Flood Risk & Sustainable Drainage

Local guidance for developers

Warwickshire County Council as Lead Local Flood Authority

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CONTENTS

1 POLICIES AND GUIDANCE

1.1 National Planning Policy Framework and Planning Practice Guidance

The National Planning Policy Framework (NPPF)[1] states in paragraphs 155-165 the policy principles of development with regards to flood risk and sustainable drainage. The NPPF is supported by Planning Practice Guidance (PPG)[2] which contains a chapter on flood risk and coastal change. This provides a view on how the NPPF should be used in practice. Both documents are updated regularly.

1.2 Flood and Water Management Act 2010

Under the Flood and Water Management Act[3] (FWMA), Lead Local Flood Authorities (LLFA) have responsibility for managing local flood risk (surface water, groundwater and ordinary watercourses) within their areas and maintaining a register of flood risk assets. The Act places a duty on risk management authorities (RMAs) to co-operate with each other.

Warwickshire County Council (WCC) Flood Risk Management team as LLFA works closely with other RMAs to ensure consistency between local and national plans.

The Environment Agency (EA) is also a statutory consultee for all planning applications in Flood Zones 2 and 3 from fluvial and coastal flood sources.

1.3 Town and Country Planning (Development Management Procedure) (England) Order 2015 Statutory Instrument

On 15 April 2015 the Town and Country Planning (Development Management Procedure) (England) Order 2015[4] came into force which, under Schedule 4, made Lead Local Flood Authorities a statutory consultee on surface water drainage for all 'major' planning applications. The definition of 'major' is given within Part 1 of this Order.

1.4 Non-statutory Technical Standards for Sustainable Drainage Systems

To coincide with the statutory instrument, Defra released the Non-Statutory Technical Standards for Sustainable Drainage Systems[5]. This document outlines standards for the design, maintenance and operation of sustainable drainage systems associated with both residential and commercial developments. This document is designed to be read in conjunction with the NPPF and PPG.

1.5 Strategic planning documents

[1] Ministry of Housing, Communities and Local Government (2019) *National Planning Policy Framework*

[2] Ministry of Housing, Communities and Local Government (2019) Planning Practice Guidance

[3] *Flood and Water Management Act (2010).* London: The Stationary Office (page 7)

[4] *Town and Country Planning (2015) Development Management Procedure, England:* Order 2015, No. 595

[5] Department for Food, Environment & Rural Affairs (2015) *Non-statutory technical standards for sustainable drainage systems*

There are five local planning authorities (LPAs) in Warwickshire: Warwick District Council, Stratford-on-Avon District Council, Rugby Borough Council, Nuneaton & Bedworth Borough Council and North Warwickshire Borough Council.

The five LPAs within Warwickshire have a number of strategic planning documents such as Local/Borough Plans, Core Strategies and Supplementary Planning Documents. Some town/parish councils within Warwickshire also have adopted Neighbourhood Development Plans. Many of these strategic planning documents contain key flood risk and drainage policies or guidance.

The LLFA recommend undertaking a review of all available national and local policies relevant to flood risk and drainage at a development site to inform any Flood Risk Assessment (FRA) or Drainage Strategy.

1.6 LLFA strategies and guidance

A Surface Water Management Plan (SWMP)[6] and Local Flood Risk Management Strategy (LFRMS)[7] have been completed for Warwickshire in line with our duties as a LLFA. These contain detailed information of historic flooding, planning matters and wider flooding issues in Warwickshire.

There is also a Strategic Flood Risk Assessment (SFRA)[8] for Warwickshire which contains details of historic flooding records and other flood risk information relevant to planning applications.

1.7 Industry guidance

There is a wealth of information available on designing sustainable drainage systems, such as the CIRIA SuDS Manual C753[9]. The key pieces of guidance are referenced at the end of this guide.

[6] Warwickshire County Council (2015). *Surface Water Management Plan Methodology Report*. Birmingham: AECOM Ltd.

[7] Warwickshire County Council (2016). *Local Flood Risk Management Strategy*. Warwick: WCC.

[8] Warwickshire County Council (2013). *Level 1 Strategic Flood Risk Assessment*. Basingstoke: URS Infrastructure & Environment UK Ltd.

[9] CIRIA (2015) *The SuDS Manual* (C753)

2 PRE-APPLICATION ADVICE

2.1 Freely available flood risk information/guidance

The LLFA refer the developer of a site to the range of freely available documentation listed in the previous chapter, and this guide. This is not an exhaustive list and further important information may be found elsewhere.

The Environment Agency holds freely available information online on Flood Zones used for planning purposes[10] and long-term flood risk mapping for surface water, rivers, the sea and reservoirs[11]. There is also information on what a developer needs to do and who will be consulted when completing an FRA[12].

Where the development site is less than a hectare in size, the LLFA would still expect the developer to produce a drainage strategy / FRA report to ensure that the proposed development will not adversely affect the local management of flood risk and to ensure that the development will not increase flood risk to others.

Information on our standard requirements for FRAs is detailed in our Surface Water Drainage Pro-forma for New Developments (Refer to Appendix A).

2.2 Historic flooding information

If the documents referenced above do not hold details of flooding in the vicinity of a development site, this does not necessarily indicate that there have not been any historic flood events in the area. As such, the LLFA suggest that developers carry out further consultation to fully inform any FRA or Drainage Strategy.

Warwickshire County Council's historic flood map is available online (http://maps.warwickshire.gov.uk/historical-flooding/) and provides information on the number of reports of flooding to the Council.

The relevant district or borough council may hold more detailed information, as may the parish council or residents around the proposed development area. Results of further consultation should be included within your FRA. Any reports of flooding should be considered within the development proposals.

2.3 Chargeable pre-application advice from the LLFA

Warwickshire LLFA are trialling a pre-application service which offers developers tailored advice on their development proposals. It is aimed at developers in the early stages of their development proposals and is a chargeable service. The service can include; a search of LLFA records and mapping, informal written advice, meetings and site meetings.

Contact us directly on frmplanning@warwickshire.gov.uk if you would like specific information on what the LLFA can offer.

[10] Environment Agency (2019) *Flood map for planning* [online].
[11] Environment Agency (2019) *Long term flood risk information* [online].
[12] Environment Agency (2019) *Flood risk assessment for planning applications* [online].

3 SURFACE WATER DISCHARGE HEIRARCHY

Surface water management must be a consideration on any development site to ensure that surface water is managed using sustainable drainage systems in accordance with the NPPF and PPG. Sustainable drainage systems are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible.

In accordance with Paragraph 080 of PPG and the CIRIA SuDS Manual, surface water run off should be discharged as high up the following hierarchy of drainage options as reasonably practicable:

- reuse on site (i.e. rainwater harvesting);
- into the ground (infiltration);
- to a surface water body;
- to a surface water sewer, highway drain, or another drainage system;
- to a combined sewer.

Some types of sustainable drainage systems may not be practicable in all locations. The above discharge options should all be assessed for any site and the most appropriate option should be established within any FRA or Drainage Strategy.

3.1 Discharge to Ground / Infiltration

The surface water drainage system should, where feasible, discharge into an at-source infiltration system such as a soakaway or infiltration basin. The LLFA highly recommends that this should be a priority aim if it is possible.

If the Drainage Strategy proposes to discharge to soakaways or make use of other infiltration systems, then percolation test results should be submitted to the LLFA. These tests must be carried out in accordance with BRE Digest 365[13] or CIRIA guidance R156[14].

