

Appendix 6 – BGS Historical Borehole Records

DEPTH (m)	O.D. Level	Type & No of Sample	Boring Details			Legend	Description
			Penetration	Lining	Water		
0.76	6.159						TOPSOIL + FILL MATERIAL
		D	Brickearth		S.W.L.		SOFT TO FIRM BROWN MOTTLED CLAY
2.28	4.639	U/274					FINE LIGHT BROWN SAND
3.66	3.259	D		S(LC)			
			BOREHOLE TERMINATED				

U. Undisturbed
D. Disturbed
W. Water
B. BULK

Sheet No 46 of 57

Contract HAYLING ISLAND Date started Finished
Borehole No 2/15 Operator R.E.
Ordnance Datum Level 6.844 m. Type of Penetration Test
Type of Boring STA Weight Drop
Diameter of Boring 152 mm Standing Water Level 5.214 m. O.D.

DEPTH (m)	O.O. Level	Type & No of Sample	Boring Details			Legend	Description
			Penetration	Lining	Water		
0.61	6.234						TARMAC - HARDCORE
		D					FIRM SANDY BROWN MOTTLED CLAY.
1.67	5.174	D	Brickwork		S.W.L.		STIFF BROWN/ GREY CLAY.
2.28	4.564				2.44		FINE BROWN/ GREY SAND
3.66	3.184	U/274 D	fine Brackish S(LC)				
BORE HOLE TERMINATED.							

U. Undisturbed D. Disturbed W. Water B. BULK

Geo-Testing Services Ltd

Borehole Record

Contract HATLING ISLAND Date started _____ Finished _____
Borehole No 2/14 Operator R.C.
Ordinance Datum Level 6.600 Type of Penetration Test _____
Type of Boring STA Weight _____ Drop _____
Diameter of Boring 152 mm Standing Water Level 5570 m. 00.

DEPTH (m).	O.D. Level	Type & No of Sample	Boring Details			Legend	Description
			Penetration	Lining	Water		
0.76	5.840						TOP SOIL & FILL MATERIAL
		D			S.W.U.		SOFT TO FIRM BROWN/GREY SANDY CLAY WITH SOME SMALL FLINTS
2.13	4.470	D					VERY SANDY BROWN GREY CLAY WITH SOME FLINTS
2.44	4.160	D			2.44		FINE BROWN SAND.
3.96	2.640	D					
			BOREHOLE TERMINATED				

U. Undisturbed D. Disturbed W. Water B. BULK

Borehole Record

Contract HAYLING ISLAND

Date started _____ Finished _____

Borehole No 2/13

Operator P.C.

Ordinance Datum Level 6.209m

Type of Penetration Test

Type of Boring S & A

Weight _____ Drop _____

Diameter of Boring 152mm

Standing Water Level | 5.229m.O.D

DEPTH (m):	O.O. Level	Type & No of Sample	Boring Details			Legend	Description				
			Penetration	Lining	Water						
1.06	5.149	D	Brickearth		S.W.		FIRM BROWN SANDY CLAY				
1.37	4.839	D									SOFT MOTTLED CLAY
2.13	4.078	D	Raised Beach				COARSE GREY SAND				
		D									SHALLOW MEDIUM GRAVEL, SOME CLAY
		D									COARSE BROWN SAND, FLINT
3.96	2.249	D					COBBLES, MEDIUM GRAVEL.				
BOREHOLE TERMINATED											

U. Undisturbed D. Disturbed W. Water B Bulk

Borehole Record

Contract HAYLING ISLAND Date started _____ Finished _____
 Borehole No 2/13 Operator R.C.
 Ordnance Datum Level 6.528M. Type of Penetration Test _____
 Type of Boring S+A Weight _____ Drop _____
 Diameter of Boring 152mm Standing Water Level 5.418M.O.D

DEPTH (m)	O.D. Level	Type & No of Sample	Boring Details			Legend	Description
			Penetration	Lining	Water		
076	5.768	D			S.W.L.		TOP SOIL + FILL MATERIAL.
		D					SOFT TO FIRM
		D					BROWN MOTTLED
		U/2/13	Brickent				CLAY, SOME SMALL
228	4.248	NO REC.					FLINTS.
		D					SOFT TO FIRM
							VERY SANDY BROWN
305	3.478						MOTTLED CLAY
			BOREHOLE TERMINATED WITH MEDIUM + SMALL FLINTS.				[prob. Raised Beach]

U. Undisturbed D. Disturbed W. Water B. BULK

7172 7947

Sheet No 30 of 57

British Geological Survey

Borehole Record

Date started_____Finished_____

Operator R.C.

