



Consulting Civil & Structural Engineers

QuadConsult Limited
Columbus House
Village Way
Greenmeadow Springs Business Park
Cardiff
CF15 7NE

Tel: +44 (0)29 2077 9644
email: contactus@quadconsult.co.uk
Web: www.quadconsult.co.uk

Drainage Strategy Report

on

Proposed Starbucks Development, Cyfarthfa, Merthyr Tydfil

for

*Legal & General Leisure Fund Trustee Ltd (No 04301197)
and Legal & General Property Partners (Leisure) Ltd (No 04452915)
Registered Office – One Coleman Street. London. EC2R 5AA*

Date February 2021

Project no. 20231

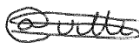
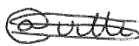


Directors
Chris Usher BSc(Hons) CEng FStructE MICE AaPS
Steve McCarthy BEng(Hons) MSc CEng MICE MCIHT

QuadConsult Limited registered in England and Wales reg.no. 06880193
Columbus House, Village Way
Greenmeadow Springs Business Park
Cardiff, CF15 7NE

Proposed Starbucks Development, Cyfarthfa, Merthyr Tydfil
Drainage Strategy Report

Document Control

Responsible for	Job Title	Name	Date	Signature
Content	Civil Engineer	Mark Llewellyn	8/02/2021	
Checked	Director	Andrew Villis	9/02/2021	
Approval	Director	Andrew Villis	9/02/2021	
Copyright:	QuadConsult ©2016	Document Reference:	20231-R-600-Drainage Strategy-2	
Signatories in this approval box have checked this document in line with the requirements of QuadConsult QMS Procedures				

Revision History

Revision	Date	Purpose/Status	Approved
0	09/02/2021	Review	ACV
1	10/02/2021	ISSUE	ACV
2	12/02/2021	ISSUE	ACV
3			
4			
5			
6			

Distribution

	Function Title	Company	Name
1	Client		
2			
3			

CONTENTS

Section	Item	Page
1.0	INTRODUCTION	4
2.0	THE EXISTING SITE	5
3.0	THE PROPOSED DEVELOPMENT	6
4.0	STATUTORY SuDS STANDARDS	7
5.0	TYPICAL SuDS FEATURES	8
6.0	PROPOSED SURFACE WATER STRATEGY	9
7.0	PROPOSED FOUL WATER STRATEGY	12
8.0	SUMMARY AND CONCLUSIONS	13
9.0	RECOMMENDATIONS	14
Appendix A	DCWW Records	
Appendix B	Soilscapes Map	
Appendix C	NRW Flood Risk Level & Zone Map	
Appendix D	20231-C-001 - Surface Water drainage Summary	
Appendix E	HR Wallingford_Greenfield Runoff Rate Estimation Tool	
Appendix F	HR Wallingford_Surface water storage volume estimation	

This document is for the exclusive use of the client and should not be used in whole or in part by any third parties without the express written permission of QuadConsult Limited.

List of Figures

Figure 1	Site Location Plan
Figure 2	CIRIA 753 Steps of Simple Index Approach

List of Tables

Table 1	Greenfield Runoff Rates
Table 2	Total Development Hazard Index
Table 3	SuDS Individual Component Mitigation Indices
Table 4	Total SuDS Mitigation Index

References

- 1 CIRIA – The SuDS Manual (C753)
- 2 Statutory Standards for Sustainable Drainage (SuDS) in Wales
- 3 Landis.org.uk/Soilscapes/soilguide.cfm
- 4 CornerPoint Topographical Survey – S21001-001-0
- 5 Ordnance Survey Mapping
- 6 BRE Digest 365 Soakaway Design
- 7 UK Centre for Ecology & Hydrology – Flood Estimate Handbook Web Service
- 8 Natural Resources Wales Online Flood Risk Map

Abbreviations

DCWW	Dŵr Cymru Welsh Water
A.O.D.	Above Ordnance Datum
NRW	Natural Resources Wales
FW	Foul Water
SW	Surface Water
SuDS	Sustainable Drainage Systems
SAB	SuDS Approving Body

1.0 INTRODUCTION

- 1.1 QuadConsult Limited has been appointed by Legal & General Leisure Fund Trustee Ltd and Legal & General Property Partners (Leisure) Ltd to prepare a Drainage Strategy Report in support of a planning application for a proposed Starbucks drive through coffee shop development at Cyfarthfa, Merthyr Tydfil.
- 1.2 This report will draw on information currently available outlining the extent of the current infrastructure.
- 1.3 The aim of this report is to demonstrate that a robust surface and foul water drainage strategy can be implemented to service the proposed development.

