# Flood and Water Management

## Supplementary Planning Document

## Appendix 1

Tewkesbury Borough Council

January 2018

# CONTENTS

# CHAPTER 1 – INTRODUCTION AND OBJECTIVES

1.1 The Council aims for the best outcomes for society as a whole. In the UK, there is no legal right to any particular standard of protection from flooding. However there are high public expectations of protection with heightened sensitivity to the threat of flooding.

1.2 Flood events have had a detrimental effect on the social, economic and environmental wellbeing of the country. Parts of Tewkesbury Borough in particular have suffered from the effects of flooding in recent times, largely due to its proximity to the Severn and Avon Rivers. This highlights the need for comprehensive, integrated and forward-thinking approaches to managing flood risks.

1.3 All forms of flooding and their impact on the natural and built environment are material planning considerations that are taken into account when determining planning applications. Tewkesbury Borough Council expects an integrated approach to flood risk and water cycle management (including rainwater, storm water, sewage, ground water, surface water and recycled water) to secure a range of social, economic and environmental benefits. Consequently, there is a need for a comprehensive approach to dealing with flood risk and the aim of Tewkesbury Borough Council is to ensure that this matter is properly considered at the very earliest, and all subsequent, stages of the planning process.

1.4 Every application for planning approval will be individually assessed on its own merit and this document will be a material consideration when considering planning applications. It should be read in conjunction with national and local planning policies and guidance (see Chapter 3 below). In accordance with these; Tewkesbury Borough Council will always seek opportunities to reduce the overall level of flood risk in the area and beyond. It will also seek to maximise amenity, biodiversity and water quality benefits, as well as those opportunities and benefits which can be obtained from effective flood and water management.

1.5 The aim of this SPD is to provide guidance on the approach that should be taken to manage flood risk and the water environment as part of new development proposals. The SPD highlights the documents which will be required to accompany planning applications, including:

- Sequential Test, and where appropriate Exception Test, reports

- Site Specific Flood Risk Assessments (FRA's) and Drainage Strategies (incorporating an appropriate approach to surface water drainage including suitability evidence)

1.6 The key flood and water management objectives of Tewkesbury Borough Council are summarised as follows:-

## Key Objectives

1. **To steer new development to areas with the lowest probability of flooding.**
2. **To ensure that new development does not increase the risk of flooding either on a site or cumulatively elsewhere; and to always seek betterment over the bare minimum requirements, wherever possible.**
3. **To require the inclusion of effectively designed Sustainable Drainage Systems (SuDS) within new developments which mimic natural drainage as closely as possible, with the provision for their long-term maintenance, in order to sustainably mitigate the risk of flooding.**
4. **To ensure that development incorporates appropriate water management techniques which improves the existing hydrological conditions and maximises the opportunities and benefits of betterment of water quantity, water quality, biodiversity and amenity.**
5. **To ensure on-site storage capacity for surface water attenuation for storm events up to the 1% probability event (1 in 100 year) including allowance for climate change.**
6. **Encourage the use of water efficient and recycling devices within new developments.**

1.7 The policy framework is provided by the Joint Core Strategy (JCS) and the emerging Tewkesbury Borough Plan, which includes policies relating to flood risk and water management. Policy INF2 of the emerging JCS specifically relates to flood and water

management issues. This SPD provides additional information to supplement this emerging policy, as well as those in the emerging Tewkesbury Borough Plan and the existing 'saved' policies contained within the Tewkesbury Borough Local Plan to 2011. Early use of this document by applicants in the design process is therefore essential.

**How to Use This Supplementary Planning Document.**

1.8 To ensure that Tewkesbury Borough has a consistent and appropriate approach to flood risk and water management, this SPD should be used by:-

- Developers and applicants when considering sites for development.
- Developers and applicants when preparing the brief for their design team to ensure drainage and water management systems are sustainably designed.
- Consultants when carrying out site-specific flood risk assessments.
- Design teams preparing master plans, landscape and surface water drainage schemes and assessments.
- Development management officers and their specialist consultees when determining delegated planning applications, selecting appropriate planning conditions, making recommendations to committees and drawing up section 106 obligations that include contributions for SuDS.
- Other interested parties (e.g. local members) who wish to better understand the interaction between development, flooding and drainage issues.
- Developers and applicants in designing future maintenance regimen for the life time of the development

1.9 This SPD is set within the context of a water flood risk management hierarchy to help developers and decision-makers understand flood and water management and to embed it in decision-making at all levels of the planning process.

1.10 The flood risk management hierarchy.

| Assess | | Avoid | | Substitute | | Control | | Mitigate |
|---|---|---|---|---|---|---|---|---|
| Appropriate flood risk assessment | ▶ | Apply the sequential test to the site location | ▶ | Apply the sequential approach at site level | ▶ | E.g. SuDS design, flood defences, etc. | ▶ | E.g. flood resilient construction |

1.11 This SPD addresses the flood and water management issues associated with development within the Tewkesbury Borough context. It should however be understood that the design of drainage systems and water features is dependent on a number of constraints such as existing ground conditions, including site contamination levels. This SPD does not provide detailed information in relation to groundwater contamination or remediation measures.

1.12 Neither does this SPD provide a comprehensive guide on all other development related issues. There is a wide range of other guidance available as part of the national planning policy, and from various sources, for other matters.

# CHAPTER 2 – SETTING THE LOCAL CONTEXT

2.1 Tewkesbury Borough is heavily influenced by the Severn and Avon Rivers. These rivers can pose a major flood risk, especially in the vicinity where the two watercourses meet at Tewkesbury town. A considerable amount of land to the western side of the Borough comprises the functional flood plain and the majority of the borough area ultimately drains into the Severn. Flooding from surface water is also a problem as drainage is closely linked to river levels. With the largely impermeable geology and generally gentle topography of the Borough exacerbating flood risk (as well as general sources; further information on soils and geology can be found in the '**Sustainable Drainage Systems for Local Development Framework FINAL REPORT – Volume 3**' produced for the JCS).

2.2 Tewkesbury Borough has suffered from numerous severe flooding events in its history, one of the most notable of which was in the summer of 2007.

The effects of global climate change are likely to result in more occurrences of extreme weather events and resultant flooding in the future. With the need for significant levels of new housing and employment development within the Borough, as identified through the Joint Core Strategy, it is imperative that issues associated with water management are identified and subsequently tackled if existing

## Case Study

**The summer of 2007 was one of the wettest on record.**

**Following a very dry April, Gloucestershire experienced heavy rainfall in June. This overloaded the county's drainage systems through a combination of the influx of surface water and very high water levels in main rivers and brooks and lead to some localised flooding across the county.**

**During July however the rains were even heavier. On 20th July, two months' worth of rain fell in just 14 hours. This ultimately resulted in two emergencies; widespread flooding and water shortages. The water shortage occurred due to the Severn Trent Water Treatment Works in Tewkesbury being contaminated with flood water.**

**With flood water reaching depths of over two metres in some places, across Gloucestershire over half of all homes and 7,500 businesses were without any mains water for up to 12 days and without drinking water for 17 days. Electricity was lost to 48,000 homes for two days. Within Tewkesbury borough over 1800 homes were directly affected by the floods.**

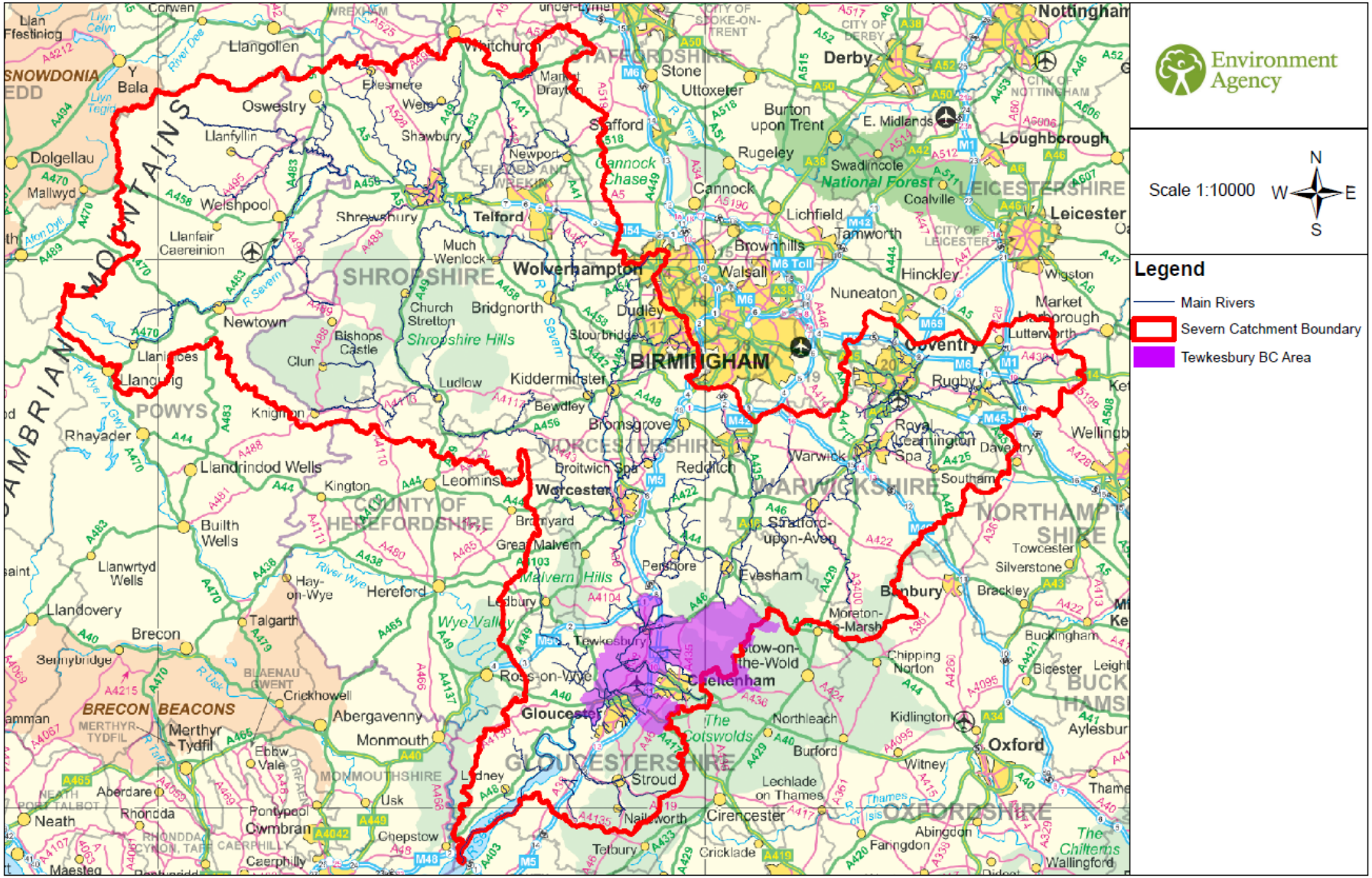
problems are not to be made worse, along with the associated negative social, environmental and economic impacts. Key issues to be tackled include: the location and design of existing and future development; flood risk management; design and maintenance of flood risk management infrastructure; future water resource needs; water supply and sewerage.

2.3 Tewkesbury Borough Council will always seek to manage, and reduce flood risk through the development management process.

2.4 As flood risk is determined by activity within the wider hydrological catchment, the consideration of flood risk should not be limited to the Local Authority area alone. Risks to and from neighbouring local authority areas should also be considered where appropriate.

2.5 To give this context; the Borough is located in one of the largest river catchments, as described in the following catchment map.

# River Severn Catchment



# CHAPTER 3 - LEGISLATIVE AND POLICY BACKGROUND

3.1 There are a number of legislative and policy considerations that have been taken into account in the preparation of this SPD, and which must also be taken into account when submitting a planning application. These considerations are summarised as:

## LEGISLATION

### 3.2 European Legislation

The Floods Directive

3.2.1 **The EU Floods Directive - 2007/60/EC** came into force due to a need for European Union countries (member states) to better understand and gather accurate data about the risks from surface water flooding. In the UK the Directive came into force via the Flood Risk Regulations 2009 which in turn sets the requirement for Preliminary Flood Risk Assessments (PFRA) to be produced by all unitary and county councils.

The Water Framework Directive

3.2.2 **The Water Framework Directive - 2000/60/EC (WFD)** was enacted into UK law in December 2003. This legislation requires member states to make plans to protect and improve the water environment. In summary, the Directive aims to protect and prevent the deterioration of aquatic ecosystems; conserve habitats and species that depend directly on water; reduce the release of individual pollutants that present a significant threat to the aquatic environment; reduce the pollution of groundwater and prevent or limit the entry of pollutants; and help reduce the effects of floods and droughts.

