

Minimum flow rate (I/s):

(mm):

5

2

## Surface water storage requirements for sites

| Storage estimation tool Site Details Calculated by: Megan Au Latitude: 53.27941° N Site name: Ince AGI Longitude: 2.79829° W Site location: Ince, England This is an estimation of the storage volume requirements that are needed to meet normal Reference: 3071446808 best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and Date: Jul 22 2022 16:41 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. Methodology Site characteristics Total site area (ha): Q<sub>MED</sub> estimation method: Calculate from BFI and SAAR 0.18 Significant public open space (ha): BFI and SPR method: 0 Calculate from dominant **DHAST** Edited Area positively drained (ha): Soil characteristics 0.18 Impermeable area (ha): 0.18 **HOST class:** Percentage of drained area that is impermeable (%): **BFI HOST:** 100 0.302 Impervious area drained via infiltration (ha): 0 SPR HOST: 0.6 Default Edited Return period for infiltration system design (year): Hydrological 10 characteristics Impervious area drained to rainwater harvesting (ha): 0 Q<sub>MED</sub>: 0.93 Return period for rainwater harvesting system (year): 10 Q<sub>BAR</sub> / Q<sub>MED</sub> conversion 1.075 Compliance factor for rainwater harvesting system (%): 66 factor: Net site area for storage volume design (ha): 0.18 Rainfall 100 yrs 6 hrs: 63 Net impermable area for storage volume design (ha): 0.18 Rainfall 100 yrs 12 hrs: 78.54 Pervious area contribution to runoff (%): 30 FEH / FSR conversion factor: 1.02 1.02 \* where rainwater harvesting or infiltration has been used for managing SAAR (mm): 722 722 surface water runoff such that the effective impermeable area is less M5-60 Rainfall Depth (mm): than 50% of the 'area positively drained', the 'net site area' and the 20 20 estimates of Q<sub>BAR</sub> and other flow rates will have been reduced 'r' Ratio M5-60/M5-2 day: 0.4 0.4 accordingly. Hydological region: 10 10 Design criteria Growth curve factor 1 year: 0.87 0.87 Climate change allowance 1.4 factor: Growth curve factor 10 year: 1.38 1.38 Urban creep allowance Growth curve factor 30 year: 1.7 1.7 factor: Growth curve factor 100 2.08 2.08 Volume control approach Use long term storage years:

Q<sub>BAR</sub> for total site area (I/s):

QBAR for net site area (I/s):

1

1

1

Site discharge rates	Default	Edited	Estimated storage volumes	Default	Edited
1 in 1 year (l/s):	2	2	Attenuation storage 1/100 years (m³):	94	94
1 in 30 years (l/s):	2	2	Long term storage 1/100 years (m³):	0	0
1 in 100 year (l/s):	2.1	2.1	Total storage 1/100 years (m³):	94	94

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# Surface water storage requirements for sites