2.0 THE EXISTING SITE

- 2.1 The existing site (0.088ha) is currently used as a tarmac finished carpark area which is part of the existing leisure village development located adjacent to the Cyfarthfa retail park, Merthyr Tydfil.
- 2.2 The ground topography of the site comprises of the tarmac construction car park falling South to North at an average gradient of 1 in 28.
- 2.3 On review of the Dŵr Cymru/Welsh Water drainage records there appears to be a FW sewer adjacent to the site allowing potential connection points. The DCWW plan also indicates a private surface water network throughout the site discharging directly to the adjacent River Taff. The presence of onsite flow control and possible existing attenuation is to be investigated and confirmed (See Appendix A - DCWW Records).
- 2.4 The current site area is impermeable surfacing falling to gullies and channel drains connecting into the local private network before discharging into the adjacent River Taff. The DCWW records indicate no adopted surface water network within the immediate area.
- 2.5 With no formal Geotechnical Investigation carried out onsite currently, referencing Soilsmap mapping, it is assumed the ground is made of a slowly permeable seasonally wet acid loamy & clayey soil and as such infiltration to ground will not be a reliable drainage strategy. (See Appendix B - Soilsmap Map)
- 2.6 Reviewed NRW Flood Risk Maps (See Appendix C – NRW Flood Risk Level & Risk Maps) outline the location of development sits within Flood Zone B (Area known to have flooded in the past).

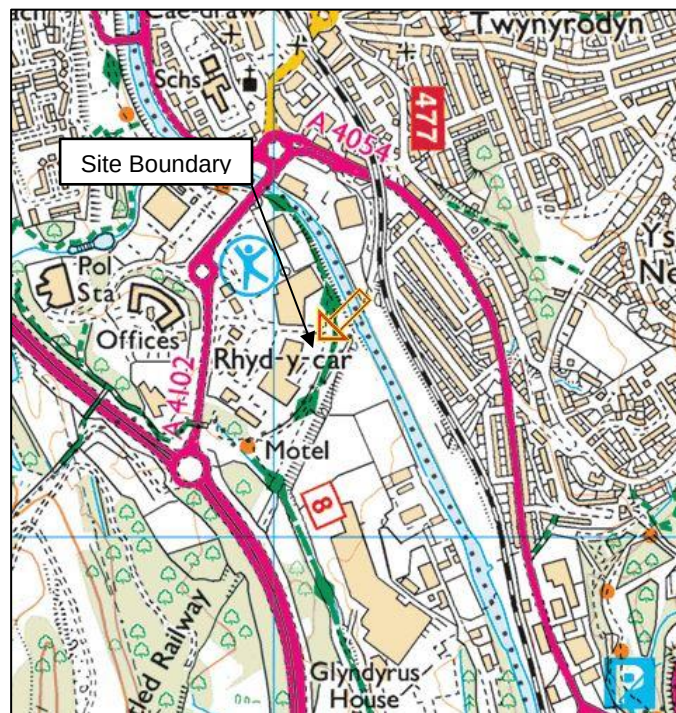


Figure 1 – Site Location Plan (Ordnance Survey ©)

3.0 THE PROPOSED DEVELOPMENT

- 3.1 The proposed development consists of a single drive through coffee shop which will be accessed through the existing carpark. (See Appendix D – 20231-C-001 - Surface Water Drainage Summary)
- 3.2 The proposed development area is 880m² including 234m² of roof catchment, the remaining site construction will include a mixture of permeable surfacing and landscapes areas.
- 3.3 The development will tie in to existing surrounding levels and topography.

