

South Worcestershire

Water Management and Flooding

Supplementary Planning Document



Adopted
July 2018



The Town and Country Planning (Local Planning) (England) Regulations 2012**ADOPTION STATEMENT for Supplementary Planning Documents**

Notice is hereby given that, in accordance with regulation 14 of the above regulations the south Worcestershire councils (SWC) [Malvern Hills District Council, Worcester city Council, and Wychavon District Council] adopted the following Supplementary Planning Documents (SPD):

- a. On 17th July 2018 Malvern Hills District Council agreed to adopt the South Worcestershire Renewable and Low Carbon Energy SPD; The South Worcestershire Revised Developer Contributions SPD ;and the South Worcestershire Water Management and Flooding SPD
- b. On 23rd July 2018, Worcester City Council agreed to adopt the South Worcestershire Renewable and Low Carbon Energy SPD; The South Worcestershire Revised Developer Contributions SPD ;and the South Worcestershire Water Management and Flooding SPD
- c. On 25th July 2018, Wychavon District Council agreed to adopt the South Worcestershire Renewable and Low Carbon Energy SPD; The South Worcestershire Revised Developer Contributions SPD ;and the South Worcestershire Water Management and Flooding SPD
- d. That any person with sufficient interest in the decision to adopt any of the SPDs may apply to the High Court for permission to apply for judicial review of that decision.
- e. That any such application must be made promptly and in any event not later than 3 months after 26th July 2018

Area Covered:

The three Supplementary Planning Documents are applicable to Malvern Hills District, Worcester City Council and Wychavon District Council.

Subject Matters:**1. South Worcestershire Renewable and Low Carbon Energy SPD**

The Renewable and Low carbon Energy SPD sets out guidance on how the requirements in Policy SWDP 27 relating to Renewable and Low Carbon Energy should be applied. It includes guidance on what must be provided in Energy Assessments; Issues that need to be considered when examining the potential for decentralized energy and heat networks in large scale development proposals to comply with SWDP 27B; the various renewable and low carbon energy technologies and the planning issues associated with each technology that will need to be addressed.

Adoption Statement

2. The South Worcestershire Revised Developer Contributions SPD

The South Worcestershire Developer Contributions SPD sets out guidance relating to the collection of developer contributions, to be used when determining planning applications.

3. South Worcestershire Water Management and Flooding SPD

This SPD sets out in detail the SWC approach to minimising flood risk, managing surface water and achieving sustainable drainage systems. This applies to both new and existing development whilst ensuring that the reduction, re-use and recycling of water is given priority and water supply and quality is not compromised. It relates to policies SWDP28, SWDP29 and SWDP30 of the adopted SWDP, relating to flood risk, Sustainable Drainage Systems and water supply.

Chapters

1	Introduction	1
1.1	Introduction	1
1.2	Purpose and Status	1
1.3	Consultation	2
1.4	Aims and Objectives	2
2	Planning Requirements	5
2.1	Water Management Statement	5
2.2	Water Management Statement Flowchart:	7
3	Location of Development	9
3.1	Site Vulnerability	9
3.2	Urban Areas	9
3.3	Sequential Test	10
3.4	Exception Test	11
3.5	Site Specific Flood Risk Assessments	11
4	Advice and Guidance	13
4.1	Pre-Application Advice	13
5	Policy and Legislation	15
5.1	Policy and Legislation	15
6	Responsibilities	16
6.1	Responsibilities	16
7	Water Quality, Supply and Infrastructure	17
7.1	Background	17
7.2	Supply and Infrastructure	18
7.3	Groundwater	19
7.4	Wastewater	19
7.5	Foul Drainage	19
7.6	Water Quality	20

Contents

7.7	Minimising Pollution	20
8	Water Management and Flood Mitigation	22
8.1	Water Management and Flood Mitigation Best Practice	22
8.1.1	Proactive Actions	22
8.1.2	Surface Water Flooding	23
8.1.3	Surface Water Management Train	23
8.1.4	Prevention	24
8.1.5	Source Control	25
8.1.6	Site Control	25
8.1.7	Regional Control (the management of runoff from several sites)	26
8.1.8	Mitigation	26
8.1.9	Floor levels in new residential and non-residential development:	26
8.1.10	Protection of Flood Flow Routes	26
8.1.11	Use of Flood Resilient Construction in new development:	27
8.1.12	Provision of safe access and egress routes in new development:	27
8.1.13	Development adjacent to watercourses:	27
8.1.14	Maintenance of existing structures and flood storage areas: ...	27
8.1.15	Innovation	28
9	Flooding in Context	29
9.1	General flooding requirements	29
9.2	Main Types of Flooding	29
9.3	Flooding and the Planning System	30
9.4	Areas outside Flood Plains	31
9.5	Biodiversity and Flooding	31
9.6	Green Infrastructure and Flooding	32
9.7	Climate Change and Flooding	32
9.8	Historic Environment	34
9.9	Undesignated Archaeology	35

10 Sustainable Drainage Systems (SUDS)	37
10.1 Sustainable Drainage Systems (SUDS)	37
10.2 Planning Obligations and Conditions	38
10.3 SuDS Approaches	38
10.4 Cost	39
10.5 Health and Safety	39
10.6 SuDS Maintenance	39
10.7 Adoption	40
10.8 Ecological Impact	40
11 Water Recycling	41
11.1 Water Recycling and Harvesting Requirements	41
11.2 Rainwater Harvesting and Greywater Recycling	42
11.3 Maintenance	42

Appendices

12 Appendix 1 - Context: Flooding in South Worcestershire	43
13 Appendix 2 - Policy and Guidance	45
14 Appendix 3 - Responsibilities	55
15 Appendix 4 - Water Management: Checklists and Types of Development	58
16 Appendix 5 - Water Management: Water Conservation Methods	61
17 Appendix 6 - Planning Application Validation Checklists	65
18 Appendix 7 - Useful Contacts	66
19 Appendix 8 - Table 2: Flood Risk Vulnerability Classification	68
20 Appendix 9 - Flood Risk Innovation	70
21 Appendix 10 - WMS Flowchart	77
22 Appendix 11 - SUDS Maintenance Options	78
23 Appendix 12 - Climate Change Guidance	94

Contents

Sources of Further Information

24 Sources of Further Information 98

Abbreviations

25 Abbreviations 99

Glossary of Terms

26 Glossary of Terms 100

1 . Introduction

1.1 Introduction

1.1.1 Flood risk management, water and sewerage requirements are key issues that need to be addressed in South Worcestershire for both existing and future development. Most evidence strongly suggests that ongoing Climate Change will mean more extreme weather patterns. Therefore the South Worcestershire Council (SWC) need to prepare for both a potential increase in flooding episodes and water shortages in the future.

1.1.2 It is essential that all new development is suitably designed and in locations which minimise the impacts of flooding events. Planning is one way of addressing water and flooding matters, and their impact on the natural and built environment, as they are 'material considerations' that are to be taken into account when determining applications.

1.1.3 Given its geographical location, south Worcestershire is at a high risk of experiencing future flood events. This has potential to mirror previous events that caused large scale urban and rural flooding, along with the associated negative social, environmental and economic impacts in the District. These events were largely due to the amount of surface and rainwater run-off rapidly entering rivers and drainage systems that were subsequently unable to cope with the influx of water. Further information on flooding in south Worcestershire is included in Appendix 1.

1.2 Purpose and Status

1.2.1 The SWC and Worcestershire County Council (WCC) are adopting an integrated approach to water resource management, flood risk management and climate change. The aim is to ensure that flood risk and water cycle management (including rainwater, storm water, sewage, ground water, surface water and recycled water) are properly considered at all stages of the planning process.

1.2.2 The purpose of this Supplementary Planning Document (SPD) is to set out in detail the SWC approach to minimising flood risk, managing surface water and achieving sustainable drainage systems. This applies to both new and existing development whilst ensuring that the reduction, re-use and recycling of water is given priority and water supply and quality is not compromised.

1.2.3 This approach is in line with the principle of 'Water Sensitive Urban Design' which is "the process of integrating water cycle management with the built environment through planning and urban design" (CIRIA 'Water Sensitive Urban Design in the UK' 2013).

1.2.4 The intention is to assist applicants in addressing any water management issues arising from their development proposals; to facilitate the delivery of infrastructure to manage water and flood risk; and to emphasise the SWC commitment to minimising flood risk.

1 . Introduction

1.2.5 Adoption of this SPD will mean that it will become a material consideration in the determination of planning applications, adding further detail to the relevant policies within the SWDP (SWDP22: Biodiversity & Geodiversity, SWDP28: Management of Flood Risk, SWDP29: Sustainable Drainage Systems, SWDP30: Water Resources Efficiency & Treatment and SWDP31: Pollution and Land Instability). The SPD will support the aims and objectives set out in the Water Framework Directive, the Severn River Basin Management Plan and the Local Flood Risk Management Strategy.

1.2.6 Early use of the document, in conjunction with national and local planning policies and guidance in the design and scoping process is therefore essential for those proposing development.

1.3 Consultation

1.3.1 This SPD was subject to a Strategic Environmental Impact Assessment in 2014 in line with the SWCs individually adopted Statement of Community Involvement (SCI). Subsequently the SWDP was adopted in 2016 and a scoping report for this document published and consulted on between Monday 13 February and Monday 27 March 2017. A focused consultation on the initial draft SPD was then run with key stakeholders from Wednesday 16 August 2017 to Friday 8 September 2017. They assisted in further refining the SPD to consultation draft. This SPD has been developed having regard to these initial processes, and takes into account the consultation responses received.

The consultation on the draft SPD took place for a six week period, from Friday 2 February 2018 – Friday 16 March 2018, in line with the SWCs SCI.

1.4 Aims and Objectives

1.4.1 Local Planning Authorities (LPAs) have a responsibility to take account of water – in both flooding and drainage matters as material considerations in the determination of planning applications for new developments. They are also required to consult with relevant water authorities that have a responsibility for giving approval to different drainage proposals. Relevant Water Authorities include Severn Trent Water (STW) and the lead Local Flood Authority (LLFA) in regards to surface water drainage, the Environment Agency (EA) for fluvial flooding and Highway Authorities/Agencies in relation to roads and highway drainage. This SPD aims to assist co-ordination between the regulatory authorities in the resolution of water management.

Aims and Objective of the SPD:**Ensure only appropriate new development is located in areas at risk of flooding through:**

- Requiring that proposals demonstrate the Sequential and Exception tests have been applied where necessary.
- Ensuring that Site Specific FRA's are undertaken where required with relevant incorporation of Climate Change'.
- Requiring provision of floodplain compensation where necessary.
- Ensuring 'vulnerable uses' are not permitted in inappropriate areas.

Prevent flood exacerbation for all development proposals through:

- The inclusion of Sustainable Drainage Systems (SuDS) including permeable paving, planted roofs, filter drains, swales, basins and ponds wherever appropriate.
- The provision of on-site storage capacity for surface water attenuation for storm events up to the 1 in 100 years (1%) probability event including an appropriate allowance for climate change.
- The use of porous materials to reduce surface water run-off in new developments and applications for changes of use.
- The provision of Green Infrastructure, where necessary, to reduce surface water run-off within developments.
- Requiring, as a minimum, for Greenfield and Brownfield sites, that the post-development surface water run-off rate will not increase.

Promote effective water management through:

- The installation of water efficiency devices in new developments including water harvesting, saving and recycling in any new built scheme wherever practical/ viable.

1 . Introduction

Maintain water quality through:

- Appropriate water management techniques to, at the very least, maintain existing hydrological conditions and prevent adverse effects on the natural water cycle caused by surface water pollution and discharges into watercourses and groundwater.
- Reducing negative impacts on, and maximising biodiversity gain and amenity interest.

Reduce negative impacts on, and maximise biodiversity gain and amenity interest.through:

- Establishing coherent ecological networks.
- Requiring developers to demonstrate that SUDs schemes will benefit water habitat and biodiversity.

2 . Planning Requirements

2.1 Water Management Statement

2.1.1 The SWC will require all outline or detailed planning applications that will result in waste or surface water to be drained to be accompanied by a Water Management Statement (WMS). This will comprise a report outlining the water cycle issues relevant to a development proposal and the suitable means of providing for drainage in the long term. It may need to include an assessment of existing drainage systems and problems, infiltration, groundwater, surface water flow, foul and storm water disposal and other drainage related flooding issues.

2. Planning Requirements

Water Management Statement Requirements:

- The submission of a feasibility study evaluating the means of incorporating SuDS as part of the proposed development.
- Evidence that the Sequential and/or Exception Tests have been applied where necessary.
- Evidence that potential biodiversity gains have been considered in the deliberation of water management.
- Inclusion of a FRA where one is required.
- Evidence that a chosen SuDS technique is suitable for the development and supporting evidence to back up calculations.
- A study of local soils and geology supported by porosity and permeability tests and site investigation results if necessary.
- Details of those organisations responsible for each individual element of a drainage system – including any SuDS features and a long-term maintenance strategy for all elements provided.
- Evidence that consideration has been given to the incorporation of rainwater harvesting and greywater recycling in the form of a feasibility study and the appropriate measures for collecting and reusing water incorporated into the development.
- A statement detailing how both foul and storm water sewage from a development will be managed using the principles of the 'Management Train'.
- A method report detailing how contaminated water arising during construction will be dealt with and how the measures for mitigation of pollution will be incorporated into a development proposal.
- A water resources study / audit on proposals using a significant amount of water with details on how their water can be recycled and requirements managed.

2.1.2 It is recommended that the appropriate details to be submitted within the WMS should be agreed in principle with the LLFA i.e. WCC and / or South Worcestershire's Land Drainage Partnership (SWLDP) prior to submission of the planning application.

2. Planning Requirements

2.1.3 The WMS is viewed as a crucial element in managing flood risk and therefore no application will be validated until satisfactory information has been received for each site. The WMS should be viewed as a process involving several stages.

2.2 Water Management Statement Flowchart:

The developer should undertake an assessment of the site in terms of the requirements set out in this SPD in order to assist appraisal of site development constraints and land acquisition costs.



The WMS must accompany the submission of an outline or detailed planning or change of use application. The level of detail required will depend on the scale and type of development and individual site conditions. It is suggested that early contact with the LLFA and / or is made in order to ascertain the level of information required for an individual site.



Evaluation of the submitted WMS will be undertaken by the relevant LPA in conjunction with the other regulatory bodies, including the Environment Agency, Water Authority and Highways Authority.



The developer must notify the relevant LPA following approval of planning permission and any other required consent before the commencement of any works involving land drainage and flood defence measures on site.



The WMS will be used by all the relevant Authorities as a basis for their considerations of how water is managed for a site.

2.2.1 A WMS checklist (including guidance from the LLFA) and further information on types of development affected by water cycle issues can be found at Appendix 4 to this document.

2 . Planning Requirements

2.2.2 The level of detail required for the WMS will vary depending on individual site conditions and the nature of the development being proposed. It may only be necessary to provide a few short sentences for a minor house extension, for example, where the proposal is in an area at nominal risk of pluvial or fluvial flooding. In this instance the utilisation of a water butt on site may be satisfactory, particularly if there is adequate surface water drainage existing on site.

2.2.3 It is recommended therefore that the LLFA and / or SWLDP are contacted at the very initial stages of project planning to scope the level of details required in the WMS for each individual site.

2.2.4 In considering development the SWC will have regard to guidance set out within the National Planning Policy Framework (NPPF) and National Planning Policy Guidance (NPPG) regarding viability. Paragraph 173 of the NPPF refers to requiring careful attention to viability and costs in plan-making and decision-taking and making sure that sites are not threatened in terms of being able to be developed viably. Paragraph 174 states that “LPAs should assess the likely cumulative impacts on development in their area of all existing and proposed local standards, supplementary planning documents and policies that support the development plan, when added to nationally required standards. In order to be appropriate, the cumulative impact of these standards and policies should not put implementation of the plan at serious risk”. If a developer is concerned that the requirements set out within this SPD will affect the viability of a site this should be assessed, quantified and evidenced within the WMS.

3. Location of Development

3.1 Site Vulnerability

3.1.1 It is necessary to identify how ‘vulnerable’ a proposed development is using the classification in Table 2 of the NPPG's on Flood Risk and Coastal Change – see Appendix 8. This is important as different types of developments are acceptable in different flood risk zones. In simple terms, the more vulnerable the development type is, the more important it is to locate it in areas with the lowest possible flood risk.

3.1.2 The Environment Agency (EA) has identified (set out in Table 1 of the NPPG on Flood Risk and Coastal Change) different flood zones which cover areas that are at different levels of flood risk:

- Flood Zone 1 (Low Probability) – this zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). (Shown as ‘clear’ on the Flood Map).
- Flood Zone 2 (Medium Probability) – this zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (0.1%-1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.1%-0.5%). (Land shown in light blue on the Flood Map).
- Flood Zone 3a (High Probability) – this zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (0.5%). (Land shown in dark blue on the Flood Map).
- Flood Zone 3b (The Functional Floodplain) – this zone comprises land where water has to flow or be stored in times of a flood. (Not separately distinguished from Zone 3a on the Flood Map).

3.2 Urban Areas

3.2.1 Policy SWDP28 C assesses urban areas **within high risk flood zones** (Flood Zones 3a and 3b). This includes Worcester, Droitwich Spa, Evesham, Malvern, Tenbury Wells and Upton-upon-Severn highlighted on the SWDP interactive map at: <http://swdp.addresssafe.com>. The following zones apply to new development and redevelopment land:

- “Blue Zone” – functional floodplain, development will not be permitted within the Blue Zone.
- “Red Zone” – new development and redevelopment will not be permitted in the Red Zone or within eight metres of the top of both banks of other watercourses.
- “Yellow Zone” – redevelopment of existing sites within the Yellow Zone is supported in areas not subject to significant flood flows, provided that it is for a less vulnerable or water compatible use, ground floor levels are set above the 1 in 100 year flood level, safe access is available, car parking is designed to

3 . Location of Development

have regard to potential flood depths and hazards, there is no impairment to the available flood storage capacity of the floodplain and additional flood storage is created, and unnecessary obstructions to flood flow are removed.

3.3 Sequential Test

3.3.1 The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding, with the Environment Agency's Flood Zones typically providing the starting point for such assessments. Development should not be permitted if there are reasonably available sites in areas with a lower probability of flooding. A Sequential Test will need to be applied in areas known to be at risk from any form of flooding.

3.3.2 Development should be steered to Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the SWC will take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exceptions Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

3.3.3 The sequential approach should also be applied within the application site itself by locating the most vulnerable elements of the development in the lowest flood risk areas in the first instance. The use of flood risk areas (i.e. Flood Zones 2, 3a and 3b) for recreation, amenity and environmental purposes can provide an effective means of flood risk management, as well as providing connected green spaces with consequential social and environmental benefits.

3.3.4 Policy SWDP28 requires development proposals, other than sites allocated in the Plan, to clearly demonstrate that the Sequential Test has been applied. The Sequential Test does not apply form in or development or changes of use, unless the proposal includes a change of use of land for the siting of a caravan(s), camping or a holiday chalet site.

3.3.5 These tests can often cause confusion; and a common problem when applying the Sequential Test is defining the 'area of search'. In line with the NPPG (paragraph 30), the Sequential Test should normally be applied to the SWC's whole local planning authority area to broaden the areas of search that are less likely to flood. However, where a planning application relates to a site where there has been no sequential testing or is not in accordance with the development plan, a pragmatic approach may need to be taken and the Sequential Test should apply to local circumstances or as defined by Local Plan policies. It is imperative that when applying the Sequential Test both EA's Flood Zone maps and the latest Strategic Flood Risk Assessment (SFRA) L2 mapping are used as the extents of these differ in places due to the current modelling techniques employed and the threshold of the catchment area used.

3 . Location of Development

3.4 Exception Test

3.4.1 If, following the application of the Sequential Test, it is not possible for the development to be located in zones with a lower probability of flooding; the Exception Test must be applied. For the Exception Test to be satisfied:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared; and
- A Site Specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

3.4.2 The Exception Test applies to both planning applications and the allocation of land through the development plan process.

3.4.3 Application of both the Sequential and Exception Tests should be demonstrated through the WMS where required.

3.5 Site Specific Flood Risk Assessments

3.5.1 A FRA demonstrates how flood risks will be managed so that the development remains safe throughout its lifetime. Climate Change must be taken into account with proposals demonstrating how flood risk elsewhere (individually or cumulatively), will not increase.

3.5.2 Policy SWDP28 A iii. requires Site Specific FRA, (informed by the latest SFRA) to be submitted accompanying planning applications in Flood Zones 2 and 3, and Flood Zone 1 where the development is over 1 hectare in size and where evidence indicates there are records of historic flooding or other sources of flooding on the site.

3.5.3 Policy SWDP28 B requires all development proposals, through a FRA, to:

- Provide level for level, volume for volume, floodplain compensation where necessary, near to or opposite the site, up to the Design Flood Level.
- Ensure no increase in flood risk or harm to third parties.
- Explore opportunities to reduce flood risk overall, including contributions where appropriate.
- Ensure development is safe from flooding for its lifetime.
- Ensure development is appropriately flood resistant and resilient.
- Take into account all forms of flooding.

3 . Location of Development

- Include appropriate allowances for Climate Change.
- Ensure safe access and exits are available for residential development in accordance with DEFRA guidance. Access to “safe refuges” or “dry islands” are unlikely to be considered safe as this will further burden the Emergency Services in times of flood.
- Provide an assessment of residual risk.
- Provide satisfactory Evacuation Management Plans, where necessary, including consultation with the Emergency Services and Emergency Planners.
- Ensure development layouts are informed by drainage strategies incorporating SuDS, as set out in SWDP29.
- Further information about planning application requirements for each LPA can be found on the SWC websites, as shown in Appendix 6.

3.5.4 The Environment Agency have detailed FRA guidance notes to assist development proposals and these are available at the following link:
<https://www.gov.uk/government/organisations/environment-agency>.

