Milton Keynes City Council

Surface Water Drainage Guidance for Developers

December 2022

Image used with kind permission of the Parks Trust

Contents

1. Document Purpose

1.1 Introduction

1.1.1 A significant amount of new development will occur in Milton Keynes over the next 20 years and beyond. In order to reduce the impact upon the water environment, development must be appropriately located, well designed, managed and take account of the impacts of climate change.

1.1.2 This guidance has been prepared to support developers and their consultants in the preparation of surface water documents to support planning applications.

1.1.3 This document is 'live' and will therefore be reviewed annually and/or updated should new guidance or legislation be introduced.

Photo 1: Pond at Ferry Meadows
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2. Policy Background and LLFA Role

2.1 Statutory Consultee

2.1.1 Milton Keynes City Council is a Lead Local Flood Authority (LLFA) with a role as statutory consultee to the planning process for all major developments. Major development is defined[1] 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—
>
> a. the number of dwelling-houses to be provided is 10 or more; or
>
> b. the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub-paragraph (c)(i);
>
> (d) the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or
>
> (e) development carried out on a site having an area of 1 hectare or more.

2.1.2 As a statutory consultee we are required to provide a substantive response to any consultations we receive. A substantive response is one which: –

> (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; or
>
> (d) provides advice to the consultor.

2.1.3 The LLFA will endeavour to reply to statutory consultations within 21 days of being consulted.

2.1.4 LLFA advice can be sought on other planning applications, which raise surface water or other local flood risk issues. Whilst it is not a statutory function, the LLFA will often also respond to non-major as well as minor applications across Milton Keynes to ensure flood risk and drainage is being managed appropriately.

[1] by Article 2(1) in Part 1 (Preliminary) of the Town and Country Planning (Development Management Procedure) (England) Order 2015

2.2 National Planning Policy Framework

2.2.1 In March 2012 Government published the National Planning Policy Framework (NPPF). The framework acts as guidance for LPAs and decision-takers in making decisions about planning applications. Section 14 of this document contains key information on how flood risk and Sustainable Drainage Systems (SuDS) should be considered as part of new development.

2.3 Planning Practice Guidance

2.3.1 The Planning Practice Guidance (PPG) has been produced to support the NPPF. Paragraph 057 of the Planning Practice Guidance (PPG) states, *'The types of sustainable drainage system which it may be appropriate to consider, will depend on the proposed development and its location, as well as any planning policies and guidance that apply locally. 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 water body;*
3. *to a surface water sewer, highway drain, or another drainage system;*
4. *to a combined sewer.*

2.3.2 Paragraph 058 of the PPG states, *'The local planning authority should be satisfied that the minimum standards of operation for the proposed sustainable drainage system are appropriate, and that there are clear maintenance and adoption arrangements in place for the lifetime of the development. The local planning authority will need to consider whether the proposed standard of construction would facilitate adoption and maintenance by an appropriate body such as the water and sewerage company under the Ofwat-approved Sewerage Sector Guidance. Also refer to the non-statutory technical standards. The use of monitoring and operation technology as part of sustainable drainage systems could help to optimise their effectiveness and allow their operation to be adapted over time.'*

2.3.3 Paragraph 063 of the PPG states how sustainable drainage can reduce the causes and impact of flooding – '*A comprehensive sustainable drainage approach can help to alleviate flood risk as well as managing the impacts where flooding does occur, for example by:*

- *Maximising opportunities for infiltration of surface water through replacement of impermeable surfaces with permeable surfaces;*
- *Maximising opportunities for planting and vegetated areas, in preference to engineered surfaces, to increase evapo-transpiration and provide improvements for biodiversity and wider natural capital benefits;*
- *Providing additional surface water storage over and above the minimum requirements e.g. an over-sized pond, to accommodate more extreme rainfall events; and*
- *Reducing surface water loadings on the existing sewerage network. This could include using systems to capture run-off from surrounding development, not just the proposed development, by incorporating it into the provision of an area-wide strategic sustainable drainage system, planned in conjunction with local risk management authorities and*

sewerage providers. This approach could help reduce the risk of sewer flooding and free up capacity in wastewater treatment works, off-setting the need for off-site reinforcements of the sewerage network.'

2.3.4 It should be noted that Milton Keynes City Council still seeks **all new development and redevelopment** to incorporate SuDS in order to reduce flood risk, improve water quality and present options for biodiversity and public amenity.

2.4 Local Policy

2.4.1 Plan:MK (the Local Plan for Milton Keynes) was adopted on 20th March 2019. As outlined in the plan, the early masterplan for Milton Keynes sought to reduce flood risk via the development of an innovative approach to flood risk based on a strategic water management system and planned green infrastructure provision.

2.4.2 However as outlined in the Level 1 Strategic Flood Risk Assessment (2015), there are a number of areas across the Borough at risk of flooding from various sources and it is expected that, even with no further development, the impacts of climate change are likely to increase this risk. It is therefore necessary that a robust and sustainable approach is taken to reducing and mitigating the potential impacts that climate change may have upon the area.

2.4.3 Policy SC1 of Plan:MK includes policies that seek the incorporation of green roofs and/or walls into the structure of buildings where technically feasible to improve water management in the built environment, provide space for biodiversity and aid resilience and adaptation to climate change. Furthermore, water reuse and recycling and rainwater harvesting should also be incorporated wherever feasible to reduce demand on mains water supply, subject to viability.

2.4.4 Policies FR1 – FR3 of Plan:MK includes locally specific strategic flood risk management policies to maintain and continue the exemplar sustainable drainage model of Milton Keynes which prohibits development within the floodplain and seeks flood management and drainage infrastructure to be provided as strategically as possible and as part of a maintained, multi-functional blue-green infrastructure. The policies can be seen below:

Policy FR1 - Managing Flood Risk

A. All new development must incorporate a surface water drainage system with acceptable flood control and demonstrate that water supply, foul sewerage and sewage treatment capacity is available or can be made available in time to serve the development. Suitable access is safeguarded for the maintenance of water supply and drainage infrastructure.

B. Plan:MK will seek to steer all new development towards areas with the lowest probability of flooding. The sequential approach to development, as set out in national guidance, will therefore be applied across the Borough, taking into account all sources of flooding as contained within the Council's Strategic Flood Risk Assessment (SFRA).

C. Development within areas of flood risk from any source of flooding, will only be acceptable if it is clearly demonstrated that it is appropriate at that location, and that there are no suitable available alternative sites at a lower flood risk.

D. Development proposed in an area at risk of flooding will be required:
   1. To be supported by a site specific Flood Risk Assessment (FRA) (subject to the triggers set out below);
   2. To take into account all forms of flooding including, but not limited to: fluvial, groundwater, surface water and reservoir flooding;
   3. To ensure that opportunities to reduce the causes and impacts of flooding to the site and the surrounding area are taken as far as possible, in order to improve the existing situation, taking into account climate change. At a minimum, proposals will need to demonstrate no increase in flood risk to the site or surrounding area;
   4. To clearly demonstrate that the benefits of the development to the community, outweigh the risk of flooding when applying the sequential test and exception test (where required);
   5. When applying the sequential test, to clearly demonstrate that the impacts of climate change are taken into account;
   6. To demonstrate the application of a sequential approach to the site design and layout to ensure highest vulnerability land uses are located within areas of the site at lowest risk of flooding;
   7. To build resilience into a site's design;
   8. To ensure that a site's design and any flood mitigation measures implemented are designed with an allowance for climate change and the potential impact it may have over the lifetime of the proposed development (31);
   9. To provide a safe access and egress route for future users of the development; and
   10. To attenuate surface water run-off in line with Policy FR2.
   11. To consult the Fire and Rescue Service as to the feasibility of undertaking rescue and recovery operations during and in the aftermath of flooding events.

