Norfolk County Council

Lead Local Flood Authority

Statutory Consultee for Planning

Guidance Document

Version 7.1, June 2024

Contents

Tables

Figures

1 Purpose of this document

1.1.1 This guidance document is intended to support the development of Norfolk County Council (NCC), as Lead Local Flood Authority's (LLFA) role as a statutory consultee to planning, and to inform stakeholders in this process such as Local Planning Authorities (LPAs) and developers. This document is broken into three parts.

Part A aims to:

- Outline planning policy with regard to local flood risk and surface water drainage.
- Explain the role of the LPA in determining Sustainable Drainage Systems (SuDS) proposals on new developments.
- Outline the LLFA's role as a statutory consultee to planning.

Part B aims to:

- Explain how the LLFA will fulfil this function and when it should be consulted.

Part C aims to:

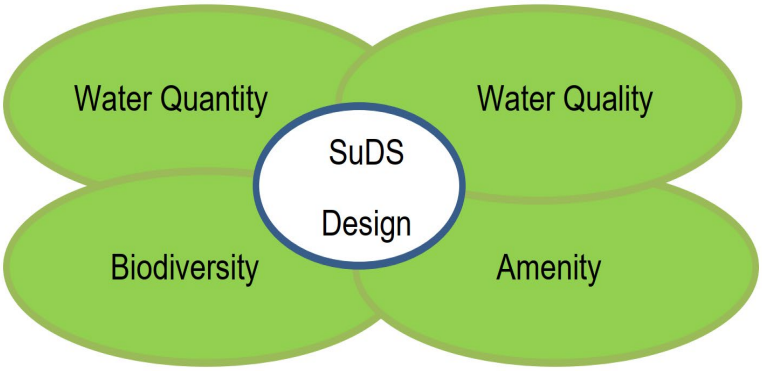
- Provide guidance for developers on the information required by the LLFA from applicants to enable it to provide responses to major planning applications.

1.1.2 This document will be periodically reviewed to ensure that its contents remain accurate and provides an appropriate level of detail. References and links are included within the text of this document to highlight other publications that should be read in conjunction with this guidance. The role the LLFA plays in supporting the development of Local Plans and policies is not currently covered by this document.

2 What is Sustainable Drainage?

2.1.1 Surface water drainage systems developed in line with the ideals of sustainable development are collectively referred to as SuDS. Approaches to manage surface water that takes into account water quantity (flooding), water quality (pollution), amenity and biodiversity issues are collectively referred to as sustainable drainage. These are the four pillars of SuDS design. The

philosophy of SuDS is to replicate, as closely as possible, the natural drainage from a site before development and to use multifunctional features such as shallow open basins to mimic the pre-development scenario and manage water close to where it falls (interception). SuDS can be designed to slow water down (attenuate and / or reuse it) before it enters streams, rivers and other watercourses, they provide areas to store water in natural contours and can be used to allow water to soak (infiltrate) into the ground, evaporate from surface water or be transpired from vegetation (known as evapotranspiration).



2.1.2 Due to developer concerns of long-term maintenance more conventional piped drainage that conveys water to an attenuation tank are often proposed as SuDS. Whilst these systems provide some elements of SuDS and may meet some of the required standards, they frequently do not consider any water reuse, interception, water quality, amenity or biodiversity benefits. The piped and tanked systems can be put forward for adoption and long-term maintenance by Anglian Water Services Limited (or NAV), but these will be classed as conventional drainage systems and not SuDS.

New appointments and variations (NAVs) are limited companies which provide a water and/or sewerage service to customers in an area which was previously provided by the incumbent monopoly provider. A NAV, therefore, involves **one company replacing another as the appointee** for a specific geographic area. Further information about NAVs is available on the OFWAT website (OFWAT website for NAV information).

2.1.3 NCC will require that all four pillars of SuDS design be proposed to be classed as SuDS in a planning application. Sufficient justification would be required to demonstrate why all four pillars cannot be achieved.

2.1.4 Early engagement with Anglian Water Services Limited (or NAV) and / or the Highways Authority is advised. In line with the water company Codes for Adoption also known as the Design and Construction Guidance (DCG) both Authorities have recently changed the way they review SuDS and adoption, please contact them for up-to-date information. DCG now warrants adoption for open (and some closed) SuDS hence they are considered for adoption. Any proposal needs to meet with the appropriate authorities' standards. NCC Highways Authority will consider adopting SuDS if they are appropriate and only take drainage from the adoptable Highway.

3 Abbreviations and Definitions

3.1.1 Abbreviations used in this document are set out below:

Acronym / Abbreviation	Description
ASA	Association of SuDS Authorities
CC	Climate change
CWaMP	Construction Water Management Plan
DCG	Design and Construction Guidance (Water UK)
EA	Environment Agency
FRA	Flood Risk Assessment
GIS	Geographic Information System
ha	Hectares
IDB	Internal Drainage Board
LASOO	Local Authority SuDS Officer Organisation (superseded by ASA as of Feb 2019)
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority

Acronym / Abbreviation	Description
LPA	Local Planning Authority
MHWS	Mean High Water Spring
NAV	New Appointments and Variations
NCC	Norfolk County Council
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance
RoFSW	Risk of Flooding from Surface Water
RoSPA	Royal Society for the Prevention of Accidents
RMA	Risk Management Authority
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
WFD	Water Framework Directive
100% AEP (Annual Exceedance Probability) flood	Commonly referred to as the 1 in 1 year storm but is an event which is likely to happen every year
10% AEP (Annual Exceedance Probability) flood	Commonly referred to as the 1 in 10 year storm. Has a 10% chance of occurring in any single given year.
3.33% AEP (Annual Exceedance Probability) flood	Commonly referred to as the 1 in 30 year storm. Has a 3.33% chance of occurring in any single given year and not just every 30 years
1 % AEP (Annual Exceedance Probability) flood	Previously referred to as the 1 in 100 year storm. Has a 1% chance of occurring in any single given year and not just every 100 years

Acronym / Abbreviation	Description
0.1% AEP (Annual Exceedance Probability) flood	Previously referred to as the 1 in 1,000 year storm. Has a 0.1% chance of occurring in any single given year and not just every 1000 years

4 Part A - National Policy Background and Approach

4.1 Background

4.1.1 From April 2010 to late 2014 the Government had intended to implement Schedule 3 of the Flood and Water Management Act 2010. The inclusion of SuDS in the Act was seen as essential due to the number of properties flooded from surface water and the overloading of drainage systems in 2007 (as reported in the Pitt Review). Schedule 3 of the legislation would have placed Unitary Local Authorities and County Councils at the centre of a new process (separate from planning), for approving, adopting and maintaining SuDS on new major developments. Subsequent to proposing and delaying the implementation of this Schedule on a number of occasions, the Government resolved to deliver SuDS on new developments using the existing Town and Country Planning process with changes implemented on 15 April 2015.

4.1.2 As per National Planning Policy Framework (NPPF) 'Major Development' can be defined as follows "for housing, development where 10 or more homes will be provided, or the site has an area of 0.5 hectares or more. For non-residential development it means additional floorspace of 1,000m2 or more, or a site of 1 hectare or more, or as otherwise provided in the Town and Country Planning (Development Management Procedure) (England) Order 2015".

4.1.3 As set out in the PPG in Paragraph 051 Reference ID: 7-051-20220825 "'Non major development' is any development falling below the above thresholds but excluding minor development. For example, a planning application for 8 dwellings, an office building creating 750 square metres of floor space, or a development with a site area of 0.4 hectares".

4.1.4 As set out in PPG Paragraph 051 Reference ID: 7-051-20220825 "Minor development means:

- minor non-residential extensions (industrial/commercial/leisure etc): extensions with a floorspace not in excess of 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) or any other development with a purpose not incidental to the enjoyment of the dwelling".

4.1.5 In 2023 the Government committed to reviewing implementation of Schedule 3 of the Flood and Water Management Act 2010. Further updates to the guidance will be undertaken at appropriate intervals.

4.1.6 Further information can be found within Annex 1.

4.2 The role of the LPA in determining planning applications

4.2.1 The role of the LPA is to determine planning applications in accordance with national policy, local policies and relevant guidance whilst taking into account advice from statutory consultees (such as the LLFA and Environment Agency (EA)) alongside other material considerations. The LPA would also consider advice from other consultees which are non-statutory. These include other risk management authorities (RMAs) such as Internal Drainage Boards (IDBs), Anglian Water Services Limited (or NAV) or the Canal and River Trust.

4.2.2 Where the planning application falls within the boundary of an IDB, they should be consulted along with the LLFA. The IDB, as an RMA, would have a significant role in managing the risk of flooding and the LLFA would want to avoid duplication of advice to the LPA. However, the LLFA would, where appropriate, ensure that SuDS and other local flood risk issues had been considered in a consistent approach across the county of Norfolk.

4.3 Recent National Policy Update on Flood Risk and SuDS

4.3.1 In December 2023 the Government updated the NPPF. The framework acts as guidance for Developers, LPAs and wider decision-takers, both in drawing up plans and making robust spatial planning decisions for new development proposals. Section 14 of the NPPF, "Meeting the challenge of climate change,

flooding and coastal change" (paragraphs 157 to 175) contains key information on how flood risk and SuDS should be considered as part of new development. Paragraph 180 also highlights the need to prevent pollution which is integral to a well-designed SuDS scheme.

4.3.2 Paragraph 173 and 175 of the NPPF includes key references to flood risk and SuDS for LPAs considering planning applications. It highlights that when determining planning applications, LPAs should for all types of development:

- Ensure flood risk is not increased elsewhere.
- Only consider development appropriate in areas at risk of flooding where it can be demonstrated that within the site:
    - The most vulnerable development is located in areas of lowest flood risk for any source.
    - Development is appropriately flood resilient and resistant and can be brought back into use without significant refurbishment.
    - It incorporates SuDS.
    - That any residual risk can be safely managed.
    - Safe access and escape routes are included were appropriate as part of an agreed emergency plan.

4.3.3 Footnote 59 of the NPPF states that a site-specific Flood Risk Assessment (FRA) is required for:

- All development in Flood Zones 2 and 3.
- Development in Flood Zone 1 where the proposal is 1 hectare or greater.
- Land that has been identified by the Environment Agency as having critical drainage problems.
- Land that has been identified within any Strategic Flood Risk Assessment (SFRA) that may be at increased risk of flooding in the future.
- Land that is subject to other sources of flooding where development would introduce a more vulnerable land use.

4.3.4 NCC published its Environment Policy (including the Norfolk and Suffolk Natural Capital Assets Evidence Compendium, October 2020) which was

presented and approved at Full Council on 25 November 2019 to support the Government's 25 year environmental plan. The Policy supports the management and adaptation to ever increasing extremes such as flooding and drought through integrated water management (i.e. SuDS). Key policy aims are as follows: -

- Using and managing land sustainably.
- Recovering nature and enhancing the beauty of landscapes.
- Connecting people with the environment to improve health and wellbeing.
- Increasing resource efficiency and reducing pollution and waste.
- Secure clean, healthy, productive and biological diverse seas and oceans.

- Protecting and improving our global environment.

Photo 1: Photo showing example of retrofit SuDS: Tree pit Wymondham NCC Recycling Centre, Norfolk. Treating surface runoff from hard standing before discharging to watercourse.

Photo 2: Photo showing example of retrofit SuDS: Planter with under drained raingarden, over edge drainage from the highway and paths. Sheffield Grey to Green Project.

4.4 Involving the LLFA when determining planning applications

4.4.1 The Government acknowledged the need for LPAs to access advice from LLFAs when determining planning applications. As part of the consultation on further changes to statutory consultee arrangements for the planning application process, the Government sought to avoid unnecessary over-consultation of the LLFAs. The focus of the LLFAs in their statutory consultation role is to provide the LPAs with expert advice in order for the LPAs to determine the application. The Government's response to this consultation confirmed it was for this reason that they limited the LLFAs statutory consultee role to major development.

4.4.2 As part of the consultation, it was suggested that LPAs may find it helpful to agree with the LLFA the circumstances and locations where LLFA advice

should be sought about a planning application which raises surface water or other local flood risk issues on a non-statutory basis. It was noted that the risk of over-consultation could also be managed locally by the LLFA informing the LPA that it does not wish to be consulted in certain instances or through providing standing advice. This was reinforced by the Government's New Burdens Assessment that stated it was expected that in the first year of their statutory consultee role the LLFA will develop standing advice. It is against this background that Part B of this document has been developed.

4.4.3 The LLFA will provide a substantive response to all consultations received for major development within the statutory timescales. The type of response the LPA can expect are detailed in Table 1 below and Annex 1, Section A4.4, which includes standing advice or where the LLFA choose not to comment. Only in exceptional circumstances would the LLFA not provide a response.

4.4.4 As of 01 October 2018, planning permission can only be granted subject to recommended pre-commencement conditions being agreed with the applicant. For outline stage the LLFA recommends pre-commencement conditions to ensure that detailed design will be finalised to the appropriate standard and secure space for SuDS / local flood risk management that is compatible with other layout constraints e.g. services landscaping or road network prior to the commencement of works. This is to assist the applicant as the LLFA know that detailed information is not always available at an initial planning application. However, if the applicant does not wish to accept pre-commencement conditions the LLFA request that the information be supplied prior to LPA determination to ensure there is no increase in flood risk due to the proposed development and therefore not in line with the NPPF. This is because the LLFA have frequently experienced that modifications to the drainage design cannot be incorporated if the development has commenced.

4.4.5 For the avoidance of doubt at full planning, the LLFA now require all information to be provided upfront i.e. full detailed designs as we do not apply pre-commencement conditions (only in very extenuating circumstances i.e. confirmatory investigations).

5 Part B – Norfolk Lead Local Flood Authority Approach

5.1 When to consult the LLFA?

5.1.1 All consultations and correspondence should be directed to the LLFA inbox at llfa@norfolk.gov.uk. Please note it is still necessary to consult other departments of the County Council as is current practice (e.g. for Highways matters). The Flood and Water Management Team will respond to any such consultations within 21 days of being consulted.

5.1.2 The thresholds at which the LLFA will provide bespoke advice will be periodically reviewed to ensure that the resources of the LLFA are focused where they can make the biggest contribution to mitigating and reducing local flood risk.

5.1.3 The current LLFA thresholds for bespoke advice are:

Residential developments with greater than or equal to	**100 properties**
All developments with an area greater than or equal to	**2 hectares**

However, there are other high-risk applications which the LLFA will aim to respond to under this general threshold (see Table 1 and text below). The LLFA will currently aim to provide bespoke consultation responses for the following application types:

- All residential development applications where the **number of units is greater than or equal to the LLFA threshold**. This would include individual applications of a multi-phased development that in total would be equivalent to or greater than the LLFA threshold.
- All other development applications with an **area greater than or equal to the LLFA threshold**.
- Any major development applications that have a **local flood risk** and are on an obvious flow route or include extensive surface water or fluvial flooding on the site. Significant ponding of surface water over a large proportion of the site boundary also falls within this category. Further information on screening applications against local flood risk is

provided in Section 5.2.

- Sites adjacent to, or within, areas with **records of local flooding** (as evidenced and provided by the LLFA). Further information on screening applications against local records of flooding is provided in Section 5.2.

5.1.4 Standing advice is provided to assist the LPA in determining the remaining developments for which the LLFA would not expect to be consulted. A matrix setting out when the LLFA should be consulted on applications is included as Table 1.

Table 1: Matrix indicating when to consult the LLFA depending on development and local flood risk ranking.

Development Category	Local flood risk	Records of local flooding (internal property flooding only as evidenced by LLFA)	No flood records or local flood risk
Minor / Non-Major development	No consultation required – standing advice applies	No consultation required – standing advice applies	No consultation required – standing advice applies
Major development below LLFA thresholds	**Consult LLFA**	**Consult LLFA**	No consultation required – standing advice applies
Major development above LLFA thresholds	**Consult LLFA**	**Consult LLFA**	**Consult LLFA**

5.1.5 Standing Advice provided by the LLFA and detailed in Section 5.4 includes:

- **Standing Advice 1: Developments that may require consent for works within ordinary watercourses** (any watercourse, ditch, stream, culvert or pipe (except those regulated by IDBs or Main Rivers which are regulated by the Environment Agency), as represented by the Detailed River Network or Ordnance Survey mapping) on, or within 5 meters of the development sites, including culverted or piped watercourses. Any applicant would still be required to apply separately

to LLFA for consent. Further information on this process is available on the NCC website.

- **Standing Advice 2: Major developments outside of the current LLFA thresholds** set out above in Section 5.1.3. or developments identified as only having potential isolated areas of surface water ponding on the Environment Agency's Risk of Flooding from Surface Water (RoFSW) map which indicates local flow points on the site. These are unlikely to be of a depth to cross the threshold of buildings and are usually rationalised during development.
- **Standing Advice 3: Minor / Non-Major development** for which the LLFA will not be consulted, including domestic extensions, residential developments less than 10 dwellings, basements etc.
- **Standing Advice 4: Solar farm development sites** and guidance the applicant should ensure the proposed development is in line with.
- **Standing Advice 5: Quarries and mineral extraction sites** and guidance the applicant should ensure the proposed development is in line with, for each phase of development.
- **Standing Advice 6: Polytunnels, glasshouse, agricultural and horticultural buildings** linked to increased flood risk and the requirement for mitigation measures.

5.1.6 Please note if LPAs determine applications contrary to the LLFA statutory consultee advice they are asked to inform the LLFA (by email at llfa@norfolk.gov.uk). Reporting these decisions aids the LLFA in monitoring the impact of planning on local flood risk in line with our Local Flood Risk Management Strategy.

5.1.7 Failing to adequately consider local flood risk or making adequate provision for SuDS within a development site may result in properties within the development being placed in an area at risk of flooding or alternatively may result in an increase in the risk of flooding elsewhere. This is contrary to the requirements of Paragraph 173 and 175 of the NPPF. As part of our responsibilities as LLFA, when and where incidences of flooding occur within

buildings, the LLFA investigate the sources and contributing factors to that flooding incident. As part of this investigation, the LLFA would review how flood risk had been considered by the development management process.

LLFA Paid Advice Service:

5.1.8 The LLFA welcome and encourage early engagement and offer advice to developers or their consultants on a chargeable basis. Information on charges and how to apply are available on NCC's website. The LLFA advice can range from a simple desk top study of information the LLFA hold, initial scoping meeting, bespoke advice on issues or a full review of documents prior to submission to the LPA. When requesting the service, the LLFA would find it helpful that the extent of advice sought is clear and, as a minimum, a plan showing a red line boundary of the site to discuss is submitted. The LLFA's aim is to discuss and offer advice for technical constraints on specific sites. This advice is most useful prior to applying for planning permission or consent to alter a watercourse. The LLFA provide this service when resources allow as it is outside of its statutory duties.

5.2 How to screen applications based on local flood risk and local flood records?

Local flood risk

5.2.1 There are a number of data sources that are available to LPAs to screen planning applications when determining the need to consult the LLFA. The key datasets are:

- The Environment Agency's RoFSW maps - specifically the 3.3% Annual Exceedance Probability (AEP) and 1% AEP extent maps downloadable from the Environment Agency Defra Data Services Platform or online mapping at the Environment Agency long term flood risk for an area in England. The District SFRA surface water flood maps and LLFA SWMPS, also provide updates on these risk bands but also shows evidence of impacts of climate change, which national mapping does not currently make an allowance for.

- The UK Centre for Ecology and Hydrology (UKCEH) digital river network of Great Britain (1:50,000) includes centrelines for rivers, canals, surface pipes (man-made channels for transporting water such as aqueducts and leats); and miscellaneous channels (including estuary and lake centrelines and some underground channels). This dataset is less reliable in pumped catchments but is available for download on the website.

5.2.2 The LLFA should be consulted on development sites that have a current risk of flooding or have the potential to increase local flood risk. Greenfield example sites are shown in Figure 1 and brownfield example site are shown in Figure 2.

5.2.3 As a guide (but with reference to Table 1 above), the **LLFA expects** to be consulted on developments that:

(a) Have a flow path passing though the development.

(b) Have a risk of surface water flooding along all or part of the development boundary.

(c) Where there is a risk of flooding to adjacent properties.

5.2.4 The **LLFA does not expect** to be consulted on applications where there are (d) isolated areas of surface water ponding identified on the site. In the case of brownfield development where there are isolated areas of surface water ponding (d), the LLFA do not expect to be consulted but do expect the applicant provide betterment to the current surface water runoff by the provision of surface water drainage runoff and attenuation.

5.2.5 It should be noted that pumped or artificially managed catchments are not accurately represented by national fluvial and surface water mapping produced by the Environment Agency.

Figure 1: Four maps showing local flood risk consultation examples in greenfield areas.

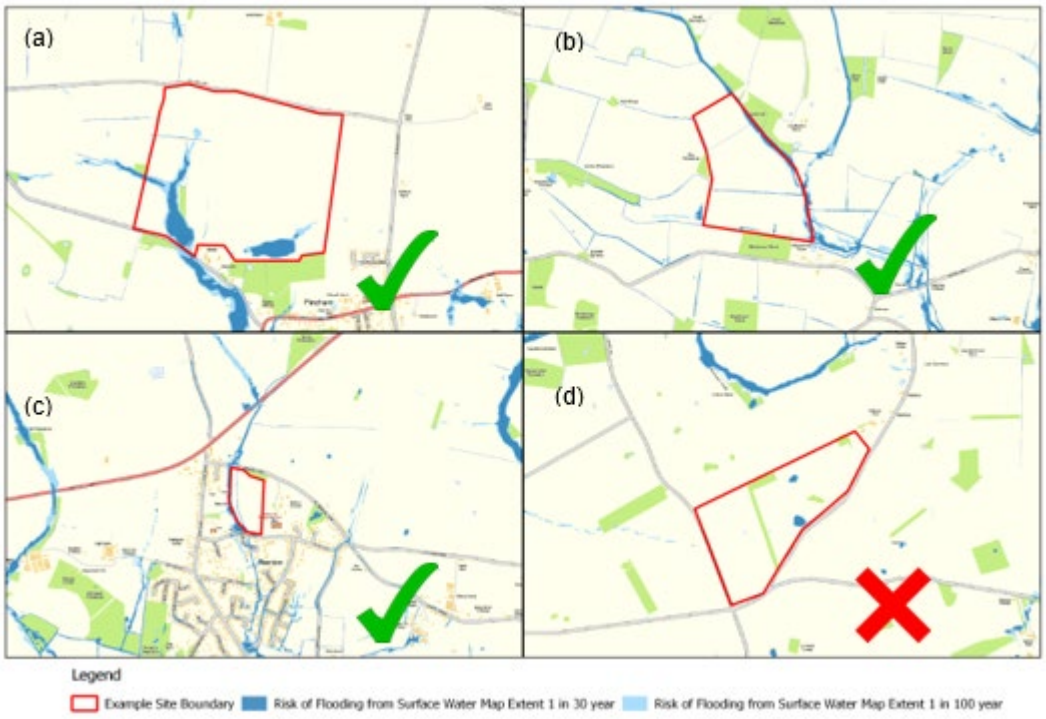
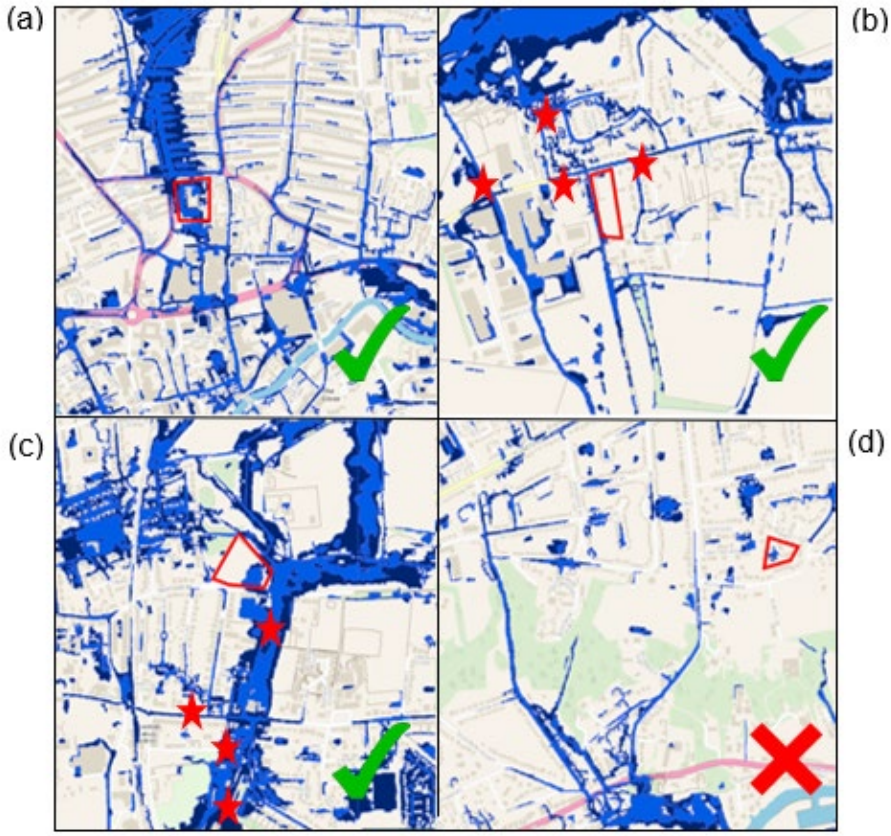


Figure 2: Four maps showing local flood risk consultation examples in brownfield areas (red stars = historical flooding)



Records of local flooding

5.2.6 There are areas in Norfolk for which there are historic records of flooding. In these areas, the LLFA would expect to be consulted on applications. The LLFA holds a GIS database of recorded flood incidents in Norfolk which have been investigated and published. These records are restricted to those properties which have been internally flooded or certain roads if made impassable due to flooding.