4 . Advice and Guidance

4.1 Pre-Application Advice

4.1.1 Developers and applicants are strongly advised to use the pre-application advice service (chargeable) to discuss any potential issues that might arise from development proposals before they are formally submitted. In addition, contacting the LLFA, South Worcestershire Land Drainage Partnership (SWLDP) and/or the Canal and River Trust (with any development adjacent to the River Severn or Worcester & Birmingham and Droitwich canals) at the earliest stages of development proposal formulation is advisable as it can potentially save time and costs. In addition, the EA also offer pre-application advice services, included a charged service for review of detailed FRAs, flood models and technical meetings.

4.1.2 Pre-application advice may help to address fundamental issues, including:

- Whether a FRA needs to be submitted;
- The level of detail required in the WMS;
- Confirmation of whether the Sequential Test and/or Exceptions Test needs to be applied;
- When a development proposal has, or may have, water management and flooding implications;
- Whether there are known water supply and/or quality issues;
- Advice on the most appropriate form of sustainable drainage measures for the site;
- Whether there are any known contamination issues on the site to inform risk assessment and potential remediation options/improvement opportunities; and
- Clarification on Climate Change allowances

4.1.3 The Environment Agency can provide LiDAR data, risk of flooding from Reservoirs map, as well as historic flooding events map where available as a free data request. They also hold hydraulic model information for various rivers in the county. Please contact: Enquiries_Westmids@environment-agency.gov.uk

4.1.4 Pre-application advice will help developers and applicants understand the flood risk and water management issues relating to their proposal in advance of a planning application being submitted. It is important that the correct information is provided to ensure applications can be validated and determined in a timely manner. Further information about the pre-application advice services, fees and forms can be found on the following links:

Wychavon District Council

www.wychavon.gov.uk/business-planning-advice

Malvern Hills District Council

4 . Advice and Guidance

www.malvern hills.gov.uk/planning-advice

Worcester City Council

www.worcester.gov.uk/planning-advice

Environment Agency

Environment Agency West Area Sustainable Places team

shwgplanning@environment-agency.gov.uk

5 . Policy and Legislation

5.1 Policy and Legislation

5.1.1 This SPD was produced with due consideration of national and local planning policy and flood risk guidance, and a summary of the policy context can be found at Appendix 2. Note that the NPPF was updated on 24 July 2018. The Management of Flood Risk policy SWDP28, the Sustainable Drainage Systems policy SWDP29 and the Water Resources, Efficiency and Treatment policy SWDP30, their examination and this SPD and the related consultations, have taken place in the context of the NPPF 2012.

6 . Responsibilities

6.1 Responsibilities

6.1.1 Responsibility for the management of flood risk falls within the remit of a number of bodies and organisations. The key responsibilities of each of the key parties are set out at Appendix 3.

7 . Water Quality, Supply and Infrastructure

7.1 Background

7.1.1 LPA's have a general responsibility as part of the decision making on planning applications, not to compromise the aims of the Water Framework Directive (WFD). More specifically, the SWDP has regard to the River Severn Basin Management Plan. The Localism Act 2011 requires LPA's to co-operate on the provision of water supply infrastructure, water quality, water supply and enhancement of the natural environment. Consequently, there is a need for developers to engage positively with Severn Trent Water to ensure that all of the necessary infrastructure is secured so as to ensure that planning proposals do not result in any deterioration in the quality or quantity of water.

7.1.2 Paragraph 94 of the NPPF states that LPA's should adopt proactive strategies to mitigate and adapt to Climate Change, taking full account of flood risk, coastal change and water supply and demand considerations. Paragraph 156 makes clear that LPA's should work closely with other LPA's to produce strategic policies that deal with water supply to include within their Local Plans. Consequently, planning for the necessary water supply to serve allocated sites was addressed through the SWDP.

7.1.3 Water quality objectives are contained within the WFD to ensure that development, both individually and cumulatively, does not have a detrimental impact on water quality by tackling diffuse pollution at source. Paragraph 109 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of water pollution. The SWC will seek to ensure that new developments achieve this objective.

7.1.4 The SWC encourage opening up of culverts, improvement to, naturalisation and creation of new watercourses, and the provision of other environmental infrastructure that would provide wider biodiversity benefits and help deliver WFD improvements, 'good ecological status' by 2027. Future development should seek to address the issues that currently prevent the water catchment from achieving Good Ecological Status or seek to maintain it. WFD data is available from the Environment Agency 'Catchment Data Explorer' tool at:
<http://environment.data.gov.uk/catchment-planning/RiverBasinDistrict/9>

7 . Water Quality, Supply and Infrastructure

Water Supply and Infrastructure Requirements (Policy SWDP 30)

- Major development proposals will need to demonstrate that they can be implemented without detriment to the quality or quantity of existing water and the wider environment. Development proposals that significantly threaten groundwater resource will not be permitted.
- In terms of foul drainage, the first presumption will be to drain into a public sewer. If not feasible, a package sewage treatment plant incorporating treatment processes will be considered. The use of a septic tank will be considered only as a last resort.
- Early engagement with the LPA, the Environment Agency and relevant water and sewerage companies can help to establish if water quality is likely to be a significant planning concern.
- Supporting documentation to accompany planning applications for major developments should explain how contaminated water arising during the construction process will be addressed.
- Mitigation measures will be required to minimise resultant pollution within new development.
- Ponds and wetlands will be encouraged where feasible, along with other Suds measures such as infiltration trenches and filter drains.

7.2 Supply and Infrastructure

7.2.1 Adequate water and wastewater infrastructure is needed to support sustainable development. A healthy water environment will also deliver multiple benefits, such as helping to enhance the natural environment generally and adapting to Climate Change.

7.2.2 There will be certain planning proposals that will require water supply issues to be considered in great detail. These might include large scale developments not allocated within the Development Plan; sites that require enhanced water efficiency as part of a strategy to manage water demand locally and proposals that will be using significant amounts of water.

7 . Water Quality, Supply and Infrastructure

7.3 Groundwater

7.3.1 Groundwater is water that is beneath the surface of the ground held within the porous spaces. Groundwater flooding can occur when the water table in permeable rocks rises to enter basements/cellars or comes up above the ground surface. Groundwater flooding is not necessarily linked directly to a specific rainfall event and is generally of a longer duration than other causes of flooding.

7.3.2 Groundwater resources are also a vital component of potable water supplies; once polluted, the damage can be irrevocable. They can also have an impact on sites of wildlife significance. Development proposals that significantly threaten this resource will not be permitted. Major development proposals (e.g. developments of over 10 houses or commercial developments comprising over 1,000 square metres) will need to demonstrate that they can be implemented without detriment to the quality or quantity of existing water and the wider environment. The SWC will have regard to current Environment Agency guidance on the protection of groundwater and their groundwater protection position statements are available at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/658135/LIT_7660.pdf.

7.3.3 The SW area and specific potential sites, may be located upon or within aquifers and Source Protection Zones (SPZ's). SPZ 1 is especially sensitive. Developers should consider these when assessing sites. The relevance of the designation and the potential implication upon development proposals should be seen with reference to the EA's Groundwater Protection guidance:

<https://www.gov.uk/government/publications/groundwater-protection-position-statements>
 (This replaces Groundwater protection: Principles and practice (GP3).

As well as additional information found at:

<https://www.gov.uk/government/collections/groundwater-protection>

The location of features such as SPZ's can be found at

<http://apps.environment-agency.gov.uk/wiyby/37833.aspx>.

7.4 Wastewater

7.4.1 Wastewater is the water from toilets, baths, sinks and washing machines from domestic and residential premises, industrial waste water discharges to sewers and the rainwater contaminated with metals, oils and other pollutants in rainwater run-off from urban areas.

7.5 Foul Drainage

7.5.1 When preparing sewerage proposals for any development, the first presumption will be to provide a system of foul drainage discharging into a public sewer. This should be achieved in consultation with the statutory sewerage undertaker for the area. If, by taking into account the cost and/or practicability, it can be shown to the satisfaction of the relevant LPA that connection to a public sewer is not feasible, a package sewage treatment plant incorporating a combination of treatment processes will be considered that must be installed and maintained in accordance with British Standard (6297:2007+A1:2007) and Building Regulations H (2015). The plant should

7 . Water Quality, Supply and Infrastructure

offer full treatment (including secondary and if necessary tertiary treatment) with the final effluent discharge from it meeting the standard and conditions set by the EA where applicable. Proposals for package treatment plants should also set out clearly the responsibility and means of operation and maintenance to ensure that the discharge consent is not likely to be infringed in the life of the plant. Such provision may be adopted by the statutory sewerage undertaker under section 104 of the Water Industry Act 1991.

7.5.2 Only if it can be clearly demonstrated that the sewerage and sewage disposal methods referred to above are not feasible, will a system incorporating septic tank(s) be considered. Applications for planning permission should be supported by an assessment of the proposed use of septic tanks, to confirm that there will be no adverse effects. This assessment should focus on the likely effects on the environment, amenity and public health. It should include a thorough examination of the impact of disposal of the final effluent, whether discharged to a watercourse or disposed of by soakage into the ground.

The EA have published a foul drainage assessment form, which gives clarity on order of preference for waste water options and detailed non mains drainage advice. This is available at the following link:

<https://www.gov.uk/government/publications/foul-drainage-assessment-form-fda1>

7.6 Water Quality

7.6.1 Some methods of building can cause poor water quality as run-off can contain a variety of pollutants and this can also have a direct negative impact on biodiversity. In addition, large areas of hard landscaping can directly cause water quality problems as the surplus run-off picks up pollutants as it runs over land and transports them into watercourses. Run-off from roads will contain heavy metals and hydrocarbons and run-off from farmland is more likely to contain nitrates and sediment that can have serious implications for water quality.

7.6.2 Early engagement with the relevant LPA, the EA and relevant water and sewerage companies can help to establish if water quality is likely to be a significant planning concern and, if it is, to clarify what assessment and remediation will be needed to support the application.

7.6.3 Information about the water environment can be found in the EA's River Basin Management Plans and Groundwater Vulnerability Maps, the districts Water Cycle Studies, Water and Sewage company's drainage strategies and data published by government.

7.7 Minimising Pollution

7.7.1 Some pollution arising from surface water runoff may be unavoidable and water treatment at every outfall may be impractical. However, moderating flows and filtering runoff through SuDS can deliver significant reductions in the impact on the water resource by means of ground infiltration, sub base storage and filtration.

7 . Water Quality, Supply and Infrastructure

7.7.2 Applicants will be required to use mitigation measures to minimise resultant pollution within new development. Supporting documentation to accompany planning applications for major developments should explain how contaminated water arising during the construction process will be addressed.

7.7.3 Methods that can help to reduce pollution include infiltration trenches, basins ponds, wetlands and filter drains.

7.7.4 Infiltration trenches comprise stone filled reservoirs to which storm water run-off is diverted, and from which the water gradually infiltrates the ground. Infiltration is unlikely to be successful in clay soils, and therefore a soil analysis will therefore be required for any major development proposal to demonstrate whether this approach would be effective.

7.7.5 Ponds and wetlands remove pollution by a range of chemical, physical and biological processes. Pollutant removal is by absorption, filtering and microbial decomposition in the surrounding soil. Systems can be designed which successfully incorporate both infiltration and filter systems. Ponds and wetlands must be sensitively designed so as to maximise their biodiversity potential and will be encouraged where feasible. The EA have produced guidance on Water Storage Reservoirs and Rural SuDS that may provide valuable information to developers. This is available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291508/scho0612buwh-e-e.pdf and <http://www.ukia.org/>

8 . Water Management and Flood Mitigation

8.1 Water Management and Flood Mitigation Best Practice

- Consideration should be given to the use of more efficient domestic and non-domestic appliances, such as low flush or compost toilets, waterless urinals, reduced flow rates for showers, low-flow or spray taps and water meters with pulsed output.
- The SWC will encourage and support the reuse of water that is safe, environmentally sustainable and cost-effective by seeking the use of grey water recycling methods in new development, where practical and feasible.
- Water recycling measures should be considered when designing any landscaping scheme for residential or non-residential development.
- The SWC will require all proposals to apply the 'Surface Water Management Train' principle to drainage on a development site to mimic natural water catchment and establish which elements are feasible. It is the techniques at the top of the hierarchy that are preferred so that prevention and control of water at source should always be considered before site or regional controls.
- Floor levels for habitable rooms in new development must be set at 600 mm or more above the flood level predicted for the 1:100 year flood event (plus climate change).
- Development should ensure it does not inhibit the function of flood flow routes to convey floodwater as efficiently as possible across floodplains.
- New development should be built with flood resilient materials and construction methods where appropriate.
- As a minimum, safe pedestrian access should be provided to and from the development without crossing through the 1 in 100 year plus Climate Change floodplain.
- Identification of innovative design is encouraged as a key driver for more resilient, sustainable, cost-effective and multidisciplinary flood risk management.

8.1.1 Proactive Actions

8.1.1.1 The South Worcestershire Water Cycle Study (2012) and its 2014 update looked at the level of planned growth and the ability of the infrastructure (i.e. water supply and waste water treatment) to accommodate it without detrimentally affecting the natural water cycle. It identified an overall shortage in future water supplies that

8 . Water Management and Flood Mitigation

necessitates the delivery of minimum water efficiency targets in advance of Government's legislation. In terms of the SWDP this translates to the following measures:

- i. Reduce - consideration should be given to the use of more efficient domestic and non-domestic appliances, such as low flush or compost toilets, waterless urinals, reduced flow rates for showers, low-flow or spray taps and water meters with pulsed output.
- ii. Reuse - encouraging and supporting the reuse of water that is safe, environmentally sustainable and cost-effective by seeking the use of grey water recycling methods in new development, where practical and feasible.
- iii. Recycle - encouraging and supporting water recycling that is safe, environmentally sustainable and cost-effective by seeking the use of rainwater harvesting in new development, where practical and feasible. Water recycling measures should also be considered when designing any landscaping scheme for residential or non-residential development. Such measures could include working with existing natural vegetation, selecting drought-resistant plants or low water use landscaping / gardens and using automatic drip irrigation systems.

8.1.2 Surface Water Flooding

8.1.2.1 Surface water flooding occurs wherever high rainfall events exceed the drainage capacity in an area. Such events can lead to serious flooding of property and possessions where surface water flows and collects. The Foresight Future Flooding report (2004) (www.foresight.gov.uk) estimated that currently 80,000 properties are at very significant risk from surface water flooding (10% annual probability or greater), which could cause an average £270 million of damage each year. These problems were exemplified during flood events when extreme rainfall over the Midlands and the north of England led to large-scale flooding, with over 55,000 flooded properties causing around £3 billion of damage, the majority of which was caused by surface water run-off. Continuing to drain built up areas in south Worcestershire without considering wider issues is therefore not a long-term sustainable option.

8.1.3 Surface Water Management Train

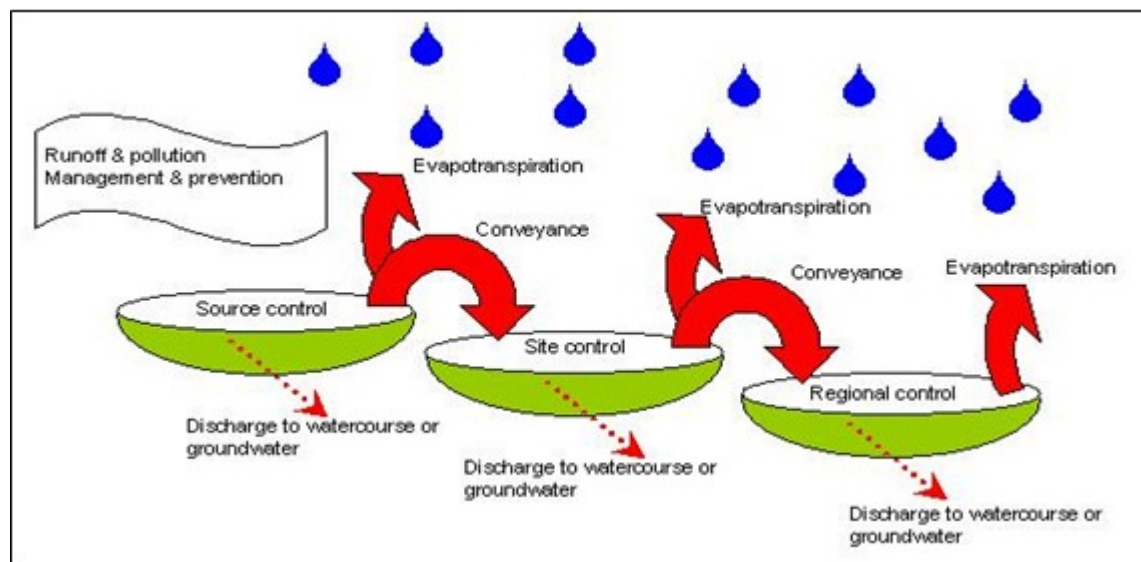
8.1.3.1 To mimic natural water catchment processes as closely as possible a Surface Water Management Train is required. This is a Building Regulations requirement advocated by the SWC that provides a hierarchy of drainage techniques for improving quality and quantity. The SWC will require all proposals to apply this principle to drainage on a development site to establish which elements are feasible.

8.1.3.2 The surface water management train (sometimes called the treatment train) is fundamental to designing a successful SuDS scheme and provides a hierarchy of drainage techniques for improving quality and quantity. If water cannot be dealt with at one level in the management train, it should be taken; preferably using SuDS

8 . Water Management and Flood Mitigation

techniques, down the hierarchy and techniques closer to source are preferable to those lower down the hierarchy. Therefore prevention and source control should always be considered before site or regional control and discharging runoff to surface water sewers should only be a last resort, when no other option is available.

Figure 1: Surface Water Management Train



(Source: CIRIA, July 2005)

8.1.4 Prevention

8.1.4.1 Prevention seeks to prevent or minimise runoff and pollution; effectively to stop water entering the drainage system. It is applied on individual sites and involves good design. Prevention also involves good site housekeeping measures that will prevent pollutants entering the drainage system:

- Keeping impervious areas to a minimum would maximise the amount of water that soaks into the ground.
- Collecting rainwater for re-use.
- A tidy yard with bunds around chemical storage areas will reduce spillage and leakage into the drainage system.
- Minimising use of fertilisers, herbicides and fungicides on landscaped areas will reduce runoff of chemicals.
- Any excess surface runoff that can't be prevented from entering the drainage system is dealt with by the next level down so is subject to source control.

8 . Water Management and Flood Mitigation

8.1.5 Source Control

8.1.5.1 Source control is the control of runoff at or near its source and forms the start of the surface water management train and should be considered at the outset of development proposals. Source control (best management practice) is the preferred choice in any surface water drainage scheme.

8.1.5.2 Controlling water at or near its source will usually be achieved by relatively small-scale techniques with each technique serving a small catchment area. Source control techniques can include the following:

- Minimising paved areas - allowing surface water run-off to drain naturally, through areas such as gardens, and public open space.
- Use of porous surfaces where possible.
- Rainwater recycling/harvesting - capturing rainwater from the roofs of buildings. The capture of rainwater can be used for indoor needs such as flushing toilets, filtered and purified for use within the main water system, stored via water butts for use as grey water for activities such as car washing and general irrigation of gardens.
- Good housekeeping and education is essential in minimising pollution associated with surface water run-off. Simple measures include, keeping paved areas clean and free of litter and animal waste and informing and educating occupants about how the site is drained.

8.1.5.3 Any water not controlled at source should be subject to the next level down, i.e. site control.

8.1.6 Site Control

8.1.6.1 Site controls are the management of water from several sources and are used where adequate control of quantity or quality cannot be achieved with source controls alone after exhausting potential to manage surface water run-off through preventative measures. This next level of the management train should be designed with the objective of minimising the quantity of water discharged directly to a river and can include the following:

- Rainwater recycling.
- Permeable surfaces & filter drains - permeable surfaces offer alternatives to conventional hard surfaces. Use of materials such as porous paving, gravel, and grass allows water to permeate through the surface, rather than draining off it.

8 . Water Management and Flood Mitigation

- Infiltration devices - work by enhancing the natural capacity of the ground to store and drain water. Devices may be in the form of surface features such as swales and filter strips. Generally these are small-scale systems, which are designed to fit into landscaped areas, consisting of vegetated sections of land and grassed depressions, which mimic natural drainage patterns, controlling discharge to a pond or wetland, or other discharge system.
- These systems assist in removing excess solids and pollutants before final discharge. Devices may also be in the form of below ground features, such as soakaways and trenches. These features create underground reservoirs, which allow surface water to infiltrate gradually into the subsoil, or discharge to another structure at a controlled rate.
- Grass swales – grassed areas adjacent to roads and pavements with a very shallow depression, allowing water to infiltrate

8.1.6.2 Where adequate control of quantity or quality cannot be achieved at site level, flows should be conveyed to regional controls.

8.1.7 Regional Control (the management of runoff from several sites)

8.1.7.1 Where surface water cannot be accommodated on site, techniques should be considered which drain water away to a point where it can be returned to the natural water cycle. Regional control of surface water run-off is the management of runoff from several sites. This sits at the bottom of the surface water management train and is similar to site control, except the overall catchment area will be greater. Regional control deals with water from several sites and involves the same control techniques although they should not be used on their own without source control provided at the level of individual developments. These systems can contribute to the flow and quality of run-off and should be considered as water amenity features that provide habitat and encourage biodiversity. Regional control systems can include filter drains swales and infiltration devices.

8.1.8 Mitigation

8.1.9 Floor levels in new residential and non-residential development:

8.1.9.1 Floor levels for habitable rooms in new development must be set at 600 mm or more above the flood level predicted for the 1:100 % likelihood event (plus Climate Change) in order to reduce the potential risk to life and damage to property.

8.1.10 Protection of Flood Flow Routes

8.1.10.1 Development should ensure it does not inhibit the function of flood flow routes to convey floodwater as efficiently as possible across floodplains.

8 . Water Management and Flood Mitigation

8.1.11 Use of Flood Resilient Construction in new development:

8.1.11.1 Where appropriate, new development should be built with flood resilient materials and construction methods. Flood resilient construction allows buildings to recover quicker than conventional buildings following a flooding event.

8.1.11.2 Flood-resistant construction can prevent entry of water or minimise the amount that may enter a building. This form of construction should be used with caution and accompanied by other resilience measures, as effective flood exclusion may be reliant on elements, such as barriers to doorways, being maintained in a good state. Buildings may also be damaged by water pressure or debris being transported by flood water. This may breach flood excluding elements of the building and permit rapid inundation.

