APPENDIX D: CALCULATIONS

The following calculations have been referenced within the body of this report:

- 23120-SWD-MH-01-P01 – Microdrainage Calculations
- HR Wallingford Greenfield runoff rate estimation calculations

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	-0.435	0.565	2.2	0.0	2.2	0.5	O K
30 min Summer	-0.378	0.622	2.3	0.0	2.3	0.6	O K
60 min Summer	-0.512	0.488	2.1	0.0	2.1	0.4	O K
120 min Summer	-0.883	0.117	2.0	0.0	2.0	0.1	O K
180 min Summer	-0.923	0.077	1.6	0.0	1.6	0.0	O K
240 min Summer	-0.935	0.065	1.4	0.0	1.4	0.0	O K
360 min Summer	-0.947	0.053	1.0	0.0	1.0	0.0	O K
480 min Summer	-0.954	0.046	0.8	0.0	0.8	0.0	O K
600 min Summer	-0.958	0.042	0.7	0.0	0.7	0.0	O K
720 min Summer	-0.962	0.038	0.6	0.0	0.6	0.0	O K
960 min Summer	-0.966	0.034	0.5	0.0	0.5	0.0	O K
1440 min Summer	-0.972	0.028	0.3	0.0	0.3	0.0	O K
2160 min Summer	-0.978	0.022	0.2	0.0	0.2	0.0	O K
2880 min Summer	-0.980	0.020	0.2	0.0	0.2	0.0	O K
4320 min Summer	-0.984	0.016	0.1	0.0	0.1	0.0	O K
5760 min Summer	-0.986	0.014	0.1	0.0	0.1	0.0	O K
7200 min Summer	-0.987	0.013	0.1	0.0	0.1	0.0	O K
8640 min Summer	-0.988	0.012	0.1	0.0	0.1	0.0	O K
10080 min Summer	-0.988	0.012	0.1	0.0	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	153.676	0.0	2.3	0.0	19
30 min Summer	100.632	0.0	3.0	0.0	26
60 min Summer	62.527	0.0	3.8	0.0	42
120 min Summer	37.843	0.0	4.5	0.0	68
180 min Summer	28.005	0.0	5.0	0.0	96
240 min Summer	22.492	0.0	5.4	0.0	126
360 min Summer	16.331	0.0	5.9	0.0	188
480 min Summer	12.914	0.0	6.2	0.0	250
600 min Summer	10.720	0.0	6.4	0.0	300
720 min Summer	9.184	0.0	6.6	0.0	360
960 min Summer	7.165	0.0	6.9	0.0	496
1440 min Summer	5.013	0.0	7.2	0.0	718
2160 min Summer	3.495	0.0	7.5	0.0	1124
2880 min Summer	2.711	0.0	7.8	0.0	1432
4320 min Summer	1.908	0.0	8.2	0.0	2096
5760 min Summer	1.498	0.0	8.6	0.0	2952
7200 min Summer	1.251	0.0	9.0	0.0	3552
8640 min Summer	1.087	0.0	9.4	0.0	4248
10080 min Summer	0.969	0.0	9.7	0.0	4944

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	-0.455	0.545	2.2	0.0	2.2	0.5	O K
30 min Winter	-0.445	0.555	2.2	0.0	2.2	0.5	O K
60 min Winter	-0.749	0.251	2.0	0.0	2.0	0.2	O K
120 min Winter	-0.928	0.072	1.5	0.0	1.5	0.0	O K
180 min Winter	-0.943	0.057	1.2	0.0	1.2	0.0	O K
240 min Winter	-0.950	0.050	1.0	0.0	1.0	0.0	O K
360 min Winter	-0.958	0.042	0.7	0.0	0.7	0.0	O K
480 min Winter	-0.963	0.037	0.6	0.0	0.6	0.0	O K
600 min Winter	-0.967	0.033	0.5	0.0	0.5	0.0	O K
720 min Winter	-0.969	0.031	0.4	0.0	0.4	0.0	O K
960 min Winter	-0.974	0.026	0.3	0.0	0.3	0.0	O K
1440 min Winter	-0.978	0.022	0.2	0.0	0.2	0.0	O K
2160 min Winter	-0.982	0.018	0.1	0.0	0.1	0.0	O K
2880 min Winter	-0.984	0.016	0.1	0.0	0.1	0.0	O K
4320 min Winter	-0.987	0.013	0.1	0.0	0.1	0.0	O K
5760 min Winter	-0.988	0.012	0.1	0.0	0.1	0.0	O K
7200 min Winter	-0.989	0.011	0.1	0.0	0.1	0.0	O K
8640 min Winter	-0.990	0.010	0.0	0.0	0.0	0.0	O K
10080 min Winter	-0.991	0.009	0.0	0.0	0.0	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Winter	153.676	0.0	2.3	0.0	18
30 min Winter	100.632	0.0	3.0	0.0	26
60 min Winter	62.527	0.0	3.8	0.0	42
120 min Winter	37.843	0.0	4.5	0.0	66
180 min Winter	28.005	0.0	5.0	0.0	98
240 min Winter	22.492	0.0	5.4	0.0	128
360 min Winter	16.331	0.0	5.9	0.0	188
480 min Winter	12.914	0.0	6.2	0.0	230
600 min Winter	10.720	0.0	6.4	0.0	326
720 min Winter	9.184	0.0	6.6	0.0	358
960 min Winter	7.165	0.0	6.9	0.0	484
1440 min Winter	5.013	0.0	7.2	0.0	694
2160 min Winter	3.495	0.0	7.5	0.0	1096
2880 min Winter	2.711	0.0	7.8	0.0	1436
4320 min Winter	1.908	0.0	8.2	0.0	2288
5760 min Winter	1.498	0.0	8.6	0.0	2584
7200 min Winter	1.251	0.0	9.0	0.0	3912
8640 min Winter	1.087	0.0	9.4	0.0	4072
10080 min Winter	0.969	0.0	9.7	0.0	5344

Model Details

Storage is Online Cover Level (m) 0.000

Tank or Pond Structure

Invert Level (m) -1.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	0.0	0.100	1.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0075-2000-0450-2000
Design Head (m)	0.450
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	-1.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.450	2.0	Kick-Flo®	0.317	1.7
Flush-Flo™	0.137	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 (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0	1.200	3.1	3.000	4.8	7.000	7.2
0.200	2.0	1.400	3.4	3.500	5.1	7.500	7.5
0.300	1.8	1.600	3.6	4.000	5.5	8.000	7.7
0.400	1.9	1.800	3.8	4.500	5.8	8.500	7.9
0.500	2.1	2.000	4.0	5.000	6.1	9.000	8.2
0.600	2.3	2.200	4.1	5.500	6.4	9.500	8.4
0.800	2.6	2.400	4.3	6.000	6.7		
1.000	2.9	2.600	4.5	6.500	6.9		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 0.000

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Carlos Geog
Site name:	Grandpont House
Site location:	Oxford

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:	51.74487° N
Longitude:	1.2559° W
Reference:	1359129931
Date:	Dec 14 2023 16:36

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.536

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	632	632
Hydrological region:	6	6
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 ≤ 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):	0.87	0.87
1 in 1 year (l/s):	0.74	0.74
1 in 30 years (l/s):	1.99	1.99
1 in 100 year (l/s):	2.76	2.76
1 in 200 years (l/s):	3.24	3.24