7.4.4 Source Control - managing runoff at source

Source Control features include pervious surfaces, filter strips, green / blue roofs, and some basins and swales. Source control features slow the flow of runoff, and remove the worst pollution at the beginning of the management train.

Source control features protect the remaining parts of the management train, enhancing amenity and biodiversity within the development.

Source control also ensures that SuDS components are less susceptible to erosion further down the management train, as runoff is not conveyed at peak flow rates along the system, thereby increasing the potential for interception losses.

Design Note:

Source Control features, such as pervious pavements and blue-green roofs, can be designed to attenuate all of the 1 in 100 + CCA storage, with the introduction of a simple flow control device.

A basin without source control can result in silt, oil and litter pollution that reduces both the amenity and biodiversity value of the feature.

7.4.5 Conveyance of runoff between SuDS components

Runoff should travel along the management train at or near the surface wherever possible. The features commonly used for this purpose are swales or other vegetated channels and hard-surfaced channels such as rills, gutters or dished channels in a more urban context. Conveyance is also possible through permeable pavement sub-base as well as filter drains and under-drained swales.

Surface conveyance can provide the following benefits:

- a reduction in infrastructure costs
- increased interception losses
- treatment of pollution
- ease of maintenance
- easily understood SuDS – legibility
- connectivity for wildlife
- attractive landscape features.

Where runoff is conveyed below ground through a pipe, for example connecting one SuDS component to the next to facilitate crossing under a road or pathway, the invert level of the pipe should be kept as shallow as possible to re-connect flow into surface SuDS features. Pipes should ideally only be used as short connectors, without inspection chambers or bends, to reduce the risk of blockage and allow simple rodding or jetting when necessary.

The CIRIA SuDS manual (Page 876) notes that:

> **“SuDS design usually avoids use of below-ground structures such as gully pots, oil interceptors, and other sumps which are a wildlife hazard, often ineffective and expensive to maintain.”**

Identification of surface or shallow sub-surface conveyance at the Concept Design stage is important to ensure that these pathways are retained through the remaining design process.

Conveyance swale at Waseley Hills High School, Worcestershire.

7.4.6 Introducing sub-catchments

Many drainage designs adopt an approach where all flows are taken to the lowest point of the site and attenuated in a single location, often referred to as a **‘pipe-to-pond’** or ‘pipe to box’ approach.

The ‘pipe to pond’ approach can result in unsightly, polluted and sometimes hazardous pond or basin features that offer little amenity or wildlife benefit. The ‘pipe to box’ approach results in below-ground structures that provide no amenity or wildlife benefit at all. All end of pipe solution may fill with silt and generate management problems.

When integrating SuDS into a development, the site should be divided into sub-catchments to maximise treatment and storage capacity.

The sub-catchment boundary is usually defined as the surface area which drains to a particular flow control, and can be considered as a mini-watershed.

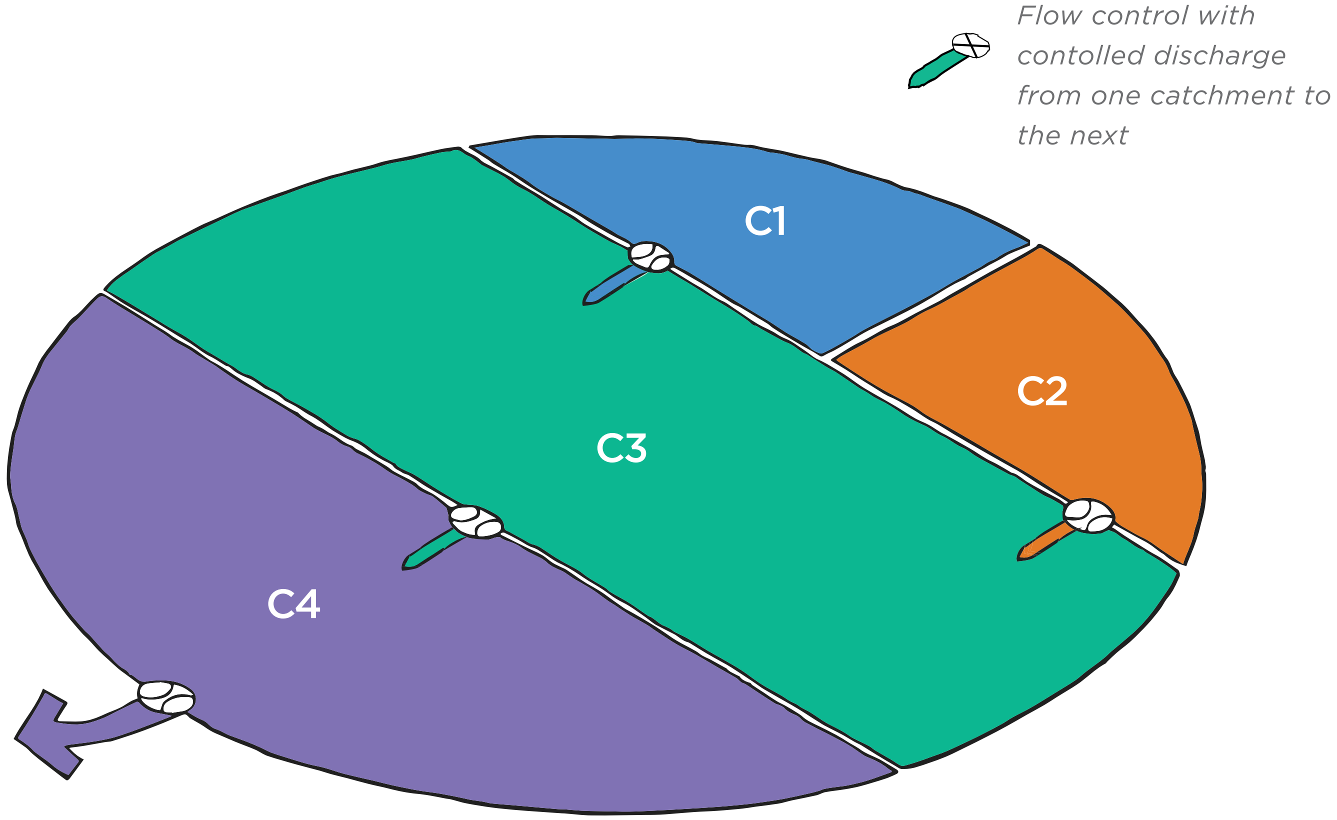
Flows are conveyed from one sub-catchment to the next along one or more management trains, following the modified flow routes determined early in the design process.