### 3.3 National legislation

The Flood and Water Management Act (FWMA) 2010

3.3.1 **The Flood and Water Management Act 2010** (FWMA) has brought about significant legislative changes to the management of flood risk and water. Gloucestershire County Council (GCC) has been established as a Lead Local Flood Authority (LLFA) with responsibility for managing local flood risk from surface runoff, ordinary watercourses and groundwater in the area. GCC has a responsibility to produce a Local Flood Risk

Management Strategy, and they also have powers and duties to issue consents for works on ordinary watercourses and undertake enforcement activities.

3.3.2 The FWMA and subsequent 2014 House of Commons Written Statement (HCWS161) seek to secure Sustainable Drainage Systems (SuDS) by agreeing new approaches to the management of drainage systems. This new approach seeks to deliver SuDS by strengthening of current planning policy. It makes clear that the Government's expectation is that SuDS are to be provided in new developments.

## PLANNING POLICY

### 3.4 National Planning Policy Framework (NPPF)

3.4.1 In March 2012 Government published the **National Planning Policy Framework (NPPF)** which sets out Government planning policy in England. The framework replaced many of the previous Planning Policy Guidance (PPG) or Planning Policy Statements (PPS), including PPS25: Development and Flood Risk. However, the accompanying planning practice guidance to the NPPF retains key elements of PPS25 and its associated Practice Guide.


3.4.2 At the heart of the NPPF is the presumption in favour of sustainable development, which is described as 'a golden thread running through both plan-making and decision-taking.' Sustainable development comprises three dimensions; economic, social and environmental and these should not be treated in isolation as they are mutually dependent. To achieve sustainable development, economic, social and environmental gains should be sought simultaneously through the planning system.

3.4.3 Flood risk and water management falls within Section 10: 'Meeting the challenge of climate change, flooding and coastal change' and one of the core planning principles of the framework is that planning should take full account of flood risk. Furthermore, the framework sets out the government's intention that planning authorities should adopt proactive strategies to mitigate and adapt to climate change.

3.4.4 Solely as a starting point, the flood risk assessment climate change allowance guidance on the gov.uk website can be reviewed. Extracts from which are included below:

**Table 1 peak river flow allowances by river basin district (use 1961 to 1990 baseline)**

| River basin district | Allowance category | Total potential change anticipated for the '2020s' (2015 to 2039) | Total potential change anticipated for the '2050s' (2040 to 2069) | Total potential change anticipated for the '2080s' (2070 to 2115) |
|---|---|---|---|---|
| Thames | Upper end | 25% | 35% | 70% |
| | Higher central | 15% | 25% | 35% |
| | Central | 10% | 15% | 25% |
| Severn | Upper end | 25% | 40% | 70% |
| | Higher central | 15% | 25% | 35% |
| | Central | 10% | 20% | 25% |

## Using peak river flow allowances for flood risk assessments

Consider the appropriate flood risk vulnerability classification to decide which allowances apply to your development or plan. This will help you understand the range of impact. The higher central, central, and upper end allowances are in table 1. Whilst the majority of the Borough is within the Severn River Basin District there is a small area to the east of the Borough within the Thames District. Please refer to the EA's River Basin District Map to identify the relevant district for your site.

Table 2 shows anticipated changes in extreme rainfall intensity in small and urban catchments. For flood risk assessments and strategic flood risk assessments, assess both the central and upper end allowances to understand the range of impact.

**Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)**

| Applies across all of England | Total potential change anticipated for the '2020s' (2015 to 2039) | Total potential change anticipated for the '2050s' (2040 to 2069) | Total potential change anticipated for the '2080s' (2070 to 2115) |
|---|---|---|---|
| Upper end | 10% | 20% | 40% |
| Central | 5% | 10% | 20% |

**Table 3 sea level allowance for each epoch in millimetres (mm) per year with cumulative sea level rise for each epoch in brackets (use 1990 baseline)**

| Area of England | 1990 to 2025 | 2026 to 2055 | 2056 to 2085 | 2086 to 2115 | Cumulative rise 1990 to 2115 / metres (m) |
|---|---|---|---|---|---|
| South West | 3.5 (122.5 mm) | 8 (240 mm) | 11.5 (345 mm) | 14.5 (435 mm) | 1.14 m |

For further guidance on the application of climate changes allowances please refer to the EA's local area advice on Climate Change Allowances for Planning at APPENDIX V of this document.

Whilst the majority of Tewkesbury Borough Council area is not directly affected by Tidal flooding, the increase in sea level may have an impact on parts of the Borough and will therefore need to be taken into account.

The NPPF and its associated **Planning Practice Guidance** is an important consideration in the decision making process.

3.4.5 The framework indicates that local plans and planning applications should both ensure that flood risk, including surface water flooding, 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 has been undertaken which follows the Sequential Test, and if required, passes the Exception Test;
- 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.
- The framework also indicates that local plans should use opportunities offered by new developments to reduce flood risk elsewhere.

3.4.6 Sustainable Drainage Systems: Written Ministerial Statement

On 18th December 2014, a ministerial statement was made by the Secretary of State for Communities and Local Government (Mr Eric Pickles). The statement has placed an expectation on local planning policies and decisions on planning applications relating to major development to ensure that SuDS are put in place for management of runoff, unless

demonstrated to be inappropriate. The statement made reference to revised planning guidance to support local planning authorities in implementing the changes and on 23rd March 2015, the Department for Environment Food and Rural Affairs (Defra) published the "Non Statutory Technical Standards for Sustainable Drainage Systems"

## 3.5 Local Planning Policy

The Tewkesbury Borough Local Plan to 2011 – March 2006

3.5.1 **The Tewkesbury Borough Local Plan to 2011** was adopted in March 2006. In accordance with paragraph 215 of the NPPF, due weight should be given to relevant 'saved' policies in the local plan according to their degree of consistency with this framework (the closer the policies in the plan to the policies in the framework, the greater the weight that may be given). Planning law makes it clear that planning applications should be determined in accordance with the development plan, unless material considerations indicate otherwise. The local plan therefore remains the starting point for decision making.

The emerging Joint Core Strategy

3.5.6 **The adopted Joint Core Strategy (JCS)** is a strategic development plan document that has been prepared through a partnership between Gloucester City Council, Cheltenham Borough Council and Tewkesbury Borough Council. The JCS provides a co-ordinated strategic plan for this joint administrative area during the period up to 2031. The JCS has an extensive and up to date evidence base, including Strategic Flood Risk Assessments which provide a detailed assessment of multiple flood sources for specific broad locations within the JCS area.

The emerging Tewkesbury Borough Plan

3.5.7 Whilst the JCS provides the strategic level policies for development in the area, this will be supplemented at individual district level by locally specific plans. In Tewkesbury Borough, the council has begun preparation of the **Tewkesbury Borough Plan**, which is at a relatively early stage of preparation at the time of the publication of this SPD.

# CHAPTER 4 - THE IMPORTANCE OF PRE-APPLICATION ADVICE

4.1 The Council encourages early discussions in relation to development proposals. Developers are strongly advised to use the Council's **pre-planning application advice service** to discuss any potential issues that may arise from development proposals. There is also an expectation that developers seek early engagement with local communities and relevant organisations on their development proposals.

4.2 Seeking pre-application advice may help applicants to address issues such as:

- Whether the proposed development is acceptable in principle and thus warranting further investigations in respect of flooding and drainage
- Whether a Flood Risk Assessment (FRA) needs to be submitted and, if so, what is the required scope of the assessment?
- Confirmation of whether the Sequential and/or Exceptions Tests need to be applied, and advice on how to undertake the tests appropriately;
- Advice on the most appropriate form of sustainable drainage measures for a site;
- Whether there are any known contamination issues on the site which could affect site design and layout and the types of SuDS used?
- Agreeing the discharge points for site drainage with the LPA and relevant RMA;
- Obtain any relevant data needed in order to prepare the site specific FRA and drainage strategy.

4.3 The Council will, if necessary, seek the technical advice and views of the following Flood Risk Management Authorities (FRMA) when providing pre-application advice to applicants and determining subsequent planning applications:-

Environment Agency

4.4 **The Environment Agency** (EA) is a public body that has responsibilities for protecting and enhancing the environment as a whole and contributing to the government's aim of achieving sustainable development. The EA are a statutory consultee and provide bespoke advice on certain planning applications in Flood Zones 2 and 3 and on sites in Flood Zone 1 which have critical drainage problems (as notified to the local planning authority by the Environment Agency). The EA do however apply standing advice to a wide range of development proposals. For the EA's local level consultation filter, flood risk matrix and

standing advice please refer to APPENDIX V. The consultation filter should be used to identify when the EA should be consulted and the flood risk matrix to identify when standing advice applies and which standing advice note to refer to. In providing pre-application advice the Council will refer to the EA's standing advice where applicable. **It should be noted however that the EA operate charges for providing bespoke pre-application advice (i.e. in situations where standing advice does not apply) and in such circumstances the Council is unable to consult the EA as part of its own pre-application advice service. Applicants are therefore expected to obtain pre-application advice from the EA on a separate basis.**

Water and sewerage undertakers

4.5 **Severn Trent Water** (STW) and **Thames Water** (TW) have the responsibility to maintain foul, surface and combined public sewers in Tewkesbury Borough so that they can effectively drain the area. They ensure that the public sewer system has the capacity to accept flows from new developments. To provide the necessary capacity they may require planning conditions to be imposed on planning permissions requiring the delay of any connection to the sewerage system until the additional capacity to accommodate the development is provided. Depending on location; STW or TW will be a statutory consultee on future developments.

Lead Local Flood Authority (Gloucestershire County Council)

4.6 The 2010 FWMA establishes **Gloucestershire County Council** as Lead Local Flood Authority (LLFA). As Lead Local Flood Authority, it has responsibility for managing local flood risk from surface runoff, ordinary watercourses and groundwater in the area and is a statutory consultee. Gloucestershire County Council is also the Local Highway Authority, and in this regard it is responsible for road construction and highway drainage consents.

Lower Severn Internal Drainage Board (IDB)

4.7 IDBs are local public authorities that manage water levels. They are an integral part of managing flood risk and land drainage within areas of special drainage need in England and Wales. IDBs have permissive powers to undertake work to provide water level management within their Internal Drainage District. They undertake works to reduce flood risk to people and property and manage water levels for local needs. Much of their work involves the maintenance of rivers, drainage channels, outfalls and pumping stations, facilitating drainage of new developments and advising on planning applications. They also have statutory duties with regard to the environment and recreation when exercising their

permissive powers. IDBs input into the planning system by facilitating the drainage of new and existing developments within their districts and advising on planning applications; however they are not a statutory consultee to the planning process.

**Planning Application Requirements**

4.8 Pre-application advice will help applicants to understand the issues relating to their proposal by the time a planning application is submitted. However, it is also important that all the correct information is submitted to ensure applications can be validated and determined efficiently. The Council's **validation checklists** set out the requirements for submission. In addition; all relevant checklists from the suite provided in Appendix B of The SuDS Manual (CIRIA, C753) are to be utilised.

# CHAPTER 5 - FLOOD RISK AND SITE SELECTION

## 5.1 Introduction

5.1.1 Development in areas at risk of flooding should be avoided. Flood risk includes risk from all sources of flooding, including from:

- rivers (fluvial)
- tidal and coastal flooding;
- rainfall surface water (pluvial);
- overwhelmed sewers and drainage systems;
- groundwater; and
- From reservoirs, canals and lakes.

Where development is necessary, it should be safe and should not increase flood risk elsewhere.

5.1.2 Flood risk is an expression of the combination of the flood probability (how likely the event will happen) and the magnitude of the potential consequences (the impact such as economic, social or environmental damage) of the flood event.

5.1.3 The likelihood or risk of flooding can be expressed in two ways:

**Chance of flooding:** As a percentage chance of flooding each year. For example, for Flood Zone 3b there may be a 5% annual probability of this area flooding

**Return period:** This term is used to express the frequency of flood events. It refers to the estimated average time interval between events of a given magnitude. For example, for Flood Zone 3b the return period could be expressed as 1 in 20 year

5.1.4 There is however a move away from using return periods as an expression of flood risk as this approach does not accurately express the risk of flooding. For example, it is misleading to say that a 1 in 100 year flood will only occur once in every hundred years. This suggests that if it occurs in one year then it should not be expected to reoccur again for another 100 years; however this is not the case. The percentage chance of flooding each year, often referred to as **annual probability**, is now the preferred method of expressing flood risk.