Details are also required on the groundwater levels in the vicinity of any proposed soakaways. As stated in CIRIA SuDS Manual[15], there should be a minimum of 1 metre between the base of the infiltration device and the maximum likely groundwater level to ensure groundwater does not enter infiltration devices. Infiltration features should have a positive high-level overflow or an alternative means of managing exceedance flows. Infiltration systems should not create new pathways for pollutants or mobilise contaminants already in the ground, which can sometimes be a barrier for their use on brownfield sites.

Soakaway design should follow guidance in CIRIA SuDS Manual with regards to half drain times, design return periods and construction; they should also comply with relevant buildings regulations, i.e. soakaways should be no closer than 5m to the foundations of adjacent buildings.

As part of the detailed design stage, further infiltration tests may be requested taking into account the final location of the infiltration feature/s.

[13] Building Research Establishment (2003) *Digest 365:* Soakaway Design, Watford: BRE Bookshop

[14] CIRIA (1996) *Infiltration Drainage* – Manual of Good Practice (R156)

[15] CIRIA (2015) *The SuDS Manual* (C753), page 62

3.2 Discharge to Watercourse

Where ground or site conditions do not allow for infiltration systems, the next most desirable discharge is to a suitable watercourse. Evidence, such as percolation test results, must be provided to prove that infiltration is not possible before developing plans for discharge into a watercourse.

3.2.1 Downstream connectivity

Where the development is proposing to discharge runoff from the development to a drainage ditch (or similar channel), suitable evidence should be provided to demonstrate that from the point of outfall, the drainage ditch is contiguous and connects to either a suitable watercourse (such as those shown on Environment Agency Detailed River Network mapping) or a sewer maintained by the sewerage undertaker. This is to ensure that the receiving watercourse can convey flows away from the development site.

It must also be shown that the condition of the channel or culvert is suitable for the purpose of adequately draining the development, such as ensuring it is free flowing and cannot be easily blocked.

3.2.2 Land ownership or agreement for outfall construction

A developer must be able to show that the location of the outfall/s to the watercourse is/are either within their land ownership or that the necessary permissions have been obtained from the riparian landowner.

Severn Trent Water are unable to requisition a surface water sewer to a watercourse without the necessary land owner permissions and deed of grant of easement[16]. As such, the developer must produce evidence to the LLFA to show that the necessary steps have been taken.

3.2.3 Land Drainage Consent

Where the proposals include works or alterations to a watercourse, it may require consent from the LLFA where it is an Ordinary Watercourse, or from the Environment Agency where it is a Main River. Such consent is required to avoid increasing flood risk, both locally and to those upstream and downstream of the proposed works. Consent is still required even if the applicant has secured planning permission and/or other consents that may be required.

Discharge from one or more outfalls into a watercourse has potential to cause erosion to the river bank and bed. When an outfall is proposed, the applicant must consider whether the velocity of the discharge (or effect of multiple outfalls in close proximity) is likely to cause any erosion impacts on the channel in the immediate area or downstream. Appropriate mitigation measures should be proposed.

[16] Severn Trent Water Guidance Note 3 (GN3) 'Public sewer or lateral drain connections guidance notes'

Early consultation with the LLFA is advised to discuss any requirement for Land Drainage Consent as part of the development design process. For further information on what is required and how much it costs, visit http://www.warwickshire.gov.uk/watercourse

See Appendix B for the Land Drainage Consent advice note which gives further information on what the LLFA requires from applicants, including our position on culverting.

3.3 Discharge to Sewers

Prior to developing plans to discharge surface water to a sewer, the developer must provide evidence to the LLFA to demonstrate that it is not possible to discharge to an infiltration system or watercourse. A developer's right to requisition a sewer does not negate the need to follow the discharge hierarchy as detailed above.

If the development is close to or over a public sewer, we advise that the applicant contacts Severn Trent Water to discuss their requirements (such as an easement protection or a build-over agreement).

3.3.1 Surface Water Sewer

Where it has been agreed with the LLFA that surface water discharge from the development is not feasible to an infiltration system or watercourse, the developer should consider discharging to a surface water sewer.

The developer should hold early discussions with Severn Trent Water to establish whether such a connection is possible. The LLFA will require evidence of correspondence with Severn Trent Water (such as a Developer Enquiry) at the Outline or Full planning stage to show that there is a viable means of draining the development, considering the capacity of the system and discharge rate agreed with the LLFA. At the detailed design stage, the LLFA will require evidence of the written agreement to connect to the Severn Trent Water asset which should include details on the point of connection[17].

3.3.2 Combined Sewer

Surface water should never be discharged into a foul sewer and where possible, not into a combined sewer. Combined sewer discharge/connection should be an absolute final resort, and sufficient evidence must be provided to demonstrate that the above methods (in order) are not possible. The LLFA strongly advises that the applicant seeks further advice by consulting Severn Trent Water to agree the best solution, and for the applicant to explore whether evidence for more sustainable discharge has been missed.

To ensure that there is enough capacity within the sewer network, the LLFA require developers to consult with Severn Trent Water early in the process as this may involve undertaking a sewer capacity assessment.

[17] Severn Trent Water (2017) Building and Development [online] available from <https://www.stwater.co.uk/building-and-developing/regulations-and-forms/application-forms-and-guidance/>

3.3.3 Highways Drains

Where the applicant proposes to discharge into existing highway drainage, the developer must undertake discussions directly with Warwickshire County Highways to agree whether this would be appropriate. They may request a condition survey of the drainage network and seek the repair of any significant defects before considering the outfall as suitable means of draining the site.

Typically, ditches adjacent to the highway are the ownership and responsibility of the adjacent land owner. Further information can be found in the WCC Land Drainage document, accessed here: https://apps.warwickshire.gov.uk/api/documents/WCCC-1039-69

4 SURFACE WATER DISCHARGE RATES

The LLFA recommend that the applicant consults with all the relevant Risk Management Authorities (RMA) at their earliest convenience (WCC, Severn Trent Water, EA). Regardless of whether another RMA indicates that a receiving water body or surface water sewer has enough capacity, the LLFA still expects developers to follow the discharge hierarchy and calculate allowable rates of runoff as stated in this guide and other policies/guidance. This is to ensure that the discharge from the site does not exceed the runoff rate from the pre-developed site.

A permitted discharge rate for surface water from the site should be calculated or demonstrated in one of the following ways.

4.1 Undeveloped (Greenfield) sites

A full assessment of available surface water management outfalls from site will be required, as detailed above. The chosen method will then require either of the following.

For discharge via soakaways, the design must use the most conservative infiltration rate measured through percolation tests carried out in the vicinity of the proposed soakaway in accordance with BRE 365 and as stated in CIRIA SuDS Manual.

For discharge offsite into a watercourse or sewer, the discharge rate will be based on the calculated pre-development Greenfield runoff rate for the site. The Greenfield rate should be calculated using the whole development area (including gardens) but excluding any significant green areas such as general public open space that are considered to have a runoff response similar to the pre-development state[18]. The methodology in the EA/Defra document '*Rainfall Runoff Management for Developments*' (SC030219)[19] should be used as the basis for calculations. Rates should not exceed the Qbar greenfield rate for the development.

Consultation with the LLFA will be required for any rates proposed above the Qbar Greenfield rate or on larger developments where several surface water sub-catchments are proposed.

4.2 Previously developed (Brownfield) sites

In accordance with BS 8582:2013 Code of Practice[20] (Surface Water Management for Development Sites) and Defra Non-Technical Standards on Sustainable Drainage Systems, surface water run-off from all previously developed sites should be reduced to Greenfield run-off rates wherever possible.