5.2.7 Local representations may be provided alongside development applications that identify historic incidents of flooding on the site or flood risk issues in the vicinity of the site. The LLFA will review and acknowledge anecdotal evidence where surface water flooding has been experienced on the development site or if local representations identify previous incidents of surface water flooding

in the Highway or in properties adjacent to the development site. The LLFA do not, however, have sufficient resources to comment on all applications where there are anecdotal records of flooding but where no internal flood incidents have been investigated and published.

5.3 Other sources of advice for Local Planning Authorities

5.3.1 In addition to seeking advice from the LLFA, the NPPF Planning Practice Guidance recommends that LPAs consult the following stakeholders as appropriate:

(a) The relevant sewerage undertaker where a connection with a public sewer is proposed.

(b) The Environment Agency, if the drainage system directly or indirectly involves the discharge of water into a watercourse or groundwater (although advice is given only when certain thresholds are passed). It would include if any deep infiltration was proposed to ensure that the development is not contrary to the Environment Agency's Groundwater Protection Position Statement G9.

(c) The relevant Highway Authority for an affected road.

(d) The Canal and River Trust, if the drainage system may directly or indirectly involve the discharge of water into or under a waterway managed by them.

(e) An IDB, if the drainage system may directly or indirectly involve the discharge of water into an ordinary watercourse within a Board's district; or if the site is within the maintenance strip of a Board's maintained watercourse.

5.4 LLFA Standing Advice

5.4.1 The standing advice referred to in the matrix of Table 1.

Standing Advice 1: Ordinary Watercourse Consenting

NCC as the LLFA for Norfolk is the drainage authority under the Land Drainage Act 1991 for regulating works on ordinary watercourses for the 80%

of Norfolk outside of Internal Drainage Board (IDB) areas. If there are any works proposed as part of this planning application that are likely to obstruct flows in an ordinary watercourse, then the LPA should inform the applicant they are likely to need the approval of NCC or the relevant IDB. This approval is separate from the planning process and the LLFA / IDB will issue a consent where appropriate.

In line with good practice, the LLFA seeks to avoid culverting, and its consent for such works will not normally be granted except as a means of access and it can be evidenced that there is no other feasible option. This is supported by LLFA Policy (OW4: Culverting) within Norfolk Local Flood Risk Management Strategy.

Where culverting is proposed, the LLFA expect the application to consider the appropriate design flow considering the local circumstances. This may include design elements for both low and high flow scenarios. Where culverts are being replaced or upgraded then the LLFA expect an assessment to show how flood risk is not increased downstream from the loss of storage of water behind a culvert.

Guidance on this process as well as downloadable applications forms can be found on the NCC website page "Consenting works on ordinary watercourses".

Standing Advice 2: Major Development below LLFA thresholds

To ensure that development is undertaken in line with Paragraph 173 and 175 of the NPPF the LLFA recommends that LPAs satisfy themselves of the following considerations prior to granting permission for major development below LLFA thresholds:

1. Is the development site currently at risk of flooding?
2. How does the site currently drain?
3. How will the site drain?
4. What sustainable drainage measures have been incorporated into the design?

5. How many SuDS pillars (Water Quantity (flooding), Water Quality (pollution), Amenity and Biodiversity) are included?

At a high level, the following evidence should be submitted by applicants for review by the LPA to demonstrate compliance with Paragraph 175 of the NPPF.

A checklist to assist LPAs determine if this information has been submitted is in Annex 2.

Standing Advice 3: Minor / Non-Major Development

All minor / non-major development should be assessed appropriately according to the scale of the development and its location in relation to existing or possible future flooding risk. To ensure that minor / non-major development is undertaken in line with Paragraph 173 of the NPPF the LLFA recommends that LPAs satisfy themselves of the following considerations prior to granting permission for minor / non-major development:

1. Is the development site currently at risk of flooding?

   The risk of flooding on the current site should be acknowledged using national flood risk datasets such as the Environment Agency's Risk of Flooding from Surface Water maps and available information from the relevant SFRA. If any areas at risk of flooding are identified, these should be avoided from development or adequate flood resilience measures incorporated in the design. This may include an emergency flood plan where appropriate.

2. How does the site currently drain?

   The method through which the site currently drains should be described, such as whether there are existing infiltration features, ordinary watercourses within or at the boundary of the development, or existing surface water sewer infrastructure.

3. How will the site drain?

   The proposed method for draining the site should be in accordance with the sustainable drainage hierarchy; with a preference for shallow (<2m deep) infiltration measures, followed by measures to drain to a nearby watercourse,

otherwise discharging to a surface water sewer. The last method of draining a site would be to either a combined sewer, or via deep infiltration methods (>2 m below ground level). Discharge of surface water to a foul sewer is not acceptable. Betterment of surface water runoff from an existing brownfield runoff must be considered. Brownfield surface water runoff rates and volumes should be attenuated as close to greenfield rates as possible. Evidence of at least one achievable drainage proposal (Plan A) should be provided if not, then evidence of an alternative (Plan B) should also be included. Surface water runoff attenuation must include climate change and urban creep allowances.

4. What sustainable drainage measures have been incorporated into the design?

   Surface water drainage systems should replicate natural drainage processes as closely as possible. Sustainable Drainage Systems (SuDS), such as permeable paving, swales, green roofs / walls or attenuation basins should be preferred on all development sites ahead of conventional drainage measures (piped systems). Geocellular storage crates can provide elements of SuDS such as attenuating the amount of water to prevent an increase in flood risk, however without another SuDS component (swales, filter strips or drains) they do not provide any water quality treatment.

5. How many SuDS pillars (Water Quantity (flooding), Water Quality (pollution), Amenity and Biodiversity) are included?

   Should the development be prioritised over a site that does not have SuDS? All four pillars need to be considered to enable the application to be classed as SuDS. Some brownfield sites may not be able to meet all four pillars, but justification and supporting evidence must be provided why fewer are achieved.

   Minor / non-major development commonly includes extensions that may build over existing surface water drainage infrastructure. The LLFA recommend that any existing drainage scheme is diverted rather than built over as this can lead to internal property flooding if not adequately designed. If it cannot be diverted a minimum of two inspection / maintenance manhole chambers

should be provided at either end of the pipework which will be built over in discussion with the LPA and / or Building Control. If the drainage is Anglian Water Services Limited (or NAV) infrastructure, suitable build-over agreements, in consultation with them, should be in place prior to seeking planning approval or starting construction.

Due to the risk of rapid inundation by floodwater, basements should be avoided in areas at risk of flooding. The LPA may hold additional guidance for basement extensions, e.g. within relevant SFRAs.

Standing Advice 4: Solar Farm Development Sites

Generally, with a solar farm proposal a portion of the site will comprise of proposed solar/photovoltaic (PV) panels and energy storage facilities, whilst the remainder of the site comprises of the existing grassed spacing between rows and field margins. The design of PV panels means that the area represented by the proposed panels is not considered impermeable, as the ground beneath all panels will be grassed and as such remains permeable.

This common setup means sites are usually considered 95% permeable, but associated infrastructure like battery storage units, solar stations, substations, internal roads should be considered as fully impermeable.

It should also be noted however that panel arrays can sometimes be very long and also pitched together which needs to be assessed differently and may require a different drainage strategy. Also, some panel types have wide pad foundations which can affect overall PIMP (Percentage Impermeable proportion of a catchment or development contributing to runoff from the site).

Rainfall will drain freely off the panels onto the ground beneath the panels where the surface remains permeable. Thus, the total surface area of the photovoltaic array is not considered to act as an impermeable area and the impact is assumed to be nil. However, the nature of the underlying groundcover and antecedent conditions can have a demonstrable influence on the surface water run-off characteristics of a site, i.e. if the ground cover beneath panels is proposed as bare earth which is susceptible to hardening in summer months, then peak discharges can increase significantly. As such, it

should be ensured as part of any proposed scheme that grass or wildflower cover will be well-maintained across the site to ensure that such proposed schemes will not increase the surface water run-off rate, volume or time to peak compared to the pre-development situation. This will also help provide net biodiversity gain.

You should satisfy yourself that the applicant has demonstrated compliance with:

- The National Planning Policy Framework ("NPPF") paragraphs157 to 175 by ensuring that the proposal would not increase flood risk elsewhere and will incorporate sustainable drainage systems.

The applicant should also demonstrate how the proposal accords with national standards and relevant guidance. If the proposal does not accord with these the applicant should state their reasoning and the implications of not doing so. The key guidance available is set out below:

- Planning Practice Guidance - Flood Risk and Coastal Change

To ensure that development is undertaken in line with Paragraph 173 and 175 of the NPPF the LLFA recommends that LPAs satisfy themselves of the following considerations prior to granting permission for major development below LLFA thresholds:

1. Is the development site currently at risk of flooding? The application submission should include a site-specific assessment of the risk of flooding to the development site from all sources.
2. The risk of flooding on the current site should be acknowledged using national flood risk datasets such as the Environment Agency's Risk of Flooding from Surface Water maps. If any areas at risk of flooding are identified, development should avoid these areas in line with NPPF. Where this cannot be achieved a robust strategy should be provided that includes adequate flood resilience measures incorporated in the design. This may require an emergency flood plan where appropriate.

3. How does the site currently drain? The method through which the site currently drains should be described, such as whether there are existing infiltration features, ordinary watercourses within or at the boundary of the development, or existing surface water sewer infrastructure. Land drains are common, especially in previously agricultural land, and do not comply with good SuDS practise.
4. Restrict vehicular movements on-site to designated access tracks. In doing so, the risk of soil compaction is minimised and limited to specific locations. The applicant should design the vehicular access tracks to be permeable (e.g. gravel medium) to mimic the existing surface conditions.
5. Rutting during the operation phase is also another common problem with solar farm sites, especially during intense storms at the foot of the panels. This can alter natural flow paths and should be avoided where possible or mitigated if avoidance is not possible.
6. Specify what type of vegetation will be planted across the site and how will it be managed / maintained in perpetuity. The ideal situation is that vegetation is grassed and is kept reasonably high or grazed by livestock. Good vegetation cover will limit the transfer of sediments and slow the flow of water.
7. Where required, a drainage strategy should be provided and implemented for any large impermeable areas, internal roads, substation footprint and compound areas. All drainage should be formalised in line with the discharge location hierarchy.
8. If there are any concerns with residual risk, due to concentrated rainfall (flash events etc), then simple shallow features (e.g. 0.6m deep) like linear swales or filter drains could be proposed along the lowest parts of the site to capture any exceedance. No runoff should leave the site up to the 1% AEP event plus climate change allowance.
9. A Construction Environmental Management Plan (CEMP) should also be provided.

If you are aware of a particular surface water flooding issue at this location which requires further bespoke advice, please re-consult detailing the perceived nature of flooding or details of flooding that has occurred.

Further guidance for developers can be found on our website.

Source: A study on the hydrological implications of solar farms (Cook, L.M. and Mccuen, R.H. (2013) 'Hydrologic Response of Solar Farms', Journal of Hydrologic Engineering, 18: 536 - 541).

Standing Advice 5: Quarries and Mineral Extraction Sites

A site over 1 hectare will require an FRA to assess all sources of flooding, regardless of the Flood Zone classification, as set out in the NPPF.

Supporting information submitted must include an assessment of relevant water environment matters, including but not limited to hydrology, flood risk, surface water drainage and hydrogeology. With specific emphasis on avoiding the increase in rainfall runoff rates and volumes during the operations and restoration. The assessment will consider the potential impacts during all phases of clearance of the site, construction, operation (extraction) and decommissioning (restoration).

Enabling and Construction: A Construction Surface Water Management Plan (CSWMP) must be provided to manage surface water runoff and should include all clearance and construction elements such as highways access, site works facilities or compounds, weight facilities and truck washing.

A CSWMP shall include:

Method statements, scaled and dimensioned plans and drawings detailing surface water management proposals to include:

i. Temporary drainage systems.

ii. Measures for managing pollution / water quality and protecting controlled waters and watercourses.

iii. Measures for managing any on or off-site flood risk associated with the development.

Operational Phase: An FRA and Drainage Strategy should be provided as technical documents to support any application and Environmental Statement (ES). The documents will include evidence of how surface water will be managed on-site in accordance with NPPF, PPG and local policies for parts of the development (including ancillary works, compounds, temporary buildings all roads and areas where the permeability is reduced by the works. See Standing Advice 2 for details on surface water management for major development. Monitoring and proposed impacts on groundwater will need to be carefully considered prior to the start of any operational activities.

If any new haul roads cross any watercourses, then the proposals should outline and address any **requirement for obtaining EA Environmental Permit(s) and consent from other relevant third parties such as the Internal Drainage Board or LLFA**.

Decommissioning and Restoration: Prior to starting any clearance or operational works, the planned restoration should account for the changes in permeability of the site, changes in land topography, post development hydrological regime and long-term monitoring. Typical documents the LLFA would expect to see are:

- Hydrological and Hydrogeological Risk Assessment.
- Proposed restoration works and associated engineering drawings.
- Any mitigation required to prevent the increase of flood risk or surface water runoff to any receptors (land outside the development, housing or infrastructure). Diffuse discharge should not be replaced by point discharge to a watercourse.
- Phased timeline for the restoration to show how works will stop and mitigation will be implemented.
- Mitigation measures to avoid the increase of flood risk to off-site areas following restoration can be provided in the form of:
    - Cross slope (with contour) interception features i.e. filter drains, infiltration or lined swales or limit surface water runoff.

- Attenuation for any increase in greenfield runoff rate or volumes should be provided and directed to a positive outfall location (infiltration features, a watercourse connected to the wider network.
- A network of land drains in any capping layer, leading to positive outfall locations.

Standing Advice 6: For agricultural and horticultural structures (including polytunnels and glasshouses) on agricultural land

This standing advice is relevant for applications that include the use of agricultural and horticultural structures on agricultural land. Implementation on greenfield sites can lead to an increase in flood risk off-site, should the appropriate surface water management not be in place, therefore supporting flooding and drainage related information is required to support any planning application.

The main flood risk to consider relates to the surface water runoff rate and volume that can increase with the introduction of the impermeable surface. This can lead to channelised flows which erode soil and result in greater volumes of runoff entering watercourses or flowing off-site to adjacent land.

Subsequently, mitigation measures that reduce the impact of channelised flows and promoting infiltration should be adopted where feasible, such as incorporating, rainwater reuse, filter drains or bunds.

Structures also have the potential to impact existing surface water overland flow routes, therefore the proposed location of a development should review the existing flood risk (from the publicly available information from the Environment Agency) and avoid those areas or ensure water is managed to prevent an increase of flood risk elsewhere.

6 Documentation to be provided to the LLFA

6.1 General

6.1.1 To enable the LLFA to provide its response as a statutory consultee, the developer should produce a Flood Risk Assessment (FRA) and / or Drainage Strategy for the development that includes the minimum level of information corresponding to the stage of the application submitted. Table 2 provides a summary of the expected level of information to be submitted with applications. Further information should be provided or may be requested where there are complex local issues. This information is required by the LLFA for all major developments to ensure that the standard of surface water management is appropriate. If an FRA is also required for a site, then the surface water management proposals may be incorporated within this document.

6.1.2 The submitted information should include how the surface water Drainage Strategy demonstrates how the four pillars of SuDS have been considered and also complies with the requirements of the SuDS Non-Statutory Technical Standards and BS8582. All developments will be expected to meet all four pillars of SuDS. Some developments e.g. brownfield sites may find it difficult to implement all four pillars of SuDS, but evidence must be provided to justify why it cannot be achieved. It will also need to show if a cost-effective source control rainwater harvesting SuDS can be implemented in accordance with the discharge hierarchy (see Policy 3 in Section 9).

6.1.3 It is important that the type of SuDS to be used on a development site is identified at concept design stage. This information, as well as details of the extent and position of the SuDS, should be provided for masterplan, outline and full applications so it is demonstrated that the SuDS can be accommodated within the proposed development. It is not in line with best practice to condition an application and leave the allocation of SuDS to a later application stage as this may preclude certain SuDS elements due to restrictions in the agreed layout. The LLFA recommend that 10-15% of land be set aside within allocations to facilitate the implementation of SuDS and maintenance strips along river (blue) corridors. Whilst maintaining a neutral or

improved benefit to flood risk, SuDS / blue corridors can also provide multiple biodiversity, amenity and water quality benefits (NPPF paragraph 124, 173, 175, 180 and PPG Paragraph: 037 Reference ID: 7-037-20220825 / Paragraph: 055 Reference ID: 7-055-20220825 / Paragraph: 059 Reference ID: 7-059-20220825).

Photo 3: Photo of a rill from a carriageway through a path to a SuDS Basin – Drayton, Norfolk (image E Simpson @ NCC LLFA)

Photo 4: Photo of a swale draining the highway (bus lane and shared use path) located at Queens Hill development, Costessey, Norfolk (image E Simpson @ NCC LLFA)

6.1.4 The Drainage Strategy should demonstrate how SuDS options have been considered with reference to the SuDS management train and hierarchy. Justification and evidence of how it will be achieved should be provided to document the chosen method(s) of surface water disposal. There are several SuDS components that can make a drainage scheme and combine into a management train to meet the four pillars of SuDS (see Table 3).

Table 2: Matrix showing the level of information required for planning applications

Outline	Full	Reserved Matters (unless condition specifies otherwise)	Discharge of Conditions	Documents to be Submitted	Section in Technical Guidance
Yes	Yes	Yes	Required at different stage	Flood Risk Assessment / Statement including plans and drawings showcasing a sequential approach to spatial planning. Detailed pre-development (and ideally post development) flood hazard modelling if appropriate (i.e. large ordinary watercourses not covered by EA flood zones). In rare cases details of mitigation measures including compensatory storage or managed surface water flow path creation, consideration for access / egress and if an agreed emergency plan is required. and opportunities for flood relief to offsite receptors. Where appropriate required maintenance access/easements to existing watercourses and structures.	8
Yes	Yes	Yes	Required at different stage	Existing Drainage Plans – outline pre-development drainage infrastructure or if brownfield site the existing drainage infrastructure, if any. Topographical and subterranean surveys are expected alongside visual inspections of the site to ascertain catchment boundaries, on-site and off-site connectivity of existing watercourses, blue corridors or any other surface water bodies. Existing flood defences are to be highlighted or any other constraints. Existing features should be retained, protected and provided amble space for future maintenance as part of the sites overall master planning. If opportunities arise for betterment or enhancement of blue corridors, they should be proposed in the FRA/DS. If a coastal site or pumped catchment information on predicted coastal extremes and/or any defences must be provided.	No specific section in Part C
Yes	Required at different stage	Required at different stage	Required at different stage	Preliminary Drainage Strategy / Statement). Including preliminary contributing area and drainage layout plans (evidencing Plan A and Plan B where appropriate. Must be cross-referenced with outline hydraulic calculations and indicative site layout to evidence that site has provided amble space for SuDS.	9
Yes	Required at different stage	Required at different stage	Required at different stage	Preliminary layout drawings of development proposals, including built development and green spaces. Proposed SuDS features and the existing water features to be retained such as watercourses, blue/green corridors or ponds. Also see Section 15.1.3 - Good Master Planning and Section 6.1.3.	No specific section in Part C
Yes	Required at different stage	Yes	Required at different stage	Preliminary “Outline” hydraulic calculations (utilising infiltration rates), pre-development and post-development runoff rates / volumes, storage required including interception, climate change, urban creep and pervious uplifts). Key for allocating space required for SuDS at earliest planning stage.	12 and 13

Outline	Full	Reserved Matters (unless condition specifies otherwise)	Discharge of Conditions	Documents to be Submitted	Section in Technical Guidance
Yes	Required at different stage	Required at different stage	Required at different stage	Preliminary site investigation report (describing ground conditions, groundwater and infiltration potential). Refer to Table 5.	10 and 11
Yes	Required at different stage	Required at different stage	Required at different stage	Preliminary landscape proposals (showing SuDS component locations and required maintenance easements).	No specific section in Part C
Yes	Required at different stage	Required at different stage	Required at different stage	Preliminary indication how each of the four pillars of SuDS will be met. Inclusion of SuDS water quality assessment and consideration if rainwater harvesting can be implemented.	No specific section in Part C
Yes	Yes	Required at different stage	Required at different stage	Evidence of 'in-principle' agreement of a third party for SuDS discharge to their system (e.g. Anglian Water Services Limited (or NAV), Highways Authority or third-party owner). Identification of the maintenance responsibility of any ordinary watercourse (including structures) within or adjacent the development.	9
Yes	Yes	Required at different stage	Required at different stage	Infrastructure and Construction Phasing Plan (Inc. temporary works).	Refer to paragraph 6.2.2
Required at different stage	Yes	Required at different stage	Yes	Detailed layout drawings of the development (i.e. various land uses with all items stated above including easements/maintenance strips clearly shown).	No specific section in Part C
Required at different stage	Yes	Required at different stage	Yes	Full Drainage Strategy / Statement including dimensioned general arrangement drawings of the drainage infrastructure clearly showing final SuDS and conveyance network (open or closed). Infiltration trial holes to be added where relevant. SuDS management train must be clearly annotated. Showing all locations, dimensions and freeboard of every element of the proposed system. Storage features to have clear naming convention and specifications (i.e. depth, base, cover level, volume, max water level and freeboard). Similarly, conveyance system (i.e. pipe IDs, diameters, invert and cover levels, gradient, manhole details).	No specific section in Part C

Outline	Full	Reserved Matters (unless condition specifies otherwise)	Discharge of Conditions	Documents to be Submitted	Section in Technical Guidance
Required at different stage	Yes	Required at different stage	Yes	Detailed hydraulic calculations (i.e. full modelling outputs of storage and conveyance systems) and must cross reference with engineering drawings. Calculations must use the latest Flood Estimation Handbook (FEH) rainfall data and factors of safety/uplifts. Coefficient of Runoff (Cv) and additional storage/MADD Factor set to 1.	9 10 11 12 13 18
Required at different stage	Yes	Required at different stage	Yes	Contributing Area Plan – summary table to be inserted and plan clearly colour coded to each zone of the network.	No specific section in Part C
Required at different stage	Yes	Required at different stage	Yes	Full ground investigation (Geotechnical logs, factual and interpretive reports and including infiltration results in accordance with BRE365). LLFA may require contamination assessment (i.e. Phase 2 Geo-Environmental Report and Geo-Technical Report).	10 and 11
Required at different stage	Yes	Required at different stage	Yes	SuDS Water Quality Assessment.	14
Required at different stage	Yes	Required at different stage	Yes	Detailed landscaping details linking to SuDS amenity and biodiversity elements.	15 and 16
Required at different stage	Yes	Required at different stage	Yes	Detailed Management and Maintenance Plan with named adoption bodies and corresponding maintenance schedules. Consideration for Health and Safety requirements.	17
Required at different stage	Yes	Required at different stage	Yes	Exceedance flow plan.	18
Required at different stage	Yes	Required at different stage	Yes	Construction Water Management Plan (CWaMP) highlighting how runoff during the site's construction stage is dealt with effectively so no on-site or off-site impacts are realised. Temporary drainage features should be clearly shown on any plans and measures to reduce pollution and flooding due to sites construction phase highlighted.	Refer to paragraph 6.2.3 and 6.6.2

Table 3: Matrix of SuDS components and how the benefits contribute to the four pillars of SuDS (reproduced from Table 7.1 of the SuDS Manual (2015))

Component	Water Quantity Peak Runoff Rates	Water Quantity Runoff Volumes (Small Events) Interception	Water Quantity Runoff Volumes (Large Events)	Water Quality	Amenity	Biodiversity
Rainwater Harvesting	No	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	No	Likely valuable contribution to SuDS design	No
Green Roofs	May be some potential for contribution to SuDS design	Likely valuable contribution to SuDS design	No	Likely valuable contribution to SuDS design	No	Likely valuable contribution to SuDS design
Infiltration Systems	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design
Proprietary Systems	No	No	No	Likely valuable contribution to SuDS design	No	No
Filter Strips	No	Likely valuable contribution to SuDS design	No	Likely valuable contribution to SuDS design	May be some potential for contribution to SuDS design	May be some potential for contribution to SuDS design
Filter Drains	Likely valuable contribution to SuDS design	May be some potential for contribution to SuDS design	No	Likely valuable contribution to SuDS design	May be some potential for contribution to SuDS design	May be some potential for contribution to SuDS design
Swales	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design
Bioretention Systems	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design
Trees	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	No	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design
Pervious Pavements	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	May be some potential for contribution to SuDS design	May be some potential for contribution to SuDS design
Attenuation Storage Tanks	Likely valuable contribution to SuDS design	No	No	No	No	No
Detention Basins	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	No	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design
Ponds and Wetlands	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	No	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design	Likely valuable contribution to SuDS design

6.2 Master Planning

6.2.1 A strategic **Masterplan** should include an FRA and Drainage Strategy with enough 'in-principle' evidence to set conditions for individual phases to provide detailed designs. The Drainage Strategy should include sufficient infiltration testing to be representative across the site, pre and post development runoff rates / volumes based on the type of development, how permeable open spaces will drain if not included within the drainage scheme, how SuDS will be implemented in each phase. More information about this can be found in Section 6.7. The LLFA expects that surface water attenuation features will be located outside of the 1% AEP areas from all sources of flood risk. Early engagement and pre-planning advice are recommended to assist with an integrated infrastructure delivery.

