SURFACE WATER DRAINAGE, FLOOD RISK MANAGEMENT AND WATERCOURSES

PLANNING ADVISORY NOTE (PAN)

Property Flooding in Lancaster District in 2008

MAY 2015

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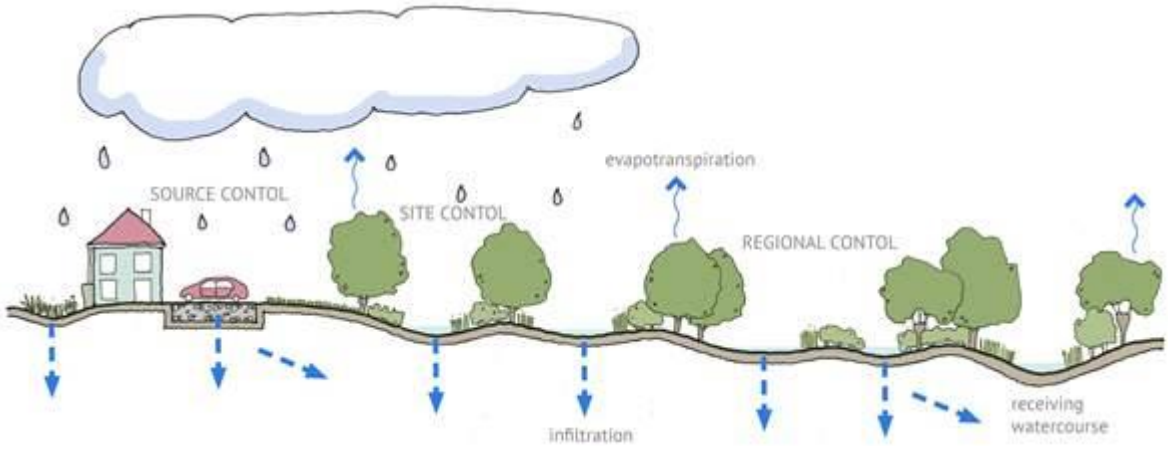


SuDS Management Train – www.sudsdrain.org

SUDS AND DRAINAGE GUIDANCE

LANCASTER CITY COUNCIL

1. INTRODUCTION

This document sets out how Lancaster City Council expect developers to manage surface water and flood risk on development sites by providing additional guidance for development surface water drainage.

The Development Management DPD adopted in December 2014 sets out how drainage should be designed and managed under a SuDS Approval Body (SAB) which was expected to come into place in 2015. As this is no longer anticipated, supplementary guidance to ensure applicants have clearer direction for planning applications has been developed.

Although Policy DM39 is still valid within the published document, this Planning Advisory Note aims to give specifics to ensure applicants provide Drainage Strategies and Flood Risk Assessments which are satisfactory for approval.

2. SUSTAINABLE URBAN DRAINAGE SYSTEMS

Lancaster City Council advocate use of the SuDS hierarchy for new developments in line with best practice, as demonstrated below. The merits of providing green solutions to manage surface water which have benefits to ecology, local habitat and biodiversity outweigh more conventional systems and usually improve the appeal a development has.

Developments should be designed with this in mind and the areas most susceptible to pooling or with the most scope for infiltration/soakaways should be reserved for SuDS features.

Layouts around ponds and reed beds are desirable for prospective purchasers and such features also provide environmental mitigation and surface water/ flood risk management benefits too.

Examples of SuDS features are shown on pages seven and eight.

2.1 PRINCIPLES – SUDS HIERARCHY

Any proposed surface water scheme must consider the following. The SuDS hierarchy and the best and latest guidance, of which Lancaster City Council promotes, orders the preferential destination of surface water as follows:

1. Discharge into the ground (infiltration);

2. Controlled discharge to a surface water body/watercourse or the sea;

3. Controlled discharge to a surface water sewer.

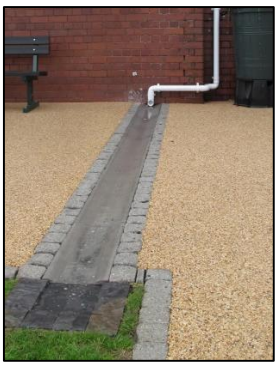
Surface water must not be discharged into the foul sewer system; United Utilities will not grant permission for this. Surface water must not be discharged onto the highway, or onto other land without a watercourse. Surface water may not be discharged unrestricted.

2.2 GOOD PRACTICE

Lancaster City Council are committed to ensuring that the impacts of development on our environment is minimised. Through the construction of a successful SuDS system using techniques and features known to work as well as new and innovative ones, the risk of flooding on and off site can be dealt with whilst providing wider reaching positive impacts to a site and it's locality.