Each sub-catchment contributes flows to the following sub-catchment or to an outfall.

Controlled flows are released from one sub-catchment feature to the next, as here at Birchen Coppice Primary School, Kidderminster.

A flow control generally defines the downstream end of a sub-catchment, with the flow control situated at the lowest topographical point within the sub-catchment in locations that are accessible for inspection and maintenance.

Concept Design drawings should identify sub-catchment boundaries with associated storage and flow control locations throughout the development.



Sub-catchments are generally defined by flow controls. Flows are conveyed from one sub-catchment to the next.

Design Note:

Integrating storage within sub-catchments, as part of site layout, greatly reduces the land take requirement for attenuation, by exploiting the inherent storage capacity of individual SuDS features.

7.4.7 Managing pollution

The treatment required to mitigate pollution depends upon the level of pollution hazard. An adequate number (and type) of SuDS components is required in order to intercept or break down pollutants.

Source control components are introduced at the beginning of any management train to protect the development and meet amenity and biodiversity criteria within the site.

The following table is based on the requirements for discharge to surface waters set out in the SuDS Manual, Chapter 26, Water quality management: design methods, (CIRIA, 2015).

Discharge to surface water (usually on impermeable soils)

Contributing Surface Type	Pollution Hazard Level	SuDS Components
Residential roofs	Very Low	Discharge to any SuDS components
Normal commercial roofs	Low	Discharge to any SuDS components
Leachable metal roofs	Low but polluting	Bioretention or source control with one or two further SuDS components. Refer to Detail Design Section
Driveways, residential, car parks, low traffic roads, low use car parks (schools and offices)	Low	Permeable pavement or source control with one SuDS component
Commercial yards, delivery areas, busy car parks, other low traffic roads (except trunk roads and motorways)	Medium	Permeable pavement or source control with one or two further SuDS components. Refer to Detail Design Section
Haulage yard, lorry parks, waste sites, sites handling chemicals and fuels, industrial sites (for trunk roads and motorways follow Highways Agency risk assessment process).	High	Carry out detailed risk assessment and consult with the environmental regulator.

Additional considerations for infiltrating soils

- Discharge to protected waters or protected groundwater (e.g. SSSI or SPZ's) may require additional treatment stages and liaison with the environmental regulator.
- More general discharge to groundwater (usually infiltrating soils) can be referenced in table 26.4 of the SuDS Manual.
- Medium pollution hazard level developments will require risk screening to determine appropriate mitigation measures. Refer to table 26.5 and 26.6 of the SuDS Manual
- For developments of a high pollution hazard level a detailed risk assessment will be required.

Typical diffuse urban pollution concentrated at a conventional gully.

Linear swales alongside an entrance path at this infiltration SuDS project, Burlish Primary School.

7.4.8 Method of discharge – how rainfall leaves the site

Rainfall should not discharge into the foul sewer.

The way that rainfall leaves a development should follow the preferred hierarchy:

1. re-use on site
2. infiltration into the ground
3. a natural watercourse
4. surface water sewer
5. combined sewer.

The final swale at Bewdley School is a colourful outfall into the existing watercourse.

7.4.9 Preliminary flow and volume calculations

It is convenient to consider flow and volume requirements at this stage in the design process to ensure that natural losses are replicated and sufficient volumes of runoff can be temporarily accommodated to allow for discharge from site via a flow control and/or infiltration.

