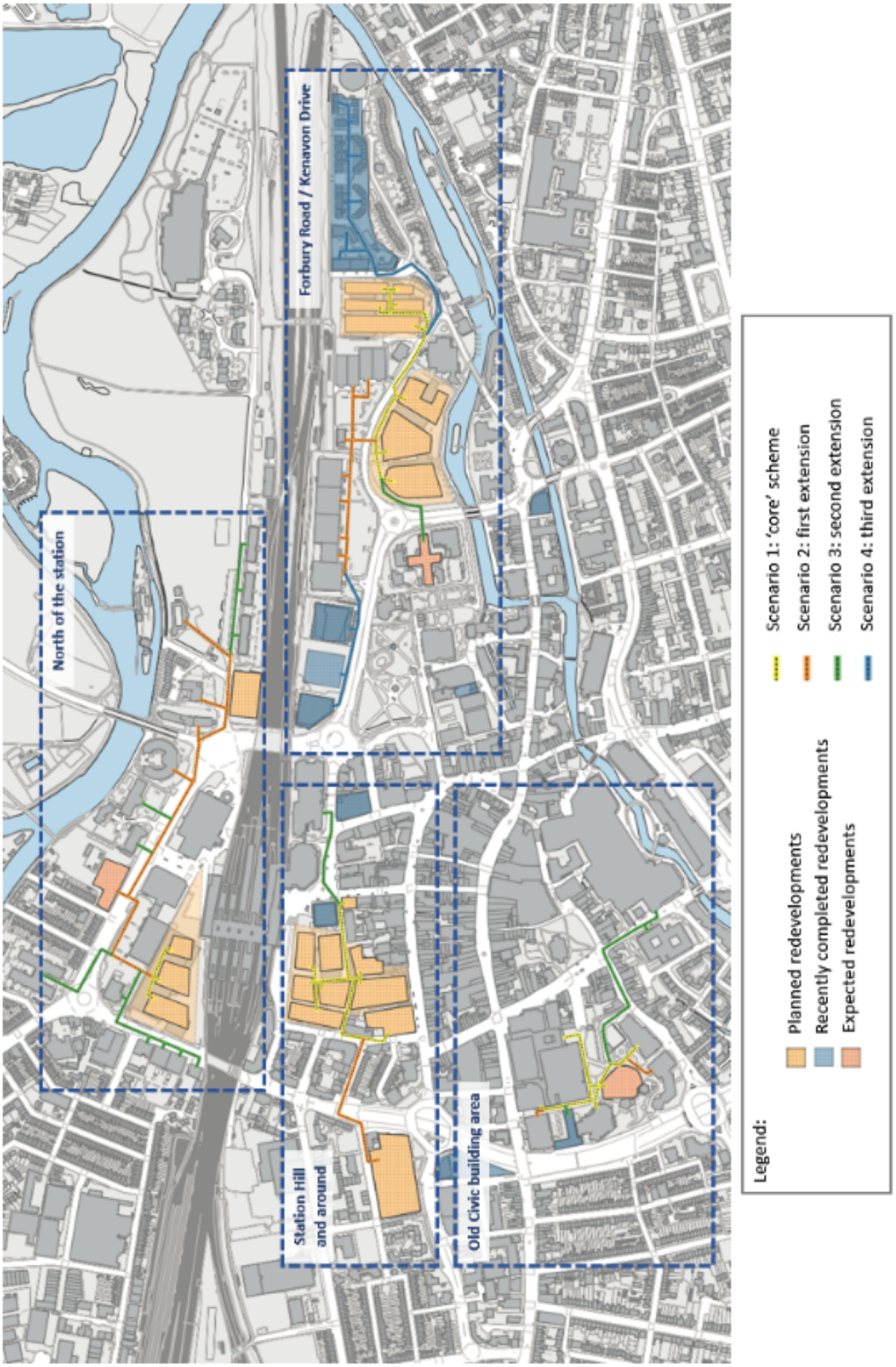
## 8 SITE SPECIFIC CONSIDERATIONS

8.1 Element Energy was commissioned by RBC to undertake a heat mapping and energy masterplanning study for Reading town centre. The number of anticipated redevelopment sites and existing density of domestic and non-domestic energy uses present an opportunity to establish heat network schemes.