8.1.12 Provision of safe access and egress routes in new development:

8.1.12.1 For residential developments to be classed as 'safe', as a minimum, safe pedestrian access should be provided to and from the development without crossing through the 1 in 100 year plus Climate Change floodplain, however in cases where this is not achievable, FRAs may demonstrate that access is acceptable based on an appropriate assessment of 'hazard risk' (set out at DEFRA Hazard Risk FD2320). In addition, vehicular access to the site should be achievable, taking into account extreme events. The production of flood plans are also recommended to aid evacuation and rescue during a flood event. Such a plan should satisfy the concerns of the local authority emergency planner and the emergency services. Safe access will also need to be considered for other vulnerable uses.

8.1.13 Development adjacent to watercourses:

8.1.13.1 Any riverside developments should leave a minimum 8 metre wide undeveloped buffer strip, to preserve the river and its floodplain as an enhancement feature and to allow for routine maintenance. Such developments should also have a maintenance strategy for clearing and maintaining the channel, and any structures such as trash screens and bridges. Development proposals should also consider opportunities to undertake river restoration and enhancement to make space for water.

8.1.13.2 Development adjacent to canals might not require a blanket buffer of 8 metres, instead each site is considered on its own merits with other matters such as ecology, placemaking and accessibility considered alongside the requirement for maintenance. Early contact with the Canal and River Trust will be key to understanding the requirements and attributes at a location.

8.1.14 Maintenance of existing structures and flood storage areas:

8.1.14.1 Existing flood water storage areas should be maintained and safeguarded from development. New development should also be designed not to prohibit the maintenance and functioning of structures required for flood risk management purposes.

8 . Water Management and Flood Mitigation

8.1.15 Innovation

8.1.15.1 Identification of innovative design is encouraged as a key driver for more resilient, sustainable, cost-effective and multidisciplinary flood risk management. It is therefore important for those involved in the development of a site to explore new methods against existing and future issues when planning and introducing new flood risk measures, infrastructure and policies

8.1.15.2 Examples of innovative flood risk inventions and designs can be found in further detail at Appendix 9.

9 . Flooding in Context

9.1 General flooding requirements

General Flooding Requirements:

- New development proposals should identify and manage issues at the early stages of a planning application to minimise flood risk and avoid development in inappropriate locations that are prone to flood episodes.
- Developers should have regard to the local Biodiversity Action Plan and will be required to identify and demonstrate opportunities for water habitats and biodiversity. Opportunities should also be explored to recreate more natural habitats along watercourses.
- The benefits of Green Infrastructure should be recognised in planning for new development to ensure the creation, protection, enhancement and management of networks of biodiversity and green infrastructure.
- Development proposals should respond positively to Climate Change. Appropriate allowance for Climate Change is required in flood risk assessments to help minimise the vulnerability and provide resilience to flooding and coastal change in the future.
- It is important to recognise that proposals for flood mitigation measures do not cause harm to the Historic Environment.
- Opportunities should also be explored to recreate more natural conditions along watercourses.
- Any schemes to reduce or respond to flood risk must be sensitive to the unique historic characteristics of the area.

9.2 Main Types of Flooding

9.2.1 Fluvial Flooding occurs when excessive rainfall over a period of time causes a watercourse to exceed their capacity and burst their banks or retaining structures and subsequently cause the water to flow over land. Factors affecting fluvial flooding include the nature of the landscape around a watercourse, the lack of vegetation or woodland in the drainage basin and the underlying geology. Flash flooding is caused by rapidly rising water levels, usually as a result of intense rainfall and rapid response catchment areas (areas known to be at risk of flash flooding that responds rapidly to a rainfall event) are present across the SW District.

9 . Flooding in Context

9.2.2 Fluvial flood risk maps are shown on the Environment Agencies website at: <http://apps.environment-agency.gov.uk>. Long term flood risk information is available on the government's website: <https://flood-warning-information.service.gov.uk>. This assessment will indicate what flood zone a parcel of land falls within and provides details on a site location's flood probability as part of development planning.

9.2.3 'Pluvial Flooding' occurs when heavy rainfall generates overland flows that pool before entering any watercourse or sewer. Factors affecting this type of surface water flooding include the existing saturation of the ground reducing the ability to soak up more rainfall and the proliferation of non permeable surfaces increasing flows to existing drainage systems beyond their capacity. Pluvial flooding in south Worcestershire is detailed in the Strategic Flood Risk Assessments that have been undertaken. These reports identify which locations are most and least likely to experience flooding. They can be viewed, alongside their accompanying maps by using the following link: www.swdevelopmentplan.org. There are also Surface Water Flood Risk Maps available on the Environment Agencies web site at: www.gov.uk

9.3 Flooding and the Planning System

9.3.1 Measures taken through the planning system are the primary means of avoiding and reducing flood risk affecting and arising from new development. They are an important element in managing flood risk in the long term and offer opportunities to reduce flooding through changes to the urban fabric.

9.3.2 As all forms of flooding and their impact on the natural and built environment are material planning considerations, the aim in south Worcestershire is to ensure that flood risk is taken into account at all stages of the planning process to avoid inappropriate development in areas at risk of flooding. Where new development is exceptionally necessary in such areas, the aim is to make it safe without increasing the risk elsewhere and where possible reducing overall risk.

9.3.3 Planning for flood risk exists to ensure that developments on vulnerable areas of land are of a safe and sustainable nature. Regional and Local Planning bodies are responsible for assessing flood risk. LPAs are required to consult the Environment Agency on relevant developments in Flood Zones 2 and 3 of 'all rivers'. However, catchments under 3km² in size (e.g. ordinary watercourses) will not have flood zones associated with them. This is due to the restrictions with the level of this generalised mapping technique rather than the fact that these watercourses do not have flood risk associated with them. Any FRA may need to provide a hydraulic model and/or will need to take an alternative approach to assess these watercourses. The LPA will also consult the LLFA for development on land with surface water drainage issues and are responsible for ensuring that developers assess flood risk for their development proposals.

9 . Flooding in Context

9.4 Areas outside Flood Plains

9.4.1 It must be stressed that previous flood events in south Worcestershire occurred mainly in areas outside designated flood plains. This was a result of pluvial (surface water run-off) rather than fluvial (watercourse) flooding and therefore managing all forms of water, and not just those areas within flood plains, is a major consideration for the SWC. Further information and advice on flooding arising from ordinary watercourse (Non-Main River) flooding may be available by contacting the South Worcestershire Land Drainage Partnership (SWLDP) (contact details can be found at Appendix 7).

9.5 Biodiversity and Flooding

9.5.1 Under the 2006 Natural Environment and Rural Communities (NERC) Act, Local Authorities and Water Companies have a legal duty to have regard to Biodiversity in carrying out all of their functions.

9.5.2 Paragraph 109 of the NPPF also states that the planning system should contribute to, and enhance, the natural and local environment by minimising impacts on biodiversity and providing net gains in biodiversity where possible. The Government is committed to halt the overall decline in biodiversity, by establishing coherent ecological networks that are more resilient to current and future pressures.

9.5.3 In accordance with the NPPF and the 2006 Act, developers will be required to demonstrate that where practicable, SuDS schemes will benefit water habitats and biodiversity. The SWC therefore expect features such as ponds and wetlands to be planted to enhance biodiversity. It is essential that the physical elements of such features should be designed in such a manner that considers biodiversity and helps deliver benefits.

9.5.4 The planting of native species appropriate to the local conditions will be favoured and where appropriate the mix of planted species should aim to create habitats that contribute to the local Biodiversity Action Plan – www.worcestershire.gov.uk.

9.5.5 Some common landscape and ecological design requirements may have to be adapted slightly to ensure that the SuDS can function effectively. It will also be important that the types of planting proposed are considered in line with the design of the SuDS features. For example, the soil moisture profile may be very different at the top of a swale's bank to the bottom and this will need to be taken into consideration to ensure the success of both the plants and the operation of the drainage feature.

9.5.6 Opportunities should also be explored to recreate more natural conditions along watercourses. Examples of this include: de-culverting; restoring or re-profiling rivers to promote ecological and flow improvements; removal of barriers to fish migration; integration with wider green/blue infrastructure networks; setting back development from watercourses to enable access and enhancement; and protection of sensitive locations.

9 . Flooding in Context

9.6 Green Infrastructure and Flooding

9.6.1 The NPPF states that local planning authorities should ‘plan positively for the creation, protection, enhancement and management of networks of biodiversity and green infrastructure’. Urban green space provides multi-functional benefits – it contributes to coherent and resilient ecological networks, allowing species to move around within and between towns and the countryside, with even small patches of habitat benefitting movement.

9.6.2 Urban GI is also recognised as one of the most effective tools available to us in managing environmental risks such as flooding and heat waves. Greener neighbourhoods and improved access to nature can also improve public health and quality of life, and reduce environmental inequalities. There may be significant opportunities to retrofit green infrastructure in urban environments. These can be realised through green roof systems and roof gardens; green walls to provide insulation or shading and cooling; and new tree planting or altering the management of land. There may also be opportunities for de-culverting and improving / adding new river channels. Issues relating to protection of natural resources, including air quality, ground and surface water, and soils within urban design plans, could also be considered.

9.7 Climate Change and Flooding

9.7.1 Policy SWDP28 B vii states that all development proposals must adhere to the advice from the EA publishing of Flood Risk Assessment Guidance Notes for Worcestershire and, by doing so, include appropriate allowance for climate change.

9.7.2 Flooding is the most common natural hazard and third most damaging globally after storms and earthquakes. Anthropogenic climate change is expected to increase flood risk through more frequent heavy precipitation, increased catchment wetness and a rise in sea levels. Mitigating the flood risk within planning is an essential practice in order for developments to yield a sustainable status.

9.7.3 Guidance has been released by the EA and Defra on Climate Change allowances (CCA). Making CCA in flood risk assessments will help minimise the vulnerability and provide resilience to flooding and coastal change in the future. The vulnerability of the persons or objects (the element at risk) in an area, which is inundated if a flood of a certain magnitude occurs, is weighted with the frequency of occurrence of that flood.

9.7.4 The CCA are predictions of anticipated change for Peak river flow by river basin district:-

9 . Flooding in Context

- i. Table 1 shows the river basin district relevant for south Worcestershire –illustrating the peak river flow allowances and the anticipated changes to peak flow. The range of allowances based on percentiles. A percentile is a measure used in statistics to describe the proportion of possible scenarios that fall below an allowance level.
- ii. The
 - Central allowance is based on the 50th percentile
 - Higher central is based on the 70th percentile
 - Upper end is based on the 90th percentile

The revised CCA provided in Table 1 are based on the same approach used in the 2011 version of 'Adapting to Climate Change: Guidance for Flood Risk Management Authorities' but with two clear differences:

 - a. A 'Higher Central' allowance has been added on the 70th percentile as an option between Central and Upper allowances.
 - b. The Upper is based on 90th percentile rather than 80th percentile plus one standard deviation used in the 2011 document.
- iii. Central (50th percentile), Higher Central (70th percentile) and Upper (90th percentile) CCA are provided to help represent the range of the future risks. The design and resilience of flood and coastal erosion risk management (FCERM) schemes, which should consider credible and reasonable climate change impacts. The EA state that most FCERM schemes are designed to the Central, with sensitivity testing completed against the Upper allowance to understand potential impacts, where the flooding consequences of the Upper allowance may shift and the impact becoming extremely severe.
- iv. The Upper allowance should be used in scheme design to consider the longer term sensitivity to future Climate Change impacts. Mitigation measures should be determined and planned for in the scheme up to the higher Central allowance – thereby encouraging the use of managed adaptation.
- v. The Central, Higher Central and Upper allowances are designed by the Government to have full consideration and appreciation of emission scenarios and climate uncertainty.

Table 1: Peak river flow allowances for river basin district Severn		
River basin district	Allowance category	Total potential change anticipated for the '2020s' (2015 to 2039)
Severn	Upper end	25%

9 . Flooding in Context

	Higher central	25%
	Central	10%

- vi. Peak rainfall intensity - Although we are able to make qualitative statements as to whether extreme rainfall is likely to increase or decrease over the UK in the future, it is difficult to posit the changes to individual, locally examined, places.
- vii. Increased rainfall affects river levels and land and urban/sustainable drainage systems. (More detail issued in section 8). Table 2 presents the potential change anticipated for the '2020s' in the extreme rainfall intensity. The percentage is the given allowance illustrated by the Government guidance

Table 2: Anticipated changes in extreme rainfall intensity in urban catchments	
Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)
Upper end	10%
Central	5%

- viii. These four allowances are based on Climate Change projections and different scenarios of carbon dioxide (CO2) emissions to the atmosphere.

Developers should refer to the to the most recent guidance released by the EA and D e f r a , a v a i l a b l e a t : <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>. Developers will also need to look at the EA's recent local climate change guidance entitled 'Climate Change allowances for planning (SHWG area)' This is an important factor for developers to consider when assessing Flood Risk and can be found at Appendix 12.

9.8 Historic Environment

9.8.1 Flooding has had a considerable impact on shaping the Historic environment, and without careful considering into the design of flood mitigation works, this can increase risk towards other heritage assets not previous affected by flooding as it travels downstream. With approximately 4784 Listed and at least 12,000 undesignated historic buildings within the South Worcestershire Boundary; management, adaptation and mitigation of these assets, especially when flooding occurs, is held with significant importance.

9.8.2 Appropriate consideration of the historic environment within flood risk management can present a number of opportunities, ranging from the re-use of historic water-management systems, to a greater understanding of modern flooding by looking back at historic events. Of which a study, which utilises mapping data from the EA and WCC, presents flooding hotspots against 40,000 historic environment records. This aims to help identify assets potentially at risk from fluvial or pluvial flooding. So far this has led to 15,000 assets being identified for consideration.

9 . Flooding in Context

9.8.3 This information can be used as part of an evidence base to inform the subsequent appraisal of sites whilst also being utilised further when considering SuDs schemes and flood alleviation works.

9.8.4 To identify the potential impact on the historic environment and to insure that any unavailable damage is minimized. It is advisable to engage with the Worcestershire Historic Environment Record (HER) which holds 54,000 records on all aspects of Worcestershire's archaeology and historic environment, including archaeological sites, historic buildings, monuments and landscape features.

9.8.5 Further details can be found in SWDP6 'Historic Environment' and SWDP24 'Management of the Historic Environment'. Policy SWDP6 should be read in conjunction with SWDP24 when considering the Historic Environment and the way it should be managed. Further information has been produced by WCC and Historic England on flooding and the historic environment for Worcestershire: This can be found at: <http://www.worcestershire.gov.uk/archaeology/flooding>

9.8.6 The cumulative impact of large developments are considered by South Worcestershire's local planning authorities throughout the application process and when required a flood risk assessment will help to determine applications without any significant risk to upstream historic riverside towns. Further SuDs are identified as a means for alleviating the risk

9.8.7 Once a risk of river, surface, ground water or sewer flooding has been identified it is important to apply specific measures to all types of buildings, especially those with Historic value. For further information please visit Historic England's guidance published for Flooding and Historic Buildings at <https://historicengland.org.uk/images-books/publications/flooding-and-historic-buildings-2ednrev/>

9.8.8 Further you can engage with the expertise of South Worcestershire's Conservation Officers or appropriate Archaeological staff by contacting:
Email: contact@swdevelopmentplan.org
Phone: 01386 565000

9.9 Undesignated Archaeology

9.9.1 Policy SWDP24 states that "it is important that any Climate Change mitigation/adaption measures do not cause harm to the significance of heritage assets". In addition, it is also important to seek confirmation that the site does not hold undesignated archaeology. The vulnerability of the assets would require the applicant to consult the Historic Environment Record with the correct measures then followed.

9.9.2 As the impacts to the historic environment from flood events can be considerable.

9.9.3 The impacts of a flood can prove to be considerable to communities, people's livelihoods and the historic environment, of which creates a degree of culture and identity for the south Worcestershire area. Therefore, protection measures must be

9 . Flooding in Context

followed with well informed works to maximise the integrity and sustainability of significant heritage assets. Any ill-informed works can have a detrimental effect to the valued contributions to the local economies and communities. Moreover, flood alleviation schemes are highly sensitive projects in respect of the historic environment. Ensuring that the potential archaeological and historic environmental impact of any scheme is fully quantified and flood mitigation is considered at all stages when works and development is required.

9.9.4 Any schemes to reduce or respond to flood risk must therefore be sensitive to the unique historic characteristics of the area with consideration for any archeological remains that may be on-site.

10 . Sustainable Drainage Systems (SUDS)

10.1 Sustainable Drainage Systems (SUDS)

10.1.1 SuDS highlight the benefits of providing a sustainable solution to help reduce and manage surface water run-off which might otherwise cause flooding and pollution. These are physical structures built to receive surface water run-off and provide drainage solutions that mimic natural processes, (rather than piped solutions). By dealing with rain close to its source, SuDS can deal with polluted water and slow down flows across sites and into watercourses allowing settlement, filtering and infiltration, which also have ecological benefits.

10.1.2 Developers are required to work with the SWC, the LLFA/ SWLDP, the Canal and River Trust and the Environment Agency to incorporate SuDS, where possible, in all new development to reduce the risk of flooding, pollution to watercourses and minimise negative impacts on biodiversity. This should be considered at the earliest stages possible and preliminary consultation with the SWC is advised. Policy SWDP 29 'Sustainable Drainage Systems' sets out the requirements for all development proposals.

SuDS Requirements (Policy SWDP 29):

The SWC will require, where viable, the provision of SuDS techniques in **all** built development proposals and change of use applications:

- The objective is to exhaust all measures at the top of the Management Train before considering other control options.
- The three objectives of quantity, quality and amenity / biodiversity should have equal standing and the ideal SuDS solution will achieve benefits in all three categories.
- Details of the proposed SuDS measures must be provided in the WMS, which must also identify long-term ownership and provide adequate proposals for the regular maintenance and management of such measures over the life expectancy of the development.
- Where the physical layout of a development or other constraints, such as high ground water levels or clay soils limits free drainage, the SWC will expect developers to provide full justification for proposals which do not follow SuDS principles. As a minimum, the SWC will not normally permit development that will increase the rate of runoff to a watercourse.
- Evidence must be submitted that demonstrates a chosen SuDS technique is suitable for the development and supporting evidence to back up calculations
- A long-term maintenance strategy for all elements of SuDS techniques proposed within a scheme must also be set out in the WMS.

10 . Sustainable Drainage Systems (SUDS)

10.1.3 SuDS can be designed to fit into most settings. The options available should be considered at the early stages of development. These should take full account of the Surface Water Management Train, with the objective of exhausting all measures at the top of the Management Train before considering other control options.

10.1.4 SuDS measures seek to mimic natural drainage processes and reduce the impacts of urbanisation on downstream watercourses. These can operate at the level of individual properties (green roofs, water butts, soakaways in garden areas and porous paving of driveways), within neighbourhoods (swales, detention basins and porous paving of highways); and at the strategic level (through features such as large balancing ponds).

10.1.5 The basic principle with SuDS is to minimise the impacts of the development on the quantity and quality of run-off and maximise amenity and biodiversity opportunities. This three way concept is described as the SuDS triangle, discussed in further detail in 'The SuDS Manual (C753)', produced by CIRIA. The three objectives of quantity, quality and amenity / biodiversity should have equal standing and the ideal SuDS solution will achieve benefits in all three categories. This integrated approach is supported by the SWC and should be demonstrated through the WMS.

10.2 Planning Obligations and Conditions

10.2.1 The ownership and maintenance of traditional piped drainage systems is clearly defined in Sewers for Adoption (Water Services Association, 1994). It is expected that as far as reasonably practicable, all drainage systems will be formally adopted by the appropriate authority i.e. Severn Trent Water and Worcestershire County Council Highways.

10.2.2 Arrangements for the ongoing maintenance of non-traditional SuDS components such as ponds, swales and wetlands are not as clear cut. There is currently no clear guidance in place regarding who should be responsible for the operation and maintenance of such facilities. However, maintenance agreements should be negotiated on a site-by-site basis. A range of viable maintenance options for the ownership and adoption of sustainable drainage systems (SuDS) are available and table 3 at Appendix 11 collates various options for SUDs maintenance responsibility.

10.3 SuDS Approaches

10.3.1 It is well acknowledged that there should be a SuDS approach for every situation, The suitability of each will depend on the type of scheme, the catchment area, local hydrology and geology and potential contaminants present in the run-off. A list of SuDS techniques can be found below and these are detailed in the CIRIA publication 'The SUDS manual (C753)' available from their website: www.ciria.org.

- Soakaway
- Permeable surfacing

10 . Sustainable Drainage Systems (SUDS)

- Swales and Basin
- Infiltration Trenches and Filter Drain
- Ponds and Wetlands
- On Site Stormwater Detention
- Reed Bed Filtration
- Green Roofs
- Tree Planting

10.4 Cost

10.4.1 SuDS have the potential to reduce costs to the developer by avoiding the need to construct additional surface water drainage infrastructure. Provision of open space, wildlife improvements and water conservation are a number of additional benefits achieved.

10.5 Health and Safety

10.5.1 It is good practice to undertake a safety audit or risk assessment of a SuDS scheme before the design is finalised to ensure that risks to workers and the public have been designed out as far as possible. Some SuDS techniques will only be feasible in large-scale developments. However, measures can be incorporated into small-scale developments through using permeable surfacing materials and soft planting, providing water butts and recycling greywater.

10.6 SuDS Maintenance

10.6.1 Where the LPA's and relevant Operating Authorities give approval for a SuDS scheme, the developer will be responsible for meeting all necessary costs. This includes planning, design and installation of such systems and must ensure that the long term maintenance and management of SuDS are secured. Approval of submitted details for SuDS proposals will normally be dealt with through the WMS and subsequently followed through by means of planning conditions or a legal agreement.

10.6.2 A SuDS maintenance strategy must be submitted as part of the WMS, together with details on appropriate commuted payments if necessary. Commuted sums for maintenance will generally be sought where drainage schemes incorporate open space / amenity space and / or the physical maintenance of drains, filters and other similar works. The SWC may also apply planning conditions that would require completion of the necessary works before further stages of a development can proceed or link completion of the works to a phasing plan.

