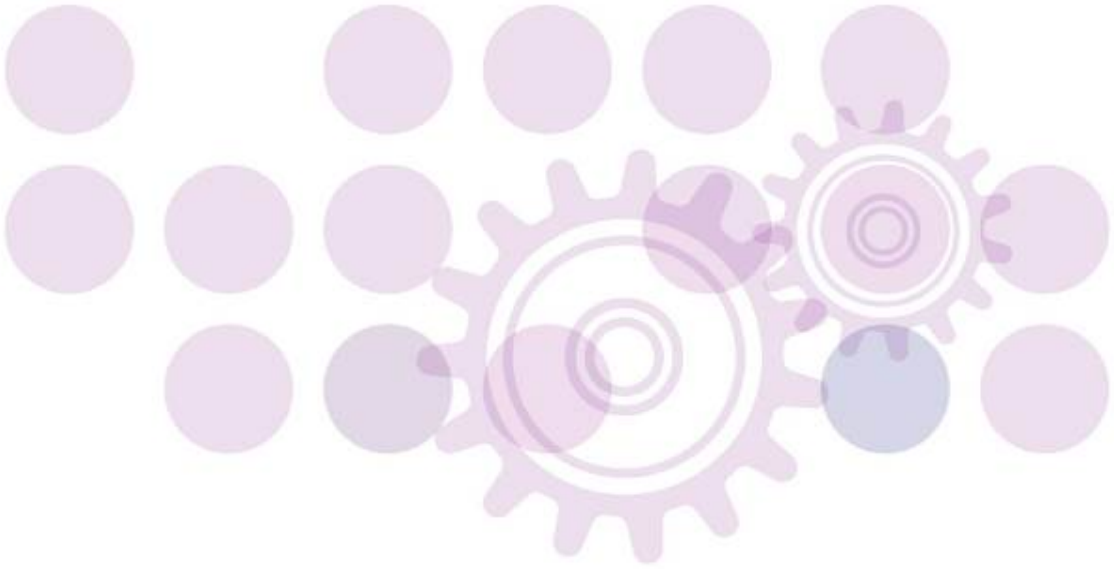
spd 16

supplementary planning document

Brighton & Hove City Council Local Development Framework

Sustainable Drainage



Brighton & Hove City Council

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FOREWORD

Water is a defining part of Brighton and Hove's landscape; especially its groundwater, which is an important component of the water resources of the area.

Tackling flooding (from all sources), water supply and water quality is imperative for the housing and economic growth planned for the area. Equally, Brighton and Hove's growth must not come at the expense of its environment; instead, it must be a mechanism for its urban and rural environmental improvement.

Sustainable Drainage Systems (SUDS) can be an important contributor to effective water management. SUDS can and should play an important role in shaping the Brighton and Hove of the future.

SUDS use a wide range of techniques to manage flood risk, water quality and the quantity of surface water run-off from development as close to the source as possible. SUDS can help reduce pollution and maintain the groundwater aquifer – an important point considering the aquifer provides drinking water for Brighton and Hove. Furthermore, well-designed SUDS can contribute to quality neighbourhoods, providing opportunities for wildlife to thrive, and enhancing the leisure, play and educational offer within our public open spaces.

This Supplementary Planning Document (SPD) provides guidance for developers on what is expected of them as they bring sites forward for planning. It is essential that the management of water is considered at the earliest stage of a development. By adopting a sequential approach to development site allocation and integrating SUDS into the site design, the maximum benefits can be achieved, for people, for biodiversity and the environment.

1. INTRODUCTION

1.1 Background

Brighton and Hove City Council is committed to delivering sustainable high quality development that is designed to mitigate and adapt to the effects of climate change.

While Brighton and Hove is a coastal authority, the relatively steep topography and high ground levels, in comparison to sea levels, mean that flood risk from the sea is generally low and constrained to relatively small areas in the vicinity of Shoreham Harbour. The Risk of Flooding from Rivers and the Sea mapping set, prepared by the Environment Agency therefore indicates the risk of flooding from these sources to be relatively low.

Flooding has however affected Brighton and Hove repeatedly over the past 20 years, with surface and groundwater flooding being the key sources of flooding. It is therefore essential that future development takes into account and does not increase the risk of surface water or groundwater flooding. Sustainable Drainage Systems (SuDS) are an approach to surface water management which mimic natural processes by storing and treating rainwater close to where it falls. In addition to reducing the risk and consequences of flooding, SuDS can improve water quality, biodiversity and create spaces for public amenity and recreation. SuDS are now recommended by a range of national and local policies, legislation and technical guidance.

1.2 Purpose of this document

This Supplementary Planning Document (SPD) sets out a long-term vision for the implementation of sustainable drainage measures in the Brighton and Hove area and

- supports the delivery of the City Plan Part One and draft City Plan Part Two
- supports the delivery of adopted City Plan Part One policy CP11: Managing Flood Risk
- supports the delivery of emerging policies in the draft City Plan Part Two policy DM43: Sustainable Urban Drainages
- supports the delivery of emerging policies in the draft City Plan Part Two policy DM42; Protecting the Water Environment
- provides guidance for developers and planning officers for the incorporation of SuDS into developments
- repeats the Non-statutory Technical Standards for Sustainable Drainage Systems published by the Department for Environment Food and Rural Affairs (DEFRA) dated March 2015
- sets out Local Guidance to be considered in the provision of SuDS

- sets out supporting information to be submitted to assist the assessment of proposed SuDS measures included within planning applications

Following formal adoption by Brighton and Hove City Council, this SPD will form a material consideration in the assessment of planning applications.

This SPD sets out the Non-statutory Technical Standards for Sustainable Drainage Systems published by DEFRA in March 2015 which, provides Local Guidance on sustainable drainage systems and guidance on information likely to assist in the assessment of planning applications. The SPD does not provide detailed guidance on SuDS design. Detailed guidance for the design of and the principles behind sustainable drainage systems is available from a range of sources and advice should be sought from suitably experienced professionals regarding the design of individual drainage schemes.

1.3 Development and the City Plan

The Brighton and Hove City Plan Part One sets out the Council's objectives for growth and development until 2030. Eight Development Areas have been identified where the majority of new housing, employment and retail development will be delivered. These areas are largely "brownfield" in nature and are shown in Figure 1.

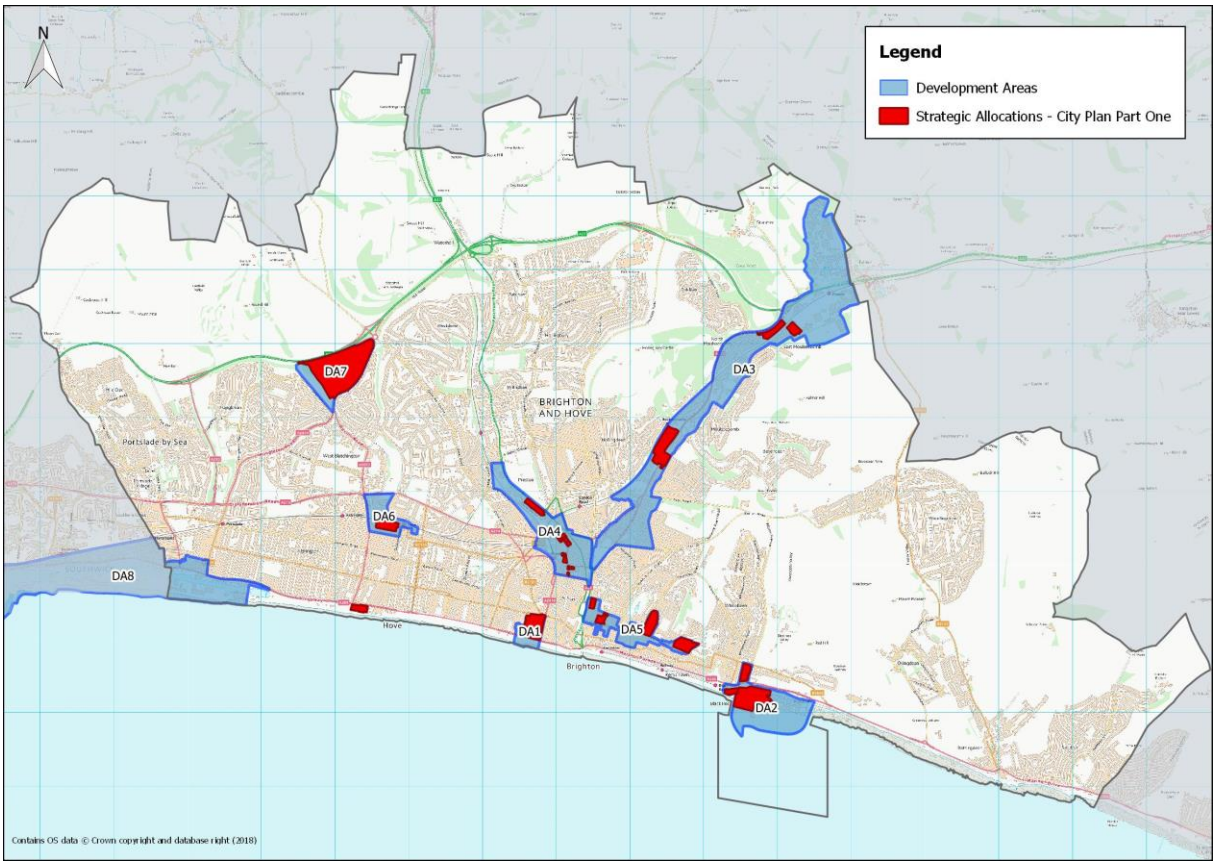

Figure 1 Development Areas and Strategic Allocations identified in the City Part One

Development is also expected to come forward across the city and the draft City Plan Part Two allocates further site allocations on brownfield and urban fringe sites.

A number of potential development sites are likely to be at risk of surface water flooding, based on a review of past flood events or future predictions of flood risk based on hydraulic modelling. Surface water flood risk therefore needs to be considered at an early stage in the design of future development and appropriate sustainable drainage measures need to be incorporated into the design of development. The Strategic Flood Risk Assessment (2018) provides detail on the risk associated with surface water in the city.

1.4 Who should use this guidance?

This document is primarily aimed at developers, their designers, architects, landscape designers and consultants, and local authority planning officers.

It will also be of interest to stakeholders including Southern Water and the Environment Agency, and may be of interest to organisations and individuals with an interest in local flood risk management and the built environment.

2. SETTING THE SCENE

2.1 Introduction

The need for a sustainable approach to surface water management in Brighton and Hove is driven by a range of factors, including the local topography and geology, as well as national and local government policy. These are summarised in the sections below and more detail on local flood risk and the policy drivers can be found in Appendices A and B, respectively.

2.2 The physical environment

Local topography and geology play a significant role in surface water flood risk and should be considered when scoping and designing SuDS schemes. The steep slopes and urban areas characterising much of Brighton and Hove contribute to rapid runoff and the prevention of water soaking into the ground below. Local topography ranges from 193 m Above Ordnance Datum (AOD) at Bullock Hill in the north east to -2.1 m AOD at the sea front.[1] The geology is dominated by permeable chalk, which can permit the infiltration of rainfall into the aquifer. However, the combination of steep topography, impermeable surfaces in urban areas and a lack of watercourses means that substantial areas of Brighton and Hove are vulnerable to surface water flooding.