E. A site specific FRA will be required for:

1. All sites of 1ha or more in Flood Zone 1;
2. All sites within Flood Zone 2 or 3;
3. All sites highlighted as being at high risk from surface water flooding, or which are located within a Critical Drainage Catchment (CDC), as identified in the Milton Keynes Surface Water Management Plan. In this case the FRA will be required to demonstrate that the development will not increase the flood risk to the CDC and where possible will provide an improvement to the existing situation.

F. The FRA should include an assessment of flood risk to and from the proposed development, and demonstrate how the development will be safe, will not increase flood risk elsewhere and where possible will reduce flood risk overall in accordance with the NPPF and PPG

Policy FR2 - Sustainable Drainage Systems (SuDS) and Integrated Flood Risk Management

A. Plan:MK advocates the continuation of a strategic, integrated approach to managing flood risk which seeks the management of surface water to be planned at the largest appropriate scale for the new development and incorporated into the site at the earliest opportunity in the design process.

B. New development is required to incorporate SuDS; in line with national policy and guidance and, which meet the requirements set out in national standards and the Council's relevant local guidance. It is expected that:

   1. Flood risk management and SuDS will be provided at a strategic scale and in an integrated manner, wherever possible;
   2. Space will be specifically set aside for SuDS and fluvial flood risk reduction features and used to inform the overall layout of development sites;
   3. Above ground attenuation will be provided in preference to below ground attenuation;
   4. SuDS will be designed as multi-purpose green infrastructure and open space, to maximise additional environmental, biodiversity, social and amenity value, wherever possible. The use of land to provide flood storage capacity should not conflict with required amenity and recreation provision - floodplains and floodplain habitats should be safeguarded;
   5. SuDS will be designed with an allowance for climate change and the potential impact it may have over the lifetime of the proposed development;
   6. Proposals for development within Critical Drainage Catchments, as identified in the Milton Keynes Surface Water Management Plan, should investigate the potential for the scheme to reduce or mitigate existing risk in the surrounding area;
   7. All surface water drainage proposals for new development must include full details of the means of achieving future management, maintenance and adoption of the systems, prior to approval of any planning permission, to ensure that it will function effectively over the lifespan of the development. This will include details of funding and should be formulated through discussion with the relevant responsible bodies, including Milton Keynes City Council, The Parks Trust, Anglian Water and the Internal Drainage Board;
   8. Development will ensure no adverse impact on the functions and setting of a watercourse and its associated corridor;
   9. Development should avoid building over or culverting watercourses, encourage the removal of existing culverts and seek opportunities to create wetlands and wet grasslands and woodlands and restore natural river flows and floodplains.

Policy FR3 - Protecting and Enhancing Watercourses

A. All new development must be set back at a distance of at least 8 metres from any main rivers, at least 9 metres from all other ordinary watercourses, or at an appropriate width as agreed by the Environment Agency, Lead Local Flood Authority or Internal Drainage Board, in order to provide an adequate undeveloped buffer zone. Development that restricts future de-culverting of waterways should be avoided.

B. The Council will resist proposals that would adversely affect the natural functioning of main rivers, ordinary watercourses and wet or dry balancing lakes, this includes through the culverting of open channels, unless for access purposes.

3. Pre-application Discussions

3.1 Introduction

3.1.1 Milton Keynes City Council can offer a pre-application service for all scales of development. As part of the pre-application service, the LLFA can offer advice on the following:

• Topography & drainage patterns	• Proposed surface water destination	• Permitted discharge rates/volumes
• Attenuation volumes and locations	• Flood risk to and from the site	• Third party consents
• Any required off-site works	• Temporary drainage during construction	• Presence of sensitive receptors
	• Future maintenance and adoption of SuDS	

3.1.2 If you wish to take up this Milton Keynes City Council pre-application service, a request should be made via the formal pre-application advice service. You should provide as much information about your development as possible so that we can give you accurate and relevant advice and calculate the applicable fee correctly.

A planning officer will respond to your enquiry and make appropriate arrangements. The LLFA do not currently accept direct requests for pre-application advice.

4. Formal Submission Requirements

4.1 Introduction

4.1.1 To enable the LLFA to provide its response as a statutory consultee the developer should produce a surface water drainage strategy for the proposed development that includes the level of information corresponding to the type of application submitted.

4.1.2 We have produced a series of checklists in the following sections which provide a summary of the expected level of information. Further information may be requested to support the application where there are complex local issues. This information will draw on other information contained within the planning application but is required by the LLFA to ensure the standard of surface water management is appropriate.

4.1.3 Working from these checklists will help developers to ensure the LLFA does not object to the application on the grounds of lack of information. If, during the preparation of a surface water drainage strategy you have any questions about the required information then please do not hesitate to contact us at LLFA@milton-keynes.gov.uk. Contacting the LLFA during the early stages to clarify any issues will also help reduce the likelihood of an objection.

4.2 Outline Applications

	Outline	(✓)
1	Type of development (e.g. new development, extension to existing development, change of use etc.)	
2	Status of site (i.e. greenfield or previously developed)	
3	Total site area (ha)	
4	Existing impermeable area (ha)	
5	Proposed impermeable area / developable area (ha) (including an allowance for urban creep)	
6	Description of site topography	
7	Identification of watercourses within vicinity of site and their outfalls and associated flood risk	
8	Description of ground conditions (using site investigation reports where available) including information regarding geology and groundwater depth	
9	Identification of any surface water flood risk	
10	Existing site drainage arrangements	
11	Proposed method of surface water disposal (using drainage hierarchy) & evidence to support this	
12	Existing runoff rates (l/s/ha)	
13	Proposed runoff rates (l/s/ha)	
14	Existing runoff volumes (m^3/ha)	
15	Proposed runoff volumes (m^3/ha)	
16	Required volume of attenuation (m^3 per m^2 of impermeable area)	
17	Appropriate consideration of climate change	
18	Preliminary SuDS proposals (type, location, size)	
19	Infiltration test results in accordance with BRE365 (if proposing infiltration) **or** second viable option for surface water disposal if testing has not been undertaken	
20	Evidence of in principle agreement from third party if discharging into their system	
21	Preliminary site layout plans (including SuDS features)	
22	Details of proposed phasing (if applicable) and how each phase will be delivered in relation to the strategic surface water drainage strategy	
23	Management/maintenance plan and on-going maintenance responsibilities	