10 . Sustainable Drainage Systems (SUDS)

10.6.3 It is essential that the ownership and responsibility for maintenance of every sustainable drainage element is clear; the opportunity for dispute kept to a minimum; and durable and long-term accountable arrangements made, such as by using management companies.

10.6.4 Where such works would provide a wider benefit, the funding provided by developers may be proportional to the benefits to them. For instance, the development might fund the provision of the defences or other measures which would then be vested in and maintained by the Operating Authority. Where development is undertaken adjacent to a watercourse, the SWC will normally require the developer to carry out necessary improvements to the watercourse along the frontage of development, in addition to the required SuDS drainage measures.

10.6.5 Arrangements for the maintenance of the entire SuDS should be clear. It is anticipated that responsibility should rest with one or more publicly accountable body. There may be opportunities where the private management of facilities is considered appropriate. However, the SWC and its partners will have to be assured that a management regime is in place to ensure that long-term maintenance of the facilities will ensue, evidenced by the WMS.

10.6.6 Where the development results in a system of private drainage being constructed i.e. built to un-adoptable standards, the developer must provide details of how the future maintenance and replacement will be carried out. This will usually mean the setting up of a management body for the development.

10.7 Adoption

10.7.1 The SWC will not consider the adoption of SuDS devices, except under exceptional circumstances. However, other Operating Authorities may consider adopting facilities. For example, in Wychavon District the Councils Parks team, for instance, will consider adopting areas of public open space surrounding new surface water drainage facilities in the larger towns but all such details should be incorporated into the WMS. The adopting organisation, along with relevant partners, will need to approve the design included as part of the WMS prior to construction and this is likely to influence the design just as much as technical considerations.

10.8 Ecological Impact

10.8.1 Those proposing development should seek opportunities to use multi-purpose open space for amenity; with the incorporation of wildlife habitat and flood storage uses. It needs to be demonstrated that flooding and biodiversity can be jointly managed.

11 . Water Recycling

11.1 Water Recycling and Harvesting Requirements

11.1.1 Water recycling is a key component of integrated water cycle management. The safe implementation of water recycling can help to reduce inputs of nutrients and other contaminants to surface waters, conserve drinking water and provide economic and social benefits to communities. Developers need to take into account the possibilities of re-using and recycling surface water in as many ways as feasible.

11.1.2 The aim in south Worcestershire is to encourage and support water recycling that is safe, environmentally sustainable and cost-effective by encouraging rainwater harvesting and greywater recycling methods to be included in new development where practical and viable

Water Recycling and Rainwater Harvesting Requirements:

- Rainwater harvesting should be incorporated on development sites for uses such as car washing, watering gardens and topping up ponds or wetland habitats.
- Greywater recycling systems should be incorporated on development sites for non-potable uses such as for flushing toilets.
- Consideration should be given to the use of more efficient domestic and non-domestic appliances such as low flush or compost toilets, waterless urinals, reduced flow rates for showers, low-flow or spray taps and water meters with pulsed output.
- Other water recycling measures should be considered when designing any landscaping scheme for residential or non-residential development. Such measures could include working with existing natural vegetation, selecting drought-resistant plants or low water use landscaping / gardens and using automatic drip irrigation systems.
- For proposals using a significant amount of water (e.g. on large housing sites of 10 dwellings or above or agricultural uses where abstraction is required), detailed information must be submitted as part of the WMS on proposed water use and water management (i.e. a water resources study / audit) with details on how their water can be recycled and requirements managed.
- The WMS should also include a rainwater harvesting and greywater recycling feasibility study showing how the appropriate measures for collecting and reusing water will be incorporated into the development.
- Future maintenance arrangements should be addressed in the earliest project planning stages and agreed as part of the WMS.

11 . Water Recycling

11.2 Rainwater Harvesting and Greywater Recycling

11.2.1 Rainwater harvesting is described as being water collected from roofs via traditional guttering, through down pipes to an underground tank(s). This water is then delivered on demand by an in-tank submersible pump direct to toilets, washing machine and outside tap use. More than 50% of mains water can be substituted by rainwater in this way.

11.2.2 Greywater recycling is typically defined as being water from the bath, shower and wash hand basin. The ideal situation for greywater is in living accommodation where sufficient amounts are generated daily for reuse in toilets, the washing machine and any outside tap.

11.2.3 The SWC will seek to achieve further reductions in mains water use by encouraging the inclusion of rainwater collection and greywater recycling measures in all developments where feasible. (Further information and illustrations on water conservation methods and techniques can be found at Appendix 5).

11.3 Maintenance

11.3.1 The facilities for both rainwater harvesting and greywater recycling require maintenance to ensure their effectiveness and to prevent deterioration of water quality. The SWC will use conditions and / or legal agreements for the long-term retention of rainwater harvesting and greywater recycling systems based on the models available from CIRIA.

11.3.2 Future maintenance arrangements should be addressed in the earliest project planning stages and included in any WMS.

12 . Appendix 1 - Context: Flooding in South Worcestershire

The main causes of flooding in south Worcestershire are fluvial and pluvial (either overland or from sewers). Main river flooding has occurred many times with significant events occurring in 1998, 2000, 2007 and 2014 when several hundred properties flooded on each occasion.

The floods in 1998 were attributed to a large storm event, whilst the November and December 2000 events were the largest flood events since 1947. In 2007, there were over 1,600 recorded incidents of flooding in Wychavon alone and nearly 200 properties flooded in Worcester. This particular event was a combination of main river and surface water flooding.

The main causes of flooding within the villages are the smaller watercourses and surface water flooding from sewers and overland flow.

Summary of Flood Risk by District:

Malvern Hills – the main cause of flooding in Malvern Hills is from local watercourses and surface water sewers. In particular, rapid response catchments are of concern, and as many of the watercourses at risk are less than 3km² in area there are no flood risk maps covering these.

Worcester City – fluvial flood risk issues in Worcester primarily arise from the River Severn, River Teme and the Barbourne Brook. Other historic flood issues in Worcester are localised surface water flooding and flooding in the Barbourne Brook catchment, caused by a combination of heavy rainfall, inadequate culverts and their maintenance / operation.

Wychavon – in Wychavon, flood risk is from the River Avon in Evesham and Pershore, the River Salwarpe, the Droitwich canals and many small watercourses in rural areas. In addition, surface water is an issue in many locations. A broad scale surface water sewerage model has been produced confirming that surface water discharge in some areas of Droitwich will exacerbate flooding of the River Salwarpe.

Lower Severn Internal Drainage Board – the area of the Severn Internal Drainage Board (IDB) within South Worcestershire is limited to the Longdon Marshes in the south of Malvern Hills District. The main flood risk issue for the Severn IDB is the condition of the Longdon Brook which will affect the IDB drains that run into it.

Flood Defences - A number of flood defence schemes have been implemented across South Worcestershire in recent years, and these include:

Pershore – completed September 2010, the scheme consists of a flood relief channel and earth embankments to the south of the town and a flood wall built through community allotments. The scheme provides protection to 61 properties in Pershore to a 1 in 100 year chance of flooding in any given year.

Riddings Brook, Wribbenhall – completed in 2011, the scheme consists of a 200m earth bund.

12 . Appendix 1 - Context: Flooding in South Worcestershire

Uckinghall – completed in 2011, the scheme consists of an earth embankment, flood wall, pumping station, and highway alterations at Ferry Lane including a flood gate. The scheme provides protection to a 1 in 100 year chance of flooding in any given year.

Powick – completed in November 2011, the scheme consists of the construction of two flood embankments, providing protection from a flood with a 1 in 75 year chance of occurring in any given year.

Upton upon Severn – completed in July 2012, the scheme consists of an earth embankment, flood wall and floodgates across New Street. Additionally a flood wall was constructed in the Waterside area. The scheme protects 64 properties to a 1 in 150 year chance of flooding in any given year.

Kempsey – completed in July 2012, the scheme consists of 180m long earth embankment constructed downstream of the village to stop flooding from the River Severn. Additionally a large culvert and automated penstock allows Hatfield Brook to flow freely into the River Severn in periods of low flow. Pumps are in place to discharge surface water and water from Hatfield Brook to the other side of the embankment when the penstock is closed. The scheme provides protection to a 1 in 100 year chance of flooding in any given year.

13 . Appendix 2 - Policy and Guidance

Local Policy Context and Advice

South Worcestershire Development Plan (SWDP) (2016)

This was adopted in 2016 and developed jointly by Malvern Hills, Worcester City and Wychavon District Councils. The SWDP considers the long term vision and objectives for South Worcestershire up to the year 2030, as well as containing the policies for delivering these objectives in a planned and cohesive manner, through:

- Allocating larger 'strategic' sites across South Worcestershire;
- Providing policies to ensure that any development is sustainable; and
- Assessing all other potential development sites whether it is for housing, employment, retail, education, health, community use or indeed an open space use

The SWDP has replaced the existing Local Plans of the three partner councils and supersedes elements of WCC's County Structure Plan.

In order to manage water and avoid flood risk in new development proposals and support sustainable development, the following key SWDP policies should be read in conjunction with this SPD:

- SWDP 6 'Historic Environment' and SWDP 24 'Management of the Historic Environment' requires water management and flood risk measures to be sympathetic to the historic environment and heritage assets in instances where they may be affected.
- SWDP 7 'Infrastructure' states that new proposals will be required to provide or contribute towards the provision of infrastructure needed to support development. Cross reference should be made to the flood risk and drainage schemes identified in the south Worcestershire Infrastructure Delivery Plan (SWIDP) (latest 'live' version of the document updated in July 2016), the Community Infrastructure Levy and the Developer Contributions SPD.
- SWDP 22 'Biodiversity & Geodiversity' seeks to prevent development that would comprise the favourable condition of a Special Area of Conservation (SAC), Site of Special Scientific Interest (SSSI), Ancient Woodland (AW), Veteran Tree (VT) Grassland Inventory Site (GIS), Local Wildlife Site (LWS) or Local Geological Site (LGS). Also requires development, where practical, to be designed to enhance biodiversity and geodiversity interests.
- SWDP 28 'Management of Flood Risk' applies a sequential, risk-based approach to the location of development to avoid flood risk to people and property and manage any residual risk, taking account of the impacts of Climate Change.

13 . Appendix 2 - Policy and Guidance

This is achieved by applying the Sequential and Exception tests, where necessary and Site Specific Flood Risk Assessments on development proposals that meet certain criteria. This policy also prohibits development in urban areas in areas of high flood risk and does not permit development for caravan, mobile home and chalet parks within the high risk floodplain. SWDP 28 only allows the granting of planning permission for development that provides protection and enhancement of existing watercourses.

- SWDP 29 'Sustainable Drainage Systems' seeks to minimise flood risk, improve water quality and groundwater recharge and enhance biodiversity and amenity interest through the provision of SUDs. The Governments 'Non-statutory Technical Standards for Sustainable Drainage Systems' published since the plan adoption requires that, as a minimum, for Greenfield and Brownfield sites, the post-development surface water run-off rate will not increase.
- SWDP 30 'Water Resources, Efficiency and Treatment' requires all development proposals to demonstrate that adequate water supply and water treatment facilities are in place to serve the development. This policy also sets a limit on the amount of daily non-recycled water use per person of 110 litres for housing proposals. It also sets water standards for business / commercial proposals and requires water quality and quantity to be preserved.
- SWDP31 'Pollution and Land Instability' requires development proposals to be designed in order to avoid any significant adverse impacts from pollution on the water environment.
- SWDP 62 'Implementation' seeks to ensure the strategy and objectives of the plan are delivered.

There are also other relevant and interlinked policies that can have implications on water management:

- SWDP1 'Overarching Sustainable Development Principles'
- SWDP2 'Development Strategy and Settlement Hierarchy'
- SWDP3 'Employment, Housing and Retail Provision Requirement and Delivery'
- SWDP5 'Green Infrastructure'
- SWDP17 'Travellers and Travelling Showpeople'
- SWDP18 'Replacement Dwellings in the Open Countryside'
- SWDP19 'Dwellings for Rural Workers'
- SWDP25 'Landscape Character'

13 . Appendix 2 - Policy and Guidance

- SWDP27 'Renewable and Low Carbon Energy'
- SWDP35 'Visitor Accommodation'
- SWDP36 'Static and Touring Caravans, Chalets and Camping Sites'
- SWDP37 'Built Community Facilities'
- SWDP38 'Green Space'
- SWDP39 'Provision for Green Space and Outdoor Community Uses in New Development'
- SWDP40 'Waterfronts'
- SWDP41 'Marinas and Moorings'
- SWDP42 'Residential Moorings'

Developer Contributions SPD (October 2016) Flood Risk and Surface Water Management Contributions - where development is permitted in areas at risk of flooding the Framework is clear that the risk of flooding should not be increased elsewhere, and that any residual risk is safely managed. Application of the sequential test may, in some circumstances, result in development being permitted that requires the provision of off-site flood defence and mitigation works. Such provision, generally funded by the developer, would only be acceptable if it is consistent with the relevant flood-risk management policies (SWDP28 and SWDP29). Where a development requires the provision of defences to mitigate residual flood risk, the developer will be expected to provide these directly or pay for the timely completion of the necessary works. In all cases, the type and location of the defences should be justified and agreed with the appropriate Risk Management Authority (either the Environment Agency or the LLFA, as defined in the Flood and Water Management Act 2010).

Community Infrastructure Levy (April 2017) - The Levy is a planning charge that came into force on 6 April 2010 through the CIL Regulations 2010 (as amended). The Levy allows charging authorities to raise funds from developers and land owners undertaking new developments in their area. The money can be used to fund a wide range of additional infrastructure (separate to Section 106 planning obligations) that is needed to support development.

Developer contributions towards local and strategic infrastructure improvements have been identified in the South Worcestershire Infrastructure Delivery Plan (SWIDP) (latest 'live' version of the document updated in July 2016), which underpins the development strategy set out in the SWDP, and is guided specifically by policy SWDP 7 'Infrastructure'.

13 . Appendix 2 - Policy and Guidance

The Regulation 123 list, sets out the types of infrastructure that the SWC's could be, wholly or partly funded by CIL. In relation to flooding, these include the provision, expansion, improvement, or replacement of new and existing flood mitigation measures (including flood risk management infrastructure). However, it excludes those items of infrastructure stated as to be provided through Section 106 obligations. Further information on CIL can be found using the following link: www.swdevelopmentplan.org

Worcestershire's Local Flood Risk Management Strategy 2015 - 2021 (Adopted March 2016) - The Flood and Water Management Act 2010 placed a number of statutory duties on WCC in its new role as a LLFA. One of the duties was to produce a Local Flood Risk Management Strategy: This is publically available by using the following link:

http://www.worcestershire.gov.uk/info/20236/flood_risk_management/1046/plans_policies_and_strategies/2

The Strategy is the overarching document on flood risk in the county. It sets the scene for understanding flood risk, and the issues and challenges which the county faces. It draws together information from a number of sources and partners and outlines how environmental and sustainability objectives will be incorporated into flood risk work. Local Flood Risk Management Plans are also published in certain areas and these are available from the LLFA on request.

Local Authority Services and the Water Environment: Advice Note on the Water Framework Directive for Local Authorities across the Midlands (June 2012) - This Advice Note provides information to local authorities on the important contribution they can make to local improvements in the water environment and to meeting the objectives of the Water Framework Directive.

South Worcestershire Land Drainage Partnership – Flooding – Information and Advice (January 2016) - The leaflet has been produced by the SWDLP and is intended to provide helpful advice and guidance for those at risk of flooding, and explain the roles of the various organisations that may have a responsibility.

SWDLP is a partnership formed between Worcestershire County Council, Malvern Hills District Council, Worcester City Council and Wychavon District Council to provide responsibility for all non-main river land drainage related matters.

Planning for Water in Worcestershire Technical Research Paper (Update December 2011) - This Paper provides a consistent, strategic approach to the management of water by identifying the key issues and implications surrounding the management of water in the County so that water related issues can be properly and strategically planned for at an early stage in the plan making process. Its primary focus is with regard to public water supply; economic and built development such as new and existing industrial and housing stock; waste and minerals operations; and opportunities arising for enhancement of biodiversity.

13 . Appendix 2 - Policy and Guidance

Strategic Flood Risk Assessment (SFRA) (2012) - The SFRA of south Worcestershire highlights areas with surface water problems, as well as fluvial risk, which could link into a consideration for strategic surface water and will assist in the sequential approach to development. The SFRA also informs policies on SuDS and appropriate techniques within the area and will provide baseline data for developers in assessing their proposals as well as providing advice on mitigation techniques.

Severn Trent Water – Water Resources Management Plan (2014) –The Water Resources Management Plan 2009 sets out a proposed 25 year strategy for maintaining the balance between the supply and demand for water in our region and maintaining our service level of no more than three hosepipe bans per 100 years. The plan demonstrates how Severn Trent Water can meet the future demand of their customers in a dry year in a way that complies with all relevant legislation, guidelines and directions and strikes the right balance between keeping down customer bills, minimising impact on the environment and ensuring the sustainable use of water resources. The overall aim of the Water Resources Management Plan is to define how the company plans to meet demand now and into the future in as efficient and sustainable a way as possible, whilst complying with environmental legislation and regulatory requirements.

Environment Agency – Managing Flood Risk: River Severn Catchment Flood Management Plan (2009) - This document gives an overview of flood risk in the River Severn catchment and sets out the EA preferred plan for sustainable flood risk management over the next 50 – 100 years. The document is to be used to ensure that policies and plans that affect land use planning, rural development, agriculture, transport, recreation, nature conservation and the historic environment in the river catchment area take into account flood risk management. The document calls for public authorities to work together better and to work with local communities to make choices on future changes that take account of flood risk. The document promotes sensible and sustainable development that works with nature and the assets that are of value and importance to the area. The emerging **County-wide Surface Water Management Plan** and **LLFA SuDS Guide** are available on request from the LLFA.

European Legislation

EU Water Framework Directive (2000/60/EC) – Enacted in UK law in the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (SI 3242) applies to surface waters (including some coastal waters) and groundwater (water in underground rock). It requires member states, among other things, to prevent deterioration of aquatic ecosystems and protect, enhance and restore water bodies to 'good' status. Local planning authorities must, in exercising their functions, have regard to the river basin management plans on the Environment Agency website that implement the Water Framework Directive. For South Worcestershire, the River Severn Basin Management Plan, (available at <https://www.gov.uk/government/collections/river-basin-management-plans-2015>)

13 . Appendix 2 - Policy and Guidance

which contains the main issues for the water environment and the actions needed to tackle them, must be taken into consideration. Further details are available at : <https://www.catchmentbasedapproach.org/severn>.

The Groundwater Directive (2006/118/EC) - was developed in response to the requirements of Article 17 of the Water Framework Directive (An effective and coherent water policy must take account of the vulnerability of aquatic ecosystems located near the coast and estuaries or in gulfs or relatively closed seas, as their equilibrium is strongly influenced by the quality of inland waters flowing into them. Protection of water status within river basins will provide economic benefits by contributing towards the protection of fish populations, including coastal fish populations).

The EU Floods Directive (2007/60/EC) – enacted in UK law in the 2009 Flood Risk Regulations which sets the requirement for Preliminary Flood Risk Assessments (PFRA) to be produced by all unitary and county councils.

National Legislation and Guidance

The Flood and Water Management Act 2010 – brought about significant legislative changes to the management of flood risk and water. It established county and unitary authorities as Lead Local Flood Authorities (LLFA).

LLFAs have responsibility for managing local flood risk from surface runoff, ordinary watercourses and groundwater in the area. LLFA have a responsibility to produce a Local Flood Risk Management Strategy and also have powers and duties to issue consents for works on ordinary watercourses and undertake enforcement activities.

The Act also introduces a duty for Local Authorities to co-operate with each other and share data in pursuance of the objectives of the legislation.

The key features of the Act include:

- Establishing the Environment Agency as the lead body to provide a strategic overview of all flood and coastal erosion flood risk management, with unitary and county councils leading in managing local flood risks.
- Introducing an improved, risk-based approach to reservoir safety.
- Encourage the uptake of sustainable drainage systems by removing the automatic right to connect to sewers.
- Widening the list of uses that water companies can control during periods of water shortage, and enable Government to add to and remove uses from the list.

13 . Appendix 2 - Policy and Guidance

- Enabling water and sewerage companies to operate concessionary schemes for community groups on surface water drainage charges.
- Reducing 'bad debt' in the water industry by amending the Water Industry Act 1991 to provide a named customer and clarify who is responsible for paying the water bill.
- Making it easier for water and sewerage companies to develop and implement social tariffs where companies consider there is a good cause to do so, and in light of guidance that will be issued by the Secretary of State following a full public consultation.

The Water Resources (Environmental Impact Assessment) (England and Wales) (Amendment) Regulations 2017 – amends the Water Resources (Environmental Impact Assessment) (England and Wales) Regulations 2003. The 2017 regulations transpose the amendments made to the Environmental Impact Assessment (EIA) Directive 2011/92/EU by Directive 2014/52/EU and make a number of significant changes to the EIA regime in England and Wales.

Water Supply (Water Quality) (England) Regulations 2016 - this regulation provides the legislative framework for drinking water quality in England in respect of public supplies provided by water companies and licenced water suppliers. This is water intended for human consumption including cooking, drinking, food preparation and other domestic purposes as well as water used in food production undertakings.

The Water Act 2014 – This Act makes provision about the regulation of the water industry. It allows for compensation for modification of licences to abstract water and deals with main river maps. The Act also addresses the regulation of the water environment and water resources, and makes provisions about flood insurance for household premises.

The Localism Act (2011) - The 'Duty to Cooperate' in the Localism Act 2011 requires local authorities to take a lead on strategic planning and tackle issues that impact on a 'larger than local' area and cut across administrative boundaries. This includes the provision of water supply infrastructure, water quality and enhancement of the natural environment.

