



CALCULATIONS

DOCUMENT No
104-015-UA001881-02

OFFICE

PROJECT TITLE

NW Bicester Eco Development - Exemplar Site

SUBJECT

S38 Eastern spine road drainage

SHEET No

1 OF 6

ISSUE	TOTAL SHEETS	AUTHOR	DATE	CHECKED BY	DATE	APPROVED BY	DATE	COMMENTS
2	6	MP	31/10/12	SJ	02/11/12	SAD	02/11/12	

SUPERSEDES DOC No

DATE

DESIGN BASIS STATEMENT (Inc. sources of info/data, assumptions made, standards, etc.)

Introduction

This calculation covers the design of the proposed SuDS network incorporating soakaways, pipes and pond and swale as detailed on drawings 7253 to 7256.

The drained areas are shown on drawings 103-015 and 103-016.

The network has been assessed using WinDES software, a widely used industry standard package for drainage design produced by MicroDrainage.

The individual swale designs have been included in calculation 104-012.

Soakways 2 to 5 and 6 to 8 are linked via pipe overflows and have been simulated as a cascade for a variety of rainfall events. Soakways 5 and 8 overflow to an oversized pipe under the spine road. Any overflow passed forward is accommodated within the next soakaway in the chain before discharging to the pipe network. The cascade feature of WinDES has been used to link and model the soakaways and oversized pipe.


Assumptions

- 1) Design to accommodate 100 yr rainfall events with a variety of durations
- 2) Climate change factor of 30% applied to rainfall
- 3) Ground infiltration rates derived from site investigation as per calculation 104-012

Results


The calculation shows the following key results:

- No flooding during any of the rainfall events
- Peak discharges at the outfall meet the discharge restriction of 5l/s set for this catchment within the drainage strategy

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HCL House Fortran Rd St Mellons B'ness Park Cardiff CF3 0EY		
Date 05/11/2012 18:21 File Cascade (South).casx	Designed By sja74793 Checked By	
Elstree Computing Ltd		Source Control W.12.4

Cascade Summary of Results for 1050mm Outflow pipe.srcx

Upstream Structures		Outflow To	Overflow To			
Soakaway 5.srcx		(None)	(None)			
Soakaway 4.srcx						
Soakaway 3.srcx						
Soakaway 2.srcx						
Soakaway 8.srcx						
Soakaway 7.srcx						
Soakaway 6.srcx						
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	
15 min Summer	85.277	0.627	2.7	14.6	O K	
30 min Summer	85.416	0.766	3.0	22.9	O K	
60 min Summer	85.515	0.865	3.1	29.9	O K	
120 min Summer	85.550	0.900	3.2	32.5	O K	
180 min Summer	85.548	0.898	3.2	32.3	O K	
240 min Summer	85.534	0.884	3.2	31.2	O K	
360 min Summer	85.494	0.844	3.1	28.3	O K	
480 min Summer	85.450	0.800	3.0	25.2	O K	
600 min Summer	85.404	0.754	2.9	22.1	O K	
720 min Summer	85.357	0.707	2.9	19.2	O K	
960 min Summer	85.262	0.612	2.7	13.9	O K	
1440 min Summer	85.074	0.424	2.5	6.0	O K	
2160 min Summer	84.794	0.144	2.5	0.5	O K	
2880 min Summer	84.729	0.079	1.6	0.2	O K	
Storm Event	Rain (mm/hr)	Time-Peak (mins)				
15 min Summer	128.285	18				
30 min Summer	84.226	33				
60 min Summer	52.662	62				
120 min Summer	31.800	102				
180 min Summer	23.353	134				
240 min Summer	18.644	166				
360 min Summer	13.543	234				
480 min Summer	10.792	304				
600 min Summer	9.043	370				
720 min Summer	7.823	434				
960 min Summer	6.219	560				
1440 min Summer	4.493	794				
2160 min Summer	3.241	1104				
2880 min Summer	2.568	1472				

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Cascade Summary of Results for 1050mm Outflow pipe.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
4320 min Summer	84.688	0.038	0.6	0.1	O K
5760 min Summer	84.683	0.033	0.5	0.0	O K
7200 min Summer	84.680	0.030	0.4	0.0	O K
8640 min Summer	84.677	0.027	0.3	0.0	O K
10080 min Summer	84.675	0.025	0.3	0.0	O K
15 min Winter	85.349	0.699	2.8	18.7	O K
30 min Winter	85.507	0.857	3.1	29.3	O K
60 min Winter	85.618	0.968	3.3	37.7	O K
120 min Winter	85.704	1.054	3.5	44.0	O K
180 min Winter	85.691	1.041	3.5	43.1	O K
240 min Winter	85.660	1.010	3.4	40.8	O K
360 min Winter	85.573	0.923	3.3	34.2	O K
480 min Winter	85.501	0.851	3.1	28.9	O K
600 min Winter	85.435	0.785	3.0	24.2	O K
720 min Winter	85.368	0.718	2.9	19.9	O K
960 min Winter	85.231	0.581	2.6	12.3	O K
1440 min Winter	84.817	0.167	2.5	0.7	O K
2160 min Winter	84.725	0.075	1.5	0.2	O K
2880 min Winter	84.698	0.048	0.9	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
4320 min Summer	1.847	2144
5760 min Summer	1.461	2864
7200 min Summer	1.217	3568
8640 min Summer	1.048	4352
10080 min Summer	0.923	4984
15 min Winter	128.285	18
30 min Winter	84.226	32
60 min Winter	52.662	60
120 min Winter	31.800	118
180 min Winter	23.353	152
240 min Winter	18.644	186
360 min Winter	13.543	264
480 min Winter	10.792	326
600 min Winter	9.043	396
720 min Winter	7.823	462
960 min Winter	6.219	590
1440 min Winter	4.493	752
2160 min Winter	3.241	1088
2880 min Winter	2.568	1532

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Cascade Summary of Results for 1050mm Outflow pipe.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
4320 min Winter	84.681	0.031	0.4	0.0	O K
5760 min Winter	84.677	0.027	0.4	0.0	O K
7200 min Winter	84.674	0.024	0.3	0.0	O K
8640 min Winter	84.672	0.022	0.3	0.0	O K
10080 min Winter	84.670	0.020	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
4320 min Winter	1.847	2152
5760 min Winter	1.461	2896
7200 min Winter	1.217	3720
8640 min Winter	1.048	4440
10080 min Winter	0.923	5192

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Cascade Rainfall Details for 1050mm Outflow pipe.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.040

Time	Area
(mins)	(ha)

0-4	0.040
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Cascade Model Details for 1050mm Outflow pipe.srcx

Storage is Online Cover Level (m) 86.900

Pipe Structure

Diameter (m) 1.050 Length (m) 81.200
Slope (1:X) 96.000 Invert Level (m) 84.650

Hydro-Brake® Outflow Control

Design Head (m) 2.250 Diameter (mm) 77
Design Flow (l/s) 5.0 Invert Level (m) 84.650
Hydro-Brake® Type Md6 SW Only

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.1	1.200	3.7	3.000	5.9	7.000	8.9
0.200	2.5	1.400	4.0	3.500	6.3	7.500	9.3
0.300	2.3	1.600	4.3	4.000	6.8	8.000	9.6
0.400	2.3	1.800	4.5	4.500	7.2	8.500	9.9
0.500	2.5	2.000	4.8	5.000	7.6	9.000	10.1
0.600	2.6	2.200	5.0	5.500	7.9	9.500	10.4
0.800	3.0	2.400	5.2	6.000	8.3		
1.000	3.4	2.600	5.5	6.500	8.6		