In some circumstances, for example where development is speculative, it may be acceptable for the Concept Stage to omit flow and volume calculations, but a Modified Flow Route analysis will be required to show that runoff can be effectively conveyed to a discharge location.

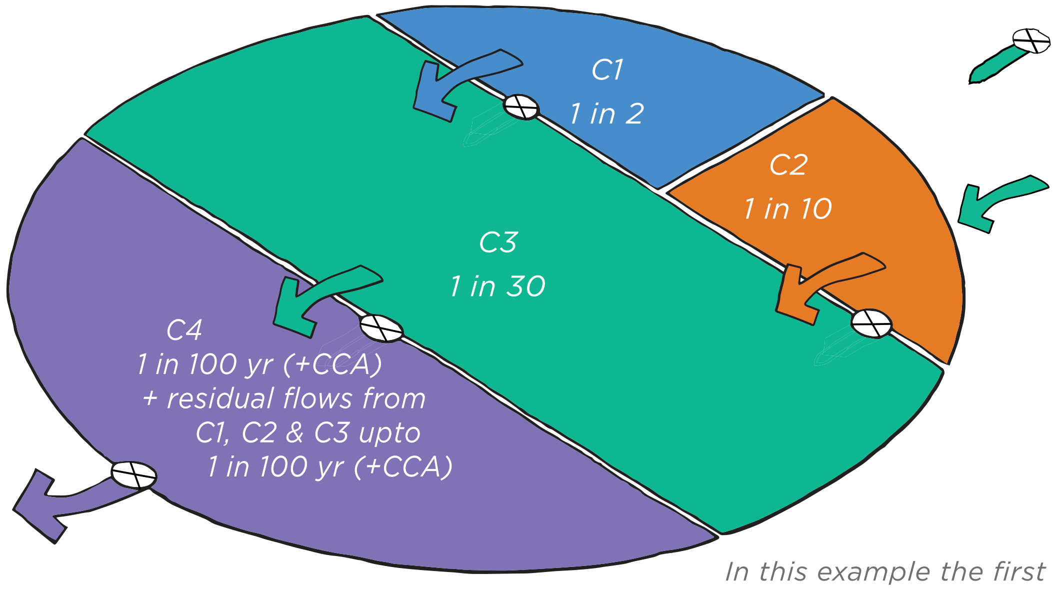
Storage volumes are usually presented as a single volume.

This form of expression encourages the 'pipe to pond' practice and prevents simple comparison of storage values between similar sites.

Expressing storage as 'volume per m^2' allows the designer to allocate storage throughout a site in discrete sub-catchments, and provides a straightforward way for the evaluation team to check that calculated storage volumes are acceptable.

Ideally each sub-catchment will manage its own runoff up to the 1 in 100 year return period rainfall event. Where this is not viable, part of the storage volume will be provided depending upon the opportunities for storage within the subcatchment, with all residual flows cascaded into an adjacent sub-catchment or 'site control'.

This approach maximises the opportunity for storage throughout the development.



Each catchment may only control and attenuate runoff up to lesser rainfall events (eg. 1 in 2 years, 1 in 10 year, 1 in 30 years) with residual flows passing into the next subcatchment.

In this example the first three catchments (C1, C2 & C3) only partially attenuate their own runoff, with residual flows passing into catchment C4 where these residual flows must be attenuated, along with C4's own runoff, to the maixmum design storm (eg. 1 in 100 + CCA).

7.4.10 Infiltration

After any allowances have been made for the potential to harvest runoff, the next consideration in managing flows and volumes is to assess the ability of a site to infiltrate rainfall completely, partially, or discharge largely as runoff.

The ability of a site to infiltrate water should be evaluated considering:

- the nature of the soil geology and capacity to infiltrate
- the risk to stability of the ground where infiltration is proposed
- the risk of pollution to groundwater
- the depth of seasonal groundwater
- the risk of unpredictable pathways being taken by infiltrating water.

Infiltration will generally be possible if the infiltration rate is 1 x 10^{-5} ms (36mm/hr) or greater, subject to the soil and subsoil retaining infiltration capacity following construction or site disturbance. Infiltration is still viable on sites with lower infiltration rates, however additional storage capacity would be required to allow time for flows to infiltrate.

Measures must be taken to protect infiltration capacity during construction. Compaction of soil layers may affect the ability of sites with infiltration rates lower than 1 x 10^{-5} to allow water to soak into the ground. These sites are particularly susceptible to damage due to construction activity.

The depth and location of infiltration tests should reflect where infiltration is proposed on site. Shallow features such as permeable pavements will require shallow infiltration tests.