6.2.2 For larger applications where there may be Master Planning or phased development it is particularly important that any submission considers how each phase will be delivered in relation to the surface water Drainage Strategy as a whole. A phasing plan should be provided, in particular, highlighting where different phases rely on each other for connection to an infiltration basin or the wider watercourse network and how this will be implemented during construction and operation of the development.

6.2.3 Information on how temporary measures will be implemented must be provided as part of a Construction Water Management Plan (CWaMP), see 6.6.2. Masterplans led by one developer that contain land that will be developed by others e.g. a school, should also show evidence that at least one drainage option will be achievable e.g. though infiltration testing or connection to a watercourse through the larger masterplan site boundary. Triggers for additional building should also be included e.g. when associate infrastructure such as schools or strategic link roads are required and how these drainage schemes will be progressed ahead of housing development in the area. This is particularly important if final outfalls or drainage basins are distant from the infrastructure. Appropriate legal agreements may be required to show how phases will be able to develop if they are progressed by different applicants or multiple landowners.

6.2.4 Where an application is part of a larger site, which may already have planning permission, it is essential that the new proposal does not compromise the drainage scheme already approved. Information would also need to be provided to show how temporary works would be incorporated to prevent an increase in flood risk considering any phased approach to works over a long period of time e.g. how riparian owners will still be able to access watercourses for maintenance until future phases are completed.

6.3 Outline

6.3.1 An application for **Outline** planning permission should include details of one workable solution for managing surface water (Plan A). Where infiltration drainage is proposed, and infiltration testing in accordance with BRE Digest 365 has not been undertaken for example, evidence or agreement in-principle of an alternative surface water drainage discharge location proposal will be required (Plan B). Climate change, urban creep and pervious uplifts should be included at outline planning as these can significantly impact the amount of attenuation storage required and space for SuDS. Outline planning is a critical stage for allocating **sufficient space** and positioning for blue/green infrastructure generally, taking into account the impact of increases in flood extent for all sources of flooding as a consequence of climate change over the development's lifetime. This is also especially important through the planning stages as proposed layouts develop over time.

6.3.2 Where an FRA is required, the LLFA expect the FRA to consider all sources of flooding in detail and for it to be provided with the outline planning application. The FRA should identify how the development has avoided flood risk in the first instance, apply the sequential approach and evidence of achievable mitigation measures that may be employed during the detailed design of the site, noting any constraints for the development of the future site layout. An 'in-principle' agreement of the party expected to manage and maintain surface water features e.g. watercourses and SuDS is required by planning policy. In addition, the application should include evidence of the route which the surface water drainage scheme water will take when leaving

the site and whether the receiving watercourse or sewer network will be able to convey the proposed discharge i.e. off-site connectivity.

6.4 Reserved Matters

6.4.1 An application for **Reserved Matters** planning permission should provide sufficient information to demonstrate that adequate space has been allocated within the development layout for the proposed SuDS and surface water drainage infrastructure. It should include calculations as evidence to support the sizing of drainage infrastructure including climate change, urban creep and pervious uplifts and how the scheme would meet the SuDS National Standards, including a commitment to appropriate SuDS features being provided. Evidence should also be provided to confirm information that might influence appearance, access, landscaping, layout, and scale, such as, but not limited to, ground floor finished floor levels, exceedance flow routes and maintenance access.

6.4.2 Any updated FRA from an outline approval, should assess in detail the risk of flooding from all sources.

6.4.3 This should identify the avoidance of risk or mitigation measures to be employed and reflected in the detailed design of the site, noting any constraints for the development of the site layout. The LLFA would expect the submitted documents to acknowledge any flood risk constraints on the site, such as existing areas at risk of flooding, and demonstrate how the development layout has been designed to avoid and minimise the risk of flooding. Where additional flood risk information has become available since the original planning application FRA or there has been alterations to the proposed layout, the LLFA would expect any Reserved Matters application to assess the risk of flooding against this updated information.

6.5 Full

6.5.1 An application for **Full** planning permission should provide both a detailed Drainage Strategy and FRA to ensure that there is sufficient information to prevent the need for pre commencement conditions (Table 2). As of the 1

October 2018, planning permission may not be granted subject to pre-commencement conditions without the agreement of the applicant.

6.5.2 The details required for a full application includes the following, for further information please refer to Table 2 of this guidance. Evidence of ‘in-principle' agreement of a third party for SuDS discharge to their system (e.g. Anglian Water Services Limited (or NAV), Highways Authority or third-party owner). Identification of the maintenance responsibility of any ordinary watercourse (including structures) within or adjacent the development. Flood Risk Assessment / Statement depending on the expected flood risk from all sources of flooding. Detailed development layouts showing SuDS locations plus comprehensive contributing areas plan. Detailed drainage design hydrology / hydraulic calculations and drawings using the latest FEH rainfall data. Full hydraulic and ground investigations. SuDS water quality assessment. Detailed landscaping details linking to SuDS amenity and biodiversity elements. Detailed Maintenance program and on-going maintenance responsibilities and an exceedance flow plan.

6.5.3 As the LLFA, the LLFA would expect any flood risk assessment or surface water drainage strategy, as a standard, to be produced in accordance with, but not limited to, the latest revisions of the following relevant national and local policy, frameworks, strategies, guidance (including best practice) and statutory / non-statutory standards:

- BS8582:2013 - Code of practice for surface water management for development sites
- National Planning Policy Framework (NPPF)
- Planning Practice Guidance (PPG)
- Norfolk Local Flood Risk Management Strategy
- Surface Water Management Plan Recommendations/Action Plans
- Norfolk County Council Environmental Policy
- LLFA Statutory Consultee for Planning Guidance Document

- CIRIA C753 – The SuDS Manual
- Non-Statutory Technical Standards for Sustainable Drainage Systems
- If applicable, relevant guidance documents specific to the site and drainage proposals. For example, approval and adoption guidance etc.

6.5.4 The level of detail required within documents submitted for full planning should be in line with the detail required for Stage 4 Technical Design of the RIBA Plan of Work 2020.

6.5.5 The general stance of the LLFA is that the LLFA will not apply pre-commencement conditions to full applications, therefore sufficient evidence should be provided to support a full application. A build in accordance condition will be attached to any approved full application.

6.6 Discharge of Condition

6.6.1 Information to **Discharge a Condition** (including those to be discharged at Reserved Matters stage) should be submitted as one package in a Drainage Strategy rather than in piecemeal submissions. The summary report should include the methodology applied in the calculations for the scheme such as the global variables and any assumptions used. The report should also include an explanation of how the system operates, such as physical access arrangements for maintenance, establishment of legal rights of access in perpetuity and an appraisal of health and safety considerations for construction, operation and maintenance of the SuDS. Where additional flood risk information has become available since the original planning application, the LLFA expect the original FRA to be updated with information such as climate change allowance, flood extent outline or significant flood event evidence. This would include a modelled scenario including the updated information and review of any mitigation required in response to these outputs. Any application for the Discharge of Conditions is to consider the detailed design of the drainage system against this updated information.

6.6.2 Construction Water Management Plan

Temporary drainage must be monitored throughout construction. Specific

details must be confirmed in the CWaMP as a guide, but not exhaustive a CWaMP should include the following chapters: -

1) Staff Awareness and Training
2) Pollution Plans
3) Storage of Materials and Spillage Risk
4) Discharge/Disposal of Site Runoff and Temporary Drainage
5) Flood Risk

6.7 Drainage Calculations

Note: This section should be read in conjunction with chapters 9, 10, 11 and 12.

6.7.1 To assist the LLFA to audit any Drainage Strategy, the LLFA expect to see the following minimum information/variables submitted with any application:

- Greenfield Calcs – LLFA require pre-development runoff rates to be calculated using the whole development area (paved and unpaved surfaces - houses, gardens, roads, and other open space) that is within the area served by the drainage network. Significant green areas such as recreation parks, general public open space should be excluded where their runoff response will be unchanged and not served by the drainage system. If parts of a site are served by infiltration these should be excluded from greenfield catchment area.
- Crossing catchments - this must be avoided at all costs but if unavoidable then the LLFA will still require the outfall to be limited to its natural greenfield rate and storage volumes will have to increase.
- FEH Statistical (scale to plot size) or REFH2 rainfall runoff method are only accepted approaches by LLFA. Latest FEH or observed parameters must be used.
- Brownfield calculations using modified rational method will be not accepted – see BS8582 for recommend methods.

Storage Sizing and Network Design

- Model Outputs: Summary of Results – select critical rank by maximum level. Outputs must include all sub options e.g. flow, max volume, max discharge etc.
- Area summary – contributing drainage areas must include all impermeable areas and unpaved areas served by the drainage system (including the surface area of any open SuDS features, which receive any direct rainfall). For ease the LLFA require a “pervious uplift” to be applied to the impermeable area using the following steps: -
  - Define the "impermeable area" of the site (either using site layout or a relevant PIMP %).
  - Then define the pervious or green areas (large open spaces downslope of the residential land uses can be excluded, similar to greenfield calcs). Those green spaces will be added into the “area positively drained” using the following scaling factor: - **Permeable area * SPRHOST Class * 75% pervious contribution or robust technical justification for lower is provided**.
  - Thus “net impermeable area” equals impermeable area + (permeable area * SPR * pervious area contribution).

This “pervious uplift” is now mandatory and has been adapted from the UKSUDS website with their permission (UKSUDS). **Note: The LLFA would expect the Designer to demonstrate how the SPRHOST figure has been derived.**

- Then an appropriate urban creep uplift is added, regardless of the discharge location being used.
- Appropriate factors of safety used in design of both underground and above ground SuDS - see section 11.1.3 to 11.1.5.
- Storm durations ranging from 0 to 4 days (4320 mins) must be run to find the critical storm (Subject to the design philosophy, longer durations may be necessary to identify the critical storm).

- Within the model input parameters, no superficial cap (typically 50mm/hr) to the design rainfall intensity should be applied to computer modelled drainage design calculations.
- Simulation Settings and Global Variables - The use of precautionary values for modelling parameters are required for storage sizing **(including coefficient of volumetric runoff (Cv) set to one and factors that simulate extra storage in a system (such as the MicroDrainage 'MADD' factor) must be set to zero).**
- The application of a surcharged outfall for discharges to watercourse where tidal or fluvial locking scenarios are a potential issue see Section 12.1.26.
- At outline stage networks details may not be available but enough information should be submitted clearly showing there is enough space for SuDS features sized to accommodate the 1% AEP + CC within the proposed development layout.
- Many different types of drainage simulation software are available, and for the avoidance of doubt, the LLFA do not recommend any particular software package and will review any calculations, including hand calculations.
- All hydraulic calculations and Network modelling must use a logical naming convention. This must be cross referenceable between model outputs, contributing area plans and engineering drawings. For avoidance of doubt a "Network" means conveyance systems (pipes, swales, filter drains) and storage features (attenuation and infiltration basins) integrated into a single simulation. The LLFA may request the model to assist with an audit of the drainage scheme.
- If direct application of the most up to date FEH parameters (for determining applied rainfall profiles) is not possible then assessment, comparison and uplift of input rainfall data to match the rainfall data that would have been generated by the most up to date FEH parameters should be undertaken.

6.8 LLFA response to LPAs

6.8.1 The LLFA will respond to planning applications where the LLFA have been consulted. Where the LLFA feel there is no or inappropriate information supplied with a planning application to demonstrate achievable mitigation or can advise that appropriate conditions could be set, the LLFA will object stating that the FRA or Drainage Strategy is inadequate and does not meet with policy or guidance. A summary of types of responses the LLFA will give to the LPA are in Table 4 below.

Table 4: Summary of the type of response to the LPA

Type of Response	Summary of Response
No objection, with advice and recommendations	This response will be submitted if standing advice is provided to the LPA or depending on the scale of development bespoke advice summarising that information has been submitted with only a few concerns, but conditions are not appropriate.
No objection subject to conditions being attached to a consent	This response will be submitted if bespoke advice summarises appropriate information has been attached to the application to show that local flood risk has been adequately considered and at least one feasible SuDS scheme has been proposed. Enough information should be available to meet the PPG standards for setting conditions, that are: o Necessary o Relevant to planning and to the development to be permitted. o Enforceable o Precise o Reasonable in all other respects

Type of Response	Summary of Response
Removal of our objection	This response is likely be submitted where bespoke advice summarises that additional information has been submitted to address the LLFA concerns. For example, when information shows a condition can be discharged.
Objection in principle	This response will be submitted if bespoke advice summarises that the LLFA do not see there is a technical solution to the issues with the proposed development. The LLFA will highlight this at an early stage to give an applicant an opportunity to review the commercial viability of the development. A technical review of the proposal will be provided, in the understanding this does not prejudice the outcome of any decision by the LPA.
Objection	This response will be submitted where bespoke advice summarises that either no FRA or Drainage Strategy has been provided, or the documents submitted have significant information absent or is inappropriate to address the risks of flooding and / or to show that the proposed SuDS is not achievable. If this is not resolved after four iterations the LLFA may decide to issue an objection in principle.
No comment	The LLFA will provide a “no comment” response if it has been screened and determined that bespoke comments will not be provided. It does not imply the development meets with all policy, best practice guidance and standards.

7 Part C- Technical Guidance

This technical guidance sets out the expectations of NCC when reviewing FRA and Surface Water Drainage submissions. The guidance is aimed at providing developers and their consultants with the locally specific technical knowledge to ensure that any submissions are aligned with the expectations of the LLFA. The technical guidance covers a limited range of areas and is expected to be built upon in further submissions.

8 Local Flood Risk

Policy 1: Local Flood Risk Guidance

"When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific Flood Risk Assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

(a) 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.

(b) the development is appropriately **flood resistant and resilient** such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment.

(c) it **incorporates sustainable drainage systems**, unless there is clear evidence that this would be inappropriate.

(d) any **residual risk can be safely managed.**

(e) **safe access and escape routes** are included where appropriate, as part of an agreed **emergency plan**."

[Paragraph 173 of the National Planning Policy Framework]

"What is the aim of the sequential approach?"

The approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. This means **avoiding, so far as possible, development in current and future**

medium and high flood risk areas considering all sources of flooding including areas at risk of surface water flooding. Avoiding flood risk through the sequential test is the most effective way of addressing flood risk because it places the least reliance on measures like flood defences, flood warnings and property level resilience features. Even where a flood risk assessment shows the development can be made safe throughout its lifetime without increasing risk elsewhere, the sequential test still needs to be satisfied. Application of the sequential approach in the plan-making and decision-making process will help to ensure that development is steered to the lowest risk areas, where it is compatible with sustainable development objectives to do so, and developers do not waste resources promoting proposals which would fail to satisfy the test. **Other forms of flooding need to be treated consistently with river and tidal flooding** in mapping probability and assessing vulnerability, so that the sequential approach can be applied across **all areas of flood risk"**.
[NPPF Flood Risk and Coastal Change PPG Paragraph: 023 Reference ID: 7-023-20220825]

8.1 Sequential Approach

8.1.1 All development should consider the existing risk of flooding from all sources; including main rivers, the sea, ordinary watercourses, surface water, groundwater, sewers and artificial waterbodies (such as canals or reservoirs) providing an FRA where required.

8.1.2 The NPPF and associated PPG (see Policy 1) sets out the national expectations for the assessment and management of flood risk on the site. The vulnerability of development (Annex 3 of NPPF and Table 2 of the Flood Risk and Coastal Change section of the PPG) indicates the type of development that is appropriate according to the level of flood risk.

8.1.3 Without early consideration of local flood risk in the planning process the viability for the site can be compromised and affects the layout, housing density, location of strategic infrastructure such as pumping stations, electricity sub stations, SuDS and roads. This may require significant alteration of the layout or trigger the need to re-apply or vary historic planning

permissions if the original sequential test did not include surface water or groundwater flood risk.

8.1.4 The LLFA encourage the identification of greenfield areas within the site boundary that are required to be protected for future flood risk management. Every opportunity to improve an existing local flood risk issue is encouraged (supported by PPG paragraph 062 Reference ID: 7-062-20220825 and LLFA policy within the Local Flood Risk Management Strategy), particularly within those areas defined by the Environment Agency or the LLFA as a Critical Drainage Area or Catchment. In areas highlighted as having existing flood risk problems, new or re-development could provide improvements through careful consideration of available land and the proposed surface water drainage scheme. Within any critical drainage catchment, the LLFA expect any brownfield development to limit surface water drainage discharge as close to greenfield rates as possible. Retaining pre-redevelopment 100% runoff rates and volume from impermeable areas will not be acceptable. Opening or daylighting of culverts and reinstating open watercourses should be investigated and undertaken in accordance with CIRIA guide C786 (Culvert Screen and Outfall Manual) where possible. Any proposed strategic infrastructure must consider the changes to local flood risk which includes the construction of new embankments, cuttings or significant alterations to ground levels. These structures or modifications can affect surface water and groundwater flow paths. Mitigation should be included within any proposal which may include cut off channels to manage greenfield runoff.

8.1.5 The sequential approach is a precautionary one, to avoid the risk of flooding in the first instance. The LLFA support this approach as it is the most sustainable form of flood risk management. In accordance with NPPF paragraph 173 (footnote 59), PPG (Paragraph: 023 Reference ID: 7-023-20220825 and Paragraph: 024 Reference ID: 7-024-20220825), development should be steered to areas at the lowest risk of flooding from any sources. Sites in Flood Zones 2 and 3 should only be considered (employing the exception test where required – see NPPF paragraph 165 - 175) where there are no reasonable alternative sites, considering flood risk and the vulnerability of the land use proposed (NPPF Annex 3). Table 1 of PPG which defines

Flood Zones (only based on river and sea flooding) can be supplemented with the following information:

- Indicative Environment Agency's RoFSW maps (extent, depth, velocity and Hazard layers) for both the 1% AEP and 0.1% AEP **to identify potential risk of flooding from surface water flow paths and / or significant ponding**. The RoFSW has known limitations in pumped or artificial catchments so, the LLFA expect these to be combined with other sources of information in these locations.
- Indicative Environment Agency's River and Sea Flood Maps for Planning for both Flood Zone 2 and 3 – or up to 1% AEP and 0.1% AEP **to identify potential risk of flooding from ordinary watercourses**. Where no mapping of fluvial flood risk (watercourses with catchments smaller than $3km^2$), or there is uncertainty within the Environment Agency mapping, the RoFSW map is used as a proxy and used consistently with river flood mapping probability. To avoid doubt, the 1% AEP event is deemed equivalent to Flood Zone 3 and 0.1% AEP event is equivalent to Flood Zone 2 (as per PPG – Flood Risk and Coastal Change Paragraph 078 Reference ID: 7-078-20220825).

8.1.6 Climate change must be considered within all sources of flooding including surface water flow paths and any ordinary watercourse proxy Flood Zones. There is additional surface water flood risk mapping including 40% climate change within the Norwich City, Borough Council of West Norfolk and Kings Lynn, South Norfolk, Broadland, North Norfolk and Broads Authority individual SFRAs. Also, LLFA have updated mapping for areas such as Thetford, Watton, Dereham, Kenninghall and Saham. Where a site does not fall within any of these maps or it's deemed the maps are outdated, the 0.1% AEP surface water event map can give an indication of the 1% AEP event map including climate change. It is recognised that this method may over predict in some locations but unless further site-specific information is available, the LLFA expects this approach be followed.

8.1.7 For the avoidance of doubt, the LLFA will also use the following sources of information to assist with any review of an application:

- Historical information from the LLFA using published flood investigation report locations which highlight those properties which have already flooded both externally and internally. Reports of flooding that are yet to be investigated and published as well as Anglian Water Services Limited (or NAV) records of reported locations of sewer flooding will also be reviewed as part of a precautionary approach to reviewing applications.
- Current SFRA, Surface Water Management Plans (SWMP) or previous FRAs / Drainage Strategies which the LLFA has been consulted on through the planning process. This would help with other sources of information such as the location of critical drainage catchments and reported groundwater flooding incidences.
- Other relevant information such as Ordnance Survey current MasterMap; Ordnance Survey Historical Maps (First Edition 1886, Second Edition 1905); Aerial Photography (1988 or 1946); Google Street View or the Detailed River Network (DRN) mapping to highlight surface watercourses or structures; NCC produced sub-catchment identification; local officer experience or representations made by the public to the LLFA.

8.1.8 The LLFA expects three key criteria to be met to protect the public from local sources of flooding, both on-site and off-site, this INCLUDES during the Construction stages as well. These are:

- Protection against flooding from watercourses and groundwater.
- Protection against flooding from the drainage system.
- Protection against flooding from overland flows (from sources within or external to the site).

British Standard BS 8582:2013 Code of Practice for surface water management for development sites also states in Section 6.2.2 the following:

- The layout of the development site and drainage system should be designed so that surface water that enters the site from off-site sources is conveyed safely around or through the site, without compromising the level of service of the proposed drainage system or introducing unacceptable additional risk on-site or downstream.
- Where runoff from off-site sources is drained together with the site runoff, the contributing catchment should be modelled as part of the drainage system in order to take full account of the additional inflows.
- Where runoff from off-site sources is conveyed separately to the proposed drainage system the flood risk should be managed in accordance with BS8533:2011 Assessing and managing flood risk in development – code of practice.
- The layout of the development site and the drainage system should be designed so that natural low-lying areas and overland conveyance pathways are used to manage surface runoff, where appropriate, where they do not pose an unacceptable risk to the new development or downstream areas.

Photo 5: Photo of a development site located on the mapped surface water flood path that flooded in 2016, Hemsby, Norfolk.

Photo 6: Photo of a development site located on the mapped surface water flood path that flooded in 2023, Attleborough, Norfolk. Source: Wymondham and Attleborough Mercury, October 2023.