4.3 Full Applications

	Full	(✓)
1	Type of development (e.g. new development, extension to existing development, change of use etc.)	
2	Status of site (i.e. greenfield or previously developed)	
3	Total site area (ha)	
4	Existing impermeable area (ha)	
5	Proposed impermeable area / developable area (ha) (including an allowance for urban creep)	
6	Description of site topography	
7	Identification of watercourses within vicinity of site and their outfalls and associated flood risk	
8	Description of ground conditions (using site investigation reports where available) including information regarding geology and groundwater depth	
9	Identification of any surface water flood risk & proposed mitigation	
10	Existing site drainage arrangements	
11	Proposed method of surface water disposal (using drainage hierarchy) & evidence to support this	
12	Existing runoff rates (l/s/ha)	
13	Proposed runoff rates (l/s/ha)	
14	Existing runoff volumes (m^3/ha)	
15	Proposed runoff volumes (m^3/ha)	
16	Total required volume of attenuation (m^3)	
17	Appropriate consideration of climate change	
18	SuDS proposals (type, location, size)	
19	Infiltration test results in accordance with BRE365 (if proposing infiltration) **or** second viable option for surface water disposal if testing has not been undertaken	
20	Formal agreement from third party if discharging into their system	
21	Drainage layout drawing & supporting hydraulic calculations	
22	Management/maintenance plan identifying the future maintenance schedule and which body/bodies will own and be responsible for maintaining the system and how they will be funded	
23	Site layout plans	

4.4 Reserved Matters

4.4.1 Further detail has been provided on some items within this table. They are provided later in the document or can be accessed by clicking on the hyperlinks.

	Reserved Matters	(✓)
1	Detailed drainage layout	
2	Proposed impermeable area (ha)	
3	Proposed method of surface water disposal (using drainage hierarchy) & evidence to support this	
4	Hydraulic calculations to show performance of the system up to the 1% AEP plus climate change storm event	

Where a surface water condition has been requested on an outline permission, but this has not been discharged before the reserved matters application, it should be noted that if the layout of the development needs changing to account for the surface water scheme, a revised reserved matters application may be required to achieve satisfactory surface water drainage arrangements without increasing flood risk off site.

The LLFA would normally suggest that such surface water conditions should be determined alongside any reserved matters application. This may avoid subsequent changes or constraining the drainage approach unnecessarily with a layout that has been approved before SuDS details were made available.

4.5 Discharge of Condition

4.5.1 The exact wording of surface water conditions may vary but the checklist below should provide the majority of what we would require to recommend the discharge of most surface water conditions:

	Discharge of Condition	(✓)
1	Detailed drainage layout	
2	Proposed impermeable area (ha)	
3	Proposed method of surface water disposal (using drainage hierarchy) & evidence to support this	
4	Proposed runoff rates (l/s/ha)	
5	Proposed runoff volumes (m^3/ha)	
6	Total required volume of attenuation (m^3)	
7	Detailed SuDS proposals (type, location, size)	
8	Infiltration test results in accordance with BRE365 (if proposing infiltration)	
9	Details of proposed flow controls (type, size)	
10	Hydraulic calculations to show performance of the system up to the 1% AEP plus climate change storm event	
11	Consideration of a surcharged outfall	
12	Exceedance flow plan	
13	Management/maintenance plan identifying the future maintenance schedule and which body/bodies will own and be responsible for maintaining the system and how they will be funded	
14	Formal agreement from third party if discharging into their system	

5. Technical Guidance

5.1.1 The following sections provide technical guidance on the aspects contained within the checklists in the preceding chapter. This is aimed at providing developers and their consultants with locally specific technical guidance to ensure their submissions are aligned with the expectations of the LLFA.

5.2 Identification of Flood Risk

5.2.1 "Flood risk" is a combination of the probability and the potential consequences of flooding. Areas at risk of flooding are those at risk of flooding from any source, now or in the future. Sources include rivers and the sea, direct rainfall on the ground surface, rising groundwater, overwhelmed sewers and drainage systems, reservoirs, canals and lakes and other artificial sources. Flood risk also accounts for the interactions between these different sources (as per PPG Paragraph: 001).

5.2.2 The sequential 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 (as per PPG Paragraph: 023).

5.2.3 Measures to avoid, control, manage and mitigate flood risk should also not increase flood risk elsewhere.

5.3 Existing Site Drainage Arrangements

Greenfield Sites

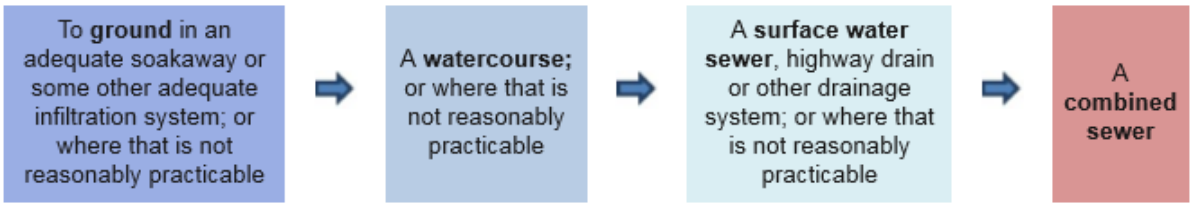
5.3.1 Detail should be provided on the existing land use, natural contours of the land, flow paths, existing points of discharge and vegetation cover. If there are multiple catchments within the site, these should be identified and retained following development unless it can be demonstrated that the alteration of catchments will provide betterment.

Previously Developed Sites

5.3.2 As much detail as possible should be provided on the existing positive drainage system (if present). However as a minimum, details of the final outfall including its location and destination must be provided. If the site discharges into a third party asset such as an IDB drain under non-standard conditions (e.g. a higher rate of discharge), agreements outlining this should be provided within the report.

5.4 Proposed Method(s) of Surface Water Disposal

5.4.1 As required by the Building Regulations and PPG, surface water must discharge to the following, listed in order of priority:



Infiltration

5.4.2 For an **outline or full** application, whilst we would prefer to receive infiltration test results, we appreciate that it is not always possible to undertake these and therefore we would accept a thorough desk-based assessment provided that a second viable option for surface water drainage is also proposed (e.g. to an adjacent watercourse).

5.4.3 When **discharging a surface water condition** and infiltration is proposed, infiltration testing in accordance with BRE365 must be undertaken at representative locations and depths across the proposed development site. The results of infiltration testing will need to be submitted alongside the application for review. The minimum infiltration rate the LLFA accepts is 1.0×10^{-6} m/s. To protect groundwater from pollution, any infiltration structure must be shown to be constructed with the base set at a minimum of 1.2 m above the anticipated groundwater level. Information to support this could include trial pits or boreholes on site. Where trial pits or boreholes find groundwater to be within 1.2 m of the ground level, groundwater monitoring should take place to measure fluctuations.

5.4.4 Infiltration through made ground should be avoided as this generates a potential risk of contamination to receiving groundwater bodies. Any made ground should be removed from beneath infiltration SuDS where possible. Infiltration through made ground will only be accepted by us if site investigations demonstrate the absence of contamination. To that effect, we would expect samples of made ground to be tested for potential contaminants of concern and the risks to controlled waters to be appropriately assessed. For example, leachate testing would allow a comparison against suitable water quality standards. We would expect a suitably qualified consultant to be capable of undertaking the assessment to ensure that the development / they do not cause pollution of controlled waters.

5.4.5 It is our view that deep soakaways (> 2 m below ground) or borehole soakaways do not meet the requirements of the first level of the hierarchy. Whilst in some cases they can provide important groundwater recharge, they do not mimic the natural drainage system as would shallow infiltration. These should only be considered as a final option for the disposal of surface water on a par with a sewer. If deep infiltration is the only feasible way to discharge surface water, we would expect the applicant to provide evidence they have agreed the strategy with the Environment Agency's groundwater team.