The National Planning Policy Framework (NPPF) 2012 and National Planning Policy Guidance (NPPG) 2014 – replaced many of the previous Planning Policy Guidance (PPGs) or Planning Policy Statements (PPSs) including PPS25: 'Development and Flood Risk'. Note that the NPPF was updated on 24 July 2018. The Management of Flood Risk policy SWDP28, the Sustainable Drainage Systems policy SWDP29 and the Water Resources, Efficiency and Treatment policy SWDP30, their examination and this SPD and the related consultations, have taken place in the context of the NPPF 2012.

13 . Appendix 2 - Policy and Guidance

Flood risk and water management form part of the environmental dimension to sustainable development which is at the heart of the NPPF and one of the core planning principles set out is that planning should take full account of flood risk. Section 10 sets out the requirement for planning authorities to adopt proactive strategies to mitigate and adapt to climate change. The Framework sets out strict tests to avoid inappropriate development in areas at risk of flooding.

The Framework indicates that local development plans and planning applications should both ensure that flood risk is not increased as a result of development and that development proposals should only be permitted in areas at risk of flooding where it can be demonstrated that:

- a site specific flood risk assessment (para. 103) has been undertaken which follows the Sequential Test (para. 101), and if required, passes the Exception Test (para. 102);
- within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location;
- development is appropriately flood resilient and resistant, including safe access and escape routes where required;
- that any residual risk can be safely managed, including by emergency planning; and
- the site gives priority to the use of sustainable drainage systems

Further guidance is set out in the NPPG which was produced to support the NPPF. Relevant sections of the NPPG advise on how spatial planning can ensure the risks associated with flooding and coastal change are taken into account in the planning process. The aim of the NPPG is to ensure that if there are better sites in terms of flood risk, or a proposed development cannot be made safe, it should not be permitted.

The National Policy Statement for Waste Water (2012) - covers nationally significant waste water infrastructure.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69505/pb13709-waste-water-nps.pdf

Non-Statutory Technical Standards for Sustainable Drainage Systems (2015)

- This document contains non-statutory technical standards for the design, maintenance and operation of SUDs. Systems to drain surface water from housing, non-residential or mixed use developments for the lifetime of the developments.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

13 . Appendix 2 - Policy and Guidance

The SuDS Manual (C753) (2015) - The SuDS manual has been updated to incorporate the latest technical advice and adaptable processes to assist in the planning, design, construction, management and maintenance of good SuDS. The updated SuDS manual incorporates the latest research, industry practice and guidance. In delivering SuDS there is a requirement to meet the framework set out by the Government's 'non statutory technical standards' and the revised SuDS manual complements these but goes further to support the cost-effective delivery of multiple benefits.

<https://ciria.sharefile.com/share/view/8f7bd896c1774629>

Sustainable Drainage Systems - Maximising the potential for people and wildlife - A guide for local authorities and developers (2012) - The guidance is aimed at local authorities, landscape architects, developers, engineers, masterplanners and anyone wishing to deliver benefits for people and wildlife through SuDS. It describes how to maximise the biodiversity potential of SuDS and identifies a set of design criteria and the design features required to deliver these benefits as well as their long-term management. It is not intended to replace the SuDS Manual (CIRIA 2007), instead it signposts the way to existing, relevant guidance and uses best-practice case studies to highlight and explain the opportunities for delivering better places for people and wildlife.

<https://www.rspb.org.uk/globalassets/downloads/documents/positions/planning/sustainable-drainage-systems.pdf>

Environment Agency: Living on the edge (2012) - Explains landowner's rights and responsibilities of riverside ownership.

<https://www.gov.uk/guidance/owning-a-watercourse>

Catchment Abstraction Management Strategy (CAMS) Reference Boundaries – the Catchment Abstraction Management Strategy Reference Boundaries are an external reference dataset giving an indication of where technical assessments have been undertaken. The CAMS help to look at the balance between society, the economy and the environment. The technical assessment helps identify where water may be available for future use but also where water resource demands may be impacting the water balance.

<https://catalogue.ceh.ac.uk/documents/c75c0b83-6b84-4462-a4b5-637484d9f339>

Learning lessons from the 2007 Floods – Sir Michael Pitt (2007) - the Pitt Review is an independent review of the flooding emergency that took place in June and July 2007 by Sir Michael Pitt on behalf of Ministers. The Review recommends a wider brief for the Environment Agency and asks councils to strengthen their technical capability in order to take the lead on local flood risk management. The Review argues that more can be done to protect communities through robust building and planning controls. The Review believes that the role of local authorities should be enhanced so that they take on responsibility for leading the coordination of flood risk management in their areas. As LPA's already have a substantial role because of their responsibilities for ordinary watercourses, drainage, highways and planning, the review considers that their place-shaping role and local democratic accountability will help to ensure that the right local action is taken on flooding.

13 . Appendix 2 - Policy and Guidance

http://webarchive.nationalarchives.gov.uk/20100702222546/http://archive.cabinetoffice.gov.uk/pittreview/_/media/assets/www.cabinetoffice.gov.uk/flooding_review/flood_report_lowres%20pdf.pdf

The National Flood Emergency Framework for England (December 2014) - the National Flood Emergency Framework sets out the Government's approach to achieving the aims set out below and is intended for use by all those involved in planning for and responsible to flooding.

The concept of a National Flood Emergency Framework was promoted by Sir Michael Pitt in his report on the summer 2007 floods. Its purpose is to provide a forward looking policy framework for flood emergency planning and response. It brings together information, guidance and key policies and is a resource for all involved in flood emergency planning at local and national levels. It is a common and strategic reference point for flood planning and response for all tiers of Government and for responder organisations.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/388997/pb14238-nfef-201412.pdf

Building Regulations 2010 (Part H)

Building Regulations are approved by Parliament and deal with the minimum standards of design and building work for the construction of domestic, commercial and industrial buildings. They also contain a list of requirements, which cover subjects such as structure, fire safety, ventilation, drainage, energy conservation, and access and facilities for disabled people.

In specific terms, for water issues the most important element of current Building Regulations is Part H which is focused on drainage and waste disposal. This introduces the surface water drainage hierarchy that follows the same principles as the Surface Water Management Train. This places a requirement for surface water disposal to be dealt with preferably through the use of SuDS. Some further relevant issues are covered by Part A of current regulations (which tackles subsidence) and Part C (which includes the protection of buildings from flooding).

14 . Appendix 3 - Responsibilities

a. Government Departments:

The Department for Communities and Local Government (DCLG) provides planning policy and guidance. The Department for Environment, Food and Rural Affairs (Defra) is responsible for policy and regulation on flood/coastal risk management, improving the environment, control of pollution, improving water quality and regulating the water industry.

b. Government Agencies:

The Environment Agency (EA) is responsible for managing water resources in England and their duties include:

- Regulating major industry and waste
- Treatment of contaminated land
- Water quality and resources
- Fisheries
- Inland river, estuary and harbour navigations (excluding the River Severn as it runs through the area)
- Conservation and ecology
- Managing the risk of flooding from main rivers, reservoirs, estuaries and the sea
- Preparing River Basin Management Plans and implementing the Catchment Based Approach

It is also responsible for pollution control and environmental permitting.

Natural England (NE) has a statutory role in the water planning process to ensure that water companies can deliver their statutory obligations for Natura 2000 sites, Sites of Special Scientific Interest (SSSIs) and Biodiversity Action Plans (BAPs).

c. Local Authorities

Unitary Authorities and County Councils are Lead Local Flood Authorities and have lead responsibility for managing the risk of flooding from surface water, groundwater and ordinary watercourses in their areas. They are also the Waste Planning Authority dealing with wastewater treatment plants. Unitary Authorities and District Councils also produce Water Cycle Studies as evidence for Local Development Plans and

14 . Appendix 3 - Responsibilities

associated SPD Development. They will consider the imposition of planning conditions and/or obligations to secure mitigation and compensatory measures where the relevant tests are met.

Land Drainage Officers working in the SWC investigate complaints concerning blockages watercourses (brooks, streams, ditches etc.) and offer advice to landowners with watercourses on their land (Riparian Landowners) in order to avoid problems such as disputes or legal action.

Emergency Planners working in the SWC are responsible for the following duties, which include dealing with flooding emergencies:

- Risk assessment.
- Business Continuity Management.
- Emergency Planning.
- Maintaining public awareness and arrangements to warn, inform and advise the public.
- Provision of advice and assistance to the commercial sector and voluntary organisations.
- Co-operation and information sharing

d. **Utility Companies**

- Statutory Water Company – undertake water resource management plans.
- Water and Sewerage Company – undertake Business Plans and Drainage Strategies (how they plan to deliver their statutory drainage functions).

e. **Catchment Partnerships**

Community partnerships led by the EA are delivering the Catchment Based Approach (CaBA) that embeds collaborative working at a river catchment scale to deliver cross cutting improvements to water environments.

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14 . Appendix 3 - Responsibilities

f. **Highway Authorities**

- i. The Highways Authority is responsible for managing, maintaining and improving the local road systems and their associated drainage and flood risk across England.
- ii. Highways England - operates, maintains and improves England's motorways and major A roads with the ambition of ensuring that major roads are more dependable, durable and safe. (Both these organisations are classed as flood risk management authorities).

g. **Land / Property Owners**

- Generally, landowners with watercourses on their land (Riparian Landowners) are responsible for the land drainage of their land.

h. **The Canal and River Trust**

- The Canal & River Trust own and maintain the Worcester & Birmingham and Droitwich canals within the South Worcestershire Area as well as act as Navigation Authority for the River Severn. It inspects, maintains and operates the water control structures within its ownership primarily to meet its statutory obligation to maintain navigation.

i. **Network Rail Land**

- Network Rail seeks to ensure that water management measures do not encroach onto Network's Rail property or into their culverts or drains.

15 . Appendix 4 - Water Management: Checklists and Types of Development

Water Management Checklists- Question for applicants

Have you contacted the LPA to determine which statutory undertaker you are required to consult with on your proposals?

Have you established the level of detail required within your WMS?

How do you propose to minimise the use of potable water supplies, for example through grey water collection or the use of water efficient appliances?

Does the design incorporate facilities to collect, store and use rainwater and / or grey water?

Has the integration of rain / grey water collection for flushing toilets and irrigating landscape features been integrated?

Do your landscaping schemes and planting design plans for the site minimise the need for watering?

Has the potential for treating wastewater on site and potential to integrate reed bed treatment into the landscape design of the site been considered?

Have you specified water efficient taps, toilets, showers and urinals?

Has the effect of the development on the quality and quantity of run-off from the site been considered?

Has a SuDS feasibility study been conducted?

Have you discussed water storage and retention requirements with the Environment Agency, LLFA and /or SWLDP?

How do you propose to deal with both foul and storm water disposal?

How do you propose to mitigate surface water pollution arising during construction?

Is a site specific FRA required for your proposal?

Does your proposal use a significant amount of water?

Have you consulted a professional to undertake porosity / percolation tests at your site?

How do you propose to protect existing biodiversity on the site and secure biodiversity gains in your proposal?

15 . Appendix 4 - Water Management: Checklists and Types of Development

Types of development affected by Water cycle issues:

Water cycle management affects every form of development to some extent but particular attention should be given to the following types of development:

- laying of hard standings / driveways / patios;
- individual new residential dwellings;
- applications for minor and major residential development;
- commercial and industrial new build or changes of use;
- development or change of use of community buildings, e.g. schools / hospitals / village halls;
- agricultural / horticultural development;
- leisure uses, such as sports centres, tennis courts and swimming pools;
- any extension or physical alterations to individual business, industrial, leisure or residential properties.

In addition to the types of development above, planning applications likely to require particular consideration of water management issues in south Worcestershire include those for development:

- 1) Within a river flood plain or flood zone shown on the indicative flood plain map prepared by the EA;
- 2) Within or adjacent to any watercourse, particularly where there might be potential for flash flooding;
- 3) Adjacent to or including any flood bank or other flood control structure;
- 4) Situated in an area where the Environment Agency LLFA and/or SWLDP have indicated that there may be drainage problems;
- 5) Likely to involve the culverting or diverting of any watercourse; of such a size or nature relative to the receiving watercourse/drainage system that there could be a significant increase in surface water run-off , or, of a significant size or nature that may put pressure on the existing water supply or sewer/drainage systems

15 . Appendix 4 - Water Management: Checklists and Types of Development

LLFA Checklist

	Outline	Detailed/Full
Site location plan	Yes	Yes
Site layout plan	Yes	Yes
Plan showing any existing watercourses on and adjacent to the site, and information on how these are incorporated into the wider SuDS scheme	Yes	Yes
Runoff rates and volumes to demonstrate that the proposed SuDS system should operate as designed with allowances for climate change. This should including balancing flows up to and including the 1 in 100 year event plus an allowance for climate change in line with current national guidelines.	Yes	Yes
Concept drainage strategy and masterplan demonstrating how SuDS have been incorporated into the site design	Yes	
Copy of the site specific flood risk assessment (FRA) where required (under NPPF)	Yes	Yes
Details of connections (including flow control devices) to watercourses, sewers, public surface water sewers and highway drains *		Yes
Comprehensive drainage strategy and masterplan demonstrating how SuDS have been incorporated into the site design		Yes
Results of ground investigation/permeability tests (in line with BRE 365) including infiltration tests *		Yes
Plan demonstrating exceedance routes for events over and above the 1% annual event with an appropriate allowance for climate change *		Yes
Information on who will maintain the SuDS and how maintenance will be funded *		Yes
Management plan and proposed contractual arrangements for the management of the drainage scheme over its lifetime *		Yes
Maintenance access arrangements for all proposed drainage systems *		Yes

* - These points can potentially be recommended for conditions, following consultation with the LLFA.

16 . Appendix 5 - Water Management: Water Conservation Methods

Water saving tap devices

Tap Aerators - with integrated flow regulators reduce the flow rate by 50 % and more

Tap Restrictor Valves – reduce flow rates and pressure

Water saving shower devices

Shower timer devices - restrict the amount of time the shower is left running

Low flow showers - low flow shower-heads help reduce water waste by restricting the flow of water leaving your shower head

ShowerStart converter-connects to existing showerheads and automatically pauses a running shower once it gets warm

Aerating Showers – to reduce flow rates

Water saving WC's and Urinals

Urinal Controls - minimise water consumption within the washroom, whilst maintaining desirable levels of hygiene required for everyday public use.

Waterless Toilets - waterless composting toilets treat the waste without needing water and are ideal where water supply is limited or where waste-water disposal is difficult

Dual Flush Toilets and Water Saving Syphons - the water saving dual flush valve can replace an old fashioned syphon. Water saving syphon are also effective in reducing water wastage

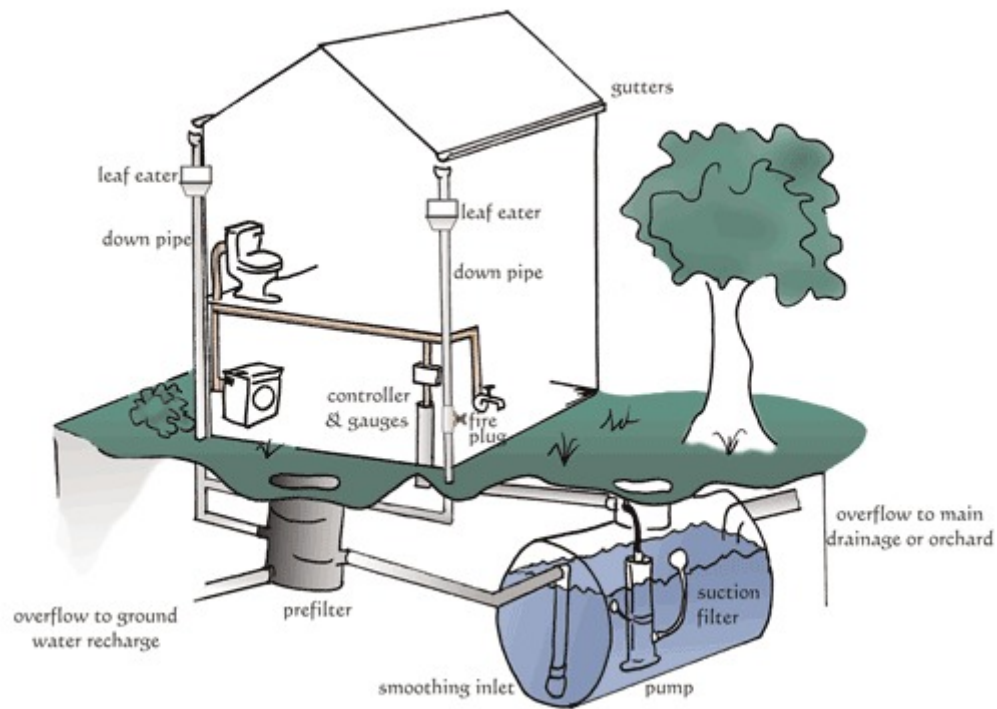
Reduced Flush tools - displacement devices, e.g. save-a-flush bags, toilet float booster, toilet tank-bank and water 'hippo'

Low flush Toilets - use at least 20 percent less water than a standard WC

Rain Catchment

Rain Catchment Systems - collects rainwater from a roof, paved area or runoff. The water is then filtered and stored in an above or below ground tank and can be used for either residential, commercial or landscape use.

16 . Appendix 5 - Water Management: Water Conservation Methods



16 . Appendix 5 - Water Management: Water Conservation Methods

Greywater Recycling Systems

Greywater recycling - the first step in installing a grey water recycling system is to separate the grey water (shower/bath/basin and laundry) from black water (toilet and kitchen). Various types are available including:

The **standard system** allows greywater dispersal and reuse from the complete household. This system uses trench systems and subsurface irrigation. A typical trench for this system is about 400 mm deep and 300 mm wide, filled with stone and capped with a layer of sand. The greywater is initially passed into a settling (sedimentation) tank. This enables larger particles to settle at the bottom of the tank, thus preventing blockages

The **Watersave TrenchSystem** is used for partial greywater reuse situations and permits wastewater from limited sources, such as from the washing machine and / or bathroom to be re-diverted into a settling tank (or through a filter) and then into a subsurface drain system, to be re-directed onto garden areas. This system also uses trench systems and subsurface irrigation

The **Watersave Dripper system** comprises four parts. Initially, greywater is diverted from the normal waste stream, then it passes through either a sedimentation tank or filter, into a pump chamber, and finally the wastewater is dispersed throughout an interconnecting subsurface dripper system

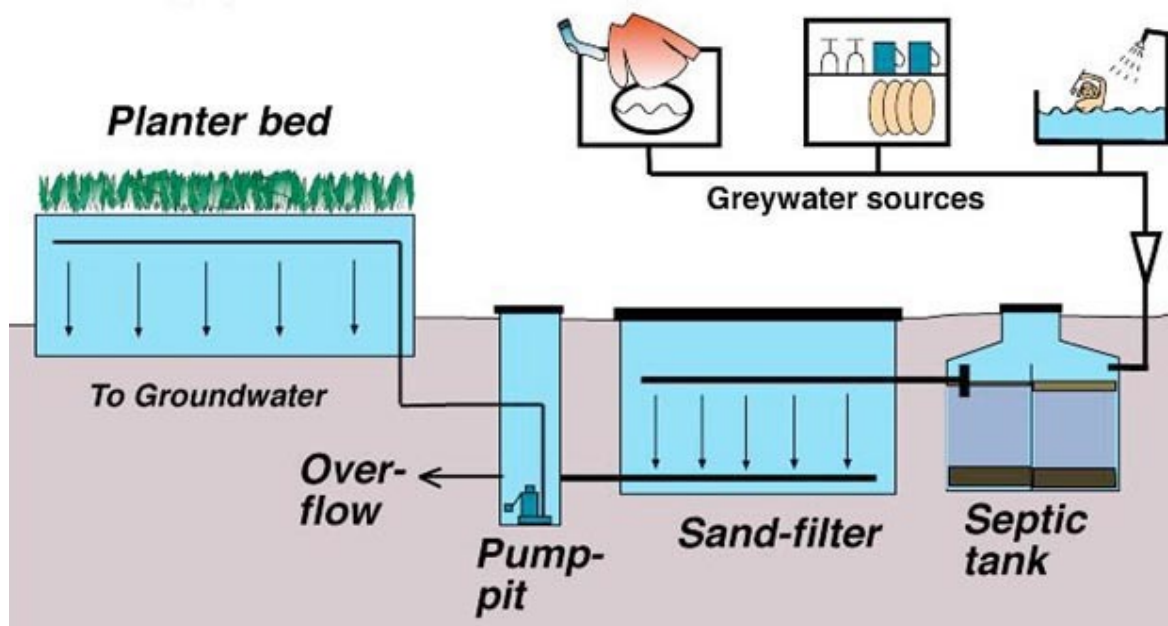
Advanced greywater treatment

Fig 3: Advanced Greywater Treatment System

16 . Appendix 5 - Water Management: Water Conservation Methods

Figures 2 and 3 above show typical Rain Catchment and Advanced Greywater Treatment Systems. Developers are advised to seek professional advice on the type of system most suitable for their particular site.