Guidance exists which states that where infiltration features are situated within 5m of foundations, the risk to the foundations should be considered. This is usually applied as a general rule where infiltration within the 5m offset from the foundation is not permitted. However, the guide was originally intended for point infiltration soakaways in susceptible soils. SuDS design encourages ‘blanket infiltration’ features that are less likely to affect soil conditions, as they mimic grass surfaces around buildings. The distance offset for infiltration will be at the professional judgment of a suitably qualified engineer.

Additional site investigations will be necessary to assess risks associated with infiltration, and should follow guidance in the CIRIA SuDS Manual 2015, Chapter 25 p543.

BGS Infiltration SuDS map

www.bgs.ac.uk

Using SuDS Close to Buildings

www.susdrain.org

Risks Associated with Infiltration

CIRIA SuDS Manual 2015, Chapter 25

7.4.11 Managing runoff from site

If the site does not infiltrate effectively over all return periods, then rainfall will leave the site as runoff to a watercourse, the surface water sewer or combined sewer. The greenfield flow rates from the site must be calculated, and then attenuation volumes determined.

Rainfall calculations are necessary, even at Concept Design stage, to gain an idea of volumes of runoff to be stored on site.

These calculations can also be used at the Outline Design stage, but may need to be re-assessed at the Detail Design stage.

New hard surfaces that are introduced through development increase both the rate and volume of runoff. This is because runoff flows more quickly from the site, and natural volume losses do not happen as they did before development.

The additional rate of runoff is managed through **attenuation storage**.

Some of the pre-development volume losses can be mimicked by using SuDS components to demonstrate interception losses and ongoing losses (Long Term Storage). Other methods such as rainwater harvesting will further reduce the additional volume generated by the development.

The approach to managing flows and volumes from developments - set out in the NSTS - seeks to minimise the impact of the additional volume generated by development as well as control the rate of runoff to pre-development patterns.

It allows a variable ‘greenfield rate’ of runoff from development between the 1 in 1 and 1 in 100 year return periods with the additional volume generated by the development allowed to discharge at a maximum of 2 litres per second per hectare. This approach **(Approach 1)** is now the preferred method set out in the 2015 SuDS Manual. Managing flows and volumes to a single Qbar discharge rate **(Approach 2)** may be acceptable if Approach 1 can be shown to be unachievable.

See Section 7.4.13 for more info on

Flow rate calculations

Design Note:

The website **www.uksuds.com** provides estimation tools for the calculation of ‘greenfield runoff rates’, ‘attenuation’ volumes and ‘long-term storage’ volume losses.

7.4.12 Attenuation storage - managing restricted flow rates

Attenuation is the temporary storage of surface water at or near the surface in a suitable feature. Attenuation is required when the rate of runoff being generated by a rainfall event (**inflow**) is greater than the allowable discharge rate (**outflow**) from the development. Discharge from the feature is restricted by a **flow control** which allows the stored water to drain down slowly.

The inflow of rainfall is calculated by multiplying the **design rainfall** by the **developed area**.

The developed area may be subject to an **Urban Creep** factor to take into account the creation of additional impermeable surfaces following development (such as extensions, additional parking and paving). This can increase attenuation volumes by up to 10%.

The **design rainfall** is determined using historic records to predict how much rainfall is likely to occur at a particular location and over a given **return period**. The data is then used in attenuation calculations to calculate runoff and inflow into SuDS components.

The design rainfall may be subject to a **Climate Change Allowance (CCA)**, applied to rainfall intensity values. CCA is intended to anticipate future increases in rainfall intensities, and is currently estimated to range between 5% and 40%. As it will impact upon attenuation volumes, the appropriate figure should be considered at Concept Design stage.

The term '100-year rainfall event' is used to define rainfall (intensity and duration) that statistically has a 1% chance of occurring in any given year. This can also be expressed as a 1 in 100 year event or 1% Annual Event Probability (AEP).

In SuDS design it is useful to use a range of return periods to identify everyday rainfall (e.g. 1 in 1 or 1 in 2 year events), occasional rainfall (e.g. 1 in 10 year events) and exceptional rainfall (e.g. 1 in 30 or 1 in 100 year events). This enables the allocation of different volumes in different places, and encourages the use of sub-catchment design.

Attenuation occurs within permeable pavement sub-base and these attractive 'canals' at this 106 units per hectare housing development at Riverside Court, Stamford. Permeable paved areas are unlined and demonstrate significant losses for further volume control.

Design Note:

The Designer should consider the implications of **Climate Change, Urban Creep** and how flows will be controlled (**Approach 1** or **Approach 2**) as these can significantly impact the amount of attenuation storage calculated.

Qbar and **Qmed** are terms used to describe the average Greenfield runoff rate. Qbar and Qmed are derived using different equations but should result in similar values, as both relate to a return period of approximately 1 in 2 year. Qbar / Qmed are used to define the **maximum outflow** rate for **Approach 2**.

7.4.13 Flow rate calculations

The aim of controlling flow from a development, whether it has been previously developed or not, is to restrict outflow rates to pre-existing ‘greenfield runoff rates’.