Watercourse

5.4.6 If it is proposed to discharge into a watercourse within the site boundary this should be shown on a plan. We will require evidence that the watercourse itself has an outfall and is in a suitable condition to receive surface water. The lack of detailed information on these grounds may increase the level of uncertainty we have about the effectiveness of a drainage strategy. If this degree of uncertainty is great, then as LLFA we would have grounds to object to the drainage proposal.

5.4.7 If a site seeks to discharge to a watercourse that is not in or adjacent to the development site, then it is necessary to demonstrate permission in principle or third-party agreement. If the site discharges into a third-party asset such as an IDB drain under non-standard conditions (e.g. a higher rate of discharge), agreements outlining this should be provided before we are able to approve the proposal.

Surface Water Sewer

5.4.8 Any proposed connection to the public sewer will need agreement from Anglian Water. For an **outline** application, correspondence with the responsible body should be submitted to demonstrate agreement in principle to the discharge and connection point. Anglian Water may require local capacity improvements for sewer connections, or a new sewer may need to be requisitioned to connect to the best point on the network. These should be negotiated with the sewerage undertaker directly. For any **full or discharge of condition** application, correspondence with the responsible body agreeing to accept surface water at an agreed rate should be appended to the surface water drainage strategy.

Combined Sewer

5.4.9 Where a surface water connection to an existing combined sewer is unavoidable, it must be undertaken in such a manner and at such a location to facilitate future separation of the surface water from that combined system. As outlined above, for an outline application, correspondence with the responsible body should be submitted to demonstrate agreement in principle to the discharge and connection point. Anglian Water may require local capacity improvements for sewer connections, or a new sewer may need to be requisitioned to connect to the best point on the network. These should be negotiated with the sewerage undertaker directly. For any **full or discharge of condition** application, correspondence with the responsible body agreeing to accept surface water at an agreed rate should be appended to the surface water drainage strategy.

5.5 Milton Keynes Highways - Drainage

5.5.1 Milton Keynes Highways will not accept any new connections to its existing drainage systems. Furthermore, developers are expected to be able to demonstrate that their proposals do not lead to an increase in surface water runoff onto the local road network.

5.5.2 For the avoidance of doubt, the LLFA with regards to drainage and SuDS approval is independent of Milton Keynes Highways with regards to highway development control, highway agreements and highway adoptions.

5.6 Existing Runoff Rates

5.6.1 We require calculations of the existing peak runoff rates (l/s/ha) for the following storm events:

- 100% Annual Exceedance Probability (AEP) (1 in 1)
- 3.3% AEP (1 in 30)
- 1% AEP (1 in 100)

5.6.2 Consideration should be given to sub-catchments that may exist on site and individual calculations should be provided per sub-catchment where appropriate.

5.7 Proposed Runoff Rates

5.7.1 We require the rate of runoff from a development to be restricted in line with the SuDS Non-Statutory Technical Standards.

5.7.2 All new developments on greenfield land are required to discharge the runoff from the impermeable areas at the same greenfield runoff rate, or less than, if locally agreed with an appropriate authority. Where a **simple** flow control is proposed, the peak runoff rate should be limited to Q_{BAR} (mean annual flow rate). Where a **complex** flow control is proposed the peak runoff rate from the developed site for events up to and including the 1% AEP plus climate change event should not exceed the greenfield equivalents.

5.7.3 Brownfield (previously developed land) sites must reduce the existing runoff from the site as part of the redevelopment. Where possible, in order to provide betterment, redevelopments should look to reinstate greenfield runoff rates. This is particularly important in those areas of Milton Keynes that are classified as Critical Drainage Catchments (see Appendix A). These catchments outlines can also be found within our Surface Water Management Plan (2016).

5.7.4 **IMPORTANT:** Where debris can enter the control (e.g. where the upstream system is open or where the inlets are gullies), static controls should have a minimum opening size of 100 mm unless appropriate pre-treatment is provided. Where the design of the upstream system will prevent debris entering the system (e.g. underground systems where the inlets are pervious pavement systems), static controls should have a minimum opening size of 50 mm. Variable controls may have a smaller opening provided they have a self-cleansing mechanism. The outlet diameter and associated risk of blockage should be considered on a site by site basis.

5.7.5 **NOTE:** Self cleansing velocity should be achieved for all pipes.

5.8 Existing Runoff Volumes

5.8.1 We require calculations of the existing peak runoff volumes (m^3/ha) for the following storm events:

- 100% Annual Exceedance Probability (AEP) (1 in 1)
- 3.3% AEP (1 in 30)
- 1% AEP (1 in 100)

5.9 Proposed Runoff Volumes

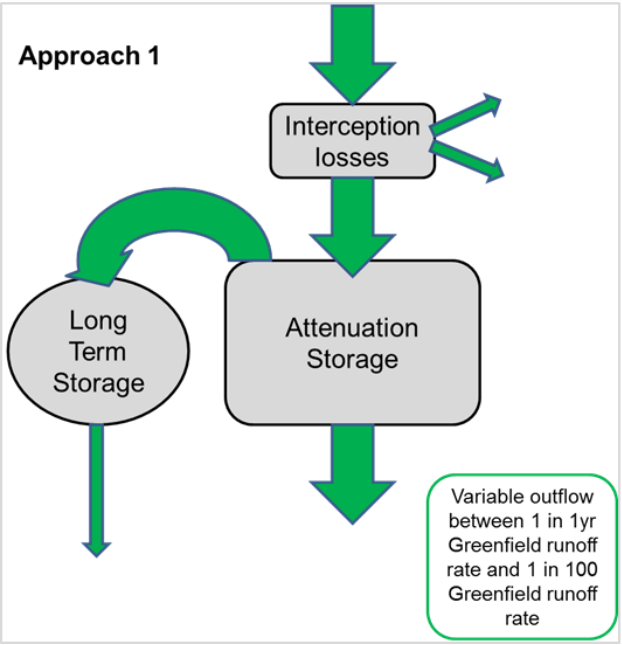
5.9.1 Runoff volumes from the developed site will usually increase in comparison to the site in its natural condition; this may increase flood risk in natural receiving systems. Controlling the volume of runoff from the site is therefore vital to prevent flood risk in natural systems.

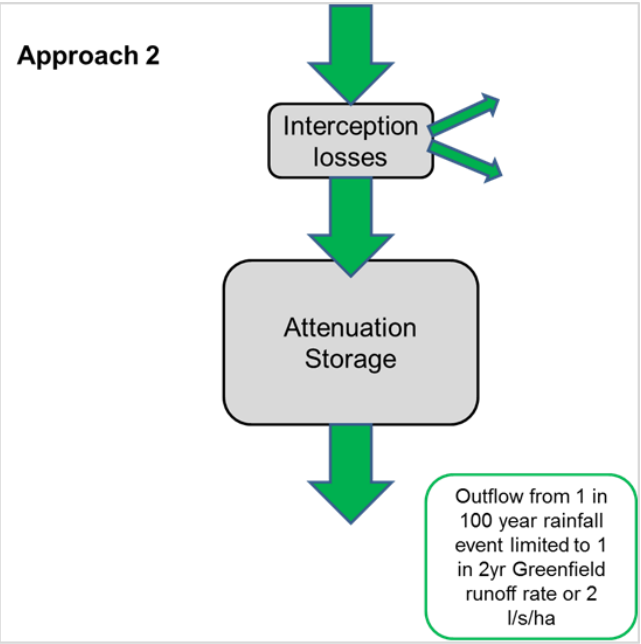
5.9.2 The volume should, where reasonably practicable, be controlled in accordance with the below standards.