Full details of the pre-development drainage characteristics and scale of development should be provided to the LLFA, include the existing drainage details for the site and an assessment of Greenfield rates.

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[18] HR Wallingford (2019) *Frequently asked questions*. Available at: http://www.uksuds.com/help-support/frequently-asked-questions

[19] Environment Agency (2013) *Rainfall Runoff Management for Developments Report*: SC030219, EA: Bristol

[20] The British Standards Institution (2013) *Code of practice for surface water management for development sites*: BS 8582:2013, London: BSI Standards Ltd.

Post development discharge rates off site should not exceed the site Greenfield rates calculated. Where it has been established to the satisfaction of the LLFA this is technically not possible to achieve these rates, a minimum of 50% betterment should be applied to the pre-development discharge rate as calculated in the following paragraph.

To establish an acceptable brownfield discharge rate details should be provided as part the assessment outlined above. The following methods can also be used to estimate the current discharge from a site to apply 50% betterment:

a) Establish if the site is currently positively drained; if so, undertake a hydraulic assessment of the network using the existing drainage details to estimate maximum discharge at the outfall.
b) Estimate using either the Rational Method or Modified Rational Method, using the industry standard figure of 35 mm/hr as recommended in Part E of the CIRIA Guidance document X108 *'Drainage of development sites'*[14].

4.3 Cross-catchment discharge

The LLFA recommend that where possible surface water should not be discharged cross catchment to a new receiving watercourse unless there is sound justification for the reasons of the cross-catchment discharge.

If a cross catchment discharge cannot be avoided, the LLFA will require a technical justification for the reasons of the cross-catchment discharge, together with an assessment of the capacity of the receiving watercourse to ensure that the additional flows will not increase the flood risk elsewhere.

4.4 Cumulative impact

Consideration should be given to the cumulative impact on flood risk and water quality where there are proposals for large development sites or several smaller development sites within the same catchment or near each other.

Without due consideration and mitigation, cumulative flood risk impacts are possible within water bodies receiving surface water discharge from new developments. Cumulative water quality impacts are also possible, for example from silt wash-off during construction phases of development.

4.5 Minimum practical discharge rate

It is now possible to restrict outfall discharge rates to below 5 l/s in a variety of ways including newer flow control devices, protected orifices, and better design. The argument for a practical minimum of 5 l/s will be challenged, particularly where the drainage systems are split into multiple small catchments with individual outfalls.

[14] CIRIA Guidance (2004) *Drainage of Development Site* – A Guide (X108), page 153

5 URBAN CREEP

Urban creep is the conversion of permeable surfaces to impermeable ones over time, e.g. surfacing of front gardens to provide additional parking spaces, extensions to existing buildings, creation of large patio areas. Much research has been carried out in to the effect of urban creep and its impact on the drainage systems which cater for urban areas. It has been shown that, over the lifetime of a development, urban creep can increase impermeable areas by as much as 10%.

An allowance for urban creep is required as part of the surface water drainage proposals for new development in Warwickshire. The requirement is shown below.

The consideration of urban creep should be assessed on a site-by-site basis but is limited to residential development only.

The appropriate allowance for urban creep must be included in the design of the drainage system over the lifetime of the proposed development. The allowances set out in Table 1 below must be applied to the impermeable area within the property curtilage as detailed in the LASOO guide[21]: Note that where the inclusion of the appropriate allowance would increase the total impermeable area to greater than 100%, 100% should be used as the maximum. 'Curtilage' means area of land around a building or group of buildings which is for the private use of the occupants of the buildings.

Residential development density, Dwellings per hectare	Change allowance % of impermeable area
≤ 25	10
30	8
35	6
45	4
≥ 50	2
Flats & apartments	0

Table 1 – Urban Creep allowance

[21] LASOO (2016) 'Non-Statutory Technical Standards for Sustainable Drainage: Practice Guidance' available from https://www.susdrain.org/files/resources/other-guidance/lasoo_non_statutory_suds_technical_standards_guidance_2016_.pdf

6 CLIMATE CHANGE

Revised climate change allowances were released by the Environment Agency in 2016. These new allowances made changes to rainfall intensities, the extract below indicates the rates that should be used (for development in Warwickshire 40% should be used alongside a sensitivity check at 20% as required)[22].

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

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

Table 2 – Climate Change allowances (2016)

[22] Environment Agency (2019) Flood Risk assessments: climate change allowances [online] available from <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

7 ATTENUATION

Where attenuation is required to hold runoff arising from the development in excess of the allowable discharge rate or infiltration rate, the LLFA require calculations to demonstrate that it is adequately sized for various return periods up to and including the 1 in 100 year, plus climate change, critical storm event.

Attenuation features should be above-ground features and look to form part of a larger SuDS management train across the development site. Support for the SuDS approach is set out in the NPPF.

7.1 Attenuation design

Any drainage features proposed should be designed in accordance with best practice to provide maximum benefit. Any deviation from above-ground drainage features or best practice will require full justification as to why this is the case. Only with sound justification that above-ground features are unfeasible will the LLFA accept alternative features. Refer to the CIRIA SuDS Manual and LASOO Guide for further details of best design for drainage features.

Above ground attenuation features should be designed as shallow features and where possible the depth of water should not exceed 1 m. Very deep basins ('bomb craters') are unacceptable. In accordance with the CIRIA SuDS Manual, attenuation ponds should ideally have 1 in 4 bank slopes and as minimum 1 in 3. A freeboard of 300 mm should be provided between the highest design water level and the top of any attenuation feature (such as a basin). This is to take account of residual uncertainty in the design parameters so that the risks of an exceedance event are minimised. This requirement is also stated in CIRIA SuDS Manual.

Where attenuation basins and other open water features are accessible to the public, consideration should be given to the gradient and width of a 'dry bench' and 'wet bench'. The suitable width of these benches must be determined by the developer, but there is some guidance on this in Chapter 36 of the CIRIA SuDS Manual.

Any above or below ground attenuation must take account of the water table and ensure that there is adequate separation between the base of any attenuation and the groundwater level. This is to ensure that the attenuation does not fill with groundwater which would otherwise reduce the designed performance of the attenuation. High groundwater may require extensive earthworks or engineering to ensure basins are not adversely affected by water ingress.

Attenuation features must be located within Flood Zone 1 to ensure there is no ingress of fluvial flood waters into the attenuation which may otherwise affect its capacity. This also ensures there is no detrimental impact on the floodplain or increase in flood risk.

7.2 Education and safety

The developer should consider whether any solutions are required to enable open water features (such as basins) to be safely located within areas accessible to the public. Consideration should also be given to the use of educational signs giving the public information on the purpose of the pond. Applicants may wish to consider

completing a RoSPA assessment and one may be requested by the LLFA for review by the adopting authority, particularly where depths of basins exceed 1 m.

7.3 Providing multiple benefits

In accordance with the principles outlined in the SuDS Manual, the LLFA expect the drainage strategy for a development to outline how multiple benefits will be delivered. The strategy should be based on SuDS and have provision for the control of water volume and rate, improvements to water quality, and maximise benefit to amenity and biodiversity.

As such the LLFA do not consider oversized pipes or box culverts as sustainable drainage as they do not offer multiple benefits. Surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management.

If infiltration is not feasible at the site, alternative sustainable drainage should be used, with preference for above-ground solutions that offer a combination of environmental benefits.

See Chapter 12 (Water Quality and WFD) for further details on the importance of delivering SuDS which provide multiple benefits to the wider environment.

8 ADOPTION AND MAINTENANCE

The adoption and maintenance of all drainage features are a key consideration to ensure the long-term operation at the designed standards.