| Storage estimation tool

Calculated by:	Megan Au			Site Details	5	<u> </u>		
Site name:	Rock Bank	, D\/C		Latitude:			53.2	23617° N
				Longitude:			2.8	88363° W
Site location:	Rock Bank	k, England olume requirements that are	pooded to most por	mal				
best practice criteria i	n line with Envir	ronment Agency guidance "F	Rainfall runoff manage	Dotoropoo:			256	7233292
the non-statutory star of drainage systems.	ndards for SuDS It is recommen	i), the SuDS Manual C753 (C S (Defra, 2015). It is not to be ded that hydraulic modelling ails before finalising the desi	e used for detailed de software is used to d	calculate		J	lul 22 20	022 16:53
Site characteris	stics			Methodology				
Total site area (ha)	:		0.1050	Q <sub>MED</sub> estimation method	d: C	alculate fi	rom BFI	and SAAR
Significant public	open space (	(ha):	0	BFI and SPR method:	C	alculate fi	rom dom	ninant
Area positively dra	ained (ha):		0.105	Soil characteristics	рф	PASTE	Edi	ted
Impermeable area	ι (ha):		0.105	HOST class:				
Percentage of dra	ined area tha	at is impermeable (%):	100	BFI HOST:			0.492	
Impervious area d	rained via inf	iltration (ha):	0	SPR HOST:			0.47	
Return period for i	infiltration sys	stem design (year):	10	Hydrological		Defa	ıult	Edited
Impervious area d	rained to rair	water harvesting (ha):	0	characteristics				
Return period for	rainwater har	vesting system (year):	10	Q <sub>MED</sub> :				0.31
Compliance factor	r for rainwate	r harvesting system (%)	: 66	Q <sub>BAR</sub> / Q <sub>MED</sub> conversior factor:	1			1.075
Net site area for st	torage volum	e design (ha):	0.11	Rainfall 100 yrs 6 hrs:				55
Net impermable a	rea for storaç	ge volume design (ha):	0.11	Rainfall 100 yrs 12 hrs:				65.52
Pervious area con	tribution to r	unoff (%):	30	FEH / FSR conversion fa	actor:	1.04		1.04
* where rainwater	harvesting o	r infiltration has been us	ed for managing	SAAR (mm):		698		698
		the effective impermeat y drained', the 'net site		M5-60 Rainfall Depth (m	nm):	17		17
estimates of $Q_{\text{BAR}}$	•	ow rates will have been		'r' Ratio M5-60/M5-2 d		0.4		0.4
accordingly.				Hydological region:	-	10		10
Design criteria Climate change al	lowence	4.4		Growth curve factor 1 y	ear:	0.87		0.87
factor:	iowai ice	1.4		Growth curve factor 10	year:	1.38		1.38
Urban creep allow	ance	1		Growth curve factor 30	year:	1.7		1.7
factor:				Growth curve factor 100	)	2.08		2.08
Volume control ap	proach	Use long term storage	Э	years:				
Interception rainfa (mm):	ll depth	5		Q <sub>BAR</sub> for total site area (	[l/s):	0.34		0.34
Minimum flow rate	e (l/s):	2		Q <sub>BAR</sub> for net site area (I/	's):	0.34		0.34

Site discharge rates	Default	Edited	Estimated storage volumes	Default	Edited
1 in 1 year (l/s):	2	2	Attenuation storage 1/100 years (m³):	36	36
1 in 30 years (l/s):	2	2	Long term storage 1/100 years (m³):	0	0
1 in 100 year (l/s):	2	2	Total storage 1/100 years (m³):	36	36

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Minimum flow rate (I/s):

(mm):

5

2

## Surface water storage requirements for sites

| Storage estimation tool Site Details Calculated by: Megan Au Latitude: 53.22534° N Site name: Mollington BVS Longitude: 2.92793° W Site location: Mollington, England This is an estimation of the storage volume requirements that are needed to meet normal Reference: 2036154066 best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and Date: Jul 22 2022 17:01 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. Methodology Site characteristics Total site area (ha): 0.1050 Q<sub>MED</sub> estimation method: Calculate from BFI and SAAR Significant public open space (ha): BFI and SPR method: 0 Calculate from dominant **DHAST** Edited Area positively drained (ha): Soil characteristics 0.105 Impermeable area (ha): 0.1050 **HOST class:** Percentage of drained area that is impermeable (%): **BFI HOST:** 100 0.682 Impervious area drained via infiltration (ha): 0 SPR HOST: 0.3 Default Edited Return period for infiltration system design (year): Hydrological 10 characteristics Impervious area drained to rainwater harvesting (ha): 0 Q<sub>MED</sub>: 0.16 Return period for rainwater harvesting system (year): 10 Q<sub>BAR</sub> / Q<sub>MED</sub> conversion 1.075 Compliance factor for rainwater harvesting system (%): 66 factor: Net site area for storage volume design (ha): 0.11 Rainfall 100 yrs 6 hrs: 55 Net impermable area for storage volume design (ha): 0.11 Rainfall 100 yrs 12 hrs: 65.52 Pervious area contribution to runoff (%): 30 FEH / FSR conversion factor: 1.04 1.04 \* where rainwater harvesting or infiltration has been used for managing SAAR (mm): 699 699 surface water runoff such that the effective impermeable area is less M5-60 Rainfall Depth (mm): than 50% of the 'area positively drained', the 'net site area' and the 17 17 estimates of Q<sub>BAR</sub> and other flow rates will have been reduced 'r' Ratio M5-60/M5-2 day: 0.4 0.4 accordingly. Hydological region: 9 9 Design criteria Growth curve factor 1 year: 0.88 0.88 Climate change allowance 1.4 factor: Growth curve factor 10 year: 1.42 1.42 Urban creep allowance Growth curve factor 30 year: 1.78 1.78 factor: Growth curve factor 100 2.18 2.18 Volume control approach Use long term storage years:

