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Date: 24/05/2023
Project Name: Land off Staple Street, Hernhill, Kent, ME13 9HY
Project Reference: 65204822
Document Reference: 65204822-SWE-XX-XX-T-C-0002

Planning Reference 20/503666/FUL - Discharge of condition 14 under application number 22/505852/SUB.

Dear Mr Wilson,

Please see our response below, to the Lead Local Flood Authority consultation letter dated 30 January 2023, in order to discharge condition 14. We have included the Lead Local Flood Authority comments below for your ease of reference.

1. *We note that the discharge rate previously approved on the 15th December 2020 was 2 l/s from the site. Drainage Layout Sheets 1 and 2 (65204882-SWE-ZZ-XX-DR-C-0100 and 65204882-SWE-ZZ-XX-DR-C-0101) now provided, appear to show three further points of unrestricted discharge into the ditch. We would expect discharge from the whole site to be restricted to 2 l/s as previously approved unless it can be shown that discharge rates from the site are not exceeding greenfield rates for their respective storm events or QBAR.*

The previous surface water drainage from the access road allowed surface water runoff to be directed across the verge and into the existing ditch. The new layout will mimic the previous drainage by directing surface water to a swale before discharging to the ditch. The IH124 calculation in Appendix A provides the greenfield runoff rates for the site in the table below. The table shows that the proposed surface water discharge rates are not exceeding the greenfield runoff rates for this site in accordance with Chapter 7 of the Kent design guide *Making it happen – sustainability (drainage systems).*

Storm Event	IH124 Greenfield Rates	Discharge from Site (l/s)	Discharge from the road (l/s)	Total Discharge (l/s)
1:1	5.93	2	3.5	5.50
1:30	16.04	2	14	16.0
1:100	22.25	2	18.5	20.5

2. *In addition to point one above, it is noted a package treatment plant is provided onsite to treat foul water prior to discharge into the watercourse. With this addition of flow there is concern that the rates entering the ditch is now above greenfield rates and as such could result in increase flood risk downstream.*

The above comment assumes that there will be flows from the package treatment plant at the same time as a rainfall event. Whilst this may happen, the additional flows are very low in the order of 0.07 l/s.

3. *Full network modelling of the drainage system should also be provided. This should demonstrate the drainage system's operation and performance for the critical duration 1/2 year, 30 year and 100 year storm intensities, with relevant climate change allowances for the 100 and 30 year event. No surcharging of the network should be experienced for the 1/2 year events, unless where unavoidable at features such as flow controls.*

Drainage calculations are provided in Appendix B, there is no surcharging or flooding for the above rainfall events taking climate change into account.

4. *Additionally, the discharge of condition 14 requires the submission of the maintenance details of the proposed sustainable drainage scheme. We recommend submission of an operation and maintenance manual that comprises:*

- *An approximate timetable for the implementation of the drainage system during construction of development.*

The construction phase of the development is complete.

- *A description of the SuDS components associated with the proposed drainage system and the key features that affects their operational performance if not properly maintained. This should be accompanied with a drawing which shows the drainage arrangement.*
- *Details of the operation and maintenance activities associated with each of the SuDS. This should consider the frequency of inspections and the types of maintenance activities required on a regular, periodic or remedial basis.*
- *Details of who will undertake inspections and maintenance activities. This should include the arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage system throughout its lifetime.*

In this instance no information has been submitted with respect to the proposed

maintenance of the drainage system.

A Surface Water Maintenance Plan is provided in Appendix C of this letter.

We trust that the above covers everything needed for the condition 14 to be discharged, but if there is anything else or further clarification required, please contact us.

Yours faithfully,

Colin Halford
Principal Engineer

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Enc.:
Appendix A – IH124 Greenfield Calculation
Appendix B – Drainage Calculations
Appendix C – Surface Water Maintenance Plan

Appendix A – IH124 Greenfield Calculations

hr wallingford

Greenfield runoff
estimation for s

www.uksuds.com | Greenfield runc

Calculated by:	Henry Bwanika
Site name:	Faversham Crematorium
Site location:	Faversham, Kent

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:	51.30408
Longitude:	0.93603
Reference:	12680337
Date:	May 23 2023 12:

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	4.10

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):	660	660
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 ≤ 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):	6.97	6.97
1 in 1 year (l/s):	5.93	5.93
1 in 30 years (l/s):	16.04	16.04
1 in 100 year (l/s):	22.25	22.25
1 in 200 years (l/s):	26.09	26.09

Appendix B – Drainage Calculations

Cascade Summary of Results for Faversham Perm. Paving NEW.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	Faversham-New Pond-Design 2.SRCX	(None)

Half Drain Time : 89 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	21.876	0.026	0.1	0.9	0.9	0.1	O K
30 min Summer	21.966	0.116	0.5	0.9	1.2	1.6	O K
60 min Summer	22.043	0.193	0.8	0.9	1.6	4.4	O K
120 min Summer	22.106	0.256	1.1	0.9	1.9	7.9	Flood Risk
180 min Summer	22.144	0.294	1.2	0.9	2.1	10.3	Flood Risk
240 min Summer	22.170	0.320	1.3	0.9	2.2	12.3	Flood Risk
360 min Summer	22.205	0.355	1.5	0.9	2.4	15.1	Flood Risk
480 min Summer	22.227	0.377	1.6	0.9	2.5	17.1	Flood Risk
600 min Summer	22.243	0.393	1.6	0.9	2.5	18.5	Flood Risk
720 min Summer	22.253	0.403	1.7	0.9	2.6	19.5	Flood Risk
960 min Summer	22.264	0.414	1.7	0.9	2.6	20.5	Flood Risk
1440 min Summer	22.263	0.413	1.7	0.9	2.6	20.4	Flood Risk
2160 min Summer	22.253	0.403	1.7	0.9	2.6	19.5	Flood Risk
2880 min Summer	22.239	0.389	1.6	0.9	2.5	18.1	Flood Risk
4320 min Summer	22.205	0.355	1.5	0.9	2.4	15.1	Flood Risk
5760 min Summer	22.170	0.320	1.3	0.9	2.2	12.3	Flood Risk
7200 min Summer	22.138	0.288	1.2	0.9	2.0	9.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	184.994	0.0	48.1	65
30 min Summer	120.364	0.0	69.4	183
60 min Summer	73.889	0.0	119.6	264
120 min Summer	43.537	0.0	145.4	344
180 min Summer	31.780	0.0	161.3	404
240 min Summer	25.361	0.0	172.8	452
360 min Summer	18.405	0.0	189.2	560
480 min Summer	14.637	0.0	200.7	654
600 min Summer	12.244	0.0	209.5	738
720 min Summer	10.577	0.0	216.3	828
960 min Summer	8.389	0.0	226.2	1004
1440 min Summer	6.041	0.0	236.2	1280
2160 min Summer	4.343	0.0	297.6	1656
2880 min Summer	3.432	0.0	307.6	2056
4320 min Summer	2.463	0.0	313.5	2812
5760 min Summer	1.948	0.0	356.4	3552
7200 min Summer	1.624	0.0	362.6	4344