2.3 Flood risk in Brighton and Hove

2.3.1 Surface water flood risk

Surface water flooding can occur following intense rainfall when water is unable to soak into the ground and sewers or other drainage infrastructure are overwhelmed by the volume of water.

The 2018 *Brighton and Hove City Council Strategic Flood Risk Assessment* (SFRA) identified Surface Water Flood Zones defining areas within the city where surface water is likely to accumulate or be conveyed during a flood event. The extents of Surface Water Flood Zone a: the Accumulation Zone and Surface Water Flood Zone b: the Conveyance Zone are shown Figure 2, and further guidance relating to the management of surface water flood risk within each of these zones is provided in Section 4.2.

2.3.2 Risk of flooding from other sources

Whilst there are no watercourses in the Brighton and Hove area to pose a risk of fluvial flooding, flood risk exists from additional sources including the sea, groundwater and sewers. Further detail on the risk of flooding from a range of sources can be found in Appendix A.

[1] *Brighton and Hove City Council Strategic Flood Risk Assessment,* JBA Consulting (2018: 1.2.1).

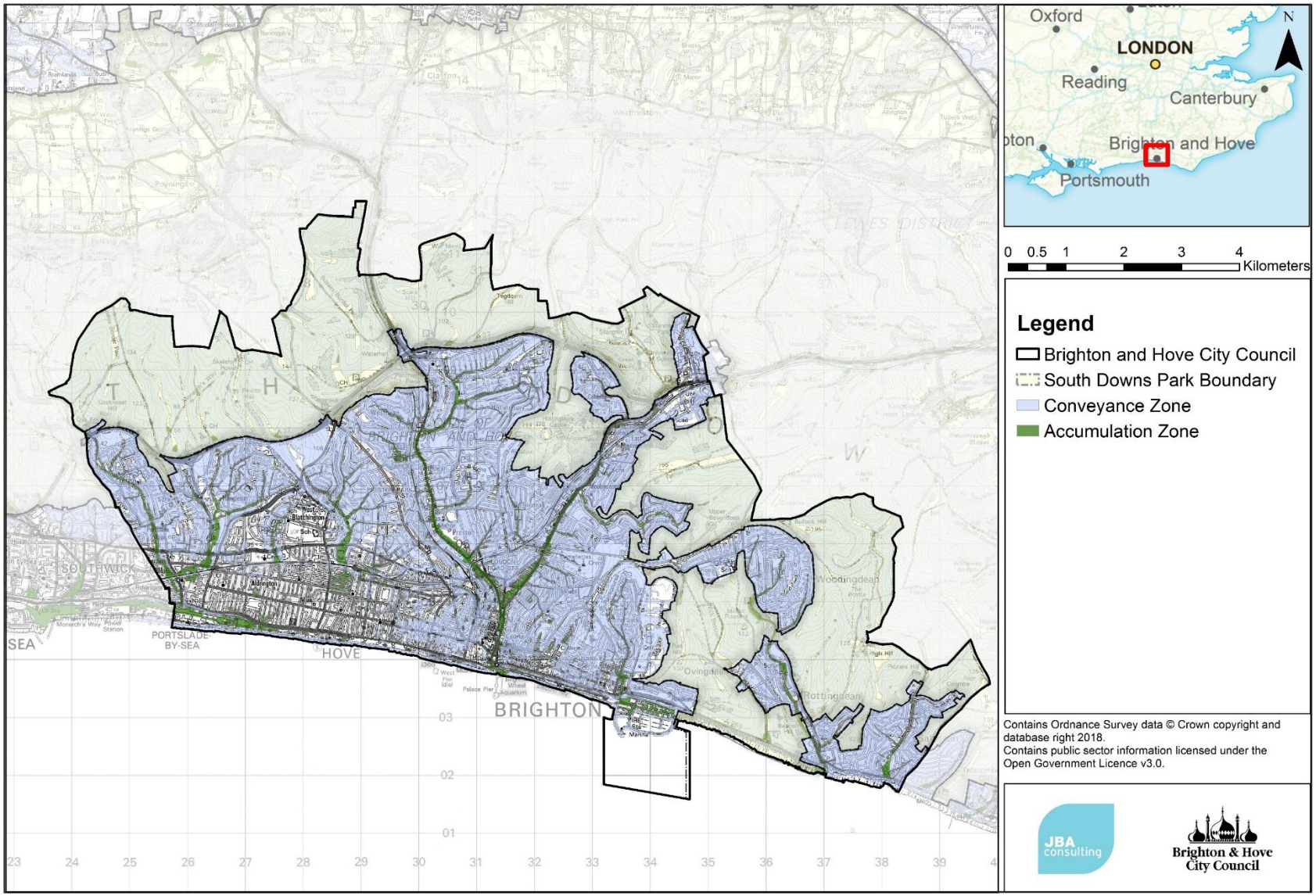

Figure 2. Map of Surface Water Flood Zones

2.4 Groundwater quality

All clean (drinking water) supplied in the Brighton and Hove City Council area relies upon the abstraction of groundwater from the underlying chalk aquifer, and it is therefore essential that sustainable drainage systems incorporate adequate measures to ensure that runoff disposed of via infiltration does not impact on the quality of groundwater.

The Environment Agency has defined a number of Source Protection Zones (SPZs) for groundwater sources such as wells, boreholes, and springs used for public drinking water supply. These zones indicate the likely risk of contamination from any activities that might cause pollution in the area. Three zones, Inner Zone 1, Outer Zone 2, and Total Catchment Zone 3 are defined, and are shown in Figure 3.

Generally, the closer the activity the greater the risk. However, the fractured nature of the chalk means that it is particularly vulnerable to the rapid conveyance of contaminants and the Environment Agency is likely to take a precautionary approach and treat the Outer Zone 2 source protection zone in a similar manner as it would the Inner Zone 1 source protection zone.

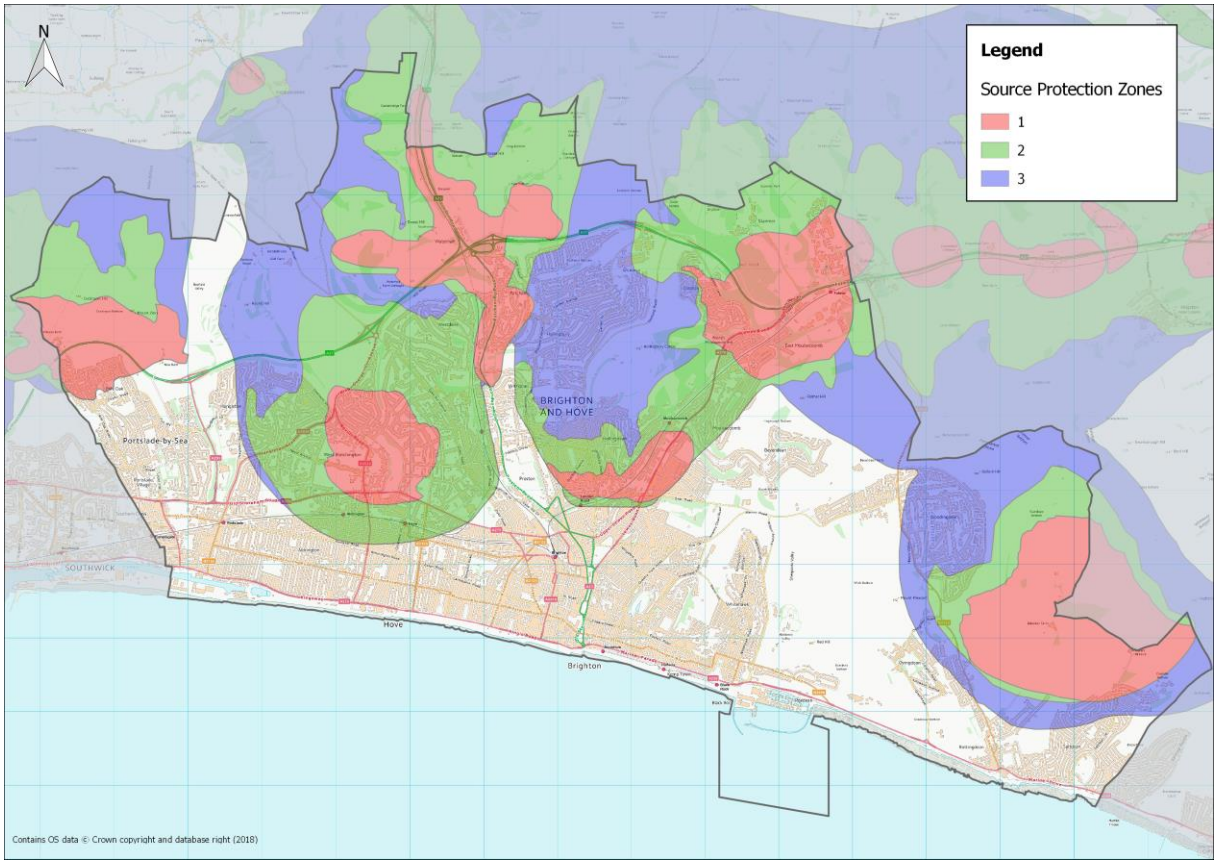

Figure 3. Ground water source protection zones

It should also be noted that chalk formations can be vulnerable to the development of solution features (or dissolution features) following the concentrated discharge of surface water runoff, and the potential development of such features should be taken into consideration in the design of infiltration systems and building foundations.

2.5 Contaminated land

The Environment Agency typically requires the removal of contaminated land from development sites in the Brighton and Hove area and will not normally accept the capping of contaminated land as a suitable mitigation measure. Therefore subject to the potential mobilisation of contaminants being carefully considered and suitable mitigation measures being put in place contaminated land should not prevent infiltration techniques being used.

2.6 Policy, legislation and guidance

This Supplementary Planning Document was prepared in the context of policy and legislation, both local and national, which recommends the uptake of sustainable drainage measures. A range of technical resources and standards for best practise in SuDS design and implementation are also available. Key documents are summarised in Figure 4 and are discussed in more detail in Appendix B.