There is a certain amount of published information on water conservation / saving techniques on the web. Some of the more popular sites include:

www.rainharvesting.co.uk

www.eartheasy.com

www.freewateruk.co.uk

www.make-green.co.uk

www.underground-tanks.co.uk

www.h2obuildingservices.co.uk

www.catchrainwater.com

www.bracsystems.com

www.harvesth2o.com

www.greywater.com

17 . Appendix 6 - Planning Application Validation Checklists

- Wychavon District Council - Local Area Planning Application Requirements List:
<https://www.wychavon.gov.uk/making-a-planning-application>
- Malvern Hills District Council - Local Area Planning Application Requirements List:
<https://www.malvernhills.gov.uk/planning-application-checklist>
- Worcester City Council Validation Checklist :
<https://www.worcester.gov.uk/documents/10499/47612/Local+Validation+Checklist.pdf/fa5788de-4263-480c-a5cd-f717130dea86>

18 . Appendix 7 - Useful Contacts

South Worcestershire Land Drainage Partnership

Malvern District Council

01684 862393

worcestershirehub@malvernhills.gov.uk

www.malvernhills.gov.uk

Worcester City Council

01905 722233

customerservicecentre@worcester.gov.uk

www.worcester.gov.uk

Wychavon District Council

01386 565354

engineers@wychavon.gov.uk

www.wychavon.gov.uk

Worcestershire County Council Flood Risk Management Team

01905 765765

flooding@worcestershire.gov.uk

www.worcestershire.gov.uk/info/20236/flood_risk_management

Planning Services Policy Team

01386 565187

angie.matthews@wychavon.gov.uk

www.wychavon.gov.uk/planning-policy

Environment Agency

03708 506 506

enquiries@environment-agency.gov.uk

www.environment-agency.gov.uk

(For a data request (i.e. flood levels) where available, contact the Area External Relations Team on 08708 506506, midswest@environment-agency.gov.uk)

Lower Severn Internal Drainage Board

01454 413340

admin@lowersevernldb.org.uk

www.lowersevernldb.org.uk

Severn Trent - Network Development Team - West

01902 793743

customercare@severntrent.co.uk

www.stwater.co.uk

Worcestershire Highways Authority

[01905 763763](tel:01905763763)

Khanchett@worcestershire.gov.uk

www.worcestershire.gov.uk

18 . Appendix 7 - Useful Contacts

Highways England

0300 123 5000

info@highwaysengland.co.uk

www.highways.gov.uk

The Canal and River Trust

Customer Services

0303 040 4040

water.information@canalrivertrust.org.uk

www.canalrivertrust.org.uk

19 . Appendix 8 - Table 2: Flood Risk Vulnerability Classification

Essential infrastructure

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

Highly vulnerable

- Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').

More vulnerable

- Hospitals
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non-residential uses for health services, nurseries and educational establishments.
- Landfill* and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Less vulnerable

- Police, ambulance and fire stations which are not required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.

19 . Appendix 8 - Table 2: Flood Risk Vulnerability Classification

- Waste treatment (except landfill* and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Water-compatible development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

20 . Appendix 9 - Flood Risk Innovation

Examples of innovative flood risk inventions and designs include urban water management schemes in the USA, Germany and Scandinavia.

Pontbren Project – sustainable land management

The Pontbren Project is an innovative approach to using woodland management and tree planting to improve the efficiency of upland livestock farming, led by a group of neighbouring farmers in mid-Wales. They went on to develop new on-farm uses for woodland products, and when it became clear that tree planting had not just improved farm businesses and wildlife habitats, but had also reduced water run-off during heavy rain, they invited scientists to investigate. Supported by government funding, this internationally important research has revealed why strategically located belts of trees are so effective at reducing the amount of water running off improved upland grasslands. The scientific data from Pontbren is now being used to study the effects of land use on bigger catchments prone to flooding.

SCaMP - private sector-led woodland planting

In Cumbria, United Utilities owns two large estates at Thirlmere and Haweswater. These catchments cover an area of about 16,000 hectares and are predominately high fell land. Through the Sustainable Catchment Management Programme (SCaMP), United Utilities is planting large areas of woodland and scrub to reduce erosion. By 2015, it will have planted in excess of 700 hectares, benefiting water quality and providing improvements for biodiversity and carbon capture. SCaMP is a public-private funded initiative. United Utilities provide the one-off costs and Rural Development funding is covering some of the cost of the planting works.

Woodland for Water – opportunity mapping exercise

The benefits of woodland creation for water are increasingly being recognised by the water regulatory authorities and others as having an important role to play in improving the condition of the water environment and meeting the objectives of the [Water Framework Directive \(WFD\)](#). Another water service provided by woodland is the ability to 'slow the flow' and thus help to reduce downstream flood risk. Managing the risk of flooding to households is a major challenge for the country and one that is expected to increase in the future with climate change.

There is strong evidence to support woodland creation in appropriate locations to achieve water management and water quality objectives. However, opportunities for woodland planting are constrained by many factors, not least economics. It's therefore important that planting is targeted to the most effective locations where it can best benefit society.

Opportunity mapping has been developed to help identify these locations and promote more integrated catchment management. The method uses Geographical Information Systems (GIS) and can be applied across a range of scales, from assessing opportunities for planting at a strategic national or regional level down to the practical catchment or farm scale.

20 . Appendix 9 - Flood Risk Innovation

The national opportunity maps identify priority areas where woodland planting could deliver positive outcomes for water quality and/or flood risk management in England and Wales. The maps identify priority areas (at a scale of 1 km²) in catchments of river waterbodies at risk of failing good status due to diffuse pollutant loads (Nitrate, Phosphate, Sediment, Pesticides and Faecal Indicator Organisms); areas at risk from flooding from rivers and surface water and priority areas where runoff from soils is rapid and finally include information on constraints to woodland planting.

Keeping Rivers Cool - promotion of the benefits of riparian shade

The threat from climate change to river ecosystems cannot be ignored. In the next 60 – 70 years, projected increases in water temperatures will make some rivers inhospitable for our freshwater wildlife, upsetting finely balanced ecosystems. It is imperative that ways are found of keeping rivers cool to mitigate the effects of climate change. Using trees, shrubs and their vegetation to create shade is a low-risk action which can deliver a range of ecological benefits and provide a good start to keeping rivers cool.

In England, the Environment Agency (EA) has developed catchment 'shade maps' for every Water Framework Directive management catchment in England. These shade maps can be used to support the identification of key areas to increase riparian shade. The amount of shade shown is relative within the catchment, meaning that the map shows, and colour codes, the most and least shaded areas within a catchment.

Pilot projects have been delivered in Hampshire Avon, the Ribble and the Wye.

Berlin – sustainable urban water management

The isolation of West Berlin created a situation whereby half of the city was reliant on water resources from within its administrative boundaries, forcing the city to adopt a closed water cycle approach. As a result, Berlin is today acknowledged as a forerunner and trendsetter in innovative and holistic urban water management. The city has accumulated considerable expertise in sustainable water solutions, often derived from the necessities of Berlin's isolation over a period of almost 40 years.

For a long time, Berlin has also been a city where many landmark projects in service water use have been executed. A few examples are:

The famous DaimlerChrysler Potsdamer Platz, where rainwater is collected from 19 buildings over an estimated 32,000 m² area and is then stored in a 3,500 m³ rainwater basement tank. It is later used as service water, i.e. for toilet flushing, the watering of green areas and also the replenishment of an artificial pond.

The GSW2 Housing settlement in Lankwitz that collects rainwater for use as service water and saves up to 2,650 m³ of high quality drinking water per year.

20 . Appendix 9 - Flood Risk Innovation

The Institute of Physics in Berlin-Adlershof that showcases the collection of rainwater to irrigate a facade greening system, which acts as an air-conditioner for the building by generating an evaporative cooling effect.

Denmark – recreative green-blue area

The Stork Field (Storkeengen) in the Vorup neighbourhood is a low lying area in Randers near the river Gudenåen. This makes the area vulnerable to extreme rain events and flooding from the river. Thus the Municipality of Randers and Randes Waste Water Management (Randers Spildevand) has started the climate adaptation project, Project Stork Field.

The project has received DKK 3 million from the Danish Ministry of Environment and Food and will combine climate adaptation and recreation value in the new green-blue area.

This project includes the necessary climate proofing for the Vorup neighbourhood. At the same time, the population of Randers will gain access to green areas in a completely new way, meaning that a virtue is made out of a necessity for the benefit of the whole town.

In this new project, rainwater from roofs, car parks and streets in Vorup is led down to Storkeengen where the water is purified in wetlands before being released into Gudenåen. During normal rainfalls, the rain is drained away in underground pipes, but during extreme rainfalls, the water can be channelled down specific storm drains.

In accordance with the project plan, a new dike will be built between Storkeengen and Gudenåen. This will ensure a good purification of the rainwater and protect the low-lying parts of Vorup in the event of flooding.

Project Storkeengen builds extensively on a wish to create climate proofing solutions that also function as new areas for recreation so that Storkeengen ends up benefiting the town in every way.

Cape Town, South Africa - Saving water on a massive scale

Cape Town has been internationally recognised for its efforts in water management. Over the past 15 years the city has managed to reduce water use by 30%, despite a population increase of 30% over the same period.

The city's water conservation programme has a two-pronged approach: persuading people to use less water, and deploying the latest technology to use water efficiently.

The city has adjusted the water pressure to reduce wastage, replaced old pipes, improved leak detection, carried out extensive repairs and improved the management of water meters. In 2011, Cape Town replaced 20,574 faulty water meters and trained 100 school caretakers in 60 schools about water conservation. It also persuaded 95

20 . Appendix 9 - Flood Risk Innovation

parks and golf courses to irrigate with treated effluent rather than potable water, saving millions of gallons a year. The project has even enabled the city to put plans for a new dam on hold.

Sorocaba, Brazil - Cleaning up polluted rivers

The people of Sorocaba are working hard to clean up the city's rivers which have been badly polluted by industry, mining and sewage. In a single day in June 2015, residents removed 228kg of rubbish from the Sorocaba river. City workers regularly remove 10 tonnes of dirt, leaves, branches, rubbish and recyclables in a month. Attempts are also being made to change the riverside into a place of beauty rather than a place to tip rubbish. Linear parks are being created along the river banks to provide space for leisure and recreation when the river is flowing normally, and to hold the extra water in times of high flows. Trees are also being planted to provide a habitat for wildlife.

Beira, Mozambique – Harbour regeneration

Mozambique's second-largest city, Beira, is a port town on the Pungue River, at the spot where the river meets the Indian Ocean. With help from the Dutch, including the NGO Alterra, the city has created Beira 2035, a master plan to tackle the urgent problem of urban storm water which has repeatedly caused flooding and soil erosion, and posed a threat to infrastructure and human health in the city.

In a smart move, Beira 2035 also takes the opportunity to plan for urban expansion. The city is bursting at the seams and its growing population urgently needs more housing, so the city is funding its flood protection by attracting 300 investors who are interested in developing the port area.

Money will be used to dredge the harbour, build low-cost housing, develop local industry, improve transport links and drainage and extend the provision of water services.

Living with flooding is already a way of life for much of the world. The Netherlands for example has more than half its landmass below sea-level and building techniques there show how to adapt to where we live and to work with water, rather than against it.

This can be achieved by a combination of improving the way we [manage the water system](#), the amount that we build and the way that we build. We should build less, not more, in flood risk areas and increase the amount of space we give to water storage. This means more green spaces, storing water and permeable surfaces.

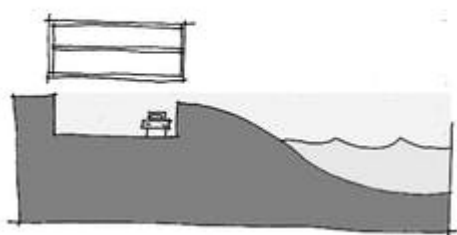
And, if housing has to be built in flood risk areas, there are many designs for flood resilient buildings that can be used. Some examples are shown below, designed differently to protect and minimise damage to property (and life) when flooding happens.

Sacrificial Areas

20 . Appendix 9 - Flood Risk Innovation

In the UK, especially on new developments in the Thames Estuary, houses with “sacrificial ground floors” can be found. This constitutes a building with a raised ground floor, where residential areas on the first floor. The basement – which can be used for storage or as a car park in times of no flooding – is there to contain water when it floods and protect the residential areas from water damage.

A. Sacrificial basement/ ground floor

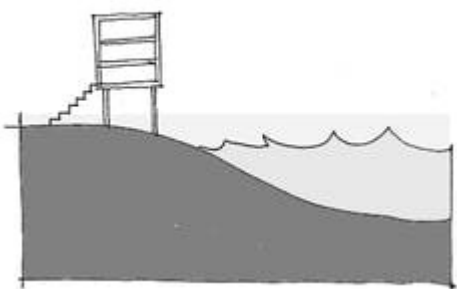


This design is suitable in areas that have a low to medium probability of flooding and has the drawback of having to sacrifice the basement when it floods. The space has limited uses such as for storage and the contents will have to be moved above flood risk level in the event of flooding.

Building on Stilts

Building on stilts has been used in high flood probability zones and is [more common in the Netherlands](#). This structure is useful in areas liable to a lot of flooding and particularly coastal areas. Added protection is still needed, however, from breakwaters to prevent debris damaging the stilts.

B. Building on stilts

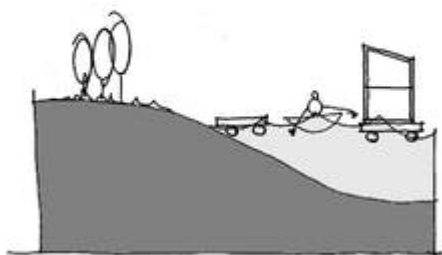


Urban environments are less suitable to stilt structures. The area underneath the stilts is hard to manage and use effectively. Nothing can grow under them so it's difficult to make the area into a public space. A lack of surveillance and ownership of the area can cause security issues in an urban environment. Erecting buildings on stilts also creates the need for ramps, lifts and aerial walkways – all of which are tricky in urban areas.

20 . Appendix 9 - Flood Risk Innovation

Floating Homes

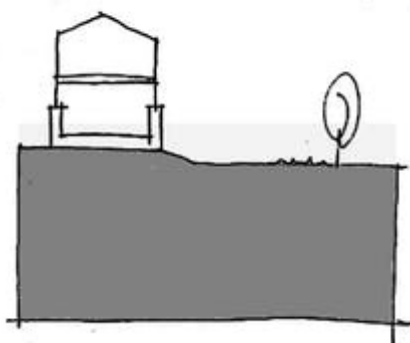
Floating buildings are another option, but may not be suitable for much of the UK, as they are built directly onto water. They use special polystyrene slabs that are covered in concrete for the base of the structure. As the water level rises, the ground floor moves with it, up to around five and a half metres.

C. Floating buildings

Building on water avoids the need to reclaim land and floating structures could be suitable for areas with a high risk of flooding. Connected to a floating pier, smaller buildings of two storeys are most suitable for this. They can still be connected to services using pipework that is waterproof and flexible to allow for the vertical movement of the building.

Waterproofing Buildings

Another way of making buildings more flood proof is to ensure minimal damage occurs to properties by “wet-proofing” them. This may be achieved through the use of water-resistant materials, for example concrete or tiles for floors, and more robust walls and fixtures. Electrical controls, cables and appliances should be placed higher than the normal, usually above one metre from the ground. This could be done in all areas that may potentially flood.

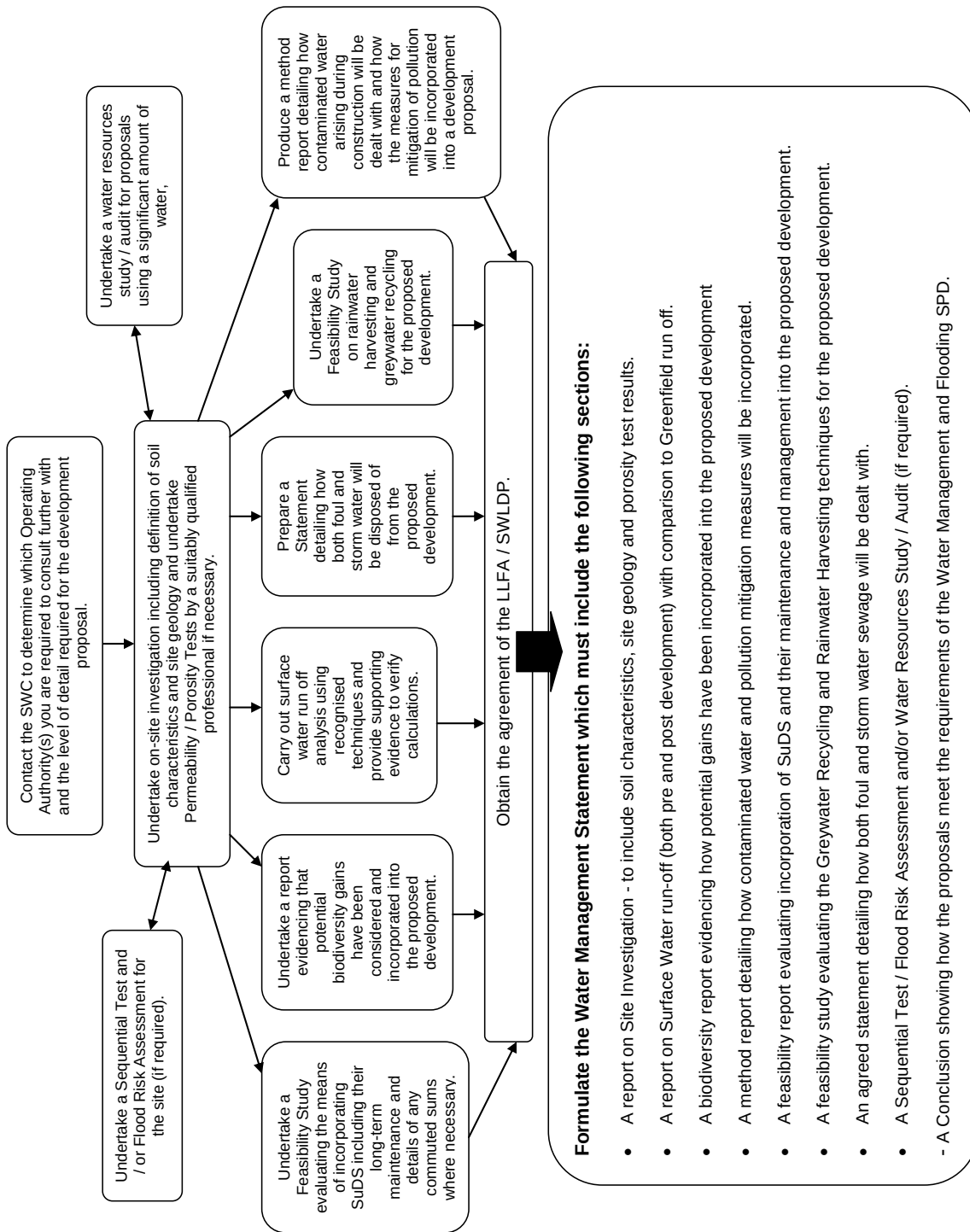
D. Flood-resilient or ‘wet-proofed’ buildings

20 . Appendix 9 - Flood Risk Innovation

As well as new building in the future, most existing structures can be wet-proofed. This means they are designed with possible future flooding in mind and result in only minimal damage to the property should this happen.

21 .Appendix 10 - WMS Flowchart

WMS Flowchart



22 . Appendix 11 - SUDS Maintenance Options

SUDs Maintenance Options



Sustainable Drainage Systems (SuDS) maintenance and adoption options (England)



This fact sheet is intended to support developers, designers and local authorities consider appropriate arrangements for the on-going maintenance of SuDS over the lifetime of the development. It will also be of use to designers who should design the SuDS to ensure that the maintenance and operation requirements are economically proportionate.

The author

This factsheet has been prepared by Robin Campbell of Arup.

Robin Campbell is a Chartered Civil Engineer with 11 years' experience in the appraisal, design and delivery of flood risk management and drainage schemes. Most recently he has been supporting Bristol and Birmingham City Councils build awareness of sustainable drainage systems and their capacity to respond to changes to policy that encourage the use of SuDS in new developments.

Introduction

A range of viable maintenance options for the ownership and adoption of sustainable drainage systems (SuDS) are available. The fact sheet is general guidance to support more detailed discussions. It is not exhaustive and the topic is expected to develop over time.

Background

SuDS provide opportunities to reduce the adverse impacts of traditional surface water systems; remove pollutants from urban run-off at source; and potentially combine surface water management with green space with benefits for amenity, recreation and wildlife.

Following a Written Statement, in England from 6 April 2015, local planning policy and decisions on Major Developments (10 dwellings or more; or equivalent non-residential or mixed

development¹) are expected to ensure that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate.

*"In considering planning applications, local planning authorities should consult the relevant lead local flood authority on the management of surface water; satisfy themselves that the proposed minimum standards of operation are appropriate and ensure through the use of planning conditions or planning obligations that there are clear arrangements in place for ongoing maintenance over the lifetime of the development. The sustainable drainage system should be designed to ensure that the maintenance and operation requirements are economically proportionate"*²

Like all drainage systems, SuDS components need to be inspected and maintained to ensure efficient operation and prevent failures. Planning Practice Guidance³ states 'When planning a sustainable drainage system, developers need to ensure their design takes account of the construction, operation and maintenance requirements of both surface and subsurface components, allowing for any personnel, vehicle or machinery access required to undertake this work.' This is described in detail within the SuDS Manual (CIRIA C697, 2007) and a related Susdrain Factsheet on maintenance⁴ (Wilson and Davies, 2012).

¹<http://tinyurl.com/p6nagdk>

²<http://tinyurl.com/n9g2jok>

³<http://tinyurl.com/nm9np83>

⁴<http://tinyurl.com/nlpc4o4>

22 . Appendix 11 - SuDS Maintenance Options



The challenge is that institutional arrangements for the ongoing maintenance of piped conventional drainage are clear, but remain less-so for non-traditional components such as ponds, swales and wetlands.

Traditional drainage systems consist of surface water sewers and lateral drains. Traditional systems focus on removing surface water as quickly as possible. The approach concentrates silts and other pollutants. Pipe design should maintain self-cleansing flow velocities to minimise maintenance requirements. Sewers are designed to industry standards (Sewers for Adoption, WRc) and then offered for adoption and maintenance by Water and Sewerage Companies (WaSC) into their regulated asset base under Section 104 of the Water Industry Act (WIA) 1991, subject to the payment of fees and charges. Highway gullies and associated drainage are designed to agreed standards with the local Highways Authority and then offered for adoption under Section 38 of the Highways Act 1980, and may require a commuted sum payment for exceptional future costs.

Effective SuDS are designed to slow water and trap silt. SuDS components on or near the surface are accessible to inspect and can usually be maintained using simple landscaping techniques. The arrangements for the future maintenance of the system should be considered during the early stages of SuDS design as this will influence the design.

Responsibilities

Selecting a responsible party to maintain SuDS

There are many options that will allow the successful operation and maintenance of a SuDS component for the lifetime of the development. With each option there may be associated risks for the onsite and surrounding land and property owners; Local Planning Authority, Local Highways Authority and Lead Local Flood Authority should the chosen maintenance option become compromised.