Cascade Summary of Results for Faversham Perm. Paving NEW.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	22.109	0.259	1.1	0.9	1.9	8.1	Flood Risk
10080 min Summer	22.083	0.233	1.0	0.9	1.8	6.5	Flood Risk
15 min Winter	21.906	0.056	0.2	0.9	1.1	0.4	O K
30 min Winter	22.010	0.160	0.7	0.9	1.4	3.1	O K
60 min Winter	22.087	0.237	1.0	0.9	1.8	6.8	Flood Risk
120 min Winter	22.157	0.307	1.3	0.9	2.1	11.3	Flood Risk
180 min Winter	22.198	0.348	1.4	0.9	2.3	14.5	Flood Risk
240 min Winter	22.226	0.376	1.6	0.9	2.5	16.9	Flood Risk
360 min Winter	22.264	0.414	1.7	0.9	2.6	20.6	Flood Risk
480 min Winter	22.289	0.439	1.8	0.9	2.8	23.1	Flood Risk
600 min Winter	22.306	0.456	1.9	1.0	2.8	24.9	Flood Risk
720 min Winter	22.317	0.467	1.9	1.0	2.9	26.2	Flood Risk
960 min Winter	22.330	0.480	2.0	1.0	3.0	27.6	Flood Risk
1440 min Winter	22.328	0.478	2.0	1.0	2.9	27.5	Flood Risk
2160 min Winter	22.308	0.458	1.9	1.0	2.9	25.2	Flood Risk
2880 min Winter	22.282	0.432	1.8	0.9	2.7	22.4	Flood Risk
4320 min Winter	22.226	0.376	1.6	0.9	2.5	16.9	Flood Risk
5760 min Winter	22.174	0.324	1.3	0.9	2.2	12.6	Flood Risk
7200 min Winter	22.127	0.277	1.1	0.9	2.0	9.2	Flood Risk
8640 min Winter	22.089	0.239	1.0	0.9	1.8	6.9	Flood Risk
10080 min Winter	22.054	0.204	0.8	0.9	1.6	5.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.400	0.0	365.0	5080
10080 min Summer	1.235	0.0	363.3	5688
15 min Winter	184.994	0.0	56.6	105
30 min Winter	120.364	0.0	80.9	228
60 min Winter	73.889	0.0	137.5	292
120 min Winter	43.537	0.0	166.6	378
180 min Winter	31.780	0.0	184.6	440
240 min Winter	25.361	0.0	197.6	490
360 min Winter	18.405	0.0	216.2	586
480 min Winter	14.637	0.0	229.4	682
600 min Winter	12.244	0.0	239.4	766
720 min Winter	10.577	0.0	247.2	856
960 min Winter	8.389	0.0	258.6	1034
1440 min Winter	6.041	0.0	270.5	1364
2160 min Winter	4.343	0.0	338.4	1752
2880 min Winter	3.432	0.0	350.3	2176
4320 min Winter	2.463	0.0	358.5	2960
5760 min Winter	1.948	0.0	406.3	3720
7200 min Winter	1.624	0.0	414.7	4512
8640 min Winter	1.400	0.0	418.7	5256
10080 min Winter	1.235	0.0	418.1	6120

Cascade Rainfall Details for Faversham Perm. Paving NEW.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)	26.250	Shortest Storm (mins)	15
Ratio R	0.396	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Pipe Network

Volume in Pipe Network (m³)	400	Dia of Outfall Pipe (m)	0.1
Slope of Outfall Pipe (1:X)	100	Roughness of Outfall Pipe (mm)	0.600

Time Area Diagram

Total Area (ha) 0.296

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.000	4	8	0.296

Cascade Model Details for Faversham Perm. Paving NEW.SRCX

Storage is Online Cover Level (m) 22.380

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.09300	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	296.4
Max Percolation (l/s)	823.3	Slope (1:X)	80.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	21.850	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0049-1000-0840-1000
Design Head (m)	0.840
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	49
Invert Level (m)	21.540
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.840	1.0
Flush-Flo™	0.214	0.9
Kick-Flo®	0.435	0.7
Mean Flow over Head Range	-	0.8

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	0.8	1.200	1.2	3.000	1.8	7.000	2.6
0.200	0.9	1.400	1.3	3.500	1.9	7.500	2.7
0.300	0.9	1.600	1.3	4.000	2.0	8.000	2.8
0.400	0.8	1.800	1.4	4.500	2.1	8.500	2.9
0.500	0.8	2.000	1.5	5.000	2.2	9.000	3.0
0.600	0.9	2.200	1.5	5.500	2.3	9.500	3.0
0.800	1.0	2.400	1.6	6.000	2.4		
1.000	1.1	2.600	1.7	6.500	2.5		