5.1.5 Fluvial flooding is divided into flood zones based on the risk of flooding:

**Figure 5.1: Fluvial Flood Risk Zones**

| Flood Zone | Definition |
|---|---|
| **Zone 1 - Low Probability** | Land having a less than a 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3) |
| **Zone 2 - Medium Probability** | Land having between a 1% and a 0.1% annual probability of river flooding; or Land having between a 0.5% and a 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map) |
| **Zone 3a - High Probability** | Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map) |
| **Zone 3b - The Functional Floodplain** | This zone comprises land where water has to flow or be stored in times of flood.<br>LPAs should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the EA.<br>(Not separately distinguished from Zone 3a on the Flood Map) |

5.1.6 Maps showing Flood Zones are available on the gov.uk website. Flood Zones refer to the area affected by flooding from fluvial or tidal sources only, ignoring the presence of defences, for differing probabilities as defined in Table 1 of sub-section 25 within the Flood and Coastal Change section of the National Planning Practice Guidance (NPPG). These areas are shown upon the Environment Agency's Flood Map for Planning. It should be noted that the EA's flood map is indicative only and does not cover the entire Borough. For example; flood risk associated with smaller watercourses with a catchment of less than 3 km² do not necessarily feature on the EA flood map. This does not however mean

that there is not a risk of flooding associated with these watercourses. Therefore; individual site specific hydraulic modelling may well be required in to establish the flood risk on a site.

5.1.7 To cope with the potential risks from forecasts of climate change (warmer summers, wetter winters and increased river flows, storm surge, wave climate, predicted 1.14m cumulative rise in sea levels in the South West of England by 2115) and to ensure that new development is safe for its lifetime, the Government has emphasised that development in areas at risk of flooding should be avoided by directing development away from the highest risk areas. Where development is necessary it should be made safe without increasing flood risk elsewhere. Please see the DEFRA/ EA technical report 'Flood Risk Assessment Guidance for New Development – FD2320/TR2' for further information on what is considered a danger to people.

5.1.8 All proposals should therefore follow a Sequential Approach to flood risk. This means relevant development will be directed to the areas at the lowest risk of flooding at a strategic, local and site-scale level. It will be necessary to consider flooding from all sources: the sea (tidal), rivers (fluvial), surface water (pluvial) and ground water, and a possible combination of all of these. Further detail on the Sequential Test is provided below.

5.1.9 The 'design flood'; which is defined as the fluvial flood level likely to occur with a 1% annual probability, or 0.5% tidal, plus climate change allowance, should be used to inform the sequential approach, including appropriate location of built development; consideration of flood risk impacts, mitigation/enhancement and ensure 'safe' development.

## 5.2 Site Vulnerability

5.2.1 The general approach to flood risk and planning is to ensure that where possible, development is located in the areas of lowest flood risk and this approach can be applied at various levels i.e. strategic scale, individual site scale and building scale to ensure the most vulnerable uses are located in the area of lowest flood risk

5.2.2 Therefore it is necessary to identify how 'vulnerable' the proposed development is using the vulnerability classification set out in Table 2 of the **Planning Practice Guidance.** This is important because different types of development are acceptable in different flood risk

situations. In simple terms, the more vulnerable the development type is, the more important it is to locate it in areas of the lowest possible flood risk. The table in the **Planning Practice Guidance** sets out in more detail what types of development can be located in which flood zone and categorises the developments into the following areas.

- Essential Infrastructure
- Highly Vulnerable
- More Vulnerable
- Less Vulnerable
- Water Compatible Development.

## 5.3 The Sequential Test

5.3.1 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 zone' maps normally being the starting point for any assessment. Development should not be permitted if there are reasonably available sites in areas with a lower probability of flooding. The sequential approach is to be used in areas known to be at risk from flooding.

5.3.2 The overall aim is to steer new development to Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, Tewkesbury Borough Council will take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 where flood risk is minimal, applying the Exception 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. In applying the sequential test to major developments Tewkesbury Borough Council will require the developer to provide information and if deemed necessary, request additional up to date modelling to demonstrate that the application takes account of changes both in climate change requirements and any actual recorded flooding events since the original Environment Agency modelling was carried out.

5.3.3 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 consequent social and

environmental benefits. Sequential test guidance can be found at **https://www.gov.uk/guidance/flood-risk-assessment-the-sequential-test-for-applicants.**

5.3.4 The Sequential Test does not need to be applied for:

- Individual developments on sites which have been allocated in development plans, as the Sequential Test process has already been undertaken (unless the Flood Zones for the site have changed);
- Minor development or change of use (except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site); or
- Sites located wholly in Flood Zone 1

5.3.5 The definition of minor development for the purposes of the Sequential Test is:

- Minor non-residential extensions: industrial/commercial/leisure etc. extensions with a footprint less than 250 square metres;
- Alterations: development that does not increase the size of buildings e.g. alterations to external appearance;
- Householder development: for example sheds, garages, games rooms etc. within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling e.g. subdivision of houses into flats.

5.3.6 All sources of flood risk should be considered when assessing the need for the Sequential Test as well as undertaking the test.

5.3.7 The PPG requires a pragmatic approach to the Sequential Test and site availability and suggests that it might be impractical to suggest there are more suitable alternative sites in some circumstances. For example, it may be that proposals are submitted which involve the redevelopment of heritage assets where the benefits that would arise from bringing the buildings back into use cannot be provided by development on an alternative site.

5.3.8 The following sets out how applicants should undertake the Sequential Test for assessment by the LPA. This would normally take the form of the submission of a report commensurate in size to the scale of development proposed.

- The Applicant should agree with the LPA the geographical area over which the test is to be applied. This will normally be based on the circumstances and requirements of the proposed development in question. For example, where a large scale strategic

housing development is proposed it will normally be appropriate to consider the Borough as a whole; however, where a small scale housing development meeting local needs is proposed the geographical area may be more refined and based on that local area. Furthermore, there may be situations where the functional requirements and objectives of the proposed development justify a refined catchment area (e.g. the catchment area for a school, community facilities and development within a regeneration zone).

- The relevant policies of the local plan should be the starting point to understand areas of local need. For uses that have a sub-regional, regional or national impact it may be appropriate to expand the area beyond the LPA boundary.

- The developer should identify and list reasonably available sites that meet the functional requirements of the application in question and are considered reasonably available and would be given planning permission for the proposed use. The Council's Strategic Assessment of Land Availability (SALA) provides a source of information on sites in the Borough that are available for development. It must however be noted that the identification of a potential site within the SALA does not imply that it is deliverable and developable and the council would grant planning permission for development. All alternative sites must still be in conformity with the Adopted Development Plan, the National Planning Policy Framework and its associated National Planning Practice Guidance. Other sources of alternative sites may include unimplemented site allocations within an adopted Development Plan Document and unimplemented planning permissions (although permissions that are likely to be implemented are not considered to be reasonably available).

- The Developer should obtain the necessary flood risk information for all the sites. This should be from all available sources including but not limited to the EA's Flood Zones maps, the EA's Areas Susceptible to Surface Water Flooding Maps, the SFRAs, and the British Geological Society Areas Susceptible to Groundwater Flooding Maps together with any other local flood risk knowledge.

- The Developer should apply the Sequential Test and compare the flood risk from all sources for the reasonably available sites to the original sites flood risk as set out in the site specific FRA to demonstrate if there are any reasonably available sites that have a lower flood risk, state how they compare regarding flood risk and any reasons why they are unsuitable or not available within the report.

- If the site is not within Flood Zone 1 are there any reasonably available sites in the area with a lower probability of flooding that would be appropriate to the type of development or land use proposed. If no, this does not mean that the proposed development is acceptable in flood risk terms as it may be necessary to apply the exception test as part of the site specific flood risk assessment.

- Reasonably available does not mean that the sites must be in the same ownership. Instead the Council will view reasonably available sites as those that are both 'deliverable' and 'developable' as defined by the NPPF (Para.47, footnotes 11-12). The Council does not necessarily accept however that to be 'deliverable' for the purposes of the Sequential Test an alternative site must have a realistic prospect of housing being delivered on it within the first five years. Instead, determining whether an alternative site is deliverable should be based on the likely delivery trajectory of the proposed development in question (for example where a very large, complex development is proposed and it is unlikely that the site would deliver within the first five years, it is inappropriate to only consider alternative sites that can deliver within five years). Furthermore, for non-residential developments delivery timeframes may not be as important a consideration. The deliverability of alternative sites will therefore be considered on a case by case basis. In addition, reasonably available sites should:

  1. Lie within the agreed area of search; *and*

  2. Can accommodate the general requirements of the development; *and*

  3. Are, in principle, in conformity with the Adopted Development Plan, the National Planning Policy Framework and its associated National Planning Practice Guidance.

5.3.9 In considering whether an alternative site can accommodate the general requirements of the development the Council will expect a flexible approach to be employed. For example, where appropriate, applicants will be required to consider disaggregating proposals where two or more alternative sites with a similar combined capacity have been identified.

## 5.4 The Exception Test

5.4.1 If, following 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 can be applied if required (see Table 3 Flood Risk Vulnerability and flood zone compatibility PPG). For the Exception Test to be passed:

- it must be demonstrated that the development provides wider sustainability benefits (including social, economic and environmental benefits) to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment; and
- a site-specific flood risk assessment 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.

5.4.2 The Exception Test applies to planning applications and the allocation of land through the development plan process. Both elements of the exceptions test must be satisfied.

## 5.5 The Joint Core Strategy Strategic Flood Risk Assessment

5.5.1 To complement the Environment Agency's flood zone maps, Gloucestershire County Council prepared a **Strategic Flood Risk Assessment (SFRA) Level 1** for the County in September 2008. This assessed all forms of flood risk: fluvial (rivers), tidal (sea), surface water, groundwater, sewers, reservoirs and canals.

5.5.2 To provide further information, two **SFRA Level 2** reports were published in October 2011 and April 2013. It must be noted that currently the SFRAs do not take account of the revised allowances for climate change. An additional SFRA Level 2 report on specific sites will also be published as part of the emerging Tewkesbury Borough Plan. These involve a more detailed review of flood risk at identified broad locations, based on the risk identified in the Level 1 SFRA. Areas with the lowest flood risk (Flood Zone 1) were not subject to the Level 2 SFRA.

5.53 If developers wish to refer to the Level 2 SFRA then they should provide detailed evidence, by reviewing the hydraulic modelling that forms the basis of the data, to show why the SFRA outlines should supersede the Flood Map for Planning outlines. As the Flood Map for Planning is regularly reviewed and updated in comparison; this approach would

adhere to the principle of the best available data approach. This, along with the Environment Agency's flood maps and the site specific FRA, provide the information necessary to apply the Sequential Test and Exception Test in the development management process by helping to identify sites that may or may not be suitable for development.

## 5.6 Site Suitability and Flood Risk Considerations for Planning Applications and Site Specific Flood Risk Assessments (FRA)

5.6.1 Developers proposing development or a change of use to a more vulnerable class in areas of flood risk from any source or with critical drainage problems (as notified to the local planning authority by the Environment Agency) or which could create flood risk for others or are more than 1 hectare in size are responsible for:

- Demonstrating that the proposed development is consistent with national and local planning policy.
- Undertaking appropriate consultation with the flood risk management authorities (Section4)
- Providing a site-specific Flood Risk Assessment (FRA), as part of the planning process, which meets the requirements of this Section, and those set out by the relevant flood risk management authority.
- Integrating measures into the proposals design that reduce flood risk to the development and elsewhere, by incorporating appropriate flood risk management measures (Chapter 9) including the use of Sustainable Drainage Systems (SuDS) (Chapter 6)
- Ensuring that any necessary flood risk management measures are sufficiently funded to ensure that the site can be developed, occupied and maintained safely throughout its proposed lifetime. (Section 6.15)

5.6.2 The Council will refuse to validate applications for sites in Flood Zones 2 and 3 where no FRA is submitted.

5.6.3 The following section sets out the points that need to be taken into consideration when determining a site's suitability for development due to flood risk. All requirements are consistent with the NPPF and PPG with local requirements explained further.

Assessment

5.6.4 Applicants must consider allocations within the local Development Plan. If the site has been allocated in the Development Plan for the same land use type/vulnerability classification that is now being proposed, then an assessment of flood risk, at a strategic level, has already been undertaken. This will have included assessing the site, against other alternative sites, as part of the sequential approach to flood risk. A site's allocation in the Development Plan for the same land use/vulnerability does not however preclude it from requiring a site specific FRA, only from the application of the Sequential Test.

5.6.5 It must be demonstrated that the flood risk information contained within the SFRA and associated sequential test assessment accompanying the local plan/development plan (where applicable) is still appropriate for use. It must be clarified whether the flood zoning of a site changed after adoption of the relevant part of the local plan or if there is any updated climate change allowances or a recorded flood. In this case Tewkesbury Borough Council will require the developer to provide evidence that the changes have been taken into account and, for a Major Development, the Developer will need to provide an updated Flood Risk Assessment using updated modelling to redefine the flood zones.

5.6.6 Where the site has not been allocated in the local plan or the flood zone classification has changed since adoption of the plan (i.e. it is a windfall or non-allocated site), a detailed flood risk assessment including the sequential test and, where appropriate, the exception test will need to be undertaken following the overarching principles of the sequential approach. Details of the sequential and exception test are specified above at 5.3 and 5.4.