Q<sub>BAR</sub> for total site area (I/s):

Q<sub>BAR</sub> for net site area (I/s):

0.17

0.17

0.17

0.17

Site discharge rates	Default	Edited	Estimated storage volumes	Default	Edited
1 in 1 year (l/s):	2	2	Attenuation storage 1/100 years (m³):	36	36
1 in 30 years (l/s):	2	2	Long term storage 1/100 years (m³):	0	0
1 in 100 year (l/s):	2	2	Total storage 1/100 years (m³):	36	36

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any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.	



# Surface water storage requirements for sites

| Storage estimation tool

Calculated by:	Megan Au			Site Details	S	<u> </u>		
Site name:	Aston Hall	DVC		Latitude:			53.1	9439° N
[				Longitude:			3.0	3233° W
Site location:	Aston Hall,							
best practice criteria i	n line with Envir	rolume requirements that are ne ronment Agency guidance "Rai 8), the SuDS Manual C753 (Ciria	nfall runoff manage	Potoronoo:			7	5357765
the non-statutory star of drainage systems.	ndards for SuDS It is recommen	S (Defra, 2015). It is not to be uded that hydraulic modelling so ails before finalising the design	sed for detailed de oftware is used to d	calculate		J	ul 22 20	22 17:03
Site characteris	· ·	and soloto intailoring the deelight	or the drainage oc	Methodology				
Total site area (ha)			0.1050	Q <sub>MED</sub> estimation metho	d: C	alculate fi	om BFI :	and SAAR
Significant public		(ha):	0	BFI and SPR method:		alculate fi		
Area positively dra		. ,	0.105	Soil characteristics		PASTE	Edi	
Impermeable area			0.1050	HOST class:				
•		at is impermeable (%):	100	BFI HOST:			0.492	
Impervious area d			0	SPR HOST:			0.492	
•		stem design (year):	10	Hydrological		 Defa		 Edited
	-	nwater harvesting (ha):	0	characteristics				
•		vesting system (year):	10	Q <sub>MED</sub> :				0.34
		or harvesting system (%):		│ │ Q <sub>BAR</sub> / Q <sub>MED</sub> conversior	า			1.075
·			66	factor:				
Net site area for st	_		0.11	Rainfall 100 yrs 6 hrs:				61
·		ge volume design (ha):	0.11	Rainfall 100 yrs 12 hrs:				75.92
Pervious area con	tribution to ri	unoff (%):	30	FEH / FSR conversion f	actor:	1.04		1.04
	_	r infiltration has been used the effective impermeable		SAAR (mm):		719		719
		y drained', the 'net site are		M5-60 Rainfall Depth (n	nm):	17		17
estimates of Q <sub>BAR</sub> accordingly.	and other flo	ow rates will have been re	duced	'r' Ratio M5-60/M5-2 d	ay:	0.3		0.3
Design criteria				Hydological region:		9		9
Climate change al	lowance	1.4		Growth curve factor 1 y	ear:	0.88		0.88
factor:				Growth curve factor 10	year:	1.42		1.42
Urban creep allow	/ance	1		Growth curve factor 30	year:	1.78		1.78
factor:				Growth curve factor 10	0	2.18		2.18
Volume control ap		Use long term storage		years:				
Interception rainfal (mm):	ll depth	5		Q <sub>BAR</sub> for total site area	(l/s):	0.36		0.36
Minimum flow rate	e (I/s):	2		Q <sub>BAR</sub> for net site area (l/	/s):	0.36		0.36

Site discharge rates	Default	Edited	Estimated storage volumes	Default	Edited
1 in 1 year (l/s):	2	2	Attenuation storage 1/100 years (m³):	39	39
1 in 30 years (l/s):	2	2	Long term storage 1/100 years (m³):	0	0
1 in 100 year (l/s):	2	2	Total storage 1/100 years (m³):	39	39