Applications for development which include sustainable drainage features are likely to receive greater support from consultees and the Local Planning Authority.

The below example from a Stebonheath Primary School in Llanelli, Wales shows a number of innovative SuDS features which manage surface water at the source and use sustainable techniques which benefit the environment and give wider benefit to the site.


A notable example of SuDS is in Upton, Northampton. The whole feel of the development and its desirability has been improved by the use of SuDS. Exploring the development at Street Level gives a feel of SuDS can be used in urban development effectively.

Further examples on page seven and eight include a link to a case study. A number of case studies can be found at http://www.susdrain.org/case-studies/

2.3 SUDS DESIGN

2.3.1 SuDS should not be designed around a development, but the development should be designed around the SuDS. Such an approach will ensure that full consideration has been given for the surface water drainage on a site, and that flood risk has been effectively managed.

2.3.2 Applicants should ensure that thorough and accurate calculations are submitted. These calculations should include:

- Pre development runoff calculations
- Post development runoff calculations
- Required attenuation for flood events up to and including the 1 in 100 year plus 30% allowance for climate change critical storm
- Drainage times for the system/ soakaway given runoff restriction or findings from testing on site.

Most consultants use the same software for calculating runoff and evaluating SuDS proposals. The full printouts from such software are useful and can be checked through by engineers to ensure that they are correct and to satisfy that flood risk will not be increased on or off site as result of development.

2.3.3 Despite the fact that SuDS Approval Body legislation has not been adopted, Lancaster City Council recognises the importance of managing flood risk; and ensuring that new development does not increase flood risk elsewhere. It is the responsibility of all developers to ensure that flood risk is managed on site and off site upon occupation of the development and for its lifetime.

2.3.4 It is also important that flood risk is managed during construction, and drainage should be installed at the earliest possible opportunity. As construction often exposes loose materials, drainage networks downstream are vulnerable to pollution and blockage from such materials, hence the importance of this being well managed.

2.3.5 In accordance with SuDS principles, developers must design a surface water drainage scheme for which, if surface water is to be discharged off site, runoff is restricted in accordance with the guidance further on in this document.

2.3.6 Lancaster City Council's Engineers will be consulted on the majority of applications where surface water drainage amendments/ schemes are to be designed, and will recommend and promote the implementation of the following methods of managing surface water on sites:

- Permeable paving and surfacing (on driveways, paths and pavements, and roads in the development where the expected traffic volumes will not damage this surfacing)

- Plant hedges instead of erecting fences

- Install water butts/ rainwater collection to new dwellings/ premises; at least for use in garden maintenance.

- Contour ALL driveways, roads and other impermeable/hard surfacing towards driveways and planted areas/ gravel trenches, and other SuDS features. For example, driveways and parking areas directed into planting will ensure that runoff is slowed down, and much of the runoff will not enter the drainage system on a site.

- Plant reeds along the flow routes of surface water from surfaces used by vehicles, to filter out pollutants, and improve downstream water quality.

- Plant as many shrubs and trees as possible around developments. These will soak up surface water, and help control groundwater levels. Sites which are heavily developed and have mostly grass will have much higher runoff than more densely planted and wooded sites. This will also limit the impact of development on the surroundings, and on local wildlife, whilst improving the desirability, and subsequently saleability of developments. [See the example on page 1 of this document.]

- Installing a weir at one end of a pond will maintain water, and also act to help manage runoff if upstream of an outfall structure.

- Grass verges and planted areas should be lower than the adjacent hard surfacing. Kerbs cause channelling and pooling of water, so the divert runoff into green areas is much preferred.

- Use amenity areas and open spaces as flood storage areas during significant events. Such areas should drain away if ground conditions permit following storm events, and it reduces the need for large visible storage capacity.

- Use of gravel on paths will ensure that runoff is reduced and will reduce the developments impermeable areas.

- Keep existing hedges and planting in place, to reduce runoff and minimise impacts.

- Raise all finished floor levels to at least 150mm above surrounding ground levels to reduce the risk of surface water flooding In the future. Try to ensure that thresholds are above the levels of the roads in the development for the same reason.

2.4 INFILTRATION DRAINAGE DESIGN

Infiltration structures include soakaways, trenches, basins, swales and permeable paving. Ponds can be used as a destination, with infiltration structures constructed before these in system.

By building small walls or obstructions into swales and trenches, water will accumulate and increased storage capacity will be provided. This also works on sloping sites. Effectively, this will, during heavy rainfall, increase the capacity and maximise infiltration, whilst slowing down flows through the site to mimic natural/existing flow regimes.

