

Sustainable Drainage & Surface Water Management

Technical Guidance for Developers

The Lead Local Flood Authority (LLFA) advises that you first check with the Local Planning Authority that your development proposal is acceptable in principle and on a policy basis.

This advice is based on the current extent of the knowledge of the LLFA and the information available at that time. Therefore our comments are without prejudice.

1. The Role of the Lead Local Flood Authority (LLFA)

[The Flood and Water Management Act \(FWMA\) 2010](#) introduces a range of new powers, duties and responsibilities and makes Knowsley Council a Lead Local Flood Authority (LLFA). The Flood and Water Management Act 2010 sets out the requirement for LLFAs to manage 'local' flood risk within their area. 'Local' flood risk refers to the flood risk from surface water, groundwater and/or from ordinary watercourses.

The LLFA is a statutory consultee for all major development proposals which have surface water drainage implications in any flood zone. As a statutory consultee the LLFA has a legal obligation to provide the local planning authority with an informed substantive response to applications on which they are statutorily consulted on.

The submission of an acceptable amount and quality of information is fundamental for the LLFA to carry out its statutory duties and also if the local planning authority is to make an informed decision when determining whether your drainage proposals are acceptable in principle and in planning terms. It is in this capacity that this guidance note has been produced.

2. Flood Risk Assessment (FRA)

2.1 Do I need a Flood Risk Assessment?

A site-specific flood risk assessment (FRA) may be required for your development proposal as detailed under Footnote 20 of Paragraph 103 of the [National Planning Policy Framework](#).

A site-specific FRA is required if your development is:

- in Flood Zone 2 or 3 including [minor development](#) and [change of use](#)
- greater than 1 hectare (ha) in flood zone 1
- less than 1 ha in Flood Zone 1, including a change of use in development type to a more vulnerable class (e.g. from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (e.g. surface water drains, reservoirs)
- in an area within Flood Zone 1 which has critical drainage problems as notified by the Environment Agency

If your development proposal meets any of these criteria, there are no exemptions to a site-specific FRA and you must submit one in order for your planning application to be validated by the Local Planning Authority.

If your development proposal is less than 1 ha in Flood Zone 1 but is at risk of sources of flooding other than rivers and the sea, for example surface water and groundwater flood risk, the LLFA or Local Planning Authority may request for a site-specific FRA to be carried out in accordance with Footnote 20 of Paragraph 103 of the National Planning Policy Framework to determine the flood risk to and from the development proposal in order to be able to make an informed decision about that risk.

2.2 What information should be contained within the FRA?

A site-specific FRA must assess the risks of river and watercourses (fluvial), sea (tidal), surface water, groundwater, and all other sources of flooding. Once the risks have been assessed appropriate mitigation measures should be identified to reduce or manage the risk, both on-site and elsewhere, to an acceptable level.

The detail and technical complexity of any FRA will reflect the scale, nature and location of your development proposal. Guidance on what information your FRA needs to include is contained within '[Flood risk assessment for planning applications](#)' and the [Planning Practice Guidance](#). Reference should also be made to the [Knowsley MBC's Strategic Flood Risk Assessment \(SFRA\) Level 2](#) for locally specific guidance and information.

It should be noted that an appropriate level of detail and quality of information is needed if the local planning authority and relevant consultees are able to make an informed decision about the risk of flooding to and from the development proposal. All planning applications must be accompanied by an appropriate drainage strategy, more information on which can be found in [Section 3.2](#) of this guidance.

In summary a minimum of the following key information is needed within a site-specific FRA for development proposals:

- a) A location plan that includes geographical features, street names and identifies the catchment, watercourses or other bodies of water in the vicinity.
- b) A plan of the site showing existing development proposals, identification of any structures (e.g. embankments) which may influence local overland flow or any watercourses / culvert present on the site.
- c) Site levels of both existing and proposed. Reference to Ordnance Datum, may be required where details of context of the site to its surroundings is needed. Site contours should be referenced at intervals appropriate to the site topography.
- d) Details of the existing surface water drainage arrangements on site (if any) and the receptor e.g. soakaway, sewer, canal, watercourse etc.
- e) Proposals for surface water management that aims to not increase, and where practicable reduce the rate of surface water runoff from the site as a result of the development.
- f) Information about the surface water disposal measures already in place and estimates of the rates of run-off generated by the surfaces being drained.
- g) An assessment of the volume of surface water run-off likely to be generated from the proposed development and confirmation of how any excess volumes would be retained within the development.
- h) Information on how the proposed drainage design will perform under the increased frequency and intensity of rainfall that is predicted as a result of climate change. For more information refer to the '[Flood risk assessments: climate change allowances](#)' webpage.
- i) Information about other potential sources of flooding, if any, that may affect the site e.g. streams, surface water run-off, sewers, groundwater, reservoirs, canals and other artificial sources or any combination of these; including details on how these sources of flooding will be managed safely within the development proposal.