8.2 Surface Water Flooding

Where a risk of flooding from surface water is identified, the LLFA requires that this risk is assessed (and where appropriate, modelled) to show how more vulnerable development (as per Annex 3 of NPPF and Table 2 of the PPG) is placed outside of the risk of surface water flooding for the 1% AEP rainfall event plus climate change allowance.

8.2.1 In the case of surface water overland flow routes, if the areas cannot be avoided, the LLFA expects sufficient information to be provided to demonstrate how this overland flow route will be managed within the site without creating a risk to people or property and not increasing the risk elsewhere. The LLFA would suggest that public open space is the most appropriate land use for this purpose. If roads or car parks are intended to be used, the LLFA would request that the hazard of this management be fully considered, emergency access and egress be assessed, and the drainage of

these impermeable areas be sized to accommodate the additional catchment of off-site flows (see Section 8.1.8 above).

8.2.2 Flood depths will be minimised in line with Table 12.3 of CIRIA Design for Exceedance in Urban Drainage (C635). This states depth of water in flood events greater than 3.33% AEP should be minimised to 100mm on minor roads that have speeds restricted to 30mph (this assumes that there is a kerb upstand on roads and not level shared spaces) and 200mm within car parks (with sufficient retaining measures). The LLFA expect that evidence is provided to show that velocities of flood water will be minimised in these instances and do not impede safe access or egress. This would be in line with the DEFRA / Environment Agency Hazard to People Classification / Rating. In addition, the LLFA would expect that residual risks are mitigated in the form of raised finished ground floor levels on residential properties to account for exceedance routes in rainfall events with a probability greater than 1% AEP event plus climate change allowance (see Section 13 of this document).

Photo 7: Photo of Surface Water Flooding in North Norwich (Oct 2019): Surface water in a petrol station and car park, overtopping the kerb, leaving the site uncontrolled and flooding the highway. The traditional drainage system was overwhelmed. Flooding also occurred in 2016 causing significant traffic disruption (Image from E Simpson @ NCC LLFA).

8.2.3 Surface water modelling is required where an application site includes a major surface water flow path through the site, and the development has the potential to cause negative off-site impacts. If surface water modelling to define pre- and post-development scenarios is prepared, the LLFA expects the following parameters to be used as a basis and any deviation from these parameters must be justified through the provision of site-specific information:

- Delineation and generation of contributing catchment(s) for each flow path using local topographic information i.e. 1m or 2m Composite LiDAR. FEH Catchments must be assessed against the site-specific topographical information.
- 2D mesh element sizing: The LLFA would expect the use of flexible mesh sizing in accordance with the principles given in the latest version of the CIWEM Integrated Urban Drainage Modelling Guide or alternative a model resolution with 2m grid.
- 3.33% AEP event, 3.33% AEP event plus climate change, 1% AEP event and 1% AEP event plus climate change. If the model is to be submitted to the Environment Agency to update the Surface Water Flood Map, the 0.1% AEP event should also be modelled.
- A range of storm durations should be simulated to identify the critical storm event. At a minimum, durations including the 1hr, 3hr and 6hr should be modelled. However, longer durations maybe required up to the 7-day duration to identify the critical event.
- If direct rainfall modelling is undertaken, it should be consistent with standard FEH procedures. Any Hyetographs input should be provided.
- A typical allowance of 8mm/hr is normally provided for loss to the sewer drainage system. However, the LLFA will be in line with local Surface Water Management Plan modelling including: 7mm/hr in Norwich, 3mm/hr in Kings Lynn and 3mm/hr in other urban areas around Norfolk. In some critical catchments or water sensitive

areas, the LLFA are likely to request additional sewers to be included in the model should this be considered appropriate.

- Representations of existing building footprints should use specific survey data or a standard of 0.1m to represent floor levels. Basement features should be included where they exist and allowed to flood within the model.
- Ground truthing checks should be undertaken to understand and improve accuracy of any base digital terrain model such as artificial ground height at tops of trees, creating cuttings in linear features to represent culverts or bridges etc. The LLFA will expect evidence of this process to be provided within any technical submission.
- Calibration/verification modelling scenarios should be run using historic flooding information to the actual recorded rainfall event return period. Further guidance will be taken from the latest version of the CIWEM Integrated Urban Drainage Modelling Guide or the latest Environment Agency Hydraulic Modelling: Best Practice (Model approach) guidance.

8.3 Ordinary Watercourse Flooding

8.3.1 If there is a risk of flooding from an ordinary watercourse, the LLFA expects this risk is assessed (and where appropriate modelled) to show how the vulnerability of development (as per Annex 3 of NPPF and Table 2 of the PPG) is considered and where it is not water compatible, placed outside of the risk of fluvial flooding for the 1% AEP rainfall event plus climate change allowance. The LLFA expects that surface water attenuation features will be located outside of the 1% AEP areas from all sources of flood risk.

Photo 8 ordinary watercourse in North Norwich which is near bank-full during a rainfall event

Photo 9: entirely dry during summer drought

Images E Simpson @ NCC LLFA

8.3.2 Where an ordinary watercourse has been modelled to map the fluvial or tidal flood risk (Flood Zones 2 and 3) this can be used to update the Environment Agency's Flood Map for Planning. The model will need to be reviewed by the Environment Agency to ensure that it is suitable to be incorporated into the Flood Map (for further advice please contact the local Environment Agency office). The LLFA would expect that pre- and post-development modelling scenarios follow national guidance for modelling fluvial flood risk, alternative approaches will be considered in heavily urbanised or pumped catchments. The contributing catchment must be defined using local information similar to

paragraph 10.2.3. The LLFA require that ReFH2 or FEH Statistical method is used to define the hydrological inputs. However, alternative hydrological approaches can be considered if a robust hydrological assessment and comparison of the different methods are undertaken and presented as part of the evidence base, using the most up to date data parameters. Appropriate roughness of the channel, floodplain and other land uses should be defined. The downstream boundary should be representative of the on-site conditions, as should be the number cross sections of the channel and structures, to meet with standard modelling procedure. Calibration modelling scenarios should be run using historic flooding information to the actual recorded rainfall event return period. Further guidance will be taken from the latest version of the CIWEM Integrated Urban Drainage Modelling Guide or the latest Environment Agency Hydraulic Modelling: Best Practice (model approach) guidance.

8.3.3 The LLFA is the drainage authority under the Land Drainage Act 1991 for regulating works on ordinary watercourses for the 80% of Norfolk outside of IDB areas. If there are any works proposed that are likely to obstruct flows in an ordinary watercourse or any culverting is proposed, then approval of NCC or the relevant IDB is required. This approval is separate from the planning process and the LLFA / IDB will issue a consent where appropriate. In line with good practice, the LLFA seek to avoid culverting, and its consent for such works will not normally be granted except as a means of access and other alternatives are unfeasible. This is supported by LLFA Policy (OW4: Culverting) within Norfolk Local Flood Risk Management Strategy.

8.3.4 Where culverting is proposed, a risk-based approach to assessment design and operation must be followed in line with CIRIA Culvert, Screen and Outfall Manual (C786, 2019):

- If a structure is needed, the LLFA expect a single span bridge or covered watercourse / tunnel with access track adjacent to be provided to minimise impacts on the hydraulics and environmental impacts on the watercourse.

- If a single span bridge or tunnel cannot be provided, a culvert is proposed and the development is not considered essential infrastructure, the assessment must justify why other options are not viable and there is an overriding need (see Section 3.2 of CIRIA guidance C786).
- Any proposal to replace or upgrade an existing culvert, must first demonstrate that the watercourse cannot be daylighted and the culvert removed. If a culvert is retained, any improvement to hydraulic, environmental and operational must be demonstrated e.g. removal of a screen or justification of retaining a screen, preventing sediment build up by altering inlet or outlet controls, provision of additional wildlife corridors etc.

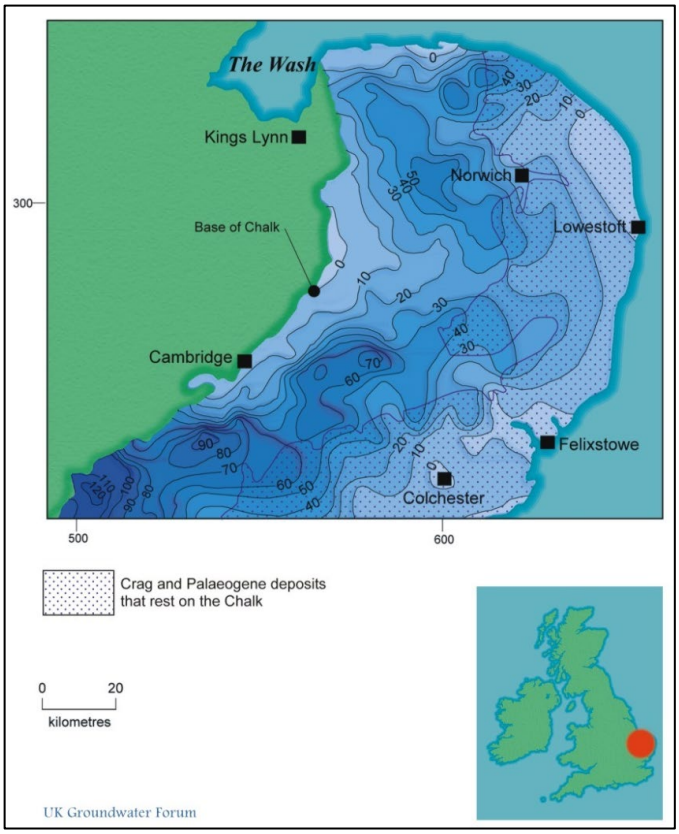
8.3.5 Where culverting is proposed, the LLFA expect the application to consider the appropriate design flow considering the local circumstances. This may include design elements for both low and high flow scenarios with appropriate modelling showing that any receptors are not adversely affected. Where culverts are being replaced or upgraded then the LLFA expect an assessment to show how flood risk is not increased downstream from the loss of storage of water behind a culvert. Guidance on this process as well as downloadable applications forms can be found on the NCC website page "Consenting works on ordinary watercourses". The LLFA offers advice to developers or their consultants on a chargeable basis. Further information on this service can be found in section 5.1 of this document.

8.4 Groundwater Flooding

8.4.1 Groundwater flooding is difficult to predict. It is most likely to occur in low lying areas underlain by permeable rocks / aquifers e.g. chalk or sandstone and localised in sands and river gravels (regional Norfolk groundwater levels are seen in Figure 3). Groundwater flooding can occur several weeks or months following heavy rainfall or at the same time as surface water / river flooding depending on the local conditions. Flooding may also be slower to happen and have a longer duration than other sources of flooding. It is characterised

by coming up through the ground or through floorboards rather than spilling through doors. It may also follow routes of previously dry valleys.

Figure 3: Diagram showing regional groundwater levels in the Chalk aquifer (in m above sea level) from the UK Groundwater Forum. Groundwater hydraulic gradient is from the darker to lighter areas. Localised information will be required to understand groundwater on individual sites.



8.4.2 There are two key types of groundwater flooding, clearwater flooding and alluvial (or permeable superficial deposits) flooding.

8.4.3 Clearwater Flooding happens when groundwater levels within bedrock aquifers rise above ground level. This is normally a result of prolonged rainfall when the groundwater levels are either high or extremely high. This type of groundwater flooding can be prolonged and last for weeks or months until groundwater levels within the aquifer recede naturally. Therefore, this is considered the more disruptive and damaging form of groundwater flooding. It is most likely to occur in 'dry valleys' in permeable geology, e.g. chalk bedrock, or form springs on hillsides.

8.4.4 Alluvial or permeable superficial deposits flooding occurs in unconsolidated superficial aquifers when groundwater levels rise in response to extreme river or tide levels in a hydraulically connected surface water body. Superficial groundwater flooding is often overlooked as it can occur just prior to fluvial or tidal flooding. Groundwater influenced fluvial or tidal flooding can increase the predicted flood level, extent and duration of flooding. It may occur in defended areas if flood defences cut off shallow groundwater flow from a river or the sea. If groundwater is not considered during construction of flood defences, groundwater that would naturally discharge to the surface water body is prevented from doing so and can pond against the flood defence without any method of draining.

8.4.5 In addition, there are artificial influences that can lead to groundwater flooding, which include groundwater rebound and mine-water flooding. Groundwater rebound occurs when a rise in groundwater level following the end of long-term groundwater pumping. This may be associated with the closure of a quarry, mine or large industrial groundwater abstraction. Long term pumping can happen over decades and there may also be long term changes to natural surface topography which could alter natural flow paths. If vulnerable development such as housing, occurs during this time, there may need to be significant mitigation to prevent groundwater flooding during rebound.

8.4.6 The impacts from groundwater flooding are often like other sources e.g. surface water or river flooding, however mitigation for groundwater flooding is different. Mitigation can include avoiding the area where groundwater is expected to emerge and flow. Where there are existing problems, floorboards with voids under them can be replaced with more suitable material such as concrete and very occasionally by long term pumping. Construction of new basements should be avoided in areas prone to groundwater flooding. There are UK maps of groundwater susceptibility, however these only provide an indication of where groundwater flooding could possibly occur based on hydrogeological conditions. These maps do not provide a likelihood of the flooding occurring as they are not risk maps for the use of setting development management policies. Summary information on regional

groundwater levels each month can be found on the National Rivers Flow Archive website. Further information is available in the DEFRA / Environment Agency Making Space for Water HA5 report, Groundwater Flooding Records Collation, Monitoring and Risk Assessment, Consolidated Report (2007). There is currently a joint Defra and Environment Agency research and development project on the overview of groundwater flood management that is ongoing.

8.4.7 To assess the potential of groundwater flooding, an assessment of the hydrogeological setting should be undertaken, using available information. It should also consider whether groundwater flooding at the site is likely or not and then present a conceptual model for feasible mechanisms and suggesting possible mitigation e.g. groundwater flood routes through the site, protection of ground floors etc.

9 SuDS Disposal Destination

Policy 2: NPPF Drainage Hierarchy

National Planning Policy Framework Flood Risk and Coastal Change Planning Practice Guidance

“Where possible, preference should be given to multi-functional sustainable drainage systems, and to solutions that allow surface water to be discharged according to the following hierarchy of drainage options:

1. Into the ground (infiltration)
2. To a surface waterbody
3. To a surface water sewer, highway drain or another drainage system
4. To a combined sewer”

[Paragraph: 056 Reference ID: 7-056-20220825]

“Local planning authorities may wish to encourage the incorporation of rainwater harvesting in sustainable drainage systems. Such systems are likely to be most appropriate for larger commercial or industrial applications and/or for development in areas with a current or likely future Water Stressed Area

Classification. Refer to Water Efficiency Standards and consider such features as part of a Water Cycle Study."

[Paragraph: 056 Reference ID: 7-056-20220825]

Policy 3: DCG Drainage Hierarchy

Water UK Design and Construction Guidance – Sewerage Section Guidance Appendix C.

"The government guidance to local authorities includes a hierarchy of connection, which can be summarised as follows:

a. Surface water runoff is collected for use.

b. Discharge into the ground via infiltration.

c. Discharge to a watercourse or other surface waterbody.

d. Discharge to a surface water sewer, highway drain or another drainage system discharging to a watercourse or other surface waterbody.

e. Discharge to a combined sewer."

[Appendix C: Section C3: Paragraph 12]

9.1.1 The LLFA prefer the use of the DCG discharge location hierarchy. However, due to Norfolk being recognised as in "water stressed" region, the LLFA expects surface water drainage to be managed in a way that replicates the natural drainage processes on the site as closely as possible. Development sites must be split into sub catchments for drainage and proposals put forward on how to best manage runoff within these sub catchments. All sites will have different constraints and varying degrees of existing drainage provision and condition. However, any proposed strategy for the management of surface water must utilise methods as high up the drainage hierarchy as possible. Additionally, source control measures are preferred in the first instance rather than site or regional control measures to best replicate the natural drainage process.

9.1.2 It should clearly be demonstrated in any submission how the proposals follow the NPPF hierarchy (Policy 2). Adequate justification and evidence will be required should surface water be proposed to be discharged using methods

lower down the hierarchy than infiltration. The LLFA expect that at least one option is demonstrated to be feasible, can be adopted and properly maintained and would not lead to any other environmental problems. This is supported by several documents including, CIRIA SuDS Manual (C753), Building Regulations Part H, British Standard BS8582:2013.

9.1.3 Any proposed surface water discharge to a foul water sewer will not be accepted.

9.1.4 Water UK Design and Construction Guidance (DCG), version 2.3 was released in November 2023 in section C3.12 and states the top of the hierarchy should demonstrate that surface water runoff is collected for use prior to moving down the hierarchy (Policy 3).

9.1.5 Rainwater harvesting is an important component of source control SuDS which assists with wider integrated water management strategies. This includes supporting water resource strategies in Norfolk. NCC is a member of Water Resources East (WRE), whose vision is to have sufficient water resource to support the region.

9.1.6 One WRE strategy, is to be as water efficient and resilient as possible, linking land and water management effectively enhancing natural systems. Rainwater harvesting is considered an amenity benefit in the four pillars of SuDS due to its benefit in resilience, climate change and water resource availability.

9.1.7 Rainwater harvesting to supply non-potable water may be possible in many scenarios including schools, civic or commercial properties, agricultural buildings, landscape or allotment irrigation, garden centres or flat developments where a defined daily rate of demand of the water reuse can be better estimated.

9.1.8 To support the WRE strategy, NCC require each development to consider if a cost-effective rainwater harvesting, source control SuDS can be implemented. This is applicable for both greenfield and brownfield sites. It is noted that brownfield sites can be highly constrained, limiting opportunities to retrofit SuDS, but rainwater harvesting may be an option due to its ability to reduce

surface water runoff volumes. This could include green roofs, blue roofs or tanked systems (passive, pumped or combined). Whilst water butts can provide some domestic reuse of water through dry periods, it is difficult to define the benefits as many are full at the time of significant storm events. Information would be required from hydraulic modelling to show how water butts could provide effective surface water management and slow the release of water into downstream drainage systems.

9.1.9 The LLFA consider that the use of photovoltaic (PV) panels on proposed development roofs do not negate the potential for green roof or blue roof application. There are on occasions, benefits from combining green roofs and PV, where the green roofs enhance the performance on hot days by helping to lower the temperature of the roof.

9.1.10 The LLFA expects any drainage proposal to, therefore, include the following as a minimum:

- If there is a foreseeable demand for non-potable water in the design life of the development.
- An estimate of the benefit from a reduction in potable water supply to the development.
- Both the above points should be supported by appropriate calculations/evidence.

9.1.11 If a rainwater harvesting system is designed the following additional information will be required:

- The type of system being proposed, passive, pumped or combined.
- Consideration of the seasonality of supply and demand patterns.
- Comment on how the SuDS Manual's simple, intermediate or detailed methods have been used to calculate the system size.
- How the system will contribute to interception of water at the start of the rainfall event. If it is proposed that final peak flow rates from the

development will be reduced, then significant modelling would be required to demonstrate this.

- How the system will contribute to the management of water storage within the overall SuDS which reduces the need for large attenuation systems elsewhere.
- How the system will connect to an overflow surface water discharge destination next on the hierarchy, as infiltration, watercourse etc.
- How water quality will be managed for non-potable supply of water.
- How any shared rainwater harvesting systems will be maintained in the future by individual properties.

Further information can be found within Chapter 11 of the SuDS Manual.

9.1.12 At least one feasible proposal for the disposal of surface water drainage should be demonstrated and, in all cases, supported by the inclusion of appropriate evidence. Infiltration should be considered first (Plan A) and be supported by BRE Digest 365 testing or equivalent (see Section 10). If shallow infiltration cannot be undertaken or testing results are less than 3 x 10^{-6} m/s (or 10mm/hr) the LLFA deem this geology unfavourable due to difficulties of meeting half drain times at these low infiltration rates. Therefore, the LLFA would expect to see an alternative solution (Plan B) for the next available discharge location in the hierarchy. If Plan B is connection to a watercourse within the site boundary, this must be shown on a drawing, however, if there is a need to cross third-party land, the LLFA expect an in-principle agreement from a landowner to connect across land to a surface watercourse to be provided.

Photo 10: Photo showing a newly created channel as an extension of a watercourse, North Norwich, Norfolk (image E Simpson @ NCC LLFA).

9.1.13 Off-site Connectivity – In some circumstances the LLFA also require evidence, such as a site walkover, drawings and photographs, to illustrate that a watercourse is connected to the wider network and able to convey water away from the development site adequately. In Norfolk, there are many localised drainage soakaway ditches which are cut off from a wider watercourse network (e.g. are “blind”). These watercourses would not be a suitable location to accept the siting of a long-term positive surface water drainage connection.

9.1.14 Where superficial geology returns poor infiltration rates, but “deeper” infiltration testing is favourable (generally between 2m below ground level and 6m below ground level) and this is acceptable to the Environment Agency in groundwater pollution prevention terms, the LLFA would consider these

proposals (pending Section 11.1.4). Classic example of this is where a shallow clay lense caps a “deeper” deposit of sands and gravels.

9.1.15 LLFA still expect that shallow open SuDS components to be included in the overall macrostructure coupled with a trench or similar infiltration feature to tap into the better geology at depth. This dual design of SuDS must be used to provide the necessary protection to the water environment and to incorporate the multi-benefits in accordance with the SuDS philosophy of surface water attenuation, treatment train, amenity and biodiversity benefits. The LLFA will expect evidence of an in-principle agreement with the Environment Agency to be provided by the developer as part of the submission.

d) Discharge to another drainage system (onto discharging to a watercourse)

9.1.16 When no other practicable alternative exists to dispose of surface water other than a separate surface water sewer, the Water Company, the Highways Authority or their agents should confirm there is adequate spare capacity in the existing system taking future development requirements into account. LLFA and the relevant authority will collectively agree the permitted discharge rate(s). The LLFA will support Anglian Water’s requirement for the Section 101 connection rules and policy on discharge to be applied.

Options considered Last Resorts

9.1.17 Norfolk LLFA see deep borehole soakaways as an absolute final resort, these infiltration systems do not meet the requirements of the first level of the drainage hierarchy. Whilst they can provide important groundwater recharge via infiltration at depth, it does not mimic the natural drainage system as would shallow infiltration and poses a much-elevated risk to groundwater quality. The LLFA would only expect it to be used as a final option for the location of discharge of surface water on par with a combined sewer.

9.1.18 Additional land take should also be provided to allow access by drilling equipment for future maintenance which may require the re-drilling of the boreholes. Depending on the confidence of the information an applicant may be required to show there is enough land to replace 50% of the proposed

deep infiltration boreholes or construct additional boreholes as part of the development that can be used as back up if initial boreholes fail.

9.1.19 A direct discharge to regional chalk aquifers or groundwater, i.e. within the saturated zone, is only acceptable if clean roof water can be separated out and sealed from any other surface water, due to its lower pollution risk. See Environment Agency Position Statement G12.

10 Infiltration Drainage and Testing

10.1.1 The LLFA require that the design of infiltration systems to be supported by ground investigations, that have been undertaken at the proposed depth and location of the soakaway. Appropriate testing in the target geological horizon must be undertaken to prove the viability of the soakage and that the worst rate (not the average) to be used to define the number and size of soakaways required. The testing would also support and provide an evidence base for any discussions with the Environment Agency regarding water quality treatment potential in the unsaturated zone and protection of groundwater. This may include the environmental sensitivity of groundwater when designing the drainage scheme, such as, Principal / Secondary Aquifer, Source Protection Zone location and depth to groundwater. To define peak seasonal groundwater levels, an extensive monitoring programme may be required. If multiple boreholes are proposed then appropriate space between them should be allowed, so as not to inhibit the infiltration capacity.

Policy 4: Infiltration Testing Guidance

BRE Digest 365: Soakaway Design (2016)

- Excavate a soakage trial pit to the same depth as anticipated in the full-size soakaway.
- The inflow should be rapid so that the pit can be filled to its maximum effective depth in a short time, i.e. to the design invert level of the drain to the soakaway.
- Fill the pit and allow it to drain three times to near empty [in quick succession]; each time record the water level and time from filling,

at intervals sufficiently close to clearly define water level versus time.