Cascade Summary of Results for Faversham-New Pond-Design 2.SRCX

Upstream Structures	Outflow To	Overflow To
Faversham Perm. Paving NEW.SRCX	(None)	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	21.268	0.068	1.9	19.6	O K
30 min Summer	21.287	0.087	1.9	25.3	O K
60 min Summer	21.304	0.104	2.0	30.5	O K
120 min Summer	21.317	0.117	2.0	34.3	O K
180 min Summer	21.319	0.119	2.0	35.0	O K
240 min Summer	21.319	0.119	2.0	35.0	O K
360 min Summer	21.317	0.117	2.0	34.4	O K
480 min Summer	21.314	0.114	2.0	33.5	O K
600 min Summer	21.311	0.111	2.0	32.5	O K
720 min Summer	21.308	0.108	2.0	31.6	O K
960 min Summer	21.301	0.101	1.9	29.6	O K
1440 min Summer	21.289	0.089	1.9	25.8	O K
2160 min Summer	21.272	0.072	1.9	20.7	O K
2880 min Summer	21.258	0.058	1.8	16.6	O K
4320 min Summer	21.239	0.039	1.7	11.2	O K
5760 min Summer	21.229	0.029	1.5	8.1	O K
7200 min Summer	21.221	0.021	1.4	5.9	O K
8640 min Summer	21.215	0.015	1.3	4.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	41.252	0.0	23.3	22
30 min Summer	27.339	0.0	33.3	36
60 min Summer	17.456	0.0	49.8	64
120 min Summer	10.869	0.0	65.4	122
180 min Summer	8.143	0.0	75.1	170
240 min Summer	6.626	0.0	82.6	202
360 min Summer	4.951	0.0	93.9	266
480 min Summer	4.025	0.0	102.4	338
600 min Summer	3.427	0.0	109.4	408
720 min Summer	3.006	0.0	115.2	478
960 min Summer	2.439	0.0	124.3	618
1440 min Summer	1.818	0.0	136.8	886
2160 min Summer	1.356	0.0	169.1	1280
2880 min Summer	1.101	0.0	180.2	1648
4320 min Summer	0.821	0.0	192.9	2380
5760 min Summer	0.664	0.0	218.0	3112
7200 min Summer	0.563	0.0	224.8	3816
8640 min Summer	0.493	0.0	229.3	4584

Cascade Summary of Results for Faversham-New Pond-Design 2.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	21.211	0.011	1.2	3.1	O K
15 min Winter	21.277	0.077	1.9	22.2	O K
30 min Winter	21.299	0.099	1.9	28.7	O K
60 min Winter	21.319	0.119	2.0	35.0	O K
120 min Winter	21.335	0.135	2.0	39.9	O K
180 min Winter	21.339	0.139	2.0	41.3	O K
240 min Winter	21.340	0.140	2.0	41.4	O K
360 min Winter	21.337	0.137	2.0	40.5	O K
480 min Winter	21.333	0.133	2.0	39.3	O K
600 min Winter	21.328	0.128	2.0	37.8	O K
720 min Winter	21.323	0.123	2.0	36.2	O K
960 min Winter	21.313	0.113	2.0	33.1	O K
1440 min Winter	21.293	0.093	1.9	27.2	O K
2160 min Winter	21.269	0.069	1.9	19.9	O K
2880 min Winter	21.251	0.051	1.8	14.5	O K
4320 min Winter	21.232	0.032	1.6	9.1	O K
5760 min Winter	21.221	0.021	1.4	6.0	O K
7200 min Winter	21.214	0.014	1.2	4.0	O K
8640 min Winter	21.209	0.009	1.1	2.6	O K
10080 min Winter	21.205	0.005	1.0	1.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.440	0.0	232.8	5248
15 min Winter	41.252	0.0	27.0	22
30 min Winter	27.339	0.0	38.4	36
60 min Winter	17.456	0.0	57.6	64
120 min Winter	10.869	0.0	75.2	120
180 min Winter	8.143	0.0	86.3	176
240 min Winter	6.626	0.0	94.8	230
360 min Winter	4.951	0.0	107.6	292
480 min Winter	4.025	0.0	117.4	370
600 min Winter	3.427	0.0	125.3	450
720 min Winter	3.006	0.0	132.0	526
960 min Winter	2.439	0.0	142.3	680
1440 min Winter	1.818	0.0	156.6	972
2160 min Winter	1.356	0.0	193.6	1384
2880 min Winter	1.101	0.0	206.6	1760
4320 min Winter	0.821	0.0	221.9	2512
5760 min Winter	0.664	0.0	251.5	3288
7200 min Winter	0.563	0.0	260.5	4040
8640 min Winter	0.493	0.0	266.7	4760
10080 min Winter	0.440	0.0	270.8	5552

Cascade Rainfall Details for Faversham-New Pond-Design 2.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.396	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.278

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.094	4	8	0.184

Cascade Model Details for Faversham-New Pond-Design 2.SRCX

Storage is Online Cover Level (m) 21.900

Tank or Pond Structure

Invert Level (m) 21.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	280.0	0.700	470.7	1.400	0.0	2.100	0.0
0.100	304.2	0.800	0.0	1.500	0.0	2.200	0.0
0.200	329.5	0.900	0.0	1.600	0.0	2.300	0.0
0.300	355.7	1.000	0.0	1.700	0.0	2.400	0.0
0.400	383.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	411.2	1.200	0.0	1.900	0.0		
0.600	440.5	1.300	0.0	2.000	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0071-2000-0750-2000
Design Head (m)	0.750
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	71
Invert Level (m)	21.150
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.750	2.0
Flush-Flo™	0.225	2.0
Kick-Flo®	0.480	1.6
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	1.8	1.200	2.5	3.000	3.8	7.000	5.6
0.200	2.0	1.400	2.7	3.500	4.1	7.500	5.8
0.300	2.0	1.600	2.8	4.000	4.3	8.000	6.0
0.400	1.9	1.800	3.0	4.500	4.6	8.500	6.2
0.500	1.7	2.000	3.1	5.000	4.8	9.000	6.4
0.600	1.8	2.200	3.3	5.500	5.0	9.500	6.5
0.800	2.1	2.400	3.4	6.000	5.2		
1.000	2.3	2.600	3.5	6.500	5.4		