The appropriate responsible party to maintain (and operate) the SuDS component(s) should be evaluated on a site by site basis. Factors to consider include:

- Siting and selection of the SuDS component
- Function(s) and benefiting parties of SuDS component
- Complexity of the SuDS component
- Defined minimum standards of operation and maintenance
- Competence and longevity of prospective responsible party
- Land ownership and access
- Interaction with other assets

Default maintenance responsibility

The landowner is the party responsible for ensuring that SuDS component(s) within their land are maintained over the lifetime of the development even if it serves other properties, unless the SuDS component(s) have been adopted.

Adoption

Adoption is when an organisation agrees to take responsibility for the future management and maintenance of the SuDS component(s). There are examples where local authorities, water companies, private companies and other organisations have adopted SuDS components. Typically this calls for a payment and a legal agreement, possibly backed up by the deposit of a repayable performance bond. The adopting organisation will generally wish to approve the design before construction.

In many cases the property freehold is not transferred. The adopter will ensure they have the right to access and maintain the adopted asset. Some SuDS components, particularly surface SuDS components, may be adopted and the freehold of the land on which they lie is also transferred into the ownership of the same (or a different) authority.

Planning Conditions and Obligations

The Written Ministerial Statement notes that *local planning authorities should... ensure through the use of planning conditions or planning obligations that there are clear arrangements in place for on-going maintenance over the lifetime of the development.* Planning Practice Guidance sets out expectations on the use of planning

22 . Appendix 11 - SUDS Maintenance Options



susdrain

conditions⁵ and planning obligations⁶. Statutory consultees may wish to recommend conditions for the local planning authorities' consideration.

Planning conditions may address the drainage design and maintenance, compliance with technical standards etc. Unless the permission otherwise states, planning permission runs with the land and any conditions imposed on the permission will bind future owners⁷. Planning conditions associated with flooding cannot be "deemed to be discharged" and must be reviewed and approved prior to discharge⁸.

Breaches of planning conditions may be subject to enforcement action where the local planning authority considers it expedient. Section 187 A(2) provides that a breach of condition notice may be served on any person who is carrying out or has carried out the development or any person having control of the land. Development may become immune from planning enforcement if no action is taken over time⁹. In some circumstances, development may be regularised via certificates of lawfulness or retrospective planning applications where appropriate.

Planning obligations may be used in lieu of conditions. Section 106 of the Town and Country Planning Act 1990 (as amended) allows a local planning authority to enter into a planning obligation with a landowner in association with the granting of planning permission. These agreements are a way of delivering or addressing matters that are necessary to make a development acceptable in planning terms. Section 106 agreements can be used to require the payment of commuted sums or other provisions. The terms are negotiated with local planning authorities on an individual basis and can cater to the different aspects of a particular development. Planning obligations run with the land by virtue of Section 106 (3) of the Town and Country Planning Act 1990 (as amended) meaning that they are enforceable against the original covenantor and any subsequent owners of the land.

⁵<http://tinyurl.com/m83e5n7>

⁶<http://tinyurl.com/lmjyb4o>

⁷<http://tinyurl.com/nl8qyoa>

⁸<http://tinyurl.com/qfagqm8>

⁹<http://tinyurl.com/muwngsl>

Sustainable drainage system maintenance responsibility options, risks and safeguards

The following table collates various options for sustainable drainage system maintenance responsibility. It provides a summary of the approaches and is intended to support a risk-based approach by Local Planning Authorities (LPAs) to ensuring there are clear arrangements in place for on-going maintenance over the lifetime of the development and informing prospective owners/responsible parties of sustainable drainage systems.

22 . Appendix 11 - SUDS Maintenance Options



SuDS maintenance option	Type of application	Possible opportunities	Possible risks	Possible LPA mitigation measures and safeguards
All SuDS maintenance options				
Private residential and non-residential individual property owners	Where a SuDS is within the private curtilage of a property. Includes source control components such as rain gardens, water butts and soakaways.	It is reasonable to expect the owner(s) of a property drained by SuDS that do not also drain other properties to act as the responsible party to maintain the SuDS.	Often low risk – often localised flood risk effect as serving single property.	Note - In general, failure of surface water drainage of single property likely to result in localised impact. Third-party could instigate civil litigation¹¹. Action – Consider the merit of using a S106 planning obligation and maintenance agreement to ensure the provision of information on the location and details of the SuDS including maintenance and replacement requirements to owners.
			Asset failure impacts on third-parties. Lack of awareness/information to operate.	

¹⁰ LLFA have a duty to maintain a register of structures or features which, in their opinion, are likely to have a significant effect on flood risk and record information including ownership and state of repair under Schedule 21 of the FWMA. Inclusion on the register is not designation under Schedule 1 FWMA and does not place a Local Land Charge on the title or require the owner to seek LLFA consent to alter, remove or replace the feature.

Example guidance <http://tinyurl.com/q7f7h9w>

¹¹ Example guidance: <http://tinyurl.com/pmek6n3>

22 . Appendix 11 - SUDS Maintenance Options



SuDS maintenance option	Type of application	Possible opportunities	Possible risks	Possible LPA mitigation measures and safeguards
Internal drainage boards (IDB)	For SuDS serving one or more properties. In drainage board areas, subject to IDB consent, by agreement and following either payment of a commuted sum or ongoing infrastructure charge, a developer may build (or contribute to) SuDS that IDB subsequently owns and/or maintains. Often IDBs will only adopt a limited number of SuDS types. Further, local investigations may find high groundwater levels constrain the use of some SuDS techniques.	IDBs have duties, under the Land Drainage Act 1991, to exercise a general supervision over all matters relating to water level management of land within its district. Within drainage board districts, and catchments that discharge into them, changes in surface water runoff as a result of changes to land will be subject to IDB consent under Land Drainage Act 1991 and bylaws. IDB consent is separate to planning permission. IDBs make recommendations on works to make the required positive contribution to reducing or managing flood risks in accordance with NPPF.	Low risk - adopted by public authority with established funding.	Note - Compensatory storage and contributions to improvement of local drainage infrastructure expected (payable before IDB consent). Note - Generally IDBs have established processes to adopt by agreement significant drainage infrastructure, built to agreed standards (fee for checking and inspection) with either a commuted sum or ongoing payments for a defined period for operational/repair costs. Note - Generally IDBs insist that any significant drainage infrastructure designed, constructed or financed by a developer will be adopted by a public authority, and that any surface water discharge from a development is to a publically adopted drainage network. Action - LLFA to add SuDS with significant effect on flood risk to asset register⁶

22 . Appendix 11 - SUDS Maintenance Options



SuDS maintenance option	Type of application	Possible opportunities	Possible risks	Possible LPA mitigation measures and safeguards
Water and Sewerage Companies (WaSC) For SuDS serving more than one property. By agreement, developer build (or contribute to) SuDS that WaSC subsequently owns. Included within ordinary charging.	WaSC have powers under the Water Industry Act Section 104 to adopt sewers through a vesting declaration, normally carried out upon the completion of works in accordance with the terms of an adoption agreement. A developer can, by agreement, build (or contribute towards the construction of) a SuDS that the WaSC would subsequently own. The SuDS would be included within the WaSC's ordinary charging scheme, and maintenance costs would be funded through the surface water drainage element of household water bills regulated by Ofwat. Some SuDS components may not be considered as adoptable sewerage assets. WaSCs have concern about their ability to adopt some types of SuDS as a 'sewer' under the WIA. Many SuDS components require comparable maintenance activities to the WaSC regulated asset base. Some WaSCs have a mature policy and guidance for SuDS adoption. Some will adopt certain components such as below ground SuDS (attenuation tanks, flow control chambers, bypass sewers) and outfalls associated with balancing ponds.	Low risk - adopted by organisation with regulated charging regime.	The position of each WaSC on the maintenance of SuDS is emerging and a variety of positions have been taken. Poorly designed SuDS present a risk of land drainage contributions to the sewer, which the WaSC must ensure are not captured. Some WaSCs will not adopt SuDS. Some will only adopt certain components of a SuDS scheme. For example some will not adopt surface SuDS components/structures linked by overland flow or connecting pipes from filter strips, permeable paving, swales, detention basins etc nor shared soakaways or infiltration trenches. The exclusions may limit amenity and biodiversity opportunities. Accepting and draining highway run-off and risk of groundwater inundation is also a discretionary point. Some WaSCs will approve new connections and adopt sewers downstream of SuDS approved by LPAs in consultation with the LLFA.	Advice - Discussions with individual WaSCs is recommended to understand their current position on maintenance of SuDS. Note - May require use of agreed construction standards of SuDS if WaSCs are intended to be responsible for their maintenance. For example WaSC likely to seek suitable measures to ensure debris is prevented from entering downstream sewer. Note - WaSC will seek developer contribution to reasonable costs of appraisal and/or network modelling to confirm impact of new development on critical sewers and overflows. Note - WaSC should be consulted on any variations to conditions of approval that affect discharge to public sewer.

22 . Appendix 11 - SUDS Maintenance Options



SUDS maintenance option	Type of application	Possible opportunities	Possible risks	Possible LPA mitigation measures and safeguards
Local Authority	For SuDS serving one or more properties. By agreement, LAs maintaining as part of open space and amenity management, or publicly maintained highway.	Some local authorities may wish to take on responsibility for the maintenance of SuDS as part of their wider public open space and amenity management function and/or where SuDS provides advantages for the wider community. Public open-space maintenance activity synergy with surface SuDS components. Local authorities would need to charge to fund their activities in maintaining SuDS. Any contributions would be a matter of agreement through the planning process i.e. there is no requirement on either party.	Risk that maintenance liability if SuDS not fully funded by beneficiary for life time of development or that charges are prohibitive to development's overall viability. Agreement could require design to a Local Authority's preference.	Advice - Typical agreements include for developer to construct the SuDS and provide a scheme for its maintenance (a maintenance plan), with the developer maintaining for a minimum period, usually 24 months before handing over to the Local Authority. Note - Some Local Authorities define a minimum development size before adoption is considered or where sites have the potential to impact an area of high flood risk. Note/Action - A preference for one form of drainage over another can be expressed in local policy including supplementary planning guidance or site development briefs. However applications would be determined on their merits and by a consideration of all relevant material considerations.
	Commuted sum	Simple approach with maintainer funding certainty. Section 106 of the Town and Country Planning Act 1990 contributions can require commuted sums to be paid towards matters which are directly related to the development involved. The method of calculating	Medium risk - public authority adopter but finite funding. Section 106 agreements are generally negotiated at the outline stage where matters of principle are established.	Note/Action - An appropriate planning document may support the necessary contributions to be paid by the developer. Note - S106 agreements may be amended, requiring a Deed of Variation.

22 . Appendix 11 - SUDS Maintenance Options



SuDS maintenance option	Type of application	Possible opportunities	Possible risks	Possible LPA mitigation measures and safeguards
		commuted sums can therefore vary by Local Authority.	Any commuted sum would need to be consistent with the need for the site to be viable. A commuted sum may not be able to be accommodated by the development's appraisal. The one-off charge is typically a disincentive for a developer. The finite commuted sum is agreed for a defined period, typically calculated over a duration shorter than the lifetime of the development, and so risks creating a future unfunded liability unless revenue allowances are made from elsewhere in the Local Authority. Unspent Section 106 funds may be required to be returned to the developer after the specified time period.	There is no mitigation for the finite period of funding. Note/Action - Some Authorities have developed commuted sum calculators with variables including unit costs of the drainage items taken from construction works price books, lifespan of the commuted sum and a contingency percentage for issues not necessarily covered by planned maintenance. Note - Some Local Authorities charge a fee to cover technical approval and maintenance liabilities for an appropriate period of time for the asset. For example, an Infrastructure Charge of 2.5% of the agreed estimated construction costs of the drainage infrastructure with additional commuted sums for certain SuDS components.
			It is not be acceptable to secure more than five contributions towards relevant infrastructure.	Note/Action - Consider provision of SuDS infrastructure through Community Infrastructure Levy (CIL) to support development. Guidance on spending the levy is available¹².

¹² <http://tinyurl.com/nlwc74j>

22 . Appendix 11 - SUDS Maintenance Options



SuDS maintenance option	Type of application		Possible opportunities	Possible risks		Possible LPA mitigation measures and safeguards
		Occupier charging				
			Local Authorities can provide and charge occupiers for non-statutory services such as SuDS maintenance. Charging avoids developers incurring a one-off significant cost and passes the cost of maintenance to those property occupiers benefiting over time however there is a risk of non-payment. A Local Authority has used Section 123 of the Local Government Act 1972 to enter into contract with the developers for shared-SuDS on Local Authority retained land. The Local Authority then relied on its powers under Section 111 of the Local Government Act 1972 for the ongoing maintenance liability. They have also employed the Property Act 1925 which provides for the situation whereby a estate rent charge is placed on defined properties and costs recouped for defined activities with an agreement defining that costs can be reviewed after a defined period. Other occupier charging approaches are available such as utilising the Localism Act and a Local Authority could form a SuDS management company.	Low risk - public authority adopter but ongoing funding (provided suitable legal agreement).	Relies upon developer entering into Agreement with Local Authority and Local Authority accepting land and SuDS ownership and funded liability. Occupiers may consider this as another tax.	Action – Consider setting out maintenance responsibilities with details of obligations, fee calculation and management of any deficit/surplus. Note - Local Authority responsible for collection and recovery of any arrears.

22 . Appendix 11 - SUDS Maintenance Options



SUDS maintenance option	Type of application	Possible opportunities	Possible risks	Possible LPA mitigation measures and safeguards
Local Highways Authority	For SUDS serving publically maintained highway	In many instances SuDS are also appropriate to drain the publicly maintained highway – the adoption of highway constructed by others is dealt with by agreement under Section 38 of the Highways Act 1980 (and Section 278 as necessary). In terms of drains, there is no clear definition on what can be adopted other than guidance from Section 264 of the Highways Act which provides that on the adoption of a road then the drains belonging to that road vest in the highway authority. Section 115 of the WIA provisions allow a Highway Authority to adopt a highway drain if it was also intended to convey survey water generally into the sewerage system. Land outside the highway can be adopted if it benefits the highway i.e. drainage channels. Some Local Authorities have entertained developers seeking the adoption SuDS serving the highway, within the highway boundary, or forming an integral part of a road being offered for adoption by voluntarily entering into agreement under Section 38 of the Highways Act 1980, financed by a commuted sum. Section 38 agreements can include provision for the construction to be monitored and inspected.	Medium risk - public authority but finite funding.	As with Local Authority commuted sums (see above)

22 . Appendix 11 - SUDS Maintenance Options



SUDS maintenance option	Type of application	Possible opportunities	Possible risks	Possible LPA mitigation measures and safeguards
Maintenance company (private company or trust)	For SuDS serving one or more properties. Householders pay annual service charge or commuted sum paid by the developer to the Maintenance Company (could be Trust or WaSC)	Maintenance Companies are often set up to manage public spaces on new developments and maintenance of sustainable drainage systems could be added to their remit. Under this option householders and premises occupiers would pay for sustainable drainage systems maintenance as part of the annual service charge or equivalent outdoor space service charges that they pay to cover a range of activities. Management company funded by annual payment by way of service charge/rent in a sum to be agreed which may be reviewed each year. Collected by or on behalf of the management company from each occupier. The buyer of a dwelling becomes a member or shareholder of the management company. Management company appoints third party company	Medium risk – private company with risk of financial insolvency. SuDS components with potentially significant impact on local flood risk would not automatically be recorded by a responsible authority and risk being altered. Enforcement action and routes to counter-charge remedial works would be limited to individual property owners who might have paid all fees. If the management company fails to maintain in accordance with an agreed maintenance schedule, is it reasonable to take action against the subsequent land owner?	Note/Action – LPA to consider, in partnership with LLFA merits of Designation of the SuDS components ¹³ . Designating before developer sells individually to households ensures new purchaser is aware of component/responsibilities at time of purchase. Developer should be 'pre-warned' ideally through pre-application.

¹³ LLFA have power to designate under Schedule 1 FWMA. Any physical structure or feature (natural or manmade) not 'owned' by another responsible authority can be designated. Designation is neither automatic nor mandatory. LLFAs are most likely to seek designation in situations where the considered flood risk and vulnerability to damage justifies its use. Designation means the owner needs to seek LLFA consent for alteration, removal and/or replacement. There is no obligation on an owner to maintain a designated structure or feature. The designated feature becomes a Land Charge, recorded on the property freehold title, so any new owner of the private feature would be alerted to it during the purchase of the land containing the feature. All designated structures are also included on the LLFA Asset Register. More information: <http://linxurl.com/p2295ye>

22 . Appendix 11 - SUDS Maintenance Options



SuDS maintenance option	Type of application	Possible opportunities	Possible risks	Possible LPA mitigation measures and safeguards
		to be responsible for maintenance of SuDS in accordance with a management company. Some Local Authorities prefer to not undertake the maintenance themselves and will require a third party management company to be employed.	No public authority safeguard that SuDS to be maintained as designed for lifetime of development. If SuDS are maintained by a company then this presents a risk when agreeing adoption of assets which will rely on the performance of the SuDS. For example generally Local Highways Authorities require systems draining adopted highway water to be regulated over their lifetime. WasCs often take a similar approach for SuDS communicating with their networks. Risk that the management company becomes insolvent if charges not paid or costs of maintenance outweigh monies collected (e.g. future exceptional/unplanned maintenance/renewal). Unlikely owners could recover any sums paid to company prior to insolvency.	Note/Action – LPA to consider merits of transfer of land ownership to Local Authority or a Trust who in turn lease to the management company for a peppercorn and set out the maintenance obligations. The lease should contain provision for termination or forfeiture in event of breach by management company where it cannot be rectified. Note - Some WasCs will adopt networks that discharge to SuDS that a management company is responsible for when the freehold of the SuDS is transferred to Local Authority. Note/Action – LPA to consider merit of S106 planning obligation requiring landowners to pay a SuDS service charge.

22 . Appendix 11 - SUDS Maintenance Options



SUDS maintenance option	Type of application		Possible opportunities	Possible risks		Possible LPA mitigation measures and safeguards
	WaSC (non-regulated)	As above.		Company with largely regulated business although in unregulated division.	No WaSC offers this service currently.	
			A WaSC could offer its services as a Service Management Company. In this instance it would not be exercising its statutory function so could not spread its charges amongst all its bill payers for those services. Instead the beneficiaries of the service would be billed (not regulated by Ofwat).			As with Maintenance Companies (see above).

22 . Appendix 11 - SUDS Maintenance Options



The following section outlines examples of approaches taken.

Case study 1 - Central Park, Darlington - Service Management Company

Central Park is a phased 30 ha brown field mixed-use regeneration site and includes part of the Tees Valley Enterprise Zone. Up to 500 new homes, commercial, leisure and community facilities are planned overall. The key component is a linear park throughout the development, designed to create high quality multi-functional open space. The land is owned by Darlington Borough Council.

Physical constraints make the only discharge option a Northumbria Water sewer. The SuDS includes a series of attenuation ponds within a linear park will cross through the site and will provide ecological and amenity value. Resilient planting will discourage access to the deeper pond. The level of amenity and ecological value is a design driver for the developer.

Maintenance of SuDS is the responsibility of the developer for the first five years, and this then transfers to Darlington Borough Council. The maintenance is to be undertaken by a management company. Contributions to the

long term maintenance of the open space/green infrastructure will be achieved from a maintenance charge paid by households and businesses. A Friends of Central Park resident association interacts with a management company set up to maintain the open space. The resident association Board includes residents and the Council.

Case study 2 - Nottingham City

Nottingham City Council considers ownership and maintenance responsibility of SuDS on a site-by-site basis. Pre- (planning) application advice is provided for a fee charged by their Development Management department.

Generally speaking, where a SuDS component takes highway drainage only, the City Council will consider adopting it as part of the public highway. Acceptable measures are negotiated during pre-application stage. Some sites are currently under construction where geocellular units will be included beneath low traffic-loaded estate roads and some proposals are currently going through the planning process that have highway verges that double up as swales. The policy of the City Council has changed in the last year and they will no longer accept large areas of permeable (block) paving on adopted highway, though permeable paving is encouraged on private shared driveways.



Figure 1 - Central Park Masterplan, Darlington

22 . Appendix 11 - SUDS Maintenance Options



Providing the SuDS take highway drainage only and the City Council accepts the design, the components are adopted using Section 38 of the Highways Act 1980.

The City Council encourages developers to install SuDS components that take non-highway surface water such that the maintenance liability transfers to the property owner: i.e. private soakaways in back gardens.

Ownership and maintenance is more complex where SuDS components take surface water from multiple property owners and is managed through negotiations with developers at pre-application stage. For Larkhill Retirement Village, the developer required SuDS to overcome an EA objection and constructed a large swale to attenuate surface water flows. Following construction and inspection, the land transferred to City Council ownership and a legal agreement was reached such that the component would be maintained by the site owner. The actual maintenance work is carried out by a management company on behalf of the site owner. If the management company fails to maintain the component then the legal agreement can be used to take action. In the event of default, the maintenance liability will transfer to the City Council. The risk to the Council at this site is considered low because a maintenance or management company was required to operate the retirement village site, regardless of any SuDS elements.

Bespoke arrangements such as that described above are considered for developments on a site-by-site basis once all other options have been exhausted.

Case study 3 - Milton Keynes - Nominated Adoption Body

Milton Keynes features a large number of balancing lakes for the town. The Local Authority has published Supplementary Planning Document that covers drainage and flood risk issues.

The Local Authority advocates a strategic integrated approach to surface water drainage, which incorporates the further benefits

associated with incorporating these components within open green space. Therefore in their approach to adoption and maintenance they effectively separate the different functions of the green infrastructure, one function is surface water management (e.g. a dam/water control structure or a culvert) and the other is 'structural landscaping' (e.g. tree belts, planted-up noise attenuation bunds, blocks of shrub planting and grassland).

Developers are required to layout and construct surface water and structural landscaping green infrastructure in accordance with the required standards and planning approvals and conditions at their own cost.

Developers are required to offer to the Local Authorities' nominated adopting bodies all the green infrastructure. The Local Authority must therefore ensure the adopting bodies are happy with the standards and conditions the council imposes on developers.