To facilitate any future maintenance activities on shared surface water drainage infrastructure, the LLFA expect that all storage systems are placed within publicly available space.

At the detailed design stage, the LLFA will require the adoption and maintenance of all drainage features to be duly considered. An adoption and maintenance plan must show how the drainage systems will be maintained for the lifetime of the development and the party responsible for the maintenance of the system. CIRIA SuDS Manual provides templates and useful information on maintenance regimes for a variety of SuDS features.

Prior to the discharge of the surface water drainage condition/s, the LLFA will require evidence that an appropriate adoption/maintenance in-principle agreement is place between the developer and the relevant maintenance company/adopting body. See the CIRIA SuDS Manual for more details.

8.1 LLFA position on adopting SuDS

Schedule 3 of the Flood and Water Management Act (2010) aimed to designate Warwickshire County Council as a SuDS Approval Body (SAB). However, this legislation was not enacted in England.

Given the above, Warwickshire County Council as Lead Local Flood Authority is not in a position to adopt or maintain any private SuDS features or other drainage infrastructure at this time. This is not likely to change in the foreseeable future however this guide will be updated should this position change.

9 FLOW CONVEYANCE

The CIRIA SuDS Manual gives details on the conveyance of water through a development site, as part of a SuDS management train. The LLFA supports this approach and any drainage strategy should utilise SuDS such that they reduce final attenuation volumes, and provide improved water quality, habitat and amenity benefit. However, piped networks are not considered to have such benefits and should therefore not be given priority over sustainable drainage systems.

9.1 Pumped drainage systems

Pumping of surface water in perpetuity is considered by the LLFA to be an unsustainable drainage method. The LLFA preference is for gravity discharge to the surface water drainage system. All alternative methods should be fully considered, including those further down the drainage hierarchy (as described in Chapter 3), if it means that a gravity solution would be possible. Early discussion with the LLFA is advised.

The LLFA requires that the developer attempts to discharge as much surface water runoff as possible via a gravity system, such as through the use of shallow attenuation, source control SuDS, or alternative outfall.

If it can be demonstrated that a partial or completely pumped surface water drainage system is the only viable option, the LLFA require that the residual risk of flooding due to the failure of the pumps be investigated, as supported by Water UK draft adoption code[23]. This must include an assessment of the exceedance flood routes under the following conditions:

- The pumps were to fail and,
- The attenuation storage was full and,
- A design storm occurred.

The developer must then identify any appropriate mitigation to ensure that there is no unacceptable increase in flood risk to the development itself or third parties as a result.

Furthermore, any pumping station should be located outside of the Flood Zone 2 and 3 extents (i.e. within Flood Zone 1) and outside of all areas susceptible to surface water flooding as shown on the Environment Agency's Risk of Flooding from Surface Water mapping[24].

9.2 Exceedance and failure flows

In the context of surface water drainage design, exceedance flows are considered as flood flows caused by a failure on the system (such as a blockage) or a rainfall event with a return period greater than the design capacity of the system.

[23] Water UK (2019) Design and construction Guidance for foul and surface water sewers offered for adoption: Sewerage Sector Guidance Appendix C, page 75 [online] available from <https://www.water.org.uk/wp-content/uploads/2019/03/RDY-SSG-Appendix-C.pdf>

[24] Environment Agency (2019) Long term flood risk information [online] available from <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?>

Information on how exceedance flows will be managed on site should be provided. Using the post-developed site topography, it should be demonstrated that exceedance flows will not be directed toward property or flow onto third party land. Intelligent but simple design (such as kerb heights, location of manholes etc) can help avoid flooding in events exceeding the design of the system by considering appropriate exceedance routes. Further information on building layout, surface pathways and storage can be found in CIRIA C635 '*Designing for exceedance in urban drainage – good practice*'.

Overland flows and flood water should be managed to be safe and not enter any buildings or disrupt emergency access routes. The volumes, depths, velocity and extent should be modelled and mapped on a topographical plan of the site. If flooding is extensive, the hazard should be considered in line with guidance from the Environment Agency/Defra[25].

9.3 Overland flows from outside the development

Where overland flows are emanating from outside of the development, the drainage strategy must identify how these flows will be managed. Such flows should be incorporated into exceedance and overland flow routing plans and modelling. The strategy should consider the use of cut-off ditches / boundary treatments to intercept the flows and managed as part of the development drainage proposals.

Flow paths should be retained and no development should take place where there have been clearly identified flow paths/ ephemeral watercourses

9.4 Ground raising and changes in ground level

The LLFA do not support significantly changing the pre-development ground level to facilitate development. Changing ground levels inherently changes the way the land drains and can cause unsuitably deep open water features. This has also been known to have caused issues during and post construction with regards to level differences between development phases.

If a developer is proposing to alter existing ground levels as part of their development proposals, then the drainage strategy must demonstrate that this work will not act to negatively disrupt existing flood flow routes or floodplain and ensure that there will be no increased flood risk on or off site as a result. Flows at the interface will need to be managed.

Any ground raising in an area of known surface water flood risk should ensure level for level compensation for the volume of surface water displaced by any ground raising. This may require modelling of pre and post scheme flows.

9.5 Access and egress

Where the proposed primary access/egress route is shown to be within a modelled or known flood risk area (from surface water or river sources), then the developer

[25] Environment Agency / Defra (2006) FD2321/TR2: Flood Risks to People

should provide adequate information to quantify the risk to occupants and propose mitigation with reference to Defra report FD2321[26].

Warwickshire LLFA will highlight any concerns relating to unsafe depth of flooding on primary access or egress to the Local Planning Authority and recommend that they consult with their emergency planners and/or emergency services for further assessment on the appropriateness of the development given the risk posed by flooding to the access route to the site. Further information is available in the joint Environment Agency / ADEPT guide '*Flood Risk Emergency Plans for new Development*' available here: www.adeptnet.org.uk/floodriskemergencyplan

[26] Environment Agency / Defra (2006) FD2321/TR2: Flood Risks to People

10 EASEMENTS ADJACENT TO WATERCOURSES AND WATER BODIES

Easements alongside watercourses and water bodies are important in providing access for maintenance, protecting and promoting biodiversity and in improving water quality and run-off.

Appropriate easements should be built into any development proposal. The guidance below lists LLFA requirements for watercourses and other water bodies such as attenuation basins or ponds.

10.1 Easements adjacent to ordinary watercourses

It is important for any development adjacent to an ordinary watercourse to be offset a distance from the channel. This is to ensure that adequate access to the watercourse is available for maintenance purposes (such as vegetation clearance, grass cutting, inspection of assets, dredging etc). Physical separation of activities from the watercourse also maintains bank vegetation, enriches the riparian habitat and promotes connectivity between the watercourse and its floodplain.

An easement of 8 m is required measured from the top of the river bank perpendicular to the direction of flow. Ideally this easement should be free of all development for the reasons given in the paragraph above, however in some instances it may be acceptable for low-level development (such as parking areas and pavements) to encroach into this easement. This should be discussed and agreed with the LLFA at an early stage in the planning process to ensure it would be appropriate. Built development, such as walls, fences and building that would impede future maintenance access to the watercourse would not be acceptable.

10.2 Easements adjacent to other water bodies (i.e. attenuation basins)

The developer should demonstrate that future access to any SuDS features is possible for inspection and maintenance, by for example, providing an adequate development-free easement around such features. The LLFA recommends an easement of at least 3 m around the perimeter of any open water feature to allow for a maintenance vehicle to gain access.

Where possible, easements for maintenance access should be within designated public open space to ensure long term protection.