8.2 Based on heat mapping and constraints analysis, the following four clusters were identified as potentially suitable for heat network schemes:

| Cluster | Relevant Local Plan site allocation |
|---|---|
| North of the station – centred on the large Royal Mail redevelopment and could include the current SSE building and the Coopers sites, as well as existing retail space in Vastern Court Retail Park and large office buildings north of Vastern Road and along Napier Road | CR11e: North of Station<br>CR11f: West of Caversham Road<br>CR11g: Riverside<br>CR11h: Napier Road Corner<br>CR11i: Napier Court<br>CR14m: Caversham Lock Island |
| Station Hill and around – centred on seven plots of the large Station Hill redevelopment site and includes three other planned redevelopments at Sainsbury's, Garrard House and Weldale Street. | CR11a: Friar Street and Station Road<br>CR11b: Greyfriars Road Corner<br>CR11c: Station Hill and Friars Walk<br>CR11d: Brunel Arcade and Apex Plaza<br>CR12a: Cattle Market<br>CR12b: Great Knollys Street and Weldale Street<br>CR14b: Former Reading Family Centre, North Road |
| Old Civic building area – available land where the RBC office was located before it was demolished and includes various large existing buildings in the area, e.g. the Oracle, Broad Street Mall, the Hexagon theatre, the police station and/or the Magistrate's Court. | CR10b: Tall Buildings, Western Grouping<br>CR12c: Chatham Street, Eaton Place and Oxford Road<br>CR12d: Broad Street Mall<br>CR12e: Hosier Street<br>CR14g: The Oracle Extension, Bridge Street and Letcombe Street |
| Forbury Road and Kenavon Drive – two major redevelopment sites, the Toys R Us and Homebase site, and the Kodak and Ventello site. It may also include recent completions at Forbury Place and 42 Kenavon Drive, Forbury Retail park and the Reading prison site. | CR10c: Tall Buildings, Eastern Grouping<br>CR13a: Reading Prison<br>CR13b: Forbury Retail Park<br>CR13c: Forbury Business Park and Kenavon Drive<br>CR13d: Gas Holder<br>CR14e: 3-10 Market Place, Abbey Hall and Abbey Square |

Figure 8.1 Overview of the four identified clusters (Element Energy)



8.3 A range of heat supply technologies were assessed:

| Option | Pros | Cons |
|---|---|---|
| **Water-source heat pumps (WSHP)** | ✓ Potential to be very **low carbon**<br>✓ Can be relatively cost-effective where **supported by RHI**<br>✓ Where **cooling** is also required, economics improved significantly | • **High capital cost**<br>• Requires substantial **electrical grid capacity**<br>• Some risk of RHI support being reduced/withdrawn |
| **Gas combined heat and power (CHP)** | ✓ **Mature and proven** technology<br>✓ Relatively **cost-effective** without subsidy<br>✓ Opportunity to deliver **on-site electricity** | • **Fossil fuel-based**, so carbon savings may not be large (and may be negative in future) |
| **Biomass boiler / Biomass CHP** | ✓ Potential to be very **low carbon**<br>✓ Biomass boiler - Cost-effective option where **supported by renewable heat incentive** (RHI) | • **Regular deliveries** and/or large **storage** required for biomass<br>• **Air Quality** and environmental issues<br>• Some risk of RHI support being reduced/withdrawn<br>• Biomass CHP - **High capital cost** |
| **Waste heat from industry, power and Energy-from-Waste plants** | ✓ Potential to be **very low cost heat**<br>✓ **Very low carbon** (exact carbon intensity depending on source) | • Unless heat source close to demand centres, heat transmission cost can be high<br>• Likely to have some downtime so additional backup plant required<br>• None available in town centre |

Figure 8.2 Summary of Heat Supply Options Pros and Cons (Element Energy)

8.4 A detailed technical and economic assessment identified several potentially deliverable heat network scheme options centred on the four clusters. These would reduce energy costs and carbon emissions, as well as improve air quality and increase inward investment, spurring local economic growth. Almost all scheme options in all four clusters were found to be viable, some with additional financial support and some without.

8.5 Water Source Heat Pump (WSHP) was determined to be the most viable heat supply option for schemes in all four clusters. At the time of writing, all four clusters are entering detailed feasibility analysis.