There are two approaches to controlling outflow rates: Approach 1, as set out in the NSTS (non-statutory technical standards) requiring additional volume management, and Approach 2, the current practice commonly called the **Qbar method**.

Approach 1 – (NSTS S2 and S4), where the volume of runoff is managed to Greenfield volume, the allowable discharge rate is permitted to vary between the 1 in 1 year and 1 in 100 year Greenfield runoff rates for the respective rainfall return periods.

Approach 2 – (NSTS S6), where additional runoff volumes cannot be managed on site, runoff rates must be further restricted to ensure that there is no increase in flood risk elsewhere. The general approach that is adopted is to limit the maximum outflow rate to Qbar (approximately equivalent to 1 in 2 year greenfield rate) for all rainfall return periods up to the 1 in 100 year rainfall event depending on the local soil type.

Approach 2 is simpler but usually results in larger storage volumes than Approach 1.

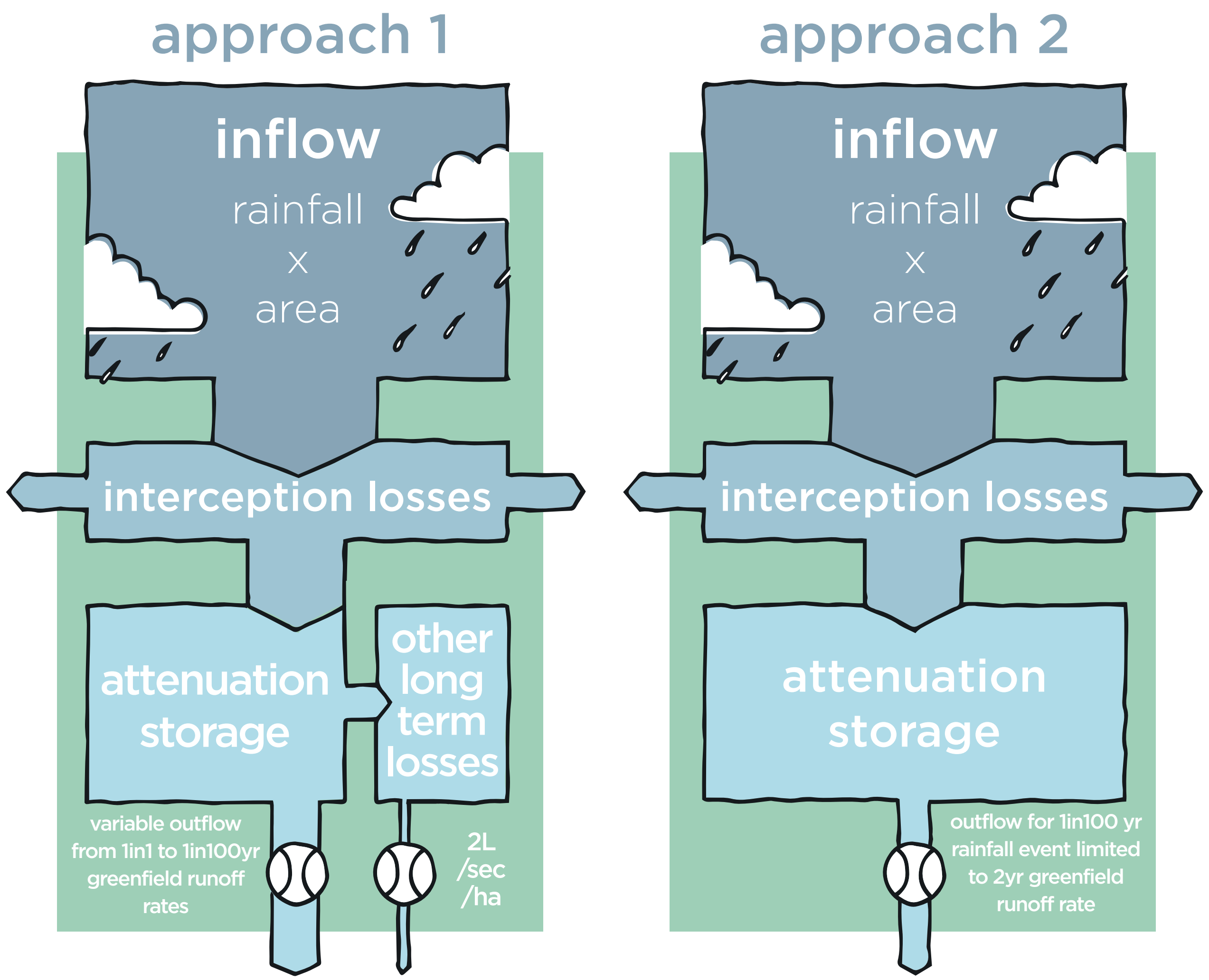
An allowance for climate change, and in certain situations urban creep, should be included in hydraulic calculations.