5.6.7 Applicants should indicate their site boundary on a plan and, if applicable, the boundary of any allocated site and provide evidence of any checks to see if there is any updated Flood Risk information after the preparation of the relevant SFRA.

5.6.8 Where the drainage system discharges to a surface water body that can accommodate uncontrolled free discharge without any impact on the flood risk (e.g. the sea or a large estuary) the peak flow and volume control standards need not apply.

5.6.9 For 'major' development (as defined within The Town and Country Planning Development Management Procedure (England) Order 2015) a detailed FRA is to provide an appropriate assessment (hydraulic model) of the **1%** annual probability flood event, with **70%** allowance added to 'peak river flows' to account for climate change. This is as per set out in Environment Agency guidance as the 'Upper' allowance for the Severn river basin district in their 'Adapting to Climate Change' document.

5.6.10 For non-major development; the preference is to undertake the same approach as for major development. However in the absence of modelled climate change information, it may be reasonable to utilise an alternative approach (see APPENDIX V).

5.6.11 Have other sources of significant flood risk from sources other than fluvial or tidal, such as pluvial (surface water, as demonstrated either by the LLFA surface water management plan or physical photographic evidence of previous events), groundwater, reservoirs, sewers, etc. been considered (see Sequential Test details at 5.3)?

## 5.7 What an FRA Should Contain

5.7.1 A brief FRA is all that is normally required for small-scale proposals such as householder development and other minor extensions (<250m$^2$) in Flood Zones 2 and 3. The FRA (which must be submitted along with supporting evidence, as part of a planning application) for such developments must, as a minimum, be based on the most up to date EA guidance for Minor Development in Flood Zone 2 and 3. In addition, it needs to take into account the most up to date SPD requirements and advice on climate change (see APPENDIX V for local Environment Agency Guidance on both these points). However, for other types of development a more detailed FRA will be required. Obtaining pre-application advice from the Council will assist in determining the level of detail required for a FRA.

5.7.2 For more complex development schemes, an FRA will be required to include a detailed sustainable drainage scheme to mitigate the site. Any suggestion that preferred SuDS techniques for a particular site are unviable or unduly onerous, by virtue of factors such as extraordinarily high development costs or significant harm to heritage assets must be robustly evidenced. The **Environment Agency** has published further guidance setting out what an FRA should contain and **English Heritage** has published guidance on the consideration of heritage assets within flood mitigation schemes.

5.7.3 FRAs should be proportionate to the risk and appropriate to the scale, nature and location of the development. A FRA should always be undertaken **as early as possible** in the planning process to avoid abortive work raising landowner expectations where land is unsuitable for development.

5.7.4 **FRAs should:**

a) Consider and quantify the **different types of flooding** whether from natural or human sources (e.g. canals, dam breaches and reservoir breaches) and including joint and cumulative effects. The LPA will expect links to be made to the management of surface water as described in Chapters 6 and 7. Information to assist with the identification of surface water and groundwater flood risk is available from the LLFA, the EA and the LPA. Applicants should also assess the risk of foul sewage flooding as part of the FRA. STW/TW as sewerage undertaker can provide relevant information to the applicant to inform preparation of FRAs.

b) Consider the effects of a range of flooding events including the **impacts of extreme events** on people, property, the natural and historic environments and river processes.

c) Consider the **vulnerability of occupiers and users** of the development, taking account of the Sequential and Exception Tests and the vulnerability classification, and include arrangements for safe access (Please see the Defra/EA technical report 'Flood Risk Assessment Guidance for New Development – FD2320/TR2' for further information on what is considered a danger to people).

d) Identify relevant **flood risk reduction measures** for all sources of flood risk not just for the site but elsewhere i.e. downstream existing flooding problems.

e) Consider both the potential adverse and beneficial **effects of flood risk management infrastructure** including raised defences, flow channels, flood storage areas and other artificial features together with the consequences of their failure.

f) Include assessment of the remaining **residual risk** after risk reduction measures have been taken into account and demonstrate that this risk is acceptable for the particular development or land use. Further guidance on this is given in Chapter 9.

g) Be supported by appropriate **evidence data** and information, including historical information on previous events. All topographical survey data submitted with applications must be presented as an accurate height Above Ordnance Datum, Newlyn (mAOD)

h) Consider the risk of **flooding arising from the proposed development** in addition to the **risk of flooding to development on the site**. This includes considering how the ability of water to soak into the ground may change after development. This would mean the preparation of surface water drainage proposals. This includes all flow routes including flood flow paths or ordinary watercourses flowing onto the development site and therefore needing to be taken account of.

i) Take a **'whole system'** holistic approach to drainage to ensure site discharge does not cause problems further along in the drainage sub-catchment and can be safely catered for downstream and upstream of the site.

j) Take the appropriate **impacts of climate change** into account for the lifetime of the development including the proposed vulnerability classification.

k) The FRA must clearly demonstrate that the **Sequential Test** and **Exception Test**, where required, have been passed.

l) A surface water drainage strategy contains the proposals for the surface water drainage of the development. Such a strategy should include initial proposals that are sufficient to demonstrate a scheme can be delivered that will adequately drain the proposed development whilst not increasing flood risk elsewhere as part of the FRA.

m) If an outline application is to be submitted for a major development, then an outline surface water drainage strategy must be submitted as part of the FRA, outlining initial proposals and quantifying the conceptual surface water management for the site as a whole. This should detail any strategic features, including their size and location. A detailed surface water drainage strategy must subsequently be submitted and approved for the whole site and, with each reserved matters application that comes forward, it must be demonstrated that the surface water drainage strategy is still appropriate and how the reserved matters application complies with the outline and detailed whole site surface water drainage strategy's.

**Surface Water Drainage Strategy**

5.7.5 Developers should prepare the surface water drainage strategy as part of the FRA, ensuring consistency between the surface water flood risk and any initial drainage proposals. It is recommended that a surface water drainage strategy is based on the following principles:

a) Work up your drainage strategy in tandem with your site layout and highway designs. This will help avoid abortive work in any one area. Use Chapters 6, 7 and 9 to ensure that the following have been considered:

a.1. The submission requirements, including any supporting investigations

a.2. Sustainable drainage design principles

a.3. Interception, infiltration, flow rate runoff control, volumetric runoff control, and exceedance flow management

a.4. Site discharge location and attenuation provision

a.5. Water quality treatment, habitat provision and biodiversity

a.6. Health and safety, access and amenity

a.7. Use the correct climate change allowances for the development based on its lifetime.

a.8. Ensure that the required management and maintenance of all site features has been clearly set out as part of the drainage strategy. Get initial agreements in place to cover management funding for the lifetime of the development.

b) Check that the quality of the water environment (and therefore WFD issues) has been specifically considered as part of all of the flood and drainage measures proposed. Is development of the site likely to cause detriment to the WFD status of a water body? Have opportunities been taken to enhance the water environment?

5.7.5 Where there are proposals which include changing the discharge of surface water flows between catchments, planning permission will be expected to be refused unless copies of Legal Easements from the new point of discharge to the original point of discharge to the original watercourse are provided to the Planning Authority as part of any planning submission. Whilst there may be some significant contrast between riparian rights and nuisance, the boundaries between the two are not always clearly defined. Therefore; the aim is to ensure that if a development changes the drainage characteristics of the location that the necessary endorsements are in place from potentially affected third party landowners.

5.7.6 The design will aim to ensure that any attenuation facility has a normal Flood Hazard Rating (FHR) of less than **1.25,** with a maximum depth of **1.2m** and banks no steeper than a **1 in 4** slope (exceptions could be considered for very small scale/depths of slope). Where it is demonstrated that meeting these standards would be unfeasible the design of attenuation facilities must reduce risks as far as possible through the implementation of significant multiple health and safety mitigation design measures e.g. position siting and lighting, edge gradient above and below the water line, barrier planting (which doesn't obstruct visibility of the water from the surrounding area), depth profile of water with dry and wet 'benches', signs etc. This is predominantly aimed at accessible SuDS or the edges of regional ponds. Large regional ponds may have greater water depths and subsequently higher FHRs.

5.7.7 The design shall ensure that the attenuation storage requirement is assessed against a **1%** annual probability flood event plus **70%** allowance for climate change on the receiving watercourse. In addition; that run-off is restricted to the existing 1/1 green-field rate for

the 1/1 event and the **Mean Annual Flood Flow ($Q_{bar}$)** green-field rate for all events above the 1/1 and up to the 1% event. Due to the significant flooding issues within the Borough developers are encouraged to apply a **70%** allowance for climate change as part of a precautionary approach for extreme rainfall events. This approach is to ensure that sufficient run-off is retained on site for extreme events to protect the receiving water course in times of flooding. However, as a minimum, the Council will expect a 40% allowance to be made as per Environment Agency guidance for the 'upper estimate' in their 'Adapting to Climate Change' document. The preferred method of calculation is by the Revitalised Rainfall-runoff model Version 2 (ReFH2) using design rainfall hyetographs derived from the FEH13 Depth Duration Frequency (DDF) rainfall model. Other hydrological models may be acceptable but a comparison with ReFH2 and FEH13 should be provided.

5.7.8 For Development Sites where either there is recent photographic evidence, or if the Surface Water Management Plan shows the presence of pluvial flooding, the Development will need to compensate for the pluvial flood volume lost by providing additional flow and storage capacity within the developments surface water drainage system and attenuation storage. In a large-scale development or an allocation, the compensatory storage would need to be comprehensive, contiguous and protected from development.

5.7.9 The detailed design of development should seek to reduce the risks of flooding for any existing development and land in or around the application site as part of the new development and deal with flooding in a comprehensive manner for the whole of the site.

5.7.10 Within an application site, where there is reason to believe that overland flow could occur into the site, then provision shall be made to accommodate those flows within the site layout. The design of the site must also ensure that flows resulting from these overland flows are managed in exceedance routes that minimise the risks to people and property and avoids creating hazards to pedestrian and vehicular access and egress routes.

5.7.11 Critical duration events for watercourses and rivers can typically range from around 4 hours for small catchments, up to 3 days for the large rivers such as the River Severn. Therefore, it is plausible that the critical duration event for the development site could coincide with major flows in rivers, with subsequent hydraulic consequences. Where there is this 'dependency' then the relevant return period needs to be applied to both the site drainage system and the relevant watercourse, to ascertain what the implications are for the site system. Where the impact is considered to be significant; more

detailed examination of the interconnection needs to be undertaken. The combination of return periods should undergo joint probability analysis, in order to refine the site design.

# CHAPTER 6 - SUSTAINABLE DRAINAGE SYSTEMS (SuDS)

6.1 SuDS are surface water drainage systems which manage water runoff in a more sustainable way than traditional drainage, through managing flow rates and protecting water quality. All developments regardless of scale and constraints should seek to incorporate SuDS and in virtually all cases it will be a requirement. It is incorrect to assume that ground conditions preclude their use, as there are a variety of solutions available depending on the location and needs of a development – SuDS are not difficult, just different. SuDS are intended to replicate, as closely as possible, the natural drainage from a site before development takes place.

6.2 SuDS offer significant advantages over traditional piped drainage systems in reducing flood risk, by reducing the quantity of surface water run-off from a site and the speed at which it reaches water courses, promoting groundwater recharge and improving water quality and amenity. The range of SuDS techniques available means that a SuDS approach in some form will be applicable to almost any development, to maximise the opportunities and benefits obtainable from surface water management.

6.3 Please note that reference is made to 'SuDS' throughout this chapter, rather than 'surface water drainage' as the National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG) and adopted and emerging Local Planning policies require a SuDS solution to surface water management for new development. Many of the general principles within this chapter can also be applied to traditional surface water drainage and so this chapter needs to be complied with on all development sites and the provision of SuDS maximised. Even on very constrained sites SuDS can be implemented in one form or another.

## 6.4 WHAT IS REQUIRED?

6.4.1 For all Greenfield sites, developers must attenuate run-off so that the flow to the receiving waterbody is restricted as per 5.7.7 above. The climate change allowance must be added to the post-development run-off rate and volume calculations only.

6.4.2 For brownfield sites, in all instances innovative SuDS design solutions will be supported in principle and opportunities to improve runoff rates and reduce flood risk will be sought, with a minimum discharge reduction of **40%** expected**.** SuDS techniques should reduce the proven current instantaneous runoff rate to the 1/1 green-field rate for the 1/1 event and the **Mean Annual Flood Flow ($Q_{bar}$)** green-field rate for all events above the 1/1 and up to

the 1% event, and a minimum 40% allowance for climate change in line with 5.7.7 above. If this is demonstrated to the satisfaction of the local planning authority to be completely unviable, for example due to the constraints and complexity of the site, then , an approach of 'as close as reasonably possible' may be accepted.

6.4.3 In all cases; the preferred method of hydrological assessment is by the ReFH2 model, using design rainfall hyetographs derived from the FEH13 DDF rainfall model. Other hydrological models may be acceptable but a comparison with ReFH2 and FEH13 should be provided.