11 CULVERTED WATERCOURSES

Culverts are typically manmade underground pipes which are used to convey flow from watercourses. They can have a detrimental impact on flood risk, the geomorphology of the river, biodiversity, water quality and amenity of a place. It is for these reasons that the LLFA generally oppose the construction of culverts and will expect detailed justification for any culverts as part of the Land Drainage Consent process.

Where a culvert passes through a development site, an opportunity exists to restore the watercourse to a more natural condition. Doing so can help to reduce flood risk, improve water quality, benefit biodiversity and add amenity value. As part of the early stages of the planning process the LLFA expect developers to consider the technical feasibility of de-culverting when developing their proposals for the site.

If an existing culverted watercourse must be retained within a development site, then its condition and capacity must be surveyed and modelled. This exercise should highlight any works required to ensure the structure will remain fit for purpose for the lifetime of the development. Due consideration should be given to the likely loading etc. on services or structures that are placed in proximity to the culvert.

To facilitate maintenance activities/repair works, the LLFA would strongly recommend that no buildings/structures are located above the culverted watercourses, and adequate access points are available throughout.

The LLFA recognise that there may be instances where culverting is unavoidable, such as short sections to accommodate highway access. Our preference is for a free-spanning bridge rather than a culvert, i.e. keeping a more natural river bed and banks. If a culvert is required, it should be a minimum length. Oversized box culverts sunk 150mm below bed level are preferred to round pipe sections.

If a culvert is proposed, or any other structure which may temporarily or permanently affect the flow of an ordinary watercourse (such as a dam, weir or headwall), then prior written consent of WCC under Section 23 of the Land Drainage Act 1991[27] must be obtained. This consent is in addition to any planning or building regulation approvals that maybe required. Refer to the chapter on Land Drainage Consent for more details.

[27] Land Drainage Act (1991) *Section 23: Prohibition on obstructions etc. in watercourses*,19-20, London: HMSO

12 WATER QUALITY AND THE WATER FRAMEWORK DIRECTIVE (WFD)

12.1 Water Framework Directive

The EU Water Framework Directive (WFD)[28] was transposed into UK law in 2003. The aim of the Directive is to establish a framework for the protection of inland surface waters (including streams, rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. Its aim is for all water bodies to achieve Good Ecological Status (GES) or Good Ecological Potential (GEP) through a number of quality elements (biological, physio-chemical, hydromorphological and chemical).

The aims of the WFD are delivered through a Programme of Measures and a series of River Basin Management Plans (RBMPs)[29] across England produced by the Environment Agency. These are plans for protecting and improving the water environment. They describe the main issues for the water environment within each river basin district. They tell us, at a local level, which actions and measures the LLFA and others need to implement to achieve the objectives of the WFD.

Warwickshire is mainly within the Severn RBMP area, but there are also parts of the county within the Humber RBMP and Thames RBMP. We are currently in Cycle 2 of the plans which cover the period 2015-2021.

Development has the potential to affect the status of a water body and activities such as discharge from development sites or works to or within watercourses may require a WFD Compliance Assessment. These activities must support the objectives of the RBMP and must not deteriorate the WFD status or individual quality elements.

The Environment Agency as Competent Authority hold further guidance[30] on when a WFD Compliance Assessment is required and how to complete one. This document may be required to support a planning application and/or Land Drainage Consent application.

12.2 Water Quality

An appropriate treatment train of SuDS components should be used across development sites to reduce the risk of pollutants adversely affecting the water quality of watercourses and groundwater.

As detailed in CIRIA SuDS Manual, a treatment, or management, train is a series of drainage techniques designed into the development layout. The design should achieve a system where pollution is incrementally reduced at each stage. This helps to achieve a resilient system and ensure that there is no significant accumulation of silt or pollutants in attenuation features which may otherwise have negative impact on biodiversity and amenity value of the system and the maintenance regime of the system.

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[28] European Commission (2000) *EU Water Framework Directive* 2000/60/EC

[29] Gov.UK (2019) River basin management plans: 2015 [online] available from <https://www.gov.uk/government/collections/river-basin-management-plans-2015>

[30] Gov.UK (2019) Water Framework Directive assessment for a flood risk activity [online] available from <https://www.gov.uk/government/publications/water-framework-directive-how-to-assess-the-risk-of-your-activity>

The level of pollution found within surface water runoff will depend on the nature of the development from which it arises, the time since the last rainfall event and the duration and intensity of rainfall.

The LLFA require applicants to demonstrate how the pollution risks arising from their development will be mitigated through the surface water drainage strategy. The LLFA recommend applicants refer to the Simple Index Approach (SIA) as described in CIRIA SuDS Manual.

The SIA shows that most SuDS components have an ability to provide water quality treatment by either filtering out pollutants or reducing flow rates to encourage deposition of any contaminants. The level of treatment (or mitigation) required is proportionate to the pollution risk posed by the development.

12.3 Biodiversity Net Gains

Sustainable drainage systems have the opportunity to assist with National Planning Policy Framework[31] objectives to ensure biodiversity net gains. The Council welcomes schemes that assist in this objective. For more information please contact planningecology@warwickshire.gov.uk, or visit: http://www.warwickshire.gov.uk/ecology

[31] Ministry for Housing, Communities and Local Government (2018) *National Planning Policy Framework*

13 PHASED DEVELOPMENT SITES

For development sites with many phases, explanation of how the site will adequately consider flood risk at all stages of the development will be required, including avoiding interim developed phases that are unprotected. The LLFA expect the development masterplan to indicate how the surface water drainage for the entire site will be managed during construction and before individual phases are brought forward.

Phases can only progress if adequate flood mitigation measures are in place for that particular phase. This should avoid one small phase of the site being allowed to discharge at the calculated rate for a larger part of the entire development. Adequate flood risk measures for each individual phase should be able to stand alone until the entire site is completed, without unacceptable levels of flood risk on site and without increasing flood risk off site.

Where the development will be phased then information should be provided on how the requirements listed will be suitably met at each phase, such as the allowable discharge rate and/or impermeable area.

Furthermore, the drainage infrastructure must be effective during construction where there are occupied areas of the site. For example, raised ironworks or silted up gully pots on occupied areas of the development could bring an increased risk of flooding from surface water in the event of heavy rainfall as the drainage infrastructure cannot operate effectively.

14 CONSTRUCTION ENVIRONMENTAL MANAGEMENT

A strategy is required to prevent siltation or pollution of watercourses as a result of the construction phase of development, for example runoff from bare earth.

Appropriate measures should be proposed within the drainage strategy, or separate Construction Environmental Management Plan (CEMP), such as the use of silt fencing. Both during and on completion of construction works, the surface water drainage infrastructure should be de-silted and if applicable culverts/sewers should be CCTV surveyed to ensure they are operating as designed.

Where existing drainage infrastructure, such as those on brownfield sites, will be retained during the construction phase, then sufficient protection will be required. This is to ensure that existing services are not damaged.

During development it may be necessary to alter or divert a watercourse that runs through the site. The developer should hold early discussions with the LLFA regarding any such proposals to ensure that it is appropriate. The CEMP should detail when any such diversion or alteration of a watercourse will take place, how it will be done and who will maintain it afterwards.

Remedial works should be carried out in accordance with CIRIA C768: Guidance on the construction of SuDS[32].

[32] CIRIA (2017) *Guidance on the Construction of SuDS* (C768)

15 PHOTOVOLTAIC (SOLAR FARM) DEVELOPMENT SITES

For Solar Farms on entirely Brownfield sites, the impact is assumed to be nil. Therefore, the LLFA seek reductions in surface water runoff from the site in the form of restricting surface water rates and providing attenuation up to the 1 in 100 year (+ climate change) event (minimum 50% betterment to existing rates).