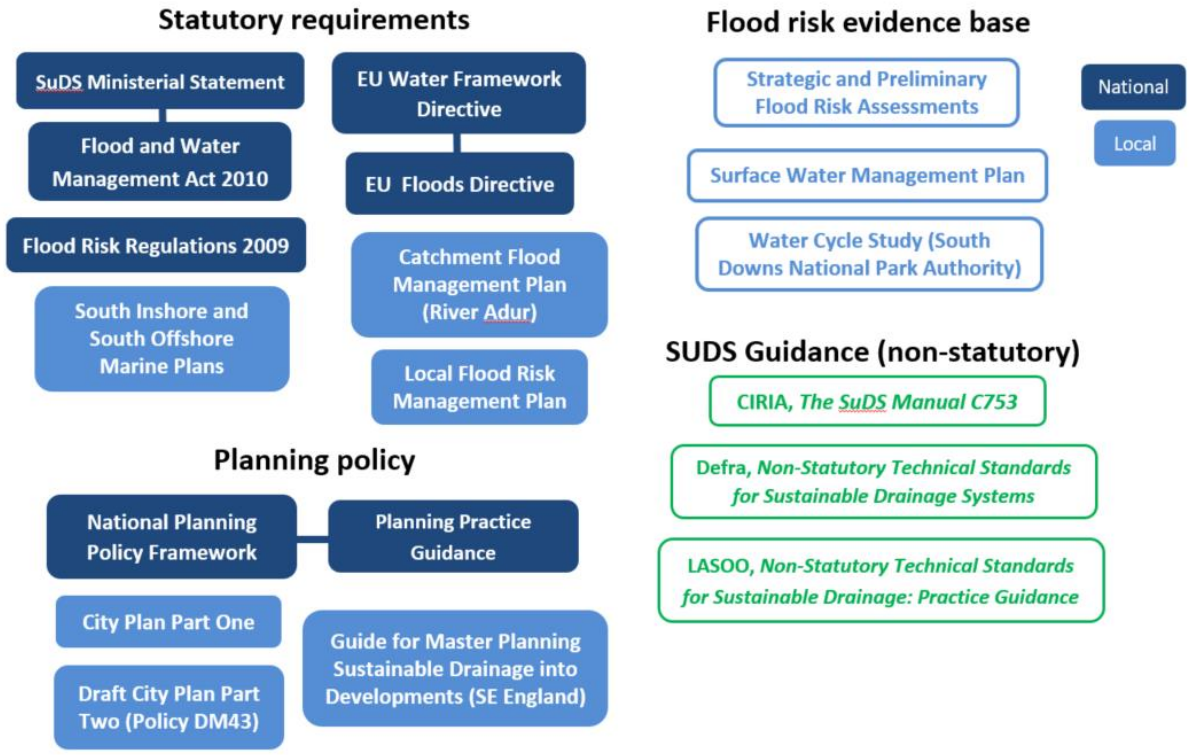

Figure 4. Local and national policy and reports relating to sustainable drainage

3. WHAT ARE SUSTAINABLE DRAINAGE SYSTEMS (SUDS)?

3.1 Introduction

Sustainable Drainage Systems (SuDS) aim to minimise the adverse impacts caused by runoff following rainfall, particularly from impermeable urban surfaces, whilst maximising the opportunities for improving water quality, enhance biodiversity and providing amenity value.

SuDS mimic natural processes in the interception, storage, conveyance, treatment and disposal of surface water. SuDS components can include 'soft' engineering of the landscape such as swales, rain gardens or detention basins, as well as 'hard' engineered structures, including permeable paving or attenuation tanks.

3.2 Sustainable Drainage Hierarchy

The National Planning Practice Guidance (paragraph 80) sets out the Sustainable Drainage Hierarchy. Generally, the aim should be to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable:

1. into the ground (infiltration);
2. to a surface water body;
3. to a surface water sewer, highway drain, or another drainage system;
4. to a combined sewer.

It should be noted that while the sustainable drainage hierarchy includes reference to discharge to highway drains, the discharge of surface water runoff from development to highway drainage systems will not normally be permitted. Highways England manages and operates the strategic road network, comprising the A27 trunk road in the Brighton and Hove City Council area, and has specific policy stating that "no water run off that may arise due to any change of use will be accepted into the highway drainage systems, and there shall be no new connections into those systems from third party development and drainage systems. Where there is already an existing third party connection the right for connection may be allowed to continue providing that the input of the contributing catchment to the connection remains unaltered".[2]

3.3 The benefits of SuDS

Well-designed SuDS schemes can deliver four main types of benefits: managing the quantity of surface water, improving water quality, as well as enhancing the amenity

[2] Para 50, *Circular 02/2013 The Strategic Road Network and the Delivery of Sustainable Development*

value and biodiversity of urban areas. These are sometimes termed the 'four pillars' of SuDS design, as illustrated in Figure 5.[3]

3.3.1 Flood risk management

SuDS can contribute to local flood risk management by slowing down and reducing the rate and volume of surface water runoff. SuDS can temporarily store water, releasing it in a slow controlled manner either into the ground below, into watercourses, into a conventional sewer system, or via evapotranspiration from plants.

3.3.2 Water quality

During storms, surface water runoff can wash contaminants into sewers, rivers and streams, which has adverse consequences for the environment and biodiversity. Common contaminants include oils on roads, agricultural chemicals, sediments and litter. Some SuDS components can filter harmful chemicals through soils and vegetation, or enable the deposition of sediments, before they enter sewers or watercourses.

3.3.3 Amenity

The provision of open space in a development enhances the amenity value for people living and working nearby. SuDS components can deliver both green vegetated areas, as well as water bodies, such as ponds and wetlands. The amenity value of a SuDS scheme will typically go hand-in-hand with its role in managing surface water and creating ecological habitats.

3.3.4 Biodiversity and ecology

SuDS components have the potential to improve biodiversity by creating new wildlife habitats and enhancing existing ones. These include permanent water features, like ponds and wetlands, as well as increasing areas of vegetation and planting existing areas with appropriate plants species.

[3] p6, CIRIA (2015) *The SuDS Manual. C753.* CIRIA, London.

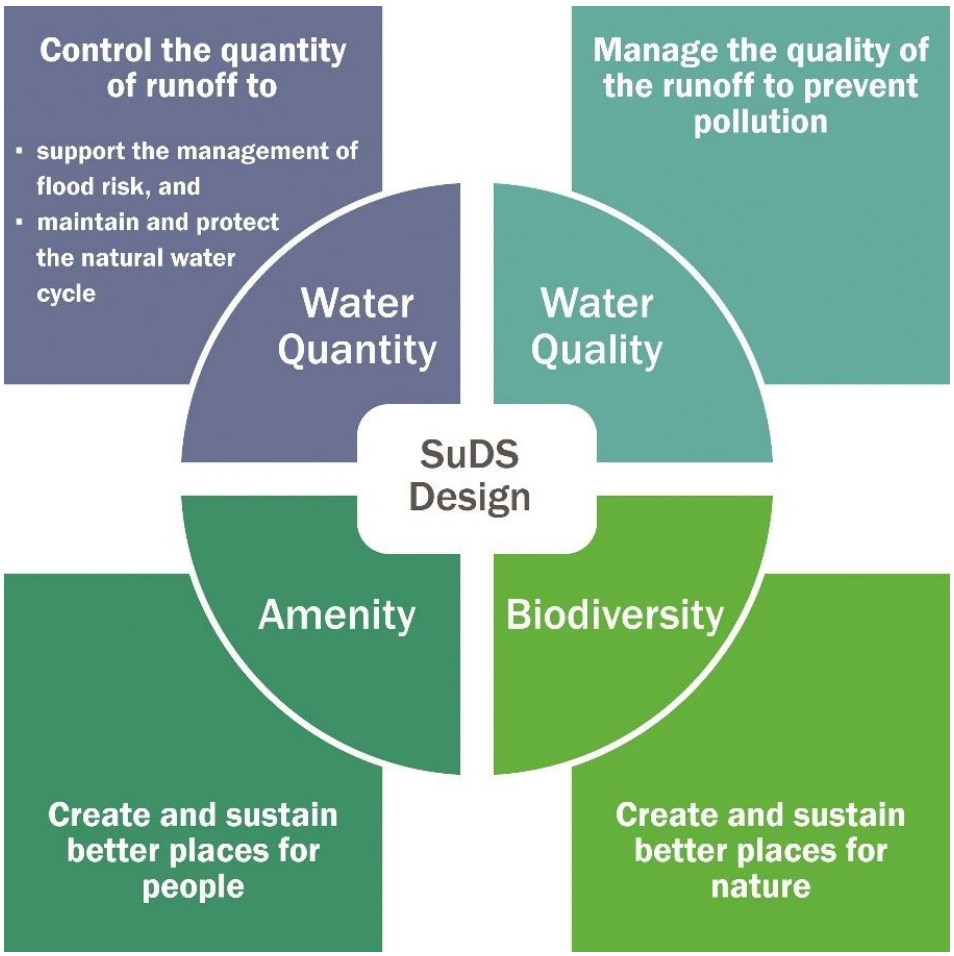

Figure 5. The main benefits of SuDS (image: courtesy CIRIA)

3.3.5 Additional benefits

SuDS can also deliver additional benefits, including contributing to:

- Air quality
- Microclimate and mitigating the Urban Heat Island effect
- Water security
- Noise pollution mitigation
- Carbon storage
- Access to nature
- Pollinator habitat
- Fish migration and spawning

3.4 The SuDS Management Train

A principal theme for the design of sustainable drainage schemes is the SuDS Management Train, as indicated in Figure 6. Rather than acting as standalone features, SuDS components should act as linked systems which deliver a gradual improvement in the quality and quantity of surface water runoff.

The SuDS Management Train starts with the **prevention** of runoff and pollution (e.g. reducing the size of impermeable areas) and managing runoff at, or near to, where it fell as rain (**source control**), before controlling surface water runoff further downstream on a larger scale, utilising site wide measures (**site control**) or even area wide measures (**regional control**) (e.g. ponds and wetlands).

Developing a SuDS Management Train requires a collaborative approach between developers, architects, drainage engineers and landscape architects. By selecting SuDS components appropriate to local site conditions and development considerations, SuDS can be applied to a range of developments varying in scale and context. Individual SUDS components which may be suitable for the Brighton and Hove area are described in more detail in Appendix C.

The SuDS Management Train should be considered early in the design process to allow surface water drainage considerations to inform and evolve alongside the site layout. The consideration of SuDS at an early stage can help avoid costly delays in the revision of design works and resubmissions of planning applications to retrospectively incorporate SuDS into the design.

3.5 Consideration of the wider landscape and delivery of wider benefits

SuDS should be sensitively located and designed and should be considered in the context of the neighbouring and wider land use as this can have a significant influence on the site-specific design of SuDS. The delivery of wider biodiversity, ecology, amenity and sustainability objectives should be explored, and is strongly encouraged, in the design and implementation of SuDS systems in the Brighton and Hove area.

The linking of habitats, nature conservation sites and green and blue infrastructure is also strongly encouraged, in the design and implementation of SuDS systems in the Brighton and Hove area.

3.6 Cumulative effect of development

The cumulative effect of small scale development on surface water runoff can be significant. It is therefore important that adequate measures are incorporated in all development to deal with and prevent increases in surface water runoff.

The connection of surface water runoff to the combined sewer system is particularly detrimental and rapidly erodes the sewer's capacity, and should be avoided if at all possible.

3.7 Further reading

Further information on the design and technical standards for designing sustainable drainage schemes can be found in the Technical guidance and standards list in Appendix B, Section 4.