Cascade Summary of Results for Faversham-New Pond-Design 2.SRCX

Upstream Structures	Outflow To	Overflow To
Faversham Perm. Paving NEW.SRCX	(None)	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	21.368	0.168	2.0	50.5	O K
30 min Summer	21.412	0.212	2.0	64.9	O K
60 min Summer	21.452	0.252	2.0	78.3	O K
120 min Summer	21.485	0.285	2.0	89.9	O K
180 min Summer	21.501	0.301	2.0	95.7	O K
240 min Summer	21.510	0.310	2.0	98.8	O K
360 min Summer	21.518	0.318	2.0	101.4	O K
480 min Summer	21.517	0.317	2.0	101.4	O K
600 min Summer	21.513	0.313	2.0	99.9	O K
720 min Summer	21.507	0.307	2.0	97.8	O K
960 min Summer	21.496	0.296	2.0	93.8	O K
1440 min Summer	21.478	0.278	2.0	87.4	O K
2160 min Summer	21.455	0.255	2.0	79.4	O K
2880 min Summer	21.434	0.234	2.0	72.1	O K
4320 min Summer	21.395	0.195	2.0	59.2	O K
5760 min Summer	21.362	0.162	2.0	48.5	O K
7200 min Summer	21.334	0.134	2.0	39.6	O K
8640 min Summer	21.310	0.110	2.0	32.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	100.901	0.0	70.8	22
30 min Summer	65.363	0.0	96.2	37
60 min Summer	40.257	0.0	137.7	68
120 min Summer	23.976	0.0	167.5	126
180 min Summer	17.608	0.0	184.5	186
240 min Summer	14.115	0.0	196.2	246
360 min Summer	10.313	0.0	212.3	364
480 min Summer	8.243	0.0	223.3	484
600 min Summer	6.924	0.0	231.9	602
720 min Summer	6.002	0.0	239.1	702
960 min Summer	4.788	0.0	250.3	802
1440 min Summer	3.477	0.0	265.5	1042
2160 min Summer	2.523	0.0	317.9	1448
2880 min Summer	2.007	0.0	335.6	1848
4320 min Summer	1.454	0.0	359.0	2640
5760 min Summer	1.158	0.0	405.5	3408
7200 min Summer	0.970	0.0	422.5	4176
8640 min Summer	0.840	0.0	434.9	4920

Cascade Summary of Results for Faversham-New Pond-Design 2.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	21.290	0.090	1.9	26.2	O K
15 min Winter	21.388	0.188	2.0	56.9	O K
30 min Winter	21.437	0.237	2.0	73.2	O K
60 min Winter	21.482	0.282	2.0	88.6	O K
120 min Winter	21.520	0.320	2.0	102.2	O K
180 min Winter	21.539	0.339	2.0	109.2	O K
240 min Winter	21.550	0.350	2.0	113.3	O K
360 min Winter	21.561	0.361	2.0	117.3	O K
480 min Winter	21.564	0.364	2.0	118.4	O K
600 min Winter	21.563	0.363	2.0	118.0	O K
720 min Winter	21.559	0.359	2.0	116.7	O K
960 min Winter	21.548	0.348	2.0	112.6	O K
1440 min Winter	21.522	0.322	2.0	102.9	O K
2160 min Winter	21.489	0.289	2.0	91.1	O K
2880 min Winter	21.456	0.256	2.0	79.8	O K
4320 min Winter	21.397	0.197	2.0	59.9	O K
5760 min Winter	21.352	0.152	2.0	45.2	O K
7200 min Winter	21.315	0.115	2.0	33.9	O K
8640 min Winter	21.287	0.087	1.9	25.2	O K
10080 min Winter	21.264	0.064	1.9	18.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.743	0.0	443.3	5648
15 min Winter	100.901	0.0	81.1	22
30 min Winter	65.363	0.0	109.9	37
60 min Winter	40.257	0.0	157.0	66
120 min Winter	23.976	0.0	187.6	124
180 min Winter	17.608	0.0	204.7	184
240 min Winter	14.115	0.0	216.2	242
360 min Winter	10.313	0.0	232.9	358
480 min Winter	8.243	0.0	245.3	472
600 min Winter	6.924	0.0	255.1	588
720 min Winter	6.002	0.0	263.1	698
960 min Winter	4.788	0.0	275.8	916
1440 min Winter	3.477	0.0	292.8	1144
2160 min Winter	2.523	0.0	350.3	1584
2880 min Winter	2.007	0.0	370.3	2020
4320 min Winter	1.454	0.0	399.5	2816
5760 min Winter	1.158	0.0	456.1	3624
7200 min Winter	0.970	0.0	480.3	4392
8640 min Winter	0.840	0.0	498.1	5104
10080 min Winter	0.743	0.0	509.4	5848

Cascade Rainfall Details for Faversham-New Pond-Design 2.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.396	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.278

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.094	4	8	0.184

Cascade Model Details for Faversham-New Pond-Design 2.SRCX

Storage is Online Cover Level (m) 21.900

Tank or Pond Structure

Invert Level (m) 21.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	280.0	0.700	470.7	1.400	0.0	2.100	0.0
0.100	304.2	0.800	0.0	1.500	0.0	2.200	0.0
0.200	329.5	0.900	0.0	1.600	0.0	2.300	0.0
0.300	355.7	1.000	0.0	1.700	0.0	2.400	0.0
0.400	383.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	411.2	1.200	0.0	1.900	0.0		
0.600	440.5	1.300	0.0	2.000	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0071-2000-0750-2000
Design Head (m)	0.750
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	71
Invert Level (m)	21.150
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.750	2.0
Flush-Flo™	0.225	2.0
Kick-Flo®	0.480	1.6
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	1.8	1.200	2.5	3.000	3.8	7.000	5.6
0.200	2.0	1.400	2.7	3.500	4.1	7.500	5.8
0.300	2.0	1.600	2.8	4.000	4.3	8.000	6.0
0.400	1.9	1.800	3.0	4.500	4.6	8.500	6.2
0.500	1.7	2.000	3.1	5.000	4.8	9.000	6.4
0.600	1.8	2.200	3.3	5.500	5.0	9.500	6.5
0.800	2.1	2.400	3.4	6.000	5.2		
1.000	2.3	2.600	3.5	6.500	5.4		