## APPENDIX 1: SUSTAINABLE DESIGN AND CONSTRUCTION CHECKLISTS

A1.1 The two sustainable design and construction checklists are based on the BREEAM standards but are not a complete repetition of these requirements. They are intended to help provide pointers as to the type of considerations that the development should be taking into account in order to achieve relevant standards of the BREEAM and/or Zero Carbon Homes and thereby comply with policies CC2-CC5, EN18 and H5. These checklists form the basis of Sustainability Statements.

Table A1.1: RESIDENTIAL DEVELOPMENT – SUSTAINABLE DESIGN CHECKLIST

| Sustainable Design Checklist |
|---|
| Energy/$CO_2$ |
| *Aim: To conserve energy, in particular carbon dioxide emissions and maximise the use of energy efficient techniques.*<br><br>1. How has the development been designed to optimise the use of the energy from the sun and limit heat losses?<br>2. How has the development been designed to optimise natural daylighting, energy efficient lighting, external lighting and natural ventilation?<br>3. How will the design of the building make efficient use of energy? (e.g. use of thermally massive materials, levels of insulation, energy efficient white goods and use of green/brown roofs etc.).<br>4. Has local energy generation from renewables and/or decentralised energy been considered as part of the scheme?<br>5. How have cycle storage facilities been considered?<br>6. Does the development meet the requirements of policies H5? Is this clearly illustrated?<br>7. Is a Section 106 contribution required? If so, what amount? |
| Water |
| *Aim: To improve efficiency in the use of water, conserve water resources and minimise vulnerability to flooding.*<br><br>8. How will the development incorporate the use of water saving devices to achieve the higher water efficiency standard under Regulation 36(3) of the Building Regulations?[27]<br>9. How will the development incorporate recycling rainwater and reduce the use of potable water?<br>10. Has the collection, treatment and re-use of grey water been considered? If so, how will these facilities be incorporated within the development? |
| Materials |
| *Aim: To retain local character and promote the use of materials with a low environmental impact.*<br><br>11. How will the selected materials help retain local character, ensure long life and ensure a low environmental impact? |
| Surface Water Run-off |
| *Aim: To reduce flooding, pollution and other environmental damage.*<br><br>12. How has the development considered flooding and pollution?<br>13. Has the design considered the use of sustainable drainage systems (SuDS) and how will they be incorporated within the development? |

[27] This refers to the 2015 Building Regulations.

| |
|---|
| 14. Does the development meet the requirements of policy EN18? |
| Waste |
| *Aim: To minimise the production of waste and maximise re-use and recycling.*<br><br>15. How will the development minimise waste sent to landfill?<br>16. How will the development make the maximum use of construction and demolition waste?<br>17. How will the development make maximum use of re-used and recycled materials?<br>18. How will provision be made for the storage and recycling of waste for all users of the site? |
| Pollution |
| *Aim: To minimise damage to the environment through air, ground/surface water, land, noise or light pollution.*<br><br>19. What measures have been incorporated to ensure that noise and light pollution will be minimised through the development?<br>20. What measures have been incorporated to reduce nitrogen oxide emissions and reduce the global warming potential of insulants?<br>21. What measures have been incorporated to reduce the release of pollution into the atmosphere? |
| Health & Well-being |
| *Aim: To improve the quality of life in homes through good daylighting, improved sound insulation, provision of outdoor space with good accessibility.*<br><br>22. How has the development been designed to maximise natural lighting, reduce the likelihood of noise complaints, incorporate private outdoor space and ensure the layout of the development can be easily adapted to meet the needs of future occupants? |
| Management |
| *Aim: To manage the site in an environmentally and socially considerate manner.*<br><br>23. What measures have been taken to ensure the construction of the site is managed in an environmentally and socially considerate manner, mitigating environmental impacts?<br>24. How has the development been designed to ensure people feel safe and secure? |
| Ecology |
| *Aim: To retain, protect and enhance wildlife habitats and natural features.*<br><br>25. How have the wildlife habitats and natural features on and adjacent to the site been considered and how will they be retained, protected and enhanced? |

Table A1.2: SUSTAINABLE DESIGN CHECKLIST FOR NON-RESIDENTIAL DEVELOPMENT

| |
|---|
| SUSTAINABLE DESIGN CHECKLIST |
| Management |
| *Aim: To recognise and encourage environmentally and socially considerate development.*<br><br>1. Will guidance for the non-technical building user be provided so they can understand and operate the building efficiently and understand how the design reduced the overall environmental impact of the building and raise environmental awareness? |

2. What consideration has been given to resource use, energy consumption and pollution in terms of the construction site impacts?
3. Will site investigation and appropriate remedial action be undertaken?
4. Will the community and stakeholders be involved in the design process encouraging flexibly designed buildings which cater for shared use with the local community?
5. How has the building been designed to reduce the opportunity for and the fear of crime?
6. What consideration has been given to the maintenance of the building?