Above ground infiltration also utilises attenuation, and there is ongoing improvement in the technology available to maximise infiltration rates. Drainage matting and soakaway technologies have very high porosity and help to ensure that requirement for half-drainage within 24 hours is adhered to.

Infiltration rates for soakage structures are to be based on percolation tests undertaken in the winter period at the location and depth of the proposed structures. The percolation tests must be carried out in accordance with BRE 365, CIRIA R156 or a similar approved method, and cater for the 1 in 10 year storm event between the invert of the lowest entry pipe into the infiltration structure and the base. For the purpose of design, the percolation rate must be applied to the sides of the infiltration structure only and the rate for the base must be zero. This does not apply to infiltration basins or permeable pavements, whereby the percolation rate is applied to the base only. There must be provision to ensure that there is capacity in the system to contain the 1 in 100 year storm event plus 30% on stored volumes, as an allowance for climate change. The infiltration structure should also drain 50% of its total volume in 24 hours or less for both the 1 in 10 and 1 in 100 year (plus 30%) storm events, in order to provide spare capacity for subsequent storms.

Any infiltration drainage design must include adequate winter groundwater monitoring data to determine the highest winter groundwater table. Residential developments in excess of five properties will require ground water monitoring to be carried out between October and March inclusive. The extent of monitoring required for smaller developments will be subject to agreement with the Council's Engineers, and will usually take into account local knowledge and site topography.

Adequate freeboard must be provided between the base of the soakaway structure and the highest recorded groundwater level identified in that location.

2.5 SURFACE WATER BODIES/ WATERCOURSES OR THE SEA

Discharge to surface water bodies must be restricted to an agreed rate (see guidance below). It is very important that the watercourse capacity, and the capacity during flood events, is retained following development.

It is recommended that new outfall structures are limited to one, if possible, if it is proposed that defences are penetrated to form an outfall, robust proposals to ensure that flood risk is effectively manages must be submitted, and approved by Lancaster City Council and Lancashire County Council and/or The Environment Agency. For some defences, particularly sea defences, this approach may not be possible.

Please refer to the Watercourse Guidance on Page 10 of this document for further detailed advice.

2.6 SURFACE WATER SEWERS

Discharge to surface water sewers must be restricted to an agreed rate. This rate must be agreed by Lancaster City Council and United Utilities, and for some sites, The Environment Agency. This approach is usually only possible if there are no other options for the site, existing drainage from the pre-developed site went to this source and/or there is sufficient capacity during storms for the proposed rate of discharge.

2.7 RESTRICTED DISCHARGE

Discharge to a watercourse or surface water sewer must be restricted to the estimated mean Greenfield runoff rate (QBAR) by means of a controlled outflow (or restricted to a betterment of existing runoff rates for brownfield sites).

This can be derived from a variety of recognised modelling/calculation methods, which can be completed through software or more traditional methods. The calculations will be checked by the Lancaster City Council Engineering Team to ensure that they are adequate and satisfy local and national policy and requirements, so must be included

Any storage design must be submitted with groundwater monitoring data where applicable to ensure there will be no detrimental effect on the structure or storage. Storage areas are preferred to be in an 'open' form such as ponds, rather than underground tanks.

Attenuation MUST be provided, and calculated for the restricted runoff, for flood events up to and including the 1 in 100 year (+ 30% allowance for climate change) critical storm. Considering only impermeable areas can mean that runoff from permeable areas when the ground is saturated can cause a system to have insufficient capacity.

2.8 FLOW EXCEEDANCE ROUTES

The drainage design should show flow routes through the proposed development, demonstrating where surface water will be conveyed for three types of flow:

2.8.1 LOW FLOW ROUTES

Regular flow from source control features such as permeable pavements should travel in low flow channels through the development in a controlled way contributing to landscape quality.

2.8.2 OVERFLOWS

In the event of local blockages or surcharge a simple overflow arrangement should allow water to bypass the obstruction and return to the management train sequence until conditions return to normal.

2.8.3 EXCEEDANCE ROUTES

When SuDS are overwhelmed by exceptional rainfall, then exceedance routes are required to protect people and property. These provide unobstructed overland flow routes from the development and should be considered for all drainage schemes. Exceedance routes should also be protected from future changes in land use.

2.9 EXAMPLE SUDS FEATURES

Green Roofs

Ponds

Swales

Permeable Paving

Rainwater Harvesting/Water Butts

Green soakaways

Infiltration Trenches

Permeable Paving

Drainage into stone/gravel or planting

Hydrobrake Products – designed specifically for the specified runoff rate

Attenuation area/ basin in use during heavy rainfall

Staggering flow control structures in a system can maintain levels and provide a permanent/ habitat feature

2.10 MAINTENANCE AND MANAGEMENT

Details of the maintenance and management of the SuDS system are to be set out in writing in a site specific maintenance manual. This manual shall include details of the financial management and arrangements for the replacement of components at the end of the manufacturers recommended design life. This document is then to be submitted as part of the planning process.