Type of Penetration Test _____

Weight _____ Drop _____

Standing Water Level 4.963m.O.D

DEPTH (m)	O.D. Level	Type & No of Sample	Boring Details			Legend	Description
			Penetration	Lining	Water		
0.61	6.063	D					TOP SOIL
1.83	4.843	D		Brickearth	3.12		STIFF SANDY BROWN MOTTLED CLAY
2.44	4.233	D					FIRM BROWN FINE SANDY CLAY WITH SOME SMALL FLINTS
3.35	3.323	D		Raised Beach	2.70		FINE BROWN SAND WITH SMALL MED. FLINTS.
BORE HOLE TERMINATED							

U. Undisturbed D. Disturbed W. Water B. BULK

FOUNDATION ENGINEERING
Ltd.

British Geological Survey

BOREHOLE LOG

British Geological Survey

SZ 79 NW/13

British Geological Survey

71699986

331

LOCATION : Hayling Island

BOREHOLE No. : 101

BOREHOLE DIA. : 6"

GROUND LEVEL :

DATE (Start) : 5.7.62.

WATER LEVEL : 7'-0"

Dates	Description	Thickness	Depth	Sample	Remarks
			0'-0"		
Brickentk	Firm brown sandy clay	6'-0"		1	
			6'-0"	2	
Raised Beach	Grey/brown sandy clayey gravel	2'-0"		3	
			8'-0"		
	Grey silty clay	3'-0"			
LC	Brown compact sand	1'-6"	11'-0"	4	
	Grey sandy clay with flints.	1'-6"	12'-6"		
			14'-0"	5	
					End of borehole
R.T.W.					
22/1/83					

BOREHOLE SCALE : 1" = 5' * : DISTURBED SAMPLE ! : UNDISTURBED SAMPLE + : STANDARD PENETRATION TEST

FOUNDATION ENGINEERING
Ltd.

British Geological Survey

BOREHOLE LOG

British Geological Survey

SZ 79 NW/14

British Geological Survey

LOCATION : *Hayling Island*

BOREHOLE No. : *100.* *71789991*

BOREHOLE DIA. : *12"*

GROUND LEVEL :

DATE (Start) : *16.7.62.*

WATER LEVEL : *8'-6"*

Dates	Description	Thickness	Depth	Sample	Remarks
	<i>Topsoil</i>	<i>2'-6"</i>	<i>0'-0"</i>		
			<i>2'-6"</i>	<i>1</i>	
<i>Brickwork</i>	<i>soft brown sandy clay</i>	<i>4'-6"</i>			
			<i>7'-0"</i>	<i>2</i>	
<i>Raised</i>	<i>Brown sandy clayey gravel</i>	<i>2'-0"</i>	<i>9'-0"</i>	<i>3</i>	
<i>Bench</i>	<i>Brown sandy gravel</i>	<i>4'-0"</i>			
			<i>13'-0"</i>	<i>4</i>	
<i>LC</i>	<i>soft brown silty clay</i>	<i>1'-0"</i>	<i>14'-0"</i>		<i>End of borehole.</i>
<i>R.T.W.</i>					
<i>27.10.83</i>					

BOREHOLE SCALE : 1" = 5' * : DISTURBED SAMPLE I : UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

Ltd.

BOREHOLE LOG

British Geological Survey

British Geological Survey

SZ 79 NW/15

7188 9996

331

LOCATION : Hayling Island

BOREHOLE No. : 119.

BOREHOLE DIA. : 6"

GROUND LEVEL :

DATE (Start) : 4.7.62.