4.0 STATUTORY SuDS STANDARDS

4.1 Scope and Objective

The proposed storm water strategy will detail a suitable concept conforming to the client's scope and requirements and submit within a SAB application to the local authority SuDS Approval Body (SAB), demonstrating compliance with the 6 standards S1-S6 set out by Welsh Government within the Statutory Standards for Sustainable Drainage Systems for Wales guidance as outlined below:

4.2 Standard S1 - Surface Water Runoff Destination

This Standard addresses the use of surface water by the development and where it should be discharged. The aim is to ensure that runoff is treated as a resource and managed in a way that minimises negative impact of the development on flood risk, the morphology and water quality of receiving waters and the associated ecology. This will ensure that early consideration is given to the use of rainwater harvesting systems to both manage runoff and deliver a source of non-potable water for the site where practical. Where it is not, prioritisation should be given to infiltration. Discharges to sewerage systems must be limited where possible.

- Priority Level 1 - Surface Water is collected for use.
- Priority Level 2 - Infiltrate to Ground
- Priority Level 3 - Discharge to Surface Water Body
- Priority Level 4 - Discharge to Surface Water Sewer or Highway Sewer
- Priority Level 5 - Discharge to Combined Sewer

4.3 Standard S2 - Surface Water Runoff Hydraulic Control

The aim of Standard S2 is to manage the surface water runoff from and on a site to protect people on the site from flooding from the drainage system for events up to a suitable return period, to mitigate any increased flood risk to people and property downstream of the site as a result of the development, and to protect the receiving water body from morphological damage.

4.4 Standard S3 - Water Quality

Standard S3 addresses the drainage design requirements to minimise the potential pollution risk posed by the surface water runoff to the receiving water body.

4.5 Standard S4 - Amenity

Standard S4 addresses the design of SuDS components to ensure that, where possible, they enhance the provision of high quality, attractive public space which can help provide health and wellbeing benefits, they improve liveability for local communities, and they contribute to improving the climate resilience of new developments.

4.6 Standard S5 - Biodiversity

Standard S5 addresses the design of SuDS to ensure, where possible, they create ecologically rich green and blue corridors in developments and enrich biodiversity value by linking networks of habitats and ecosystems together. Biodiversity should be considered at the early design stage of a development to ensure the potential benefits are maximised.

4.7 Standard S6 - Design of drainage for Construction, Operation and Maintenance and Structural Integrity

Standard S6 deals with designing robust surface water drainage systems so they can be easily and safely constructed, maintained, and operated taking account of the need to minimise negative impacts on the environment and natural resource.

5.0 TYPICAL SuDS FEATURES

Suds features outlined within CIRIA C752 and used to comply with the Statutory Standards for Sustainable Drainage Wales (SSSD) that have been considered within the process of compiling this proposed scheme and drainage strategy are:

5.1 Bioretention / Rain Gardens

Bioretention features, including planters and rain gardens, are surface runoff controls that capture and treat storm water runoff at surface level. Bioretention features offer first stage treatment processes before allowing the storm water to pass onto downstream additional SuDS features. A portion of the captured runoff volume will be removed through evaporation and plant transpiration. Overflows should be considered within Bioretention features to allow conveyance during major storm events.

5.2 Pervious Surfacing

Pervious surfacing provides suitable finishes for pedestrian and vehicular accessible areas that collect and allow rainwater to infiltrate through the surface and into the porous underlying layers. The construction will provide treatment to the storm water infiltrating through the material and geotextile layers. Where the permeability of the soil is insufficient to allow infiltration, a lined system will be required with outlet connection into the proposed surface water drainage network.

5.3 Swales Conveyance / Retention

The use of Swales can be split into two categories:

- Conveyance can offer interception and treatment of flows before allowing discharge to a wider network. These could be sited adjacent to highways / carparks or rainwater down pipes capturing and holding minor rain fall volumes, heavier rainfall volumes will be allowed to overflow into downstream features.
- Retention Swales / Ponds or Basins will be larger features to capture main site runoff during heavier storm events. Storm water is held and discharged through infiltration if site conditions allow or attenuated before discharge into downstream recipient (Watercourse, Sewer etc) at an acceptable discharge rate.

5.4 Filter Drains

Shallow trenches filled with stone/gravel, with an underdrain perforated pipe creating temporary sub surface storage, conveyance, and filtration of surface water runoff, allowing infiltration to ground locally when required before discharging downstream. Geotextiles and membranes are introduced to line and maintain performance over time. Filter drains are considered on-line feature and are required to be sized accordingly ensuring conveyance downstream without excess flows and potential subsequent damage. Can be sited adjacent to highways / carparks or rainwater down pipes and used for land drainage but can also be located at the invert of Swales.