5.9.3 **Greenfield Sites:** The runoff volume from the development site to any surface water body or sewer in the 1% AEP (1 in 100), 6 hour rainfall event should not exceed the greenfield runoff volume for the same event.

5.9.4 **Previously Developed Sites:** The runoff volume from the development site to any surface water body or sewer in the 1% AEP (1 in 100), 6 hour rainfall event must be constrained to a value as close to the greenfield runoff volume for the same event but should never exceed the runoff volume from the existing site. Where it is not reasonably practicable to constrain the volume of runoff, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

5.9.5 To achieve the above, long term storage may be required. Long Term Storage is the term given to the volume of temporary storage which needs to be provided for the additional volume of surface water runoff that is generated by the development that is greater than the volume of greenfield runoff. The greenfield runoff volume is calculated using the 1:100 year 6 hour event. This volume is the amount that can be discharged at the 1:100 year greenfield runoff rate. The additional runoff volume should be discharged from the site at a flow rate less than 2l/s/ha for this event. As critical duration events for the design of the site storage system will be much longer than 6 hours, the Long Term Storage volume is not calculated using the 1:100 year 6 hour event but needs to be assessed using the critical duration event.





5.10 Required Volume of Attenuation

5.10.1 An assessment of the volume of attenuation storage that will be required on site is required. This should be based on the 1% AEP plus climate change storm event and allowable discharge rate for the site. The method and volumes of attenuation should be identified and located on a plan of the proposed development.

5.10.2 Expressing volumes in a comprehensible format such as m^3 per m^2 of developed site area for an outline application makes the approach to design more flexible and simplifies the evaluation process.

5.11 Urban Creep

5.11.1 Urban creep should be considered in any application to account for increases in impermeable surfaces throughout the lifetime of development (e.g. the addition of conservatories or building extensions). This should be limited to residential development only and use the allowances shown below.

Table 1: Urban Creep Allowances.

Residential development density (dwellings per hectare)	Change allowance (% of impermeable area)
≤25	10

30	8
35	6
45	4
≥50	2
Flats and apartments	0

5.12 Climate Change

5.12.1 All surface water drainage strategies are expected to incorporate the latest climate change allowances for rainfall intensity. The peak rainfall allowances map should be used to determine the appropriate climate change impacts on peak rainfall intensity per management catchment.

5.12.2 Applicants should use the development guidance to work out the lifetime of the development. They should consider a residential development to have a minimum lifetime of a 100 years.

5.12.3 The correct climate change allowances should be used for both the 1% and 3.3% annual exceedance probability events.

5.12.4 Where the central allowances are used, we may ask for justification of the design life of the development to ensure that the correct climate change allowances are applied.

5.12.5 If the latest National Planning Policy Framework (NPPF) guidance on climate change allowances has changed since a drainage strategy was agreed, any subsequent proposals must be designed to accommodate the latest climate change allowances.

5.13 SuDS Proposals

5.13.1 Consideration of sustainable water drainage systems early in the design process for development, including at the pre-application or master-planning stages, can lead to better integration, multi-functional benefits, and reduced land-take.

5.13.2 Surface water drainage systems should replicate natural drainage processes as closely as possible. In line with Plan:MK Policy FR2, the most sustainable SuDS techniques such as green roofs, attenuation basins, wetlands, swales, and permeable paving should be preferred on all development sites ahead of conventional piped drainage measures. Geocellular storage crates can be considered an element of SuDS however without other above ground components (swales, filter drains or strips) they do not provide any water quality treatment. Only if such features are demonstrated as not viable, then approved proprietary engineered pollution control features such as pollution interceptors may be used.

5.13.3 Proprietary systems, such as oil interceptors and silt traps, are often subject to blockage from silt and debris, and therefore demand frequent maintenance. Their combability with ecological constraints should also be considered.

5.13.4 Source control should be provided on all sites. Source control assists in mimicking the natural runoff from the site and provides the first stage of the SuDS Management Train, intercepting surface water at a localised level. As source control can be in the form of bioretention, rain gardens, over paved areas (permeable paving) and on roofs (green roofs) it is possible to fit this in every development around the hard landscaping without taking up much space.

5.13.5 Full design details of all SuDS features are contained within the Ciria SuDS Manual (C753); however for ease, we have included some of the key design criteria (taken from the Ciria SuDS Manual (C753)) that should be applied for the main SuDS features, in the following boxes.

Infiltration Systems

- Effective upstream pre-treatment required to remove sediment and silt loads to prevent long-term clogging
- A minimum infiltration rate of 1 x 10^{-6} m/s
- A minimum distance of 1.2 m between the base of the infiltration system and the maximum likely groundwater level
- Side slopes of basins should not normally be any steeper than 1 in 3 to allow for vegetative stabilisation, mowing, access and for public safety. However this may be relaxed if the basin is very shallow (e.g. less than 500 mm deep)
- Discharge from full to half full should be within a reasonable time (24 hours for anything up to the 1% AEP event plus climate change) so the risk of it not being able to manage a subsequent rainfall event is minimised. Where it is not possible to achieve a half drain time of 24 hours, it must be demonstrated that the system has capacity to accommodate an immediate and subsequent 10% AEP (1 in 10 year) rainfall event
- Single point infiltration features must be located no less than 5 m from any building or road. Features should also be positioned a minimum of 10 m from any watercourse

Filter Strips

- Contributing area should have a shallow slope that falls towards the filter strip
- Minimum longitudinal slope of 1% to prevent ponding and a maximum slope of 5% to prevent flow channelling. Level spreaders to be used where slopes are >5%
- Maximum flows across filter strip of 1.5 m/s recommended to prevent erosion

Permeable Paving

The design of permeable paving can vary significantly depending on the proposed use of the surface. Guidance should be sought from the manufacturer of the chosen permeable paving.