It should be noted that the above list is not exhaustive but provides a framework for the site-specific FRA to be prepared.

2.3 What if I don't need to submit a Flood Risk Assessment?

You don't need to do a flood risk assessment for a development that's less than 1 ha in Flood Zone 1 unless it is at risk of sources of flooding other than rivers and the sea, for example surface water and groundwater flood risk. Therefore there may be some circumstances where the LLFA or Local Planning Authority requests for a site-specific FRA outside of those listed above in accordance with [Footnote 20 of Paragraph 103 of the National Planning Policy Framework](#).

For developments less than 1 ha in Flood Zone 1 a FRA will not be required but a drainage strategy must be provided proportional to the scale of the development and follow the same design principles with regards to the calculating the maximum design flow rates for the site.

3. Sustainable Drainage Systems (SuDS)

3.1 What is the planning framework for surface water drainage?

Policies, guidance and standards for sustainable drainage have recently been introduced into the planning framework:

- [Paragraph 103 of the National Planning Policy Framework \(NPPF\)](#)
- [Written Statement on Sustainable Drainage Systems \(HCWS161\)](#)
- [DEFRA Technical Standards for Sustainable Drainage Systems](#)
- [Planning Practice Guidance](#)
- [Relevant Adopted Knowsley Local Planning Policies](#)

Applicants are advised to design the drainage system to comply with all parts of this framework to avoid delays and to minimise amendments to proposals.

3.2 What information do I need to provide?

All planning applications **must** be accompanied by an appropriate drainage strategy encompassing the detail set out in [Appendix A](#) as a minimum.

- For Outline applications an Indicative Drainage Strategy will be required.
- For Full and Reserved Matters applications a Detailed Drainage Strategy will be required.

It should be noted that the requirement to provide the appropriate drainage strategy is independent of the requirement for a site-specific FRA.

3.3 How can I demonstrate that I have satisfied the planning framework?

In order to manage flood risk all development, regardless of development type, flood zone and development size, must give priority use to SuDS as required under Paragraph 103 of the NPPF. Particularly for major developments, there is a requirement to assess and include SuDS for managing surface water at the development unless it is demonstrated during the assessment that it is inappropriate for the site.

In order to satisfy the NPPF and its accompanying PPG, applicants must demonstrate that priority has been given to the use of sustainable drainage systems (SuDS) in their development proposals. SuDS should be provided by default unless demonstrated to be [inappropriate](#). Where priority use of SuDS cannot be achieved, applicants must justify this by submitting robust and acceptable evidence.

Applicants can do this by presenting an explanation, supported by acceptable evidence, as to the parameters used to inform their proposed SuDS design. SuDS, including any proposed discharge rate(s), should be designed in line with the [Non-Statutory Technical Standards for Sustainable Drainage Systems](#).

Applicants must also state their intended surface water discharge point with evidence that this discharge point is acceptable. It should be noted that the discharge point for surface water should follow the hierarchy set out in [Paragraph 80 of Section 10 of the Planning Practice Guidance](#). Again, where preferential discharge points set out in the hierarchy cannot be achieved applicants must provide a robust justification, with acceptable evidence, as to why.

Applicants may also submit a narrative in support of their application explaining how the development proposal meets national and local planning policies (stating relevant policies) and guidance in relation to sustainable drainage, management of surface water flood risk and climate change.

[Appendix A](#) details what information needs to be submitted with your planning application and the level of information needed is dependent on application type. It should be noted that an appropriate level of detail and quality of information is needed if the local planning authority and relevant consultees are able to make an informed decision about the risk of flooding to and from the development proposal.

The proposed drainage system is to be designed using ‘Micro Drainage’ or similar approved. A disc containing the input data and the output must be submitted with each surface water drainage scheme for the approval of the LLFA.

3.4 What Climate Change Allowances should be used for Surface Water Drainage Proposals?

The appropriate climate change allowance must also be incorporated into any SuDS design so that the SuDS takes account of the likely impacts of climate change and anticipated changes in impermeable area within the development so it continues to provide effective drainage. This is to ensure that the development proposal can be appropriately flood resilient and resistant for its lifetime, direction on which is set out in [Paragraph 26 of Section 10 of the Planning Practice Guidance](#).