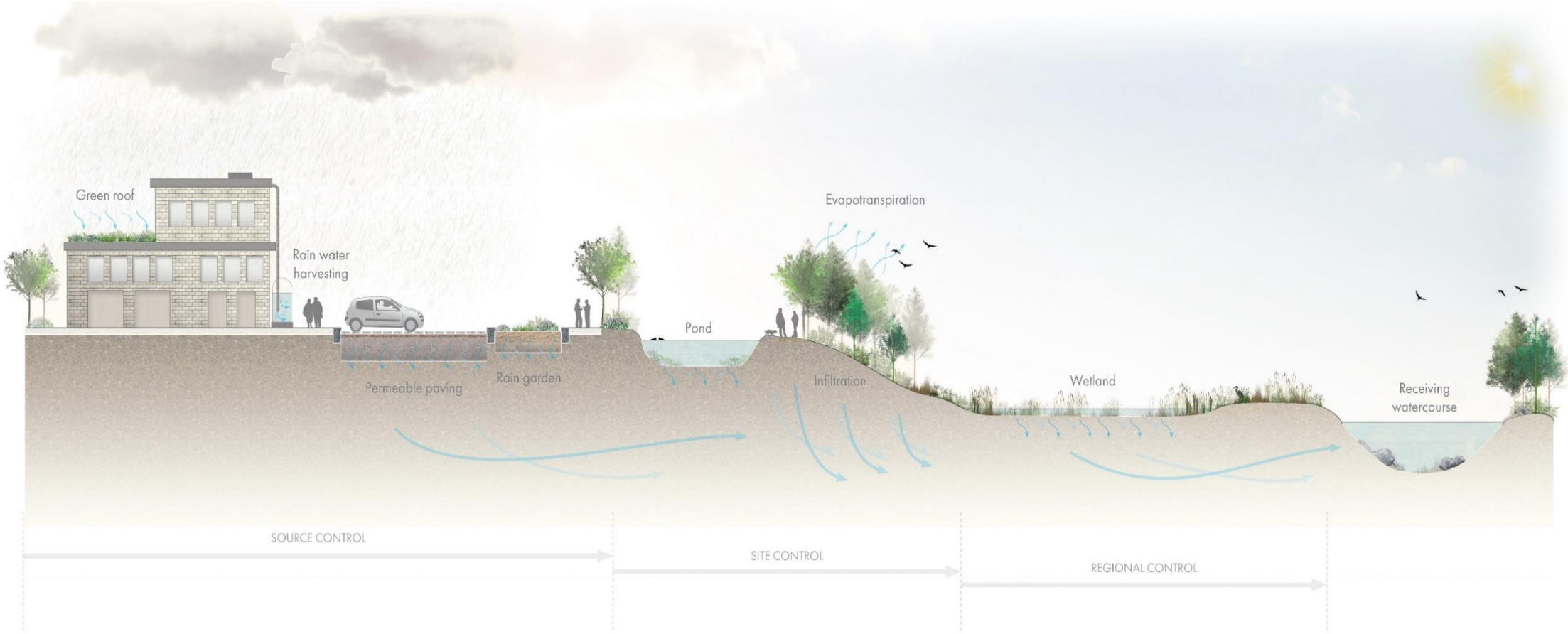

Figure 6 The SuDS Management Train operating over a range of scales (image: Project Centre Ltd)

4. TECHNICAL GUIDANCE (INCLUDING NATIONAL STANDARDS AND LOCAL GUIDANCE)

4.1 Introduction

Planning applications for major developments should be accompanied by a site-specific drainage strategy that provides details of the proposed sustainable drainage system and arrangements for its whole life management and maintenance. The submitted drainage strategy should also demonstrate compliance with the Non-statutory Technical Standards for Sustainable Drainage Systems, published by the Department for Environment Food and Rural Affairs (DEFRA) in March 2015, and consider the Local Guidance given in Section 4.4.

The definition of major development is presented below, taken from Article 2(1) of *The Town and Country Planning (Development Management Procedure) (England) Order 2010*:[4]

> *(a) the winning and working of minerals or the use of land for mineral-working deposits;*
>
> *(b) waste development;*
>
> *(c) the provision of dwelling houses where —*
>
> > *(i) the number of dwelling houses to be provided is 10 or more; or*
> >
> > *(ii) the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub-paragraph (c)(i);*
>
> *(d) the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or*
>
> *(e) development carried out on a site having an area of 1 hectare or more;*

4.2 Surface Water Flood Zones

Surface Water Flood Zones (SWFZ) are areas identified as potentially at risk from surface water flooding in the Brighton and Hove SFRA. The aim of these zones is to enable a more strategic consideration of surface water flood risk in the land allocation and planning process and secure appropriate commitments that development will be safe for its intended lifetime and not have an adverse effect on third parties. These zones are summarised below and their extents illustrated in Figure 2 in Section 2.

[4] Available online at: www.legislation.gov.uk/uksi/2010/2184/made [accessed 10.06.2018]

- **Surface Water Flood Zone a (SWFZa): Accumulation Zone**
  Surface Water Flood Zone a is defined as land affected by a high probability event (1% AEP chance in each and every year). This event was selected to be representative of the flood risk areas in Brighton, which have a reasonable chance of occurrence and be consistent with the level of risk used for river Flood Zones.
- SWFZa is the risk extent not taking account of any existing measures to manage or control risk and as such defines the zone that could potentially be affected if no measures were in place.[5]
- **Surface Water Flood Zone b (SWFZb): Conveyance Zone**
  The extent of SWFZb is based on the speed and depth with which surface water can flow over the ground surface and is to identify locations where the interruption or changing of flow direction could affect flood risk. It is defined by ground that has a gradient steeper than 1 in 20 (or gradient of 5%).[6]

4.3 Flood Risk Assessments

Flood Risk Assessments – General

National Planning Policy (foot note 50 of NPPF) states a site-specific flood risk assessment should be provided for;

- All development on Flood Zones 2 and 3

And that in Flood Zone 1, an assessment should accompany all proposals involving

- Sites of 1 hectare more
- Land which has been identified by the Environment Agency as having critical drainage problems
- Land identified in a Strategic Flood Risk Assessment as being at increased flood risk in the future
- Or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

[5] *Brighton and Hove City Council Strategic Flood Risk Assessment,* JBA Consulting (2018: 5.8)
[6] *Brighton and Hove City Council Strategic Flood Risk Assessment,* JBA Consulting (2018: 5.8)

Flood Risk Assessments – specific requirements relating to surface water flood zones

In addition, the Brighton and Hove City Council 2018 Strategic Flood Risk Assessment states that a flood risk assessment should be provided for all development or change of use falling within SWFZa or SWFZb. The flood risk assessment requirements for development falling within SWFZa or SWFZb are different, in reflection of their risk profiles. The guidance for developers for each surface water flood zone is outlined below.

Surface Water Flood Zone a: Accumulation Zone

As surface water is expected to pond in this zone, basement dwellings will not normally be permitted in SWFZa.

In accordance with CP11 and paragraphs 155 and 160 of the National Planning Policy Framework a flood risk assessment for all other development is required to demonstrate that the proposal will be safe from surface water flooding for its lifetime and will not increase flood risk elsewhere. It is recommended that Flood risk assessments include:

- Assessment of flood risk from all sources.
- Consideration of the 1% AEP plus 30% uplift for climate change flow paths across the site and how the proposed development may alter these.
- Demonstration that ground floor levels should normally be a minimum of whichever is higher of:
- 300 mm above the general ground level of the site
- 600mm above the estimated surface water level in the 1% AEP event with drainage plus 30% uplift to account for climate change
- Consideration of other surface water flood resilience measures.

The 1% AEP +30% climate change flood level has been calculated as part of the SFRA. The information is mapped in the SFRA but may not provide sufficient information to inform the floor level assessment. It is recommended that the applicant contact Brighton and Hove City Council to request detailed flood levels specific to their site. Requests should be emailed to sustainabledrainage@brighton-hove.gov.uk.

Surface Water Flood Zone b: Conveyance Zone

This area is steeply sloping, so in a rainfall event, runoff can be expected to flow over impermeable areas within SWFZb. In Brighton, even small changes to the topography

can influence flow paths. This can result in changing surface flood risk on and off the site. Generally, in the conveyance zone flood depths are low. Therefore, all types of development could be compatible in SWFZb, providing the FRA can demonstrate that the proposal will be safe from flooding for its lifetime and does not increase flood risk elsewhere. It is recommended that Flood Risk Assessments include:

- Assessment of flood risk from all sources.
- Consideration of the 1% AEP plus 30% uplift for climate change flow paths across the site and how the proposed development may alter these. Overland flow modelling maybe required to demonstrate this. The aim is to demonstrate there is no detriment to third parties and the proposed development is safe.
- Consideration of surface water flood resilience measures.

Areas indicated to be at risk of groundwater flooding

Situated on the South Downs the underlying geology of Brighton and Hove is predominantly chalk. Consequently, there is a history and recognised risk of groundwater flooding.

The Brighton and Hove City Council 2018 Strategic Flood Risk Assessment also recommends that a flood risk assessment be required for all development or change of use, regardless of Flood Zone or size, where flood risk from groundwater is identified within the Strategic Flood Risk Assessment. The flood risk assessment should clearly state the degree of risk and how the risk to the development will be mitigated.

In accordance with CP11 and paragraphs 155 and 160 of the National Planning Policy Framework flood risk assessments for subterranean development proposals should demonstrate that the development is not at risk from groundwater or other sources of flooding and should demonstrate that groundwater flow paths are preserved so as not to increase flood risk elsewhere. The design of any new subterranean development should also ensure that flood risk is not increased for existing adjacent subterranean developments by changes to groundwater flow paths.

4.4 Standards for major development

Paragraph 165 of the National Planning Policy Framework states;

Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

a) take account of advice from the lead local flood authority;

b) have appropriate proposed minimum operational standards;

c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and

d) where possible, provide multifunctional benefits.

National Standards, Local Guidance and Best Practice Advice

This section of the guidance follows the structure of the Non-statutory Technical Standards for Sustainable Drainage Systems published by the Department for Environment Food and Rural Affairs (DEFRA) dated March 2015.

The technical standards provided by government relate to the design, construction, operation and maintenance of sustainable drainage systems to be incorporated within major development and have been published as guidance for those designing schemes. Demonstration of compliance with the Non-statutory Technical Standards for Sustainable Drainage Systems (prefixed NS) will confirm appropriate minimum operational standards.

Local guidance (prefixed LG) is also provided to assist in demonstration of compliance with the National Planning Policy Framework (NPPF), the National Planning Policy Guidance (NPPG), local policy CP11 Managing Flood Risk, and emerging draft policies DM42 Protecting the Water Environment and DM43 Sustainable Urban Drainage. Best practice advice is also provided to assist in the consideration of the most appropriate SuDS system to be incorporated.

Flood risk outside the development

New development should not increase flood risk elsewhere, outside of the development. Where surface water runoff is to be discharged to a very large water body, water levels within that water body are unlikely to be affected. National Standard 1 (**NS1**) seeks to recognise this. New developments can however increase flood risk by influencing flow paths and can have an adverse effect on water quality, if suitable mitigation measures are not undertaken.