Swales

- Should generally be designed with a trapezoidal or parabolic cross-section
- Base width should be between 0.5 – 2.0 m. For swale widths >2.0 m flow dividers may be required
- Longitudinal slopes should be constrained to 0.5-6% with check dams on slopes greater than 3%
- Underdrains required for swales with a slope >1.5% (unless wet swales proposed)
- A maximum side slope of 1 in 3 but 1 in 4 is preferred
- Minimum length of swale between culverts should be 5 m
- Normal swale depth of 400-600 mm
- Flow velocities kept below 1.0 m/s to prevent erosion
- Must be designed to enable access with the machinery necessary for cost effective maintenance, including mowing machinery and equipment necessary to remove silt/debris accumulation

Attenuation/Detention Basins

- Effective upstream pre-treatment required to remove sediment and silt loads to prevent long-term clogging or alternatively a forebay should be incorporated
- Maximum depth of water should not exceed 2 m in most extreme design event, but a much lower maximum depth is desirable
- Base of basin should have a gentle slope (no more than 1 in 100) towards the outlet
- Recommended length/width ratio for on-line basins is between 3:1 and 5:1
- Side slopes should not exceed 1 in 3 unless special site and/or safety arrangements allow for steeper slopes
- Design must take into account the site location and context in relation to surrounding land use and buildings, in particular residential areas and how accessible the basin will be to the public
- Must be designed to enable access with the machinery necessary for cost effective maintenance, including mowing machinery and equipment necessary to remove silt/debris accumulation
- Suitable space should be left in surrounding zones for deposition of excavated/removed silt from basin
- Design must integrate water management with ecological and landscape objective, including consideration of nutrient levels and preventing eutrophication in permanent water bodies
- Discharge from full to half full should be within a reasonable time (24 hours for anything up to the 1% AEP event plus climate change) so the risk of it not being able to manage a subsequent rainfall event is minimised. Where it is not possible to achieve a half drain time of 24 hours, it must be demonstrated that the system has capacity to accommodate an immediate and subsequent 10% AEP (1 in 10 year) rainfall event

Wetlands

- Should include a sediment forebay, a permanent pool, attenuation storage volume and aquatic benching
- Inlets and outlets placed to maximise flow through the facility
- Maximum depth of permanent pool should be a maximum of 1.2 m
- Maximum depth of attenuation storage should be 0.5 m above the permanent pool
- An aquatic bench should extend inwards from the normal pond edge with a maximum depth of 0.4 m below the normal pool water surface elevation
- Design must take into account the site location and context in relation to surrounding land use and buildings, in particular residential areas and how accessible the wetland will be to the public
- Must be designed to enable access with the machinery necessary for cost effective maintenance
- Design must integrate water management with ecological and landscape objectives, including consideration of nutrient levels and preventing eutrophication in permanent water bodies

5.14 Infiltration Test Results

5.14.1 Infiltration testing to support the surface water drainage strategy will need to be undertaken in accordance with BRE365 guidance. The following provides good practice minimum requirements:

1. Minimum of 3 tests undertaken in quick succession at each location/trial pit
2. Lowest value obtained across the site to be used for calculating the required volume of soakaways
3. Depth of testing to be representative of drainage proposals (i.e. shallower tests for permeable paving and deeper tests for conventional soakaways)

5.14.2 The minimum infiltration rate the LLFA accepts is 1.0×10^{-6} m/s. **Please note that extrapolated results will not be accepted.**

5.14.3 Peak seasonal groundwater levels should be recorded during test pit excavations to demonstrate that the minimum distance of 1.2 m between the base of the infiltration system and the maximum likely groundwater level can be achieved. Due to fluctuations in groundwater levels as a result of seasonal changes, we request that wherever possible, infiltration testing is undertaken during or immediately following the winter months.

5.15 Detailed Drainage Layout Plan

5.15.1 A detailed drainage layout plan should be fully labelled and show details (e.g. pipe numbers, gradients, diameters, locations, and manhole details) of every element of the proposed drainage system (including all SuDS and pipes).

5.16 Details of Flow Controls

5.16.1 Details of the type and size of any flow controls (online or offline) should be included either with the report or on the detailed drainage layout plan.

5.17 Hydraulic Calculations

5.17.1 Calculations to show the performance of the system for a range of summer and winter storm durations from 15 minutes up to the 10080 minute (7 day) should be undertaken. **For storm durations less than 1 hour, Flood Studies Report (FSR) rainfall data should be used. For storm durations greater than 1 hour, Flood Estimation Handbook (FEH) rainfall data should be used.** FEH data must be used in these longer duration storms as it uses more up to data rainfall data and is more accurate for the purpose of modelling the future storm events over other data sources such as FSR for the larger duration storms.

5.17.2 For the critical 3.3% AEP rainfall event, including an appropriate allowance for climate change, there should be no above ground flooding.

5.17.3 For the 1% AEP rainfall event including an allowance for climate change some short term above ground flooding may be permitted. Flood water should be managed to be safe and not enter any buildings or disrupt emergency access routes.

5.18 Surcharged Outfall

5.18.1 The standard default setting of many surface water computer modelling programmes assumes a freely discharging outfall. Careful consideration is required, and evidence provided to demonstrate that this assumption is correct. In many circumstances an outfall maybe surcharged affecting its hydraulic capacity and impacting on the surface water network. A surcharged outfall is likely to occur if discharging into a watercourse or surface water network near capacity. In these scenarios, and with the absence of supporting information to the contrary, it is expected the surface water calculations will assume a surcharged outfall.

5.19 Exceedance Flow Plan

5.19.1 If any above ground flooding is expected for the 1% AEP (1 in 100) rainfall event including an allowance for climate change, a plan showing the volumes, depths, velocities, and extents should be mapped onto a topographical plan of the site (levels on the topographical plan should represent the post-development situation). If flooding is extensive the hazard should be considered in line with guidance from CIRIA's Design for Exceedance in Urban Drainage document.

5.19.2 Flows that exceed the design criteria or in the event of blockage must be managed in flow conveyance routes that minimise the risks to people and property both on and off site.

5.20 Water Quality

5.20.1 Surface water discharging from the site must be treated appropriately (in accordance with the Simple Index Approach) to ensure there is little risk to polluting of surrounding groundwater, watercourses, water bodies or sewer systems. A treatment train should be formed to provide a range of different phases of surface water treatment. Chapter 26 of the CIRIA SuDS Manual (C753) outlines the pollution hazard indices. Surface water should meet these indices through the use of SuDS before discharge from the site.

5.20.2 Consideration should be given to surface water drainage from the highway and surface water treatment of these surfaces should also be in line with the principles set out in the CIRIA SuDS Manual. For most residential developments this will be classed as a lightly trafficked road and therefore surface water treatment must meet the corresponding pollution hazard indices.

5.20.3 It should be noted that features such as offline basins do not provide treatment for the lower return period storms before controls are exceeded directing surface water into these features. Therefore, systems which include features such as offline basins must meet the surface water treatment within the system for runoff from these lower return period storms.

5.20.4 Surface water and groundwater bodies are highly vulnerable to pollution and the impact of construction activities. It is essential that the risk of pollution (particularly during the construction phase) is considered and mitigated appropriately.

5.21 Planting Plans

5.21.1 The plants used within a site should be appropriate to design characteristics e.g. soil types, drainage, slope, and orientation. A planting plan will need to consider how quickly and how large plants will grow and how they are likely to be managed in the long term. Planting should not be around any access/egress points required for maintenance or impact on the performance of SuDS features. For further information, please see CIRIA C753 Chapter 29.

5.22 Construction Phase

5.22.1 Construction Environmental Management Plans should identify how surface water run-off will be managed. In addition to run-off from exposed ground, pollutants from transport routes, washing areas and/or fuel storage areas have the potential to enter a surface water drainage system. It is essential that the risk of pollution is considered and mitigated appropriately. Appropriate interceptors should be included as part of this design phase rather than rely on retrospectives measures.

5.22.2 Proposed SuDS should be installed at the beginning of the construction process where possible, to enable appropriate management and treatment of surface water runoff during construction. When this is not possible, temporary surface water treatment options should be introduced (please see CIRIA 768).

5.22.3 Wheel washing facilities should be provided at construction access points to cleanse vehicles prior to leaving the development area. These should be located away from watercourses to prevent direct runoff into adjacent watercourses.

