Bold Forest Garden Village

Sustainable Drainage Design Brief

St Helen's Council

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Basis of Report

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Figures in Text

1.0 Introduction

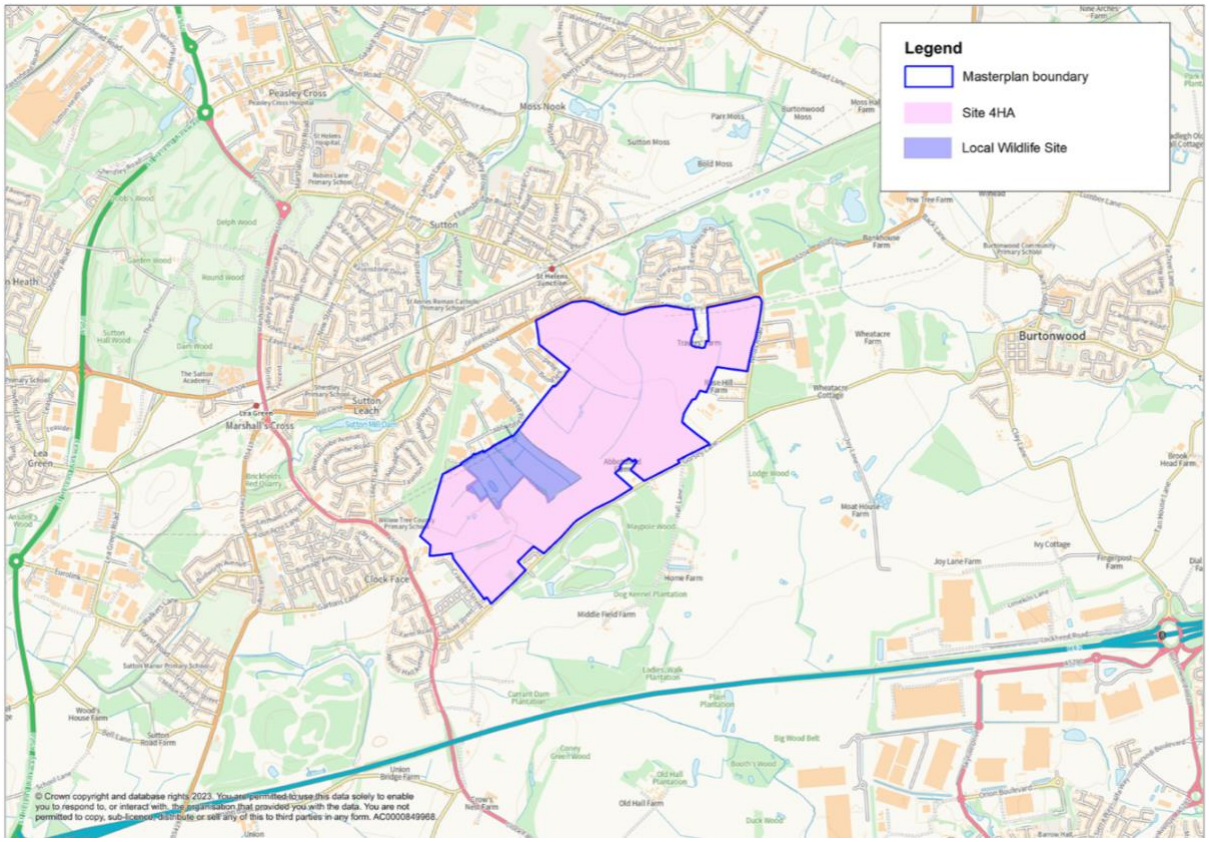
St Helens Borough Council's Local Planning Authority (the Council) has appointed SLR Consulting Limited (SLR) to deliver a Masterplan Framework for Bold Forest Garden Village (BFGV). This sustainable drainage (SuDS) design brief has been prepared in support of ongoing works on the BFGV.

1.1 Site Location and Context

The BFGV site is located on the southeastern edge of St Helens, Merseyside. Centred on the National Grid Reference (NGR) SJ 53738 92310. The site is south of the B5204, north of Gorsey Lane and encompasses 132.86 ha.

This location and extent of the land are illustrated in Figure 1.

Figure 1: Site Location Plan



The site comprises 15 land parcels under 12 different land ownerships. Aside from a local nature reserve to the northwest of the site, all land is comprised of arable farmland.

Residential areas border the site to the north and west with Clock Face Country Park and agricultural fields to the south. Reginald Road Industrial Estate and Bold Industrial Park respectively, lie on the west and east boundaries, alongside multiple private farms in proximity to the site.

1.2 Proposed Development

The BFGV site was released from the Green Belt for the purposes of allocating it for residential development in the Local Plan[1]. Initial work undertaken by the Council indicates there to be a potential development capacity of approximately 3,000 dwellings.

This work is intended to inform the masterplanning of the site, which will likely encompass ancillary development, community facilities and open space.

1.3 Objective of SuDS Design Brief

This version of the design brief has been created as part of initial discussions with key stakeholders for the project. The design brief will be updated, extended and appended to the Surface Water Drainage Strategy (SWDS) prepared and submitted in support of a future outline planning application for the scheme.

Once completed the SWDS will provide an overview of drainage within the scheme demonstrating that within the masterplan sufficient space has been allowed in appropriate areas of the Site to ensure key design objectives are achieved. The SWDS will also set out areas where phasing for the proposed development is essential for the delivery of the scheme and confirm which key elements of drainage infrastructure are required to support each phase.

Further details of the proposed drainage arrangements within each phase and the detailed design of the strategic infrastructure will then be developed on a phase-by-phase basis. The designs will take account of the preferred character of development by a given house builder and any changes in best practice, climate change guidance or SuDS technology that are available at that point. These details will be subject to approval from St Helens Council drainage team (the Lead Local Flood Authority) as part of a separate reserved matters application.

This SuDS design brief aims to provide a framework for the detailed design process to ensure that the high aspirations within the outline scheme are best delivered. Where a detailed scheme comes forward in line with the SuDS design brief there will be a presumption that the drainage strategy will be approved. If designs are presented that are contrary to the design brief, these will need to be justified and would only be accepted subject to acceptance from St Helens Council that these changes are warranted. Changes will need to be viewed holistically and give rise to wider benefits that outweigh the negative impacts on drainage.

1 St Helen's Local Plan , https://www.sthelens.gov.uk/media/4315/St-Helens-Borough-Local-Plan-up-to-2037/pdf/Local_Plan_Written_Statement_-_FINAL_adoption_version.pdf

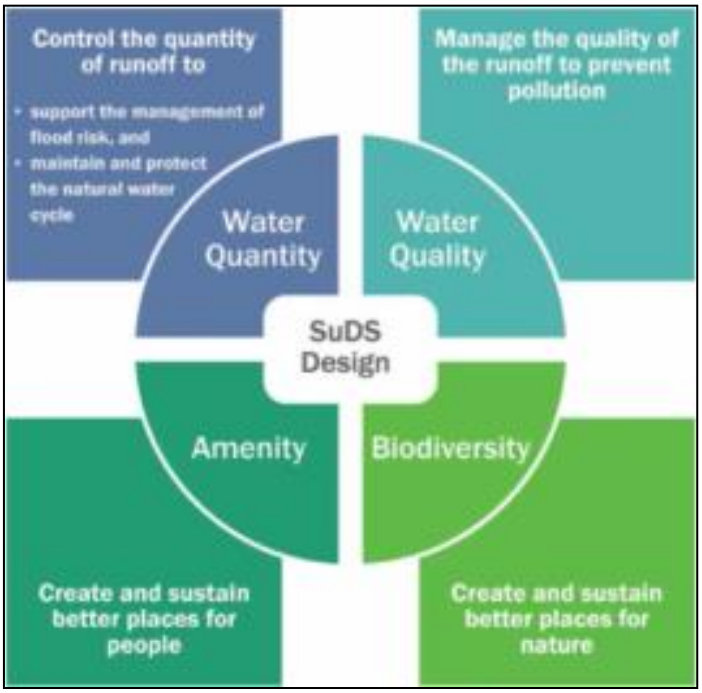
2.0 Sustainable Drainage Principles

The SWDS being developed will set out the requirements for drainage that will be implemented at the site to ensure that it is developed in line with best practice and the requirements of both national policy and St Helens Council, in their role as the LLFA for the area.

2.1 Key Principals of Surface Water Management

Current best practice guidance documens: The Sustainable Drainage System (SuDS) Manual (CIRIA Report C753)[2] and the National Standards for Sustainable Drainage Systems (SuDS)[3] promotes sustainable water management through the use of SuDS. There are four main categories of SuDS which are referred to as the 'four pillars of SuDS design' as depicted in Figure 2.

Figure 2: Four Pillars of SuDS (extract from CIRIA Report C753)



The SuDS Manual identifies a hierarchy of SuDS for managing runoff, which is commonly referred to as a 'management train'. The hierarchy of techniques is identified as:

- Prevention – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing).
- Source Control – control of runoff at or very near its source (such as the use of rainwater harvesting).
- Site Control – management of water from several sub-catchments (including routing water from roofs and car parks to one/several large soakaways for the whole site).

2 Report C753, The SuDS Manual; CIRIA (2015). Report C753, November 2015.

3 National standards for sustainable drainage systems (SuDS), Department for Environment, Food & Rural Affairs, July 2025. Accessed at: https://www.gov.uk/government/publications/national-standards-for-sustainable-drainage-systems/national-standards-for-sustainable-drainage-systems-suds

- Regional Control – management of runoff from several sites, typically in a retention pond or wetland.

2.1.1 National Policy Context

Current national planning policy guidance and best practice, namely NPPF and PPG, require development proposals in all flood zones to seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of SuDS.

2.1.2 Local Policy Context

St Helens Council has published its own Surface Water Drainage (SuDS) guidance- Design and Technical Guidance in 2020[4]. The guide is intended to provide direction on the Council's requirements for SuDS on all major developments.

Relevant sections of the guidance have been reproduced within Appendix B, it is noted that certain criterion from the document are superseded by the high aspirations set out within this SuDS Design Brief document.

Drainage submitted as part of the application should be submitted alongside the LLFA SuDS Assessment Checklist[5].

2.2 Drainage Strategy Overview

As a greenfield site, consisting of undeveloped fields, rainfall falling on the site will mostly infiltrate into the shallow soils to either be stored or evaporated during drier periods. While this will need to be confirmed for each plot the working assumption is that low-permeability shallow geology is dominant and that this reduces the ability for water to discharge to the ground. During heavy rainfall, there is therefore the potential for the ground to become saturated, resulting in surface water runoff discharging from the land as overland flow into one of the small ditches across the site.

The drainage strategy for the development seeks to mirror this existing drainage pattern encouraging infiltration and evaporation of storm water (where feasible) but allowing controlled and restricted runoff towards the local channels for larger storms and during extended wet winter periods.

To achieve this, storm water within the scheme will be managed using sustainable drainage systems (SuDS) such as raingardens, swales and wetlands as well as downstream basins and ponds that all seek to encourage infiltration and to slow and clean water as it discharges through and from the site. The SuDS will also be designed to enhance amenity and biodiversity by creating pockets of wet habitats through the site. The scheme will require some strategic SuDS area/features that serve multiple plots. For these, careful consideration of phasing and space within the masterplan will be required.

Source control measures such as property-level rainfall harvesting, permeable paving (not for individual properties, but potential for communal car parks), rain gardens and tree pits will be used throughout the site. Excess stormwater discharging from these and any hard surfaces, will be collected and conveyed by a network of swales and existing drainage ditches routed alongside roads and pedestrian routes to areas where stormwater for larger

4 St. Helens Council, Sustainable Drainage Systems, Design and Technical Guidance 2020, Flood and Water Management Act 2010, May 2020

5 St. Helens Council SuDS Submission Application and Approval Checklist, Accessed from: https://www.sthelens.gov.uk/article/7555/Sustainable-drainage

events can be controlled prior to discharge into one of the streams that pass through the site.

The features for storm water control will be integrated into the landscape design and the form and planting will seek to reflect both ground conditions and the character of the local area and so may include meadows, wet woodland, or open water. Each area will be sympathetically landscaped using a shallow profile (typical side slopes 1 in 4) and planting to avoid the need for the basin as a whole or wetter areas within the basin to be fenced off.

Once finalised this SuDS Design brief will form an integral part of that SWDS confirming the required standards for plot level drainage as well as details of the strategic SuDS element that needs to be captured during the process of detailed design.

3.0 SuDS Design Brief

SuDS measures can be broadly classified into the following areas;

- Source Control
- Conveyance
- Attenuation Control

3.1 Source Control

Source control measures act to manage storm water at or close to where it falls so that it does not enter the drainage system or is delayed/attenuated before it enters the drainage system. Source Control measures are critical for maintaining groundwater recharge and the quality of surface water discharge. Source control measures will also be important in helping the development meet wider sustainability objectives in terms of reducing water usage and creating an ecologically diverse and interesting environment at a plot level

Source control measures will be the primary control for storm water for the large majority of storms across the site and as a minimum, the source control measures will be sufficient to intercept and hold the first 5mm of a summer storm. This is in line with guidance provided by St Helens Council.

The following Source control hierarchy will be used on the site at an individual building plot level is as followed;

1 Green roofs,
2 SuDS Pods
3 Rain gardens,
4 Property-level rainfall harvesting for external irrigation (water butts),

The Source control hierarchy should be followed in order with a minimum of at least two of these techniques employed on each building (or building plot) constructed on the site.

Beyond the individual plot boundaries, the amount of hard standing will be minimised through good design and the use of reinforced vegetated tracks (grass paving etc) where vehicle access is only occasionally required (i.e. through public open space or into SuDS basins).

Source control measures will also be implemented within the public realm and street areas. These measures will include;

- Permeable paving for parking bays;
- Tree pits in all locations where landscaping design specifies tree planting along roads;
- Roadside collection swales and rain gardens (subject to adoption); and
- Roadside filter drains only where the above measures are not reasonably possible or to link other SuDS features together.

These measures will be incorporated into all streets on the site to remove the need for traditional storm water gullies and piped drainage connections. Storm water will be directed to discharge directly to the source control features located within or immediately to one side of the road.

In all cases, more than 5% of land coverage within individual development parcels will be utilised for source control SuDS measures.

3.2 Conveyance

Conveyance features are required to move excess storm water that cannot be accommodated in local source control features toward areas where water can be attenuated and controlled prior to discharge into one of the surrounding natural channels.

Where possible conveyance of storm water through the site will be achieved using unlined SuDS to promote infiltration (at low rates). The onsite aspiration is to avoid pipework in favour of conveying storm flows within SuDS features. It is however acknowledged that some short lengths of pipe connection will be required in certain locations, for example, to facilitate crossing over other services.

Local Scale

Conveyance via SuDS will be achieved through linking smaller source control areas together allowing excess water to cascade down the system into subsequent areas. This will maximise the use of local storage and infiltration capacity prior to onward discharge.

Strategic Scale

At a more strategic level, water will be transported via the existing onsite ditch network highlighted within the Surface Water Drainage Scheme (SWDS). These ditches are the existing conveyance mechanism, providing an important habitat that enhances the public domain.

Where it is not possible to convey flows within the existing ditch system, flows will be transferred through new swales that are intended to provide new wetland habitat and clean water.

Each swale will be designed in line with St Helens Council guidance to ensure that it has;

- a base width of between 0.5m and 2m (depending on modelled inflows),
- a maximum depth of 0.5m and a freeboard of 150mm during design flow conditions,
- a minimum length of 30m,
- a maximum side slope of 1 in 4,
- a maximum longitudinal gradient (without checks) of 1 in 40,
- a maximum longitudinal gradient of 1 in 10, and
- a maximum length without checks on the flow of 50m (overflow weirs or similar).

Over and above these criteria the swales should ideally be designed with variety in their course and profile to better replicate natural channels.

Immediately upstream of flow checks (check dams etc) opportunities should be taken to create wider and more open areas that are normally wet (lined) and slightly deeper than the swale itself. These wetland areas should be planted with reeds or other wetland planting of local origin. Once mature the vegetation will further slow and filter storm flows progressing along the swale.

Easements of 3m along swale features should be allowed for access. Within these easements, no raised structures will be permitted

3.3 Attenuation Control

Attenuation areas will provide space for excess storm flows from larger storms to be held and controlled before onward discharge into the adjacent natural channels at a low greenfield (1 in 1) rate.

The scheme has been designed such that these attenuation areas are provided throughout the site and downgradient of individual development parcels. However, the final form and detail of these areas still need to be progressed.

Opportunities should also be sought to incorporate smaller basins through the scheme particularly within areas of public open space. This would be in addition to rather than a replacement to the wider SuDS network planned.

The basins will avoid hard engineering infrastructure where possible and will reflect details of the final landscaping strategy and also the existing landscape character in which it will sit. For example:

- Attenuation basins close to the wildlife site might be planted with trees and act as wet woodland with wetland areas at the base.
- Attenuation basins within the existing farmland areas of the site might be a mixture of grassland and open water reflecting the adjacent farmland.

Full details of the final form and function of the basins will be set out as a part of the detailed design with specific statements confirming how landscape, amenity and ecology benefits will be appropriately achieved. This will include details of the proposed planting strategy which will be developed incorporating recommendations contained within the planting guidance produced by St Helens Council.

Over and beyond these detailed design decisions, the following general design principles will be applied to all basins:

- Side slopes into the basins will be no steeper than 1 in 4 with platforms included to break up the slope such that, once completed and operational, no fencing will be required to restrict access into the basins.
- One flank of each basin will be constructed at a grade of 1 in 10 to facilitate vehicle access into the basin for long-term maintenance
- An easement of 3m around the outside of each basin will be provided to allow access for long-term maintenance. Within this easement, no raised structures or tree planting is permitted.
- The maximum excavated basin depth (from average external ground level to outfall invert) will be 2.0m
- Areas within the base of the basin can be locally lowered beneath 2.0m to create areas of permanent open water and wetland where required to achieve ecological and amenity objectives. The profile across the lowered areas should ensure that normal water depths do not exceed 0.3m for the first 2m (from the edge of the permanent water features). This is to manage health and safety concerns and provide habitat for marginal vegetation growth.
- If necessary, areas of permanent open water can be clay-lined to minimise losses via infiltration, this would ensure the ecological value of the area is maintained during the summer. Away from areas designed to be permanent open water, the basins will be unlined to promote infiltration at limited rates.
- Reinforced grass spillways will be constructed on the downgradient side of each basin to allow the overflow of exceedance flows in the event of a blockage or any extreme storms beyond design standards.
- Pedestrian and cycle routes into and through the peripheral areas of the basins are to be encouraged to integrate the basin areas into the wider public open space. The basin design will ensure that the annual probability of these routes flooding will be less than 1 in 30 including an appropriate climate change uplift.

- Outfalls from basins will seek to minimise hard/concrete infrastructure in favour of naturalised outflow channels with necessary structures constructed using vegetated reinforced bag work or other similar approaches that result in green vegetated finishes.
- Outfall structures should be set back from the existing natural channels with the final discharge towards those channels during storm events achieved using naturalised channels or depressions.

3.4 SuDS Checklist

A SuDS checklist is provided in Appendix A. This is intended to provide an easy reference to consider whether individual strategies developed and brought forward with the Bold Forest Garden Village are in line with the requirements specified in the SuDS design brief.

This check list should be considered in addition to and not instead of the check St Helens SuDS Assessment Checklist[6].

6 St Helens SuDS Checklist, V1, https://www.sthelens.gov.uk/media/6361/STH-SuDS-Assessment-Checklist-v1/xls/STH_SuDS_Assessment_Checklist_v1_1.xlsx?m=1686773844250

Appendix A SuDS Check List

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St Helens Garden Neighbourhood – SuDS Design Code Checklist		
A. Source Control		
A1	Has the Source Control hierarchy been applied at a plot level	
A2	Have at least two source control measures been utilised on each building or building plot	
A3	Are all roadside parking bays specified to be permeable	
A4	Has all tree planting along roads been specified as tree pits that receive storm runoff	
A5	Is all road drainage being routed to source control features	
A6	Has at least 5% of land at a development parcel level been used for local source control SuDS measures	
A7	Will source control measure be effective in intercepting the first 5mm of summer rainfall	
B. Conveyance		
B1	Has the drainage design avoided the need for traditional piped road drainage	
B2	Are source control features and areas effectively linked to create conveyance	
B3	Do the profiles and dimension of the larger swales meet the following criteria; • a base width of between 0.5m and 2m (depending on modelled inflows), • a maximum depth of 0.5m and a freeboard of 150mm during design flow conditions, • minimum length 30m • a maximum side slope of 1 in 4, • a maximum longitudinal gradient of 1 in 40 (without checks), • a maximum longitudinal gradient of 1 in 10 • a maximum length without checks on the flow of 50m (overflow weirs or similar).	
B4	Do the swales include variety in the form and profile to better replicate a natural channel.	
B5	Are lined and widened wetland areas included upgradient of flow checks.	
B6	Are planting details provided for the wetland areas and does the planting mix specify an approximate mix of local origin.	
B7	Is a 3m maintenance access easement provided along swales.	
C. Attenuation Control		
C1	Is the peak rate of discharge from the basin restricted to the QBAR greenfield runoff rate from the land that actively drains to the basin.	
C2	Are the basin side slopes a maximum gradient of 1 in 4 or less	

St Helens Garden Neighbourhood – SuDS Design Code Checklist		
C3	Has one flank been specified with a gradient of 1 in 10 or less for vehicle access	
C4	Is a 3m maintenance access easement provided around the edge of the basin.	
C5	Can it be confirmed that no fencing is required and that any areas of deep water (>0.3m) are at least 2m back from the normal water's edge.	
C6	Has a landscape statement been provided and does this evidence that reasonable measures have been made to integrate the SuDS basin in the existing and development landscape.	
C7	Has an amenity statement been provided and does this evidence that reasonable measures have been made to integrate basins into the wider public open space provision through use of access routes and play area.	
C8	Has an ecology statement been provided and does this evidence that reasonable measures have been made to maximise the ecological potential for the SuDS basins through the inclusion wet features	
C9	Are planting details provided for wetland areas and does this specify appropriate wetland mix of local origin.	
C10	Has an exceedance overflow route / spillway been specified as part of the basin design.	
C11	Has the outfall for the basin been specified to minimise the use of hard structures and maximise vegetated surfaces.	
C12	Is the discharge route from the basin towards the receiving watercourse naturalised	
C13	Have the use of small-scale basin features been considered within Public Open Spaces	

Appendix B St Helen's Technical Guidance

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Guidance from St Helens Council has been reproduced within the section below, full details of the guidance are available within the guidance document[4].

Drainage Hierarchy

Order of Preference for Connection	
(1) Surface water is collected for site use (domestic, industrial etc.)	Preferred
(2) Discharge to the ground via infiltration	
(3) Discharge to a watercourse or surface water body	
(4) Discharge to surface water sewer which discharges to a watercourse etc.	
(5) Discharge to surface water sewer which discharges to a treatment centre etc.	
(6) Discharge to combined sewer	Least Preferred

Drainage Design

All connecting manholes should be included in the model. Representation of the hard surfaces draining to the network should be accurately allocated to the drainage system and all manholes should normally be included in the model. Surface water drainage should be designed for runoff from roofs and subject to the agreement of the Undertaker, roads (including verges) and other hard-standing areas. For these areas impermeable runoff coefficient of 100% shall be assumed.

An additional increase in the paved surface area of 10% shall be assumed for all areas to allow for future urban expansion (extensions and additional paved areas) unless this would produce a figure greater than 100% of the site. Refer to Section 6.3 for further information. Design event rainfall should be based on the use of the most recent version of the Flood Estimation Handbook specific to the location of the development. An allowance for climate change of an additional 40% (by factoring the rainfall intensity hyetograph values) should be applied unless otherwise specified.

Urban Creep

Urban creep is the gradual loss of permeable surfaces within urban areas which results in increased surface water runoff. Typical examples of urban creep include the creation of patios, the paving over of front gardens to generate space for parking or small-scale house extensions. To ensure that SuDS schemes can cope with future demand, an allowance for urban creep must be made in the design calculations. St.Helens Council will expect the SuDS design to include an allowance for an increase in impermeable area to accommodate urban creep as set out in Table 6a.

Table 6a: Urban Creep Allowance

Residential Development Density (dwellings/ha)	Change Allowance (% of impermeable area)
<=25	10*(Default value suggested by Ciria)
30	8
35	6
45	4
>=50	2
Flats and Apartments	0

Attenuation Storage

The limiting discharge rates from the site should normally be assessed using the Flood Estimation for Small Catchments (Institute of Hydrology, 1994). For areas smaller than 50 ha it should be applied for 50 ha and linearly interpolated to the development area. Values should be determined for the 1 in 1 year, 1 in 30 year and 1 in 100 years as a minimum. An example calculation and tool for assessing greenfield runoff rates in the St.Helens Council area is provided in Appendix B.

The maximum 1-year water level in attenuation storage should not cause significant backing up of flows in the incoming sewer and a 1-year, 1-hour duration event should not surcharge the drainage network.

Peak flow rate and volume

In low rainfall, there should be no discharge to a surface water body, or sewer that results from the first 5mm of any rainfall event. In low permeability soils where this is not achievable, the developer shall demonstrate to the Council that infiltration has been encouraged through the SuDS management train. In high rainfall either of the two approaches below must be used to manage the surface discharge:

Peak Flow Control

S2- For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

S3- For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

Volume Control

S4- Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.

S5- Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

S6- Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

Approach 1: Restricting both the peak flow rate and volume of runoff: The peak flow rates for the: 1 in 1 year rainfall event and 1 in 100 year rainfall event; must not be greater than the equivalent greenfield runoff rates for these events. The critical duration rainfall event must be used to calculate the required storage volume for the 1 in 100 year rainfall event. The volume of runoff must not be greater than the greenfield runoff volume from the site for the 1 in 100 year, 6 hour rainfall event.

Climate change should be considered in attenuation storage calculations by increasing the rainfall depth using a climate change factor. Current Environment Agency guidance should be referenced to apply the appropriate climate change factors relevant to the location and design life of the proposed development.

Approach 2: Restricting the peak flow rate:- The critical duration rainfall event must be used to calculate the required storage volume for the 1 in 100 year rainfall event.

- The flow rate discharged: For the 1 in 1 year event, must not be greater than either the greenfield runoff rate from the site for the 1 in 1 year event, or 2 litres per second per hectare (l/s/ha);
- And for the 1 in 100 year event must not be greater than either the greenfield mean annual flood for the site, or 2 litres per second per hectare (l/s/ha).

Exceedance

The design of the drainage system must take into account the impact of rainfall falling on any part of the site and also any estimated surface runoff flowing onto the site from adjacent areas. Drainage systems must be designed so that, unless an area is designated for flood management in the Local Flood Risk Management Strategy, flooding from the drainage system does not occur: on any part of the site for a 1 in 30 year rainfall event; and during a 1 in 100 year rainfall event in any part of a building (including a basement) or utility plant susceptible to water (e.g. pumping station or electricity substation) or on neighbouring sites during a 1 in 100 year rainfall event.

Flows that exceed the design criteria must be managed in flood conveyance routes, preferably in green networks, that minimise the risks to people and property both on and off the site. When considering exceedance routes, particular attention should be paid to: The position of walls, bunds and other obstructions that may direct water but must not cause ponding; the location and form of buildings (e.g. terraces and linked detached properties) that must not impede flows or cause ponding; The finished floor levels relative to surrounding ground. Submitted drawings and calculations must identify sources of water entering a site pre development, how flows will be routed through a site, where flows leave the site pre development and where they leave the site post development. For highway adoption, private or nonadopted areas (e.g. driveways) must actively place in measures to reduce water flow to adoptable areas.

Local Standard M - Multiple Benefits

The SuDS design must demonstrate, where appropriate, how environmental site constraints have been considered and how the features design will provide multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure and the enhancement of historical features. CIRIA has developed a freely available tool with associated guidance which makes it easier to assess the benefits of SuDS. The BeST (Benefits of SuDS Tool) can be accessed via the Susdrain website.

Phased Development and Drainage Strategies

For phased developments, the LLFA will expect planning applications to be accompanied by a Drainage Strategy which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase. Expected that the whole development discharge rate is assessed as one value, then broken down to individual phases/sections. Any alterations to individual phases/section discharge rates will change the allowable rates for the additional phases (totalling no greater than the overall site value).

Permeable Paving

The use of permeable paving systems should not be used in domestic situations where maintenance is the responsibility of the individual dwelling owners where the component attenuated storage is counted as a percentage of the sites overall surface water storage. In this case certain property owners would in effect have greater responsibility of maintenance, this is due to cumulative flows and any failure would affect multiple adjacent dwellings. Other options for storage requirements must be investigated.

Permeable systems will be considered only while used in a groundwater infiltration system or where the permeable paving system or equivalent is not included as part of the sites storage and climate change volumes. Full construction detail and assessment of permeable paving system must be provided as part of the full planning submission.

Pollution Prevention and Control

St.Helens Council will expect the SuDS to demonstrate how pollutants are prevented or controlled as part of the SuDS scheme. This should include consideration of the sensitivity of receiving waterbodies and particular attention should be given to the first 5mm of rainfall (‘first flush’ that mobilises the most pollutants).

Swales Design

Reference building regulations in distance easements of infiltration potential near or affecting buildings / structures. Swale systems should be designed for temporary storage (30 to 100 year event) or conveyance. Swales should be used as source controls only.

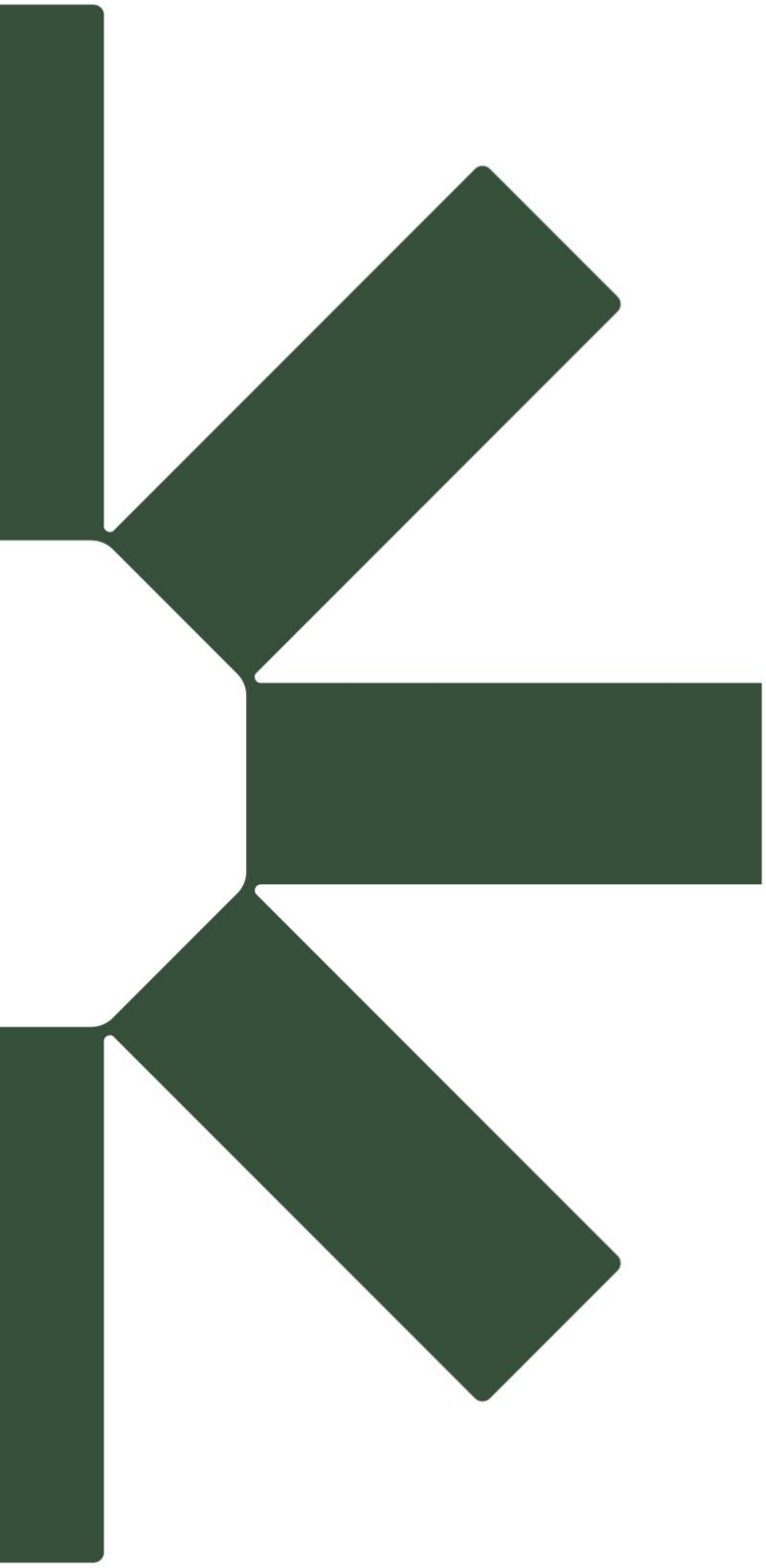
- Swales should be Trapezoidal or parabolic in cross section;
- The side slopes of a swale shall be a maximum of 1 vertically to 4 horizontally;
- Base shall be a minimum of 0.5m and a maximum of 2m wide and designed to avoid formation of rills;
- Depth shall be between (400-600mm) and achieve a freeboard of 150mm during design flow conditions;
- Swales shall be no less that 30m in length, the longitudinal slope of the swale shall not exceed 1 vertically to 40 horizontally without the use of check dams and shall not exceed 1 vertically to 10 horizontally.
- Designed so flow from a 1 in 1 year 30-minute storm event does not exceed 0.3m/s or 100mm in depth;
- The average velocity should be calculated using Manning’s equation with a roughness coefficient of 0.025 for flows up to the grass height. Grass height in the channel should be assumed to be 100-150mm;
- Flow above grass height, friction factor can be reduced to 0.01 for analysis of exceedance storm event;
- Storage volumes for the 1 in 1 year design event should dissipate within 24 hours, so that subsequent storms can be accommodated in terms of storage and treatment;
- Where practical, swales should form part of a wide blue/green network, designed for the temporary storage and conveyance of design exceedance storm events 30 to

100 year storm event. The maximum flow velocity should be below 1.0m/s. Higher velocities up to 2.0m/s may be permissible if erosion, soil stability and safety aspects can be demonstrated to the satisfaction of Council.

Detention Basin

Detention basins are surface storage basins or facilities that provide flow control through attenuation of storm water runoff. They also facilitate some settling of particulate pollutants. Detention basins are normally dry and in certain situations the land may also function as a recreational facility. However, basins can also be mixed, including both a permanently wet area for wildlife or treatment of the runoff and an area that is usually dry to cater for flood attenuation. Basins tend to be found towards the end of the SuDS management train, so are used if extended treatment of the runoff is required or if they are required for wildlife or landscape reasons.

- Maximum water depth should not exceed 3m although local safety considerations may reduce this further;
- Length/width ratio should be between 1:2 and 5:1;
- Contouring inside the basin can assist with defining areas likely to be inundated;
- Maximum side slopes of 1 in 4 to allow easy access;
- Sediment forebay or pre-treatment option will improve the water quality;
- Surface water bypass and drawdown is required to facilitate safe maintenance;
- Can be enhanced to improve ecological value;
- Large outlet pipes should be screened.
- Detention basin bases shall be designed with gentle inner slopes (1 to 100 maximum) towards the centre;
- Embankment inner slopes shall be less than 1 to 4;
- The maximum design water depth of the basins shall be 3m;
- The length to width ratio for online detention basins shall be between 5:1 to 2:1;
- The maximum volume of the detention basins shall be 5000m3.
- The drain down time should be a minimum of 24 hours, to allow for sedimentation to take place.



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