WATER LEVEL : 10'-0"

Dates	Description	Thickness	Depth		Sample	Remarks
			0'-0"			
Raised Beach	Compact sandy gravel	12'-0"			1	34 blows for 6 in.
					2	37 blows for 6 in.
	Firm brown silty clay	3'-0"	12'-0"		3	
	Compact brown sand.	2'-0"	15'-0"		4	
LC			17'-0"		5	
	Firm grey clayey silt.	5'-0"	22'-0"		6	End of borehole.
A.T.W. 27.10.81						

BOREHOLE SCALE : 1" -- 5' • : DISTURBED SAMPLE I : UNDISTURBED SAMPLE -| : STANDARD PENETRATION TEST

Appendix 7 – Drainage Calculations

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

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.

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{MED} estimation method:

BFI and SPR method:

HOST class:

BFI / BFIHOST:

Q_{MED} (l/s):

Q_{BAR} / Q_{MED} factor:

Hydrological characteristics

	Default	Edited
SAAR (mm):	686	686
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

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 $SPR/SPRHOST \leq 0.3$?

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):		6.14
1 in 1 year (l/s):		5.22
1 in 30 years (l/s):		14.12
1 in 100 year (l/s):		19.58
1 in 200 years (l/s):		22.95

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.

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

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.

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{MED} estimation method:

BFI and SPR method:

HOST class:

BFI / BFIHOST:

Q_{MED} (l/s):

Q_{BAR} / Q_{MED} factor:

Hydrological characteristics

	Default	Edited
SAAR (mm):	686	686
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

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 $SPR/SPRHOST \leq 0.3$?

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):		5.99
1 in 1 year (l/s):		5.09
1 in 30 years (l/s):		13.78
1 in 100 year (l/s):		19.11
1 in 200 years (l/s):		22.41

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.