5.23 Pumping

5.23.1 Pumping of surface water is an unsustainable drainage method. Pumps present a significant residual risk if they are not maintained or fail during a storm event. Our preference is for gravity discharge to a watercourse or surface water drainage system, mimicking the natural drainage of the site and reducing energy consumption.

5.23.2 We require that the applicant attempts to discharge as much surface water runoff via gravity as possible. This can be achieved through the use of larger areas of shallow attenuation or alternative SuDS approaches.

5.23.3 If it can be demonstrated that a partial or completely pumped drainage system is the only viable option, we would require that the residual risk of flooding due to the failure of the pumps be investigated. We would require that the flood level be determined under the following conditions:

- The pumps were to fail; and
- The attenuation storage was 50% full; and
- The 1% AEP +40% climate change event occurred

5.23.4 The pump failure modelling should be supported by an exceedance flow plan based on the topographic levels of the site to demonstrate the volume, depth, and flow direction of flood water. The floor levels of the affected properties must be raised above this level and all flooding must be safely stored onsite.

5.24 Finished Floor Levels

5.24.1 Finished floor levels (FFL) must be raised in line with current guidance as per GOV.UK: "*Preparing a flood risk assessment: standing advice*". All surface storage features should provide a minimum 300 mm residual uncertainty allowance (freeboard) above the design maximum water level to top of bank and to finished floor levels around the site.

5.24.2 '*Design flood*' is a flood event of a given annual flood probability, which is generally taken as river flooding likely to occur with a 1% annual probability; or surface water flooding likely to occur with a 1% annual probability, plus an appropriate allowance for climate change.

5.24.3 Access considerations should include the voluntary and free movement of people during a '*design flood*', as well as the potential for evacuation before a more extreme flood, considering the effects of climate change for the lifetime of the development. Access and escape routes need to be designed to be functional for changing circumstances over the lifetime of the development.

5.25 Management/Maintenance Arrangements

5.25.1 The responsibility to ensure that adequate long-term maintenance of any drainage system is delivered remains with the developer. The management and maintenance of SuDS should appropriately account for the construction, operation, and maintenance requirements of all components of the drainage system (surface and sub-surface). Applicants should sufficiently consider the likely maintenance requirements of new and existing infrastructure, over its design life including the provision of funding. 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.

5.25.2 For **outline** and **full** applications, we expect due consideration to have been given to potential organisations who may adopt / maintain the proposed surface water system, and this should be outlined within the surface water drainage strategy. There should also be a proposed management plan and maintenance schedule of work detailing the activities required.

5.25.3 When **discharging a surface water condition or as part of reserved matters**, we will require evidence and documentation as part of the planning process to demonstrate that appropriate legally binding arrangements/agreements will be put in place (at least in principle) for the entirety of the drainage system (for the lifetime of development). The LLFA advise that such plans should be colour coded to clearly demonstrate the responsible parties.

5.25.4 Further guidance regarding the typical key operation and maintenance activities for each type of SuDS component are indicated in Table 32.1 of the Ciria SuDS Manual. Where ordinary watercourses or other surface water features are bounding or within the development site, these should also be included within a management plan and maintenance schedule. Where new properties are located adjacent to 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. We recommend that at least a 10 m buffer should be allocated to an ordinary watercourse outside of IDB areas to allow for access for maintenance.

5.25.5 Any landscape management plans should include maintenance actions required and any constraints to maintenance activities. This may include recommendations for safe landscape maintenance of the SuDS features.

5.25.6 Where it is proposed that a community or private homeowners will be adopting SuDS (e.g. permeable paving within the curtilage of private dwellings), 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.

5.25.7 There are several options for adoption and maintenance of SuDS and include:

- **The Parks Trust** (the Council's preferred adopting body for SuDS that fall within public open space or other green spaces) will normally adopt land containing SuDS with commuted sum payment to cover the cost of future maintenance. The Parks Trust may have specific design requirements, and these should be accounted for early in the design process.

- **The Highway Authority** may adopt and maintain SuDS that serve the highway.

- **Anglian Water** will consider adoption of a scheme designed to their standards set out in their SuDS Design and Construction Guidance.

- An **Internal Drainage Board** may consider adopting a drainage scheme associated with new development if the site falls within their district.

- A **third party company** could be established to adopt and maintain a SuDS Scheme across the whole or part of a development.

- **Individual property owners** can become responsible for management and maintenance where it falls within their property boundary, however this would not cover any public or open space.

5.25.8 Shared responsibility of drainage features is not accepted, as this could have implications for the maintenance and longevity of the drainage feature. Drainage features serving multiple plots should therefore be maintained by an adoptee or private management company, and not by individual plot owners. All drainage features should be accessible for carrying out maintenance.

5.25.9 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. If diversion or changes to any watercourse are proposed, Land Drainage Consent will be required from Milton Keynes City Council as LLFA or the IDB (where relevant).

6. Permissions and Licences

6.1.1 It is your responsibility to identify all the necessary permissions and licences required to maintain, repair, build or remove anything in or around a watercourse.

6.2 Flood Risk Activities: Environmental Permits

6.2.1 Work on or near main rivers is regulated by environmental permitting. The Environment Agency is responsible for regulating activities affecting the coast and main rivers.

6.3 Land Drainage Consent

6.3.1 Ordinary watercourses include every river, drain, stream, ditch, dyke, cuts, sluices, culverts, sewer (other than public sewer) and passages through which water flows that do not form part of main rivers.

6.3.2 For ordinary watercourses in the Borough of Milton Keynes, outside an Internal Drainage Board area, the relevant authority is Milton Keynes City Council.

6.3.3 If enabling or permanent works to any ordinary watercourse are proposed, Land Drainage Consent will be required.

6.3.4 Any form of development within 9 metres of an ordinary watercourse will also require prior approval. This includes landscaping works (fencing and tree planting) as well as any structures (e.g. development, utilities infrastructure, drainage features, outfalls etc.).

6.3.5 For consenting works on or near to all ordinary watercourses in the Borough of Milton Keynes the process is administered by the Bedford Group of Internal Drainage Boards as they are responsible for issuing consents on behalf of Milton Keynes City Council.

6.4 Unapproved Works

6.4.1 Enforcement action may be taken against parties who carry out unapproved works or interfere with access required for maintenance of a watercourse.

6.4.2 The granting of a Land Drainage Consent does not indicate that the applicant has permission to enter any land outside their control or alter third party assets.

6.4.3 Planning permission does not remove the need for Land Drainage Consent.

7. Minor Developments (in relation to flood risk)

7.1.1 As already outlined earlier in this document, Milton Keynes City Council still seeks **all new development and redevelopment** to use SuDS in order to reduce flood risk, improve water quality and present options for biodiversity and public amenity.

7.1.2 In relation to flood risk, 'minor development' refers to minor non-residential extensions, alternations, and householder development (as described in paragraph 051 of the Planning Practice Guidance).

7.1.3 Smaller developments can still have a significant effect on local flood risk, particularly when the risks are not properly considered. For example, an extension to an existing property may look to build over existing surface water drainage infrastructure which must be avoided wherever possible. Rights that provide for hard surfaces, for householders or business, require that provision is made for a permeable or porous surface.