An online tool for estimating Greenfield runoff rates can be found at **www.uksuds.com** or calculated using the methodology in the SuDS Manual 2015. The uksuds.com calculator is based on regional geological mapping which can be unrepresentative of actual site conditions. Inputs to the Greenfield runoff calculation should rely upon **actual soil types for the site** rather than regional geological maps.

In Approach 1 the ‘greenfield runoff rate’ will increase with increasing storm return periods. The flow control mechanism will need to account for this increase in flow rate.

In Approach 2 the Qbar value for a site will only be achieved for the site or sub-catchment when the storage feature is full. Most of the time the flow rate is less until a full storage head is generated.

See Climate Change Allowance (CCA) Section 9.5.4.6
and Urban Creep Section 9.5.4.7



Approach 1 and Approach 2 - Discharge Requirements

	1 in 1 year rainfall (maximum outflow rate)	1 in 100 year rainfall (maximum outflow rate)	Long term storage-volume control
Approach 1	1 in 1 year greenfield rate	1 in 100 year greenfield rate	Yes
Approach 2	Qbar/ Qmed	Qbar/ Qmed	No

Long Term Storage

SuDS design seeks to mimic the natural losses that occur across natural catchments. The volume of post development runoff should match that of the natural catchment.

Reduction in development runoff volume can be achieved by:

- rainwater re-use (harvesting)
- interception losses
- long-term storage.

Where rain harvesting is provided, 50% of the harvest volume can be offset against volume losses where demand exceeds yield. This is a general rule of thumb which is stated within BS8515.

SuDS components such as permeable pavements provide interception losses. Long- term storage can also be incorporated into the pavement design and they can be used for rainwater harvesting in certain situations,

Previously developed land (Brownfield sites)

Approach 1 and Approach 2 also apply to management of rate and volume of runoff from previously developed sites. LPAs will request runoff from these sites to be reduced to **greenfield runoff rates**.

A relaxation on outflow controls or the extent of storage required will only be permitted with the express agreement of the LPA and LLFA at an early stage of the project. This should be discussed at the Pre-Application stage.

Design Note:
Storage volumes derived at the Concept Design stage may differ from those calculated at the Detail Design stage. Storage volumes derived at Concept Design stage should be approximate, in order to demonstrate that the scheme is sensibly proportioned.

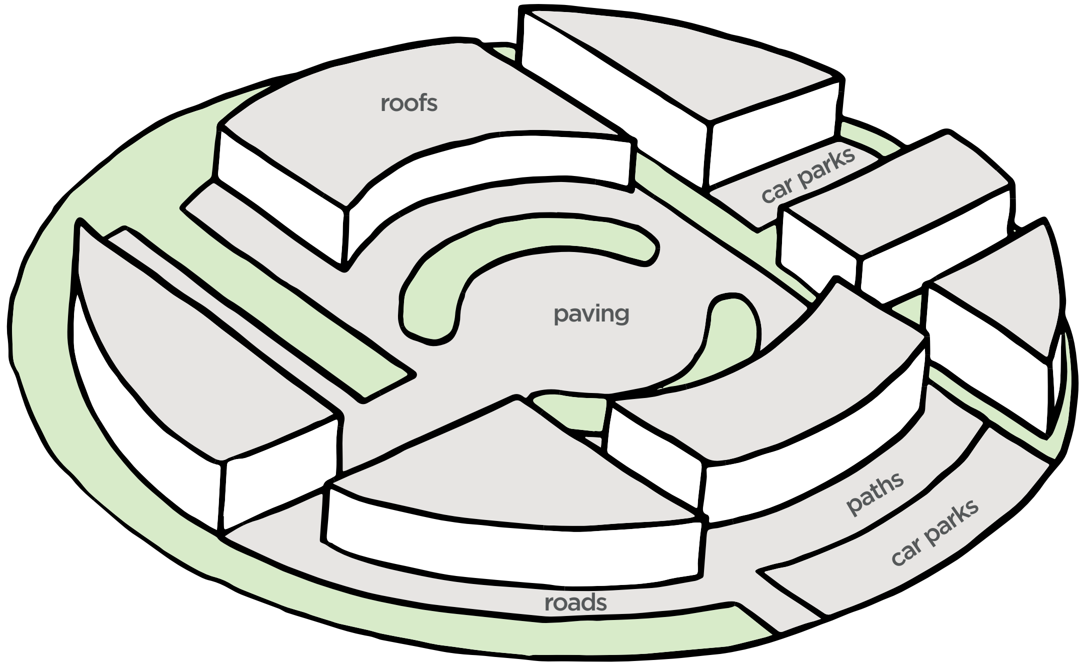
7.4.14 Defining the area of development that contributes to runoff

The area of development may change during the design process, but it is important to have an initial estimate of the amount of storage, to inform the layout of the SuDS design.

The area generating increased runoff is the developed area of the site, and comprises:

Roofs and hard surfaces (roads, car parks, paving, etc.) proposed for the site.