Health and Well-being

*Aim: To ensure a good quality amenity level is afforded to occupants of buildings.*

7. How has the development been designed to ensure users have sufficient daylight, an external view, adequate and appropriate lighting, ventilation, air quality and drinking water?

Energy

*Aim: To conserve energy and maximise the use of energy efficiency techniques.*

8. How has the building been designed to minimise $CO_2$ emissions associated with their operational energy consumption?
9. How has the development been designed to optimise the use of the energy from the sun, natural daylighting and controlled natural ventilation?
10. How will the design of the building make efficient use of energy? (e.g. use of thermally massive materials, levels of insulation and use of green/brown roofs etc.).
11. Have renewable energy sources or decentralised energy been considered for this development and if so, how would they be incorporated within the development?

Transport

*Aim: To reduce the need to travel through appropriately located development.*

12. How has the design and layout incorporated measures to reduce the need to travel, especially by car, and promote alternative and sustainable modes of transport such as walking, cycling and the use of public transport?
13. How have public transport networks been considered in terms of the location of the development and proximity to local amenities?
14. How have deliveries and the manoeuvring of delivery vehicles been considered?

Water

*Aim: To improve efficiency in the use of water, conserve water resources and minimise vulnerability to flooding.*

15. How will the development incorporate the use of water saving devices to achieve a maximum consumption of 5.5 cubic m per year per person for office developments? (or the most appropriate benchmark for other types of development).
16. Will the development and access to and from it such as roads and paths be located away from areas of potential flooding?
17. How will the development incorporate harvesting and re-use of rainwater?
18. Does this development meet the requirements of EN18?

Materials

*Aim: To retain local character and promote the use of materials with a low environmental impact.*

19. How will the selected materials help retain local character, ensure long life and ensure a low environmental impact?
20. What consideration has been given to reusing materials in-situ, responsibly sourcing materials and re-using existing structures?

| Waste |
|---|
| *Aim: To minimise the production of waste and maximise re-use and recycling.* |

21. Has an audit of the materials present on the site been conducted with an assessment of the extent to which materials could be re-used?
22. How will the development make the maximum use of construction, demolition waste and recycled materials?
23. How will provision be made for the storage and recycling of waste for all users of the site?

| Land Use and Ecology |
|---|
| *Aim: To retain, protect and enhance wildlife habitats and natural features.* |

24. How have the wildlife habitats and natural features on and adjacent to the site been considered and how will they be retained, protected and enhanced?
25. What consideration has been given to not using previously undeveloped land?
26. What consideration has been given to the removal of contamination from the land?

| Pollution |
|---|
| *Aim: To minimise damage to the environment through air, ground/surface water, land, noise or light pollution.* |

27. What measures have been incorporated to ensure that noise and light pollution plus pollution transported through surface water runoff will be minimised through the development?
28. What measures have been incorporated to ensure that light pollution will be minimised through the development?
29. What consideration has been given to reducing refrigerants and minimising nitrogen oxide emissions?
30. How has the development been sited to minimise the impact of flooding?
31. How has the design considered the use of sustainable drainage systems (SuDS) and how will they be incorporated within the development?

| Innovation |
|---|
| *Aim: To recognise innovation in the field of sustainability.* |

32. What consideration has been given to innovative sustainability measures in terms of a procurement strategy, design feature, management process or technological development?

## APPENDIX 2: ENERGY EFFICIENCY AND RENEWABLE AND LOW CARBON ENERGY SOURCES

a. **Decentralised Energy Supply**
Energy supply from local low-carbon sources either on-site or near-site, but not remote off-site. These are usually on a small scale. Decentralised energy is a broad term used to denote a diverse range of technologies, including micro-renewables, which can locally serve an individual building, development or wider community and includes heating and cooling energy.

b. **Combined Heat and Power/Combined Cooling Heat and Power (CHP/CCHP)**
This simultaneous generation of usable heat and power (usually electricity) in a single process, thereby reducing wasted heat and putting to use heat that would normally be wasted to the atmosphere, rivers or sea. CHP is an efficient form of decentralised energy supply and provides heating and electricity at the same time. CHP units generate electricity through an engine and capture the by-product, combustion heat, for use in heating and hot water systems. Opportunities for CHP can be exploited in mixed used development, large buildings (offices, shopping centres), hospitals and leisure centres and refurbished buildings through the use of district heating systems.

