

# Rsl 01 Flood and surface water management

(All buildings)

## Aim

To avoid, reduce and delay the discharge of rainfall to public sewers and watercourses, thereby minimising the risk and impact of localised flooding on and off-site, watercourse pollution and other environmental damage.

## Overview

Assessment type	Available credits	Applicable assessment criteria
Fully fitted	5+1	All except 17-18
Shell and core	5+1	All except 17-18
Shell only	5+1	All except 17-18
Residential: Fully fitted	5+1	All (see ref 2.0 and 2.1)
Residential: Partially fitted	5+1	All (see ref 2.0 and 2.1)
EU Taxonomy	-	None

## Minimum standards

Rating level	Criteria
-	None

## Assessment type specific notes

Reference	Assessment type specific note
-	None

## Building type specific notes

Reference	Building type specific note
2.0	<b>Residential – Single dwellings</b> For single dwellings, criteria 5 to 16 and 25-27 are not applicable. All other criteria apply.
2.1	<b>Residential – Multiple dwellings</b> For multiple dwellings, all criteria apply except criteria 17 and 18.

## Assessment criteria

This issue is split into six parts:

- Prerequisite – Appropriate consultant
- Flood resilience – two credits
- Surface water run-off – two credits
- Surface water run-off – Single dwellings only – Two credits
- Minimising watercourse pollution – One credit
- Exemplary credit – Improve surface water run-off rate

### Prerequisite – Appropriate consultant

- 1 An appropriate consultant is appointed to carry out and demonstrate the development's compliance with all criteria.

### Flood resilience – Two credits

#### Low flood risk – Two credits

- 2 A site-specific flood risk assessment (FRA) confirms the development is situated in a flood zone that is defined as having a low annual probability of flooding (in accordance with current best practice national planning guidance). The FRA must take all current and future sources of flooding into consideration (see M5).

#### Medium or high flood risk – One credit

- 3 A site-specific FRA, developed by an appropriate consultant, confirms the development is situated in a flood zone that is defined as having a medium or high annual probability of flooding and is not in a functional floodplain (in accordance with current best practice national planning guidance). The FRA must take all current and future sources of flooding into consideration (see M5).
- 4 To increase the resilience and resistance of the development to flooding, one of the following must be achieved:
  - 4.a The ground level of the building and access to both the building and the site, are designed (or zoned) so they are at least 600 mm above the design flood level of the flood zone in which the assessed development is located (see M6)OR
  - 4.b The final design of the building and the wider site reflects the recommendations made by an appropriate consultant.

### Surface water run-off – Two credits

#### Prerequisite for surface water run-off credits

- 5 Surface water run-off design solutions must be bespoke, i.e. they must take account of the specific site requirements and natural or man-made environment of and surrounding the site. For further guidance see CN12

**Surface water run-off – Rate – One credit**

- 6 Forsites with need for improved water management (see definitions), drainage measures are specified so that the peak rate of run-off from the site to the watercourses (See definitions) shows a 30% improvement for the developed site compared with the pre-developed site. This should comply at the 1-year and 100-year return period events.  
OR
- 7 For sites where criteria 6 is not applicable, drainage measures are specified so that the peak rate of run-off from the site to the watercourses (See definitions) is no greater for the developed site than it was for the pre-development site. This should comply at the 1-year and 100-year return period events.  
AND
- 8 Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified Sustainable drainage systems (See definitions) are in place.
- 9 Calculations include an allowance for climate change. This should be made in accordance with current best practice planning guidance (see definitions).

**Surface water run-off – Volume – One credit**

- 10 Flooding of assessed buildings will not occur in the event of local drainage system failure (caused either by extreme rainfall or a lack of maintenance);  
AND  
EITHER
- 11 Specify drainage design measures that ensure post-development surface water run-off volume is no greater than the predevelopment run-off volume. Show this with calculations for a 100-year 6-hour event adjusted for climate change, timing the event at the end of the development's expected life (see criterion 16 on the next page).
- 12 Any additional predicted volume of run-off for these events (a 100 year, 6 hour event adjusted for climate change and local drainage system failure) is prevented from leaving the site by using infiltration or other sustainable drainage systems(see definitions).
- OR (only where criteria 11 and 12 above for this credit cannot be achieved):
- 13 Justification from the appropriate consultant indicating why the above criteria cannot be achieved, i.e. where infiltration or other sustainable drainage system techniques are not technically viable options.
- 14 Drainage design measures are specified to ensure that the post-development peak rate of run-off is reduced to the limiting discharge. The limiting discharge is defined as the highest flow rate from the following options:
- 14.a The pre-development 1-year peak flow rate; OR
  - 14.b The mean annual flow rate  $Q_{bar}$ ; OR
  - 14.c 2 L/s/ha.