It should also include how watercourses are to be maintained in a development.

3 MANAGING FLOOD RISK FROM ALL SOURCES

3.1 FINISHED FLOOR LEVELS

Finished Floor Levels (FFL's) should always be higher than surrounding ground levels. Importantly, wherever possible, FFL's should be higher than highways and garden areas so as to ensure that under flow exceedance conditions and/or when the ground is very saturated, that property flooding will not occur, and that access and egress can be maintained.

Residents often have issues with flooding to garages, particularly when a driveway slopes towards it, and inadequate or unconnected drainage is installed. This can be easily avoided.

3.2 INTELLIGENT LANDSCAPING

Examples on Pages 7 and 8 of this document give some ideas as to how landscaping and levelling can be used to direct surface water to green and planted areas from impermeable areas, whilst ensuring it flows away from properties.

This approach satisfies that property flood risk has been well considered and that even during the most extreme conditions, a property is unlikely to be flooded.

Lancaster City Council and Lancashire County Council often have reports of garden flooding. Though this is not a priority in contrast to property flooding, wherever possible, the land around a property should be landscaped to ensure that water does not pool where it could cause inconvenience.

4.1 CULVERTING A WATERCOURSE

Culverting a watercourse is not advised unless there is no alternative, such as where a new road must pass over a watercourse. The resulting reduction in storage volume, flow capacity and habitat potential can have serious implications, hence this approach for long stretches of watercourse is unacceptable. Culverted watercourses are also more difficult to maintain due to the limited accessibility.

Land Drainage Consent must be sought from the Lead Local Flood Authority (Lancashire County Council – frm@lancashire.gov.uk), prior to starting any works (temporary or permanent) that affect the flow of water in the watercourse. Such works may include culverting, diversion and the installation of trash screens.

The development layout must take account of any existing watercourses (open or culverted) to ensure that future access for maintenance is not restricted.

A SuDS scheme may discharge into a watercourse if the existing site also drained into the watercourse. These proposals and the runoff rate proposed must be approved by Lancaster City Council.

4.2 DESIGNING A DEVELOPMENT AROUND A WATERCOURSE

Watercourses, if well maintained are often seen as very attractive. Therefore, development close to watercourses, especially natural streams and rivers, is often sought after. There are several important considerations and recommendations for development, which developers should take into account:

- Providing open/amenity space adjacent to a watercourse should safeguard the habitat corridor along a watercourse and that no obstructions need to be put into the easement of floodplain. It will also maintain access for maintenance, which could be conducted as part of the maintenance of the amenity/open space, limiting costs and maximising efficiency.
- Flood capacity must be maintained along watercourses. By raising ground levels and/or building in an area which would be inundated during flood events, flood risk would be increased elsewhere, which is not acceptable.
- By running gardens up to watercourses, garden waste is more likely to be deposited in watercourses, hence why this is not usually permitted.
- Obstructions, culverts and bridges are not to be installed in a watercourse, unless they are designed to provide flood mitigation and reduce flood risk downstream, or are designed with flood risk in mind, and are fully consented.
- Surface water outfalls should be designed so that they meet a watercourse at an angle, and are not as liable to siltation.

4.3 MAINTENANCE AND MANAGEMENT

Ditches and watercourses should retain a 5m easement from the retaining wall or top of the bank, with access that allows for its future maintenance. Main Rivers may require up to an 8m easement, subject to Environment Agency maintenance in an area, and existing development/obstructions on the site. It is important that development does not inhibit maintenance, in comparison with the pre-development scenario.

Developing right up to a watercourse means that future maintenance is very challenging, and obstructions to high/flood flows are put in place. This is not an acceptable approach.

Some forms of maintenance may require consent for Main Rivers, from the Environment Agency, or for ordinary watercourses from Lancashire County Council. Details of the maintenance and management of the watercourse, as with a SuDS system, should be set out in writing in a site specific maintenance manual. This manual shall include details of the financial management and arrangements for the replacement of components at the end of the manufacturers recommended design life, if new installations into a watercourse are made. This forms part of the riparian responsibilities associated with all watercourses. This document is then to be submitted as part of the planning process.

Watercourses must be maintained to maintain conveyance and to manage flood risk. As demonstrated with the above image, if an easement/access is not maintained, this cannot occur safely in the future.