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### Surface water storage requirements for sites

| Storage estimation tool Site Details Calculated by: Megan Au Latitude: 53.20337° N Site name: Northop Hall AGI Longitude: 3.10989° W Site location: Northop Hall, England This is an estimation of the storage volume requirements that are needed to meet normal Reference: 3718859926 best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and Date: Jul 22 2022 17:09 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. Methodology Site characteristics Total site area (ha): Q<sub>MED</sub> estimation method: Calculate from BFI and SAAR 0.115 Significant public open space (ha): 0 Area positively drained (ha): 0.115 Impermeable area (ha): 0.115 Percentage of drained area that is impermeable (%): 100 Impervious area drained via infiltration (ha): 0 Return period for infiltration system design (year): 10 Impervious area drained to rainwater harvesting (ha): 0 Return period for rainwater harvesting system (year): 10 Compliance factor for rainwater harvesting system (%): 66

0.12

0.12

30

Net site area for storage volume design (ha):

Net impermable area for storage volume design (ha):

Pervious area contribution to runoff (%):

Design criteria

Interception rainfall depth

Minimum flow rate (I/s):

(mm):

\* 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<sub>BAR</sub> and other flow rates will have been reduced accordingly.

#### Climate change allowance 1.4 factor: Urban creep allowance factor: Volume control approach Use long term storage

BFI and SPR method:	C	Calculate from dominant			
Soil characteristics		PASTE	Ec	Edited	
HOST class:					
BFI HOST:			0.492	2	
SPR HOST:			0.47		
Hydrological characteristics		Defa	ult	Edite	d
Q <sub>MED</sub> :				0.46	
Q <sub>BAR</sub> / Q <sub>MED</sub> conversion factor:				1.075	
Rainfall 100 yrs 6 hrs:				61	
Rainfall 100 yrs 12 hrs:				77.38	
FEH / FSR conversion fa	ctor:	1.06		1.06	
SAAR (mm):		787		787	
M5-60 Rainfall Depth (m	m):	17		17	
'r' Ratio M5-60/M5-2 da	y:	0.3		0.3	
Hydological region:		9		9	
Growth curve factor 1 ye	ar:	0.88		0.88	
Growth curve factor 10 y	⁄ear:	1.42		1.42	
Growth curve factor 30 y	⁄ear:	1.78		1.78	
Growth curve factor 100 years:		2.18		2.18	
Q <sub>BAR</sub> for total site area (l/	/s):	0.5		0.5	
Q <sub>BAR</sub> for net site area (l/s	s):	0.5		0.5	

Site discharge rates	Default	Edited	Estimated storage volumes	Default	Edited
1 in 1 year (l/s):	2	2	Attenuation storage 1/100 years (m³):	47	47
1 in 30 years (l/s):	2	2	Long term storage 1/100 years (m³):	0	0
1 in 100 year (l/s):	2	2	Total storage 1/100 years (m³):	47	47

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	Flint AGI	
•		Micro
Date 24/06/2022	Designed by MA	Drainage
File Flint storage.SRCX	Checked by AS	Diamage
XP Solutions	Source Control 2019.1	

#### Summary of Results for 100 year Return Period (+40%)

Storm Event				-	Max Control (1/s)	Volume	Status
15	min	Summer	51.327	0.197	2.0	201.6	o K
30	min	Summer	51.390	0.260	2.0	269.9	Flood Risk
60	$\min$	Summer	51.458	0.328	2.0	346.3	Flood Risk
120	$\min$	Summer	51.513	0.383	2.0	408.6	Flood Risk
180	min	Summer	51.544	0.414	2.0	444.7	Flood Risk
240	$\min$	Summer	51.564	0.434	2.0	469.1	Flood Risk
360	min	Summer	51.590	0.460	2.0	500.1	Flood Risk
480	$\min$	Summer	51.605	0.475	2.0	517.9	Flood Risk
600	$\min$	Summer	51.614	0.484	2.0	528.5	Flood Risk
720	min	Summer	51.619	0.489	2.0	534.4	Flood Risk
960	$\min$	Summer	51.621	0.491	2.0	537.4	Flood Risk
1440	$\min$	Summer	51.611	0.481	2.0	524.6	Flood Risk
2160	$\min$	Summer	51.577	0.447	2.0	483.8	Flood Risk
2880	$\min$	Summer	51.548	0.418	2.0	449.2	Flood Risk
4320	$\min$	Summer	51.507	0.377	2.0	402.1	Flood Risk
5760	$\min$	Summer	51.479	0.349	2.0	369.8	Flood Risk
7200	$\min$	Summer	51.462	0.332	2.0	351.1	Flood Risk
8640	$\min$	Summer	51.452	0.322	2.0	339.5	Flood Risk
10080	$\min$	Summer	51.448	0.318	2.0	334.3	Flood Risk
15	$\min$	Winter	51.327	0.197	2.0	201.6	O K
30	$\min$	Winter	51.390	0.260	2.0	270.0	Flood Risk