For the one-year peak flow rate the one-year return period event criterion applies (as described in the peak run-off criteria above).

- 15 Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified sustainable drainage systems are in place.
- 16 For either option, above calculations must include an allowance for climate change; this should be made in accordance with current best practice planning guidance (see definitions).

### Surface water run-off – Single dwellings only – Two credits

For single dwellings, the criteria below apply in place of the surface water run-off criteria above (criteria 5 to 16). See building type specific note 2.0.

#### Two credits – Surface water run-off – Single dwellings only

- 17 Either of the following criteria is met:
  - 17.a There is a decrease in the impermeable area by 50% or more, from the pre-existing impermeable hard surfaces;  
OR
  - 17.b Where all run-off from the roof for rainfall depths up to 5 mm from all new and existing parts of the building have been managed on site using source control methods.  
OR

#### One credit – Surface water run-off – Single dwellings only

- 18 Either of the following criteria is met:
  - 18.a There is no increase in the impermeable surfaces as a result of the new construction;  
OR
  - 18.b If there is an increase in the impermeable surfaces as a result of the new construction then the following must be met:
    - 18.b.i Hard standing areas – where there is an extension or increase in the hardstanding areas and hence an increase in the total impermeable area as a result of the new construction, the hardstanding area must be permeable or be provided with on-site sustainable drainage systems to allow full infiltration of the additional volume, to achieve the same end result. The permeable hardstanding must include all pavements and public rights of way, car parks, driveways and private roads, but can exclude small garden paths which will drain onto a naturally permeable surface.
    - 18.b.ii Building (new-build or extension) – where there is an increase in building footprint, extending onto any previously permeable surfaces, the additional run-off caused by the area of the new-build or extension must be managed on site using an appropriate sustainable drainage system technique for rainfall depths up to 5 mm.

## Minimising watercourse pollution – One credit

- 19 There is no discharge from the developed site for rainfall up to 5 mm (confirmed by the appropriate consultant).
- 20 In areas with a low-risk source of watercourse pollution, an appropriate level of pollution prevention treatment is provided, using appropriate sustainable drainage systems.
- 21 Where there is a high risk of contamination or spillage of substances such as petrol and oil, separators (or an equivalent system) are installed in surface water drainage systems.
- 22 Where the building has chemical or liquid gas storage areas, a means of containment is fitted to the site drainage system (i.e. shut-off valves) to prevent the escape of chemicals to natural watercourses (in the event of a spillage or bunding failure).
- 23 A comprehensive and up-to-date drainage plan of the site will be made available for the building or site occupiers.
- 24 Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified sustainable drainage systems must be in place.

## Exemplary credit – Improved surface water run-off rate

- 25 One credit for Surface water run-off – Rate is achieved.
- 26 For sites with need for improved water management (see Definitions), drainage measures are specified so that the peak rate of run-off from the site to the watercourses (see Definitions) shows a 40% improvement for the developed site compared with the pre-developed site. This should comply at the 1-year and 100-year return period events.  
OR
- 27 For sites where criteria 26 is not applicable, drainage measures are specified so that the peak rate of run-off from the site to the watercourses (see Definitions) shows a 30% improvement for the developed site compared with the pre-developed site. This should comply at the 1-year and 100-year return period events.

## Checklists and tables

None

## Methodology

### M1: Calculating peak rate of run-off

The assessor is not required to perform any calculations. Calculations should be provided by the appropriate consultant to demonstrate that they have sized the drainage facilities appropriately.

Further guidance on calculating peak rate run-off for different sites and situations is found in Svenskt vatten P110.

### M2: Contaminated sites

Where the site risk assessment confirms that infiltration sustainable drainage system techniques are not appropriate, sustainable drainage system techniques that do not allow infiltration, such as swales lined with an impermeable membrane, can be used. It may be the case that only some areas of the site are contaminated and therefore infiltration sustainable drainage system techniques can be used elsewhere on the site. There may also be a requirement to remediate the contaminated soils, creating opportunities for the use of infiltration sustainable drainage system post-remediation.

### M3: Limiting discharge rate

The limiting discharge for each discharge point should be calculated as the flow rates from the pre-developed site. The calculation should include the total flow rate from the total area of the site feeding into the discharge point (this should include both BREEAM-assessed and non-BREEAM-assessed parts of the development, if applicable). The discharge point is defined as the point of discharge into the watercourse or sewers (including rivers, streams, ditches, drains, cuts, culverts, dykes, sluices, public sewers and passages through which water flows, see Definitions). Where this calculation results in a peak flow rate of less than 5 L/s, the limiting discharge rate may be increased up to a level of no more than 5 L/s at the point of discharge from the site to reduce the risk of blockage.