6.4.4 Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g. the sea or a large estuary) the peak flow/volume control standards need not apply.

6.5 There are a variety of SuDS techniques and further guidance should be sought via The SuDS Manual (CIRIA, C753). The use of 'open to surface' SuDS management train techniques is preferred, as opposed to piped or tanked solutions which offer nothing in terms of water quality, biodiversity, amenity, have increased future maintenance requirements and are typically more expensive to implement. In addition, any innovative solutions will be welcomed and supported in principle.

6.5.1 One or more of the following 'open to surface' options should be considered first. This list is not exhaustive and further guidance can be found in the SuDS Manual (CIRIA C735). If these methods are discounted, robust evidence as to why this is the case should be demonstrated as part of any submission.

## Surface SuDS Elements

**Permeable surfaces:** Surfaces that allow inflow of rainwater into the underlying construction or soil; such as gravel, permeable hard surfacing, permeable block paving, porous tarmac and porous concrete. The storage can be created within the sub-base of these surfaces given careful selection of the stone fill or use of plastic box systems. They are also very effective at removing a wide range of pollutants and may also permit infiltration.

**Green roofs:** A vegetated roof which provides retention, attenuation and treatment of rainwater, and promotes evaporation and local biodiversity.

**Brown roofs:** Similar to green roofs, but the permeable layer is made from crushed material which provides a good void ratio and does not contain any contaminates.

**Rainwater harvesting:** 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 and can reduce the risk of flash flooding. Rainwater harvesting systems are not included in the calculation of attenuation storage provision due the fact that they may be full at the start of a storm event.

**Filter trenches/ drains:** Linear drains consisting of trenches filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water. They may also permit infiltration.

**Filter strips:** Vegetated areas of gently sloping ground designed to drain water evenly off impermeable areas and to filter out silt and other particulates.

**Sand Filters:** Structural controls designed to treat surface water by passing runoff through a filter bed of sand. Temporary storage can be provided by ponding above the filter layer and they can be used where high pollutant removal is required.

6.5.2

**Swales:** Shallow vegetated channels that conduct and can retain water in larger storm events. The vegetation filters out particulate matter in the flow thus providing treatment and improving water quality. They may also permit infiltration.

**Basins:** Ponds and wetland areas that may be utilised for surface runoff storage.

**Bio-retention areas:** Vegetated areas designed to collect and retain runoff and permit settlement of suspended solids and biological removal of pollutants before discharge via a piped system or infiltration to the ground.

6.6 Prior to submitting a planning application an applicant should discuss with the Council's Development Management team what SuDS techniques would be most appropriate and how they should be applied on a site. Some SuDS techniques are not appropriate on sites with particular ground conditions. The Local Highways Authority should be contacted to discuss suitable/adoptable SuDS solutions for the surfacing of estate roads.

## 6.7 SuDS DESIGN PRINCIPLES

6.7.1 It is strongly advised to consult The SuDS Manual (CIRIA, C753) Part C for guidance on the approach which is expected. In particular; Chapter 7 – The SuDS Design Process and Appendix C – Design Example.

**Design in SuDS from the start.**

6.7.2 Considering SuDS during the preliminary stages of site design provides the opportunity to incorporate features that are appropriate to the local context and character of an area. Integrated design to achieve multi-functional benefits is inherent to the site master planning and layout process; therefore it is most efficient and cost effective to design SuDS schemes into a site as early as possible. When drainage is accounted for from the beginning of the design process, it provides opportunity for the built up areas to be designed in-line with the topography, rather than to fit the drainage around the site at a later stage which is much less effective.

6.7.3 Land uses that have different pollution potential can also be clustered and phased so that management trains can be designed most effectively. The result of early inclusion of SuDS is a more effective and efficient layout which will avoid the need for abortive work and changes at a later stage which can escalate costs.

6.7.4 The better the SuDS design the more options for adoption that might be available to a development. For example, contrary to popular belief permeable/porous surfaces are *not* solely infiltration systems, do *not* have onerous maintenance requirements, *can* accommodate heavier traffic (including construction traffic) and *are* adoptable by Highways Authorities. The stages described below gives one example of how a design can integrate SuDS spatially through the evolution of a master planning exercise:

**Stage 1 – Examine site typography and geology**

Aim to mimic the natural drainage systems and processes as far as possible. Identify key natural flow paths, existing waterbodies, discharge points and potential infiltration areas to understand opportunities and constraints

**Stage 2 - Create a spatial framework for SuDS**

Minimise runoff by rationalising large paved areas and maximising permeable surfaces. Consider likely space needs for site control SuDS based on character of development and the proposed degree of source control. Use flow paths and possible infiltration or storage areas to inform development layout.

**Stage 3 - Look for multi-functional spaces**

Consider how SuDS features can be co-located with green infrastructure, open space and public realm areas to create multi-functional spaces. SuDS can be designed to be valuable amenity and ecological features.

**Stage 4 - Integrate the street network with SuDS**

Structure the street network to complement and manage flow pathways. Integrate SuDS features into street cross-sections, ensuring street widths are adequate. SuDS should be used to enhance the streetscape providing amenity and multi-functionality by integrating with other street features including tree planting, traffic calming, parking bays, verges and central reservations.

**Stage 5 - Cluster land uses to manage pollution**

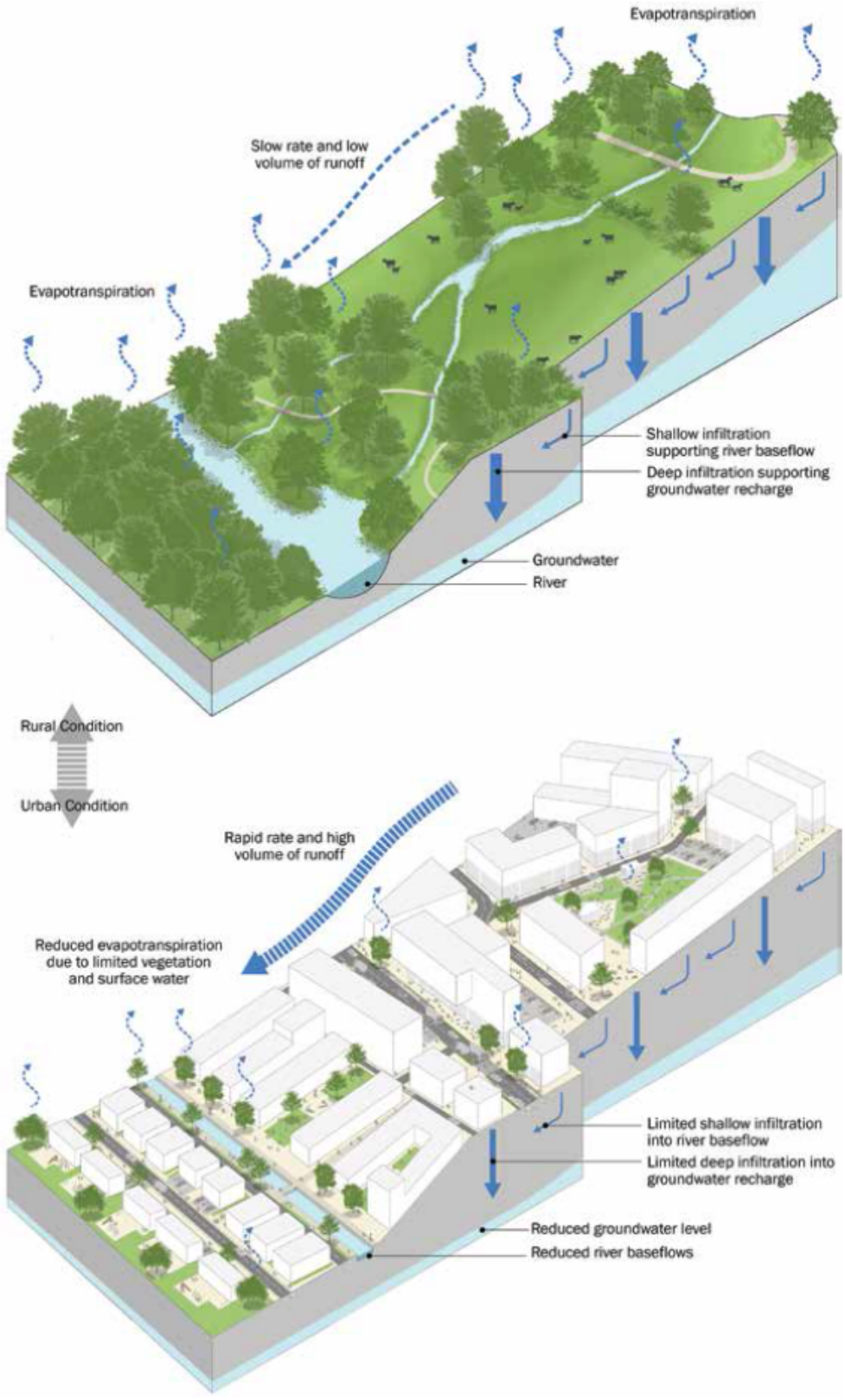
The number, size and type of SuDS selected will be affected by land uses and the corresponding pollution risk. Potential polluters, e.g. industrial development should have their own isolated SuDS network. Integrate a series of SuDS features that will provide water treatment throughout the networks, responding to the level of pollution risk. Clustering should be considered alongside other mixed use ambitions.

6.8.1 The topography of an undeveloped site provides a good indication of natural flow routes and can therefore assist in defining appropriate and efficient flow routes through a developed site without relying on additional infrastructure. The most effective and cost efficient designs make use of the local topography, increase landscape permeability, and reduce the amount of surface water flowing off site as much as possible. Allowing surface water runoff to follow the natural physical geography requires less soil movement and can eliminate the need for additional underground piping and pumping of water. Where the site is suitable for infiltration, opportunities to discharge water to the ground should be taken to mimic natural infiltration and recharge groundwater aquifers.

6.8.2 It must be demonstrated by the applicant that the site can continue to drain when receiving waterbodies are in flood conditions. Irrespective of any agreed runoff rates, source control methods must be implemented across sites to provide effective pre-treatment of surface water. This must be demonstrated as part of the proposal.

6.8.3 Figure 6.1 shows the differences in drainage patterns between natural landscapes and built-up areas. Mimicking the natural landscapes in urban areas is the best strategy to mitigate flood risk and improve water quality.

**Figure 6.1: Difference between natural and urban drainage**




**Source: Woods Ballard, B., et al (2015) The SuDS Manual, CIRIA, C753**

**The SuDS Management Train**

6.8.7 The SuDS Management Train concept (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. It should always be sought to manage run-off at source (i.e. close to where the rain falls). If required; remaining flows should be then transferred using preferred above-ground conveyance systems (e.g. swales, rills etc.) to further treatment or storage components.

**Water reuse first**

6.8.8 Reusing water whenever possible is important to improving the country's water resilience, and reducing pressures on precious water supplies. Recycled rainwater and surface water runoff can be used for non-potable purposes, such as toilet flushing and irrigation. Surface water runoff from roofs, streets or public areas can also be collected and treated using SuDS features, such as rain gardens, before storing it for surrounding buildings to reuse.

**Follow the drainage Hierarchy**

6.8.9 It is a Building Regulations and NPPG requirement that the discharge hierarchy in Figure 6.2 is used when considering proposals.

**Figure 6.2: Surface water drainage hierarchy**

Rainwater shall discharge to the following, listed in order of priority

| | | | | | | |
|---|---|---|---|---|---|---|
| **To ground in an adequate soakaway or some other adequate infiltration system; where that is not reasonably practicable** | ▶ | **A watercourse; or where that is not reasonably practicable** | ▶ | **A surface water sewer, highway drain or other drainage or where that is not reasonably practicable** | ▶ | **A combined sewer** |

Note: in all instances adequate storm water storage will need to be provided in order to meet the relevant infiltration or discharge rates and volumes (see Section 6.4).

**Use infiltration where suitable.**

6.8.10 The potential for infiltration measures on a site should be considered at the outset. Full evaluation and very careful consideration of the acceptability of infiltration drainage

should be given as there are a number of constraints in its use, particularly in relation to potable water sources (e.g. drinking water) or land contamination issues.

6.8.11 It is strongly recommended that further guidance is sought in The SuDS Manual (CIRIA, C753) Chapter 25 – Infiltration: Design Method.

**Keep surface water on the surface**

6.8.14 In some areas the presence of low permeability clay soils means that infiltration systems are not viable. Whilst low permeability soils are often cited as a reason for not including SuDS however, this is not acceptable as other SuDS solutions do exist. Although soakaways and other infiltration methods may not be suitable, many other methods such as under drained permeable/porous surfaces, swales, ponds and wetlands should be prioritised, selected and designed accordingly. It is also possible to allow some water to soak into the ground (for example out of the bottom of an unlined swale), even if drainage design calculations do not allow for it.