NS1 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 control standards (**NS2** and **NS3** below) and volume control technical standards (**NS4** and **NS6** below) need not apply.

Local Guidance

Peak flow control standards **NS2** and **NS3** and volume control standards **NS4** to **NS6** apply to major development in the Brighton and Hove City Council area.

In addition to the above National Standards Brighton and Hove City Council also has the following Local Guidance. In order to demonstrate compliance with the NPPF, NPPG, or local polices applicants are encouraged to give consideration to the following guidance:

LG1 Where developments include new outfalls to the sea, the design of the surface water drainage system should demonstrate that appropriate treatment measures have been incorporated to manage the quality of runoff and protect the natural environment. For further information refer to Chapters 26 and 27 of the SuDS Manual (CIRIA C753) (Relevant policies – emerging local policy DM42 and DM43, and NPPF paragraph 170).

LG2 Where developments include new outfalls to the sea, it should be demonstrated that high water levels in the receiving water body will not affect the performance of the sites surface water drainage system for the design event or increase flood risk to neighbouring properties (Relevant policies – CP11, and NPPF paragraphs 160 and 163).

LG3 Where development proposals include surface water drainage systems that include infiltration to ground the design will need to ensure that appropriate treatment measures have been incorporated to protect groundwater quality (Relevant policies – emerging local policy DM42 and DM43, and NPPF paragraph 170).

LG4 Details of existing flow paths onto the site and crossing the site will need to be identified and details provided confirming how flows be will routed through the proposed development without exacerbating the risk of flooding to neighbouring properties. Careful consideration should be given to the location and form of buildings to ensure that overland flow routes are not impeded or create ponding (Relevant policies – CP11, and NPPF paragraphs 160 and 163).

LG5 Where the proposed surface water drainage system includes a connection to a third party asset, including Southern Water's combined sewer system it is strongly encouraged that evidence of their agreement in principle to the connection and proposed rate of discharge is provided (Relevant policy – emerging local policy DM42).

Peak flow control

The creation of new impermeable areas will lead to an increase in surface water runoff rates and increase flood risk elsewhere, unless suitable mitigation measures are undertaken.

NS2 For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 100% AEP (equivalent to 1 in 1 year) rainfall event and the 1% AEP (equivalent to 1 in 100 year) rainfall event should never exceed the peak greenfield runoff rate for the same event.

NS3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 100% AEP (equivalent to 1 in 1 year) rainfall event and the 1% AEP (equivalent to 1 in 100 year) rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

Local Guidance

In addition to the above Nationals Standard Brighton and Hove City Council also has the following Local Guidance. In order to demonstrate compliance with the NPPF, NPPG, or local polices applicants are encouraged to give consideration to the following guidance.

The underlying strata throughout the majority of the Brighton and Hove area consist of a number of different chalk formations and greenfield runoff rates are therefore low. While flow control devices with a discharge rate of less than 5 l/s can be prone to blockage the cumulative effects of small developments discharging runoff in the order of 5 l/s can exacerbate capacity issues within the public sewer system and increase flood risk elsewhere (a discharge of 5 l/s will exceed the 1% AEP greenfield runoff rate for small sites).

Discharge rates of less than 5 l/s can be achieved if appropriate measures are included to prevent blockage of the flow control device. An example would be the use of permeable block paving to collect and filter runoff prior to discharge through a flow control device.

LG6 Where the calculated peak runoff rate for the 100% AEP (1 in 1 year) rainfall event or the 1% AEP (1 in 100 year) rainfall event is less than 5 l/s the applicant will need to demonstrate that the design of the surface water drainage system has considered measures to restrict the peak discharge rates from the development to any highway drain, sewer or surface water body to a rate that is as close as reasonably practical to the calculated peak runoff rate for the equivalent rainfall event (Relevant policies – CP11, and NPPF paragraphs 160 and 163).

LG7 While the underlying strata throughout the majority of the Brighton and Hove area consist of chalk formations, superficial deposits consisting of clay, silt, sand and gravel are present. Infiltration rates within these deposits are variable and where it is proposed that surface water runoff will be discharged via infiltration within areas of superficial deposits infiltration testing in accordance with BRE365 should be undertaken to determine likely infiltration rates. Calculations demonstrating that the proposed surface water drainage system meets the relevant design criteria should then be based on the determined infiltrations rates. (Relevant policies – CP11, and NPPF paragraphs 160 and 163).

LG8 If historic use of the site indicates a risk of contaminated ground a contamination survey should be undertaken and details of proposed remedial measures provided. If infiltration of surface water runoff is proposed in such circumstances details of measures to prevent the mobilisation of pollutants will need to be provided and discussed with the Environment Agency (Relevant policies – emerging local policy DM41, DM42 and DM43, and NPPF paragraph 178).

LG9 Development proposals for brownfield sites should demonstrate that consideration has been given to the SuDS hierarchy as set out in Section 3.2 (Relevant policies – CP11 and NPPG paragraph 80).

Applicants are also encouraged to give consideration to the following guidance relating to best practice advice:

LG10 It is recommended that a minimum 30% increase in peak rainfall intensity, and ideally a 40% increase in peak rainfall intensity, should be made as an allowance for climate change in the design of sustainable drainage systems

LG11 Seasonal high groundwater levels should be taken into account in the design of infiltration systems. Section 25.2.2 of the SuDS Manual (CIRIA C753) indicates that the base of infiltration systems should be at least 1m above the maximum anticipated groundwater level, to help ensure the performance of the infiltration system and protect underlying groundwater from contamination.

LG12 It is encouraged that where development proposals for Brownfield sites propose to continue to discharge to a highway drain, sewer or surface water body the location and size of the existing connection/s should be confirmed.

LG13 Where existing connections to a highway drain or sewer are to be abandoned it is recommended that the pipework should be capped close to the site boundary to prevent the ingress of debris or groundwater into the receiving system.

LG14 It is recommended that where development proposals for brownfield sites propose to continue to discharge to a highway drain, sewer or surface water body

the peak runoff rate for the 100% and 1% AEP (1 in 1 year and 1 in 100 year) rainfall events must be as close as reasonably practical to the greenfield runoff rate from the development for the same rainfall event. A reduction in peak runoff rate of at least 50% should normally be achievable.

Volume control

The creation of new impermeable areas will lead to an increase in surface water runoff volumes and increase flood risk elsewhere, unless suitable mitigation measures are undertaken.

NS4 Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1% AEP (equivalent to 1 in 100 year), 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.

NS5 Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1% AEP event (equivalent to 1 in 100 year), 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

NS6 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with **NS4** or **NS5** above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

Local Guidance

Applicants are also encouraged to give consideration to the following guidance relating to best practice advice.

LG15 it is recommended that a 30% increase in rainfall intensity should be allowed for in the design of surface water attenuation schemes. It is also advised that sensitivity testing is undertaken for a 40% increase in rainfall intensity to ensure flooding does not occur in any part of a building (including a basement) or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development, and that water does not flow from the development.

Flood risk within the development

The risk of flooding within new development should be managed so that the inhabitants of the development are not put at an unacceptable risk of flooding, over the lifetime of the development.

NS7 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% AEP rainfall event.

NS8 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 during a 1% AEP rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.

NS9 The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1% AEP rainfall event are managed in exceedance routes that minimise the risks to people and property.

Local Guidance

In addition to the above Nationals Standard Brighton and Hove City Council also has the following Local Guidance. In order to demonstrate compliance with the NPPF, NPPG, or local polices applicants are encouraged to give consideration to the following guidance:

LG16 In accordance with emerging draft Policy DM43 basement dwellings and basements for other uses will not be permitted in areas where there has been a history of groundwater emergence.

LG17 As surface water is expected to pond in SWFZa, basement dwellings will not normally be permitted in this zone and basements for other uses will be discouraged (Relevant policies CP11 and NPPF paragraph 160).

LG18 It is recommended that where basements for other uses (i.e. car parking) are permitted in SWFZa, the entrances and other openings that may allow water to enter the basement are located above the modelled 1% AEP plus climate change water level and that critical plant required for the operation of the development is not located within basements (Relevant policies CP11 and NPPF paragraph 160).

Applicants are also encouraged to give consideration to the following guidance relating to best practice advice:

LG19 It is recommended that all surface storage features (i.e. basins, ponds and wetlands) should provide appropriate freeboard in line with the requirements of Section 23.4.5, of the SuDS manual - Exceedance Flow Design. Freeboard allowances

on surface storage features should be agreed with the LLFA taking into account the level of risk posed to adjacent and "downstream" properties

LG20 For developments located within Surface Water Flood Zone a: Accumulation Zone (SWFZa), it is recommended that finished floor levels of developments should be a minimum of whichever is higher of:

- 300 mm above the general ground level of the site
- 600 mm above the estimated surface water level in the 1% AEP event with drainage plus 30% uplift to account for climate change.

LG21 To allow for uncertainties all surface conveyance features (i.e. swales) it is recommended that an appropriate freeboard allowance above the maximum design water level is included.

LG22 Guidance provided in Section 36.3 of the SuDS manual - Effective Health and Safety Risk Management should be taken into account in the design of sustainable drainage features. This guidance is particularly relevant where open water bodies (i.e. normally wet ponds and wetlands) are to be provided.

Structural integrity

Sustainable drainage systems should be of resilient design and construction, and should not adversely affect adjacent structures of infrastructure.

NS10 Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.
NS11 The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer must be of a suitable nature and quality for their intended use.

Designing for maintenance considerations

The design of sustainable drainage systems should take account of and facilitate future maintenance, to ensure the long term effective operation of the system.

NS12 Pumping should only be used to facilitate drainage for those parts of the site where it is not reasonably practicable to drain water by gravity.

Local Guidance

The long term effectiveness of sustainable drainage systems is dependent on appropriate maintenance being undertaken. Brighton and Hove City Council, in its role as Local Planning Authority, will seek to ensure that appropriate maintenance arrangements are in place for the lifetime of the development through planning conditions or planning obligations.

In addition to the above Nationals Standard Brighton and Hove City Council also has the following Local Guidance. In order to demonstrate compliance with the NPPF, NPPG, or local polices applicants are encouraged to give consideration to the following guidance:

LG23 Details of the proposed maintenance arrangements for the sustainable drainage system over the life time of the development will need to be provided. (Relevant policies – emerging local policy DM43 and NPPF paragraph 165). Details should include the party/parties to be responsible for maintenance of the sustainable drainage system and the maintenance schedule to be implemented. The maintenance schedule should include arrangements to ensure that blockages or any other defect that may impact upon the systems operation are identified and promptly addressed

LG24 The Local Planning Authority should be notified of any changes in the maintenance arrangements relating to the sustainable drainage system including changes in the party/parties responsible for the maintenance of the sustainable drainage system (Relevant policies – emerging local policy DM43 and NPPF paragraph 165).

LG25 Maintenance records should be kept for all elements of the sustainable drainage system and should be available for inspection upon request of the Local Planning Authority or the Lead Local Flood Authority (Relevant policies – emerging local policy DM43 and NPPF paragraph 165).

LG26 The design of sustainable drainage systems should ensure that adequate access is available to all components of the system to allow all necessary maintenance activities to be undertaken (Relevant policy – NPPG paragraph 085).