There is no industry standard for setting the rate of runoff from permeable areas (e.g. green space). In calculations allow for the location's estimated greenfield runoff rate.



Hard surfaces generate increased runoff, and determine the volumes to be managed.

Design Note:

The percentage of rainfall that occurs as runoff from a surface is called the 'coefficient of volumetric runoff' (Cv). Water & Sewerage Companies (WaSC) use Sewers for Adoption Ed7 (p.55) which recommends a Cv of 1.0 (100%) from all hard surfaces.

Cv's of 0.95 from roofs and 0.9 from paved areas would be considered by the LLFA as part of Technical Assessment, where SuDS are not being adopted by WaSC.

7.5 Concept information required for SuDS evaluation

The information required at the Concept Design stage will depend on the type and scope of the proposed development.

7.5.1 Pre-application discussion

The design team will provide a Concept Design for a pre-application design meeting, or as preliminary design information should a pre-application meeting not be appropriate.

Pre-application discussions with the LPA and LLFA provide an opportunity for the designer to confirm the preliminary requirements for the SuDS design, and for the evaluation team to understand the objectives and character of the SuDS proposed for the development.

Constructive discussion between the LPA, the LLFA and the SuDS designer will save the developer time and the cost of potential re-design, providing planners with reassurance that the project that is delivered will meet local planning expectations.

The discussions will be informed by the LASOO (Local Authority SuDS Officer Organisation) NSTS for Sustainable Drainage: Practice Guidance.

http://www.susdrain.org/files/resources/other-guidance/lasoo_non_statutory_suds_technical_standards_guidance_2016_.pdf

A sunken SuDS courtyard with solar water feature into a formal rill at Bromsgrove Civic Centre.

7.5.2 Preliminary water quantity considerations

At the Concept Design stage it is necessary to show how runoff is collected and how it is stored within the development:

- The designer will confirm whether Approach 1 or Approach 2 is being used, and confirm how volumes are being managed.
- A reduction in the volume of rainfall discharged from the site will be demonstrated by ‘interception losses’ and long-term storage, where this is appropriate (Approach 1).
- Approximate storage volumes should be provided for each location where flows are attenuated.
- Storage will be demonstrated within sub-catchments and along the management train, with the location of flow controls confirmed.

Design Note:

Ideally runoff should be stored in shallow landscape features. Where this is not possible, deeper tank or pipe storage must be justified.

Two shallow raingardens provide storage at Measham Leisure Centre. Robust ground cover should persist through winter in order to protect soils.

7.5.3 Preliminary water quality considerations

At the Concept Design stage it is necessary to show how water quality is managed:

- A simple assessment of risk using the 'treatment stage' approach is acceptable on low and medium risk development. If the risk screening (SuDS Manual p571) demonstrates that the 'simple index approach' is appropriate, then the 'treatment stage' is acceptable.
- All sites should demonstrate source control to remove silt, heavy metals and hydrocarbon pollution at the beginning of the management train.
- Unless permeable pavement is used to collect runoff, where the pavement provides high water quality treatment, there will usually be a second feature to manage additional volumes and provide additional treatment.

The design will also consider:

- Sensitivity of the receiving watercourse or groundwater.
- Environmental and technical constraints such as contamination, protected landscapes, SSSI, SAC, AONB, Ancient Woodland and existing biodiversity features.
- The LPA and LLFA will not accept the gully pot as a method of treatment. Table 26.15 of the CIRIA SuDS Manual denotes that conventional gully and pipe drainage provide zero treatment.

Design Note:

Where there is a high risk of pollution, a formal risk assessment is required.

High-risk development:

Trunk roads and highways – follow the guidance and risk assessment process set out in HA (2009)

Haulage yards, lorry parks, highly frequented lorry approaches to industrial estates and waste sites, sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured and industrial sites. Discharges may require an environmental licence or permit obtain pre-permitting advice from the environmental regulator. Risk assessment is likely to be required.

CIRIA The SuDS Manual 2015

7.5.4 Preliminary amenity considerations

Amenity relates both to the usefulness and the appearance of SuDS features. Ideally SuDS features should be integrated into the landscape, to minimise dedicated land take and management obligations.

Key amenity elements to consider when designing SuDS features include:

- Legibility – can the design be understood by users and managers?
- Accessibility – can all parts of the SuDS scheme be easily reached, both for recreation and maintenance? All parts of the scheme must be safe by design. It is not usually appropriate to fence SuDS features for safety reasons (except toddler fences where young children may not be fully supervised).
- Multi-functionality – all parts of the SuDS landscape should be available for use by people when not performing a SuDS function.
- Visual character – all elements of the SuDS design must be attractive (or at least visually neutral, e.g. inlets, outlets and control structures) and safe.