Cascade Summary of Results for Faversham-New Pond-Design 2.SRCX

Upstream Structures	Outflow To	Overflow To
Faversham Perm. Paving NEW.SRCX	(None)	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	21.499	0.299	2.0	94.6	O K
30 min Summer	21.575	0.375	2.0	122.6	O K
60 min Summer	21.644	0.444	2.0	149.1	Flood Risk
120 min Summer	21.701	0.501	2.0	172.1	Flood Risk
180 min Summer	21.732	0.532	2.0	184.9	Flood Risk
240 min Summer	21.751	0.551	2.0	193.2	Flood Risk
360 min Summer	21.775	0.575	2.0	203.2	Flood Risk
480 min Summer	21.787	0.587	2.0	208.7	Flood Risk
600 min Summer	21.794	0.594	2.0	211.6	Flood Risk
720 min Summer	21.797	0.597	2.0	213.1	Flood Risk
960 min Summer	21.798	0.598	2.0	213.3	Flood Risk
1440 min Summer	21.788	0.588	2.0	208.9	Flood Risk
2160 min Summer	21.763	0.563	2.0	198.2	Flood Risk
2880 min Summer	21.741	0.541	2.0	189.0	Flood Risk
4320 min Summer	21.703	0.503	2.0	172.9	Flood Risk
5760 min Summer	21.665	0.465	2.0	157.5	Flood Risk
7200 min Summer	21.618	0.418	2.0	138.9	Flood Risk
8640 min Summer	21.568	0.368	2.0	119.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	184.994	0.0	144.1	23
30 min Summer	120.364	0.0	167.1	38
60 min Summer	73.889	0.0	246.4	68
120 min Summer	43.537	0.0	282.3	128
180 min Summer	31.780	0.0	304.1	188
240 min Summer	25.361	0.0	313.3	246
360 min Summer	18.405	0.0	312.9	366
480 min Summer	14.637	0.0	310.6	486
600 min Summer	12.244	0.0	308.3	606
720 min Summer	10.577	0.0	306.1	726
960 min Summer	8.389	0.0	301.5	964
1440 min Summer	6.041	0.0	291.8	1442
2160 min Summer	4.343	0.0	496.3	1972
2880 min Summer	3.432	0.0	520.5	2332
4320 min Summer	2.463	0.0	517.9	3112
5760 min Summer	1.948	0.0	626.3	3928
7200 min Summer	1.624	0.0	657.3	4744
8640 min Summer	1.400	0.0	681.6	5368

Cascade Summary of Results for Faversham-New Pond-Design 2.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	21.524	0.324	2.0	103.8	O K
15 min Winter	21.531	0.331	2.0	106.2	O K
30 min Winter	21.615	0.415	2.0	137.8	Flood Risk
60 min Winter	21.690	0.490	2.0	167.7	Flood Risk
120 min Winter	21.753	0.553	2.0	194.1	Flood Risk
180 min Winter	21.788	0.588	2.0	209.0	Flood Risk
240 min Winter	21.810	0.610	2.0	218.9	Flood Risk
360 min Winter	21.838	0.638	2.0	231.3	Flood Risk
480 min Winter	21.854	0.654	2.0	238.5	Flood Risk
600 min Winter	21.863	0.663	2.0	242.8	Flood Risk
720 min Winter	21.869	0.669	2.0	245.3	Flood Risk
960 min Winter	21.873	0.673	2.0	247.1	Flood Risk
1440 min Winter	21.866	0.666	2.0	244.2	Flood Risk
2160 min Winter	21.843	0.643	2.0	233.5	Flood Risk
2880 min Winter	21.814	0.614	2.0	220.4	Flood Risk
4320 min Winter	21.765	0.565	2.0	198.9	Flood Risk
5760 min Winter	21.714	0.514	2.0	177.3	Flood Risk
7200 min Winter	21.655	0.455	2.0	153.4	Flood Risk
8640 min Winter	21.572	0.372	2.0	121.4	O K
10080 min Winter	21.503	0.303	2.0	96.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.235	0.0	700.0	6056
15 min Winter	184.994	0.0	161.1	23
30 min Winter	120.364	0.0	164.5	38
60 min Winter	73.889	0.0	270.9	68
120 min Winter	43.537	0.0	309.7	126
180 min Winter	31.780	0.0	314.7	184
240 min Winter	25.361	0.0	313.9	244
360 min Winter	18.405	0.0	312.1	362
480 min Winter	14.637	0.0	310.8	478
600 min Winter	12.244	0.0	309.9	596
720 min Winter	10.577	0.0	309.0	712
960 min Winter	8.389	0.0	307.7	944
1440 min Winter	6.041	0.0	305.1	1400
2160 min Winter	4.343	0.0	547.3	2056
2880 min Winter	3.432	0.0	574.7	2596
4320 min Winter	2.463	0.0	539.5	3288
5760 min Winter	1.948	0.0	693.7	4208
7200 min Winter	1.624	0.0	732.9	5136
8640 min Winter	1.400	0.0	764.3	5800
10080 min Winter	1.235	0.0	789.9	6456

Cascade Rainfall Details for Faversham-New Pond-Design 2.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)	26.250	Shortest Storm (mins)	15
Ratio R	0.396	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.278

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.094	4	8	0.184

Cascade Model Details for Faversham-New Pond-Design 2.SRCX

Storage is Online Cover Level (m) 21.900

Tank or Pond Structure

Invert Level (m) 21.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	280.0	0.700	470.7	1.400	0.0	2.100	0.0
0.100	304.2	0.800	0.0	1.500	0.0	2.200	0.0
0.200	329.5	0.900	0.0	1.600	0.0	2.300	0.0
0.300	355.7	1.000	0.0	1.700	0.0	2.400	0.0
0.400	383.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	411.2	1.200	0.0	1.900	0.0		
0.600	440.5	1.300	0.0	2.000	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0071-2000-0750-2000
Design Head (m)	0.750
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	71
Invert Level (m)	21.150
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.750	2.0
Flush-Flo™	0.225	2.0
Kick-Flo®	0.480	1.6
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	1.8	1.200	2.5	3.000	3.8	7.000	5.6
0.200	2.0	1.400	2.7	3.500	4.1	7.500	5.8
0.300	2.0	1.600	2.8	4.000	4.3	8.000	6.0
0.400	1.9	1.800	3.0	4.500	4.6	8.500	6.2
0.500	1.7	2.000	3.1	5.000	4.8	9.000	6.4
0.600	1.8	2.200	3.3	5.500	5.0	9.500	6.5
0.800	2.1	2.400	3.4	6.000	5.2		
1.000	2.3	2.600	3.5	6.500	5.4		