Storm		Rain	Flooded	Discharge	Time-Peak	
	Even	t	(mm/hr)	Volume	Volume	(mins)
				(m³)	(m³)	
15	min	Summer	154.086	0.0	168.8	27
30	min	Summer	103.378	0.0	163.6	42
60	min	Summer	66.653	0.0	320.7	72
120	min	Summer	39.817	0.0	309.9	130
180	$\min$	Summer	29.225	0.0	305.6	190
240	$\min$	Summer	23.384	0.0	303.6	250
360	$\min$	Summer	16.986	0.0	302.8	370
480	$\min$	Summer	13.480	0.0	303.7	488
600	$\min$	Summer	11.238	0.0	305.4	608
720	$\min$	Summer	9.671	0.0	307.4	728
960	$\min$	Summer	7.608	0.0	311.4	966
1440	$\min$	Summer	5.395	0.0	316.2	1444
2160	$\min$	Summer	3.796	0.0	629.7	2144
2880	$\min$	Summer	2.958	0.0	617.0	2452
4320	min	Summer	2.087	0.0	576.3	3168
5760	min	Summer	1.645	0.0	838.8	3984
7200	min	Summer	1.395	0.0	888.9	4832
8640	$\min$	Summer	1.236	0.0	945.1	5704
10080	$\min$	Summer	1.128	0.0	1006.6	6552
15	min	Winter	154.086	0.0	168.8	27
30	min	Winter	103.378	0.0	163.6	41
		©1	982-20	19 Inno	vyze	

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	Flint AGI	Micro
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#### Summary of Results for 100 year Return Period (+40%)

	Storm Event		Max Level (m)	Max Depth (m)	Max Control (1/s)	Max Volume (m³)	Status
6	0 min	Winter	51.458	0.328	2.0	346.4	Flood Risk
12	0 min	Winter	51.513	0.383	2.0	408.9	Flood Risk
18	0 min	Winter	51.544	0.414	2.0	445.2	Flood Risk
24	0 min	Winter	51.565	0.435	2.0	469.8	Flood Risk
36	0 min	Winter	51.591	0.461	2.0	501.2	Flood Risk
48	0 min	Winter	51.607	0.477	2.0	519.4	Flood Risk
60	0 min	Winter	51.616	0.486	2.0	530.4	Flood Risk
72	0 min	Winter	51.621	0.491	2.0	536.7	Flood Risk
96	0 min	Winter	51.624	0.494	2.0	540.5	Flood Risk
144	0 min	Winter	51.615	0.485	2.0	530.1	Flood Risk
216	0 min	Winter	51.585	0.455	2.0	493.8	Flood Risk
288	0 min	Winter	51.551	0.421	2.0	452.9	Flood Risk
432	0 min	Winter	51.502	0.372	2.0	396.4	Flood Risk
576	0 min	Winter	51.462	0.332	2.0	351.0	Flood Risk
720	0 min	Winter	51.432	0.302	2.0	316.8	Flood Risk
864	0 min	Winter	51.406	0.276	2.0	288.3	Flood Risk
1008	0 min	Winter	51.388	0.258	2.0	268.5	Flood Risk