The lifetime of a residential development should be considered for a minimum of 100 years in accordance with [Paragraph 26 of Section 10 of the Planning Practice Guidance](#) unless there is specific justification for considering a shorter period, such as a time limiting condition.

[‘Flood Risk Assessments: Climate Change Allowances’](#) updated advice was produced by the Environment Agency and came into immediate effect on 19th April 2016. The LLFA, in its role as a statutory consultee, will use these allowances when providing advice on surface water flood risk in relation to drainage proposals, flood risk assessments and strategic flood risk assessments and this guidance note sets out how this advice is to be applied.

The LLFA expects applicants to assess the design of a surface water sustainable drainage system in accordance with [‘Table 2 Peak Rainfall Intensity Allowance in Small and Urban Catchments’](#). This table, set out below, shows anticipated changes in extreme rainfall intensity in small and urban catchments.

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

[Surface water drainage proposals](#), [flood risk assessments](#) and [strategic flood risk assessments](#) must assess both the ‘Central’ and ‘Upper End’ allowances to understand the range of impact. There is significant uncertainty surrounding future peak rainfall events and hence the purpose of assessing a range of peak rainfall allowances is, under different scenarios:

- i. to understand the performance of a proposed surface water sustainable drainage system, and;
- ii. to assess flood risk management proposals and the range of risk.

Ultimately this is a more robust approach than providing a single figure. This is because UKCP09 does not provide a full representation of changes to extreme, convective rainfall at the scales needed to manage surface water flooding.

How should these allowances be assessed?

In accordance with the Environment Agency’s guidance, the range between ‘Central’ and ‘Upper End’ allowances must be assessed to understand the range of impact. Knowsley Council recommends the use of the four stage approach to determine what level of allowance should be incorporate into your surface water drainage design.

STAGE 1: Establish lifetime of the development

To establish the correct range of allowances to assess, first you must start by confirming the expected [lifetime of the development](#).

STAGE 2: Assess the appropriate range of allowances

The range of allowance can then be assessed by running the drainage design model with different climate change allowances at the intervals set out in the table below:

Epoch	‘2020s’ (2015 to 2039)	‘2050s’ (2040 to 2069)	‘2080s’ (2070 to 2115)
Scenarios to Assess	5% and 10%	10%, 15% and 20%	20%, 30% and 40%

The ‘Central’ estimate is to be used for design purposes to understand the impact on surface water drainage networks (i.e. assessing the performance of the drainage system to check the system can cope with the critical duration design rainfall event).

The range of scenarios from ‘Upper End’ to ‘Central’ should be used to examine the potential flood risk implications in the critical duration design rainfall event. For example, is surface water wholly contained on site? Is there an increased flood risk to third parties? Is flood hazard within acceptable tolerances?

STAGE 3: Determine which allowance is to be applied

The minimum allowance to be applied is the ‘Central’ allowance provided it can be demonstrated, through evidence, that the flood risk is no worse at the ‘Upper End’ scenario than it is during the ‘Central’ scenario, and that [flood water can be managed safely](#) for the range of scenarios between ‘Central’ and ‘Upper End’ for the development’s lifetime. If this cannot be demonstrated then the applicant must apply to ‘Upper End’ allowance.

This approach **must** be evidence based, justified and supported by an appropriate hydraulic output e.g. MicroDrainage. A disc containing the input data and the output must be submitted with each surface water drainage proposal.

STAGE 4: Incorporate mitigation measures

If the hydraulic output shows that the proposed sustainable drainage system will 'Flood' then the application must identify clear and appropriate exceedance routes, taking account of the [flood risk vulnerability](#) of the development and ensuring the [development can be made safe](#) during a [design flood](#) for the lifetime of the development.

It may also be appropriate to consider the use of [flood resilience and flood resistance measures](#) in the [design](#) of the development should the calculated surface water flood depth, either in isolation or in combination with other flood sources, present a flood risk.

3.5 SuDS Funding, Maintenance & Access

The local planning authority will look to ascertain that the minimum standards of operation of the SuDS are appropriate and ensure, through the use of planning conditions or planning obligations, that there are clear and confirmed arrangements in place for the ongoing funding and maintenance of all elements of the SuDS, both surface and subsurface components, over the lifetime of the development. This should include, where applicable, details of access for future maintenance works allowing for any personnel, vehicle or machinery access required to undertake this work.