5.5 Detention Basins / Attenuation Pond

Landscaped depressions that can be drained dry or have permanent marshy areas or pools of water. Can either be an on-line component where surface water runoff from regular storm events is routed through basin with water volumes attenuated as a result of a restricted outlet, or off-line with runoff diverted over a specified threshold. When designed to be vegetated and managed accordingly can provide water treatment to regular runoff flows, absorbing and infiltrating to ground where feasible, sustaining planting and can have a significant positive impact on biodiversity.

6.0 PROPOSED SURFACE WATER STRATEGY**6.1 STANDARD S1 – SURFACE WATER RUNOFF DESTINATION**

- 6.2 Priority Level 1: Due to the small scale of roof area and projected low yield it is deemed not to be economically viable to use rainwater harvesting for non-potable supply.
- 6.3 Priority Level 2: Currently no Geotechnical Investigation is available for the site but from a desk study referencing Soilscape mapping, infiltration rates are expected to be poor based on the ground classification. But soakaway testing to BRE365 is required to confirm.
- 6.4 Priority Level 3: Discharge to Surface Water Body: Runoff from the SuDS features from the proposed development will enter the existing piped network before discharge to the adjacent River Taff. The (Option A) proposal will offer significant betterment over the existing surface water system. The overall catchment will be reduced by 20% while also slowing water release into the piped network. It is assumed the existing piped network is attenuated and discharged through a flow control device prior to outfall into the River Taff. If, following investigation / survey works no attenuation or flow control measures are identified, Option B can be utilised. Option B will offer onsite attenuation through cellular storage (Refer to Appendix F for estimated size) along with a flow control chamber. This will offer a reduction to brownfield rate with 30% betterment or if required, reduction to greenfield runoff rate.

6.5 STANDARD S2 – SURFACE WATER RUNOFF HYDRAULIC CONTROL

- 6.6 Greenfield runoff rates based on a site area of 0.1ha have been calculated in accordance with UKSuDS Greenfield runoff tool (See Appendix E - HR Wallingford_Greenfield Runoff Rate Estimation Tool) and are in line with guidelines set out in Suds Manual C753 and are summarised in Table 1 below.

Table 1 – Greenfield Run-off Rates

Return Period	FSR Rate (l/s)
Q_{bar}	1.56
1	1.37
30	2.78
100	3.4

- 6.7 Primary treatment and conveyance - Roof runoff from property will be captured by Raised Bioretention Planters along with areas of Permeable paving construction, capturing, attenuating, and treating flows initially. The overflow from these features will be designed to capture the first 5mm flush as required.
- 6.8 Secondary treatment and conveyance – Permeable paving subbase construction with connecting perforated pipework sections will capture paved surface runoff and overflow from Primary system. Captured flows will outflow into the existing piped network via a catchpit chamber (Option A) or Flow control Chamber (Option B). The perforated pipe network will benefit from online catchpits to aid maintenance and reduce silt volumes into the wider piped network.

- 6.9 If no existing attenuation and control chamber are identified on site, Option B will offer attenuation storage and controlled discharge rate for all storm events up to the 100year return period + 40% climate change factor within the cellular storage attenuation.
- 6.10 Development SW discharge will be reduced through Option A, offering a catchment reduction of 20% over the existing structure. Option B will control using a flow control device, ensuring the rate does not exceed the agreed rate (greenfield runoff rate of Qbar 1.56l/s).
- 6.11 STANDARD S3 – WATER QUALITY
- 6.12 CIRIA 753 The SuDS Manual Chapter 26, provides design advice to meet water quality standards by adopting the SuDS train treatment mechanism and thereby reduce the risk of pollution by evaluating potential pollution hazards at the outset.