6.8.15 Design and layout should seek to manage and convey surface water above-ground, avoiding the use of underground piping as far as possible. This is particularly pertinent in the flatter landscape areas or areas of high groundwater. Managing surface water runoff at the surface has many multiple benefits such as

- Avoiding concentration and acceleration of surface water into waterways which causes downstream erosion;
- Integrating removal of pollutants by filtering water during conveyance;
- Reducing construction and maintenance requirements and costs;
- Creating habitats;
- Contributing to public amenity by better quality urban and landscape design;
- Increasing residents' awareness of water management; and
- Detecting blockages and obstructions more easily, not when they have become critical and more difficult and expensive to remedy.

**Place-making through SuDS design**

6.8.16 When using traditional surface water management systems, water is hidden in pipes underground. By bringing water management to the surface using SuDS, there is an opportunity to enliven public spaces and streetscapes. The presence of water features within the urban environment can promote a strong sense of place, bring an urban space to life and create unique spaces that can be enjoyed by all. SuDS features such as ponds, wetlands, pools, fountains and planted rills which can be purely aesthetic or interactive in nature, can be integrated into the public realm and open spaces to enrich the area with green infrastructure. Note that interactive SuDS should include an appropriate level of natural pre-treatment upstream before coming into human contact, such as in the case of water play areas. Designing for water quality is discussed further in Section 7.

**Landscape-led approach**

6.8.17 The selection of SuDS types and the creation of the SuDS network should both respond to and contribute to the surrounding built and natural landscape. A landscape-led approach uses SuDS as a mechanism to create strong green infrastructure networks and is important to increase connectivity to the wider ecosystem and landscape. Effective integration will also require carefully researched and selected plants, which work to improve the local green infrastructure and enhance biodiversity. Also selection of hardscape materials used in SuDS construction, such as concrete, brickwork, wood, aggregate and paving, should consider the surrounding landscape and urban character and be developed alongside the overall urban design vision. Using a landscape led approach will improve the amenity value of SuDS for local residents, and provide water management and design benefits.

**Minimise embodied carbon in SuDS**

6.8.18 One of the advantages of SuDS is their ability to improve the natural environment. It is important that environment improvements from SuDS are not reduced by incorporating high carbon solutions. The excessive use of concrete and other aggregates with high levels of embodied energy is discouraged. Eliminating energy consuming water pumps whenever possible is also encouraged. Vegetated SuDS components can have a positive impact by storing carbon as they grow, through a process known as carbon sequestration.

**Minimise waste in SuDS**

6.8.19 When undertaking the maintenance of SuDS, waste will be generated. This will be predominantly grass and other vegetation, and may be managed on site in wildlife piles. There is still a requirement to comply with all relevant waste management legislation and

ensure waste is taken to an appropriately licensed site. This is even more pertinent when waste is disposed off-site. Management of SuDS on industrial sites will need to ensure hazardous waste is disposed of separately.

**Design for wildlife and biodiversity**

6.8.20 SuDS can provide the ideal opportunity to bring urban wetlands and other wildlife-friendly green spaces into towns and cities. They can be linked with existing habitats to create blue and green corridors whilst providing an amenity and education resource for the community.

6.8.21 Where possible, existing habitats should be retained and incorporated into the landscape design. SuDS features are likely to have greater species diversity if existing habitats are within dispersal distance for plants, invertebrates and amphibians. It should however be noted that existing wetlands should not be incorporated into SuDS unless there is a guaranteed supply of clean water.

6.8.22 An aim should be to create new habitats based on the ecological context and conditions of the site. Habitats and species objectives that contribute to local, regional and national biodiversity targets should be prioritised. Specific guidance on maximising the biodiversity potential of SuDS can be found in the Royal Society for the Protection of Birds (RSPB) publication, 'Maximising the Potential for People and Wildlife'.

**Design for easy maintenance and access**

6.8.23 When designing SuDS it is crucial to consider throughout the process how features will be maintained and accessed, who is ultimately responsible for the lifetime of the development, and the likely costs involved. Embedding foresight into every stage of the design process will produce a more effective, better maintained SuDS scheme upon completion. Design should also consider Construction Design and Management (CDM) Regulations from the outset to ensure that access is provided for maintenance and that health and safety measures are adhered to. Those responsible for SuDS across a development must be provided with an operation and maintenance manual by the designer and this could be part of the documentation provided under CDM. Aspects that should be included within the operation and maintenance manual are shown in Table 6.1:

**Table 6.1: What to Include in the Operation and Maintenance Manual**

- Location of all SuDS components on site
- Brief summary of the design intent, how the SuDS components work, their purpose and potential performance risks
- Depth of silt that will trigger maintenance
- Visual indicators that will trigger maintenance
- Depth of oil in separators etc. that will trigger maintenance
- Maintenance requirements (i.e. maintenance plan) and a maintenance record pro-forma
- Explanation of the objectives of the maintenance proposed and potential implications of not meeting those objectives
- Identification of areas where certain activities are prohibited (e.g. stockpiling materials on pervious surfaces)
- An action plan for dealing with accidental spillages of pollutants
- Advice on what to do if alterations are to be made to a development or if service companies need to undertake excavations or similar works that could affects SuDS
- Details of whom to contact in the event that pollution is seen in the system or if it is not working properly

Source: The SuDS Manual (CIRIA, C753): Chapter 32

**Design SuDS for brownfield sites**

6.8.24 Previously developed land (brownfield sites) should not be seen as a barrier to using SuDS. When developing on brownfield sites, existing drainage infrastructure should be documented and mapped to determine what can be reused as part of the SuDS scheme.

6.8.25 The use of shallow surface features can often be a benefit in brownfield sites as they limit excavations into contaminated soils. The impact of the proposed SuDS features on any contamination and vice versa needs to be carefully assessed by an experienced professional. The presence of contamination in the ground may limit the use of certain features (e.g. soakaways) or require liners below ponds, basins and permeable pavements. However, it will never prevent the use of all SuDS features and a suitable system can be designed. The separation of surface water drainage and foul drainage should be a priority in these areas.

**Consider flood extents in SuDS design**

6.8.26 The natural floodplain must be protected and considered in the design of SuDS. Where SuDS are proposed in a fluvial or tidal floodplain (Flood Zones 3a or 3b) the features may fill during a flood event and would therefore not have capacity to hold the rainfall runoff from the site as originally intended. Large areas of Tewkesbury Borough, where land is low lying, are in the floodplain, and a pragmatic approach to SuDS design needs to be taken where flood risk is carefully considered. However, the presence of a floodplain should not explicitly exclude the integration of SuDS features for day-to-day water management provided the SuDS do not contribute towards stormwater storage requirements. Above ground SuDS should not be included in areas where water regularly flows or is stored

**Design open spaces to incorporate SuDS**

6.8.27 Open spaces are an asset to the community and to the environment and form an important component of a wider green infrastructure network. A network of woodland, recreational and open spaces, whether green or paved, will be essential for well-designed developments. Open spaces can provide space for SuDS features to provide attenuation and treatment of surface water runoff. Good design will seek ways to integrate SuDS with the rest of the open space and to make SuDS features multifunctional. In these areas, there is a need to concentrate on design and amenity value, recreational use, and fit with surrounding landscape. Examples of multi-functional uses in open spaces include temporary storage areas doubling as playing fields or recreation areas, hard landscape attenuation doubling as water features and public art, bio-retention areas doubling as landscaped garden areas, wetlands and ponds doubling as amenity and habitat areas, and bio-retention planters linking with open space divisions or seating areas. Within open spaces, SuDS design will also need to consider:

- The interaction with the public – safety, education, and controlled access via boardwalks or similar structures;
- Areas of the ground that are likely to be seasonally wet should not be used for formal recreation and play space such as sports pitches;
- An appropriate balance between visual amenity and water treatment needs to be achieved – while amenity value is of increased importance, it should not impinge on SuDS treatment and water management;
- Situating SuDS away from floodplains that might impact on SuDS treatment and floodplain storage and conveyance;

- Ecological needs – existing vegetation of biodiversity value should be retained whenever possible, and land stability taken into account.
- Opportunities to reuse and recycle surface water for irrigation or other purposes.
- Consideration should be given to safety issues with regard to water ponding/ storage in or near play areas.

6.8.28 Where Tewkesbury Borough Council will adopt SuDS in public open spaces, they must still be able to function and be accessible as useable open space for the majority of the time for them to be included within the open space calculations.

**Design streets to incorporate SuDS**

6.8.29 Within a catchment, streets and roads are a significant source of surface water runoff and pollutants. Streets are often used as a conveyance of surface water drainage from adjoining sites via underground pipes, and in a SuDS network they are likely to also be key conveyance routes for example through the use of roadside swales. Therefore there is a prime opportunity in streetscapes to integrate SuDS features that capture, treat and attenuate surface runoff. Improving upon traditional drainage, streetscapes can include bio-retention technology (e.g. rain gardens) with appropriate conveyance such as swales or under-drained hard landscape SuDS features, to minimise the need for traditional piping. A number of standard streetscape features can include SuDS and become multifunctional, including permeable/porous storage surfaces, verges, tree pits, traffic calming islands and parking dividers. Further guidance can be found in The SuDS Manual (CIRIA, C753) in particular Chapter 9: Designing for Roads and Highways.

**Design SuDS to match the density of developments**

6.8.31 Limited space is often cited as a reason for not including SuDS, which is not acceptable as it is still possible to use SuDS in high density developments. Ideally, initial layout should consider how source control and localised SuDS features can be sized and located to provide adequate attenuation and treatment of runoff from high density areas. For example; permeable/porous paving can provide multi-functional spaces with low cost storage without land-take to deliver safe, level, puddle-free, shared surfaces for all. Source control measures like green roofs and rainwater harvesting are strategies to reduce runoff. Additionally, building downpipes can be altered or disconnected to feed into gardens, soakaways or permeable paving. In high density courtyards and streets there is also potential for example to incorporate bio-retention features and planted rills.

**Design SuDS for flat sites**

6.8.32 Drainage is particularly important on flat sites that do not have the opportunity to take advantage of gravity. Hydraulically efficient kerbs should be designed to channel water directly onto above ground SuDS, before draining to underground storage, or a piped network. Alternatively, roadside swales located within the road verge with flush kerbs can enable surface water to discharge directly into the swale, where it is pre-treated before discharging to a SuDS feature downstream, such as a retention pond, rain garden, or wetland. By keeping water on the surface as much as possible, deep downstream management features can be avoided. Deep features are undesirable due to increased excavation, the potential need for unnecessary pumping and the requirement for mitigation measures.

**Design industrial and agricultural sites to incorporate SuDS**

**6.8.34** Industrial and agricultural sites often have larger volumes of water discharge with higher levels of pollutants, and as such they require special attention. The best pollution prevention strategy is to prevent pollutants entering the surface water system in the first place. Each site should be designed based on the risk posed for each activity taking place but should always follow a hierarchical approach of Avoid, Minimise, Prevent, Capture. The approach to be used for design on all sites (but which is particularly prevalent for sites with potentially elevated pollution hazards) is that found in The SuDS Manual (CIRIA, C753) Chapters 4 and 26

**Design standards and designing for exceedance**

6.9.1 The drainage system must be designed so that (unless an area is designated to hold and/or convey water as part of the design) flooding does not occur on any part of the site for a 3.33% (1 in 30) annual rainfall event, or in any part of a building during a 1% (1 in 100) annual rainfall event, plus the allowance for climate change as described in 6.4.1 above. The design of the site must also ensure that flows resulting from rainfall in excess of this rainfall event are managed in exceedance routes that minimise the risks to people and property and avoids creating hazards to access and egress routes. Guidance on how to apply this can be found in 'Designing for Exceedance in Urban Drainage: Good Practice' (CIRIA, C635).

**Designing for water quality**

6.10.1 SuDS have a considerable advantage over traditional drainage as a well-designed system will provide a level of treatment to surface water runoff before it is discharged into the

receiving water body. It does this through a number of processes including filtration, settlement, and uptake by plants. For example; permeable paving is very effective at removing a wide range of pollutants from runoff, so improving water quality. The pollutants may either remain on the surface or be flushed into the underlying pavement layers, where many are filtered and trapped and degrade over time.

6.10.2 To protect the water quality of receiving waters, runoff from a site should be of an acceptable water quality to help ensure current and/or future water quality objectives are not compromised. As there can be a wide range and level of contaminants contained within surface water runoff, water quality needs to be managed using a risk-based approach, facilitated by the SuDS Management Train. This refers to a variety of SuDS components in a series that provide treatment processes to deliver a gradual improvement in water quality as water moves through the system.

6.10.3 The size and number of treatment stages required is based on the level of pollution entering into the system. For example, industrial sites will contain a higher level of pollutants within surface water runoff than from a small residential road. Please refer to The SuDS Manual (CIRIA, C753) Chapters 4 and 26 for further detail on designing SuDS for water quality.