c. **District Heating**
District heating systems are an effective means of distributing heat generated in a centralised location for residential or commercial heating requirements. District heating plants can provide higher efficiencies and better pollution control that localised boilers and should be considered in larger development.

d. **Solar Water Heaters**
Solar water heating involves the use of solar collectors (panels containing fluid) that absorb the sun's heat and use this to heat water contained within a storage tank. Solar collectors can be installed at low level or on the roof of a building or incorporated as part of the roof finish. The optimum location is facing slightly west of due south and at a tilt of 30-40°, although a collector set anywhere between east and west and at a tilt of between 10° and 60° will perform at 90% of the optimum performance.

e. **Solar Thermal Heating Systems**
Solar thermal heating systems (STHS) utilise thermal energy from the sun to supply heat to hot water systems – as opposed to generating electricity, which is a separate technology (see photovoltaic below). This is achieved by using a solar collector filled with liquid, which absorbs heat from the radiation coming from the sun and transfers this heat via a heat exchange system to a dual coil (or supplementary) hot water tank that is also attached to the main boiler or immersion for backup as and when required.

f. **Photovoltaic (PV) Arrays**
Solar photovoltaics (PV) are a semiconductor-based technology that converts the sun's energy into electricity. This is one of the easiest renewable energy systems to install in the urban environment as PV panels can be fixed to or form an integral part of the roof covering, do not require any additional land and do not require the specific topographical features that other forms of renewable energy do. PV arrays now come in a variety of shapes and colours, ranging from grey 'solar tiles' that look like roof tiles to panels and transparent cells that can be used on conservatories. PVs can be used to provide extra power for customers already

connected to the natural grid or can also provide the only source of electricity for a building.

g. **Small scale wind energy**
A small wind turbine has a hub height of between 6 and 25 metres and is rated at between 1 and 25 kilowatts (kW). The amount of energy generated is determined by the wind speed and the area swept by the blades. Blade shape and rotation speed determine efficiency. The electricity generated is direct current (DC) and is therefore converted to alternating current (AC) by one or more inverters. Such machines, depending on the wind regime, can generate enough power for one house through to larger housing or commercial developments. A new generation of small-scale, building mounted wind turbines is now available.

**h. Biomass**
Energy from biomass is produced from organic matter of recent origin. It does not include fossil fuels, which have taken millions of years to form. Although there are many different forms of biomass, wood fuel is the most common for heat production. As the wood is burned $CO_2$ is released, but this will be equivalent to the amount absorbed by the plant when it was growing. There are emissions associated with the production and transportation of wood fuel, but if transportation distances are short (no more than 25 miles), the use of wood to generate heat is generally regarded as being carbon neutral. To be sustainable, the rate of use must be the same or less than the rate of natural replenishment. Therefore, it is important to ensure that fuel supply is from a managed renewable source.

**i. Small Scale Hydropower**
Water is taken from a river or stream. Usually it comes from behind a weir or a small dam. From there the water drops down a pipe (called the penstock) to turn a turbine. The height of the drop (called the head) is one of the significant aspects of whether a site will be suitable. The greater the head, the more power is generated. The turbine is located in a powerhouse with a generator, transformer and the control equipment. From there the power generated can be used directly to power your house, stored in batteries or exported to the grid. Once it has left the turbine, the water returns to the river along another canal (the tailrace).

**j. Energy from Waste**
An Energy from Waste (EfW) facility can take waste from households, businesses and industry and use it for recycling and energy recovery. Energy recovery is widely used as a way of gaining value from waste. Vitally, this technology also plays a key role in reducing reliance on landfill and meeting renewable energy targets. Energy can be generated from organic waste products in the form of slurry such as sewage, animal wastes and waste products from the food industry. A digestion process provides a gaseous product composing of methane and carbon dioxide. The gas can be used as fuel in an engine for electricity production or it can be used for heating purposes to power a boiler.