The Local Authority nominates the Parks Trust (a Local Charitable Trust) to take all of the green infrastructure land (the boundary of which should include any surface water management components). This grants the Trust a 999-year parkland lease, which will then transfer the freehold to the Local Authority subject to the Trust's lease being in place. The parkland lease terms will give the Trust the obligation to maintain the land but, if necessary, could explicitly include the obligation to maintain specific surface water management components.

The Local Authority nominates the Internal Drainage Board to take on the strategic surface water features that fall within the area. This is covered through a separate adoption agreement between the IDB and the developer, as landowner, before transfer to the Parks Trust/Local Authority. The transfer to the Parks Trust leasehold and the Local Authority freehold is therefore subject to the IDB adoption agreement being in place. Hence it is critical that the terms and conditions of the leasehold, freehold and surface water are all matched and agreed between all parties.

22 . Appendix 11 - SUDS Maintenance Options



The commuted sum to the Parks Trust for the obligations it takes on under the parkland lease (i.e. maintenance of the structural landscaping) is paid by the developer (not eligible to fall under the Milton Keynes Tariff). This could be calculated either according to a rate or formula written into the agreement under Section 106 of the Town and Country Planning Act 1990 (in this case the Parks Trust will need agree to what's written into the agreement) or as a separate agreement between the Trust and the developer.

The commuted sum to the IDB for the obligations under the surface water component adoption agreement will be paid from the Milton Keynes Tariff pot where eligible. If not eligible this can be covered under an agreement under Section 106 as above.

Acknowledgements

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- Patrick Goodey of Bristol City Council

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ARUP

23 . Appendix 12 - Climate Change Guidance

Environment
Agency

Flood Risk and Coastal Change

Climate Change allowances for planning (SHWG area)

March 2016
(updated Feb 2018)

The National Planning Practice Guidance refers to Environment Agency guidance on considering climate change in planning decisions which is available online: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

This has been updated and replaces the September 2013 guidance.

It should be used to help planners, developers and advisors implement the National Planning Policy Framework (NPPF)'s policies and practice guidance on flood risk. It will help inform Flood Risk Assessments (FRA's) for planning applications, local plans, neighbourhood plans and other projects.

Fluvial flooding – peak river flows

Table 1 of the guidance advises that an allowance should be added to 'peak river flows' to account for 'climate change' which should be specific to a river basin district catchment.

In Shropshire, Herefordshire, Worcestershire and Gloucestershire area, we would refer you to the relevant extract from Table 1 below. This outlines the '**peak river flows**' within the 'Severn River Basin District', and specifies the range of percentage allowances to reflect individual development's lifetime and vulnerability. For example, residential would be 100 years (so 2070-2115).

Table 1 Extract

Severn Peak River Flows: Total potential change anticipated	2015-39	2040-2069 (less vulnerable)	2070-2115 (more vulnerable)
Upper end	25%	40%	70%
Higher central	15%	25%	35%
Central	10%	20%	25%

Sea Level rise allowances

Table 3 of the guidance (extract below) indicates that net sea level risk remains unchanged from the 2013 version.

Area of England	1990 - 2025	2026 - 2050	2051 - 2080	2081 - 2115	Cumulative (1990 - 2115)
South West	3.5mm p/a	8mm p/a	11.5mm p/a	14.5mm p/a	1.18m

23 . Appendix 12 - Climate Change Guidance

Flood Risk Assessment considerations:

The design flood (1% flood level fluvial, or 0.5% tidal, plus climate change allowance) should be used to inform the sequential test, including appropriate location of built development; consideration of flood risk impacts, mitigation/enhancement and ensure 'safe' development.

Vulnerability classification

- Development classed as 'Essential Infrastructure' (as defined within Table 2 - Flood Risk Vulnerability Classification, Paragraph: 066 Reference ID: 7-066-20140306 of the NPPG) should be designed to the 'upper end' climate change allowance (70%).
- For highly vulnerable or more vulnerable development e.g. housing, the FRA should use the 'higher central' climate change allowance (35%), as a minimum, to inform built in resilience; but aim to incorporate managed adaptive approaches/measures for the 'upper end' allowance (70%) where feasible.
- For water compatible or less vulnerable development e.g. commercial, the FRA should use the 'central' climate change allowance (20%), as a minimum, to inform built in resilience; but aim to incorporate managed adaptive approaches/measures for the 'higher central' allowance (25%) where feasible.

Modelling approach

- Major Development:
For 'major' development (as defined within The Town and Country Planning Development Management Procedure (England) Order 2015)*, see definition note below, we would expect a detailed FRA to provide an appropriate assessment (hydraulic model) of the 1% with relevant climate change ranges.
There are two options:
Scenario 1 - Produce a model and incorporate relevant climate change allowances in Table 1.
Scenario 2 - Re-run an existing model and incorporate relevant climate change allowances in Table 1.
- Non Major Development:
For 'non major' development, we would advise that a model is produced or existing model is re-run, similar to the above approach (Scenario 1 and 2). This would give a greater degree of certainty on the design flood extent to inform a safe development.
However, for 'non major' development only, in the absence of modelled climate change information it may be reasonable to utilise an alternative approach. To assist applicants and Local Planning Authorities we have provided some 'nominal' climate change allowances within the 'Table of nominal allowances' below. These should be considered as appropriate within any FRA. There are three additional options:
Scenario 3 - Where previous modelled data (for a variety of return periods) is available, you could interpolate your own climate change figure (see note iv below).
Scenario 4 - Where the 1% level is available from an existing model add on the relevant 'nominal climate change allowance' provided in the 'Table of nominal allowances' below.
Scenario 5 - Establish the 1% level, for example using topographical levels (including LiDAR) and assessment of watercourse flow and nature and then add on the relevant 'nominal climate change allowances' provided in the 'Table of nominal allowances' below.

*Note: For definitions of 'major' development see 'Interpretation 2.—(1)', on page 5, at www.legislation.gov.uk/ukxi/2015/595/pdfs/ukxi_20150595_en.pdf

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23 . Appendix 12 - Climate Change Guidance

Table of Nominal Allowances

Watercourse	20% - 25%	35% - 40%	70%
Upper Severn	600mm	850mm	1500mm
River Wye			
River Teme			
River Avon	400mm	600mm	1000mm
Lower Severn	400mm	600mm	1000mm
Tributaries and 'ordinary watercourses'	200mm	300mm	500mm

Notes to above:-

(i) Watercourse definition:

The "Upper Severn"/"Lower Severn" boundary is taken as Lincomb Weir, Worcestershire (national grid reference SO8196869458).

An 'Ordinary Watercourse' is a watercourse that does not form part of a main river. Main Rivers are indicated on our Flood Map. You can also check the classification of the watercourse with the LLFA, some of which have produced Drainage and Flooding Interactive Maps.

(ii) Where a site is near the confluence of two, or more, watercourses, the FRA should use the larger river climate change allowances.

(iii) We may hold more precise information for some of the "tributaries". We would recommend that you seek this information from us via a 'pre-planning enquiry/data request', to the email address below.

(iv) We would also recommend that you contact us for our modelled '20%' allowances and associated flow data. This is available for some rivers. This data may help inform a more detailed climate change analysis (where necessary), including any interpolation of levels or flow to create a 'stage discharge rating' in order to estimate the required percentage; or be of assistance to inform 'less vulnerable' or 'water compatible' development proposals.

IMPORTANT NOTE

Please note the nominal climate change allowances are provided as a pragmatic approach, for consideration, in the absence of a modelled flood level and the applicant undertaking a detailed model of the watercourse. Use of nominal climate change allowances are not provided/ recommended as a preference to detailed modelling and historical data.

The Local Planning Authority may hold data within their Strategic Flood Risk Assessment (SFRA), or any future updates, which may help inform the above.

FREEBOARD NOTE

It is advised that Finished Floor Levels should be set no lower than '600mm' above the 1% river flood level plus climate change. Flood proofing techniques might be considered where floor levels cannot be raised (where appropriate). This 600mm freeboard takes into account any uncertainties in modelling/flood levels and wave action (or storm surge effects).

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23 . Appendix 12 - Climate Change Guidance

Surface Water

Table 2 of the guidance also indicates the relevant increases that surface water FRA should consider for an increase in peak rainfall intensity.

The following table is for ‘**peak rainfall intensity**’ allowance in small and urban catchments. Please note that **surface water (peak rainfall intensity) climate change allowances should be discussed with the Lead Local Flood Authority (LLFA)**.

Peak Rainfall Intensity - Applies across all of England	Total potential change anticipated for 2010-2039	Total potential change anticipated for 2040-2069	Total potential change anticipated for 2070-2115
Upper end	10%	20%	40%
Central	5%	10%	20%

Note to above:-

For river catchments around or over 5 square kilometres, the peak river flow allowances are appropriate.

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West Midlands Area -

Shropshire, Herefordshire, Worcestershire and Gloucestershire Sustainable Places Team.

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24 . Sources of Further Information

- Construction Industry Research and Information Service (CIRIA):
www.ciria.org.uk/flooding
www.ciria.org.uk/SuDS
- 'The SUDS Manual', CIRIA available at <http://www.ciria.org/downloads.htm>
- 'Interim Code of Practice of Practice for Sustainable Drainage Systems', National SUDS Working Group, information available at <http://www.ciria.org.uk/SuDS/icop.htm>
- CIRIA 'Flood Resilience Advice Sheets', available at http://www.ciria.org/flooding/advice_sheets.html
- Building Research Establishment (BRE):
www.bre.com
- Highways England
<https://www.gov.uk/government/organisations/highways-england>

Government Publications

- Interim guidance for improving the flood resistance of domestic and small business properties' (ODPM), available at: <http://www.pipernetworking.com/floodrisk/preparingforfloods.pdf>
- NPPG Flood Risk and Coastal Change available at : <https://www.gov.uk/guidance/flood-risk-and-coastal-change>
- Flood resilient and resistant construction – guidance for new build' (DCLG), available at: http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf.
- Breeam Resources and information, available at: <http://www.breeam.com/resources>

Local Information

- Worcestershire Biodiversity Action Plan, available at: <http://worcestershire.whub.org.uk/home/wcc-bio-index.htm>
- Severn Trent Water's draft Water Resources Management Plan 2009, available at: <http://www.stwater.co.uk/server.php?show=nav.6322>
- Draft Severn Catchment Flood Management Plan (CFMP), is available at: <http://www.environment-agency.gov.uk/research/planning/33624.aspx>

BREEAM - Building Research Establishment Environmental Assessment Method

CIRIA - Construction Industry Research and Information Association

CLG - Department of Communities and Local Government

Defra - Department for Environment, Food and Rural Affairs

DPD – Development Plan Document

EA - Environment Agency

EU – European Union

FRA – Flood Risk Assessment

LDD – Local Development Document

LDF – Local Development Framework

LLFA – Lead Local Flood Authorities

LPA – Local Planning Authority

NPPF – National Planning Policy Framework

NPPG – National Planning Policy Guidance

PPG – Former Planning Policy Guidance

PPS – Former Planning Policy Statement

SA - Sustainability Appraisal

SCI - Statement of Community Involvement

SFRA - Strategic Flood Risk Assessment

SPD – Supplementary Planning Document

SuDS – Sustainable Drainage Systems

SWDP – South Worcestershire Development Plan

SWLDP - South Worcestershire Land Drainage Partnership

SWC – South Worcestershire Councils

WMS – Water Management Statement

26 . Glossary of Terms

Attenuation - Reduction of peak flow and increased duration of a flow event.

Balancing pond - A pond designed to attenuate flows by storing runoff during the peak flow and releasing it at a controlled rate during and after the peak flow has passed. The pond always contains water. Also known as wet detention pond.

Basin - Flow control or water treatment structure that is normally dry.

Bioretention area - A depressed landscaping area that is allowed to collect runoff so it percolates through the soil below the area into an underdrain, thereby promoting pollutant removal.

BRE Environmental Assessment Method (BREEAM) - The most widely used environmental assessment method for buildings. It sets the standard for best practice in sustainable development and demonstrates a level of achievement.

Catchment - The area contributing surface water flow to a point on a drainage or river system. Can be divided into sub-catchments.

Construction Industry Research and Information Association (CIRIA) - CIRIA is a member-based research and information organisation dedicated to improvement in the construction industry.

Climate Change – Any long-term significant change in the “average weather” that a given region experiences. Average weather may include average temperature, precipitation and wind patterns.

Combined sewer - A sewer designed to carry foul sewage and surface runoff in the same pipe.

Detention basin - A vegetated depression, (normally dry except after storm events) constructed to store water temporarily to attenuate flows. May allow infiltration of water into the ground.

Department for Environment, Food and Rural Affairs (Defra) - A UK Government Department that champions Sustainable Development, helping Government as a whole to deliver economic, social and environmental sustainability.

Development Plan Document (DPD) – Under the new system of local planning brought in under the Planning & Compulsory Purchase Act 2004, the term 'development plan document' covers any Local Development Document that is part of the development plan. A development plan document has to be independently tested by a Government inspector and carries full weight in relation to planning applications, which distinguishes it from a supplementary planning document.

Environment Agency - Is a UK non-departmental public body of Defra with the principle aim of protecting and enhancing the environment to make a contribution towards the objective of achieving sustainable development. The Agency has principle responsibility for river (fluvial) flooding.

26 . Glossary of Terms

Evapotranspiration - The process by which the Earth's surface or soil loses moisture by evaporation of water and by uptake and then transpiration from plants.

Exception Test – If, following application of the Sequential Test it is not possible for proposed development to be located in zones of lower probability of flooding, the Exception Test can be applied as detailed in Annex D of PPS25. For the Exception Test to be passed the proposed development must provide wider sustainability benefits to the community that outweigh the estimated flood risk.

Filter drain - A linear drain consisting of a trench filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water, but may also be designed to permit infiltration.

Filter strip - A vegetated area of gently sloping ground designed to drain water evenly off impermeable areas and filter out silt and other particulates.

Flood frequency - The probability of a flow rate being equalled or exceeded in any year.

Floodplain - Land adjacent to a watercourse that would be subject to repeated flooding under natural conditions.

Flood Mitigation - Methods of reducing the effects of floods. These methods may be structural solutions (e.g. reservoirs) or nonstructural (e.g. land- use planning, early warning systems).

Flood Risk Assessment (FRA) - An assessment of the risk of flooding, particularly in relation to residential, commercial and industrial land use. FRAs are required to be completed according to PPS25 alongside planning applications in areas that are known to be at risk of flooding.

Flood routing - Design and consideration of above-ground areas that act as pathways, permitting water to run safely over land to minimise the adverse effect of flooding. This is required when the design capacity of the drainage system has been exceeded.

Flow control device - A device used to manage the movement of surface water into and out of an attenuation facility, e.g. a weir.

Fluvial flooding – Flooding from a main watercourse (brooks, streams, rivers and lakes etc.) that occurs when the water features cannot cope with the amount of water draining into them, from the land. When rainfall is heavy and / or prolonged, a large amount of run-off reaches the rivers and eventually causes them to overtop their banks.

Green Infrastructure – The network of land and water that is made up of green spaces and natural elements.

26 . Glossary of Terms

Greenfield runoff - This is the surface water runoff regime from a site before development, or the existing site conditions for Brownfield redevelopment sites.

Green roof - A roof with plants growing on its surface, which contributes to local biodiversity. The vegetated surface provides a degree of retention, attenuation and treatment of rainwater, and promotes evapotranspiration.

Greywater - Wastewater from sinks, baths, showers and domestic appliances. A Greywater system captures this water before it reaches the sewer (or septic tank system).

Groundwater - water that is beneath the surface of the ground held within the porous spaces in the saturation zone.

Highways England - The government company responsible for strategic highways, i.e. motorways and trunk roads.

Highway authority - A local authority with responsibility for the maintenance and drainage of highways maintainable at public expense.

Hydrological - the occurrence, circulation, distribution, and properties of the waters of the earth and its atmosphere.

Impermeable surface - An artificial non-porous surface that generates a surface water runoff after rainfall.

Infiltration (to the ground) - The passage of surface water through the surface of the ground.

Infiltration (to a sewer) - The entry of groundwater to a sewer.

Infiltration device - A device specifically designed to aid infiltration of surface water into the ground.

Infiltration trench - A trench, usually filled with stone, designed to promote infiltration of surface water to the ground.

Major development - Developments of over 10 houses or commercial developments comprising over 1,000 square metres

Material Consideration – A legal term describing a matter or subject which is relevant (material) for a local authority to consider when using its powers under planning law in dealing with a planning application.

Microbial decomposition - The breaking down of complex molecules into constituent parts or elements by microorganisms.

Model agreement - A legal document that can be completed to form the basis of an agreement between two or more parties regarding the maintenance and operation of sustainable water management systems.

26 . Glossary of Terms

Natural Environment and Rural Communities Act (NERC) - Designed to help achieve a rich and diverse natural environment and thriving rural communities through modernised and simplified arrangements for delivering Government policy.

Operating Authorities – Any body, including the Environment Agency, Internal Drainage Board, County Council, Highway Authority and Local Authority, who have powers to make or maintain works for the drainage of land.

Ordinary Watercourses - Any watercourse that does not form part of a main river.

Permeability - A measure of the ease with which a fluid can flow through a porous medium. It depends on the physical properties of the medium, for example grain size, porosity and pore shape.

Permeable pavement - A paved surface that allows the passage of water through voids between the paving blocks / slabs.

Permeable surface - A surface formed of material that is itself impervious to water but, by virtue of voids formed through the surface, allows infiltration of water to the sub-base through the pattern of voids, e.g. concrete block paving.

Pervious surface - A surface that allows inflow of rainwater into the underlying construction or soil.

Piped system - Conduits generally located below ground to conduct water to a suitable location for treatment and/or disposal.

Pluvial Flooding – Flooding that results from rainfall generated overland flow before the runoff enters any watercourse or sewer. It is usually associated with high intensity rainfall events. Also referred to as surface water flooding.

Pollution - A change in the physical, chemical, radiological or biological quality of a resource (air, water or land) caused by man or man's activities that is injurious to existing, intended or potential uses of the resource.

Pond - Permanently wet basin designed to retain stormwater and permit settlement of suspended solids and biological removal of pollutants.

Porous paving - A permeable surface allowing the passage of water through voids within, rather than between, the paving blocks / slabs.

Porous surface - A surface that infiltrates water to the sub-base across the entire surface of the material forming the surface, for example grass and gravel surfaces, porous concrete and porous asphalt.

Prevention - Site design and management to stop or reduce the occurrence of pollution and to reduce the volume of runoff by reducing impermeable areas.

Probability Event - The statistical probability of a flooding episode (event) occurring.

26 . Glossary of Terms

Public sewer - A sewer that is vested in and maintained by a sewerage undertaker.

Rainwater harvesting or rainwater use system - A system that collects rainwater from where it falls rather than allowing it to drain away. It includes water that is collected within the boundaries of a property, from roofs and surrounding surfaces.

Residual Risk - The Risk that remains after risk management and mitigation measures have been implemented.

Retention pond - A pond where runoff is detained (e.g. for several days) to allow settlement and biological treatment of some pollutants.

Run-off - Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.

Section 38 - An agreement entered into pursuant to Section 38 Highways Act 1980 whereby a way that has been constructed or that is to be constructed becomes a highway maintainable at the public expense. A publicly maintainable highway may include provision for drainage of the highway. (Drainage of highways is defined in Section 100 (9) of the Highways Act 1980).

Section 106 (Town and Country Planning Act 1990) - A section within the Town and Country Planning Act 1990 that allows a planning obligation to a local planning authority to be legally binding.

Section 106 (Water Industry Act 1991) - A key section of the Water Industry Act 1991, relating to the right of connection to a public sewer.

Separate sewer - A sewer for surface water or foul sewage, but not a combination of both.

Sewer - A pipe or channel taking domestic foul and/or surface water from buildings and associated paths and hardstandings from two or more curtilages and having a proper outfall.

Sewerage undertaker - A collective term relating to the statutory undertaking of water companies that are responsible for sewerage and sewage disposal including surface water from roofs and yards of premises.

Sewers for Adoption - A guide agreed between sewerage undertakers and developers (through the House Builders Federation) specifying the standards to which private sewers need to be constructed to facilitate adoption.

Sequential Test – The Sequential test (Annex D of PPS25 means going through a sequence of tests when considering the location of new development. This is to ensure that development is located in the most sustainable location first, before other, less sustainable locations are chosen.

26 . Glossary of Terms

Site and regional controls - Manage runoff drained from several sub-catchments. The controls deal with runoff on a catchment scale rather than at source.

Soakaway - A subsurface structure into which surface water is conveyed to allow infiltration into the ground.

Source control - The control of runoff or pollution at or near its source.

Stormwater - Rainwater that runs off impervious surfaces and into storm drains rather than being absorbed into the soil.

Sub-catchment - A division of a catchment, allowing runoff management as near to the source as is reasonable.

Subsidiarity - The principle that an issue should be managed as close as is reasonable to its source.

Sustainable Drainage Systems (SuDS) - A sequence of management practices and control structures designed for a natural approach to managing drainage in and around properties and other developments. SuDS work by slowing and holding back the water that runs off from a site, allowing natural processes to break down pollutants.

Surface water management - The management of runoff in stages as it drains from a site.

Swale - A shallow vegetated channel designed to conduct and retain water, but may also permit infiltration; the vegetation filters particulate matter.

Treatment - Improving the quality of water by physical, chemical and/or biological means.

Wastewater – This is ‘used’ water arising from homes and businesses and includes water from sinks, toilets, bathtubs, washing machines and dishwashers – any water that has to be drained, including storm water.

Water Act 2003 - Introduced some changes to the regulation of the water industry in England and Wales under the Water Industry Act 1991, by transferring responsibility for economic regulation from an individual Director General to an Authority (Ofwat).

Water Authority – Public, private or combined entity responsible for the provision of drinking water and sewerage service.

Water Butt – A container designed to capture rainwater for its reuse.

Watercourse - A term including all rivers, streams ditches drains cuts culverts dykes sluices and passages through which water flows.

Water Management Statement – A report outlining the water cycle issues relevant to a development proposal and the suitable means of providing for drainage in the long term.

26 . Glossary of Terms

Wetland - A pond that has a high proportion of emergent vegetation in relation to open water.