**Designing a safe environment**

6.11.1 The planning, design, construction and management of SuDS come under the requirements of the Construction, Design and Management (CDM) Regulations (2015). All SuDS schemes should be a safe environment that can be accessed and enjoyed by residents and visitors. The use of fencing and barriers should not be the approach to making SuDS features safe, particularly in residential developments. Well-designed SuDS should include features that are no more hazardous than those found in the existing traditional urban landscape. Further information can be found in The SuDS Manual (CIRIA, C753) and the RoSPA publication Safety at Inland Water Sites.

**Developing a surface water drainage strategy**

**Masterplanning**

6.12.1 For larger developments a masterplan will be necessary. It is at this stage the SuDS layout (taking into account flow routes, topography, geology and green space) and proposed maintenance of the system should be determined whilst ensuring a safe design and mitigation of flood risk (see Figure 6.1). Seeking advice at the earliest opportunity from the relevant FRMAs will help avoid any costly issues or redesigns at a later stage. Effective

master planning should ensure a robust, viable and cost-effective scheme from the outset, where objectives of the development are informed by the SuDS scheme and vice versa.

**Outline planning application**

6.13.1 When an outline planning application is required the applicant should include an outline drainage strategy with the planning application. It should include enough design information that demonstrates the conceptual surface water drainage design across the site. The assessment submitted should outline the existing surface water run-off rates from the site and an indication of post development run-off rates with associated storm water storage requirements. SuDS should have been appropriately considered, taking into account site specific drainage requirements and constraints, and incorporated effectively into the overall masterplan. The relevant checklists from the suite provided in Appendix B of The SuDS Manual (CIRIA, C753) are to be followed to ensure the correct information is included within the drainage strategy.

**Full planning application or reserved matters application**

6.13.2 Many developments move straight to a full planning application following pre-application discussions with the relevant FRMAs. At this stage applicants will also be expected to submit a detailed surface water drainage strategy with the planning application. Whilst most topics will have been covered to some degree in the outline drainage strategy (if applicable) the applicant will be expected to provide more detail at this stage. The strategy should demonstrate that opportunities to integrate SuDS have been maximised and where obstacles to their use do persist this should be fully justified within the report. Where proposing to discharge into a third party asset (such as a watercourse or public sewer), appropriate permissions and required consents should have been discussed with the asset owner and legal easements may need to be provided.

6.13.3 The key information a surface water drainage strategy must contain includes:

- How the proposed surface water scheme has been determined following the drainage hierarchy;
- Pre-development runoff rates;
- Post development runoff rates with associated storm water storage calculations
- Discharge location(s);
- Drainage calculations to support the design of the system;
- Drawings of the proposed surface water drainage scheme including sub catchment breakdown where applicable;

- Surface water and sustainable drainage systems
- Maintenance and management plan of surface water drainage system (for the lifetime of the development) including details of future adoption;
- Completed drainage pro-forma – the applicant must ensure that the surface water strategy contains the appropriate level of information in relation to the points covered in the pro-forma.

6.13.4 Note that the size and complexity of the site will determine how much information is included within the surface water drainage strategy. However using and submitting all relevant checklists from the suite provided in Appendix B of The SuDS Manual (CIRIA, C753) will ensure the right matters are covered with the appropriate level of detail.

**Approval of SuDS**

6.14.1 SuDS are approved as part of the planning application for a development. It is the LPAs responsibility to ensure that the design submitted as part of either an outline or full planning application is robust and contains adequate detail to ensure that the SuDS are appropriate for the development and will be adequately maintained throughout their lifetime. The LPA may also seek expert advice from the LLFA as part of this process. For major developments national guidance for SuDS can be found in the NPPF and NPPG.

**Adoption and maintenance of SuDS**

6.15.1 It is recommended that a statutory organisation takes on the role of maintaining the SuDS as this should more readily guarantee maintenance of the drainage system in perpetuity. However where this is not possible, alternative bodies such as private management companies may also be considered able to maintain SuDS, provided that a suitable management plan has been submitted to and agreed with the LPA. This could take the form of a simple operation and maintenance manual - what is the maintenance regime; what techniques will be employed, how often it will be undertaken, how it will be recorded, who will be responsible etc. Statutory organisations may include organisations such as the local authority, Severn Trent Water, Thames Water, the Lower Severn IDB and Parish Councils. For SuDS serving the highway these should be discussed with the Highways Authority at Gloucestershire County Council (GCC) to ensure suitability for adoption.

6.15.2 Open space provision within development sites is a normal planning requirement and offers suitable landscaped areas for the inclusion of a wide range of SuDS features (e.g. ponds, basins and swales). These features can enhance the nature conservation and

amenity value of the site, although a primary consideration should be the effectiveness and maintenance of the SuDS. Where the Council is adopting the open space provision, this could therefore include adoption of the SuDS features within the open space.

# CHAPTER 7 – WATER MANAGEMENT, RECYCLING, SUPPLY AND POLUTION CONTROL

## 7.1 WATER SUPPLY AND INFRASTRUCTURE

**Water Supply**

7.1.1 Groundwater resources are 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. Development proposals will, where appropriate, need to demonstrate that they can be implemented without detriment to the quality or quantity of existing water and the wider environment. Tewkesbury Borough Council will have regard to current Environment Agency guidance on the protection of groundwater.

**Foul Drainage**

7.1.2 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. Only if, taking into account the cost and/or practicability (such as location and distance), it can be shown to the satisfaction of the local planning authority that connection to a public sewer is not feasible, a package sewage treatment plant incorporating a combination of treatment processes will be considered. The plant should offer full treatment (including secondary and if necessary tertiary treatment) with discharges meeting the General Binding Rules and any other conditions set by the Environment Agency 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, subject to certain criteria being met. STW/TW are likely to be issuing guidance on adoption of treatment plants in the near future.

7.1.3 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.

7.1.4 Applications for planning permission should be supported by an assessment of the proposed use of septic tank or small sewage treatment plant, 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. An Environmental Permit maybe required from the Environment Agency for certain types of non-mains drainage. Further guidance on this is available from the Environment Agency advice document **'Guidance for the registration of small sewage effluent discharges'**.

**Development adjacent to watercourses**

7.1.5 Any riverside developments should leave a minimum **8 metre** wide undeveloped buffer strip from top of bank, 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.

**Maintenance of existing structures and flood storage areas**

7.1.6 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.

## 7.2 WATER RECYCLING

7.2.1 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. It can also reduce demand for water provided by water companies during periods of drought. SuDS need to take into account the possibilities of re-using and recycling surface water in as many ways as feasible.

7.2.2 The aim in Tewkesbury Borough is to encourage and support water recycling that is safe, environmentally sustainable and cost-effective by encouraging the use of rainwater harvesting and grey water recycling methods in new development, where practical and feasible. These methods are only effective outside floodplains. Applicants should give consideration to the following measures.

### 7.2.3 Rainwater Harvesting

This is typically described as being water collected from roofs via traditional guttering, through down pipes to an underground tank. This water is then delivered on demand by an in-tank submersible pump direct to toilets, washing machines and outside tap use. It is estimated more than 50% of mains water can be substituted by rainwater in this way. Rainwater harvesting can be incorporated on development sites for uses such as car washing, watering gardens and topping up ponds or wetland habitats.

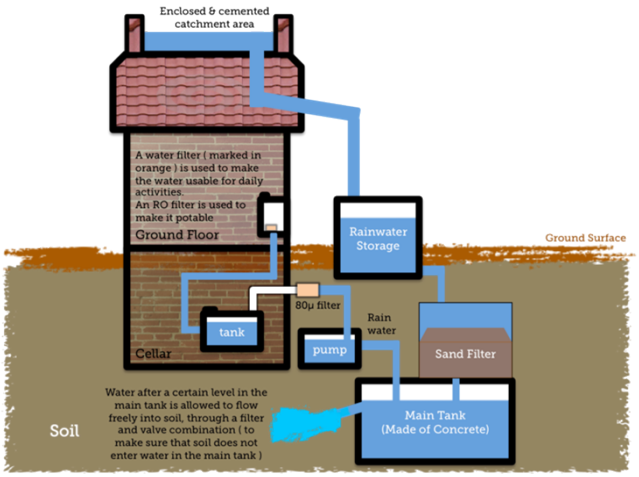



*Fig 2: Rainwater Harvesting System*

### 7.2.4 Greywater Recycling

This is typically defined as being water from the bath, shower and wash hand basin. The ideal situation for grey water is in living accommodation where sufficient amounts are generated daily for reuse in toilets, the washing machine and any outside tap. Greywater recycling systems can be incorporated on development sites for non-potable uses such as for flushing toilets.

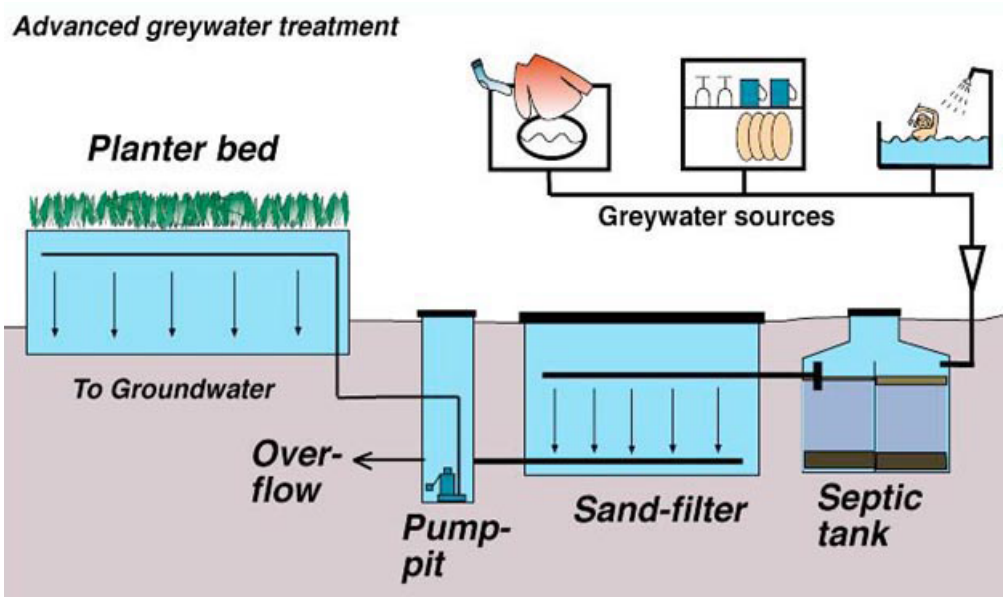



*Fig 3: Advanced Greywater* Treatment System

**Methods and Maintenance of Rainwater Harvesting and Greywater Recycling Systems**

7.2.5 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 (levels of water use should be consistent with 'very good' standards for BREEAM technical standard on new build wherever possible).

7.2.6 In addition, 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.

7.2.7 Applicants should also consider the installation of water meters to link water habits to a charging structure, thus encouraging occupants to consider their individual wastage. Further information and illustrations on water conservation methods and techniques can be found at **APPENDIX IV**.

7.2.8 The facilities for both rainwater harvesting and grey water re-use require maintenance to ensure their effectiveness and to prevent deterioration of water quality. Future maintenance arrangements should be addressed in the earliest project planning stages and subsequently be documented in the Operation and Maintenance Manual.

## 7.3 WATER QUALITY AND POLLUTION CONTROL

7.3.1 Paragraph 109 of the National Planning Policy Framework 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 Council will seek to ensure that new developments achieve this objective.

7.3.2 Large areas of hard landscaping can result in surplus run-off, exacerbating flooding, causing pollution and erosion problems and reducing natural infiltration. This can directly lead to water quality problems, by accumulating pollutants as water runs over land. Runoff from roads will also contain heavy metals and hydrocarbons and run-off from farmland is more likely to contain nitrates and sediment. These can have serious implications for water quality and amenity.

7.3.3 Wherever possible, runoff to waterbodies should be prevented for the majority of small (up to 5mm) rainfall events. This interception reduces the particular problems posed by the initial flush of pollutants which build up on surfaces during preceding dry periods. As by definition there are many more small rainfall events than larger ones (and their volume is a significant proportion of the total over any given period), this leads to more frequent flushing of pollutants from surfaces.

7.3.4 Although some pollution arising from surface water runoff may be unavoidable and water treatment at every outfall may be impractical, 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.

7.3.5 Methods that can help to reduce pollution include infiltration trenches, basins, ponds, wetlands, filter drains and permeable surfacing. For example; permeable paving can maximize opportunities for using space in a multi-functional way requiring no additional land take. They are not solely infiltration systems, do not have onerous maintenance requirements and can accommodate heavier traffic (including construction traffic). In addition, there is also evidence to show whole life costs can be significantly lower than a traditional ‘pipe’ system, as the future maintenance requirement is low and they negate the need for grates, gullies, expensive flow control structures, extensive lengths of pipework, oil separators etc.