Summary of Results for 1 year Return Period

Half Drain Time : 117 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	20.221	0.221	0.7	1.3	2.0	7.3	O K
30 min Summer	20.234	0.234	0.8	2.1	2.9	8.4	O K
60 min Summer	20.243	0.243	0.9	2.9	3.7	9.2	O K
120 min Summer	20.246	0.246	0.9	3.1	4.0	9.5	O K
180 min Summer	20.244	0.244	0.9	2.9	3.8	9.3	O K
240 min Summer	20.242	0.242	0.8	2.7	3.6	9.1	O K
360 min Summer	20.237	0.237	0.8	2.3	3.2	8.6	O K
480 min Summer	20.232	0.232	0.8	2.0	2.8	8.2	O K
600 min Summer	20.229	0.229	0.8	1.7	2.5	7.9	O K
720 min Summer	20.225	0.225	0.7	1.5	2.2	7.6	O K
960 min Summer	20.220	0.220	0.7	1.2	1.9	7.2	O K
1440 min Summer	20.213	0.213	0.7	0.8	1.4	6.6	O K
2160 min Summer	20.205	0.205	0.6	0.5	1.1	6.0	O K
2880 min Summer	20.200	0.200	0.6	0.4	0.9	5.7	O K
4320 min Summer	20.194	0.194	0.5	0.1	0.7	5.2	O K
5760 min Summer	20.187	0.187	0.5	0.0	0.5	4.8	O K
7200 min Summer	20.177	0.177	0.5	0.0	0.5	4.2	O K
8640 min Summer	20.168	0.168	0.4	0.0	0.4	3.7	O K
10080 min Summer	20.161	0.161	0.4	0.0	0.4	3.3	O K
15 min Winter	20.231	0.231	0.8	1.9	2.6	8.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	30.071	0.0	1.5	17
30 min Summer	19.723	0.0	3.3	25
60 min Summer	12.584	0.0	5.4	42
120 min Summer	7.873	0.0	7.5	74
180 min Summer	5.957	0.0	8.6	106
240 min Summer	4.883	0.0	9.2	136
360 min Summer	3.665	0.0	9.5	196
480 min Summer	2.982	0.0	9.5	258
600 min Summer	2.541	0.0	9.3	318
720 min Summer	2.229	0.0	9.1	378
960 min Summer	1.814	0.0	8.5	500
1440 min Summer	1.357	0.0	7.3	748
2160 min Summer	1.016	0.0	5.6	1104
2880 min Summer	0.826	0.0	4.0	1468
4320 min Summer	0.618	0.0	1.6	2208
5760 min Summer	0.503	0.0	0.4	2992
7200 min Summer	0.429	0.0	0.0	3744
8640 min Summer	0.377	0.0	0.0	4416
10080 min Summer	0.338	0.0	0.0	5144
15 min Winter	30.071	0.0	2.2	16

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	20.244	0.244	0.9	2.9	3.8	9.3	O K
60 min Winter	20.250	0.250	0.9	3.5	4.4	9.9	O K
120 min Winter	20.249	0.249	0.9	3.3	4.2	9.8	O K
180 min Winter	20.244	0.244	0.9	2.9	3.8	9.3	O K
240 min Winter	20.240	0.240	0.8	2.6	3.4	8.9	O K
360 min Winter	20.232	0.232	0.8	2.0	2.8	8.2	O K
480 min Winter	20.227	0.227	0.7	1.6	2.3	7.8	O K
600 min Winter	20.222	0.222	0.7	1.3	2.0	7.4	O K
720 min Winter	20.219	0.219	0.7	1.1	1.8	7.1	O K
960 min Winter	20.213	0.213	0.7	0.8	1.5	6.7	O K
1440 min Winter	20.205	0.205	0.6	0.5	1.1	6.0	O K
2160 min Winter	20.198	0.198	0.6	0.3	0.9	5.5	O K
2880 min Winter	20.194	0.194	0.5	0.2	0.7	5.3	O K
4320 min Winter	20.184	0.184	0.5	0.0	0.5	4.6	O K
5760 min Winter	20.169	0.169	0.4	0.0	0.4	3.7	O K
7200 min Winter	20.157	0.157	0.4	0.0	0.4	3.1	O K
8640 min Winter	20.147	0.147	0.3	0.0	0.3	2.7	O K
10080 min Winter	20.140	0.140	0.3	0.0	0.3	2.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
30 min Winter	19.723	0.0	4.3	25
60 min Winter	12.584	0.0	6.7	44
120 min Winter	7.873	0.0	9.2	76
180 min Winter	5.957	0.0	10.4	108
240 min Winter	4.883	0.0	11.2	140
360 min Winter	3.665	0.0	11.6	202
480 min Winter	2.982	0.0	11.5	264
600 min Winter	2.541	0.0	11.2	324
720 min Winter	2.229	0.0	10.8	384
960 min Winter	1.814	0.0	9.9	512
1440 min Winter	1.357	0.0	8.0	750
2160 min Winter	1.016	0.0	5.1	1100
2880 min Winter	0.826	0.0	2.8	1492
4320 min Winter	0.618	0.0	0.2	2280
5760 min Winter	0.503	0.0	0.0	3048
7200 min Winter	0.429	0.0	0.0	3752
8640 min Winter	0.377	0.0	0.0	4496
10080 min Winter	0.338	0.0	0.0	5152

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.700	Shortest Storm (mins)	15
Ratio R	0.383	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.144

Time (mins) From:	To:	Area (ha)
0	4	0.144

Model Details

Storage is Online Cover Level (m) 20.600

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	210.0
Infiltration Coefficient Side (m/hr)	0.09300	Side Slope (1:X)	2.0
Safety Factor	2.0	Slope (1:X)	500.0
Porosity	1.00	Cap Volume Depth (m)	0.500
Invert Level (m)	20.000	Cap Infiltration Depth (m)	0.500
Base Width (m)	0.3		

Pipe Overflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	38.0	Coefficient of Contraction	0.600
Length (m)	12.000	Upstream Invert Level (m)	20.180
Roughness k (mm)	0.600		