7.5.5 Preliminary biodiversity considerations

There are key biodiversity requirements that should be demonstrated at the Concept Design stage:

- Clean water – 'a controlled flow of clean water' is provided by the use of source control at the beginning of the management train. Subsequent surface conveyance and open SuDS features will ensure connectivity and habitat opportunities.
- Connectivity - habitat connections outside and within the development ensure that plants and animals can travel between habitat areas.
- Topographical diversity – variation in vertical and horizontal structure allows for complex habitat development. This is implicit in SuDS design, e.g. swales, basins, ponds and wetlands.
- Ecological design - the creation of habitats within the development.
- Sympathetic management – through considered management, a mosaic of habitat types can be created, ensuring maximum ecological value.

7.5.6 Management and maintenance

It is important to consider a realistic and appropriate level of ongoing maintenance at the Concept Design stage.

SuDS features that require specialist maintenance, hazardous waste removal or replacement of component parts should be avoided.

Most landscape-based SuDS treat organic pollutants passively through natural processes. This approach encourages the continual breakdown of organic pollutants throughout the design life of the SuDS.

Source control is critical to passive maintenance as silt, heavy metals and heavy oils are trapped at the beginning of the management train where they can easily be removed and will not contaminate SuDS features further down the train. This can enhance amenity and biodiversity potential.

Landscape-based SuDS techniques and surface conveyance ensures that ongoing care can be provided as part of everyday site maintenance by landscape contractors, grounds or park maintenance crews, caretakers or even by residents themselves.

All SuDS features, including inlets, outlets and control structures, must be easily accessible and able to be maintained by landscape care personnel.

LPAs may require a Section 106 Agreement (Town & Country Planning Act 1990) to confirm that maintenance of the scheme will be provided on an ongoing basis. Any requirements for maintenance arrangements should be confirmed with the LPA on a site by site basis.

Replacement

Where the design life of the SuDS component does not surpass the design life of the scheme, then suitable provision must be made for replacement. This includes :

- A methodology for how the item will be replaced whilst maintaining drainage functionality of the site.
- Identification of how replacement will be financed.

It is noted that some SuDS components may need some degree of rehabilitation / dedicated SuDS maintenance, for example, regritting of the joints in a permeable pavement. This is not the same as replacement, which may be required for geocellular tanks amongst other items with a defined design life.

Signposts

NSTS 10, 11 & 12

Non-statutory Technical Standards

Sections 10, 11 & 12

This fully infiltrating SuDS scheme at Burlish School, Worcestershire, utilises the landscape to convey, store and infiltrate runoff requiring only routine landscape maintenance.

Checklist for Concept Design Stage

Design Check	Requirement	
1. Data gathering		
Information to understand site constraints including geology, topography, flood risk, utilities, landscape context, community and wildlife	To understand site constraints that inform Concept Design	
Planning requirements that influence SuDS design	To be aware of planning constraints that impact SuDS design	
2. Flow route analysis		
Existing flow routes	To understand site hydrology	
Modified flow routes	To understand the impact of development	
3. General SuDS design elements		
Collection of runoff	Runoff retained at or near the surface	
Source control	Primary treatment stage to protect the development	
Conveyance	At or near the surface	
Management train	SuDS components in series to manage quantity and quality	
Sub-catchments	Dividing development into discreet SuDS entities	
Storage	Indicate extent and location where runoff is stored	
Flow control	Location to demonstrate storage location	
Outfall	Locations and method of discharge	
4. Quantity		
Confirm interception losses will occur	Demonstrate the use of SuDS components that provide interception losses	
Confirm how rate of flow from development will be reduced to greenfield runoff rates	Demonstrate flow rates are achievable. Increase in allowable discharge rates e.g. brownfield sites only in agreement with LPA/LLFA	
Confirm how runoff will be managed to greenfield runoff volumes	Demonstrate whether Approach 1 or Approach 2 will be used to manage volumes	
Confirm climate change allowance and whether urban creep is applied	Demonstrate additional volumes to be managed	
Confirm 'long term storage'	Demonstrate no increase in runoff from pre-development status	
5. Quality		
Confirm 'treatment stage' requirements	Demonstrate SuDS components used in series to mitigate 'pollution hazard level'	
Confirm source control is present	Demonstrate protection of development to enable amenity and biodiversity benefits	
Confirm interception losses	Demonstrate everyday pollution retained on site	
6. Amenity		
Legibility	An understanding of how the SuDS function by people using or managing the site	
Accessibility	All parts of the SuDS easily reached and safe for recreation and maintenance. Safety by design.	
Multi-functionality	All parts of the SuDS landscape usable wherever possible	
Visual character	All elements of the SuDS design attractive (or at least visually neutral, e.g. inlets, outlets, and control structures) and safe	
7. Biodiversity		
Clean water	'A controlled flow of clean water' within and outside the site using 'source control' and the 'management train'	
Connectivity	Links to outside and within development to ensure plants and animals can travel between habitat areas	
Topographical diversity	Variable vertical and horizontal structures for complex habitat development	
Habitat creation	Exploit opportunities through ecological design	
Sympathetic management	Create a mosaic of habitat types through maintenance	