Storm		Rain	Flooded	Discharge	Time-Peak	
	Even	t	(mm/hr)	Volume	Volume	(mins)
				(m³)	(m³)	
60	min	Winter	66.653	0.0	320.7	70
120	min	Winter	39.817	0.0	309.7	128
180	min	Winter	29.225	0.0	305.3	188
240	$\min$	Winter	23.384	0.0	303.2	246
360	min	Winter	16.986	0.0	302.2	364
480	min	Winter	13.480	0.0	302.9	480
600	min	Winter	11.238	0.0	304.4	598
720	min	Winter	9.671	0.0	306.3	714
960	min	Winter	7.608	0.0	309.9	946
1440	min	Winter	5.395	0.0	313.3	1404
2160	$\min$	Winter	3.796	0.0	624.0	2064
2880	$\min$	Winter	2.958	0.0	616.3	2680
4320	min	Winter	2.087	0.0	580.8	3328
5760	$\min$	Winter	1.645	0.0	838.8	4264
7200	min	Winter	1.395	0.0	888.8	5192
8640	min	Winter	1.236	0.0	944.7	6048
10080	min	Winter	1.128	0.0	1007.0	6864

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#### Rainfall Details

Rainfall Model FEH Return Period (years) 100 FEH Rainfall Version 2013 Site Location GB 325134 370797 SJ 25134 70797 Data Type Point Summer Storms Yes Winter Storms Yes Cv (Summer) 0.950 0.950 Cv (Winter) Shortest Storm (mins) 15 Longest Storm (mins) 10080 Climate Change % +40

#### Time Area Diagram

Total Area (ha) 0.559

Time	(mins)	Area	Time	(mins)	Area	Time	(mins)	Area
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.187	4	8	0.187	8	12	0.186

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	Flint AGI	
		Micro
Date 24/06/2022	Designed by MA	Drainage
File Flint storage.SRCX	Checked by AS	Diamage
XP Solutions	Source Control 2019.1	

#### Model Details

Storage is Online Cover Level (m) 51.630

#### Tank or Pond Structure

Invert Level (m) 51.130

Depth (m) Area (m<sup>2</sup>) Depth (m) Area (m<sup>2</sup>) Depth (m) Area (m<sup>2</sup>)

0.000 980.2 0.500 1214.8 0.501 1215.3

#### Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0070-2000-0800-2000 Design Head (m) 0.800 Design Flow (1/s) 2.0 Calculated Flush-Flo™ Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 70 Invert Level (m) 50.930 100 Minimum Outlet Pipe Diameter (mm) Suggested Manhole Diameter (mm) 1200

Control	Points	Head (m)	Flow (1/s)	Control Points	Head (m)	Flow (1/s)
Design Point	(Calculated)	0.800	2.0	Kick-Flo®	0.504	1.6
	Flush-Flo™	0.240	2.0	Mean Flow over Head Range	_	1.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m) Flow	(1/s)	Depth (m) Fl	ow (1/s)	Depth (m) Flow	(1/s)	Depth (m)	Flow (1/s)
0.100	1.8	1.200	2.4	3.000	3.7	7.000	5.5
0.200	2.0	1.400	2.4	3.500	3.9	7.500	5.6
0.300	2.0	1.600	2.7	4.000	4.2	8.000	5.8
0.400	1.9	1.800	2.9	4.500	4.4	8.500	6.0
0.500	1.6	2.000	3.0	5.000	4.7	9.000	6.2
0.600	1.8	2.200	3.2	5.500	4.9	9.500	6.3
0.800	2.0	2.400	3.3	6.000	5.1		
1.000	2.2	2.600	3.4	6.500	5.3		

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Minimum flow rate (I/s):

(mm):