For example, if the flow rate for the 1-year and 100-year events were 4 L/s and 7 L/s respectively, then the limiting discharges would be 5 L/s and 7 L/s. Similarly, if it was calculated to be 2 L/s and 4 L/s, then a maximum of 5 L/s limiting discharge rate could be applied to both discharge points.

Sites should not be subdivided to enable higher overall limiting discharge rates to be claimed. It is, however, recognised that some sites may require more than one discharge point as a result of the local topography or existing surrounding drainage infrastructure, and in such cases, the limiting discharge flow rate may be increased to a level no more than 5 L/s at each discharge point. The assessor should seek evidence that the number of discharge points is necessary, either due to topography, infrastructure limitations or

both. Evidence may be in the form of a topographical map and an explanation from the appropriate consultant as to why multiple discharge points are required, stating that it is not feasible to have fewer discharge points.

#### **M4: 100-year peak rate event – excess volume of run-off**

The storage of excess flows from the 100-year event does not necessarily have to be contained within the sustainable drainage system or features (the features designed solely for the purpose of drainage). Where appropriate, storage of some or all of this volume can be achieved using temporary surface flooding of areas such as a playing field. Specific consideration should be given to overland flow routing. Overland flood flows and temporary storage of flood water on the surface must not be so frequent as to unreasonably inconvenience residents and other users.

#### **M5: Sources of flooding and flood risk**

- 1 Streams and Rivers: Flooding that can take place from flows that are not contained within the channel due to high levels of rainfall in the catchment.
- 2 Coastal or Estuarine: Flooding that can occur from the sea due to a particularly high tide or surge, or a combination of both.
- 3 Groundwater: Where the water table rises to such a height where flooding occurs. Most common in low-lying areas underlain by permeable rock (aquifers), usually due to extended periods of wet weather.
- 4 Sewers and highway drains: Combined, foul or surface water sewers and highway drains that are temporarily overloaded due to excessive rainfall or due to blockage.
- 5 Surface water: The net rainfall falling on a surface (on or off the site) which acts as run-off which has not infiltrated into the ground or entered into a drainage system.
- 6 Infrastructure failure: Canals, reservoirs, industrial processes, burst water mains, blocked sewers or failed pumping stations.

Assessment of sources should also account for predicted changes to the climate which may impact on the flood risk to the site in the future. This should be done in accordance with current best practice planning guidance (see Definitions)

#### **M6: 600 mm threshold**

For buildings located in medium and high-risk flood zones it is accepted that areas of the car park and site access may be below the 600 mm threshold and may therefore be allowed to flood. In such cases, the credit is still achievable provided safe access to the ground floor of the building can be maintained, i.e. they are 600 mm above the design flood level. This is to ensure the building and site do not become an 'island' in the event of a flood.

Where the ground levels of the topography or infrastructure immediately adjacent to the site fall below the 600 mm threshold, the credit can still be awarded if the assessed building, and access to it, meet the assessment criteria. As much of the external site area as possible (or as required by an appropriate statutory body) should be designed at or above the threshold.