For greenfield sites the LLFA would expect the developer to include the following in an FRA:

a) Restrict vehicular movements on site to designated access tracks. In doing so, the risk of soil compaction is minimised and limited to specific locations. The applicant is to design the vehicular access tracks to be permeable (e.g. gravel medium).

b) Specify what type of vegetation will be planted across the site and how will it be managed/ maintained in perpetuity. The ideal situation is that vegetation is grassed and is kept reasonably high or grazed by livestock. Good vegetation cover will limit the transfer of sediments and slow the flow of water.

c) Incorporate above- or below- ground surface water attenuation features to capture runoff from the panels. There are two basic ways as follows:

    i. **IDEAL** - Gravel filter trenches positioned under the drip line of each solar panel. Typically, these are French drains 300mm x 300mm filled with a granular material to capture and store runoff from the panels. These will encourage infiltration and provide betterment in terms of reducing surface water runoff.
    ii. **MINIMUM -** Above ground swales positioned strategically around the development to capture surface water runoff from the panels as water flows downslope. The exact dimensions and number of swales required will depend upon the situation but are likely to be acceptable where designed in accordance with CIRIA SuDS Manual. Excavated material should be deposited on the downslope bank.

d) Provide attenuation measures for the areas of hardstanding (i.e. electrical infrastructure or kiosks). This should be done in the normal way (i.e. calculate greenfield runoff rate, calculate increase in impermeable area, conduct storage estimate to work out storage volume).

16 MODELLING REQUIREMENTS

16.1 Fluvial modelling

16.1.1 When to undertake fluvial modelling

Many ordinary watercourses do not have any modelled flood zones. This, however, does not necessarily mean that they do not have a floodplain or that there is no fluvial flood risk associated with them. Typically, only larger watercourses with an upstream catchment of at least 3 km^2 have been mapped by the Environment Agency.

It is important on any development site that the flood risks associated with any ordinary watercourse within or adjacent to the site boundary are understood and adequately represented in the development proposals.

Where there is doubt over the flood risk to a development site, the site-specific FRA should look to address this by undertaking a fluvial modelling exercise. One may also be specifically requested by the LLFA or EA. Modelling results should then be used to establish suitable development zones, finished floor levels and appropriate flood resilient/resistant measures as and where necessary. Where fluvial modelling has been completed, we would support the developer providing this to the Environment Agency so that the national flood map can be updated.

16.1.2 Fluvial modelling requirements

The detailed requirements regarding the design of a hydraulic or hydrological model have not been specified in this guide. The LLFA expects the developer to instruct a suitably qualified modeller to undertake the work who should follow industry standards and latest guidance produced by the Environment Agency. A summary report of the modelling work should be provided to the LLFA.

The findings of the modelling exercise should be used within the Flood Risk Assessment and Drainage Strategy to inform the development proposals. This includes, but is not limited to, the following:

- placement of all surface water drainage infrastructure outside of the modelled 1 in 1000 year return period fluvial flood event
- sequentially place development across the site, where vulnerable uses are located away from the watercourse and outside any modelled flood outlines
- a review of the invert level of any surface water outfall to the modelled watercourse to identify whether it is appropriate to model site drainage with a submerged outfall
- finished floor levels set a minimum of 600mm above the 1 in 100 year (plus climate change allowance) flood level

Any hydrological and/or hydraulic modelling report submitted to the LLFA in support of a planning application must be independently reviewed to ensure that the model meets the required industry standard and that the LLFA can be confident in the

output from the model. The applicant can choose to use an independent consultant to do this, or the LLFA can provide a quotation to do this on their behalf.

16.2 Surface water modelling

In this context, surface water modelling is considered to be the simulations of a surface water drainage network for a proposed development rather than the EA surface water flood risk mapping.

The table below provides a summary of the design parameters that should be used if the developer is using industry standard surface water drainage modelling software. The drainage strategy should outline the reasons for any departure from these design parameters.

Return Period (years)	Follow software guidelines
M5-60 (mm)	19 to 20 mm
Ratio R	0.4
Maximum Rainfall (mm/hr)	Follow software guidelines
Foul Sewage (l/s/ha)	0
Volumetric Runoff Coeff.	Follow software guidelines
PIMP (%)	Follow software guidelines

Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	Follow software guidelines
Maximum Backdrop Height (m)	Follow software guidelines
Min Design Depth for Optimisation (m)	Follow software guidelines
Min Vel for Auto Design only (m/s)	Follow software guidelines
Min Slope for Optimisation (1:X)	Follow software guidelines

When simulating the drainage network, the following parameters should be used for all storm durations in the following return periods.

Volumetric Runoff Coeff.	Follow software guidelines
Areal Reduction Factor	1 (if site <100ha)
Hot Start	Follow software guidelines
Hot Start Level	Follow software guidelines
Manhole Headloss Coefficient (global)	Follow software guidelines
Foul sewerage per hectare	0

Additional Flow - % of Total Flow	0
MADD Factor * 10m3/ha Storage	0
Inlet Coefficient	Follow software guidelines
Flow per Person per Day	Follow software guidelines
Run Time	Follow software guidelines
Output Interval	Follow software guidelines

Return periods required (critical storm only)

1 in	Climate change
1	0
30	0
100	40**

** assuming a development lifetime of at least 100 years, in accordance with Paragraph 026 of PPG.

17 INFORMATION REQUIRED FROM APPLICANTS DURING THE PLANNING PROCESS

This section provides an indication of the information the LLFA will require from the applicant at the various stages of the planning process. Although this list will cover our key requirements in most instances, development proposals can be varied and complex. As such the LLFA may request information in addition to that listed below where it is justified but should remain proportionate to the size of development.

In addition to the surface water drainage details described below, the LLFA and/or Environment Agency will also require the submission of a FRA where the development proposals meet the requirements as outlined here: https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications.

17.1 Outline planning

At Outline planning stage, the LLFA will require the applicant to submit an Outline Surface Water Drainage Strategy based on SuDS principles. The strategy should inform the Masterplan / indicative site layout by identifying suitable placement and design of the surface water drainage infrastructure. It should mitigate flood risk, provide opportunity to manage water quality and identify potential for amenity and biodiversity. The following information is required to support the strategy:

	Appraisal of existing site conditions (topography, hydrology, hydrogeology, land use)
	Appraisal of suitable SuDS methods that the development is likely to incorporate, with preference for above ground SuDS*
	Appraisal of the drainage hierarchy** and identification of a viable outfall
	Calculations of existing and proposed discharge rates and volumes
	Calculations and plans of proposed attenuation requirements (inc. urban creep where relevant)
	Assess the likely water quality hazard arising from the development and identify appropriate mitigation
	Expected adoption and maintenance regimes for all drainage features
	Correspondence from relevant risk management authorities, such as Severn Trent Water

*examples and design parameters outlined in the CIRIA SuDS Manual C753
**as detailed in Paragraph 080 of PPG

Note: Where the development will be phased then information should be provided on how the requirements listed will be suitably met at each phase, such as the allowable discharge rate and/or impermeable area.