7.3.6 Some traditional methods of building can cause poor water quality as surface water run-off can contain a variety of pollutants. The poor water quality associated with new

developments may also have direct negative impacts on biodiversity. Applicants may be required to use mitigation measures to minimise resultant pollution within new development. Supporting documentation accompany planning applications should explain how contaminated water arising during the construction process will be addressed.

# CHAPTER 8 – WATER MANAGEMENT STATEMENTS

8.1 National planning policy only requires planning applications of a certain scale and nature to be accompanied by Flood Risk Assessments. However, given the severity and sensitivity of flooding from all sources in Tewkesbury Borough, and the potential impact of cumulative development, it is considered necessary to require all applications except those proposing minor development[1] to be accompanied by an appropriate level of information in relation to the flooding. This information shall be submitted in the form of a Water Management Statement (WMS), which will be a validation requirement for such schemes.

8.2 The WMS is as a crucial element in managing flood risk and it is advised that appropriate details should be submitted to and agreed with the Council's Development Management team prior to the submission of a planning application. The WMS should involve several stages:

1. Prior to land acquisition, 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.

2. The level of detail required within the WMS will depend on the scale and type of development and individual site conditions. The level of information should be agreed with the Council's Development Management team at an early stage.

3. Evaluation of the submitted WMS will be undertaken by the Council in conjunction with the other regulatory bodies, including the Environment Agency and the LLFA.

## Water Management Statement Requirements

All outline and detailed planning applications (including reserved matters) which fall outside of FRA requirements, except those proposing minor development[2], shall, as a minimum, be accompanied by a Water Management Statement.

The Water Management Statement (WMS) shall comprise a report, being proportionate to the scale and nature of development proposed, outlining the water cycle issues relevant to a development proposal and suitable means of providing for the sustainable drainage of the site in the long term. The WMS shall also explain how both foul and storm water sewage from a development will be addressed. The WMS should include details of existing drainage systems and problems, infiltration, groundwater, surface water flow, foul and storm wate disposal and any other drainage related flooding issues that may relate to the development.

A feasibility study evaluating the means of incorporating SuDS as part of the proposed development should also be included, as will a study of local soils and geology supported by site investigation results. This information will assist in developing a proposal for SuDS to be incorporated within the proposed layout of the development. The developer must be able to demonstrate that the technique is suitable for the development and provide supporting evidence to back up their calculations. The WMS should also assess the feasibility of incorporating rainwater harvesting and grey water recycling, and the appropriate measures for collecting and reusing water should be incorporated into a development.

---

[2] The term 'minor development' is the same as that defined within the Planning Practice Guidance and means:

- minor non-residential extensions: industrial/commercial/leisure etc. extensions with a footprint less than 250 square metres.
- alterations: development that does not increase the size of buildings e.g. alterations to external appearance.

householder development: For example; sheds, garages, games rooms etc. within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling e.g. subdivision of houses into flats.

# CHAPTER 9 – MANAGING AND MITIGATING FLOOD RISK

9.1 Residual risks are those remaining after applying the sequential approach and mitigating measures. Applicants will be required to assess flood risk for their development, propose measures to mitigate it and show that any residual risks can be safely managed. However, resilience measures should not be used to justify development in inappropriate locations.

9.2 The following measures can help mitigate flood risk and will be expected to be taken into account in new development where appropriate:-

## Flood Mitigation Measures

### Floor levels in new residential and non-residential development

Floor levels for habitable rooms in new development must be set at 600mm or more above the flood level predicted for the 1% (1:100) annual probability flood event (plus the allowance for climate change) in order to reduce the potential risk to life and damage to property. All levels should be presented as an accurate height Above Ordnance Datum, Newlyn (mAOD)

### Protection of flood flow routes and culvert policy

Development should ensure it does not inhibit the function of flood flow routes to convey floodwater as efficiently as possible across floodplains. Culverting of watercourses will be strongly resisted and existing culverts required to be opened up wherever possible.

### Use of flood resilient construction in new development

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.

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.

### Provision of safe access and egress routes in new development

For routes to be classed as 'safe', as a minimum; dry pedestrian access, without the intervention of the emergency services or others, should be provided to and from the development without crossing through the 1% plus climate change floodplain. Vehicular access to a site should also be achievable, taking into account extreme events. The production of flood evacuation plans are also recommended to aid evacuation and rescue during flood events, which should satisfy the concerns of the local authority emergency planner and the emergency services. Access should be considered for all types of development.

## Site layout

9.3 The site layout of any proposed development should take into consideration areas of flood risk present on the site and this should influence the choice of where to locate elements of the proposed development, including SuDS. This is in line with the Sequential Approach to flood risk as outlined in Chapter 5. The least vulnerable elements of the proposed development should be located to coincide with the highest level of flood risk. Flood risk vulnerability classification of 'more vulnerable' and above (as defined in the NPPG) will not generally be acceptable within the 1% plus 70% flood outline.

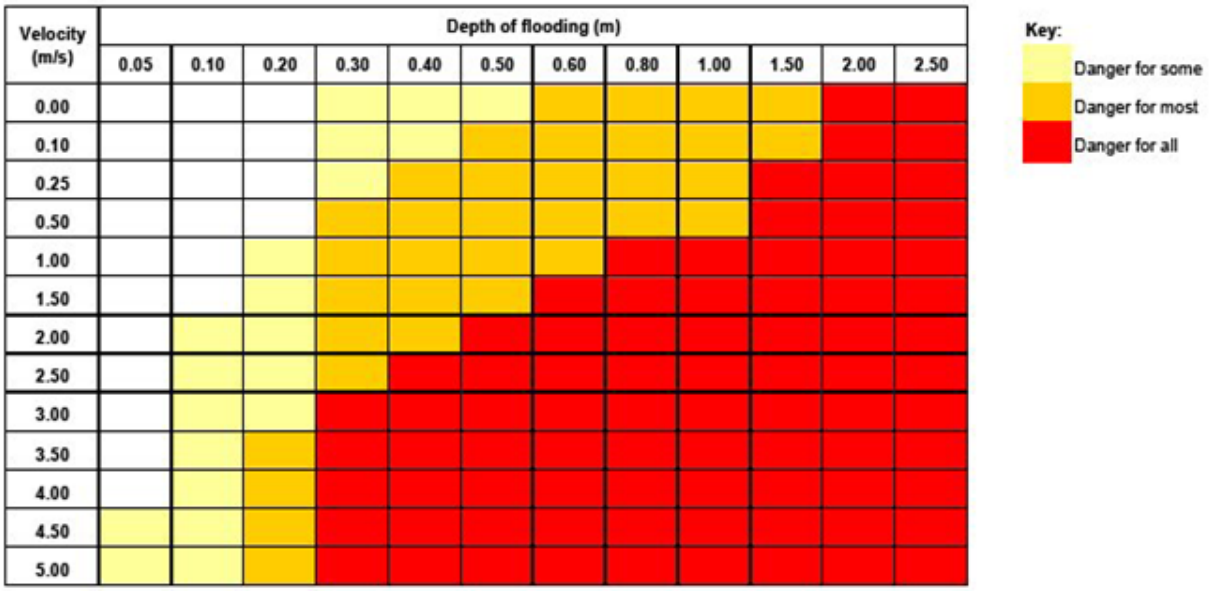
9.4 The inclusion of good quality green infrastructure (including trees and other vegetation) within a development master plan has the potential to significantly increase the profile and profitability of developments. Low lying ground can be designed to maximise benefits by providing flood conveyance and storage as well as recreation, amenity and environmental purposes such as air quality. Where public areas are subject to flooding, easy access to higher ground should be provided without resorting to inappropriate hard engineered solutions. Structures, such as street furniture and play equipment, provided within the low lying areas should be flood resistant in design and firmly attached to the ground.

9.5 Site layout does not only have to cater for the flood risk on the site but can also accommodate flood water that may contribute to a problem downstream. For example, where a proposal has a watercourse flowing through which contributes to flooding downstream (in the existing community or further downstream) the proposed development should offer flood risk betterment by holding back flood flow peaks. Within the site, this can be accommodated in the green infrastructure and by generally making space for water. This is a proactive approach to flood risk management, where new developments offer enhancements to the surrounding area. All developments with watercourses identified within their site must consider this approach.

9.6 The site layout should also respond to the characteristics of the location and the nature of the risk. In some areas it is more appropriate to make space for water and allow controlled flood water onto areas of the development site. This is particularly relevant to riverside developments where extreme events can be catered for in multi-function open space areas (likely to form part of the green infrastructure provision) that would normally be used for recreation but infrequently can flood. The use of such features in these areas

should be appropriate and compatible with the frequency, depth and duration of any flooding. However, signage clearly explaining the use of such areas for flood control and recreation should be fully visible so that infrequent flood inundation does not cause alarm.

9.7 Safe access and egress is imperative for residential developments as described above. The route should also ensure it is located where the Flood Hazard (in terms of depth and velocity of flooding) is low. This is described in the DEFRA/EA research document '**Flood Risk Assessment Guidance for New Development FD2320**' Table 13.1 from this document is shown below:



| Velocity (m/s) | Depth of flooding (m) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.05 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.80 | 1.00 | 1.50 | 2.00 | 2.50 |
| 0.00 | | | | | | | | | | | | |
| 0.10 | | | | | | | | | | | | |
| 0.25 | | | | | | | | | | | | |
| 0.50 | | | | | | | | | | | | |
| 1.00 | | | | | | | | | | | | |
| 1.50 | | | | | | | | | | | | |
| 2.00 | | | | | | | | | | | | |
| 2.50 | | | | | | | | | | | | |
| 3.00 | | | | | | | | | | | | |
| 3.50 | | | | | | | | | | | | |
| 4.00 | | | | | | | | | | | | |
| 4.50 | | | | | | | | | | | | |
| 5.00 | | | | | | | | | | | | |



9.7.1 When designing safe access and exit routes, over and above the requirement for routes to be out of the 1% plus climate change flood extent; the combinations of depth and velocity on the routes should correspond to the white boxes in the above diagram.

# CHAPTER 10 – BIODIVERSITY

10.1 The 2006 Natural Environment and Rural Communities Act (NERC) places a duty on all public authorities in England and Wales to have regard, in the exercise of their functions, to the purpose of conserving biodiversity. A key purpose of this duty is to embed consideration of biodiversity as an integral part of policy and decision making.

10.2 The NPPF is clear that pursuing sustainable development includes moving from a net loss of biodiversity to achieving net gains for nature, and that a core principle for planning is that it should contribute to conserving and enhancing the natural environment and reducing pollution.

10.2.1 Paragraph 109 of the NPPF 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, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.

10.3 Those proposing development should therefore seek opportunities to use multi-purpose open space for amenity; incorporate wildlife habitat and flood storage uses and need to consider how flooding and biodiversity can be jointly managed. Opportunities should always be explored to recreate more natural conditions along watercourses. For example; de-culverting, restoring or re-profiling rivers to promote ecological improvements, removal of barriers to fish migration, development set back from watercourses to enable access and enhancement, protection of sensitive locations and integration with wider green/blue infrastructure networks.

10.4 Further guidance on biodiversity and green Infrastructure can be found in the natural conservation policies within the **Tewkesbury Borough Local Plan to 2011** and policies SD9 and INF3 of the **Joint Core Strategy.**

10.5 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 council

therefore expects features such as ponds and wetlands to be planted to enhance biodiversity.

10.6 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 'Biodiversity 2020' strategy.

10.7 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.

10.8 Opportunities should also be explored to recreate more natural conditions along watercourses. Examples of this include: de-culverting (in accordance with the LLFA **Local Flood Risk Management Strategy Culvert Policy**) restoring or re-profiling rivers to promote ecological 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.

10.9 Local level actions and decision making can help secure improvements to the water environment. This is widely known as the '**Catchment Based Approach**' and has been adopted to deliver requirements under the **Water Framework Directive** (WFD). It seeks to:

- Deliver positive and sustained outcomes for the water environment by promoting a better understanding of the environment at a local level; and
- To encourage local collaboration and more transparent decision-making when both planning and delivering activities to improve the water environment.

The objectives of the WFD include:

- To prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters
- To achieve at least good status for all waters by 2015. Where this has not been possible, and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027.
- To conserve habitats and species that depends directly on water.

- To reduce or phase out the release of individual pollutants or groups of pollutants that presents a significant threat to the aquatic environment
- To reduce the pollution of groundwater and prevent or limit the entry of pollutants
- To help reduce the effects of floods and droughts

10.10 Development needs to be planned carefully so that it does not result in deterioration or further pressure on the water environment and compromise WFD objectives. Failure to comply with WFD requirements may lead to the European Commission bringing legal proceedings against the UK. Local Authorities have a general responsibility not to compromise the achievement of UK compliance with EC Directives.


Tewkesbury
Borough Council