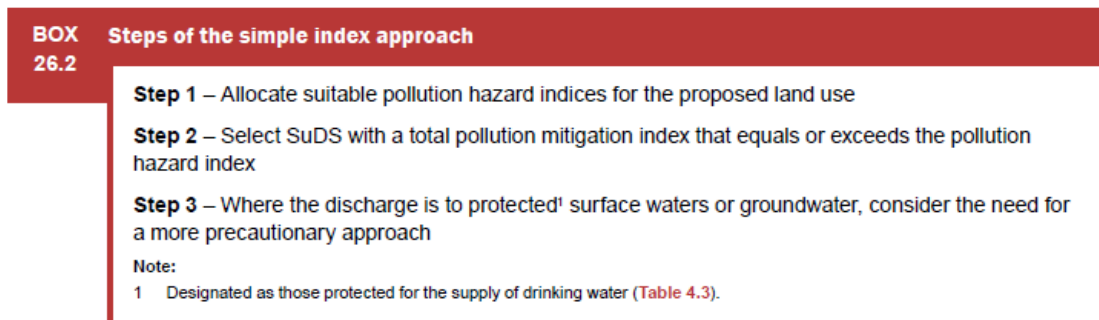


Figure 2 – CIRIA 753 Steps of Simple Index Approach

- 6.13 Runoff from a commercial roof is generally viewed as low to very low risk with commercial yards indicated as medium risk (Table 4.3 within CIRIA 753 The SuDS Manual), the proposed site layout provides the opportunity to introduce SuDS into the scheme to reduce potential contaminant risk still further.
- 6.14 We propose to apply a simple qualitative method to assess the risk (Simple Index Approach) and propose mitigation measures as defined in Table 26.1 CIRIA SuDS Manual with Table 3 outlining the total development hazard index.

Table 2 – Total Development Hazard Index

Assuming a roof/hard surface split of 30/70 and using a weighted mean:

Commercial Roof 0.3 (30%)	Total Suspended Solids (0.3)	Metals (0.2)	Hydrocarbons (0.05)
Weighted value	0.09	0.06	0.015
Commercial yard with frequent change 0.7 (70%)	Total Suspended Solids (0.7)	Metals (0.6)	Hydrocarbons (0.7)
Weighted value	0.49	0.42	0.49
Total Hazard Index	0.58	0.48	0.51

- 6.15 In comparison with the Hazard Index, Table 3 outlines the SuDS Mitigation Indices proposed for each separate feature within the proposed development, and individually satisfying the treatment requirements as the SuDS mitigation Index is greater than the pollution hazard index.

Table 3 – SuDS Individual Component Mitigation Indices

	Suspended Solids	Metals	Hydrocarbons
Bioretention	0.8	0.8	0.8
Pervious Pavement	0.7	0.6	0.7
Comparison with Hazard Index	ALL>0.58	ALL>0.48	ALL>0.51

- 6.16 However, within the outline drainage scheme treatment is proposed for the whole of the site where practical, creating a Suds Management Train improving treatment locally and further reducing risk with the best and worst case outlined within Table 4.

Table 4 – Total SuDS Mitigation Index

Total SuDS Mitigation Index = Mitigation Index₁ + 0.5 Mitigation Index₂

	Suspended Solids	Metals	Hydrocarbons
SCENARIO 1 (Roof Runoff) Planter-Permeable Paving	1.15	1.15	1.15
SCENARIO 2 (Drive Through Lane, Externals) Permeable Paving	0.70	0.6	0.7
Comparison with Hazard Index	ALL>0.58	ALL>0.48	ALL>0.51

6.17 STANDARD S4 - AMENITY

- 6.18 The proposed development incorporates various SuDS features throughout the site. It is proposed that the roof areas are taken into planters where practical and thereafter into permeable paving along with the remaining surface water runoff. Along with the proposed areas of landscaping, this strategy will offer significant improvement over the current environment.

6.19 STANDARD S5 – BIODIVERSITY

- 6.20 The proposed Suds features, and associated planting provide habitat for wildlife, softening the impact of the new development.

7.0 PROPOSED FOUL WATER STRATEGY

- 7.1 The proposed development comprises of a drive through coffee shop, proposed foul discharge rates will need to be confirmed by the client.
- 7.2 There is an extensive existing foul drainage network serving the site with multiple viable connection points. A discharge rate will need to be confirmed with DCWW through the preplanning process. Once agreed a Section 106 application for connection consent will need to be obtained.