17.2 Reserved Matters

At the Reserved Matters stage, the LLFA are mostly looking to ensure that the principles agreed at Outline planning stage, with regards to the drainage strategy, have been taken forward as the proposals have firmed up. The LLFA will be looking to review:

	Any of the information provided at Outline planning stage that has since been updated
	Site layout plans and cross sections showing all surface water drainage infrastructure which should follow the sustainable drainage principles agreed at Outline planning stage
	Modelling report of the whole drainage network demonstrating its performance during the critical storm in a 1 in 1 year, 1 in 30 year, and 1 in 100 year (plus allowance for climate change) return periods
	Exceedance and overland flow routing information, where a Reserved Matters application includes layout

Note: Where the development will be phased then information should be provided on how the requirements listed will be suitably met at each phase, such as the allowable discharge rate and/or impermeable area.

17.3 Full planning / Discharge of Conditions

At this stage in the planning process, the LLFA expect proposals for surface water drainage to be well developed and this should be reflected in the level of detail provided. Where not explicitly listed below, all details required in Outline and Reserved Matters stages must be provided at Full planning stage. The LLFA require:

	Appraisal of existing site conditions (topography, hydrology, hydrogeology, land use, flow routes)
	Appraisal of suitable SuDS methods that the development will incorporate, with preference for above ground SuDS*
	Appraisal of the drainage hierarchy**, infiltration test results and identification of a viable outfall
	Site layout plans showing all surface water drainage infrastructure supported by a fully labelled network drawing showing all dimensions of all elements of the proposed drainage system.
	Calculations of existing and proposed discharge rates and volumes
	Calculations and plans of proposed attenuation requirements (inc. urban creep where relevant)
	Exceedance and overland flow routing information
	Modelling report of the whole drainage network demonstrating its performance during the critical storm in a 1 in 1 year, 1 in 30 year, and 1 in 100 year (plus allowance for climate change) return periods
	Submission of cross-sectional drawings of all SuDS features demonstrating design in accordance with the CIRIA SuDS Manual C753***
	Assess the likely water quality hazard arising from the development and identify appropriate mitigation
	Written agreement from any third party asset or land owners required to enable the operation of the drainage infrastructure (such as evidence of an agreement with the adopting body)***

*examples and design parameters outlined in the CIRIA SuDS Manual C753
**as detailed in Paragraph 080 of PPG
***It is possible that this information can be provided later once detailed design is underway. In these cases, the LLFA is likely to secure the submission of this information by recommending a pre-commencement or pre-occupation condition to the LPA for inclusion on any Decision Notice.

Note: Where the development will be phased then information should be provided on how the requirements listed will be suitably met at each phase, such as the allowable discharge rate and/or impermeable area.

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APPENDIX A: SURFACE WATER DRAINAGE PRO-FORMA FOR NEW DEVELOPMENTS

Surface Water Drainage Pro-forma for new developments

Developers should complete this form and submit it to the Local Planning Authority (as part of the planning application submission documents). This pro-forma is supported by the Defra/EA guidance on Rainfall Runoff Management and uses the storage calculator on www.UKsuds.com. The pro-forma should be considered alongside other supporting SuDS Guidance, but focuses on ensuring flood risk is not made worse elsewhere. This proforma is based upon current industry standard practice.

1. Site Details

Site	
Address & post code or LPA reference	
Grid reference	
Is the existing site developed or Greenfield?	
Does the surface water from the site discharge via an existing positive outfall ?	
Total Site Area served by drainage system (excluding open space) (Ha)*	

***** The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers & Local Authorities
Impermeable area (ha)				If proposed > existing, then runoff rates and volumes will be increasing. Section 6 must be filled in. If proposed ≤ existing, then section 6 can be skipped & section 7 filled in.
Drainage Method (infiltration/sewer/watercourse)			N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Fill in section 6.

3. Proposing to Discharge Surface Water via

	Yes	No	Evidence that this is possible	Notes for developers & Local Authorities
Infiltration				e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse				e.g. Is there a watercourse nearby?
To surface water sewer				Confirmation from sewer provider that sufficient capacity exists for this connection.
Combination of above				e.g. part infiltration part discharge to sewer or watercourse. Provide evidence above.

4. Peak Discharge Rates – This is the maximum flow rate at which storm water runoff leaves the site during a particular storm event. Surface water should be limited to the equivalent Qbar greenfield runoff rate for all return periods wherever possible. Only where this is demonstrated to be not technically viable, would we consider a complex variable discharge rate.

	Existing Rates (l/s)	Proposed Rates (l/s)	Difference (l/s) (Proposed-Existing)	Notes for developers & Local Authorities
Greenfield QBAR		N/A	N/A	QBAR is approx. 1 in 2 storm event. Provide this if Section 6 (QBAR) is proposed.
1 in 1				QBAR is approx. 1 in 2 storm event. Provide this if Section 6 (QBAR) is proposed.
1 in 30				
1in 100				
1 in 100 plus climate change	N/A			To mitigate for climate change the proposed 1 in 100 +CC must be no greater than the existing 1 in 100 runoff rate. If not, flood risk increases under climate change. 40% should be added to the peak rainfall intensity.

Note: Should a complex flow control be the only technically viable means of limiting the discharge from the site then please refer to section 7 of this document to ensure that long term storage is provided in accordance with the requirements specified in the Environment Agency 'Science Report SC030219 Rainfall Runoff Management for Developments'.

5. Calculate additional volumes for storage –The total volume of water leaving the development site. New hard surfaces potentially restrict the amount of storm water that can go to the ground, so this needs to be controlled so not to make flood risk worse to properties downstream.

	Existing Volume (m^3)	Proposed Volume (m^3)	Difference (m^3) (Proposed-Existing)	Notes for developers & Local Authorities
1 in 1				Proposed discharge volumes (without mitigation) should be no greater than existing volumes for all corresponding storm events. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
1 in 30				
1in 100				
1 in 100 plus climate change				To mitigate for climate change the volume discharge from site must be no greater than the existing 1 in 100 storm event. If not, flood risk increases under climate change.

6. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The idea is that the additional volume does not get into the watercourses, or if it does it is at an exceptionally low rate. You can either infiltrate the stored water back to ground, or if this isn't possible hold it back with on site storage. Firstly, can infiltration work on site?

			Notes for developers & Local Authorities
Infiltration	**State the Site's Geology and known Source Protection Zones (SPZ)**		Avoid infiltrating in made ground. Infiltration rates are highly variable and refer to Environment Agency website to identify and source protection zones (SPZ)
	Are infiltration rates suitable?		Infiltration rates should be no lower than $1x10^{-6}$ m/s.
	State the distance between a proposed infiltration device base and the ground water (GW) level		Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.

	Were infiltration rates obtained by desk study or infiltration test?		Infiltration rates can be estimated from desk studies at most stages of the planning system if a back up attenuation scheme is provided.
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.		Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
In light of the above, is infiltration feasible?	**Yes/No? If the answer is No, please identify how the storm water will be stored prior to release**		If infiltration is not feasible how will the additional volume be stored? The applicant should then consider the following options in the next section.

Storage requirements

The developer must confirm that either of the two methods for dealing with the amount of water that needs to be stored on site.

Option 1 Simple – Store both the additional volume and attenuation volume in order to make a final discharge from site at **QBAR** (Mean annual flow rate). This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

Option 2 Complex – If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a very low rate of 2 l/sec/hectare. A combined storage calculation using the partial permissible rate of 2 l/sec/hectare and the attenuation rate used to slow the runoff from site.

		Notes for developers & Local Authorities
Please confirm what option has been chosen and how much storage is required on site.		The developer at this stage should have an idea of the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.