## Compliance notes

Reference	Terms	Description
<b>General</b>		
CN1	Alternative standards And recommendation from an appropriate statutory body. See criteria 2 and 3.	None of the credits can be awarded where the assessed development has proceeded against the recommendation of the statutory body on the basis that the flooding implications are too great (this includes a recommendation given by the statutory body even where such a recommendation cannot be, or is not, statutorily enforced). Where the local authority (or other statutory body) has set more rigorous criteria than those above these must be met in order to achieve the relevant credits.
CN2	Contaminated sites. See criteria 6–18	Drainage designs for sites must take into account legislation relating to contaminated sites; however in many circumstances even on contaminated sites there may be opportunities for the installation of some sustainable drainage system techniques. For more details, see M2.
<b>Flood resilience</b>		
CN3	Scope of FRA	The flood risk assessment shall give an assessment of the development site's risk of flooding before any work on the property and without specified solutions.
CN4	Functional flood plain	The BREEAM credit for locating in a flood zone of 'medium or high annual probability' cannot be awarded where the building is located in the functional flood plain. This is defined in the current best practice national planning guidance for each country. If the building assessed has been defined as a 'water-compatible development' by the local authority, confirmation must be provided by them of this designation and that they are satisfied with the proposals.
CN5	Flood defences. See criteria 2, 3, and 4	<p><b>Third party defences</b></p> <p>There are many landscape feature defences, owned by third parties, which due to their location act as a flood defence by default, e.g. motorway, railway embankments, walls etc. It can be assumed that such embankments will remain in place for the lifetime of the development, unless the assessor or project team have reason to believe otherwise. For walls, assurance must be sought that the wall is likely to remain for the design life of the building.</p> <p><b>Pre-existing flood defences</b></p> <p>In an area protected by existing flood defences (designed to withstand a certain magnitude of flooding) the appropriate number of flood risk credits can be awarded where the defences reduce the risk to 'low' or 'medium' and the following conditions are met:</p> <ol style="list-style-type: none"> <li>1. The development is not located in an area where new flood defences have to be, or have been, constructed to minimise the risk of flooding to the site and its locality purely for the purpose of the development or its wider master plan</li> <li>2. The relevant agency confirms that, as a result of such defences, the risk of a flood event occurring is reduced to low or medium risk. If firm confirmation is not provided then the credit cannot be awarded.</li> </ol> <p>A statutory body's local or regional office may be able to provide more information on existing defences in the area in which the assessed development is located.</p>
CN6	Level of detail required in the FRA for smaller sites. See criteria 2 and 3.	For smaller sites, e.g. less than 1 ha (10,000 m <sup>2</sup> ), the level of detail required in an acceptable FRA will depend on the size of the site and the arrangement of buildings on that site. For a small site with a relatively normal arrangement of buildings this might consist of a brief report. For larger sites with a higher density of buildings a more detailed assessment would be appropriate. For small normal sites (2000 m <sup>2</sup> and less), an acceptable FRA could be a brief report carried out by the contractor's engineer confirming the risk of flooding from all sources of flooding, including information obtained from the water company or sewerage undertaker, other relevant statutory authorities, site investigation and local knowledge.

Reference	Terms	Description
<b>Surface water run-off</b>		
CN7	Sites with many buildings	<p>Where the assessed building is part of a larger development of buildings, there are a number of options for assessment of the surface water run-off credits:</p> <ol style="list-style-type: none"> <li>1. The individual building and its associated hardstanding areas can be assessed independently where the run-off is being dealt with on a building-by-building basis (i.e. each building has its own dedicated sub-catchment that serves only that building)</li> <li>2. When assessing the run-off from a number of buildings (including domestic and non-domestic buildings) the assessment must take into account the drainage from the local sub-catchment serving all those dwellings or buildings. Note that proportioning cannot be used to calculate the percentage of run-off discharging into the local sub-catchment resulting from just the assessed building</li> <li>3. The whole development can be assessed for compliance.</li> </ol> <p>Whichever approach is taken to demonstrate compliance, it must be consistent when completing both the rate of run-off and volume of run-off calculations.</p>
CN8	Discharge to the sea or tidal estuaries	<p>The peak rate of run-off and volume run-off criteria can be deemed to be met by default if the site discharges rainwater directly to a tidal estuary or the sea.</p> <p>The site must discharge run-off directly into the tidal estuary or the sea, if these criteria are to be awarded by default. Typically, this would mean that drainage pipes would only carry run-off from the site and that they would not need to cross privately owned land outside the boundary of the development before reaching the sea. For a definition of tidal estuary, please see Definitions.</p>
CN9	No change in impermeable area	<p>Where the man-made impermeable area draining to the watercourse (natural or municipal) has decreased or remains unchanged post-development, the volume of run-off requirements (criteria 11-16) can be considered as met. Volume calculations will not need to be provided. Instead, drawings clearly showing the impermeable areas of the site draining to the watercourse should be provided for the pre- and post-development scenarios. Figures must also be given (ideally on the drawings) to show a comparison between the areas of drained impermeable surfaces pre- and post-development. In this instance, it is still recommended that any opportunities identified to reduce surface water run-off are implemented.</p> <p>Note 1: Compliance with criterion 10 (regarding 'exceedance') must still be demonstrated.</p> <p>Note 2: Where the above is applied and the 'Surface water run-off - rate' credit is not targeted, criterion 5 does not need to be met.</p>
CN10	Limiting discharge flow rate. See criterion 14	<p>For the surface water run-off credits, where the limiting discharge flow rate would require a flow rate of less than 5 L/s at a discharge point, a flow rate of up to 5 L/s may be used where required to reduce the risk of blockage.</p>
CN11	Derelict sites. See criteria 6, 9, 13, 14 and 16	<p>If the site has been derelict for over five years, the appropriate consultant must assess the previous drainage network and make reasonable assumptions to establish probable flow rates and volumes. To do this they should use best practice simulation modelling to determine the 1-year and 100-year peak flow rates at the relevant discharge points. To complete the calculations, a site visit prior to development will be required unless accurate data already exist from a previous survey. The resultant professional report can then be used to determine the pre-development volumes and rates of run-off</p>