- Calculate the soil infiltration rate from the time taken for the water level to fall from 75% to 25% effective storage depth in the pit, using the lowest soil infiltration rate value of the three test results for design.
- In general, soakage trials should be undertaken where the drain will discharge to the soakaway. The use of full depth and of repeat determinations at locations along the line of trench soakaways is very important when soil conditions vary.

10.1.2 The LLFA would expect all submitted Drainage Strategies to include an assessment of the suitability of the underlying geology to discharge collected surface water to the ground via infiltration. Information is expected to evidence that infiltration is or is not possible (in the form of testing). Only in very unusual cases where ground investigation reports and British Geological Survey (BGS) superficial and bedrock geological mapping information show infiltration is not considered possible, testing would not be required. The LLFA would expect information to be submitted to provide evidence to support the assumed infiltration rate(s) across the site (see Table 5 for guidance).

10.1.3 Where an application meets the statutory consultation threshold the Environment Agency will comment on issues in respect of potential to pollute groundwater or surface water bodies. However, when the statutory threshold is not met and deep infiltration is proposed, applicants are strongly advised to seek Environment Agency advice. The Environment Agency have clear Position Statements to Groundwater Protection including those relevant to SuDS (G1, G9, G10, G11, G12 and G13). Deep infiltration systems may be appropriate in some cases if it is clear that there are no other feasible surface water disposal options. The Environment Agency would consider the pollution potential following their risk assessment process, which is likely to involve detailed specific risk assessment of the pollutants likely to be within runoff or that can be mobilised in the subsoil without appropriate remediation. Whilst the Environment Agency may agree to a “deeper” infiltration approach, they

no longer have the role to advise the LPA on surface water drainage options. Therefore, the LLFA would still require a clear justification to demonstrate why the SuDS hierarchy cannot be followed (see Section 9).

10.1.4 At outline stage, the LLFA would prefer the submission of specific infiltration test results to support the application. Should infiltration testing not be possible, in line with the CIRIA SuDS Manual (C753) Section 25.2.1, an alternative strategy for draining the site (a Plan B) must be detailed in the Drainage Strategy and the LLFA expects this to include the proposed location of any discharge points, the proposed discharge rate, as well as the volume and location of any required storage. Plan A would also be detailed with required volume and location of any storage assuming the most precautionary infiltration rate of 3×10^{-6} m/s (or 10mm/hr). In masterplan development the LLFA expect that representative infiltration testing to be undertaken to determine if infiltration is to be included in the Drainage Strategy. If rates are proved to be generally unfavourable further testing at a later stage should be undertaken to determine if localised infiltration can be achieved.

10.1.5 For full permission, reserved matters or discharge of conditions applications where infiltration drainage is proposed, the LLFA would expect the results of infiltration testing to be provided as evidence to support the layout plan and calculation assumptions in the detailed design of the drainage system. This would include testing undertaken at the depth and location of the proposed structure to inform the detailed design.

10.1.6 If only indicative infiltration testing is provided e.g. at outline design stage, the LLFA will expect this to be undertaken again prior to a detailed design stage, at the location (if large basins are proposed along the length) and depth of the proposed infiltration structures.

10.1.7 To prevent groundwater intrusion and protect groundwater from pollution, any infiltration structure must be constructed 1.2m above the anticipated seasonally high groundwater level. in line with BS 6297: 2007 and Section 6.2 of CD 530 of the DMRB (Design of Soakaways) Information to support this could include geotechnical trial pits or boreholes within the site to demonstrate that groundwater is not present at shallow depths. Ideally groundwater

monitoring using telemetry would take place for 12 months prior to development. The 12-month period would include at least one seasonally high groundwater level event (most likely to be between January and March). The LLFA are however aware that there can be dry winters followed by dry summers or very wet summers, or specific ground conditions that can alter the timing of seasonally high groundwater levels. Monitoring for 12 months may not be possible at all development locations. If initial geotechnical testing is undertaken (especially at outline planning permission), the LLFA recommend that groundwater monitoring is established as soon as possible and remain in place for a long as possible. Professional judgement will be required to determine if conditions during the monitoring would show a representative seasonally high groundwater levels to support the proposals of infiltration.

Table 5: NCC Infiltration Testing Requirements for Applications

Application Stage	Outline / Masterplan	Full / Reserved Matters / Discharge of condition
Strategy promotes infiltration	Broad coverage and variable depth infiltration testing required or alternative 'Plan B' Drainage Strategy	Infiltration testing at depth and location of proposed structures required

10.1.8 The LLFA expects infiltration testing to support surface water Drainage Strategy calculations to be undertaken in line with BRE Digest 365 guidance (see Policy 4) or equivalent.

10.1.9 The LLFA consider the following to be a good practice minimum requirement for infiltration testing in Norfolk:

11 Infiltration Constraints

11.1.1 The LLFA expects that any design of infiltration structure will ensure that it can discharge from full to half volume within 24 hours in readiness for subsequent storm inflow (CIRIA SuDS Manual (C753) Section 25.7 and BRE Digest 365). The 3.33% AEP event must be able to discharge from full to half

volume within 24 hours to comply with national standards. Where the infiltration storage is designed to accept a storm event greater than 3.33% AEP event including climate change allowance, larger attenuation will be required. If a half drain down time of 24 hours cannot be achieved, and infiltration rates are close to being unfavourable, other options of disposal of surface water should be considered. In unusual circumstances and there is adequate justification (but not in a high flood risk area), the LLFA may accept longer half drain down times if additional freeboard can be provided e.g. enough storage to accept a subsequent 10% AEP+CC event.

11.1.2 The design infiltration rate on which infiltration devices are designed too following site investment can reduce over time, particularly if there is no pre-treatment or there is poor maintenance. To account for this, the LLFA expects redundancies to be incorporated into the design method being employed. In terms of infiltration design there are two methods that the LLFA accept.

1) BRE 365 Digest method

2) CIRIA R156, 'Infiltration Drainage Manual of Good Practice'.

11.1.3 For the BRE design method the LLFA expects that the infiltration coefficient is only applied to half the vertical depth of any proposed closed infiltration feature such as domestic soakaways, therefore the base and the remaining half of the vertical depth is not expected to infiltrate. Therefore, a Factor of Safety (FoS) does not need to be applied to this method of design.

11.1.4 The CIRIA R156 Method (applies the infiltration rate to the whole infiltration feature, however, a FoS found in Table 4.6 of R156 or Table 25.2 of the CIRIA SuDS Manual (C753) must be applied. The factor used is based on the contributing area and a judgement of consequence of failure of the drainage system.

11.1.5 Ciria R156 method is most commonly used for design of open infiltration devices. The LLFA expects Table 25.2 - Suggested Factors of Safety, of CIRIA SuDS Manual (C753) to be used unequivocally and **if the drainage system within a new development is to be offered to NCC Highways**

Authority to be considered for adoption, the calculations must use at least the middle column of Table 25.2.

11.1.6 The scope for using infiltration may be reduced. For example, where soils have poor infiltration capacity, where groundwater levels are high (see Section 10.1.7 above), there is a groundwater Source Protection Zone constraint (particularly SPZ1), there is ground contamination where infiltration would mobilise pollutants (see Environment Agency Groundwater Protection Position Statements G1, G9 and G13) or where ground conditions present particular risks of subsidence from voids and instability in the underlying geology. Chapter 8 of the CIRIA SuDS Manual (C753) considers how to design SuDS in areas with particular constraints.

11.1.7 Issues regarding the suitability of development (particularly housing) on unstable geology is for a suitably qualified structural engineer to consider during the design. **Ciria Guidance C574 Engineering in Chalk Chapter 7.10.2, page 236 must be adhered to** and alternative hierarchical methods of discharge must be pursued if subsidence is considered a very likely possibility.

11.1.8 The LLFA are not aware of any widespread subsidence issues across Norfolk except in some parts of Norwich City and Swaffham. It is recognised that areas of Norwich are built on chalk where there are disused mine workings, and some are especially prone to subsidence.

11.1.9 It is not the LLFA's remit to assess the impact of proposed infiltration systems on the ground stability of the site and potential for solution features (also referred to as dissolution features) forming, unless the LLFA are aware of particular issues in the area. The LLFA do not see that traditional ring (or point) soakaways as suitable in these locations due to the potential for settlement, however, not all SuDS should be automatically precluded but designed in proportion to the level of risk.

11.1.10 Traditional soakaways (domestic or highway) within 5m of buildings or road foundations have the highest potential to cause the greatest impact where the geology is susceptible to subsidence. Soakaways to be >5m from highway edge and >5m from buildings as per Building Regs Part H.

11.1.11 During spatial planning the designer will need to provide a greater exclusion zone in accordance with Ciria C574 if chalk is the predominant geology and revert to planar or blanket type infiltration systems such as permeable paving, wide swales and shallow infiltration basins. Further guidance can be found in CIRIA SuDS Manual (C753) Chapter 8, Section 20.3, Chapter 25 and within the Susdrain factsheets.

11.1.12 The LLFA expects any infiltration testing to be redone after any groundworks to compact and stabilise soils following identification of subsidence risk. Infiltration should also be avoided where there is a known landslip hazard.

11.1.13 Shallow infiltration, such as permeable surfaces, may be suitable in areas of known subsidence and close to properties. This is because permeable surface infiltration is shallow, infiltrates over a wide area and replicates runoff processes in a similar way as it would prior to development. The LLFA would hence encourage any developer to identify the risk of subsidence and propose suitable SuDS features considering the level of risk during detailed design. The LLFA highlight that Section 25.2.3 of the CIRIA SuDS Manual (C753, 2015) states that:

> “The potential risk of adverse effects from infiltrating water will depend on the volume of water being discharged along with the depth and plan area of the infiltration system. The smaller the area of the system in relation to the drained area, the greater the risk.”

11.1.14 Norwich City Council has development management policies set for surface water flooding and drainage and subsidence (DM5, DM11). These policies state that “where it is demonstrated that permeable surfaces are likely to be unacceptable for these reasons; hard surfaced paving may be accepted. In these cases, developers will be encouraged to explore alternative means of managing surface water runoff within the development site. Where soils are well drained, impermeable surfaces will only be permitted where it is demonstrated that there is an overriding need for such a surface”. The LLFA would expect that an appropriately qualified geotechnical engineer would provide a risk assessment to consider subsidence in high-risk areas.

12 Runoff Rate and Volume Control

Policy 5: Runoff Rate

SuDS Non-Statutory Technical Standards (2015)

S2. For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event [100% AEP] and the 1 in 100 year rainfall event [1% AEP] should never exceed the peak greenfield runoff rate for the same event.

S3. For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event [100% AEP] and the 1 in 100 year rainfall event [1% AEP] should 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.

Refer to Paragraph 12.1.1 for further information regarding approaches for the consideration of runoff volume from a development site.

Policy 6: Runoff Volume

CIRIA SuDS Manual (C753)

“Peak rates of surface water runoff discharged from a development (i.e. relatively impermeable) site, if left uncontrolled, are normally significantly greater than from the site in its greenfield state. This is because most of the runoff drains off the surfaces of the developed site much quicker than the greenfield site and there is much more runoff, as less water is able to penetrate the ground or be intercepted in other ways.”

Figure 4: Ciria C753 SuDS Manual diagram showing an example of a runoff hydrograph.

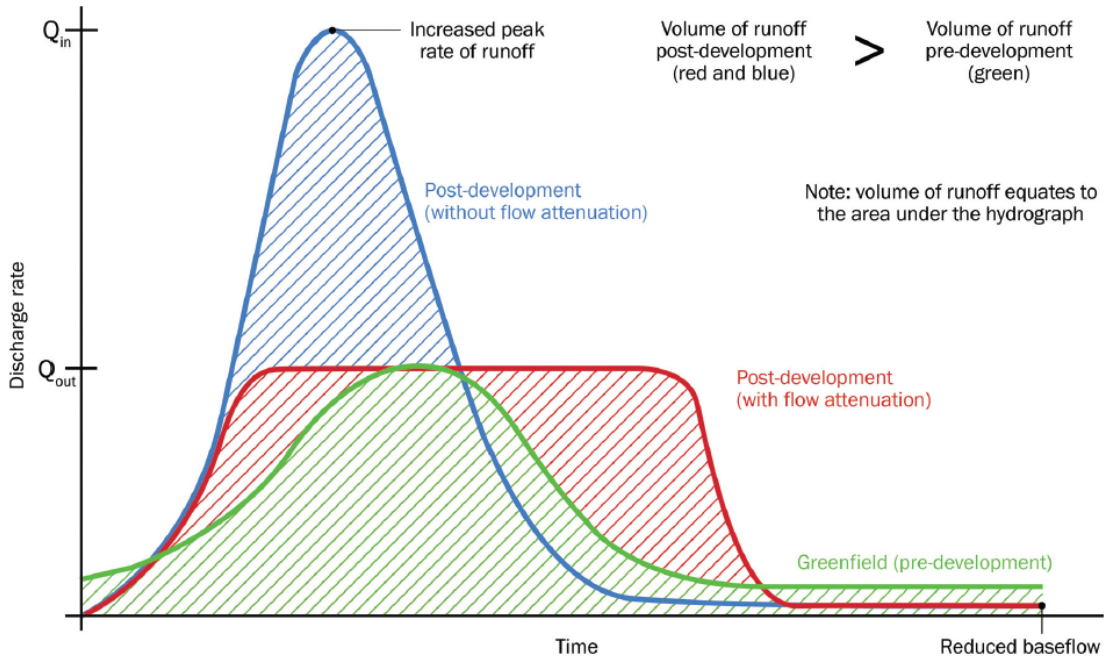


Figure 3.1 Example of a runoff hydrograph

[Reproduced from C753 SuDS Manual Section 3.1.1 ©CIRIA 2015]

12.1.1 The LLFA permit two approaches for the consideration of peak flow control (Policy 5 - S1) and runoff volume control (Policy 6) from a greenfield (pre-developed) site:

Approach 1 (Simple) – All storm events up to and including the 1% AEP including climate change must be discharged at a rate of 2l/s/ha or the annual average peak flow rate (QBAR), whichever is the greater.

Approach 2 (Complex) – also known as the flow matching technique, storm events (i.e. 100%, 3.33% and 1%) are restricted to their equivalent greenfield rate using a complex flow control.

However, this approach releases additional volume (see red and blue areas in Figure 4) into the receiving watercourse. This additional volume must be restricted to 2l/s/ha or less and be accommodated within the overall greenfield rates for the site. Approach 2 requires additional Long Term Storage to be provided (see Section 12.1.20 for more advice).

12.1.2 Although Approach 1 will require a greater volume of storage than Approach 2, this approach is preferred in Norfolk as this combines Policy 5 and 6 into a simple integrated approach.

12.1.3 Brownfield sites must discharge at the original pre-development (greenfield) runoff rate.

12.1.4 If this is not practical, the LLFA expects to see a significant reduction in the current rate of discharge achieved and agreed with the relevant drainage body (LLFA, IDB or Anglian Water Services Limited (or NAV)), providing evidence as to why an alternative should be considered. It is unlikely to be acceptable to maintain 100% runoff when considering sustainable redevelopment. This would be particularly important in areas which have been defined as Critical Drainage Areas (by the Environment Agency) or Critical Drainage Catchments (by the LLFA in conjunction with a District Council).

12.1.5 Anglian Water Services Limited (or NAV) Surface Water Drainage Policy (Nov 2017) for discharging to sewer also states “Where a brownfield site is redeveloped no historic right to connection will exist and any sewer connection be treated as new. The site will be treated as if it was greenfield and therefore the discharge rate limited to the equivalent to the 1 in 1 year (100% AEP event) greenfield rate”.

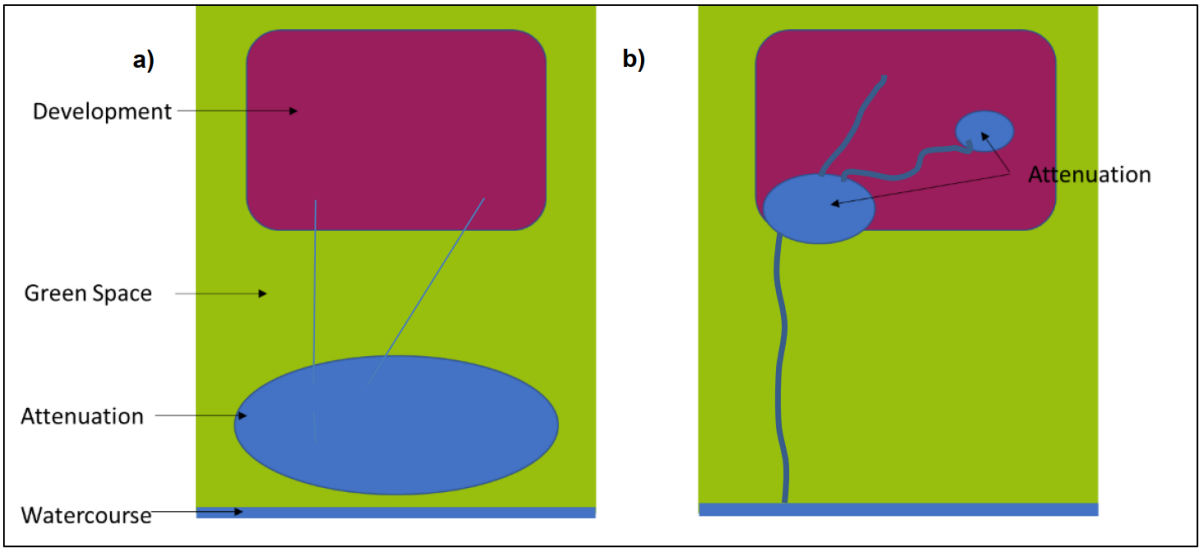
12.1.6 All calculations of greenfield runoff rates and volumes should use the most up to date Flood Estimation Handbook (FEH) rainfall data and catchment characteristics within the sub-catchment of the watercourse for the location of the proposed outfall. LLFA will also expect FEH Statistical Method or ReFH2 to be used. If multiple sub catchments are present across a site, these must be delineated, and pre-development runoff rates calculated for each one.

12.1.7 Greenfield calculations must be based on the whole development area (i.e. paved and unpaved areas of the site served by the drainage system). This includes houses, gardens, roads, and other small open spaces that are within the “area served” by the drainage network.

12.1.8 Significant areas of greenspace such as recreation parks, large public open space that will have a similar runoff response as the pre-developed state and

which are not served by the drainage system must be excluded. Small open spaces/gardens must be included as they have a potential to add a percentage runoff into close by drainage systems (see paragraph 6.7 for pervious uplift). This is to account for water that naturally enters the watercourse that would now be intercepted by a SuDS feature, see Figure 5.

Figure 5: Diagram showing an indication when to allow for open space within greenfield Runoff / Volume calculations a) include b) not required.



12.1.9 Consideration must be given to sub-catchments which may exist across a large site. Catchment delineation will be expected and greenfield runoff rates calculated for each sub catchment.

12.1.10 It may be possible to divert water to a different sub-catchment, only if the permitted rate for that receiving sub-catchment does not exceed its natural greenfield rate. It may be difficult to transfer water from a site which would naturally drain to a different watercourse catchment, as this transfer of water may necessitate large volumes of water being stored on-site before pumping over to the adjacent catchment.

Betterment

12.1.11 Where there is a known history of flooding or capacity constraints within a watercourse downstream of the site in question, a reduction in the greenfield runoff rates (i.e. 1yr flow rate) may be requested. Similarly, for brownfield sites

the LLFA require runoff rates equivalent to greenfield or a significant reduction in the existing brownfield rate.

In accordance with PPG, where existing flooding issues are known downstream of the site, new developments should seek opportunities to incorporate Natural Flood Management measures within the red and/or blue line boundary to reduce flood risk within the local area (subject to maintenance and management being agreed to reduce any residual risks).

12.1.12 However, the LLFA will take a risk-based approach to using small flow control sizes (50mm >x<100mm) and the location of these on the development site compared to downslope dwellings. If residual flood risk due to blockage is greater than the risk of downstream flooding then LLFA will keep to standard flow rates and larger openings; if not, lower flow rates and smaller openings may be requested. Low risk spatial planning is key here i.e. SuDS located on the lowest portions of the site.

12.1.13 For the avoidance of doubt LLFA will not accept orifices less than 50mm. And designers must make sure that any resulting orifice sizes less than 100mm are protected or smart monitoring is installed. The updated UK Water DCG (2023), Section C7.12 supports the design process within Chapter 28 of CIRIA SuDS Manual (C753) but also warrants the use upstream debris control (C7.12) to be included to allow low greenfield runoff flow controls to be installed without risk of blockage.

12.1.14 Upstream SuDS treatment train must consider: -

1. Treatment – Remove any gross pollutants or large objects that could cause blockage before they reach the flow control.
2. Screening – Protect the flow control inlet from debris with a mesh screen such as perforated risers.
3. Monitoring - Responsible maintenance body receives instant alerts if there is a blockage with systems using telemetry/smart Monitoring.

12.1.15 For the avoidance of doubt, the LLFA will agree a runoff rate to a watercourse, unless it is in IDB district in which case the IDB should be

consulted. Moreover, Anglian Water Services Limited set runoff rates to sewers in line with their regional policy (i.e. 100% AEP (1 in 1year) greenfield flow rate for all events). Anglian Water Services Limited (or NAV) / LLFA will agree post development runoff rates to sewers. Where discharge of surface water should be discharged to ground but cannot, due to constraints such as contaminated land or seasonally high groundwater levels, greenfield runoff rates would need to be agreed using the appropriate soil type. The LLFA will consider proposals on a site-by-site basis in the case of discharges that should go to ground and agree a rate between 1 to 2l/s/ha based on site-specific issues (as in Section 3.3.2 of CIRIA SuDS Manual (C753)).

Storage Design and Sizing

Policy 7: Flood Risk within the Development

SuDS Non-Statutory Technical Standards (2015)

S7 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 1 in 30 year rainfall event.

S8 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 in 100 year 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.

S9 The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property.

12.1.16 LLFA consider that the drainage system (storage and conveyance) as a minimum be sized to accommodate the 1% AEP +CC event for the critical storm duration (with allowances for freeboard and uplift factors) to accommodate both policies S7 and S8, where this is not practical a means of justification will be required to outline how people and property are protected if parts of the site are predicted to flood as per S8. In this scenario there must

definitely no above ground flooding up to the 3.33% AEP +CC and if areas are designed to flood it must be done safely.

12.1.17 For avoidance of doubt no stormwater should leave the site uncontrolled up to the 1% AEP +CC whether that be in a drainage network or via overland exceedance.

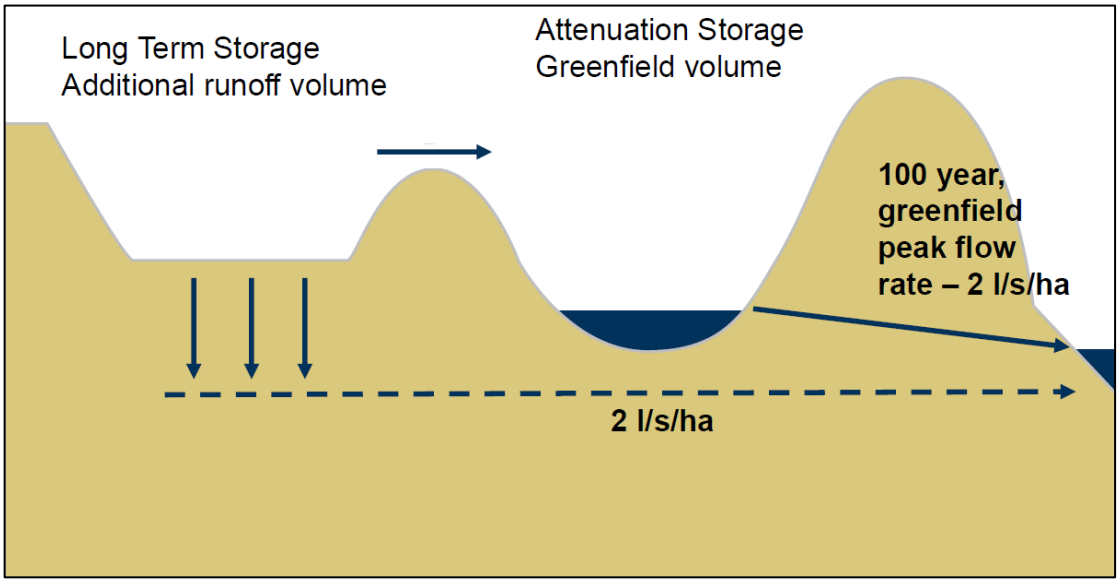
12.1.18 Drainage strategies must also consider the increase in the volume of runoff from a development as a result of increases in the area of impermeable and the greenfield volume generated from unchanged pervious surfaces, also known as “Volume Control”.