Construction

NS13 The mode of construction of any communication with an existing sewer or drainage system must be such that the making of the communication would not be

prejudicial to the structural integrity and functionality of the sewerage or drainage system.

NS14 Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed.

Local Guidance

In addition to the above Nationals Standard Brighton and Hove City Council also has the following Local Guidance. In order to demonstrate compliance with the NPPF, NPPG, or local polices applicants are encouraged to give consideration to the following guidance:

LG27 SuDS should be sensitively located and designed, and the opportunity to deliver wider biodiversity, ecology, amenity and sustainability objectives should be explored as part of the design process. The linking and repairing of habitats and nature conservation sites should also be explored as part of the design process (Relevant policy – emerging local policy DM43, CP8, CP10, CP11 and NPPF paragraph 165).

Best practice advice should be followed in the sequencing of works and construction of sustainable drainage system, to avoid short term increases in flood risk and to ensure the effective long term operation of the drainage system. Chapter 31 of the SuDS manual provides general good practice guidance on the construction of sustainable drainage schemes
Applicants are encouraged to give consideration to the following guidance relating to best practice advice:

LG28 All infiltration systems should be sited so that the structural stability of buildings or roads is not compromised. Part H3 of the Building Regulations 2010 provides guidance on rainwater drainage systems, including soakaways and other infiltration devices, and Engineering in Chalk (CIRIA C574) provides guidance on shallow and piled foundations within chalk.
LG29 Measures should be provided to intercept and allow the settlement of silt and other floating matter prior to sub-surface infiltration features, such as geocellular soakaways.
LG30 - Measures should be undertaken to ensure that flood risk to neighbouring properties is not increased at any point during the construction of the proposed development. For large sites details of the proposed phasing of works should be provided.

LG31 Measures should be taken to prevent the siltation of infiltration features during construction works.

LG32 It is recommended that porous surfaces should be constructed at the end of the construction programme, unless adequately protected from clogging or binding. Where a layer of bitmac is to be used to provide a temporary running surface above a porous sub-base with cores subsequently drilled through the bitmac to provide flow paths, the cores should be removed (not punched into the sub-base).

5. SUPPORTING INFORMATION FOR PLANNING APPLICATIONS (FOR MAJOR DEVELOPMENTS)

5.1 Introduction

This section outlines the supporting information relating to sustainable drainage systems to be submitted to assist in the assessment of planning applications for major developments. Applicants are advised to submit the information detailed below; the requirements vary according to the type of application, with information for Outline and Full planning applications presented in Sections 5.2 and 5.3, respectively.

5.2 Outline planning applications – major development

Outline planning applications must be submitted with a drainage strategy (and if appropriate a flood risk assessment). The following information will assist in the assessment of proposed surface water drainage measures.

- Topographical survey indicating existing ground levels and how water flows naturally at the site, including flows to and from the site
- Details of local geology and ground investigation results (including groundwater levels and infiltration tests if applicable)
- If appropriate, contamination survey and remediation proposals
- Preliminary drainage design demonstrating how SuDS are to be integrated into the proposed development and any wider amenity, environmental or biodiversity benefits to be delivered
- Pre-development greenfield and impermeable areas
- Proposed greenfield and impermeable areas
- Preliminary "outline" hydraulic calculation for:
    - Greenfield runoff
    - Brownfield runoff (including reductions)
    - Peak flow rates
    - Surface water volumes and storage volumes required
- Details of the storm return periods that the outline hydraulic calculations are based upon, and demonstration that the SuDS have been designed for the 1% AEP plus climate change event
- Flow routes including low flow, overflow and exceedance
- Approximate surface water storage volumes and locations

- Confirmation of proposed destination of "controlled flow of clean water" from the site post development (i.e. to ground by infiltration or combined sewer) and details of any off-site works
- Agreement(s) in principal with any relevant authorities for discharge to ground or sewer system
- Planned maintenance regime and details of body/ies to be responsible for long term maintenance
- Where appropriates details of the proposed phasing of works and measures to be undertaken to ensure that flood risk to neighbouring properties is not increased during the course of the development's construction.
- Where appropriate. justification that SuDS are not suitable

Alternatively, details can be submitted in accordance with a submission list agreed with the Local Planning Authority through a written pre-application response with regards to the same proposal.

5.3 Full planning applications, Approval of Conditions and Reserved Matters – major development

The supporting information below should be submitted with Full planning applications, and applications for the Approval of Conditions and Reserved Matters, unless already approved for the Outline Planning submission and no further submissions are required.

Applications should be submitted with a detailed drainage strategy (and if appropriate a flood risk assessment). The following information will assist in the assessment of proposed surface water drainage measures.

- Topographical survey indicating existing ground levels and how water flows naturally on the site, including flows on to and from the site
- Details of local geology and ground investigations including trial pit and / or borehole information to at least 1m below any significant proposed drainage element. Minimum number dependent on design but must take account of any variation in ground conditions
- Groundwater monitoring. Monitored for a suitable period dependent on prevailing weather conditions and regional water levels.
- Infiltration test at depth and location of significant infiltration features or other agreed representative locations
- If appropriate, contamination survey and remediation proposals
- Pre-development greenfield and impermeable areas

- Proposed greenfield and impermeable areas
- Design calculations for:
    - Greenfield runoff
    - Brownfield runoff (including reductions)
    - Peak flow rates
    - Surface water volumes and storage volumes required
    - Drain down times
- Details of the storm return periods that the design calculations are based upon, and demonstration that the SuDS have been designed for the 1% AEP plus climate change event
- Demonstration that the peak discharge rates from the proposed development will be no greater than the equivalent greenfield / pre-developed site for all events up to and including the 1% AEP plus climate change event
- Plan(s) showing details of the SuDS including levels, layout, construction and planting/biodiversity detail drawings and management proposals
- Plan(s) showing SuDS and their relationship with the wider (entire) drainage network
- How runoff is to be collected from roofs, roads and other hard surfaces
- Flow routes including low flow, overflow and exceedance routes
- Details of Source Control features for each sub-catchment
- Details of Site Control features with flow control locations and details
- Details of conveyance features from place to place
- Confirmation of final storage volumes and flow control rates
- Details of Regional (Catchment) Controls in public open space where appropriate
- Confirmation of proposed destination of "controlled flow of clean water" from the site post development (i.e. to ground by infiltration or to combined sewer) and details of any off site works
- Confirmation of approval of relevant authorities for discharge to ground or combined sewer system

- Where appropriate, details of phased implementation of the drainage system(s), including any mitigation measures during construction.
- Planned maintenance regime and details of body/ies to be responsible for long term maintenance
- Where appropriate, justification that SuDS are not suitable.

Alternatively, details can be submitted in accordance with a submission list agreed with the Local Planning Authority through a written pre-application response with regards to the same proposal.

5.4 Guidance for minor development

While the standards for sustainable drainage for minor developments vary from those for major developments, the cumulative effect of small scale development on surface water runoff can be significant. It is therefore important that adequate measures are incorporated in all development to deal with and prevent increases in surface water runoff.

The connection of surface water to the combined sewer system is particularly detrimental and rapidly erodes the sewer's capacity, and should be avoided if at all possible.

Whilst planning applications for minor developments are not required to prepare a full Drainage Strategy meeting the requirements outlined in Section 4.4 above, applicants are encouraged to demonstrate the following:

- That the SuDS hierarchy has been considered
- The development will not be at risk of flooding during flood events up to and including the 1% AEP plus climate change rainfall event
- The development will not increase flood risk elsewhere
- Provide details of who will be responsible for the maintenance of the proposed drainage system

For minor developments in Surface Water Flood Zone a: Accumulation Zone, it is recommended that floor levels should be a minimum of whichever is higher of:

  - 300 mm above the general ground level of the site
  - 600 mm above the estimated surface water level in the 1% AEP event with drainage plus 30% uplift to account for climate change
  - Or that consideration has been given to other surface water flood resilience measures.

An assessment the 1% AEP event plus 30% uplift to account for climate change has been prepared. Detailed mapping is available to assist in the preparation site

specific flood risk assessments, and requests should be sent to **sustainabledrainage@brighton-hove.gov.uk**.

For minor developments in Surface Water Flood Zone b: Conveyance Zone, it is recommended that there should be:

- an assessment of flood risk from all sources
- consideration be given to existing flow paths across the site and how the proposed development may alter these
- consideration be given to surface water flood resilience measures.

APPENDICES

Appendix A. Flood risk in Brighton and Hove

1. Introduction

Brighton and Hove has been identified as one of the top ten Flood Risk Areas in England, based on the number of people at risk of flooding. This section outlines areas affected by historic flooding and areas predicted to be at risk of flooding based on computer modelling studies.

2. Historic flooding in Brighton and Hove

Flooding has affected Brighton and Hove repeatedly over the past 20 years, with surface and groundwater flooding being the key sources of flooding. The largest recent flood event occurred in autumn/winter 2000/01 when extreme weather conditions caused flooding across the city. Rainfall in July 2014 and August 2015 also caused significant flooding across the city. Due to the intensity of rainfall, soakaways in the northern part of the area became overwhelmed and local sewers and drains were unable to cope with the volumes of runoff resulting in over 100 properties being flooded. The areas most affected were in low-lying urban areas where opportunities for natural drainage are limited with basement dwellings being particularly vulnerable. The locations of recorded historic flooding incidents are indicated in Figure 7.

3. Surface water flood risk

Surface water flooding can occur following intense rainfall when water is unable to soak into the ground and sewers or other drainage infrastructure are overwhelmed by the volumes of water. Other factors can play a role too, such as the site-specific topography where flow pathways or depressions contribute to flooding mechanisms.

The Environment Agency issued national indicative Flood Risk Areas, relating to surface water flood risk, in December 2010. The Brighton and Hove City Council area was ranked as the 8th highest indicative Flood Risk Area in England with 36,412 people potentially at risk.

The Risk of Flooding from Surface Water mapping set published by the Environment Agency in 2013 indicated areas at high or medium risk of flooding from surface water along many of the main routes through Brighton, including the A23 (London Road/Preston Road) and A270 (Lewes Road). There are also substantial areas within Hove which are at high or medium risk of surface water flooding, including the A270 at Hove Park, Portslade and Hangleton.

Due to the high level of surface water flood risk, additional hydraulic modelling was undertaken as part of the *Brighton and Hove City Council Strategic Flood Risk Assessment* (2018). Based on this modelling, Surface Water Flood Zones were identified to define areas potentially at risk from surface water flooding. The aim of

this is to enable a more strategic consideration of surface water flood risk in the planning and land allocation process and to secure appropriate commitments that development will be safe for its intended lifetime and not have an adverse effect on third parties. These zones are summarised below

- **Surface Water Flood Zone a: Accumulation Zone**
  Surface Water Flood Zone a (SWFZa) is defined as areas at risk of surface water flooding in a 1% AEP rainfall event; surface water is expected to pond in these areas. This event was selected to be representative of the flood risk areas in Brighton and Hove that have a reasonable chance of occurrence and be consistent with the level of risk used for fluvial and coastal Flood Zones. SWFZa is the risk extent not taking account of existing measures to manage or control risk and as such defines the zone that could potentially be affected if no measures were in place.
- **Surface Water Flood Zone b: Conveyance Zone**
  The extent of Surface Water Flood Zone b (SWFZb) is based on the speed and depth with which surface water can flow over the ground surface and identifies locations where the interruption or changing of flow direction could affect flood risk. It is defined by ground that has a gradient steeper than 1 in 20 (or a gradient of 5%).