**k. Ground Source Heat Pumps**
Ground source heat pumps make use of the natural heat capacity in the soil to provide heating and cooling to buildings. The temperature just a couple of metres down into the earth is roughly constant all year round at 12 degrees C in the UK. The difference between this constant temperature and fluctuating air temperature can be harnessed through a network of underground pipes. Water is pumped through the pipes absorbing the ground heat, which can be used to provide

relatively cheap heating for buildings in the winter months and cooling in the summer months. It works best with under floor heating systems in maximising the heating and cooling effect.

l. **Air Source Heat Pumps**

Air source heat pumps take energy from the air and raise it to a higher temperature, using a process which is similar to a reverse refrigeration process. For commercial and large spaces a row or bank of air source heat pumps (air handling units) will be required along with an internal heat pump and a pressured hot water tank for ongoing water usage. This is a system which utilises no external pipes and most of the working elements reside within building. The air handling unit draws air across the water and anti-freeze solution and transfers this energy into the refrigerant. The refrigerant boils and the gases from this are compressed to produce temperatures in excess of 100 degrees C. This part of the process mirrors a ground source heat pump. Air source heat pumps can be used in many more applications including large commercial projects where land space is restricted. Air source heat pumps can be used as a complete solution for room heating using the same distribution system as a ground source heat pump or a traditional system. Air source heat pumps are ideal for very tight spaces and within an eco-architectural design or within the design of a building which has large internal spaces such as audience halls and public places.

**APPENDIX 3: POLICY TEXT**

This SPD supplements the Reading Local Plan, particularly policies CC2, CC3, CC4, CC5, EN18 and H5. These policies are stated below:

***CC2: SUSTAINABLE DESIGN AND CONSTRUCTION***

***Proposals for new development, including the construction of new buildings and the redevelopment and refurbishment of existing building stock, will be acceptable where the design of buildings and site layouts use energy, water, minerals, materials and other natural resources appropriately, efficiently and with care and take account of the effects of climate change.***

***To meet these requirements:***

- ***All major non-residential developments or conversions to residential are required to meet the most up-to-date BREEAM 'Excellent' standards, where possible;***

- ***All minor non-residential developments or conversions to residential are required to meet the most up-to-date BREEAM 'Very Good' standard as a minimum;***

- ***All non-residential development or conversions to residential should incorporate water conservation measures so that predicted per capita consumption does not exceed the appropriate levels set out in the applicable BREEAM standard. Both residential and non-residential development should include recycling greywater and rainwater harvesting where systems are energy and cost effective.***

***CC3: ADAPTATION TO CLIMATE CHANGE***

***All developments will demonstrate how they have been designed to incorporate measures to adapt to climate change. The following measures shall be incorporated into development:***

- ***New buildings shall be orientated to maximise the opportunities for both natural heating and ventilation and reducing exposure to wind and other elements;***

- ***Proposals involving both new and existing buildings shall demonstrate how they have been designed to maximise resistance and resilience to climate change for example by including measures such as solar shading, thermal mass, heating and ventilation of the building and appropriately coloured materials in areas exposed to direct sunlight, green and brown roofs, green walls, etc;***

- ***Use of trees and other planting, where appropriate as part of a landscape scheme, to provide shading of amenity areas, buildings and streets and to help to connect habitat, designed with native plants that are carefully selected, managed and adaptable to meet the predicted changed climatic conditions; and***

- *All development shall minimise the impact of surface water runoff from the development in the design of the drainage system, and where possible incorporate mitigation and resilience measures for any increases in river flooding levels as a result of climate change*

***CC4: DECENTRALISED ENERGY***

*In meeting the sustainability requirements of this plan, developments of the sizes set out below shall demonstrate how consideration has been given to securing energy for the development from a decentralised energy source, including CHP.*

*Any development of more than 20 dwellings and/ or non-residential development of over 1,000 sq m shall consider the inclusion of a CHP plant, or other form of decentralised energy provision, within the site, unless it can be demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision.*

*Where there is existing decentralised energy provision, including a CHP plant or a district energy network present within the vicinity of an application site, further developments of over 10 dwellings or non-residential development of 1,000 sq m will be expected to link into the existing decentralised energy network or demonstrate why this is not feasible.*

***CC5: WASTE MINIMISATION AND STORAGE***

*Development should demonstrate measures to minimise the generation of waste in the construction, use and life of buildings and promote more sustainable approaches to waste management, including the reuse and recycling of construction waste and the promotion of layouts and designs that provide adequate, well-designed space to facilitate waste storage, reuse, recycling and composting.*