Summary of Results for 30 year Return Period

Half Drain Time : 162 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Overflow Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	20.299	0.299	1.3	10.0	11.3	15.6	O K
30 min Summer	20.313	0.313	1.4	12.7	14.1	17.5	Flood Risk
60 min Summer	20.317	0.317	1.5	13.3	14.7	18.1	Flood Risk
120 min Summer	20.308	0.308	1.4	11.8	13.2	16.9	Flood Risk
180 min Summer	20.299	0.299	1.3	10.0	11.3	15.6	O K
240 min Summer	20.291	0.291	1.2	8.6	9.8	14.6	O K
360 min Summer	20.279	0.279	1.1	6.6	7.8	13.1	O K
480 min Summer	20.269	0.269	1.0	5.6	6.6	11.9	O K
600 min Summer	20.262	0.262	1.0	4.8	5.8	11.1	O K
720 min Summer	20.256	0.256	1.0	4.1	5.1	10.6	O K
960 min Summer	20.248	0.248	0.9	3.3	4.1	9.7	O K
1440 min Summer	20.237	0.237	0.8	2.3	3.2	8.6	O K
2160 min Summer	20.227	0.227	0.7	1.6	2.3	7.8	O K
2880 min Summer	20.220	0.220	0.7	1.2	1.9	7.2	O K
4320 min Summer	20.211	0.211	0.6	0.7	1.4	6.5	O K
5760 min Summer	20.204	0.204	0.6	0.5	1.1	6.0	O K
7200 min Summer	20.200	0.200	0.6	0.3	0.9	5.6	O K
8640 min Summer	20.197	0.197	0.6	0.2	0.8	5.4	O K
10080 min Summer	20.195	0.195	0.5	0.2	0.7	5.3	O K
15 min Winter	20.310	0.310	1.4	12.2	13.6	17.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	73.738	0.0	11.5	14
30 min Summer	48.356	0.0	16.9	22
60 min Summer	30.340	0.0	22.5	38
120 min Summer	18.478	0.0	27.9	70
180 min Summer	13.676	0.0	30.5	100
240 min Summer	10.996	0.0	31.9	130
360 min Summer	8.069	0.0	33.4	192
480 min Summer	6.475	0.0	33.9	252
600 min Summer	5.455	0.0	33.8	312
720 min Summer	4.741	0.0	33.4	374
960 min Summer	3.796	0.0	32.3	494
1440 min Summer	2.773	0.0	30.1	736
2160 min Summer	2.023	0.0	26.9	1100
2880 min Summer	1.616	0.0	23.9	1468
4320 min Summer	1.176	0.0	18.7	2204
5760 min Summer	0.938	0.0	14.1	2936
7200 min Summer	0.787	0.0	10.2	3672
8640 min Summer	0.682	0.0	7.0	4328
10080 min Summer	0.604	0.0	4.5	5096
15 min Winter	73.738	0.0	13.6	14

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Overflow Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	20.322	0.322	1.5	14.0	15.5	18.9	Flood Risk
60 min Winter	20.320	0.320	1.5	13.7	15.2	18.6	Flood Risk
120 min Winter	20.305	0.305	1.3	11.2	12.5	16.4	Flood Risk
180 min Winter	20.293	0.293	1.2	8.9	10.1	14.8	O K
240 min Winter	20.283	0.283	1.2	7.1	8.3	13.6	O K
360 min Winter	20.268	0.268	1.0	5.4	6.5	11.8	O K
480 min Winter	20.258	0.258	1.0	4.4	5.3	10.7	O K
600 min Winter	20.251	0.251	0.9	3.6	4.5	10.0	O K
720 min Winter	20.246	0.246	0.9	3.1	3.9	9.5	O K
960 min Winter	20.237	0.237	0.8	2.4	3.2	8.7	O K
1440 min Winter	20.227	0.227	0.7	1.6	2.3	7.8	O K
2160 min Winter	20.217	0.217	0.7	1.0	1.7	7.0	O K
2880 min Winter	20.211	0.211	0.6	0.7	1.4	6.4	O K
4320 min Winter	20.202	0.202	0.6	0.4	1.0	5.8	O K
5760 min Winter	20.197	0.197	0.6	0.2	0.8	5.4	O K
7200 min Winter	20.193	0.193	0.5	0.1	0.7	5.2	O K
8640 min Winter	20.189	0.189	0.5	0.1	0.6	4.9	O K
10080 min Winter	20.184	0.184	0.5	0.0	0.5	4.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
30 min Winter	48.356	0.0	19.8	23
60 min Winter	30.340	0.0	26.1	40
120 min Winter	18.478	0.0	32.2	72
180 min Winter	13.676	0.0	35.3	102
240 min Winter	10.996	0.0	37.0	134
360 min Winter	8.069	0.0	39.0	196
480 min Winter	6.475	0.0	39.7	254
600 min Winter	5.455	0.0	39.8	316
720 min Winter	4.741	0.0	39.6	376
960 min Winter	3.796	0.0	38.4	492
1440 min Winter	2.773	0.0	35.3	736
2160 min Winter	2.023	0.0	30.8	1104
2880 min Winter	1.616	0.0	26.5	1468
4320 min Winter	1.176	0.0	18.5	2196
5760 min Winter	0.938	0.0	11.6	2936
7200 min Winter	0.787	0.0	6.3	3680
8640 min Winter	0.682	0.0	2.7	4296
10080 min Winter	0.604	0.0	0.6	5128

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.700	Shortest Storm (mins)	15
Ratio R	0.383	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.144

Time (mins) From:	To:	Area (ha)
0	4	0.144

Model Details

Storage is Online Cover Level (m) 20.600

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	210.0
Infiltration Coefficient Side (m/hr)	0.09300	Side Slope (1:X)	2.0
Safety Factor	2.0	Slope (1:X)	500.0
Porosity	1.00	Cap Volume Depth (m)	0.500
Invert Level (m)	20.000	Cap Infiltration Depth (m)	0.500
Base Width (m)	0.3		

Pipe Overflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	38.0	Coefficient of Contraction	0.600
Length (m)	12.000	Upstream Invert Level (m)	20.180
Roughness k (mm)	0.600		