More detailed surface water mapping, including mapping for the 1% AEP plus 30% climate change event is available for development sites from Brighton and Hove City Council's Flood Risk Management Team.

Further detail on surface water flood risk can be found in Sections 5.6-5.8 of the 2018 Brighton and Hove City Council Strategic Flood Risk Assessment.

4. Groundwater flood risk

Groundwater flooding occurs when water in the ground rise to unusually high levels, emerging at the surface or in underground structures such as basements. The chalk-dominated geology in the Brighton and Hove area allows rainfall to soak into the ground, which can contribute to increased groundwater levels leading to a risk of groundwater flooding. The area has a history of groundwater flooding, with the largest events occurring in 2000/01 leading to the closure of the A23 for several days.[7] Figure 8 indicates areas across Brighton and Hove which are at risk of groundwater flooding.

[7] *Brighton and Hove City Council Strategic Flood Risk Assessment,* JBA Consulting (2018: 5.9).

5. Risk of flooding from sewers

Where heavy rainfall overwhelms the sewer system, sewer flooding can occur. Blockages and structural defects within the sewer system can also contribute to sewer flooding.

Records held by Southern Water indicate 84 incidents of sewer flooding in the Brighton and Hove area. Whilst this is not a comprehensive register of all incidents, it indicates that sewer flooding is an issue in the Brighton and Hove area and that the unnecessary discharge of surface water to the combined sewer system should be avoided.

6. Risk of flooding from rivers and the sea

While Brighton and Hove is a coastal authority the relatively steep topography and high ground levels, in comparison to sea levels, mean that flood risk from the sea is generally low and constrained to relatively small areas in the vicinity of Shoreham Harbour. There are no main rivers in the Brighton and Hove area.

Figure 7. Map of historic flooding events

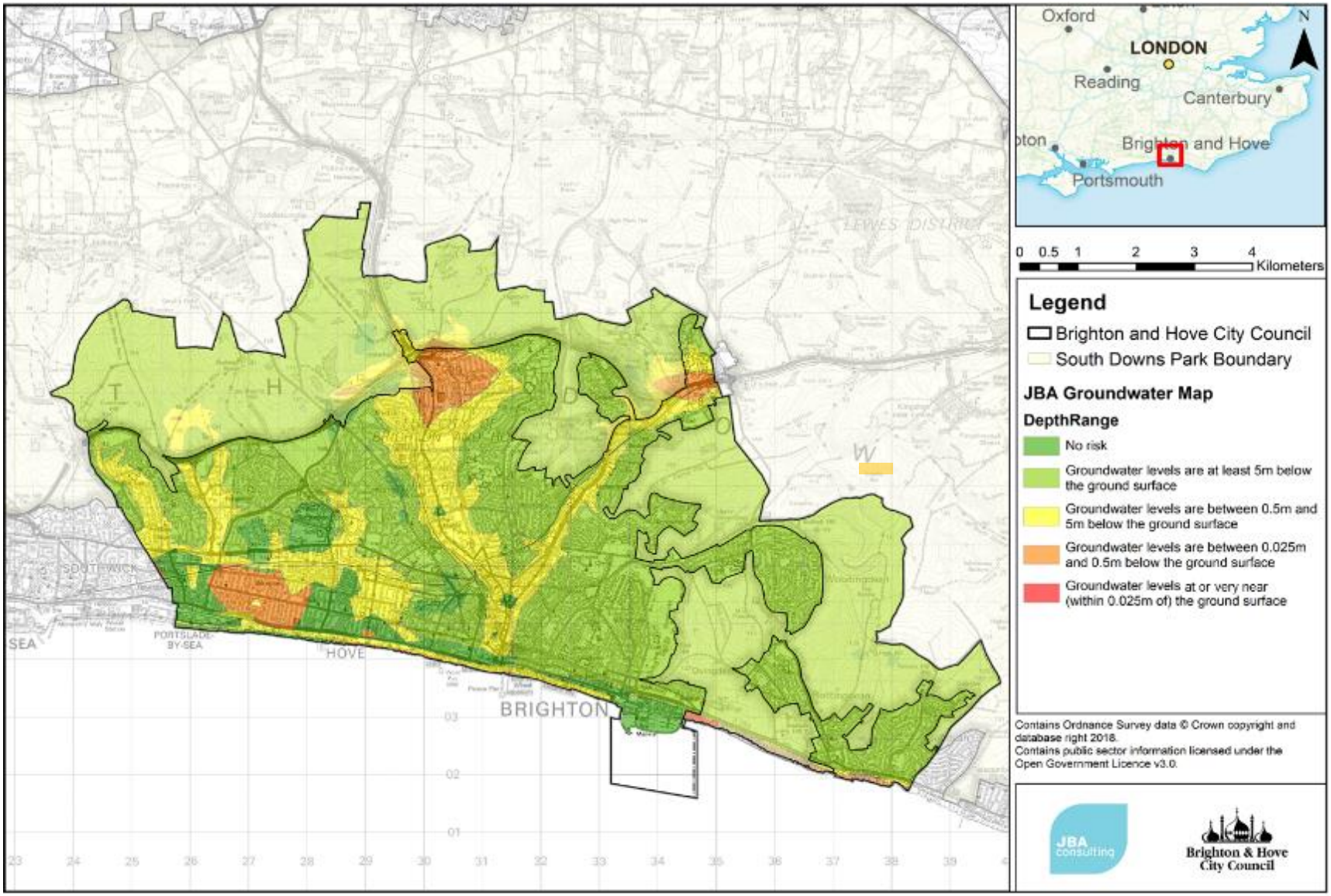

Figure 8. Groundwater flood risk map

Appendix B. Policy, legislation and guidance

1. Introduction

National and local planning policy, legislation and technical guidance all recommend the implementation of sustainable drainage measures. Key documents are summarised in Figure 9 and are discussed below.

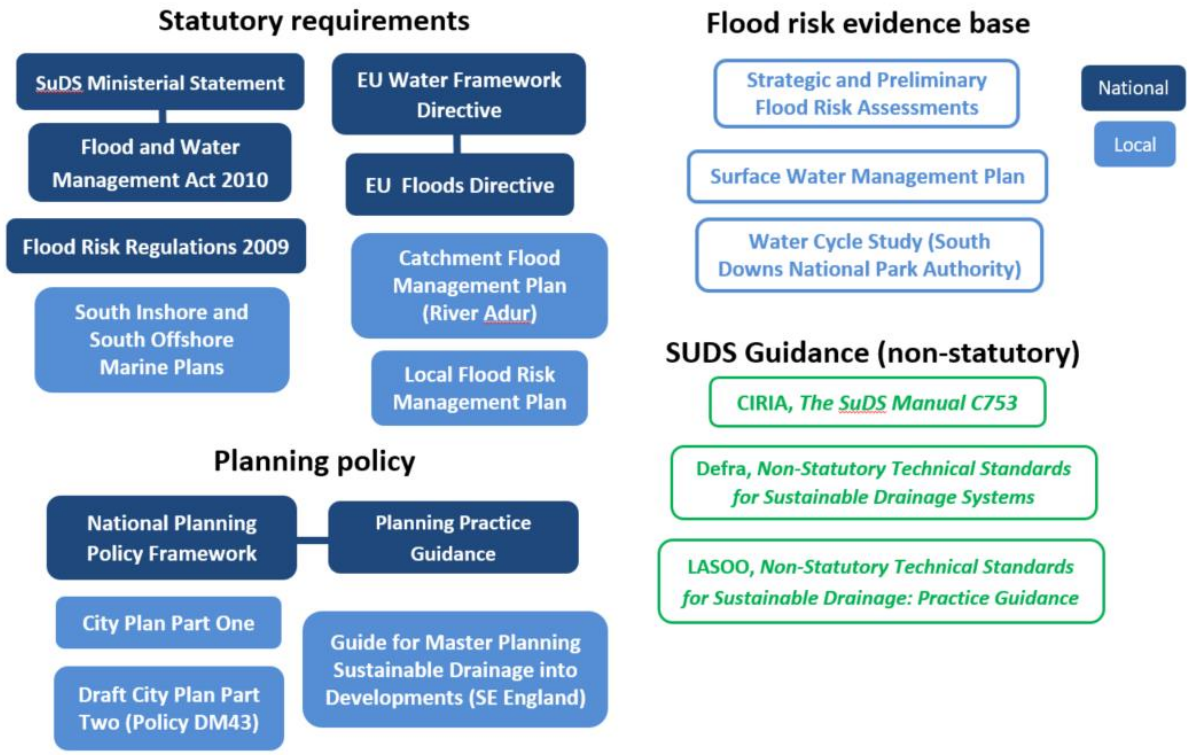

Figure 9. Local and national policy and reports relating to sustainable drainage

2. National and European policy

Following the Pitt Review, in the wake of the summer 2007 floods, a range of policy and legislation now exists relating to the management of surface water flood risk and sustainable drainage.

National Planning Policy Framework (NPPF) February 2019

The National Planning Policy Framework sets out the government's planning policies for England and how the policies should be applied including how the risk of flooding should be considered in determining planning applications. Local Authorities should ensure that flood risk is not increased elsewhere, that development is appropriately flood resilient and resistant, and that priority is given to the use of sustainable drainage systems.

Flood and Water Management Act 2010

The Flood and Water Management Act suggested that Sustainable Drainage Approving Bodies (SABs) should be set up within Lead Local Flood Authorities to ensure the implementation of appropriate sustainable drainage measures in new development. However, following a number of Department for Environment, Food

and Rural Affairs (DEFRA) consultations, it was subsequently decided that the proposed Sustainable Drainage Approving Bodies would not be implemented, and the Government announced its intention to implement sustainable drainage system via the town planning process.

House of Commons written statement on sustainable drainage systems (2014)

On 18 December 2014, The Secretary of State for Communities and Local Government issued a written statement (HCWS161) indicating that Local Planning Authorities would be expected to ensure that sustainable drainage systems where put in place, unless demonstrated to be inappropriate, in all major development (10 dwellings or more; or equivalent non-residential or mixed development – as set out in the Town and Country Planning Act). This requirement came into effect on 6 April 2015.

In March 2015 the Department for Environment, Food and Rural Affairs published Non-statutory Technical Standards for Sustainable Drainage System setting out national standards that major developments should comply with.

EU Water Framework Directive

The EU Water Framework Directive (WFD) (2000/60/EC) is a major driver for improving the quality and biodiversity of water bodies. It commits Member States to "protect, enhance and restore all bodies of surface water" (excluding artificial or heavily modified water bodies) with the aim of achieving 'good ecological status'. The WFD has been transposed into UK legislation and SuDS can contribute to achieving WFD targets by reducing pollution associated with surface water runoff and creating and enhancing aquatic habitats.