12.1.19 As per 12.1.2 the LLFA prefer the use of Approach 1 to account for this volume the LLFA control simultaneously with peak flow control, but runoff rates may also be restricted to equivalent greenfield rates.

12.1.20 If complex controls are to be used for control of discharge rates, the LLFA expects calculations for the greenfield runoff rate to be provided for the 100% AEP, 3.33% AEP and 1% AEP events. Plus, storage calculations showing the post development runoff is attenuated at these equivalent rates and the “additional” volume is discharged at 2l/s/ha for the Long Term Storage. In summary:

- Discharge (‘via Long Term Storage’) the ‘additional’ runoff volume and discharge at a rate of 2 l/s/ha or less.
- Spill and store the post development runoff volume at the allowable greenfield peak flow rate (using ‘attenuation storage’). Note must minus off 2l/s/ha to keep to overall sites greenfield volume.

Figure 6 - Long Term Storage Setting Out Example



12.1.21 An assessment of the Long Term Storage that would be required on-site must be submitted if using Approach 2. This must be based on the 1% AEP 6 hour (checked against the critical storm duration) with climate change for the site and the allowable discharge rate. The LLFA expects Flood Estimation Handbook (FEH) rainfall data to be used for all storm durations when identifying the critical storm duration. The method of Long Term Storage attenuation should be identified and located on a drawing of the site layout.

12.1.22 **Interception** of frequent everyday rainfall needs to be considered in the design of the SuDS scheme. This captures the first 5mm of rainfall from being discharged from the site. Interception can occur in any catchment including those with clay soils and does not reply on high infiltration rates. Interception water will be lost through evapotranspiration or infiltrated within 48-hours of a rainfall event. By including interception rainfall, overall extreme rainfall storage volumes of water (1% AEP event plus CC) on the site will be reduced. Interception can be provided through rainwater harvesting, green roofs, infiltration components, pervious surfaces, bioretention systems, swales and dry basins. Further information is available can be found in The SuDS Manual, Chapter 7 (applying the approach of SuDS). Designing interception advice is found in Section 24.8 including information on how likely interception will be delivered during summer (80% compliance) and winter (50% compliance) rainfall events. Including interception storage within any drainage

design will assist with achieving multifunctional benefits and the four pillars of SuDS.

12.1.23 The contributing area for proposed storage sizing needs to account for both paved and unpaved areas (such as gardens, open spaces, verges etc that have a similar runoff response to the in-situ soil conditions) also referred to as the net impermeable area. This is to ensure that the drainage network is not overwhelmed when permeable surfaces generate a percentage runoff. See pervious uplift in paragraph 6.7. The plan area of all open SuDS should also be included in the contributing area.

12.1.24 **Urban Creep** - to be applied to residential development to account for increases in private curtilage impermeable surfaces e.g. extensions of roof area, paving, driveways and roads, throughout the lifetime of the development. An additional 10% in impermeable area should be applied other than when this would increase the total impermeable area to greater than 100%. If a lesser value is deemed appropriate this should be evidenced by the applicant.

12.1.25 Flow control devices should have a free discharge (no downstream surcharge), where practicable. Where there are known high water levels or flooding issues, it should not be assumed that the drainage scheme outfall can be free flowing.

12.1.26 Similarly flat or low-lying sites near coastal fringes are more at risk to surcharged outfalls and consequential storage adjustments need to be assessed using bespoke modelling calculations. Initially, the LLFA recommend to developers to situate the formation level of all storage device(s) above any projected flood conditions in the receiving watercourse over the full design life of the scheme to maintain an adequate hydraulic head to the outfall. The minimum base level for storage should be set on higher ground equating to a 3.33% AEP event plus CC flood level in the receiving watercourse or the MHWS/ projected sea levels in a tidal river to align with Policy S7. Assessment of further scenarios including b) a 1% AEP rainfall event combined with a MHWS tide; and c) a 50% AEP rainfall event combined with a 0.5% AEP tide to assess the impacts of a surcharged outfall on the

sites flood risk from surface water. Future effects of climate change on sea level must also be considered (refer to EA Coastal Flood Boundaries Dataset).

12.1.27 A duration of 6 hours – one tidal cycle must be used to represent peak tide level.

12.1.28 Consultation with EA / relevant IDB will be required to obtain future sea level projections along the coastline and along tidally influenced rivers. MHWS and 200yr tide projection to the end of the development lifetime should be tested.

12.1.29 The 50% AEP, 3.33% AEP and 1% AEP plus CC rainfall events need to conservatively coincide, the peak of the tide with the peak flow at the outfall. The coincidence of the peaks should be tested for a range of storm durations until the critical storm is identified (the one that results in the highest peak water levels at the site). This will require some joint probability analysis or the worst-case scenario tested.

12.1.30 An appropriately designed SuDS scheme must consider the Health and Safety risks for all types of features and those risks are reduced or prevented at the design stage kept through good design e.g. inclusion of wet or dry benches in attenuation basins, good surveillance and masking of desire lines using appropriate planting/fencing. The CIRIA guide ‘Health and Safety for SuDS: framework and checklist’ (CIRIA RP/992 Nov 2013) was written in conjunction with the Royal Society for the Prevention of Accidents (RoSPA) and provides an outline of common issues and puts risks into context. This guide is free to download from the CIRIA website.

12.1.31 The LLFA consider the following as minimum requirements for open suds. Water depths in publicly accessible spaces (unfenced basins) should adhere to the following criteria:

1. 1.2m max depth of water* = 1m temporary storage + 0.2m below outfall invert for interception storage.
2. Minimum 300mm freeboard to top of bank.

3. 1.5m wide wet benches as standard at 600mm below top of bank (as per RP992).
4. Side slopes - 1:4 gradient and no steeper.
5. 3.5m wide maintenance strip (working with suitable barrier planting around the basin to reduce desire lines).
6. Safety signs.

*Certain adoptees may have local requirements.

All bodies of water with proposed depths of water greater than 1.2m to be fenced off with correct water safety equipment and a ROSPA evaluation undertaken.

12.1.32 Where pumping is proposed, it should be demonstrated with the provision of sufficient evidence that the site cannot be developed without it. Pumping of surface water drainage as part of a SuDS will only be acceptable if it can be demonstrated that it is not reasonably practical to drain those parts of a site by gravity (as stated in standard S12 of SuDS Non-Statutory Technical Standards (2015) and C.5.8 of the DCG). In the rare occasions where pumping of surface water is deemed necessary, the LLFA requests calculations/evidence to prove that:

1. No properties flood in the event of a pump(s) failure over a 24-hour period due to a power outage or other disruption in service. This mimics with the requirements of section 2.39 in Building Regulations Part H for foul pumping stations.
2. Hence the Designer will have to design for the 1% AEP + CC event with no outflow for 24 hours, with all pump system(s) afforded extra storage to contain the additional stormwater volume i.e. a larger wet well or extra upstream storage

and/or

Provide designated areas of safe above-ground flooding in the site layout whilst maintaining 300mm freeboard to FFLs and not causing any other problems offsite. If the pump station is not in close proximity

to the designated areas of flooding, adequate exceedance flood plans shall be provided to show how floodwater is routed safely to these areas of safe flood storage (see C6.5 of DCG).

3. The Designer will have to sensitivity test for a 48hr period to check freeboard allowances. This also acknowledges the Office of Gas and Electricity Markets (OFGEM) regulations for utility companies to restore power in a severe storm within 24 - 48 hours.

12.1.33 The LLFA also expect details of a robust emergency failure procedure to be submitted, covering the procedure for both mechanical and electrical failure. This should include details of how these failures will be identified (e.g. through an alarm system / telemetry etc.), as well as identifying who the responsible party will be for monitoring and responding to any failures.

12.1.34 For further guidance on the modelling requirements for storage sizing please see paragraph 6.7.

13 Climate Change

Policy 7: Flood Risk Assessments: climate change allowances

"Making an allowance for climate change in your Flood Risk Assessment will help to minimise vulnerability and provide resilience to flooding and coastal change in the future.

The climate change allowances are predictions of anticipated change for:

1. Peak river flow by river basin district.
2. Peak rainfall intensity water management catchment.
3. Sea level rise.
4. Offshore wind speed and extreme wave height.

They are allowances for climate scenarios over different epochs or periods of time over the next century. They include figures for extreme climate change scenarios."

13.1.1 All FRAs and surface water Drainage Strategies are expected to incorporate any updated Environment Agency climate change allowances for peak river flow and rainfall intensity as set out within the water management catchments (Policy 7).

13.1.2 For ordinary watercourses or drainage design the LLFA expect anyone undertaking an FRA and/or Drainage Strategy to review and apply the most up to date guidance, including assessment of the lifetime of the development and the vulnerability of the proposed land use to justify the choice of allowance applied.

13.1.3 The LLFA highlight that for FRAs and fluvial modelling, the LLFA expects peak river flow climate change allowances to be used for ordinary watercourses greater than 5km^2 in the same way that it would be considered for main rivers. Watercourses that have catchments smaller than 5km^2 are generally considered to be dominated by rainfall and so the peak rainfall allowances may be used. There may still be cases where applying peak rainfall allowances will not be appropriate and the hydrology of each catchment should be appropriately assessed.

13.1.4 As a minimum the LLFA expects a modelling scenario of the new climate change allowances or design parameters should be tested to ensure that flood resilience and resistance of any vulnerable development is sufficient for long term sustainability. For avoidance of doubt, some examples of design parameters that may change include:

1. Rainfall data/intensities
2. Climate change
3. Pervious Uplift Contribution percentage
4. Urban creep allowances
5. Changes in permeable and impermeable areas due to layout changes
6. Simple index approach
7. Others not listed above.

13.1.5 **In the case of surface water flood risk on non-residential developments with a lifetime between 2061 and 2100, the central allowance for the 2070s epoch (2061 to 2125) should be applied (Table 6)**. In addition to this, the LLFA require a sensitivity test to be undertaken using the upper end allowance to demonstrate no increase in flood risk. As of 2025 the LLFA advise that the upper end allowance for the 2070s epoch (2061 to 2125) should be applied to all development as the design life from this date would take development to 2100 or beyond.

13.1.6 **In the case of surface water flood risk on developments with a lifetime beyond 2100, including housing developments (NCC consider residential development to have a minimum lifetime of a 100 years), the '2070s' climate change epoch 'Upper End' allowance must be used in the initial design of any surface water drainage system including SuDS. See Table 6.**

13.1.7 This Upper End scenario is to inform any additional mitigation required for the development to be safe from surface water flooding and which might be required to prevent an increased risk of flooding such as additional freeboard allowances on drainage infrastructure and/or housing finished ground floor levels.

13.1.8 All surface water generated from a new development must be held within the development site boundary for the 1% AEP rainfall event plus the upper end climate change allowance to ensure there is no increase in flood risk elsewhere.

13.1.9 The construction of a commercial or agricultural building is likely to require the use the '2070s' climate change epoch 'Upper End' allowance unless significant justification can be given as to why the drainage scheme will not be expected to be in place for this length of time.

13.1.10 For development with a lifetime up to 2060 use the central allowance for the 2050s epoch (2022 to 2060). Unless the '2050s' climate change epoch allowance is greater than that of the '2070s' climate change epoch allowance, the LLFA are likely to query the use of the '2050s' climate change epoch if it is

not obvious that the development is temporary in nature (i.e. temporary haul roads or construction sites).

13.1.11 For any development proposing a design life of up to and including 2100 and applying a climate change allowance less than that required for the '2070s' epoch Upper End allowance, a decommissioning plan will be required to evidence the removal of the development at the end of the proposed design life.

13.1.12 Climate change allowances are now required to be applied on drainage designed for both the 3.33% AEP and 1% AEP events.

13.1.13 In some locations the allowance for the '2050s' climate change epoch is higher than that for the '2070s' climate change epoch. If so, and development has a lifetime beyond 2061, use the higher of the two allowances. This is the case for sites located in Broadland Rivers Water Management Catchment.

Table 6: Climate change allowances from the Environment Agency Peak Rainfall Allowances, split into relevant water management catchments (May 2022)

Management Catchment ID	Management Catchment Name	Allowance Category	Epoch 2050s 3.33% AEP (30 year)	Epoch 2050s 1% AEP (100 year)	Epoch 2070s 3.33% AEP (30 year)	Epoch 2070s 1% AEP (100 year)
6	Broadland Rivers	Central	20%	20%	20%	20%
6	Broadland Rivers	Upper End	40%	45%	40%	40%
7	Cam and Ely Ouse	Central	20%	20%	20%	25%
7	Cam and Ely Ouse	Upper End	35%	40%	35%	40%
45	Nene	Central	20%	20%	25%	25%
45	Nene	Upper End	35%	40%	35%	40%

Management Catchment ID	Management Catchment Name	Allowance Category	Epoch 2050s 3.33% AEP (30 year)	Epoch 2050s 1% AEP (100 year)	Epoch 2070s 3.33% AEP (30 year)	Epoch 2070s 1% AEP (100 year)
50	North Norfolk Rivers	Central	20%	20%	20%	25%
50	North Norfolk Rivers	Upper End	35%	40%	35%	40%
51	North West Norfolk	Central	20%	20%	20%	25%
51	North West Norfolk	Upper End	35%	40%	35%	40%
55	Old Bedford and Middle Level	Central	20%	20%	25%	25%
55	Old Bedford and Middle Level	Upper End	35%	40%	35%	40%

14 Water Quality and Water Framework Directive

14.1.1 An applicant should risk assess the development for water quality and propose mitigation in a SuDS treatment train as in Section 4 and 26 of CIRIA SuDS Manual (C753), reviewing Tables 4.3 and 26.1 in particular. A water quality treatment process should take account of the final discharge location and include extra treatment step/s for any sensitive receptors or if there is a need for an emergency shut off mechanism e.g. at the outlet of a pollution forebay. In general, housing developments would need to assess if the simple index approach (Section 26.7.1 of the CIRIA SuDS Manual (C753)) is a suitable assessment. The LLFA would expect this assessment of pollution hazard and mitigation control to be included with an application. There is an online tool provided by UKSuDS which can help with this assessment. Water Framework Directive (WFD) and sensitive receptors are discussed in Section 14.1.4 and 14.1.5 below. The Design Manual for Roads and Bridges (DMRB) Part CD530 – Design of Soakaways should be consulted regarding road runoff and considerations for pollution to groundwater. The LLFA accept the use of the Highways England Water Risk Assessment Tool (HEWRAT) for road infrastructure proposals (in line with National Highways). The post-development proposed mitigation treatment train should be clearly set out to show that sufficient mitigation is provided.

14.1.2 Inclusion of interception storage (the first 5mm of rainfall) in a SuDS design, will also benefit water quality by capturing the high polluting first flush during a storm. See the SuDS Manual Chapter 7 and Section 24.8 for more information regarding design. LLFA recommend that for open SuDS the base of the feature is set below the invert of the outfall device, sized to the interception storage requirement (5mm over the contributing area only, exclude pervious surfaces for this assessment).

14.1.3 The Environment Agency have standing advice that states, in general they consider pollution of surface water runoff from residential development to be adequately addressed if SuDS have been provided to manage the runoff. Water quality treatment would not be met if traditional piped drainage schemes are promoted. If piped schemes are promoted as part of a SuDS

scheme e.g. pipes connecting to geo-cellular crates or attenuation tank(s), other SuDS components, such as permeable paving, swales, filter drains + filter strips, bioretention areas should also be used to treat road runoff prior to the final discharge.

Photo 11: Photo of a newly created swale with over the edge drainage on Broadland Northway, Norwich, Norfolk (Image E Simpson @ NCC LLFA)

14.1.4 Clean residential roof water that is separated from other runoff can be directly discharged to the water environment (including any watercourse or soakaway) without treatment. The use of proprietary systems such as oil interceptors are not generally seen as a treatment step in SuDS but could be considered as a pre-treatment stage. There are proprietary vortex controls that can treat water to a sufficient standard reported to meet the SuDS mitigation indices required in the SuDS Manual assessment (see Section 14.1.1 above). However, there will only be considered in exceptional circumstances where open shallow SuDS cannot be achieved e.g. highly constrained brownfield development. These proprietary systems may not be acceptable to an adopting authority. Therefore, should be undertaken prior to application and in-principle agreements provided if proprietary systems are included in an approval.

14.1.5 The sensitivity of the receiving waterbody (ground or surface) should be considered, and extra water quality treatment provided if a protected resource is identified. If there is clear evidence that additional water quality treatment has been included considering the protected resource requirements, no further WFD assessment would be required. A full WFD assessment would be required if no treatment or additional requirements for sensitivity are not

included in the SuDS proposal. The following designations could be considered ‘sensitive’ protected resources and require additional mitigation in the SuDS treatment train (maps of many of these designations can be found on the DEFRA 'MAGIC' mapping website and at the Flood risk activity permits: salmonid main rivers website):

1. Groundwater Source Protection Zone 1
2. Principal Aquifers
3. 50m within a private potable of a groundwater abstraction
4. Surface Water drinking water zone
5. RAMSAR site
6. Special Area of Conservation (SAC) and consideration of tributaries
7. Special Protection Area (SPA) and consideration of tributaries
8. SSSI and consideration of tributaries
9. Salmonid fish stretches (in particular, brown trout)
10. Chalk Streams
11. National or Local Nature Reserves
12. Nitrate Sensitive Areas
13. Nitrate Vulnerable Zones

14.1.6 The Environment Agency have classified the majority of Norfolk’s main river channels and surface waterbodies as having a high sensitivity rating e.g. SSSI or salmonid fish stretches. This assessment is based on the species and habitats found in these systems and the rating given is an indication of the surface waterbodies susceptibility to change. The sensitivity of these watercourses is likely to extend to all of the connecting tributaries and ordinary watercourses which flow into these river channels and surface waterbodies. Additionally, Norfolk has many principal aquifers and groundwater drinking water Source Protection Zones which would also be classed as a ‘sensitive’ protective resource. An applicant would have to

consider if there is a significant amount of secondary superficial aquifer above the principal aquifer to provide protection and not be classed as ‘sensitive’.

14.1.7 If you are unable to design your SuDS proposal according to the sensitivity of the receiving surface water or ground waterbody you will need to demonstrate how your proposal is compliant according to WFD through the submission of a detailed WFD assessment (please contact the local Environment Agency office for advice). It is the applicant’s responsibility to ensure that the drainage scheme does not result in deterioration to any of the qualifying WFD status elements or that the scheme prevents *“good ecological status or potential from being achieved”.*

14.1.8 The Water Framework Directive provides the mechanism to protect and enhance the nation’s water environment. All waters are classified in terms of various criteria and water quality measures range from nutrient pollution to fish and plants living in the water. Each waterbody has a target which must be achieved, and any development must not cause the existing quality to decline or risk the chances of the target quality being achieved in the future. If suitable SuDS treatment is implemented, then the development will be considered compliant from a WFD perspective. Planning Applications will only need to undertake a full WFD assessment if they intend to depart from the following guidance. WFD classification.

14.1.9 Diffuse pollution from roads is considered a primary source of pollution to the water environment. The LLFA expects any proposals to consider open shallow SuDS within the treatment train of drainage schemes to mitigate potential pollution. This is supported by the SuDS Manual (C753) and DMRB (document LA 113). In the first instance, a design without the inclusion of traditional road gullies is likely to significantly reduce the potential for pollution to the water environment.

15 Amenity

15.1.1 Multi-functional use should be highlighted for any part of the SuDS landscape which is available for use by people when not being used for drainage. This is an underlying principle of place making urban design, to make a location desirable to live and work.

Photo 12: Photo of the use of permeable tarmac on a playground at the SEN School, Old Buckingham, Norfolk (Image E Simpson @ Norfolk LLFA)

Photo 13: Photo of a green wall on a commercial building in an inner-city area, Norwich, Norfolk (Image E Simpson @ NCC LLFA)

15.1.2 All developments, where practical, will be expected to meet all four pillars of SuDS which includes the amenity benefit of the drainage. The use of blue green infrastructure to produce attractive places can increase economic investment, assist with noise and air quality improvements (such as bioretention areas in traffic calming measures). To satisfy the amenity pillar of SuDS, the drainage system itself should be benefitting/enhancing the amenity onsite (e.g. through the use of multi-functional surface level SuDS features such as: permeable tarmac Multi Use Games Areas (MUGAs), raingardens/rainwater planters etc.).

15.1.3 It is critical that all existing blue corridors are identified at the masterplanning stage along with all other existing drainage features. Good masterplanning will locate the correct land uses and infrastructure using topography, geology, flood risk and other site constraints. Generally speaking, the lowest lying areas of the site must be open space and blue/green infrastructure shall be located in these areas pending clause 14.9.

15.1.4 Rainwater harvesting can be considered as an amenity benefit due to its resilience of a development to climate change and long-term water resource availability. It can also be retrofitted into brownfield sites where space is constrained. SuDS should be attractive and enhance visual amenity with well-designed features e.g. inlets and outlets of features to show minimal visual impact. Any opportunities to support community educational learning should be highlighted e.g. dipping ponds or appropriate inclusion in play areas.

15.1.5 Consideration should be given to how the SuDS can be accessed for both recreation and maintenance but also engagement with the wider local community. Further information on amenity design can be found in Chapter 5 of the SuDS Manual.

16 Biodiversity

16.1.1 Biodiversity will be able to become established if an appropriate water quality treatment train is implemented along with open shallow SuDS features to join habitats together. The design of blue green corridors within any development can create and enhance habitats and ecological connectivity along with its amenity value. The variety of structures e.g. swales, raingardens, wetlands and ponds will allow for a resilient diverse habitat development. Examples of blue green corridors using SuDS can be found in Natural England’s Green Infrastructure Guidance (2009) and further information on biodiversity design can be found in Chapter 6 of the SuDS Manual.

Photo 14: Photo of a dragonfly, Norfolk Hawker (*Anaciaeschna isosceles) (Image D White @ NCC)*

16.1.2 All greenfield developments will be expected to meet all four pillars of SuDS which includes the biodiversity benefit of the drainage. It should be noted that NCC Environment Policy embeds an 'environmental net gain' principle for development including housing and infrastructure. This complements the Environment Bill 2022 which has requirements to halt the decline in species, restore waterbodies, increase tree coverage and cut air pollution. The NCC policy also includes commitment to improve soil health, protecting the environment and improving the health and wellbeing of people. Whilst brownfield developments may be constrained on site size, the inclusion of retrofit SuDS such as green roofs, tree pits or other bio retention areas in traffic calming measures should be considered to improve biodiversity. The Environment Bill requires measurable net gains for biodiversity. To satisfy the biodiversity pillar of SuDS, the drainage system itself should be benefitting/enhancing the biodiversity onsite (e.g., through the use of multi-functional surface level SuDS features such as: green roof, rainwater planters/raingardens, bioretention areas, planted swales, tree pits, planted forebays etc.).

16.1.3 Use of flood and drought tolerant planting should be considered to ensure functionality of SuDS benefits for e.g. water quality treatment, through the lifetime of the development.

Photo 15: Photo of a green roof with insect habitat, London (Image E Simpson@ NCC LLFA)

16.1.4 In relation to Biodiversity Net Gain (BNG) for fluvial habitats please refer to the NPPF guidance (paragraph 180 to 182 ensure your proposed development meets the requirements as set out in NPPF.

16.1.5 The LLFA in partnership with the Norfolk County Council Environment Team has prepared examples low and high value biodiversity for sustainable drainage features to support developers in providing high quality biodiversity opportunities. Further information can be found in Table 7.