Reference	Terms	Description
CN12	National best practice	<p>Best practice guidance in surface water management and sustainable drainage systems is found in Svenskt Vatten P110 and P105.</p> <p>MCF (Myndigheten för Civilt Försvar, formally known as MSB) is responsible for the flood risk directive (2007/60/EG) and to provide the local authorities, such as the municipalities and the county administrative board (Länsstyrelsen), with flood maps.</p> <p>Information on sewers can be found from sewerage undertakers (VA-huvudmän) whom are a part of one or more municipalities.</p> <p>Other relevant data, reports and examples are gathered by the authority network for adaption to climate change (Myndighetsnätverket för Klimatanpassning) and is available on their webpage <a href="http://klimatanpassning.se">klimatanpassning.se</a>.</p>
<b>Minimising watercourse pollution</b>		
CN13	5 mm discharge for minimising watercourse pollution. See criterion 19.	In a small number of sites it may not be possible for the first 5 mm of rainfall to be prevented from leaving the site completely. Where this is the case, an appropriate consultant must design the system to ensure that the intent of this criterion has been met as far as possible and provide justifications to explain why the criterion could not be fully achieved on the site. Where this can be justified, the awarding of the water quality credit would not be affected, provided all other relevant criteria have been achieved.
CN14	5 mm requirement – end-of-pipe solutions. See criterion 19.	End-of-pipe solutions, such as ponds and basins, will only be deemed to comply with the 5 mm criteria where the principal run-off control to prevent discharge from the first 5 mm of a rainfall event is achieved using source control and site control methods.
CN15	5 mm requirement – green roofs. See criterion 19.	Green roofs can be deemed to comply with this requirement for the rain that falls onto their surface. However, evidence is still required to demonstrate that the 5 mm rainfall from all other hard surfaces on site is being dealt with, to allow this credit to be awarded.
CN16	Areas that are a source of pollution. See criteria 21 and 22	For the purpose of assessing the watercourse pollution credit, an area that presents a risk of watercourse pollution includes vehicle manoeuvring areas, car parks, waste disposal facilities, delivery and storage facilities or plant areas.
CN17	Extension or infill building on existing site	Where the assessment is of an individual building on an existing site, i.e. infill development, the watercourse pollution criteria apply to areas within the construction zone that present a risk of pollution, as well as any areas external to the construction zone that are affected by the new works, i.e. drainage onto or from the proposed development.
CN18	Suitable level of treatment. See criteria 17–20.	In all cases the appropriate consultant should use their professional judgment to determine the most appropriate strategy for minimising watercourse pollution.
CN19	Roof plant. See criteria 22, 23 and 17	Roof-top plant space must be considered where there is a risk from polluting substances such as petrol or oil. Refrigerants are not assessed under the pollution aspect of this issue, as the main risk of pollution is to air and not the watercourse.
CN20	Permeable paving system	Where it can be demonstrated that a permeable paving system designed to retain silts and degrade oils has been used, then this will meet the assessment criteria for minimising watercourse pollution for car parks and access roads.
CN21	No water courses present	<p>The credit for ‘minimising water course pollution’ has to be assessed even in cases where no water courses are in close vicinity to the site under assessment. This is because the aim of this credit is to encourage developments to minimise water course pollution by restricting the discharge of potentially contaminated water from entering the public sewer.</p> <p>Minimising water course pollution does not focus on water directly entering water courses.</p>