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Samuel House 5 Fox Valley Way Stocksbridge Sheffield S36...		St Mary's Road Hayling Island Southern Basin			
Date 25/11/2021 09:52 File SOUTHERN BASIN.SRCX		Designed by RB Checked by			
XP Solutions		Source Control 2020.1.3			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	5.825	0.625	6.0	558.4	O K
30 min Summer	6.001	0.801	6.0	743.8	O K
60 min Summer	6.173	0.973	6.0	939.4	O K
120 min Summer	6.297	1.097	6.0	1088.0	O K
180 min Summer	6.369	1.169	6.0	1177.6	O K
240 min Summer	6.417	1.217	6.0	1238.7	O K
360 min Summer	6.476	1.276	6.0	1314.7	O K
480 min Summer	6.508	1.308	6.0	1357.1	O K
600 min Summer	6.527	1.327	6.0	1382.4	O K
720 min Summer	6.538	1.338	6.0	1397.2	O K
960 min Summer	6.546	1.346	6.0	1408.2	O K
1440 min Summer	6.533	1.333	6.0	1390.3	O K
2160 min Summer	6.490	1.290	6.0	1333.3	O K
2880 min Summer	6.456	1.256	6.0	1288.4	O K
4320 min Summer	6.409	1.209	6.0	1227.9	O K
5760 min Summer	6.378	1.178	6.0	1188.9	O K
7200 min Summer	6.359	1.159	6.0	1164.0	O K
8640 min Summer	6.345	1.145	6.0	1147.5	O K
10080 min Summer	6.337	1.137	6.0	1137.5	O K
15 min Winter	5.891	0.691	6.0	626.2	O K
30 min Winter	6.082	0.882	6.0	834.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	135.640	0.0	486.1	27	
30 min Summer	90.500	0.0	500.3	42	
60 min Summer	57.430	0.0	910.1	72	
120 min Summer	33.663	0.0	941.0	130	
180 min Summer	24.575	0.0	928.8	190	
240 min Summer	19.609	0.0	918.1	250	
360 min Summer	14.184	0.0	904.2	368	
480 min Summer	11.221	0.0	895.5	488	
600 min Summer	9.341	0.0	889.3	608	
720 min Summer	8.034	0.0	884.8	726	
960 min Summer	6.330	0.0	879.0	964	
1440 min Summer	4.521	0.0	873.8	1442	
2160 min Summer	3.245	0.0	1799.7	1932	
2880 min Summer	2.581	0.0	1747.5	2288	
4320 min Summer	1.895	0.0	1611.5	3076	
5760 min Summer	1.542	0.0	2461.7	3920	
7200 min Summer	1.328	0.0	2648.4	4760	
8640 min Summer	1.185	0.0	2828.7	5616	
10080 min Summer	1.082	0.0	2967.0	6456	
15 min Winter	135.640	0.0	500.6	27	
30 min Winter	90.500	0.0	488.3	41	
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Samuel House 5 Fox Valley Way Stocksbridge Sheffield S36...		St Mary's Road Hayling Island Southern Basin			
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XP Solutions		Source Control 2020.1.3			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	6.270	1.070	6.0	1054.1	O K
120 min Winter	6.404	1.204	6.0	1222.0	O K
180 min Winter	6.483	1.283	6.0	1324.2	O K
240 min Winter	6.536	1.336	6.0	1394.6	O K
360 min Winter	6.602	1.402	6.0	1483.6	O K
480 min Winter	6.639	1.439	6.0	1535.0	O K
600 min Winter	6.662	1.462	6.0	1567.1	O K
720 min Winter	6.676	1.476	6.0	1587.5	O K
960 min Winter	6.691	1.491	6.0	1607.4	O K
1440 min Winter	6.687	1.487	6.0	1602.4	O K
2160 min Winter	6.653	1.453	6.0	1555.2	O K
2880 min Winter	6.610	1.410	6.0	1495.4	O K
4320 min Winter	6.552	1.352	6.0	1416.3	O K
5760 min Winter	6.505	1.305	6.0	1353.2	O K
7200 min Winter	6.468	1.268	6.0	1304.0	O K
8640 min Winter	6.437	1.237	6.0	1263.5	O K
10080 min Winter	6.411	1.211	6.0	1230.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	57.430	0.0	945.0	70	
120 min Winter	33.663	0.0	929.3	128	
180 min Winter	24.575	0.0	916.5	188	
240 min Winter	19.609	0.0	909.5	246	
360 min Winter	14.184	0.0	904.1	364	
480 min Winter	11.221	0.0	904.1	480	
600 min Winter	9.341	0.0	907.1	598	
720 min Winter	8.034	0.0	912.0	714	
960 min Winter	6.330	0.0	917.6	944	
1440 min Winter	4.521	0.0	913.5	1400	
2160 min Winter	3.245	0.0	1822.5	2056	
2880 min Winter	2.581	0.0	1772.2	2624	
4320 min Winter	1.895	0.0	1683.6	3292	
5760 min Winter	1.542	0.0	2756.4	4224	
7200 min Winter	1.328	0.0	2963.9	5184	
8640 min Winter	1.185	0.0	3153.6	6064	
10080 min Winter	1.082	0.0	3122.9	6968	
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Samuel House 5 Fox Valley Way Stocksbridge Sheffield S36...	St Mary's Road Hayling Island Southern Basin																																																	
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<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FEH</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> </tr> <tr> <td>FEH Rainfall Version</td> <td>2013</td> </tr> <tr> <td>Site Location</td> <td>GB 471813 99712 SZ 71813 99712</td> </tr> <tr> <td>Data Type</td> <td>Point</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> </tr> <tr> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Climate Change %</td> <td>+40</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 2.222 <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> <th>Time (mins)</th> <th>Area (ha)</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> <th>From:</th> <th>To:</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>4</td> <td>4</td> <td>8</td> <td>8</td> <td>12</td> </tr> <tr> <td></td> <td>0.741</td> <td></td> <td>0.741</td> <td></td> <td>0.741</td> </tr> </tbody> </table>			Rainfall Model	FEH	Return Period (years)	100	FEH Rainfall Version	2013	Site Location	GB 471813 99712 SZ 71813 99712	Data Type	Point	Summer Storms	Yes	Winter Storms	Yes	Cv (Summer)	0.750	Cv (Winter)	0.840	Shortest Storm (mins)	15	Longest Storm (mins)	10080	Climate Change %	+40	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	From:	To:	From:	To:	From:	To:	0	4	4	8	8	12		0.741		0.741		0.741
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Samuel House 5 Fox Valley Way Stocksbridge Sheffield S36...	St Mary's Road Hayling Island Southern Basin	
Date 25/11/2021 09:52 File SOUTHERN BASIN.SRCX	Designed by RB Checked by	
XP Solutions Source Control 2020.1.3		