8.0 SUMMARY AND CONCLUSIONS

- 8.1 The development is located within Flood Zone B (Area known to have been flooded in the past) site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood levels, there is no need to consider flood risk further. Proposed FFL of the coffee shop should be set at the same level of immediate adjacent commercial premises.
- 8.2 The proposed site levels should follow the existing topography as closely and practical as possible, this will allow any excess flows to be contained with the existing carpark and associated drainage network.
- 8.3 The development will have a dedicated Primary SW treatment and conveying system using a combination of Raised Planters and Permeable Paving.
- 8.4 Secondary treatment & conveying system will consist of permeable paving, perforated pipes and catchpits.
- 8.5 Option A will offer a 20% betterment over existing catchment with the additional benefits of SuDS treatment.
- 8.6 Option B (If required) will offer a controlled limited flow surface water scheme, with below ground attenuation for up to and including the 100year return period + 40% for climate via a flow control device restricting the flow to the Qbar rate of 1.56l/s mimicking greenfield runoff rates.
- 8.7 The SuDS features will present opportunity for planting points of interest and habitat for wildlife softening the impact of the development and complimenting adjacent protected areas.
- 8.8 Soakaway testing to BRE 365 will be required to confirm infiltration will not be viable onsite.
- 8.9 Existing flow control and attenuation structures to be confirmed to determine if current site wide surface water network is discharging at a pre-agreed rate.

9.0 RECOMMENDATIONS

- 9.1 Full Geotechnical Investigation is carried out to detail the ground formation.
- 9.2 Soakaway testing to BRE 365 to determine infiltration rates.
- 9.3 Existing Surface water network to be investigated and surveyed.
- 9.4 Submit a Pre-SAB application to engage the locally authority as soon as practical.

**APPENDIX A
DCWW RECORDS**



**APPENDIX B
SOILSCAPES MAP**



APPENDIX C
NRW FLOOD RISK LEVEL & ZONE MAPS



APPENDIX D
20231-C-001 - Surface Water Drainage Strategy



APPENDIX E
HR WALLINGFORD_GREENFIELD RUNOFF RATE ESTIMATE TOOL



Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:

Site name:

Site location:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:

Longitude:

Reference:

Date:

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	5	5
HOST class:	N/A	N/A
SPR/SPRHOST:	0.53	0.53

Hydrological characteristics

	Default	Edited
SAAR (mm):	1526	1526
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	1.56	1.56
1 in 1 year (l/s):	1.37	1.37
1 in 30 years (l/s):	2.78	2.78
1 in 100 year (l/s):	3.4	3.4
1 in 200 years (l/s):	3.84	3.84

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

APPENDIX F
HR WALLINGFORD_SURFACE WATER STORAGE ESTIMATE



Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:
 Site name:
 Site location:

Site Details

Latitude:
 Longitude:
 Reference:
 Date:

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site characteristics

Total site area (ha):
 Significant public open space (ha):
 Area positively drained (ha):
 Impermeable area (ha):
 Percentage of drained area that is impermeable (%):
 Impervious area drained via infiltration (ha):
 Return period for infiltration system design (year):
 Impervious area drained to rainwater harvesting (ha):
 Return period for rainwater harvesting system (year):
 Compliance factor for rainwater harvesting system (%):
 Net site area for storage volume design (ha):
 Net impermeable area for storage volume design (ha):
 Pervious area contribution to runoff (%):

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:
 Urban creep allowance factor:
 Volume control approach:
 Interception rainfall depth (mm):
 Minimum flow rate (l/s):

Methodology

esti:
 Q_{BAR} estimation method:
 SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	5	5
SPR:	0.53	0.53

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	82
Rainfall 100 yrs 12 hrs:	--	119.48
FEH / FSR conversion factor:	1.16	1.16
SAAR (mm):	1526	1526
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.2	0.2
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 10 year:	1.42	1.42
Growth curve factor 30 year:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Q_{BAR} for total site area (l/s):	1.56	1.56
Q_{BAR} for net site area (l/s):	1.56	1.56

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	1.6	1.6
1 in 30 years (l/s):	1.6	1.6
1 in 100 year (l/s):	1.6	1.6

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m^3):	69	69
Long term storage 1/100 years (m^3):	0	0
Total storage 1/100 years (m^3):	69	69

This report was produced using the storage estimation tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at <http://uksuds.com/terms-and-conditions.htm>. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.