Flood Risk Regulations 2009

Sustainable drainage systems can also contribute to the EU Flood Directive (Directive 2007/60/EC) which was transposed in domestic law as the Flood Risk Regulations 2009.

3. Local policy and studies

The provision of sustainable drainage systems is now a requirement of policies adopted by Brighton and Hove City Council, including those relating to flood risk management and planning for the built and natural environments. Key documents are outlined below:

City Plan Part One (2016)

The Brighton & Hove City Plan Part One sets out the strategic policy framework to guide new development until 2030. It contains requirements for incorporating sustainable drainage into developments and outlines how SuDS can contribute to the

delivery of multiple policy objectives, including flood risk management (Policy CP11), biodiversity (CP10) and sustainable buildings (CP8). For instance:

- All development proposals should demonstrate how they reduce surface water runoff (CP8, 2h)
- Where Flood Risk Assessments are required, developments should include SuDS to avoid increases in flood risk and, ideally, reduce it (CP11)
- Proposals at sites where there is a history of past flooding will need to demonstrate appropriate mitigation measures (CP11) which should seek to achieve wider objectives for sustainability (CP8) and biodiversity (CP10).

Draft City Plan Part Two (2018)

The draft City Plan Part Two supports the implementation and delivery of the City Plan Part One through the allocation of additional development sites and through a suite of development management policies.

Draft policy DM43 outlines requirements for Sustainable Drainage Systems and managing flood risk, including:

> *"The design and layout of all new buildings, and the development of car parking and hard standing, will be required to incorporate appropriate Sustainable Drainage Systems (SUDS) capable of ensuring that there is a reduction in the level of surface water leaving the site unless it can be demonstrated not to be reasonably practicable".*
>
> *"Subterranean development, for example, storage tanks, basements or subterranean car parks, will not be permitted in areas where there has been a history of groundwater emergence".*
>
> *"SUDS should be sensitively located and designed to ensure that the quality of local water is not adversely affected; and should promote improved biodiversity, an enhanced landscape/townscape and good quality spaces that improve public amenities in the area".*
>
> *"Details of the proposed SUDS should be submitted as part of any planning application including provision for arrangements for the whole life management and maintenance of the provided SUDS."*

Brighton and Hove City Council Strategic Flood Risk Assessment (2018)

The Brighton and Hove City Council Strategic Flood Risk Assessment (SFRA) was updated in 2018 to reflect policy changes and flood events following publication of the previous edition in 2012. It identifies both current flood risk from all sources and

the potential future impacts from climate change. The updated SFRA provides a sound evidence base allowing the Local Planning Authority to understand the risk of flooding, and should be sufficiently detailed to allow application of the Sequential tests.

Brighton and Hove City Council Surface Water Management Plan (2014)

The Surface Water Management Plan provides a framework for assessing the risk of flooding from surface water in the Brighton and Hove area, as well as the options for mitigation and management. The study identified seven 'hotspots' of significant flood risk, as well as proposals for further investigations and mitigation measures, including sustainable drainage components, property-level protection and highway works.

Brighton and Hove City Council Local Flood Risk Management Strategy (2015)

This strategy sets out objectives for managing local flood risk, considering the impact of all sources of flooding, including surface water, groundwater and the sea. It outlines the role of the Council as Lead Local Flood Authority for managing local sources of flood risk, as well as national legislation making sustainable drainage a requirement for new development proposals.

Brighton and Hove City Council Preliminary Flood Risk Assessment (2011)

This is a statutory document completed to comply with the requirements of the Flood Risk Regulations 2009. It provides a high level overview of the past and future flood risk from a range of sources, including surface water and groundwater. It does not include an assessment of coastal flood risk.

4. Technical guidance and standards

A wide range of technical resources and best practice guidance for the design and implementation of SuDS are currently available. Key documents are listed below:

- CIRIA (2015) *The SuDS Manual (C753)*
- CIRIA (2017) *Guidance on the construction of SuDS (C768)*
- Defra (2015) *Non-statutory technical standards for sustainable drainage systems*
- LASOO (2016) *Non-Statutory Technical Standards for Sustainable Drainage: Practice Guidance*
- CIRIA (2015) *BeST (Benefits of SuDS Tool, W045)*.
- Historic England *Flooding and Historic Buildings Second edition*

An extensive list of resources can be found at the Susdrain website: www.susdrain.org/resources

Appendix C. Sustainable Drainage Systems (SuDS) components and the Brighton and Hove City Council area.

SuDS should be sensitively located and designed and should be considered in the context of the neighbouring and wider land use as this can have a significant influence on the site-specific design of SuDS.

While the use of basic SuDS techniques such as permeable paving, soakaways, geocellular soakaways and infiltration trenches is likely to be acceptable in small scale development, Brighton and Hove City Council would strongly encourage the use of surface SuDS delivering wider biodiversity, ecology, amenity and sustainability benefits. The linking of habitats, nature conservation sites and green and blue infrastructure is also strongly encouraged, in the design and implementation of SuDS systems.

Brighton and Hove City Council is working with local communities, urban professionals and INTERREG 2 Seas SCAPE partners on the Shaping Climate Change Adaptive Places (SCAPE) project. The SCAPE project aims to develop 'Landscape-led Design' solutions for water management that make coastal landscapes better adapted and more resilient to climate change and seeks to increase the cost effectiveness of water management techniques and deliver pilots that test innovative tools and solutions to surface flooding that provide wider community benefits.

The retro fitting of SuDS in Carden Avenue and Norton Road is being investigated as part of the SCAPE project. Measures under consideration include a series of interception and infiltration basins, rain gardens and bio-retention planters In Carden Avenue, and the reprofiling of the carriageway to direct runoff to interception chambers, bio-retention planters, permeable paving and below ground attenuation storage in Norton Road.

Further details of the SCAPE project and the proposed retro fitting of SuDS in Carden Avenue and Norton Road can be found on the SCAPE project webpage on the City Council's website BHCC SCAPE project

It should be noted that the cumulative effect of small scale development on surface water runoff can be significant. It is therefore important that adequate measures are incorporated in all development to deal with and prevent increases in surface water runoff.

The connection of surface water runoff to the combined sewer system is particularly detrimental and rapidly erodes the sewer's capacity, and should be avoided if at all possible

A summary of typical components which can be applied in SuDS schemes, including their key features and contexts where they may be appropriate follows.

Technical detail on individual components, including criteria for selection, design, materials and maintenance, can be found in:

- *The SuDS Manual C753* (CIRIA, 2015)
- The Susdrain website: www.susdrain.org/delivering-suds/using-suds/suds-components/suds-components.html

Planting trees can intercept, store and encourage the evapotranspiration of stormwater. Tree pits and planting structures can also provide additional water attenuation capacity.

Image courtesy CIRIA

Permeable paving allows water to soak through hard surfaces, helping to attenuate runoff peaks and volumes, and provide an element of treatment. Stormwater may infiltrates into the ground below or be stored in the sub-base prior to discharge to an outfall. Utility services should be located in service strips, with conventional service finishes, routed around areas of permeable paving, to avoid future damage to the permeable paving system and avoid additional reinstatement costs following utility company excavations.

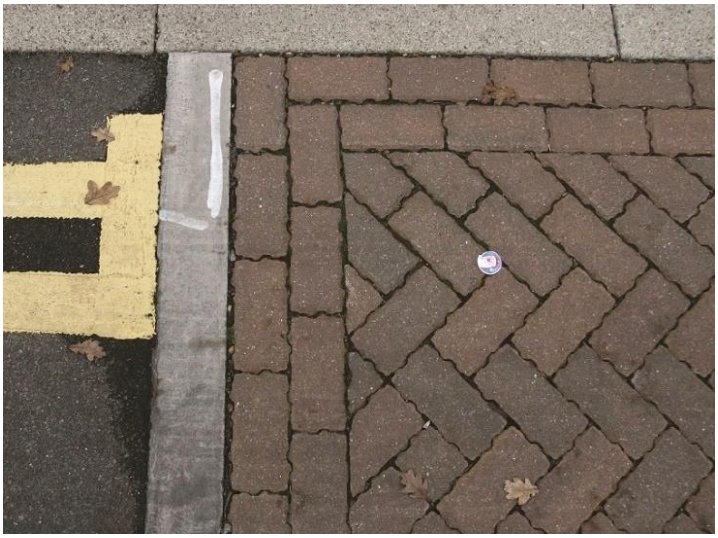

Image courtesy CIRIA

Rain gardens are shallow landscape features including enhanced planting that are typically under-drained. They provide a form of **bioretention system** that removes pollution, allows soakage to ground and reduce runoff.

Image: Project Centre Ltd

Swales are shallow vegetated channels for conveying, treating and/or attenuating surface water. "Dry" swales are normally dry and may allow water to soak into the ground naturally or via infiltration trenches. 'Wet' swales contain shallow water throughout the year, increasing during rainfall events.

Image courtesy CIRIA

Rainwater harvesting systems collect water from impermeable surfaces, such as roofs, for reuse. By intercepting rainfall, they reduce runoff volumes at source. Uses for harvested rainwater include irrigation, toilets and washing machines.

Image © Meg Stewart (cc-by-sa/2.0)

Filter strips consist of areas of gently sloping grass or other vegetation and allow treatment of runoff by encouraging the deposition of fine sediments and pollutant particulates. Filter strips are effective where runoff velocities are low and treatment processes can take place.

Image courtesy CIRIA

Detention basins are depressions formed in the landscape to allow the storage of runoff during rainfall events. They are intended to be dry in normal conditions, and may be used for other purposes, such as recreation, at such times. Detention basins may allow soakage of water into the ground or form part of a system allowing the attenuation of flows prior to discharge at a controlled rate.

Image courtesy BHCC

Ponds and wetlands treat and attenuate stormwater runoff. Ponds can remove contaminants and sediments by promoting settlement. Wetlands are shallow, heavily vegetated water bodies that remove contaminants and sediments by promoting settlement and filtration using aquatic plants species. Ponds and wetlands can deliver significant ecological benefits and should be the last stage of the Management Train to avoid excessive sedimentation.

Image: M J Richardon / *Urban Landscape - WWT London Wetland Centre* / cc-by-sa/2.0

Soakaways are sub-surface structures which temporarily store water before allowing soakage into the ground. The structure which may consist of conventional precast concrete chamber rings or geocellular units. Infiltration trenches work in a similar way.

Image © Des Blenkinsopp / cc-by-sa/2.0

Green roofs cover building roofs with a planted soil layer and can provide interception storage, and an element of attenuation and treatment of runoff, directly at source. They can also contribute to biodiversity and building energy performance.

Image: © Aloha John / cc-by-sa/2.0

Below ground storage structures allow the temporary storage of surface water. The water may subsequently be infiltrated, discharged in a controlled manner, or reused. Below ground storage includes tanks, oversize pipes and attenuation crates.

Image: WavinUK [permission requested]

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