Model Details

Storage is Online Cover Level (m) 7.000

Tank or Pond Structure

Invert Level (m) 5.200

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	772.8	1.500	1420.9	1.800	1574.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0108-6000-1500-6000
Design Head (m)	1.500
Design Flow (l/s)	6.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	108
Invert Level (m)	5.200
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	6.0
Flush-Flo™	0.448	6.0
Kick-Flo®	0.918	4.8
Mean Flow over Head Range	-	5.3

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 (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	5.4	3.000	8.3	7.000	12.4
0.200	5.4	1.400	5.8	3.500	8.9	7.500	12.8
0.300	5.8	1.600	6.2	4.000	9.5	8.000	13.2
0.400	6.0	1.800	6.5	4.500	10.1	8.500	13.6
0.500	6.0	2.000	6.9	5.000	10.6	9.000	14.0
0.600	5.9	2.200	7.2	5.500	11.1	9.500	14.4
0.800	5.4	2.400	7.5	6.000	11.5		
1.000	5.0	2.600	7.8	6.500	12.0		

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XP Solutions		Source Control 2020.1.3			
Summary of Results for 100 year Return Period (+40%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	6.823	0.623	6.1	572.3	O K
30 min Summer	6.999	0.799	6.1	762.3	O K
60 min Summer	7.173	0.973	6.1	962.9	O K
120 min Summer	7.297	1.097	6.1	1115.2	O K
180 min Summer	7.370	1.170	6.1	1207.2	O K
240 min Summer	7.418	1.218	6.1	1270.0	O K
360 min Summer	7.477	1.277	6.1	1348.2	O K
480 min Summer	7.510	1.310	6.1	1392.0	O K
600 min Summer	7.529	1.329	6.1	1418.1	O K
720 min Summer	7.541	1.341	6.1	1433.6	O K
960 min Summer	7.549	1.349	6.1	1445.4	O K
1440 min Summer	7.537	1.337	6.1	1428.1	O K
2160 min Summer	7.494	1.294	6.1	1370.6	O K
2880 min Summer	7.460	1.260	6.1	1325.0	O K
4320 min Summer	7.413	1.213	6.1	1263.7	O K
5760 min Summer	7.383	1.183	6.1	1224.3	O K
7200 min Summer	7.364	1.164	6.1	1199.4	O K
8640 min Summer	7.351	1.151	6.1	1183.1	O K
10080 min Summer	7.343	1.143	6.1	1173.4	O K
15 min Winter	6.889	0.689	6.1	641.7	O K
30 min Winter	7.081	0.881	6.1	855.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	135.640	0.0	495.5	27	
30 min Summer	90.500	0.0	508.3	42	
60 min Summer	57.430	0.0	929.3	72	
120 min Summer	33.663	0.0	955.4	130	
180 min Summer	24.575	0.0	942.0	190	
240 min Summer	19.609	0.0	931.0	250	
360 min Summer	14.184	0.0	917.0	368	
480 min Summer	11.221	0.0	908.4	488	
600 min Summer	9.341	0.0	902.5	608	
720 min Summer	8.034	0.0	898.3	726	
960 min Summer	6.330	0.0	893.4	964	
1440 min Summer	4.521	0.0	889.0	1442	
2160 min Summer	3.245	0.0	1829.3	1964	
2880 min Summer	2.581	0.0	1774.5	2304	
4320 min Summer	1.895	0.0	1637.9	3076	
5760 min Summer	1.542	0.0	2522.3	3928	
7200 min Summer	1.328	0.0	2713.4	4760	
8640 min Summer	1.185	0.0	2897.3	5624	
10080 min Summer	1.082	0.0	3026.3	6456	
15 min Winter	135.640	0.0	509.5	27	
30 min Winter	90.500	0.0	495.2	41	
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XP Solutions			Source Control 2020.1.3		
Summary of Results for 100 year Return Period (+40%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	7.269	1.069	6.1	1080.3	O K
120 min Winter	7.405	1.205	6.1	1252.6	O K
180 min Winter	7.484	1.284	6.1	1357.5	O K
240 min Winter	7.538	1.338	6.1	1429.8	O K
360 min Winter	7.604	1.404	6.1	1521.3	O K
480 min Winter	7.642	1.442	6.1	1574.2	O K
600 min Winter	7.665	1.465	6.1	1607.4	O K
720 min Winter	7.680	1.480	6.1	1628.6	O K
960 min Winter	7.694	1.494	6.1	1649.5	O K
1440 min Winter	7.692	1.492	6.1	1645.4	O K
2160 min Winter	7.659	1.459	6.1	1598.4	O K
2880 min Winter	7.616	1.416	6.1	1538.2	O K
4320 min Winter	7.558	1.358	6.1	1457.9	O K
5760 min Winter	7.512	1.312	6.1	1394.3	O K
7200 min Winter	7.475	1.275	6.1	1344.9	O K
8640 min Winter	7.444	1.244	6.1	1304.3	O K
10080 min Winter	7.419	1.219	6.1	1271.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	57.430	0.0	960.3	70	
120 min Winter	33.663	0.0	942.5	128	
180 min Winter	24.575	0.0	929.4	188	
240 min Winter	19.609	0.0	922.5	246	
360 min Winter	14.184	0.0	917.7	364	
480 min Winter	11.221	0.0	918.6	480	
600 min Winter	9.341	0.0	922.6	598	
720 min Winter	8.034	0.0	928.1	714	
960 min Winter	6.330	0.0	933.8	944	
1440 min Winter	4.521	0.0	929.5	1400	
2160 min Winter	3.245	0.0	1850.8	2056	
2880 min Winter	2.581	0.0	1800.1	2628	
4320 min Winter	1.895	0.0	1714.4	3292	
5760 min Winter	1.542	0.0	2824.2	4224	
7200 min Winter	1.328	0.0	3036.4	5184	
8640 min Winter	1.185	0.0	3227.1	6064	
10080 min Winter	1.082	0.0	3176.2	6968	
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XP Solutions Source Control 2020.1.3		