7. Please confirm

		Notes for developers & Local Authorities
Which Drainage Systems measures have been used?		SUDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SUDS devices allows treatment but not infiltration. See CIRIA SUDS Manual C753.
Drainage system can contain in the 1 in 30 storm event without flooding		This is requirement for sewers for adoption & is good practice even where drainage systems are not adopted.
Any flooding between the 1 in 30 & 1 in 100 plus climate change storm events will be safely contained on site.		**Safely:** not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths. Flood waters must drain away at section 6 rates. Existing rates can be used where runoff volumes are not increased.
How are rates being restricted (hydrobrake etc)		Hydrobrakes to be used where rates are between 2l/s to 5l/s. Orifices not be used below 5l/s as the pipes may block. Pipes with flows < 2l/s are prone to blockage.
Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.		If these are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Proforma.

How is the entire drainage system to be maintained?		If the features are to be maintained directly by the owners as stated in answer to the above question please answer yes to this question and submit the relevant maintenance schedule for each feature. If it is to be maintained by others than above please give details of each feature and the maintenance schedule. Clear details of the maintenance proposals of all element of the proposed drainage system must be provided. Poorly maintained drainage can lead to increased flooding problems in the future.

8. Evidence Please identify where the details quoted in the sections above were taken from. i.e. Plans, reports etc. Please also provide relevant drawings that need to accompany your proforma, in particular exceedance routes and ownership and location of SuDS (maintenance access strips etc

Pro-forma Section	Document reference where details quoted above are taken from	Page Number
Section 2		
Section 3		
Section 4		
Section 5		
Section 6		
Section 7		

The above form should be completed using evidence from the Flood Risk Assessment and site plans. It should serve as a summary sheet of the drainage proposals and should clearly show that the proposed rate and volume as a result of development will not be increasing. If there is an increase in rate or volume, the rate or volume section should be completed to set out how the additional rate/volume is being dealt with.

This form is completed using factual information from the Flood Risk Assessment and Site Plans and can be used as a summary of the surface water drainage strategy on this site.

Form Completed By…….....

Qualification of person responsible for signing off this pro-forma .....

Company……,.....

On behalf of (Client's details) .....

Date:…….....

APPENDIX B: LAND DRAINAGE CONSENT ADVICE NOTE

Ordinary Watercourse Land Drainage Consents in Warwickshire advice note

What requires a consent?

Section 23 of the Land Drainage Act 1991 requires that before the erection or alteration of any obstruction to the flow in an ordinary watercourse, a written consent is obtained from the Lead Local Flood Authority (LLFA) for the area. These obstructions include; any mill dam, weir or like obstruction, or a culvert.

In some cases, your proposed structure itself may not require a consent as it does not affect the flow in the watercourse, however the temporary works to construct the structure may include obstructing the flow to make a dry working area. If this is the case, a consent application should be made.

What information must be submitted?

The amount of information required to support an application is generally proportionate to the complexity of the proposals and the flood risk associated to the location or proposals.

As a minimum, a complete application should include;

- A completed application form
- A location plan (showing coordinated positions of the structure(s) covered by the application)
- Plan and section drawings of the structure(s), including how it will fit into the existing watercourse.
- A method statement and site specific risk assessment detailing how works will be done. Particular consideration should be given to what measures are in place both during and after the works to address;
    - pollution to the watercourse (silt, spillage, etc),
    - damage to the watercourse (scour, destabilising the bank, etc),
    - damage to the environment (surveys, habitats, vegetation, etc),
    - an increase in flood risk during and after the works particularly if the work area is to be dewatered (monitoring of flood alerts, weather forecasts, evacuation plans, etc).
- application fee (see section below)
- details of who will be taking ownership of the structure and will be responsible for its ongoing maintenance

Additionally, if the watercourse is not within your ownership, we will need to see some form of written agreement from the landowner that they are happy for you work on their land and construct the structures.

Please note that until all of this information is received an application may not be considered ‘live’ and the determination period referred to below will not have started.

Culverting Ordinary watercourses

WCC does not favour the culverting of ordinary watercourse and there is a preference of an increased naturalisation of them. Culverts destroy wildlife habitats, damage natural amenity and interrupt the continuity of the linear habitat of a watercourse. Culverts can also impact on water quality due to the change in structure of the watercourse bed and removal of natural systems to benefit water quality.

However WCC recognises that there may be instances where culverting is unavoidable, such as short sections to accommodate highway access. WCC prefer a single span bridge

rather than a culvert, i.e. keeping a more natural embankment to facilitate habitat. If a culvert is required, it should be the minimum length possible. Oversized box culverts sunk 300mm below bed level are preferred to round pipe sections. This reduction in flow area should be accounted for when calculating the flow capacity.

The sizing of culverts should be done by calculating the contributing flow rates. however, maintenance should be considered and a practical minimum pipe size to reduce the likelihood of blockage.

How to pay

There is an application fee of £50 per structure, if you are unsure what the total fee will be, please contact the consenting team to discuss the proposals.

The preferred method of payment is via a cheque made payable to Warwickshire County Council. We are also able to accept payment via BACS, invoice, or over the phone, please let us know if you would prefer one of these methods and somebody will be in touch to arrange payment.

Standard determination period

A determination period from the date both the application and fee are received is set out within the act. Applications are usually determined well within this period, particularly if any additional information requested is provided promptly. If further information is not forthcoming and the two month period expires, we may decide to refuse the application or give the applicant the option to withdraw the application until such time that the information is available.

Other approvals

If your proposed works are on or over the Warwickshire boundary, depending on the location of the structure, you may need approval from the neighbouring Lead Local Flood Authority. This is because as Lead Local Flood Authority for Warwickshire, we are only able to consent structures in Warwickshire. In situations like this, we are likely to discuss the application with the neighbouring LLFA, so if you have contact details of anybody you may have been dealing with, please provide them to speed things up.

In addition to an Ordinary Watercourse Land Drainage consent, some works may also require planning permission. The two approvals are separate and the granting of one does not necessarily indicate that the proposals are acceptable for the other. If you are unsure whether planning permission is required, please contact your local planning authority to discuss further.

Some works in and around a watercourse also fall within the Environmental Permitting regulations managed by the Environment Agency. If your proposed works involve or affect the following, please contact the Environment Agency;

- Impounding (holding back a watercourse),
- Abstracting (removing) water,
- Fish or fisheries,
- Disposing of waste material,
- Water quality

More information on Environmental Permitting can be found on the Gov.uk website.

As mentioned above, this consent only relates to works within an ordinary watercourse and not main rivers. Main rivers are the responsibility of the Environment Agency and further details can be found on the Gov.uk website.

Unconsented works / retrospective applications

No provision has been made in the Land Drainage Act that allows the LLFA to retrospectively grant consent for works that have already begun construction or have been completed.

Works on ordinary watercourses that take place without consent or that are allowed to remain without enforcement action can result in increased flood risk or environmental damage. Section 24 of the Land Drainage Act allows the LLFA to serve a notice for the watercourse to be restored to its previous condition within a specified time. If this is not done, the LLFA can carry out these works and recover the costs.

Dependent on the nature of the unconsented works, it may be possible to undertake appropriate remedial works with the LLFA consent. If this is not possible, the applicant may choose to provide evidence that the unconsented works have not increased the flood risk. However, as retrospective consent cannot be granted, this evidence will not remove liability for any future flooding found to be a result of the unconsented works.

The LLFA does not accept any responsibility for the design and construction of the works that are the subject of the consents they grant, and any liability for any loss or damage which may arise out of their design, construction, maintenance or use.

Historic structures and consent applications

The LLFA were given consenting responsibilities in the Spring of 2012 so we only hold records of applications since then. The Environment Agency held this responsibility prior to us so they may hold records of applications and structures built pre-2012.

For further information, please contact FRMConsenting@warwickshire.gov.uk and we will get back to you.