Table 7: Summary of High and Low Biodiversity Value for Sustainable Drainage Features

SuDS Feature (SuDS Reference Information)	**Low Biodiversity Value**	**High Biodiversity Value**
Dry Swale (SuDS Manual - Chapter 17)	• Narrow range of plant types • Grass cut short through frequent mowing • Same cross-section shape	• Diverse range of native plants (preference given to local species) • Areas of unmowed vegetation or low frequency mowing • Varied cross-section shape
Wet Swale (SuDS Manual - Chapter 17)	• Narrow range of plant type • None or very limited number of marginal or aquatic plant species • Grass cut short through frequent mowing • Same cross-section shape	• Diverse range of native plants (preference given to local species) • Use of native marginal and aquatic plant species • Areas of unmowed vegetation or low frequency mowing • Varied cross-section shape
Ditches	• Narrow range of plant types • None or very limited number of marginal or aquatic plant species • Grass cut short through frequent mowing • Same cross-section shape with shallow slopes • No opportunity for habitat connectivity provided	• Diverse range of native plants (preference given to local species) • Use of native marginal and aquatic plant species • Areas of unmowed vegetation or low frequency mowing • Varied cross-section shape with steeper slopes for watervoles habitat opportunities • Provides an enhanced opportunity for habitat connectivity and movement of species such as reptiles and amphibians
Rills (SuDS Manual - Chapter 19)	• No habitat creation on either side, limited planting or hard landscaping • No safe access for wildlife to drink water and escape channel • No bed material or stones and rocks in channel for habitat creation	• Habitat creation on either side through planting of appropriate native species • Wildlife water drinking access and safe water channel egress for wildlife • Stones and rocks in channel for diverse habitat opportunities
New Watercourse Channel (See River Restoration Manual)	• Narrow range of plant types • None or very limited number of marginal or aquatic plant species • Straight, uniform channel shape • Vegetation regularly cut back and very short • Lack of in channel features	• Diverse range of native plants (preference given to local species) • Use of native marginal and aquatic plant species • Sinuous, variable channel shape • Vegetation growth enabled with limited vegetation removal or cutting back • A variety of in channel features for habitat creation and opportunities
Rainwater Harvesting (SuDS Manual - Chapter 11)	• Pumped rainwater harvesting system for domestic use	• Gravity rainwater harvesting system for watering of outdoor spaces
Water Butts (SuDS Manual - Chapter 11)	• Simple water butt container	• Water butt container with inbuilt planter
Green Roofs (SuDS Manual - Chapter 12)	• Narrow range of plant types • Plants structural diversity limited (i.e. plants don’t vary) • Same topography across the roof	• Diverse range of native plants (preference given to local species) • Diverse range of plant structure (i.e. variation in plant heights) • Varied topography across the roof

SuDS Feature (SuDS Reference Information)	**Low Biodiversity Value**	**High Biodiversity Value**
Brown Roofs (SuDS Manual - Chapter 12)	• Narrow range of habitat types • None or limited plants included • Same topography across the roof	• Diverse range of habitat types and structural features • Some appropriate local native plants included • Varied topography across the roof
Blue Roofs (SuDS Manual - Chapter 12)	• Only a blue roof with no opportunities for planting or wildlife habitats	• Blue roof storage area with a green roof on covering the blue roof providing a planting opportunity for local native species and associated invertebrates
Soakways (SuDS Manual - Chapter 13)	• No or very limited planting on top of the soakaway • Narrow range of plant types	• Diverse planting on top of the soakaway • Wide range of local native plant types
Infiltration Trenches (SuDS Manual - Chapter 13)	• Narrow range of plant types • Vegetation cut short through frequent mowing	• Diverse range of native plants (preference given to local species) • Areas of unmowed vegetation or low frequency mowing
Infiltration Basins (SuDS Manual - Chapter 13)	• Narrow range of plant types • None or very limited number of marginal or aquatic plant species • Grass cut short through frequent mowing • Same cross-section shape	• Diverse range of native plants (preference given to local species) • Use of native marginal and aquatic plant species • Areas of unmowed vegetation or low frequency mowing • Varied cross-section shape
Infiltration Blankets (SuDS Manual - Chapter 13)	• Narrow range of plant types • Use of grass only mix • Grass cut short through frequent mowing	• Diverse range of native plants (preference given to local species) • Use of native wet grassland plant species mix • Areas of unmowed vegetation or low frequency mowing
Permeable Pavement (SuDS Manual - Chapter 20)	• Use of block paving or resin bound materials with no planting opportunities	• Use of ground reinforcement grids that can be planted with local native species
Filter Drain (SuDS Manual - Chapter 16)	• No planting included at surface	• Planting of local native species included at surface
Filter Strip (SuDS Manual - Chapter 15)	• Narrow range of plant type • Use of grass only mix • Grass cut short through frequent mowing	• Diverse range of native plants (preference given to local species) • Use of native wet grassland plant species mix • Areas of unmowed vegetation or low frequency mowing
Rain Gardens (SuDS Manual - Chapter 15)	• Narrow range of plant types • None or very limited number of marginal or aquatic plant species	• Diverse range of native plants (preference given to local species) • Use of native marginal and aquatic plant species
Bioretension Structure (SuDS Manual - Chapter 15)	• Narrow range of plant types • None or very limited number of marginal or aquatic plant species	• Diverse range of native plants (preference given to local species) • Use of native marginal and aquatic plant species
Tree Pits (SuDS Manual - Chapter 19)	• Narrow range of tree types	• Diverse range of native trees (preference given to local species)

SuDS Feature (SuDS Reference Information)	**Low Biodiversity Value**	**High Biodiversity Value**
Tree Belts / Hedge Buffer Strips (NFM Manual - Chapter 7)	• Narrow range of tree types	• Diverse range of native trees (preference given to local species)
Detention Basins (SuDS Manual - Chapter 22)	• Narrow range of plant types • None or very limited number of marginal or aquatic plant species • Grass cut short through frequent mowing • Same cross-section shape	• Diverse range of native plants (preference given to local species) • Use of native marginal and aquatic plant species • Areas of unmowed vegetation or low frequency mowing • Varied cross-section shape
Ponds (SuDS Manual - Chapter 23)	• Narrow range of plant types • None or very limited number of marginal or aquatic plant species • Grass cut short through frequent mowing • Same cross-section shape	• Diverse range of native plants (preference given to local species) • Use of native marginal and aquatic plant species • Areas of unmowed vegetation or low frequency mowing • Varied cross-section shape
Scrapes (NFM Manual - Chapter 8)	• Narrow range of plant types • None or very limited number of marginal or aquatic plant species • Grass cut short through frequent mowing • Same cross-section shape	• Diverse range of native plants (preference given to local species) • Use of native marginal and aquatic plant species • Areas of unmowed vegetation or low frequency mowing • Varied cross-section shape
Floodplain Reconnection (NFM Manual - Chapter 12 and the River Restoration Manual)	• Narrow range of plant types • None or very limited number of marginal or aquatic plant species • Use of grassland species mix • Straight, uniform shape • Vegetation regulary cut back and very short • Lack of in channel and floodplain features	• Diverse range of native plants (preference given to local species) • Use of native marginal and aquatic plant species • Use of wet grassland species mix • Sinuous, variable shape • Vegetation growth enabled with limited vegetation removal or cutting back • A variety of in channel and floodplain features for habitat creation and opportunities
Wetlands	• Narrow range of plant types • None or very limited number of marginal or aquatic plant species • Straight, uniform channel shape • Vegetation regulary cut back and very short • Lack of features	• Diverse range of native plants (preference given to local species) • Use of native marginal and aquatic plant species • Sinuous, variable channel shape • Vegetation growth enabled with limited vegetation removal or cutting back • A variety of features for habitat creation and opportunities

17 Management and Maintenance

Policy 8: Management and Maintenance

House of Commons Written Statement (HCWS161): Sustainable drainage systems.

“In considering planning applications, local planning authorities should consult the relevant Lead Local Flood Authority on the management of surface water; satisfy themselves that the proposed minimum standards of operation are appropriate and ensure through the use of planning conditions or planning obligations that there are clear arrangements in place for ongoing maintenance over the lifetime of the development.”

[National Planning Policy Framework (Paragraph 175)]

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.

d) Where possible, provide multifunctional benefits.

17.1.1 The LLFA expects the management and maintenance of SuDS to appropriately account for the construction, operation and maintenance requirements of all components of the drainage system (surface and sub-surface), see Policy 8. Applicants should sufficiently consider the likely maintenance requirements of new and existing infrastructure, over its design life including the provision of funding during the feasibility and planning stages of a scheme (in accordance with CIRIA SuDS Manual (C753) Part E, Chapter 32, 2015)). It is important that maintenance is also considered in the design of the drainage system and the development site to account for the requirements of undertaking all stages of maintenance work such as ease of access whether this is for personnel, vehicles or machinery (PPG 057 Reference ID:

7-057-20220825 / Paragraph: 058 Reference ID: 7-058-20220825 / Paragraph: 059 Reference ID: 7-059-20220825).

17.1.2 In accordance with the NPPF paragraph 175, PPG and the SuDS Manual, the LLFA require applicants to provide a management plan and maintenance schedule of work detailing the activities required and who will adopt and maintain the surface water drainage features for the lifetime of the development. The operation, management and maintenance of such systems should be accounted for in any proposed drainage works as early as possible.

17.1.3 Additionally, it is the duty of the developer to provide a Construction Management Plan for Water and Drainage to ensure that surface water quality and quantity is managed throughout the construction process to mitigate potential impacts to sensitive receptors both on and off site during the construction stage. Reasonable steps to prevent the risk of flooding and pollution to surface water bodies and/or groundwater during construction must be submitted.

17.1.4 Surface water runoff from the construction site should not drain into SuDS components unless it has been allowed for in the design and specification. Direction on what should be included is given in Table 2.

17.1.5 Further guidance regarding the typical key operation and maintenance activities for each type of SuDS component are indicated in Table 32.1 of the SuDS Manual (2015). The LLFA do not consider replication of these suggest measures alone as being adequate and further consideration of the methodology and frequency of such tasks should be provided for the drainage strategy.

17.1.6 Where it is proposed that a community will be adopting SuDS, maintenance plans and schedules should be clearly communicated to any future property owners. This should be done in accordance with Section 12 and 11.4 of British Standard BS8582:2013. Such plans should further explain the consequences of not carrying out the maintenance.

17.1.7 There are several options for adoption and maintenance of SuDS and should be considered on the following hierarchy:

1. Private Ownership – assets with the private curtilage of the freeholder becomes their sole responsibility. However, this would not cover any public or open space or complex systems where the maintenance costs are unrealistic.
2. Angian Water Services Limited (or NAV) will consider adoption of a scheme designed to standards set out in the (Design and Construction Guidance). Further information on how to express interest to adopt SuDS can be found on their website under Sustainable surface water drainage.
3. An Internal Drainage Board will maintain certain watercourses of arterial importance within the IDB Internal Drainage District that are designated by the Board as 'Main Drains' or 'District Drains'. All watercourses within the IDB area generally remain the responsibility of the riparian owner irrespective of their designation as a 'Main Drain'. IDBs also may consider adopting a drainage scheme associated with new development if the site falls within their IDB area. (Details of how to contact the IDB can be found on the ADA Internal Drainage Boards website.
4. NCC Highways Authority will consider the adoption of SuDS and drainage schemes which only drain a highway (not additional housing or open space areas). Further information on general design and landscape standards can be found on the NCC website under adopted and private roads, as well as, drainage design standards. This includes the need for a minimum carrier drain to be 225mm in diameter.
5. Adoption could be also agreed through a Section 106 Agreement with a Borough, District, Town or Parish Council. This could be combined with any public open space maintenance agreement.
6. A third-party company could be established to adopt and maintain a SuDS Scheme across the whole or part of a development.

17.1.8 The LLFA expects third party management companies to only be suggested for maintenance where no other adoption authority is achievable. Evidence should be provided that appropriate adoption authorities have been approached. Stating that an adoption authority's standards cannot be met due to lack of space within the development layout are unlikely to be acceptable. Easements around SuDS features should be provided. Distances required can vary between adopting authorities. For example, NCC Highways Authority require a 3m easement from the extremity of any drainage feature and from a root protection zone. Early consideration for open space, landscaping and easement to SuDS features may avoid conflict at later stage.

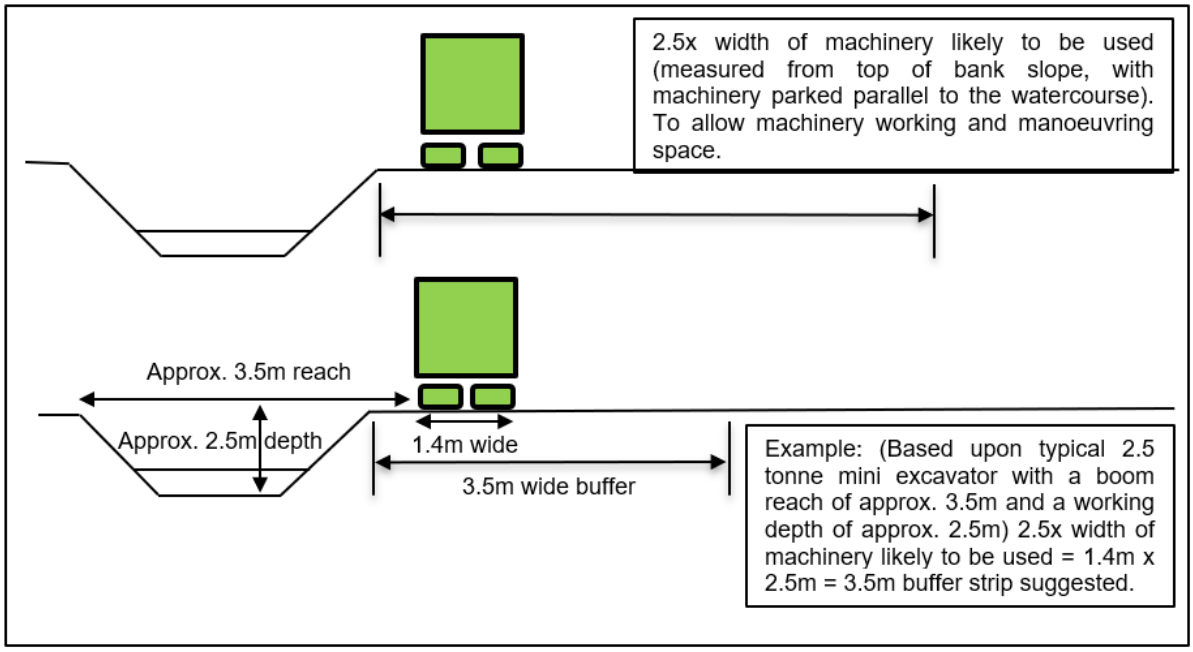
17.1.9 Where ordinary watercourses or other surface water features are bounding or within the development site, the LLFA expects these to also be included within a management plan and maintenance schedule. Where the watercourse falls within a large open space of masterplan sites, the riparian owner responsibilities is likely to fall to the authority adopting the open space, e.g. District or Parish Council. These responsibilities need to be clearly communicated and agreed in-principle with any adopting authority.

17.1.10 Where new properties bound a watercourse, each property would have riparian owner responsibilities to undertake maintenance, and this should be clearly highlighted to future property owners or tenants. An alternative is to provide other management arrangements for these features such as encompassing them in the responsibilities of any third-party company established for the site or IDB if the site is within an IDB District. A maintenance buffer zone of 10m is advocated by British Standard BS 8533:2011(Section 5.3.3) but discussions should be held with the appropriate regulatory authority (including an IDB) to discuss requirements.

17.1.11 It is recognised that ordinary watercourses can be relatively small in width and depth. **If a watercourse is outside of an IDB area, the LLFA recommends that a minimum buffer of 3.5m in width should be allocated to allow for access for maintenance.** This should be provided from the top of both banks unless it can be shown that uninterrupted access along the length of the watercourse can be delivered. Locations of outfalls into the watercourse must

be identified and machinery is not placed directly above it to prevent damage to the structure. Appropriate landscaping e.g. location of trees / plants and permanent structures such as benches must be considered. The width of this recommended buffer zone gives consideration to working room and spoil handling and is based upon the width of the largest likely machinery intended for maintenance (such as a tracked excavator or JCB type back hoe machine), multiplied by 2.5 (measured from the top of bank landwards), e.g. a typical 2.5 tonne mini excavator = 1.4m wide x 2.5 = 3.5m buffer (see Figure 7). The LLFA recommends this principle should be considered for maintenance buffers around open pond/basin/attenuation features as well as ordinary watercourses.

Figure 7: Diagram demonstrating an example distance of easement to a watercourse.



17.1.12 Many development sites are constructed on land which may have had an agricultural use. No dwelling should be constructed over an existing culvert that is to remain active and any field drains intercepted on the boundary of the development should be diverted so overall land drainage discharge can be maintained.

17.1.13 Considerations for appropriate siting and use of tree planting above underground SuDS features or systems that use perforated pipes must be

applied in the landscaping plans. Although now superseded Sewers for Adoption 6th Edition provides excellent guidance on this as well as Ciria C812 and BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations.

18 Resistance and Resilience

Policy 9: Flood level and flow exceedance management

"For the 1 in 100 year return period event [1% AEP event] (including relevant design allowances) for the site, flood levels associated with the surface water drainage system should be not less than 300 mm below the finished ground floor levels and the level of any opening into any basement of the proposed buildings on the site.

The design of the drainage system for exceedance flow management should take account of any residual flood risks for the site. An assessment should also be made of the likely significance of risks associated with the following scenarios:

a) A blockage or failure of a drainage system component

b) Failure of any embanked storage facility

c) Rainfall events that are larger than the storms used for the design of the drainage system."

[British Standard BS8582:2013 Section 5.2.2.6]

18.1.1 The LLFA expects safe access and egress through a new development site to be maintained in accordance with PPG (Paragraph: 004 Reference ID: 7-004-20220825, Paragraph: 044 Reference ID: 7-044-20220825 and Paragraph 047 Reference ID: 7-047-20220825). The LLFA expect that any source of flooding is considered and that any areas expected to flood are managed in accordance with DEFRA / Environment Agency Hazard to People Classification / Rating. It should be noted that there are currently no flood warnings provided to notify communities / residents of predicted surface water flooding events. The rapid inundation often experienced with surface water

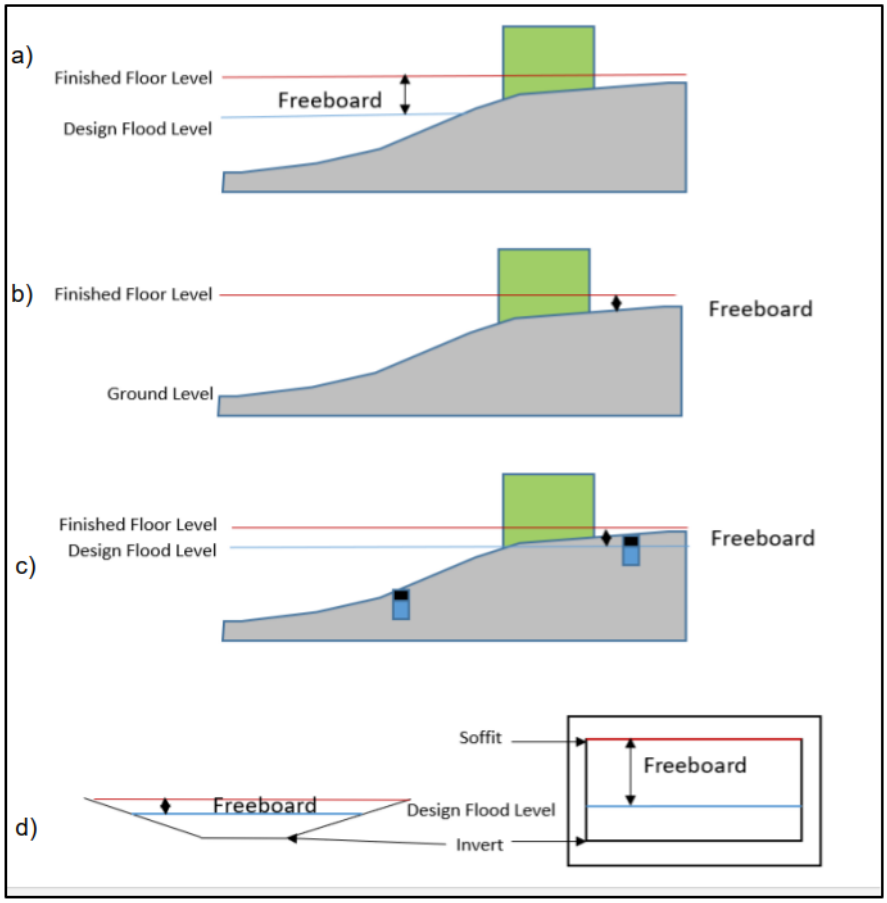
flooding, especially those events caused by convective thunderstorms, means that careful consideration should be given to development proposed in areas identified at risk from Environment Agency mapping.

18.1.2 The British Standards Institution document “BS85500:2015 Flood resistant and resilient construction – Guide to improving the flood performance of buildings” dated 2015 can be reviewed when approaching the development of a mitigation strategy. This standard is based on the Department for Communities and Local Government publication “Improving the flood performance of new buildings: Flood resilient construction” (2007) and advocates a hierarchy approach to development with the top of the hierarchy being the avoidance of vulnerable development being located in areas at risk of flooding (as stated in NPPF). The LLFA expect any resistance and resilience measures to assess the hierarchy of building and site design to avoid the risk in the first instance. Only where it is agreed this is not possible would the other steps be followed e.g. resistance (or prevention) of water entering a building and resilience of the building. Resilience seeks to ensure that if water did enter fabric of the building that the impacts are reduced. The last stage in the hierarchy is repairable design to ensure that any damage is easily repaired or replaced.

18.1.3 The LLFA expects it to be demonstrated that the drainage system is designed so that unless an area is designated to hold or convey water, flooding must not occur in any part of a building or utility plant susceptible to water e.g. pumping station or electricity sub-station (Standard S8 of the SuDS Non-Statutory Technical Standards (2015)). Resistance and resilience measures can also be included where there is a residual risk of flooding e.g. the development has avoided the risk of flooding up to a 1% AEP plus climate change allowance but there are still properties proposed that would be at risk of 0.1% AEP event. **Where properties are identified to be at residual risk in events greater than the 1% AEP +CC the LLFA would expect as a minimum that property finished ground floor levels (FFL) throughout the development are recommended to be set to a minimum of 300mm freeboard above the anticipated flood levels from any source of flooding (See Figure 8 and Policy 9).** Any source of flooding would also include an

assessment to ensure there is 300mm above anticipated flood levels within the drainage system, to provide protection in the event of an exceedance event. **Where there is uncertainty in flood levels, the LLFA expects this freeboard level to be increased to 600mm. The LLFA would expect that there would be a minimum of at least 150mm freeboard between proposed external ground levels and property FFL.** External ground levels should always slope away from any building, especially entrances to avoid ponding of water against or within a structure. An overview of mitigation is expected at an initial planning application stage to establish what is achievable within the development. The LLFA would expect the detailed design to then follow and implement any recommendations.

Figure 8: Simplified illustration of freeboard allowances from a) from a source of flooding b) surrounding ground levels c) from a drainage system d) in a culvert or structure.



18.1.4 The types of mitigation that could be included in any proposal may be limited by the source, depth and velocity of flooding. For example, groundwater flooding may require significantly different mitigation to surface water flooding.

Examples of resistance and resilience include providing measures such as landscaping of external ground levels to avoid water entering buildings (including basements) or ensuring that essential electrical equipment is located above the expected water level.

18.1.5 The LLFA would expect that any water from a drainage scheme being managed on-site during a 1% AEP event plus climate change outside of structures designed to store or convey water will meet recommendations within Table 12.3 of CIRIA Report C635 (2006), i.e. water on minor roads where speed limits are 30mph will be a maximum of 100mm deep and car parks would be a maximum of 200mm deep (assuming there is a kerb upstand). The LLFA recommend that roads are not routinely used to manage flow paths especially where several parties adopt the surface water drainage network. NCC as the Highway Authority will only adopt drainage schemes where it can be shown water draining to them is only from the highway. There may also be significant challenges to ensure that appropriate freeboard to finished floor levels of dwellings can be achieved (see above).

18.1.6 Standard S9 of the SuDS Non-Statutory Technical Standards (2015) also require an applicant to consider how impacts to people and property will be minimised in the event that the drainage system will be exceeded in an event greater than 1% AEP event plus climate change. The LLFA expect that plans be provided to show how this has been considered within the design of the development layout and comment on confirmation on how resilience has been considered.