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 471813 99712 SZ 71813 99712
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 2.277

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.759	4 8	0.759	8 12	0.759

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Model Details

Storage is Online Cover Level (m) 8.000

Tank or Pond Structure

Invert Level (m) 6.200

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	797.9	1.500	1443.9	1.800	1596.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0109-6100-1500-6100
Design Head (m)	1.500
Design Flow (l/s)	6.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	109
Invert Level (m)	6.200
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	6.1
Flush-Flo™	0.441	6.1
Kick-Flo®	0.913	4.8
Mean Flow over Head Range	-	5.3

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 (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	5.5	3.000	8.4	7.000	12.6
0.200	5.5	1.400	5.9	3.500	9.1	7.500	13.0
0.300	5.9	1.600	6.3	4.000	9.7	8.000	13.5
0.400	6.1	1.800	6.6	4.500	10.2	8.500	13.9
0.500	6.1	2.000	7.0	5.000	10.8	9.000	14.2
0.600	6.0	2.200	7.3	5.500	11.3	9.500	14.6
0.800	5.5	2.400	7.6	6.000	11.7		
1.000	5.1	2.600	7.9	6.500	12.2		

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Flooding, Drainage and Hydrology

Landscape Architecture

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BRISTOL OFFICE

The Byre
Woodend Lane
Cromhall
Gloucestershire GL12 8AA
Tel: 01454 269 237

SHEFFIELD OFFICE

Samuel House
5 Fox Valley Way
Stocksbridge
Sheffield S36 2AA
Tel: 0114 321 5151

MANCHESTER OFFICE

Ducie House
Ducie Street
Manchester
M1 2JW
Tel: 0161 413 6444

Please visit our website for more information.

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