SuDS should be designed to ensure that the maintenance and operation requirements are economically proportionate, and this should be considered by reference to the costs that would be incurred by consumers for the use of an effective drainage system connecting directly to a public sewer.

4. Managing the Discharge of Surface Water Runoff

In line with [Paragraph 80 of Section 10 of the Planning Practice Guidance](#), applicants should aim to discharge surface water from any development proposal as high up the discharge hierarchy as possible. Where preferential discharge points set out in the hierarchy cannot be achieved applicants must submit a robust justification, along with acceptable evidence, as to why for each level of the hierarchy is surpassed.

The limiting discharge figure for the proposed development should be used in the design of the drainage system to ensure that the minimum requirement that flows up to the 1 in 30 year critical rainfall event are retained within the system in line with Standard 7 of [DEFRA's Technical Standards for Sustainable Drainage Systems](#).

For the 1 in 100 year critical rainfall event 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 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 in line with Standard 8 of [DEFRA's Technical Standards for Sustainable Drainage Systems](#).

As per Standard 9 of [DEFRA's Technical Standards for Sustainable Drainage Systems](#), any excess flows and volumes of water resulting from rainfall in excess of a 1 in 100 year critical rainfall event are to be safely managed in exceedance routes which minimise risks to people and property and must be retained within the curtilage of the site.

The proposed drainage system is to be designed using 'Micro Drainage' or similar approved. A disc containing the input data and the output must be submitted with each surface water drainage scheme for the approval of the LLFA.

4.1 Greenfield Sites

Where records of the previously developed system are not available and system characteristics cannot otherwise be determined, or if the drainage system is broken or blocked (or no longer operational), then the run-off characteristics, or if the site is previously undeveloped then the site should be defined as greenfield.

Peak Flow Control: If the site is classed as greenfield, the flow rates from the development are to be limited to the equivalent pre-development greenfield runoff rates for all rainfall events up to and including the 1 in 100 year event (plus appropriate climate change allowance in line with Standard 2 of [DEFRA's Technical Standards for Sustainable Drainage Systems](#)).

Volume Control: For greenfield developments the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event in line with Standard 4 of [DEFRA's Technical Standards for Sustainable Drainage Systems](#).

It should be noted that the applicant should also consult United Utilities to determine if they have any discharge restrictions which may be more restrictive. Notwithstanding the above, the existing site drainage constraints will also be taken into account when agreeing discharge limits and the proposed flow should not exceed existing flows.

4.2 Previously Developed (Brownfield) Sites

If a site has previously been developed it should be demonstrated that the drainage system is still operational for it to be classed as 'previously developed'/'brownfield'. Information should be obtained on the drainage system, such as pipe diameters, levels, gradients, lengths and hydraulic controls. These details should be used, along with the contributing area characteristics of the site to set up a drainage model (or to inform another assessment method) to evaluate the peak flow rates at the outfalls from the existing site for the design return periods.

Peak Flow Control: The peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event in line with Standard 3 of [DEFRA's Technical Standards for Sustainable Drainage Systems](#). The LLFA advises that a minimum of 50% reduction in the rate of discharge from the development prior to redevelopment should be applied to offer improvement; this is in accordance with Table 6.1 of [Knowsley MBC's Strategic Flood Risk Assessment \(SFRA\) Level 2 \(Page 73\)](#)

Volume Control: The runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event in line with Standard 5 of [DEFRA's Technical Standards for Sustainable Drainage Systems](#).

Notwithstanding the above, the existing site drainage constraints will also be taken into account when agreeing discharge limits and the proposed flow should not exceed existing flows.

The proposed drainage system is to be designed using 'Micro Drainage' or similar approved. A disc containing the input data and the output must be submitted with each surface water drainage scheme for the approval of the LLFA.

5. Water Quality

Regardless of the sites status as greenfield or brownfield, applicants should ensure that the development proposal will not negatively impact on the water quality or ecology of any receiving watercourse or water body. No activities or works during any stage of the development proposal should deteriorate the status of any nearby watercourse as the main objective for the Water Framework Directive (WFD) is to prevent deterioration in 'status' for all waterbodies.

The ecological health of any receiving watercourse or water body can be protected, or even improved, by the implementation of a SuDS scheme with an appropriate treatment train.

For example, pollution control measures may be required and should be incorporated as an identified mitigation measure where applicable. Information on pollution control measures can be found in Pollution Prevention Guidance on the [Environment Agency's website](#).