7.1.4 The following section outlines considerations for drainage and flood risk associated with minor developments.

	Minor applications	(✓)
1	**Area of site** (ha / sum)	
2	**Proposed impermeable area** (ha)	
3	**Soil type & geology type** (as this can have an impact on what type of SuDS features can be used). This information can be found from on-site soil testing or high level information can be found here: http://www.landis.org.uk/soilscapes/ and here http://mapapps2.bgs.ac.uk/geoindex/home.html	
4	**Existing flood risk from fluvial, surface water (pluvial) and groundwater sources**. This will affect whether your application requires a Flood Risk Assessment. The information can be found here https://www.gov.uk/check-flood-risk. You should also consult our SFRA.	
5	**Existing surface water drainage system** If your site is already developed (fully or partially) it may have an existing connection to ground, a watercourse or the public sewer. This information may be found on plans of the existing site or by contacting your water/sewerage undertaker (Anglian Water).	
6	**Calculation of existing (pre-development) runoff rates** See Section 5.3 or http://www.uksuds.com/	
7	**Assessment of SuDS features** The suitability for different features should be assessed and the most appropriate should be included in the design of the site's drainage system	
8	**Calculations of required attenuation volume** See Section 5.9 or http://www.uksuds.com/	
9	**A surface water system layout** At outline stage this may be indicative. At full application stage this will need to be a detailed (labelled) layout	
10	Management / maintenance arrangements (including adopting body)	

8. Useful Links

National Planning Policy Framework

Planning Practice Guidance

BRE365 Digest

Building Regulations

Anglian Water Surface Water Policy

Ciria SuDS Manual

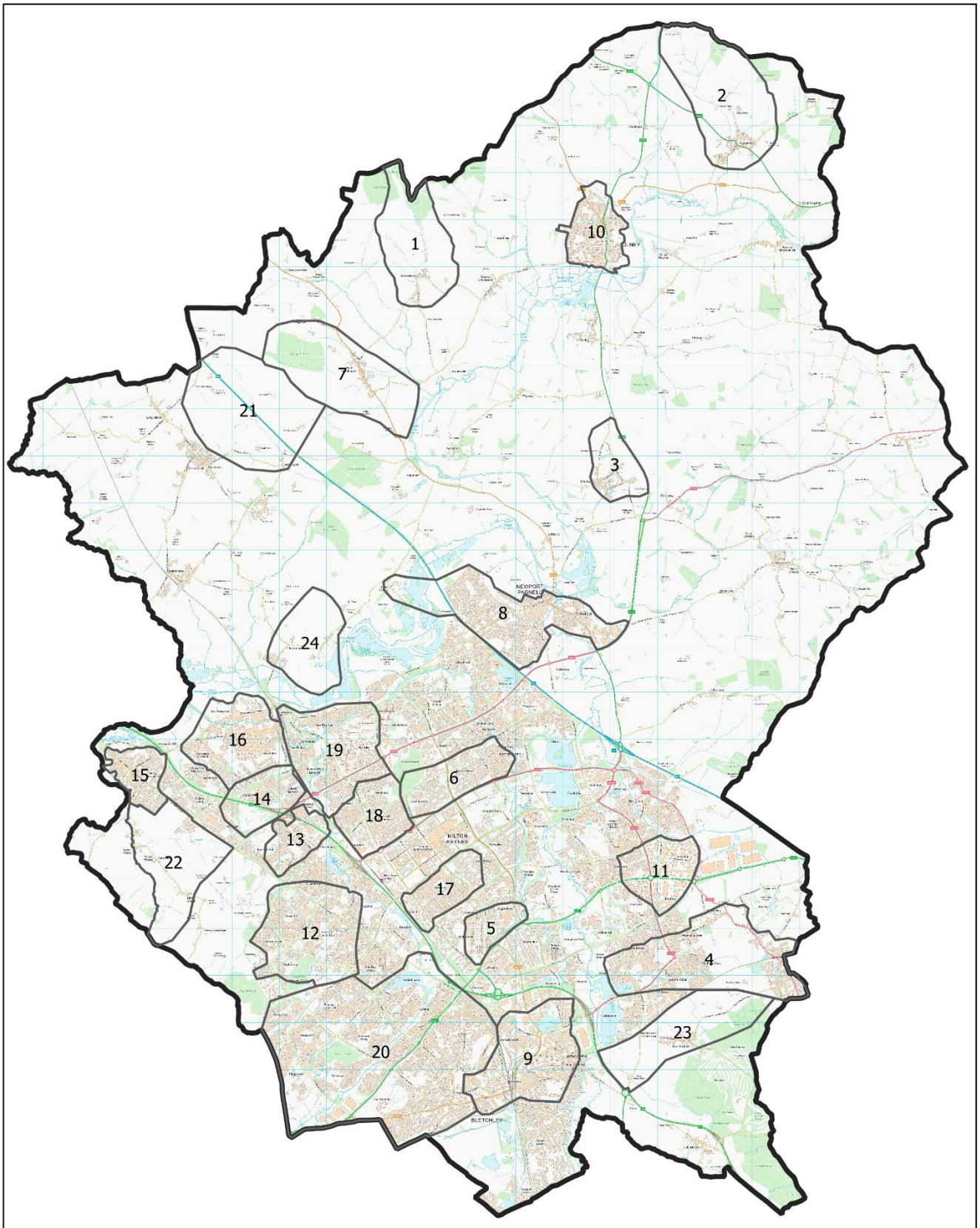
Ciria Designing for Exceedance

Written Ministerial Statement

9. Abbreviations / Definitions

LLFA	Lead Local Flood Authority
ha	Hectares
IDB	Internal Drainage Board
LPA	Local Planning Authority
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance
SuDS	Sustainable Drainage Systems
SPD	Supplementary Planning Document
l/s	Litres per second
l/s/ha	Litres per second per hectare
m^3/ha	Cubic metres per hectare
BRE	Building Research Establishment
LASOO	Local Authority SuDS Officer Organisation
EA	Environment Agency
AEP	Annual Exceedance Probability
CIRIA	Construction Industry Research and Information Association
CDC	Critical Drainage Catchment
Plan:MK	Local Plan for Milton Keynes
FRA	Flood Risk Assessment

Appendix A – Critical Drainage Catchments



milton keynes council	Lead Local Flood Authority	**Project: Milton Keynes Critical Drainage Catchments as per Surface Water Management Plan 2016**	N W E S Scale 1:100,000
	Date: 11/2/2022		
	@A4P	© Crown copyright and database rights 2022 OS [100019593]	

Reference	Critical Drainage Catchment
CDC1	Ravenstone
CDC2	Lavendon
CDC3	Sherington
CDC4	Woburn Sands
CDC5	Eaglestone
CDC6	Downs Barn & Conniburrow
CDC7	Stoke Goldington
CDC8	Newport Pagnell
CDC9	Bletchley & Fenny Stratford
CDC10	Olney
CDC11	Brinklow
CDC12	Melbourne/Crownhill
CDC13	Wymbush/Two Mile Ash
CDC14	Bradwell Abbey
CDC15	Stony Stratford
CDC16	Wolverton
CDC17	Oldbrook
CDC18	Bradwell West of Conniburrow
CDC19	Bradwell
CDC20	West Bletchley
CDC21	Tathall End
CDC22	Calverton
CDC23	Bow Brickhill
CDC24	Haversham