***EN18: FLOODING AND SUSTAINABLE DRAINAGE SYSTEMS***

*Development will be directed to areas at lowest risk of flooding in the first instance, following the Sequential and Exceptions Test set out in the NPPF, and taking into account the effects of climate change. It will consider flooding from all sources, including fluvial, surface water, groundwater and sewer flooding. Where development in areas at risk of flooding is necessary, it will not reduce the capacity of the flood plain to store floodwater, impede the flow of floodwater or in any way increase the risks to life and property arising from flooding. Wherever possible, development should be designed to reduce flood risk, both on- and off-site.*

*All major developments[28] must incorporate sustainable drainage systems (SuDS) as appropriate and in line with the Government's Technical Standards[29]. Smaller schemes are encouraged to incorporate SuDS, where possible. Runoff rates should aim to reflect greenfield conditions and, in any case, must be no greater than the existing conditions of the site. Schemes should ensure that the movement of water through vertical infiltration as well as horizontal run-off does not worsen contamination effects. Wherever possible, SuDS provision should maximise ecological benefits, link into the existing Green Network, incorporate tree planting and landscaping and avoid*

[28] 10 or more dwellings or equivalent non-residential or mixed developments

[29] Sustainable drainage systems non-statutory technical standards https://www.gov.uk/government/publications/sustainable-drainagesystems-non-statutory-technical-standards

*damage to existing significant trees, including through changes to the site hydrology. All new developments in areas of flood risk should give priority to SuDS.*

*<u>H5: STANDARDS FOR NEW HOUSING</u>*

*New build housing should be built to the following standards:*

a. *All new build housing outside the Central Area as defined on the Proposals Map will comply with the nationally-described space standard.*

b. *All new build housing will be built to the higher water efficiency standard under Regulation 36(3) of the Building Regulations[30] .*

c. *All major new-build residential development should be designed to achieve zero carbon homes;*

d. *All other new build housing will achieve at a minimum a 19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations.*

e. *All new build housing will be accessible and adaptable in line with M4(2) of the Building Regulations where it is viable, unless it is built in line with M4(3) (see below).*

f. *On developments of 20 or more new build dwellings, at least 5% of dwellings will be wheelchair user dwellings in line with M4(3) of the Building Regulations.*

[30] References are to the 2015 Building Regulations

## APPENDIX 4: GLOSSARY

**(AD L1A) Approved Document L1A**
The Building Regulations Approved Document L1A: Conservation of Fuel and Power in New Dwellings (2013 edition with 2016 amendments). Source: https://www.gov.uk/government/publications/conservation-of-fuel-and-power-approved-document-l

**Biodiversity**
The diversity of plant and animal species

**BREEAM**
A widely used means of reviewing and improving the environmental performance of buildings. BREEAM assessment methods generally apply to commercial developments (industrial, retail etc).

**Brownfield land**
Land which has been previously developed

**Brown roof**
A roof surfaced with a broken substrate, e.g. broken bricks

**Carbon Neutral Development**
Development that is truly zero carbon, meaning no $CO_2$ emissions are generated on-site

**Climate change adaptation**
Adjustments to natural or human systems in response to actual or expected climatic factors or their effects, including from changes in rainfall and rising temperatures.

**Climate change mitigation**
Action to reduce the impact of human activity on the climate system, primarily though reducing greenhouse gas emissions.

**Combined Heat and Power**
Combined Heat and Power (CHP) units generate electricity through an engine and capture the by-product, combustion heat, for use in heating and hot water systems.

**Community Infrastructure Levy (CIL)**
A charge which local authorities can charge on most types of new development in their area, to be spent on infrastructure to support the development of the area. CIL was introduced in Reading in April 2015.

**Decentralised energy**
Local renewable energy and local low-carbon energy usually but not always on a relatively small scale encompassing a diverse range of technologies.

**DER – Dwelling Emission Rate**
The DER is the estimated carbon dioxide emissions per $m^2$ per year ($Kg/CO_2/m^2/year$) for the dwelling, as designed. It accounts for energy used in heating, fixed cooling, hot water and lighting.

**Dwelling**
A single housing unit – a house, flat, maisonette, etc.

**Energy efficiency**
Making the best or most efficient use of energy in order to achieve a given output of goods or services, and of comfort and convenience.

**Green infrastructure**
A network of multi-functional green space, both new and existing, both rural and urban, which is capable of delivering a wide range of environmental and quality of life benefits for local communities.