18.1.7 Flood Re insurance is not available for houses built after 1 January 2009. This date was agreed between the Government and the Insurance industry following the Pitt Report into the 2007 flood event and ensure that the risks of flooding are appropriately considered and mitigated at the planning stage. Hence, new developments are subject to risk reflective pricing, meaning those built without due consideration of flood risk may struggle to access affordable insurance. The LLFA advise that any development fully consider the potential available finance and insurance for the future owners and / or tenants of the proposed dwellings (or mobile homes for permanent residential use).

Annex 1 – National Policy Background

A1. NPPF and Sequential Approach

A1.1 The sequential approach to the LLFA's advice is based on NPPF (2023) and PPG (online version). This uses up-to-date information to advise the Local Planning Authority at an early stage where best to steer development in line with the sequential test (PPG Paragraph: 024 Reference ID: 7-024-20220825). As a statutory consultee on surface water drainage, the LLFA also have a duty to consider our other responsibilities including, local flood risk management and consenting of works which may affect flow within an ordinary watercourse. It is assumed that LPAs have undertaken a sequential test (and exception test where appropriate) for any allocated site within a Local Plan or windfall site.

A1.2 The sequential approach is a precautionary one, to avoid the risk of flooding in the first instance. The LLFA support this approach as it is the most sustainable form of flood risk management. In accordance with NPPF paragraph 173 (footnote 59) PPG (Paragraph: 023 Reference ID: 7-023-20220825, and Paragraph: 024 Reference ID: 7-024-20220825), development should be steered to areas of the lowest flood risk from any source, where there are no reasonable alternative sites, taking into account flood risk vulnerability of land use (NPPF Annex 3) sites in Flood Zone 2 can be considered (employing the exception test where required – see NPPF paragraph 168 to 175). It is important to note the following:

1. Indicative Environment Agency's RoFSW maps (extent, depth, velocity and Hazard layers (the RoFSW has known limitations in pumped or artificial catchments and should be combined with other sources of information in these locations) for both the 1% AEP event (i.e. 1% probability flooding which can occur in any single year or the 1 in 100 year) and 0.1% AEP event (i.e. 0.1% probability which can occur in any single year or the 1 in 1000 year) **can be used to identify potential risk of flooding from surface water flow paths and / or significant ponding**.

2. Indicative Environment Agency River and Sea Flood Maps for Planning for both Flood Zone 2 and 3 – or up to 1% AEP and 0.1% AEP of flooding **can be used to identify potential risk of flooding from ordinary watercourses**. Where no mapping of fluvial flood risk (watercourses with catchments smaller than $3km^2$), or there is uncertainty within the Environment Agency mapping, the RoFSW map can be used as a proxy and should be used consistently with river flood mapping probability. To avoid doubt, the 1% AEP map is deemed equivalent to Flood Zone 3 and 0.1% AEP map is equivalent to Flood Zone 2 (as per PPG – Flood Risk and Coastal Change Paragraph 078 Reference ID: 7-078-20220825).

3. Climate change must be considered within surface water and proxy Flood Zones. NCC has produced maps using 30% climate change of parts of Norfolk within Surface Water Management Plan Documents. There is also mapping undertaken by some Norfolk SFRA's to include 40% climate change. Where a site does not fall within either of these maps, the 0.1% AEP event map can give an indication of the 1% AEP event map including climate change. It is recognised that this method may over predict in some locations but unless further information is available this approach should be followed.

A1.3 It should be noted that the NPPF has other aspirations on sustainability, promoting healthy communities, preventing pollution, green infrastructure and conserving the natural environment for which SuDS are also relevant. The multi-benefits of flood management, climate change consideration, treatment of runoff, public open space and wildlife habitat opportunities can be met through a well designed and implemented SuDS scheme. With regard to NPPF Paragraph 175 an appropriately designed SuDS, incorporating CIRIA SuDS Manual (C753) recommended treatment, is considered to address the quality of surface water runoff effectively. The Environment Agency has standing advice that states in general they consider pollution of surface water runoff from residential development to be adequately addressed if SuDS have been provided for the runoff. Water quality treatment would not be met if

traditional piped drainage schemes are promoted. If piped schemes are promoted as part of a SuDS scheme e.g. pipes connecting to geo-cellular crates or attenuation tanks, other SuDS components, such as permeable paving, swales, filter drains or strips should also be used to treat water prior to the final discharge. Extra treatment may be required if water is discharged to sensitive locations, e.g. WFD, drinking water designated sites.

A1.4 On the 18 December 2014 the Secretary of State for Communities and Local Government, Eric Pickles made a Written Ministerial Statement on SuDS. This stated that Government **expects** local planning policies and decisions on planning applications relating to major development to ensure that SuDS for the management of runoff are put in place, unless demonstrated to be inappropriate. It was also restated that the current requirement in national policy that all new developments in areas at risk of flooding should give priority to the use of SuDS. This requirement has now been incorporated within NPPF.

A1.5 It was specifically acknowledged that the Written Ministerial Statement on SuDS should be taken into account in the preparation of local and neighbourhood plans and that it may be a material consideration in planning decisions. As such the Written Ministerial Statement on SuDS should be viewed as forming part of national planning policy.

A1.6 No changes to the current planning enforcement mechanisms were made as part of the recent amendments to planning policy as any breach of a SuDS related planning condition can be enforced under the existing planning enforcement regime.

A2. Planning Practice Guidance

A2.1 Government updated PPG as part of its SuDS and LLFA planning changes. These amendments and additions were made to the Flood Risk and Coastal Change section of the PPG. This section advises on how planning should take account of the risks associated with flooding and coastal change in plan-making and planning application processes. This guidance is due to be updated again to reflect the recent changes in NPPF.

A2.2 The PPG highlights that developers and applicants need to consider flood risk to and from the development site. In doing so the PPG recommends that a broad approach of **assessing**, **avoiding**, **managing and mitigating** all forms of flood risk should be followed. A précis of this approach is set out below.

A2.3 LPAs **assess** the flood risk posed to new development by:

1. Undertaking a SFRA for their area to inform the preparation of their Local Plan.
2. Requiring developers to undertake a site-specific FRA (from all sources of flooding) to support their applications for planning permission for development that meets national and locally set thresholds.

A2.4 LPAs **avoid** the flood risk posed to new development by:

1. Applying the 'Sequential Test' and, if needed, the 'Exception Test' to Local Plans to ensure that when selecting sites development is, as far as reasonably possible, located where the risk of flooding (from all sources) is lowest.
2. Applying the Sequential Test and if needed, the Exception Test for specific development proposals to steer development to areas with the lowest probability of flooding.

A2.5 LPAs and developers can investigate measures to **control** the risk of flooding affecting a site. Early discussions with relevant flood risk management authorities, reference to Strategic Flood Risk Assessments and any programme of flood and coastal erosion risk management schemes will help to identify such opportunities.

A2.6 LPAs and developers **manage and mitigate** the flood risk posed to new development by:

1. Ensuring development is appropriately flood resilient and resistant, safe for its users for the development's lifetime, and will not increase flood risk overall.

2. Seeking flood risk management opportunities (e.g. safeguarding land) to reduce the causes and impacts of flooding (e.g. through the use of SuDS in developments).

A3. Determining SuDS proposals on new developments

A3.1 As part of the LPAs role in determining planning applications the LPA makes the final decision about the viability and suitability of the SuDS provision and whether it is proportionate to the level of flood risk affecting the site. Clearly this decision is made in the context of all the other policy and material considerations relating to the proposal.

A3.2 In determining the SuDS element of planning applications the LPA will need to satisfy themselves that any SuDS proposals meet national and local policies. In addition, as set out in the Written Ministerial Statement they also need to:

1. Consult the LLFA on the management of surface water, (where appropriate).
2. Satisfy themselves that the proposed minimum standards of operation are appropriate.
3. Ensure through the use of planning conditions or planning obligations that there are clear arrangements in place for on-going maintenance (of SuDS) over the lifetime of the development.
4. Satisfy themselves that the SuDS are designed to ensure that the maintenance and operation requirements are economically proportionate.

A3.3 The PPG states that the information sought by the LPA in answering the above requirements should be no more than necessary, having regard to the nature and scale of the development concerned.

A3.4 The LPAs Local Plan also remains a key document in relation to directing development away from areas of high flood risk wherever possible, including areas at risk of flooding from surface water. It is expected that the evidence supporting the SFRA should be used by the LPA to inform their judgement both on the appropriateness of the proposed development and on the

suitability of the proposed drainage system.

A4. The LLFA role as statutory consultee to planning

A4.1 LLFAs are unitary local authorities and County Councils who are responsible for managing flooding from surface water, groundwater and ordinary watercourses. They were conferred this status by the Flood and Water Management Act 2010 and are required to deliver a strategy for local flood risk management in their areas, to investigate flooding and to maintain a register of flood risk assets. For NCC this role is fulfilled by the authority's Flood and Water Management Team.

A4.2 The LLFA role as statutory consultee to planning is created by the Town and Country Planning (Development Management Procedure) (England) Order 2015. Specifically, Schedule 4 of this statutory instrument sets out the consultations before the grant of permission and paragraph (ze) states that the LLFA should be consulted on "major development with surface water drainage".

A4.3 Major development is defined by Article 2(1) in Part 1 (Preliminary) of the Town and Country Planning (Development Management Procedure) (England) Order 2015 as development involving any one or more of the following:

(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.

(e) Development carried out on a site having an area of 1 hectare or more.

A4.4 As a statutory consultee, in line with the Code of Practice relating to consultations on planning applications, the LLFA is expected to respond to the LPA within 21 days of receiving a consultation. The LLFA has to make a substantive response which can be one of the following:

(a) States that the consultee has no comment to make.

(b) States that, on the basis of the information available, the consultee is content with the development proposed.

(c) Refers the consultor to current standing advice by the consultee on the subject of the consultation.

(d) Provides advice to the consultor.

A4.5 For re-consultations following the submission of further information by an applicant, the LLFA will request the LPA to allow a further 21 days to provide bespoke advice to be given. The LLFA will endeavour to reply to statutory consultations within 21 days of being consulted. If the LPA requires a reply sooner than this, they should inform the LLFA at the point of consultation.

A4.6 The LLFA as a statutory consultee also has a duty to report to Government on their performance in providing a substantive response within that deadline. The annual report to the Government should be provided no later than 1st July and must relate to the previous financial year (e.g. starting 1 April in the preceding year).

Annex 2 - Standing Advice Checklist, Major Development when LLFA are not consulted

Is the development site currently at risk of flooding?

The risk of flooding on the current site should be acknowledged. If any areas at risk of flooding are identified, development should avoid these areas in line with NPPF. Where this cannot be achieved, a robust strategy should be provided that includes adequate flood resistant and resilience measures incorporated in the design. This may require an emergency flood plan where appropriate. It should be noted that flood mapping has been considerably improved over time, and any Local Plan Site allocated prior to 2014 is unlikely to have considered surface water flooding as a risk. No development should have a condition relating to defining the flood risk to the site, the only exception would be to condition post development flood modelling scenarios at reserved matters stage following outline permission.

Outline / Masterplan	**Full**	**Reserved Matters (unless condition specifies otherwise)**	**Discharge of Conditions**	**Documents to be Submitted to the LPA**	**Section in LLFA Guidance**	**Provided?**
Yes	No	No	No	Flood Risk Assessment / Statement with commentary of all sources of flood risk, using national and SFRA mapping, showing historical incidents especially in urban areas and describing how the development will apply the sequential approach. This should include, fluvial flooding risk, reservoir flood risk, ground water flood risk and surface water flood risk. The document should include plans and drawings, detailed pre- and post-development scenarios, **indication** of mitigation (including compensatory storage or managed surface water flow path creation, consideration for access / egress and if an emergency plan is required) and freeboard allowance. Where appropriate required maintenance easements to watercourses and structures should also be demonstrated.	8	Has this information been provided by the applicant?
No	Yes	Yes	Yes	Flood Risk Assessment / Statement or update from outline permission, of all sources of flood risk, as above but may include up to date flood incidents or national / local guidance. This should include, fluvial flooding risk, reservoir flood risk, ground water flood risk and surface water flood risk. The document should include plans and drawings, detailed pre- and post-development flood modelling if appropriate, **detailed** mitigation (including compensatory storage or managed surface water flow path creation) and freeboard allowances. Where appropriate emergency plans indicating safe access and egress and maintenance easements to watercourses.	8	Has this information been provided by the applicant?

How does the site currently drain?

The method through which the site currently drains should be described, such as whether there are existing infiltration features, ordinary watercourses within or at the boundary of the development, or existing surface water sewer infrastructure. Betterment of surface water runoff from an existing brownfield runoff must be considered. Brownfield surface water runoff rates and volumes should be attenuated as close to greenfield rates as possible. There is no historic right of connection to a surface water sewer if a development is brownfield and being redeveloped.

Outline / Masterplan	Full	Reserved Matters (unless condition specifies otherwise)	Discharge of Conditions	Documents to be Submitted to the LPA	Link to Section in LLFA Guidance	Provided?
Yes	Yes	No	No	Commentary on how the current site drains with information where any existing drainage outlets are. Calculations on pre-development runoff rates and runoff volumes should be provided. If the site is brownfield, pre-development brownfield rates and volumes and equivalent greenfield rates and volumes should be provided.	9 and 12	Has this information been provided by the applicant?

How will the site drain?

The proposed method for draining the site should be in accordance with the sustainable drainage hierarchy; with a preference for shallow (<2 m deep) infiltration measures, followed by measures to drain to a nearby watercourse, otherwise discharging to a surface water sewer. The last method of draining a site would be to either a combined sewer, or via deep infiltration methods (>2 m below ground level). It would be acceptable to condition Plan B if there is evidence that it can be achieved e.g. Plan A is infiltration with generalised testing across the site but is yet to be fully tested at the depth and location of SuDS in an outline application, Plan B is connection to a watercourse and it is adjacent the site with no third-party access restrictions.

Outline / Masterplan	Full	Reserved Matters (unless condition specifies otherwise)	Discharge of Conditions	Documents to be Submitted to the LPA	Section in LLFA Guidance	Provided?
Yes	Yes	No	No	Drainage Strategy / Statement and outline drainage layout plan, evidencing the drainage destination that meets with the hierarchy using shallow (<2m deep) (Plan A) ahead of all other destinations. If only indicative infiltration testing has been carried out or if it cannot yet be carried out evidence of an alternative Plan B should be provided. Discharge to foul sewer is not acceptable.	9	Has this information been provided by the applicant?
Yes	No	No	No	Ground Investigation Report (for infiltration) and infiltration testing if only relying on infiltration showing that rates are better than $3x10^{-6}$m/s or 10 mm/hr. Worse rates than this can only use infiltration as part of the proposal and a positive discharge outfall to a watercourse or sewer must also be provided. Evidence that seasonally high ground water levels are 1.2m below the base of the infiltration structure.	10 and 11	Has this information been provided by the applicant?
Yes	No	No	No	Preliminary “Outline” hydraulic calculations and commentary to explain how these meet the SuDS National Standards S1 to S9 and S12. The information should include infiltration rates found in the Ground Investigation Report, existing and proposed runoff rates / runoff volumes, appropriate attenuation required including climate change up to 40% and urban creep allowances up to 10% depending on density of development.	12 and 13	Has this information been provided by the applicant?

Outline / Masterplan	Full	Reserved Matters (unless condition specifies otherwise)	Discharge of Conditions	Documents to be Submitted to the LPA	Section in LLFA Guidance	Provided?
Yes	No	No	No	Preliminary development plan and landscape proposals, showing SuDS component locations and required maintenance easements (minimum of 3m to a linear feature but larger for a pond or basin and including 3.5m to a watercourse. Drainage components should be at least 3m from a proposed or existing root protection zone).	17	Has this information been provided by the applicant?
Yes	Yes	No	No	Evidence of 'in-principle' agreement of a third party for SuDS discharge to their system (e.g. Anglian Water Services Limited (or NAV), Highways Authority or third-party owner). Proprietary SuDS such as vortex pollution control e.g. downstream defender will not be acceptable to some adopting authorities and hence comment from them should be considered. Identification of the maintenance responsibility of any ordinary watercourse (including structures) within or adjacent the development. Consent for any culverts should already have been discussed and evidence provided that 'in-principle' agreement has been undertaken with appropriate authority (Environment Agency, IDB, LLFA).	17	Has this information been provided by the applicant?
Yes	Yes	No	No	Infrastructure and Construction Phasing Plan (including temporary works to drainage schemes required if the build out time is long).	Paragraph 6.2.3 and 6.6.2	Has this information been provided by the applicant?
No	Yes	Yes	Yes	Detailed development layouts showing SuDS locations, how the SuDS runoff volumes will be accommodated within the layout, discharge destinations and maintenance easements.	9	Has this information been provided by the applicant?

Outline / Masterplan	Full	Reserved Matters (unless condition specifies otherwise)	Discharge of Conditions	Documents to be Submitted to the LPA	Section in LLFA Guidance	Provided?
No	Yes	No	Yes	Detailed drainage design hydrology / hydraulic calculations and drawings using latest FEH rainfall data. Showing all locations, dimensions and freeboard of every element of the proposed mitigation and drainage system (e.g. swales, storage areas, ponds, permeable paving, filter strips (including sewer details if proposed (pipe numbers, gradients, sizes, locations, manhole details etc.))). Catchment plans of each part of the drainage system to understand how runoff volumes and water quality assessments have been calculated.	12	Has this information been provided by the applicant?
No	Yes	No	Yes	Specific ground investigations (Geotechnical factual and interpretive reports). Commentary should be provided to show how the testing has been undertaken at the proposed location and base depth of infiltration structures.	10	Has this information been provided by the applicant?
No	Yes	No	Yes	Detailed maintenance program / schedule and on-going maintenance responsibilities of each part of the drainage infrastructure and where appropriate watercourses / culverts (including clear distinction between private / IDB / LLFA / Anglian Water Services Limited (or NAV)).	17	Has this information been provided by the applicant?
No	Yes	No	Yes	Detailed plan showing how flows on the site exceeding the 1% plus 45% climate change rainfall event and plan or commentary on how finished ground floor levels may assist with minimising impacts.	18	Has this information been provided by the applicant?

What sustainable drainage measures have been incorporated into the design?
Surface water drainage systems should replicate natural drainage processes as closely as possible. SuDS such as permeable surfaces, swales, raingardens, tree pits, green roofs / walls or attenuation basins should be preferred on all development sites ahead of conventional drainage measures (piped systems). Geo-cellular storage crates can provide elements of SuDS such as attenuating the amount of water to prevent an increase in flood risk, however without another SuDS component (swales, filter strips or drains) they do not provide any water quality treatment.

Outline / Masterplan	Full	Reserved Matters (unless condition specifies otherwise)	Discharge of Conditions	Documents to be Submitted to the LPA	Section in LLFA Guidance	Provided?
Yes	No	No	No	Preliminary indication including plans on how each of the four pillars of SuDS will be met (four pillars should be evidenced at greenfield sites and at least two for brownfield sites). Initial assessments of how the development will meet water quality, amenity and biodiversity requirements.	14 15 16	Has this information been provided by the applicant?
Yes	Yes	Yes	Yes	Brownfield development must consider the improvement it can make through redevelopment proposals. This includes identifying opportunities for retrofitting SuDS (water reuse / green roof / wall, permeable surfaces or raingardens) and improving flood resistance and resilience to buildings where possible. Existing drainage should be diverted rather than built over. All existing runoff rates and runoff volumes should be calculated, and improvements made to get them back as close to greenfield rates / volumes as possible. They must be no worse than existing and justification be given as to why they cannot be improved. It can be justified that infiltration is not possible if an applicant demonstrates that it would mobilise contaminates and would have adverse impacts on the environment.	9 and 12	Has this information been provided by the applicant?
No	Yes	No	Yes	SuDS Water Quality Assessment, justifying using the simple index approach or detailed assessment as appropriate. The assessment should be provided for all runoff destinations; hence a separate assessment must be provided for groundwater or surface water depending on discharge location. Deep infiltration structures should undertake a detailed water quality assessment in line with any requirements of the Environment Agency.	14	Has this information been provided by the applicant?

Outline / Masterplan	Full	Reserved Matters (unless condition specifies otherwise)	Discharge of Conditions	Documents to be Submitted to the LPA	Section in LLFA Guidance	Provided?
No	Yes	No	Yes	Detailed landscaping plans and commentary linking to SuDS amenity and biodiversity elements of the development.	15 and 16	Has this information been provided by the applicant?

Annex 3 - Reference Documents

- BETTESS, R. (1996) Infiltration drainage; manual of good practice, CIRIA Report R156. CIRIA: London. ISBN: 978-0-86017-457-8
- BSI Standards Publication (2011) BS 8533:2011 Assessing and managing flood risk in development, 1st Edition. 1st Edition. British Standard Institution. ISBN 978 0 580 67892 9
- BSI Standards Publication (2013) BS 8582:2013 Code of Practice for Surface Water Management for development sites, 1st Edition. British Standard Institution. ISBN 978 0 580 76700 5
- Building Research Establishment (2016) Soakaway design; Digest 365. Watford: Building Research Establishment. ISBN 978-1-84806-438-6
- CIRIA (2015) The SuDS Manual, CIRIA Report C753
- CIRIA (2006) Design for Exceedance in Urban Drainage. CIRIA Report C635
- CIRIA (2017) Guidance on the Construction of SuDS. CIRIA Report C768
- MHCLG (2018) National Planning Policy Framework. London: DCLG. ISBN: 978-1-4098-3413-7
- DCLG (2014) Further changes to statutory consultee arrangements for the planning application process; Consultation. London: OGL. ISBN: 978-1-4098-4450-1
- DCLG (2015) Further changes to statutory consultee arrangements for the planning application process; Government response to consultation. London: OGL. ISBN: 978-1-4098-4527-0
- DCLG / Environment Agency (2007) Improving the Flood Performance of New Buildings; Flood Resilient Construction. London: RIBA Publishing. ISBN 978 1 85946 287 4
- DCLG / Environment Agency (2009) Guidance on the permeable surfacing of front gardens, 2nd Edition. London. ISBN: 978-1-4098-0486-4

- DEFRA (2015) Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems. London: OGL
- DEFRA / Environment Agency / HR Wallingford (2008) Supplementary Note on Flooding Hazard Ratings and Thresholds for Development Planning and Control Purpose – Clarification of Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1
- DEFRA / Environment Agency (2013) Rainfall runoff management for developments; Report – SC030219. Bristol: Environment Agency. ISBN: 978-1-84911-309-0
- DEFRA (2021) Recommendations to Update Non-Statutory Technical Standards for Sustainable Drainage Systems (SuDS). London. PB [WT15122]
- Environment Agency (2014) Flood Risk Assessment required if applying for planning permission
- Environment Agency (2018) The Environment Agency's approach to groundwater protection. Bristol: Environment Agency
- Kellagher, R. (2012) Preliminary rainfall runoff management for developments; R&D Technical Report W5-074/A/TR/1, Revision E. Bristol: Environment Agency
- Association of Drainage Authorities (ASA) previously known as Local Authority SuDS Officer Organisation (LASSOO), Non Statutory Technical Standards for Sustainable Drainage – Practice Guidance
- Natural England (2009) Green Infrastructure Guidance
- Norfolk County Council, (2015) Norfolk Local Flood Risk Management Strategy; Norfolk County Council
- Strategic Flood Risk Assessment Level 1 (2017) Breckland Council
- Strategic Flood Risk Assessment Level 1 (2017) Brough Council of Kings Lynn and West Norfolk
- Strategic Flood Risk Assessment Level 1 (2017) Greater Norwich Local Plan Area (Broads Authority, Broadland District, Norwich City and South Norfolk

Council)

- Strategic Flood Risk Assessment Level 1 (2017) Great Yarmouth District Council
- Strategic Flood Risk Assessment Level 1 (2017) North Norfolk District Council
- Strategic Flood Risk Assessment Level 2 (2021) Greater Norwich Authorities (Broads Authority, Broadland District Council, Norwich City Council, South Norfolk Council)
- Strategic Flood Risk Assessment Level 2 (2019) Borough Council of Kings Lynn and West Norfolk