## Evidence

Criteria	Interim design stage	Post construction stage
<b>Prerequisite</b>		
1	Appointment of an appropriate consultant and confirmation they are qualified in line with the definition.	Evidence to show an appropriate consultant was appointed.
<b>Flood risk</b>		
2-3	Copy of a compliant flood risk assessment (FRA).  Evidence to confirm that the site is not a functional flood plain, where applicable.	Copy of a compliant flood risk assessment (FRA), updated as necessary. OR Confirmation that the basis of the flood risk assessment has not changed where more than five years have passed since the flood risk assessment was carried out.
4	Evidence to show measures to increase resilience and resistance of the development to flooding: 1. Confirmation of the design flood level and design drawings to show ground level of all habitable parts of the building and access to the site and buildings to be at least 600 mm above this. OR 2. Report or correspondence from an appropriately qualified professional which includes recommendations for the design of the building and site. Evidence to confirm these are to be implemented such as design drawings, sections of the building specification, contract clauses or commitment letter.	Evidence to show measures to increase resilience and resistance of the development to flooding have been implemented: 1. Confirmation of the design flood level and final construction or equivalent drawings to show ground level of all habitable parts of the building and access to the site and buildings to be at least 600 mm above this. OR 2. Report or correspondence from an appropriately qualified professional which includes recommendations for the design of the building and site. Evidence to confirm these have been implemented within the final design such as final construction or equivalent drawings and assessor site inspection report.
<b>Surface water run-off</b>		
5	Consultant's report confirming the site-specific surface water-run off design solutions, in line with the priority levels.	Final construction drawings or equivalent showing installed surface water drainage solutions.
6, 7, 26, 27	Evidence of whether criteria 6 or 7 is deemed applicable	Evidence of whether criteria 6 or 7 is deemed applicable.
6, 7, 9, 11-14, 16, 26, 27	Calculation results to show the predevelopment and post-development peak rate of run-off and volume of run-off.  Surface water drainage report, statement or design drawings to confirm the proposed drainage design.  Where credits awarded based on the impermeable area being reduced: drawings showing the impermeable areas pre- and post-development, including areas.  Details of any opportunities identified to reduce surface water-run-off.	Calculation results to show the predevelopment and post-development peak rate of run-off and volume of run-off, updated where required.  Details of installed drainage measures.  Where credits awarded on the basis of impermeable area reducing: Drawings to show the pre-development and final construction drawings showing the post-development impermeable areas for the site and calculations for the change in impermeable area, updated where required.
8, 15	Relevant section or clauses of the building specification or contract. OR Letter of commitment	Evidence to confirm that maintenance responsibilities have been defined for any sustainable drainage solutions installed
10	Information showing the proposed drainage solution, system failure flood flow routes, potential flood ponding levels and ground floor levels	Information showing the proposed drainage solution, system failure flood flow routes, potential flood ponding levels and ground floor levels, updated with final construction evidence where the design has changed.

Criteria	Interim design stage	Post construction stage
<b>Surface water run-off – Single dwelling</b>		
17-18	<p>Drawings showing the impermeable areas pre and post-development, including areas.</p> <p>AND / OR</p> <p>Where relevant, calculations and drainage drawings to show that all run-off from roofs for rainfall depths up to 5 mm has been managed on-site using source controls methods.</p>	<p>Written confirmation from the developer or appropriate consultant that the solutions assessed at the design stage have been implemented.</p> <p>OR</p> <p>Where the design has changed, revised drainage calculations/plans must be provided.</p> <p>Final construction drawings or equivalent showing installed site and drainage solutions for the site.</p>
<b>Minimising watercourse pollution</b>		
19	<p>Calculations and confirmation from the appropriate consultant to demonstrate that there will be no discharge from the site for rainfall up to 5 mm.</p>	<p>Assessor's building or site inspection and photographic evidence.</p> <p>AND EITHER</p> <p>Written confirmation from the developer or suitably qualified consultant that the solutions assessed at the design stage have been implemented.</p> <p>OR</p> <p>Where the design has changed, the evidence identified for the design stage assessment is provided for post-construction or final construction details.</p>
20-22	<p>Design drawings or relevant section or clauses of the building specification or contract indicating:</p> <ol style="list-style-type: none"> <li>1. High and low risk areas of the site.</li> <li>2. Specification of sustainable drainage systems, source control systems, oil or petrol separators and shut-off valves as appropriate.</li> </ol>	<p>Assessor's building or site inspection and photographic evidence.</p> <p>AND EITHER</p> <p>Written confirmation from the developer or suitably qualified consultant that the solutions assessed at the design stage have been implemented.</p> <p>OR</p> <p>Where the design has changed, the evidence identified for the design stage assessment is provided for post-construction or as-built details</p>
23	<p>Relevant section or clauses of the building specification or contract.</p> <p>OR</p> <p>Letter of commitment.</p>	<p>Letter of confirmation.</p> <p>As-built drainage plan.</p>
24	<p>Relevant section or clauses of the building specification or contract.</p> <p>OR</p> <p>Letter of commitment.</p>	<p>Evidence to confirm that maintenance responsibilities have been defined for any SuDS solutions installed.</p>

## Definitions

### Appropriate consultant

A consultant with qualifications and experience relevant to designing sustainable drainage systems and flood prevention measures and completing peak rate of run-off calculations. Where complex flooding calculations and prevention measures are required, this must be a specialist hydrological engineer.