6. Land Drainage Consent for Ordinary Watercourses

Under the [Land Drainage Act 1991](#) (as amended by the Flood & Water Management Act 2010), consent is required from the LLFA to build a culvert or structure (such as a weir) or to carry out works in, under, over or within 8 metres of the top of the bank of any ordinary watercourse which may alter or impede the flow of water on any ordinary watercourse, regardless of whether it is culverted or not.

Applicants must apply for land drainage consent **before** starting any works on site and failure to do so may result in enforcement action. This is for two key reasons:

- i. To ensure that the proposals are acceptable in relation to any ordinary watercourse(s). Obtaining planning permission from the local planning authority does not automatically mean that land drainage consent will be granted by the Lead Local Flood Authority.
- ii. To ensure that any development does not negatively impact on the watercourse(s). For example, the watercourse may be ecologically or geomorphically sensitive, or pollution control measures may be required.

Where a watercourse is located within the development site, or in close proximity to it, applicants are advised to contact the LLFA even if they are not intending to carry out any works within in it or discharge to it.

It should be noted that once land drainage consent is granted and subsequently issued, it is valid for 12 months from the date of issue. You will need to reapply for consent should works continue beyond this period.

Construction of a culvert or structure (such as a weir) or carrying out works in, under, over or within 8 metres of the top of the bank of any watercourse which may alter or impede the flow of water, regardless of whether the watercourse is culverted or not, without a valid land drainage consent will result in enforcement action being taken by the Lead Local Flood Authority using its powers under the Land Drainage Act 1991.

The requirement for land drainage consent is separate to and independent of any planning permission issued by the Local Planning Authority.

For works within 8 metres of the top of the bank of any 'Main River' designated watercourse, please see the [Environment Agency's advice](#).

Appendix A: Information Checklist

Pre-app	Outline	Full	Reserved Matters	Discharge of Conditions	Drainage Strategy to include:
✓	✓	✓			1. A site-specific flood risk assessment (FRA), where required
✓	✓	✓			2. SuDS Design Statement describing the SuDS proposals to include: a. How proposals meet the SuDS framework (set out in Section 3) b. What the expected lifetime of the development is, where the development proposal is non-residential c. Information on any existing drainage on the site d. Information on how you are intending to drain surface water on the site, including the discharge hierarchy and appropriate treatment train e. Information on where you are proposing to drain the site to (discharge point)
	✓				3. Preliminary drainage layout plan/drawings
	✓				4. Preliminary 'Outline' hydraulic calculations - including information on the rate at which you are proposing to discharge surface water at, and information on what attention will be required to achieve your proposed discharge rate
	✓				5. Preliminary landscape proposals
	✓				6. Ground investigation report (for infiltration) to include the results of: a. Boreholes or Trial Pits b. Infiltration (Permeability) Testing (BRE 365)
	✓	✓			7. Evidence of any necessary third party agreement(s) for discharge to their system (in principle/consent to discharge)
		✓	✓		8. Detailed development layout plan to include: a. Topography b. Sustainable drainage system c. Sewers d. Watercourses and water bodies e. Exceedance routes, where applicable
		✓	✓	✓	9. Pre-development and post-development SuDS flow calculations for: a. 1 in 1 year; b. 1 in 2.2 year (QBAR); c. 1 in 30 year, and; 1 in 100 year + applicable climate change allowance

Regeneration & Environment

						The proposed drainage system is to be designed using 'Micro Drainage' or similar approved. A disc containing the input data and the output must be submitted with each surface water drainage scheme for the approval of the LLFA.
		✓	✓	✓	10.	SuDS flow calculations for the volume of attenuation required
		✓	✓	✓	11.	Details of any pollution prevention measures or water quality treatments, where applicable
		✓	✓	✓	12.	Detailed flood and drainage design drawings and layout, to include: a. Details of inlets, outlets and flow controls b. Exceedance routes c. Topography and floor levels
		✓	✓	✓	13.	Development management and construction phase surface water management plan, as applicable
		✓	✓	✓	14.	Timetable for implementation, including phasing as applicable
		✓	✓	✓	15.	Management and Maintenance Programme for all elements of the SuDS to include, for the development's lifetime: a. Arrangements for adoption, where applicable b. Arrangements concerning appropriate funding mechanisms c. Means of access for maintenance including easements, where applicable

NOTE: Additional information may be required under specific site conditions or development proposals.

The proposed drainage system is to be designed using 'Micro Drainage' or similar approved. A disc containing the input data and the output must be submitted with each surface water drainage scheme for the approval of the LLFA.