5

2

## Surface water storage requirements for sites

| Storage estimation tool Site Details Calculated by: Megan Au Latitude: 53.24336° N Site name: Cornist Lane BVS Longitude: 3.17405° W Site location: Cornist Lane, Wales This is an estimation of the storage volume requirements that are needed to meet normal Reference: 1886932971 best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and Date: Jul 22 2022 17:15 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. Methodology Site characteristics Total site area (ha): 0.105 Q<sub>MED</sub> estimation method: Calculate from BFI and SAAR Significant public open space (ha): BFI and SPR method: 0 Calculate from dominant **DHAST** Edited Area positively drained (ha): Soil characteristics 0.105 Impermeable area (ha): 0.105 **HOST class:** Percentage of drained area that is impermeable (%): **BFI HOST:** 100 0.492 Impervious area drained via infiltration (ha): 0 SPR HOST: 0.47 Default Edited Return period for infiltration system design (year): Hydrological 10 characteristics Impervious area drained to rainwater harvesting (ha): 0 Q<sub>MED</sub>: 0.48 Return period for rainwater harvesting system (year): 10 Q<sub>BAR</sub> / Q<sub>MED</sub> conversion 1.075 Compliance factor for rainwater harvesting system (%): 66 factor: Net site area for storage volume design (ha): 0.11 Rainfall 100 yrs 6 hrs: 61 Net impermable area for storage volume design (ha): 0.11 Rainfall 100 yrs 12 hrs: 77.38 Pervious area contribution to runoff (%): 30 FEH / FSR conversion factor: 1.06 1.06 \* where rainwater harvesting or infiltration has been used for managing SAAR (mm): 831 831 surface water runoff such that the effective impermeable area is less M5-60 Rainfall Depth (mm): than 50% of the 'area positively drained', the 'net site area' and the 17 17 estimates of Q<sub>BAR</sub> and other flow rates will have been reduced 'r' Ratio M5-60/M5-2 day: 0.3 0.3 accordingly. Hydological region: 9 9 Design criteria Growth curve factor 1 year: 0.88 0.88 Climate change allowance 1.4 factor: Growth curve factor 10 year: 1.42 1.42 Urban creep allowance Growth curve factor 30 year: 1.78 1.78 factor: Growth curve factor 100 2.18 2.18 Volume control approach Use long term storage years:

Q<sub>BAR</sub> for total site area (I/s):

Q<sub>BAR</sub> for net site area (I/s):

0.52

0.52

0.52

0.52

Site discharge rates	Default	Edited	Estimated storage volumes	Default	Edited
1 in 1 year (l/s):	2	2	Attenuation storage 1/100 years (m³):	40	40
1 in 30 years (l/s):	2	2	Long term storage 1/100 years (m³):	0	0
1 in 100 year (l/s):	2	2	Total storage 1/100 years (m³):	40	40

This report was produced using the storage estimation tool developed by HRWallingford and available at The use of
this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at
. 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.



Minimum flow rate (I/s):

(mm):

5

2

## Surface water storage requirements for sites

| Storage estimation tool Site Details Calculated by: Megan Au Latitude: 53.25007° N Site name: Pentre Halkyn BVS Longitude: 3.23855° W Site location: Pentre Halkyn, Wales This is an estimation of the storage volume requirements that are needed to meet normal Reference: 3469493473 best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and Date: Jul 22 2022 17:17 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. Methodology Site characteristics Total site area (ha): 0.105 Q<sub>MED</sub> estimation method: Calculate from BFI and SAAR Significant public open space (ha): BFI and SPR method: Calculate from dominant 0 DHASTE Edited Area positively drained (ha): Soil characteristics 0.105 Impermeable area (ha): 0.105 **HOST class:** Percentage of drained area that is impermeable (%): **BFI HOST:** 100 0.682 Impervious area drained via infiltration (ha): 0 SPR HOST: 0.21 Default Edited Return period for infiltration system design (year): Hydrological 10 characteristics Impervious area drained to rainwater harvesting (ha): 0 Q<sub>MED</sub>: 0.27 Return period for rainwater harvesting system (year): 10 Q<sub>BAR</sub> / Q<sub>MED</sub> conversion 1.075 Compliance factor for rainwater harvesting system (%): 66 factor: Net site area for storage volume design (ha): 0.11 Rainfall 100 yrs 6 hrs: 61 Net impermable area for storage volume design (ha): 0.11 Rainfall 100 yrs 12 hrs: 76.65 Pervious area contribution to runoff (%): 30 FEH / FSR conversion factor: 1.05 1.05 \* where rainwater harvesting or infiltration has been used for managing SAAR (mm): 875 875 surface water runoff such that the effective impermeable area is less M5-60 Rainfall Depth (mm): than 50% of the 'area positively drained', the 'net site area' and the 17 17 estimates of Q<sub>BAR</sub> and other flow rates will have been reduced 'r' Ratio M5-60/M5-2 day: 0.3 0.3 accordingly. Hydological region: 9 9 Design criteria Growth curve factor 1 year: 0.88 0.88 Climate change allowance 1.4 factor: Growth curve factor 10 year: 1.42 1.42 Urban creep allowance Growth curve factor 30 year: 1.78 1.78 factor: Growth curve factor 100 2.18 2.18 Volume control approach Use long term storage years:

Q<sub>BAR</sub> for total site area (I/s):

Q<sub>BAR</sub> for net site area (I/s):

0.29

0.29

0.29

0.29

Site discharge rates	Default	Edited	Estimated storage volumes	Default	Edited
1 in 1 year (l/s):	2	2	Attenuation storage 1/100 years (m³):	40	40
1 in 30 years (l/s):	2	2	Long term storage 1/100 years (m³):	0	0
1 in 100 year (l/s):	2	2	Total storage 1/100 years (m³):	40	40

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any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.



# Surface water storage requirements for sites

| Storage estimation tool

Calculated by:	Megan Au			Site Details					
Site name:	Babell BVS			Latitude:			53.2	26070°	N
Site location:				Longitude:			3.2	?7731° \	N
Site location: Babell, Wales  This is an estimation of the storage volume requirements that are needed to meet not best practice criteria in line with Environment Agency guidance "Rainfall runoff management".			nfall runoff manage	Poforonco:	e: 247217570				'O
the non-statutory star of drainage systems.	ndards for SuDa It is recommen	8), the SuDS Manual C753 (Ciria S (Defra, 2015). It is not to be useded that hydraulic modelling so ails before finalising the design	sed for detailed de ftware is used to c	alculate		U	Jul 22 20	)22 17:2	<u>'</u> O
Site characteris	stics			Methodology					
Total site area (ha)	:		0.1050	Q <sub>MED</sub> estimation method	d: C	Calculate from BFI and SA		and SA	AR
Significant public	open space	(ha):	0	BFI and SPR method:	C	Calculate from dominant			
Area positively drained (ha):		0.105	Soil characteristics	Ъф	defasit Edited		:ed		
Impermeable area	mpermeable area (ha):		0.105	HOST class:					
Percentage of dra	tage of drained area that is impermeable (%):		100	BFI HOST:			0.682		
Impervious area d	rained via inf	iltration (ha):	0	SPR HOST:			0.3		
Return period for	Return period for infiltration system design (year):		10	Hydrological		Default		Edi	ted
Impervious area drained to rainwater harvesting (ha):		0	characteristics						
Return period for rainwater harvesting system (year):		10	Q <sub>MED</sub> :				0.26		
Compliance factor for rainwater harvesting system (%):		66	Q <sub>BAR</sub> / Q <sub>MED</sub> conversion factor:				1.075		
Net site area for storage volume design (ha):			0.11	Rainfall 100 yrs 6 hrs:				61	
Net impermable area for storage volume design (ha):		0.11	Rainfall 100 yrs 12 hrs:				75.92		
Pervious area contribution to runoff (%):			30	FEH / FSR conversion fa	actor:			1.04	
$^{\star}$ 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. <b>Design criteria</b>			SAAR (mm):		859		859		
			M5-60 Rainfall Depth (mm):		17		17		
			duced	'r' Ratio M5-60/M5-2 day:		0.3		0.3	
			Hydological region:		9		9		
•	nate change allowance 1.4			Growth curve factor 1 ye	ear:	ar: 0.88		0.88	
factor:				Growth curve factor 10	year:	1.42		1.42	
Urban creep allow	/ance	1		Growth curve factor 30	year:	1.78		1.78	
factor:  Volume control ap	noroach	Use long term storage		Growth curve factor 100	)	2.18		2.18	
Interception rainfa		5		years:	/o):	0.00		0.00	
(mm):	<b>30</b> pu i	U		Q <sub>BAR</sub> for total site area (I		0.28		0.28	
Minimum flow rate	e (l/s):	2		Q <sub>BAR</sub> for net site area (I/s	S):	0.28		0.28	

Site discharge rates	Default	Edited	Estimated storage volumes	Default	Edited
1 in 1 year (l/s):	2	2	Attenuation storage 1/100 years (m³):	39	39
1 in 30 years (l/s):	2	2	Long term storage 1/100 years (m³):	0	0
1 in 100 year (l/s):	2	2	Total storage 1/100 years (m³):	39	39

This report was produced using the storage estimation tool developed by HRWallingford and available at
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