**Appropriate statutory body**

This refers to the statutory organisation, legal organisation or entity whose duty it is to carry out the planning approval function for the project.

**Catchment**

The area contributing surface water flow to a point on a drainage or water course. It can be divided into sub-catchments.

**Current best practice planning guidance**

The information include independently published figures for an allowance for climate change (based on IPCC projections) according to the annual probability of flooding in the area. Swedish best practice planning guidance can be found at SMHI and Boverket.

**Design flood level**

The maximum estimated water level during the design storm event. The design flood level for a site can be determined through either known historical data or modelled for the specific site.

**Design storm event**

Historic or notional weather conditions of a given annual probability, against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

**Discharge point**

The discharge point is the point at which the run-off from the site leaves the site boundary and enters a watercourse or sewers (including rivers, streams, ditches, drains, cuts, culverts, dykes, sluices, public sewers and passages through which water flows).

**Flood defences**

Flood defences do not completely remove the risk of flooding, but they do reduce it. Building in areas where flood defences are present (and appropriately designed to withstand a certain magnitude of flooding) is therefore preferable to building in medium or high-risk areas without defences. However, for the purpose of this issue, it is still preferable to build in areas of low risk than encourage development of new flood defences in areas with a higher risk of flooding purely for the sake of new development.

**Flood event**

A flooding incident characterised by its peak level or flow, or by its level or flow hydrograph.

### **Flood probability**

The estimated probability of a flood of given magnitude occurring or being exceeded in any specified time period. For example, the 100-year flood has a 1% chance of occurring in any given year.

### **Flood risk**

The combination of the flood probability and the magnitude of the potential consequences of the flood event.

### **Flood risk assessment**

A study to assess the risk of a site flooding, and to assess the impact that any changes or development on the site will have on flood risk to the site and elsewhere. A Flood Risk Assessment (FRA) should be prepared according to relevant planning policy and technical guidance documents. Confirmation must be based on historical, geological and geomorphic data (e.g. altitude) and take all sources of flooding into consideration. The FRA must account for future climate change and detail any necessary adaptation measures if required. Where more than five years have passed since the FRA was carried out, evidence would be required to demonstrate that the basis of the FRA has not changed in that time.

### **Flood storage**

The temporary storage of excess run-off or river flow in ponds, basins, reservoirs or on the flood plain during a flood event.

### **Hard surfaces**

These include roofs, car parks, access roads, pavements, delivery and service yards and external hard landscaping. Footpaths less than 1.5 m wide which have free drainage to soft landscaped areas on both sides may be excluded.

### **Infiltration**

The passage of water into a permeable surface, such as soil, permeable paving and soakaways.

### **Limiting discharge**

The limiting discharge is based upon the calculated pre-development flow rate at a discharge point.

### **Level of pollution prevention treatment**

When used in the context of one, two or three levels of treatment for surface water, the treatment level should be regarded as the number of sustainable drainage systems

components in series through which run-off passes from the originating surface on which rainfall fell to the site discharge point. Where a sustainable drainage systems component has more than one treatment process, it might be considered to provide more than one level of treatment. In these circumstances advice should be sought from the BREEAM office.

### **Low-risk areas (with respect to watercourse pollution)**

Low-risk areas can be defined as areas where the risk of contamination or spillage of substances such as petrol and oil is reduced. For the purpose of this issue, roofs and small car parks may be considered as low-risk areas.

### **Peak run-off rate, $Q_p$ [ $m^3/s$ ]**

This is the highest rate of flow from a defined catchment area assuming that rainfall is uniformly distributed over the drainage area, considering the entire drainage area as a single unit and estimation of flow at the most downstream point only.

### **Pre-development**

The state of the site under assessment immediately prior to purchase of the site by the client or developer (or, where the client has owned or occupied the site for a number of years, its current state).

### **$Q_{bar}$**

An estimation of the mean annual flood flow rate from a catchment (see Report IH124 Flood estimations for small catchments).

### **Rainwater discharge**

Rainwater discharge is the rainwater which flows from the development site to watercourses and sewers. It is also referred to as run-off.

### **Run-off**

This is usually rainwater, but can also be groundwater or overspill from sewers and other sources.

### **Sewerage undertaker**

This is a Body, typically a water company, with statutory responsibility for sewerage and sewerage disposal and also surface water from roofs and yards of premises. Sewerage undertaker (VA-huvudmän) are a part of one or more municipalities with responsibility for sewerage and water supply.