**Mixed-use**
Where a site contains more than one use.

**Net $CO_2$ Emissions**
The annual dwelling $CO_2$ emissions ($KgCO_2/m^2/yr.$) as defined by the Building Regulations.

**Passive Stack Ventilation**
Passive Stack Ventilation is a means of removing unwanted moisture from dwellings.

**Planning condition**
A condition that is attached to planning permission.

**Planning obligation**
A legally enforceable obligation entered into under section 106 of the Town and Country Planning Act 1990 to mitigate the impacts of a development proposal.

**Regulated energy**
Energy use that is regulated by Part L of the Building Regulations, including space heating, hot water and lighting, as well as directly associated pumps or fans.

**Renewable and low carbon 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. Low carbon technologies are those that can help reduce emissions (compared to conventional use of fossil fuels).

**Section 106 agreement**
A legally binding agreement or obligation entered into by the local authority and a land developer over an issue related to a planning application, under Section 106 of the Town and Country Planning Act 1990.

**(SAP) Standard Assessment Procedure for Energy Rating of Dwellings**
The SAP is the methodology used by the Government to assess and compare the energy and environmental performance of dwellings. SAP quantifies a dwelling's performance in terms of:

- Energy use per unit floor area,
- A fuel-cost-based energy efficiency rating (the SAP Rating), and
- Emissions of $CO_2$ (the Environmental Impact Rating).

These are used in the production of energy performance certificates (EPCs) and to demonstrate compliance with AD L1A. SAP 2012 is currently used to assess new homes, but a more recent version (SAP10) has been published, but has not yet been adopted by Government.

**Surface Water Management Plan (SWMP)**
'A SWMP is a plan which outlines the preferred surface water management strategy in a given location. In the context surface water flooding describes flooding for sewers, drains, groundwater and runoff from land, small water courses and ditches that occurs as a result of heavy rainfall. The SWMP study is undertaken in consultation with key local partners. It should establish a long-term action plan to manage surface water in an area and should influence future capital developments.'[31]

**Sustainable Drainage Systems (SuDS)**
SuDS drain surface water from housing, non-residential or mixed use development for the lifetime of the development. These systems slow the rate of surface water run-off and improve filtration, by mimicking natural drainage in both rural and urban areas. This reduces the risk of "flash-flooding" which occurs when rainwater rapidly flows into the public sewerage and drainage systems.[32]

**TER – Target Emission Rate**
The Target Emission Rate is the maximum allowable carbon dioxide emissions per $m^2$ ($KgCO_2/m^2/year$) arising from energy used in heating, cooling, hot water and lighting which would demonstrate compliance with AD L1A.

**Unregulated energy**
Energy use that is not controlled by Park L of Building Regulations. This includes energy used for cooking, white goods and small power appliances.

**U-value**
A U-value is a calculation of the amount of heat lost through a building material. The value is calculated as heat (kW) lost per hour per square metre. Using this calculation, the lower the U-value, the more thermally efficient the building. A U-value measures the rate at which heat is lost through a material such as a double glazed unit meaning a frame and glass combined. The lower the U-value, the lower the amount of heat lost and the lower the amount of energy wasted.

**Zero carbon homes**
Achieves at least 35 per cent reduction in regulated[33] carbon emissions (beyond Part L 2013) on-site. The remaining carbon emissions (to 100 per cent) are to be offset through a cash in lieu contribution to be ring-fenced for carbon savings elsewhere within the Borough.

[31] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69342/pb13546-swmp-guidance-100319.pdf
[32] https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards
[33] Covers only those emissions which are within the scope of the Building Regulations, such as those from heating, ventilation, hot water, fixed lighting and building services.

## APPENDIX 5: RESOURCES FOR APPLICANTS

**Cost of Carbon Reductions in New Buildings, Centre for Sustainable Energy (2018).**
http://www.bathnes.gov.uk/sites/default/files/sitedocuments/Planning-and-Building-Control/Planning-Policy/LP20162036/cost_of_carbon_reduction_in_new_buildings_report_publication_version.pdf

**Energy and Sustainability Statements, Energy Council.**
https://www.energycouncil.co.uk/energy-sustainability-statements.html

**SuDS Manual, CIRIA (2007).**
https://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx

**Sustainable drainage systems non-statutory technical standards, DEFRA (2015).**
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf