SUDS DESIGN GUIDE

Version 1.0

Photo courtesy of Illman Young Landscape Design Limited

Contents

1.0 INTRODUCTION

At the top of the drainage hierarchy is infiltration to Sustainable Drainage Systems. Sustainable drainage systems are a departure from the traditional approach to draining sites. They mimic nature and are designed to take account of water quantity (flooding), water quality (pollution) and amenity issues. They are supported by National, regional and local planning policies and are more sustainable than traditional drainage methods because they:

- Reduce flooding by managing runoff volumes and flow rates from hard surfaces
- Protect or enhance water quality
- Protect natural flow regimes in watercourses
- Are sympathetic to the environment and the needs of the local community creating a better place to live and work
- Provide a natural habitat for wildlife
- Promote evapotranspiration from vegetation and surface water
- Recharge groundwater and natural aquifers

Fundamental to this approach are the four components of the SuDS philosophy, as set out in the CIRIA SuDS Manual (2015):

1. Water quantity
2. Water quality
3. Amenity
4. Biodiversity

The above cannot be separated and must be considered in a holistic way to achieve "best value" from the SuDS design process.

This guide only concerns SuDS systems and for further information regarding Flood Risk Assessment and other related topics please refer to the other documents within Section 3.0. It has been produced to assist developers and other individuals in designing drainage systems incorporating SuDS features and provide information to aid approval of these features within Torbay.

2.0 SUSTAINSTAINABLE DRAINAGE SYSTEMS

There are many different types of SuDS systems that can be used, these include:

- Soakaways
- Rainwater harvesting
- Green Roofs
- Infiltration Systems
- Filter Strips
- Filter Drains
- Swales
- Bioretention Systems
- Pervious Pavements
- Attenuation Storage Tanks
- Detention Basins
- Ponds and Wetlands

Information concerning the design and suitability of these can be found in the Ciria SuDS Manual (2015).

3.0 RELEVANT LEGISLATION/GUIDANCE

3.1 The Flood and Water Management Act 2010

Further to the flooding that occurred in the summer of 2007 the government asked Sir Michael Pitt to undertake a comprehensive review of the flooding that took place. The report he produced had 92 recommendations and significantly shaped the Flood and Water Management Act. The Flood and Water Management Act updates legislation to ensure better protection from flooding, manage water more sustainably, improve public service and secure water resources during periods of drought. The Flood and Water Management Act also imparts significant new roles and responsibilities on local authorities with the creation of Lead Local Flood Authorities (LLFAs) who have responsibilities for managing local flood risk. As of 6th April 2015 LLFAs are a statutory consultee for major development (development of 10 dwellings or more; equivalent non-residential or mixed development) concerning surface water and ensuring that sustainable drainage systems for the management of runoff are put in place unless demonstrated to be inappropriate.

3.2 National Flood and Coastal Erosion Risk Management Strategy

The National Flood and Coastal Erosion Strategy now sets the direction for flood risk management across England. The Flood and Water Management Act 2010 requires the Environment Agency to 'develop, maintain, apply and monitor a strategy for flood and coastal erosion risk management in England'.

3.3 Water Framework Directive

The Water Framework Directive (WFD) has been set up to improve and integrate the way water bodies are managed throughout Europe. It establishes a legal framework to protect and restore clean water throughout Europe to ensure its long-term sustainable use. The Water Framework Directive established an approach for water management based on river basins and the natural geographical and hydrological units.

3.4 National Planning Policy Framework

National planning policy on development and flood risk is part of the National Planning Policy Framework (NPPF). The NPPF highlights that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. Local Plans should be supported by Strategic Flood Risk Assessments and develop policies to manage flood risk from all sources. Local Plans should apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account of the impacts of climate change. The NPPF and accompanying technical guidance in the National Planning Practice Guidance (NPPG) promote positive planning at all levels to deliver appropriate sustainable development in the right places, taking full account of flood risk.

3.5 Non-statutory Technical Standards for SuDS

The non-technical standards produced by Defra should be used in conjunction with Torbay's critical drainage area information published by the Environment Agency. The critical drainage area requirements will take preference over the non-statutory technical standards where they overlap.

Non-statutory technical standards for sustainable drainage systems

3.6 Critical Drainage Area

The Environment Agency have designated Torbay as a critical drainage area and as such have provided guidance on the requirements for design. These will be enforced by the LLFA.

Torbay - Critical Drainage Area

3.7 Strategic Flood Risk Assessment Level 1 & 2

Torbay Council has a Level 1 and Level 2 Strategic Flood Risk Assessment which can be found on the Council's website. These include information which will be helpful in design.

Torbay - Level 1 Strategic Flood Risk Assessment

Torbay - Level 2 Strategic Flood Risk Assessment

3.8 Torbay Local Flood Risk Management Strategy

Torbay Council has a Local Flood Risk Management Strategy that can be found on the Council's website. It provides useful information with regard to flood risk within Torbay and details our aspirations and priorities.

Torbay Local Flood Risk Management Strategy

Torbay Local Flood Risk Management Strategy Summary

3.9 Torbay Council Highways Design Guide

This document contains information relating to adoption of SuDS under a Section 38 highways agreement and the specific requirements of the highways department. This information should be read in conjunction with this guide.

Torbay Council Highways Design Guide

3.10 Building Regulations

The design must be compliant with the Building Regulations and Section 4 of this guide.

4.0 DESIGNING SUDS

The design should be carried out in accordance with the relevant legislation above and the Ciria SuDS Design Manual (2015).

4.1 Percolation tests

These should be in strict accordance with BRE365, and should have regard in particular to the following points:

- Tests should be carried out at the location and depth of the proposed SuDS feature (in areas with similar percolation test results, then within 20m of SuDS features).
- There should be three consecutive tests to near emptying (not just to 25% effective depth as extrapolation of results will not be accepted).
- The size and number should be suitable for the design.
- Permeable paving should be tested at 20m intervals (minimum 1.5x1m).
- There should be proof that ground water will not affect design (1m above seasonal ground water level).
- Health and Safety obtaining results should be fully considered.

4.2 Suitability

The SuDS feature should be suitable for the location where it is to be used. Consideration should be given to the following:

- Unsuitable ground conditions - unstable ground, contaminated ground
- Poor infiltration
- Ground slopes of greater than 10%
- Proximity to buildings and the highway
- Ground water pollution
- Other services
- Ground water levels

4.3 Hydraulic design parameters

The design should be as follows:

Unless an area is designated to hold and/or convey water as part of the design, flooding should not occur:

- on any part of the site for a 1 in 30 year rainfall event plus an allowance for climate change
- to any part of: a building (including basement);or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development for a 1 in 100 year rainfall event plus an allowance for climate change

If there is no above ground storage we would suggest that either of the following are used to demonstrate the whole system performs to the required level of protection:

1. Design using 1 in 100 year event plus climate change with the design top water level below the incoming pipe invert
2. Design using 1 in 100 year event with no flooding and check that the 1 in 30 year event plus climate change top water level is below the incoming pipe invert.

The factor of safety chosen should be in accordance with the Ciria SuDS manual (2015) and we would expect to see the values for "Minor damage to external areas or inconvenience" used. An allowance for climate change should be included based on the type of development.

In circumstances where infiltration is not suitable flows should be limited to the 1 in 10 year green field runoff rate, as per the critical drainage advice published by the Environment Agency. Brownfield development will be dealt with the same as greenfield development. The minimum flow rate that can positively discharged off site is 1.5 l/s. Any connections to a watercourse, main river, surface water sewer or combined sewer will require written permission. This will need to be supplied as part of the submission.

It should also be noted that there should be no increased risk of flooding to properties or land adjacent to the development site.

In order to demonstrate compliance with this, calculations and plans will need to be submitted in accordance with Section 5.0.

4.4 Construction details

The SuDS feature should be designed so that it operates for its whole design life. When designing a SuDS feature maintenance should be incorporated within the design. This should consider safe access for people undertaking maintenance and also for machinery to replace the feature or attend to the feature should it experience problems. Sediment transportation and removal should also be considered as this can impact on the efficiency.

If the SuDS system is underground the final surface use of the SuDS feature should be suitable i.e. if parking is above a crate system it should be structurally adequate for the design loads.

The SuDS feature and associated drainage system should be protected from damage during construction.

4.5 Overland flow routes

Flows resulting from rainfall in excess of a 1 in 100 year rainfall event plus an allowance for climate change should be managed in exceedance routes that minimise risk to people and property. These will need to be identified on a plan. The effect of blockages on the system will also require investigation along with the production of flood routes.

5.0 INFORMATION REQUIRED WITH SUBMISSION

The following information should be supplied with a planning application in order to allow the Council to assess the performance of the SuDS feature and any associated connecting system:

- Percolation test results and any associated geotechnical report
- Hydraulic calculations: SuDS feature(s) and connecting pipe system to be represented as one model
- Layout drawings to include: cover level, invert level, pipe sizes, pipe lengths, pipe gradients, gully locations, pipe numbering, catchment areas serving each pipe
- Flow control details and drawings
- SuDS feature details
- Construction drawings
- Maintenance plan and Inspection Checklist (see Section 6.0)
- Exceedance routes plan including investigation of blockage to system
- Permission for connection to any watercourse, main river, surface water sewer or combined sewer
- Information should be provided to demonstrate that the drainage hierarchy has been followed and the reason for the chosen solution.

6.0 MAINTENANCE PLAN AND INSPECTION CHECKLIST

The SuDS features and associated drainage system will require maintenance in order to ensure they operate at their optimum performance throughout their design life. The whole drainage system should be designed to ensure that the maintenance and operation requirements are economically proportionate. Each SuDS component should normally be designed with appropriate sediment management controls. As part of the submission a copy of the maintenance plan and inspection checklist should be provided. This should follow the guidance contained in the Ciria SuDS Manual (2015).

7.0 CONSTRUCTION

The construction of the SuDS feature should be in strict accordance with the design and any discrepancies should be reported to the designer and the Council so that they can be check that the design is still suitable. The Council may choose to inspect the system at, during or after construction and if the system is not as the design may choose to take enforcement action.

8.0 EDUCATION

It is important that the local residents that benefit from the SuDS and people living in the vicinity of them understand what they are and how they operate. This can be achieved by providing information and signage and making sure the local community group have all the necessary information. This will also help ensure that they remain in operation and reduce the impact of flooding.

APPENDIX

Submission checklist

Percolation Tests	**Tick**
3 consecutive tests to near emptying (not just to 25% effective depth as extrapolation of results will not be accepted)	
At correct location of proposed SuDS feature or in areas with similar percolation test results, then within 20m of SuDS features	
At the depth of the proposed SuDS feature	
Correct size and number of tests for SuDS feature (permeable paving should be tested at 20m intervals, minimum 1.5x1m)	
Proof that ground water will not affect design (evidence that 1m above seasonal ground water level)	
Calculations for the infiltration rate	
Design Calculations	
Correct rainfall and climate change used (i.e. 100 year plus 30 %)	
Plans showing the cover levels, invert levels, pipe sizes, pipe lengths, pipe gradients, gully locations, pipe numbering, catchment areas serving each pipe	
Greenfield runoff calculations (if applicable)	
Information should be provided to demonstrate that the drainage hierarchy has been followed and the reason for the chosen solution.	
Permission for connection to any watercourse, main river, surface water sewer or combined sewer	
Piped and SuDS system modelled as one model	
Results showing no flooding to properties for design storm and no increased risk of flooding to properties or land adjacent to the development site.	
Exceedance routes plan including investigation of blockage to system	
Construction Information	
Construction drawings	
Flow control details and drawings (if applicable)	
Maintenance plan and Inspection Checklist	

Please note that it would help if all this information could be accompanied with a document issue register.