## Sites with need for improved water management

Sites with need for improved water management is for this issue defined as at least one of the following:

- Where the watercourse receiving water run-off from the site is categorised with ecological status moderate (måttlig) or lower in VISS watermap.
- The municipal or local drainage system the site is or will be connected to is a combined system, i.e. stormwater run off and wastewater in the same pipes.
- Contaminated sites where the site risk assessment confirms that infiltration sustainable drainage system techniques are not appropriate, see M2.

## Soakaways

A subsurface structure designed to promote the infiltration of surface water into the ground. As a general point, soakaways may be shallow and broad – as in a blanket under permeable paving, or deeper structures. Deeper, point source soakaways should be avoided for road and car park drainage; shallow structures providing infiltration in an extensive way (infiltration trenches and permeable paving) do not need oil separators.

## Surface water run-off

Water flow over the ground surface to a drainage system. This occurs if the ground is impermeable, is saturated or if the rainfall is particularly intense.

## Sustainable Drainage systems

One or more components built to manage surface water run-off to prevent flooding and pollution, including both infiltration solutions and solutions for delay. For example: wet ponds, infiltration basins, detention basins, swales, reed beds, pervious (porous or permeable) paving, soakaways, rainwater reuse, filter strips, filter drains and trenches with or without perforates pipes, green roofs and underground attenuation storage. For more information see P105 from Svenskt Vatten

## Sustainable drainage systems management train

An approach to drainage design that combines a sequence of appropriate surface water drainage structures using Sustainable drainage systems for management of the run-off to treat the flow, reduce run-off volume and restrain the run-off rate in order to minimize man's impact on the environment. Additional benefits associated with operation and maintenance, ecology and amenity are aspects which are considered when designing a management system. The management train incorporates a hierarchy of techniques:

- 1 Source control. Examples of Sustainable drainage system techniques include:
  - 1.a Soakaways
  - 1.b Porous or pervious paving
  - 1.c Roof water directed to garden (rather than piped drains)

- 1.d Rainwater reuse
- 1.e Green roofs
- 1.f Other surface infiltration, attenuation and conveyance techniques that deal with run-off at source.
- 2 Site or local control. Examples of Sustainable drainage systems techniques include:
  - 2.a Swales
  - 2.b Pond
  - 2.c Infiltration basins
  - 2.d Detention basin
  - 2.e Larger soakaways
  - 2.f Pervious (porous or permeable) paving.
- 3 Regional control. Examples of techniques include:
  - 3.a Balancing ponds
  - 3.b Wetlands
  - 3.c Large detention basin.

### Tidal estuary

A tidal estuary is defined as a semi-enclosed coastal body of water which has a free connection with the open sea and within which seawater is measurably diluted with fresh water derived from land drainage. An estuary should be unconstrained tidal waters, i.e. there should be no barriers or constricted shorelines that would restrict the free flow of water into the open sea in any conditions. The impact on the total volume of run-off from the site (and other sites which may in future discharge into the estuary) should be insignificant in terms of the overall water levels in the estuary. Tidal rivers (i.e. where no or limited measurable seawater content is present during normal tidal movements) cannot be included as part of the estuary for the purposes of BREEAM.

### Treatment

Improving the quality of water by physical, chemical or biological means.

### Types of oil separator

- **Class 1 separators:** These are designed to achieve a concentration of less than 5 mg/l oil under standard test conditions. They should be used when the separator is required to remove very small oil droplets, such as those arising from car park run-off.
- **Class 2 separators:** These are designed to achieve a concentration of less than 100 mg/l oil under standard test conditions. They are suitable for dealing with discharges where a lower quality requirement applies or for trapping large spillages. Both classes can be produced as 'full retention' or 'bypass' separators.
- **Full retention separators:** These treat the flow that can be delivered by the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 50 mm/hr.
- **Bypass separators:** These fully treat all flows generated by rainfall rates of up to 5 mm/hr. Flows above this rate are allowed to bypass the separator. These separators

are used when it is an acceptable risk not to provide full treatment for high flows. Pollution Prevention Guideline 3 contains more detailed guidance on the selection and sizing of an appropriate type of separator.

**Volume of run-off**

The volume of run-off that is generated by rainfall occurring on the site. This is typically measured in cubic metres. Additional predicted volume of run-off is the difference between the volumes of run-off pre-development and post-development.

**Watercourses and sewers**

A term that includes rivers, streams, ditches, drains, culverts, dykes, sluices, sewers and passages through which water flows. The recipients of drainage water from a property, directly or through drainage pipes.

**Additional information**

None