Summary of Results for 100 year Return Period

Half Drain Time : 167 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	20.326	0.326	1.5	14.5	16.1	19.5	Flood Risk
30 min Summer	20.343	0.343	1.7	17.0	18.7	22.2	Flood Risk
60 min Summer	20.346	0.346	1.7	17.4	19.2	22.8	Flood Risk
120 min Summer	20.333	0.333	1.6	15.6	17.2	20.6	Flood Risk
180 min Summer	20.319	0.319	1.5	13.6	15.1	18.5	Flood Risk
240 min Summer	20.309	0.309	1.4	11.9	13.3	16.9	Flood Risk
360 min Summer	20.295	0.295	1.3	9.3	10.5	15.0	O K
480 min Summer	20.285	0.285	1.2	7.4	8.5	13.8	O K
600 min Summer	20.276	0.276	1.1	6.3	7.4	12.7	O K
720 min Summer	20.269	0.269	1.0	5.5	6.6	11.9	O K
960 min Summer	20.259	0.259	1.0	4.5	5.4	10.8	O K
1440 min Summer	20.247	0.247	0.9	3.1	4.0	9.5	O K
2160 min Summer	20.234	0.234	0.8	2.1	2.9	8.4	O K
2880 min Summer	20.227	0.227	0.7	1.6	2.3	7.8	O K
4320 min Summer	20.217	0.217	0.7	1.0	1.7	7.0	O K
5760 min Summer	20.210	0.210	0.6	0.7	1.3	6.4	O K
7200 min Summer	20.205	0.205	0.6	0.5	1.1	6.0	O K
8640 min Summer	20.201	0.201	0.6	0.4	1.0	5.7	O K
10080 min Summer	20.198	0.198	0.6	0.3	0.9	5.5	O K
15 min Winter	20.339	0.339	1.7	16.5	18.2	21.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	95.597	0.0	16.8	14
30 min Summer	63.251	0.0	24.3	22
60 min Summer	39.883	0.0	32.0	38
120 min Summer	24.286	0.0	39.4	70
180 min Summer	17.915	0.0	43.0	100
240 min Summer	14.343	0.0	45.0	130
360 min Summer	10.460	0.0	47.1	190
480 min Summer	8.358	0.0	48.1	252
600 min Summer	7.018	0.0	48.3	312
720 min Summer	6.081	0.0	48.0	372
960 min Summer	4.846	0.0	46.9	492
1440 min Summer	3.514	0.0	43.9	736
2160 min Summer	2.543	0.0	39.8	1100
2880 min Summer	2.020	0.0	36.2	1468
4320 min Summer	1.457	0.0	29.8	2200
5760 min Summer	1.155	0.0	24.2	2936
7200 min Summer	0.964	0.0	19.2	3664
8640 min Summer	0.831	0.0	14.9	4392
10080 min Summer	0.733	0.0	11.2	5080
15 min Winter	95.597	0.0	19.7	14

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Overflow Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	20.353	0.353	1.8	18.5	20.3	24.0	Flood Risk
60 min Winter	20.349	0.349	1.8	17.9	19.6	23.3	Flood Risk
120 min Winter	20.327	0.327	1.5	14.7	16.2	19.7	Flood Risk
180 min Winter	20.310	0.310	1.4	12.1	13.5	17.1	Flood Risk
240 min Winter	20.299	0.299	1.3	10.0	11.3	15.6	O K
360 min Winter	20.284	0.284	1.2	7.2	8.4	13.6	O K
480 min Winter	20.271	0.271	1.1	5.7	6.8	12.1	O K
600 min Winter	20.262	0.262	1.0	4.8	5.8	11.2	O K
720 min Winter	20.256	0.256	1.0	4.1	5.1	10.5	O K
960 min Winter	20.247	0.247	0.9	3.2	4.1	9.6	O K
1440 min Winter	20.235	0.235	0.8	2.2	3.0	8.4	O K
2160 min Winter	20.224	0.224	0.7	1.4	2.2	7.5	O K
2880 min Winter	20.217	0.217	0.7	1.0	1.7	7.0	O K
4320 min Winter	20.208	0.208	0.6	0.6	1.2	6.2	O K
5760 min Winter	20.201	0.201	0.6	0.4	1.0	5.7	O K
7200 min Winter	20.197	0.197	0.6	0.3	0.8	5.5	O K
8640 min Winter	20.194	0.194	0.5	0.2	0.7	5.3	O K
10080 min Winter	20.191	0.191	0.5	0.1	0.6	5.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
30 min Winter	63.251	0.0	28.1	23
60 min Winter	39.883	0.0	36.8	40
120 min Winter	24.286	0.0	45.2	72
180 min Winter	17.915	0.0	49.4	102
240 min Winter	14.343	0.0	51.8	132
360 min Winter	10.460	0.0	54.5	196
480 min Winter	8.358	0.0	55.9	256
600 min Winter	7.018	0.0	56.4	316
720 min Winter	6.081	0.0	56.4	374
960 min Winter	4.846	0.0	55.4	498
1440 min Winter	3.514	0.0	52.0	734
2160 min Winter	2.543	0.0	46.5	1104
2880 min Winter	2.020	0.0	41.4	1468
4320 min Winter	1.457	0.0	32.1	2192
5760 min Winter	1.155	0.0	23.6	2904
7200 min Winter	0.964	0.0	16.3	3576
8640 min Winter	0.831	0.0	10.2	4408
10080 min Winter	0.733	0.0	5.7	5120

Rainfall Details

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)	19.700	Shortest Storm (mins)	15
Ratio R	0.383	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.144

Time (mins) From:	To:	Area (ha)
0	4	0.144

Model Details

Storage is Online Cover Level (m) 20.600

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	210.0
Infiltration Coefficient Side (m/hr)	0.09300	Side Slope (1:X)	2.0
Safety Factor	2.0	Slope (1:X)	500.0
Porosity	1.00	Cap Volume Depth (m)	0.500
Invert Level (m)	20.000	Cap Infiltration Depth (m)	0.500
Base Width (m)	0.3		

Pipe Overflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	38.0	Coefficient of Contraction	0.600
Length (m)	12.000	Upstream Invert Level (m)	20.180
Roughness k (mm)	0.600		

Cascade Summary of Results for Faversham Perm. Paving NEW.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	Faversham-New Pond-Design 2.SRCX	(None)

Half Drain Time : 0 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	21.850	0.000	0.0	0.0	0.0	0.0	O K
30 min Summer	21.850	0.000	0.0	0.1	0.1	0.0	O K
60 min Summer	21.850	0.000	0.0	0.1	0.1	0.0	O K
120 min Summer	21.850	0.000	0.0	0.2	0.2	0.0	O K
180 min Summer	21.850	0.000	0.0	0.3	0.3	0.0	O K
240 min Summer	21.850	0.000	0.0	0.3	0.3	0.0	O K
360 min Summer	21.850	0.000	0.0	0.4	0.4	0.0	O K
480 min Summer	21.850	0.000	0.0	0.4	0.4	0.0	O K
600 min Summer	21.850	0.000	0.0	0.4	0.4	0.0	O K
720 min Summer	21.850	0.000	0.0	0.5	0.5	0.0	O K
960 min Summer	21.850	0.000	0.0	0.5	0.5	0.0	O K
1440 min Summer	21.850	0.000	0.0	0.5	0.5	0.0	O K
2160 min Summer	21.850	0.000	0.0	0.5	0.5	0.0	O K
2880 min Summer	21.850	0.000	0.0	0.5	0.5	0.0	O K
4320 min Summer	21.850	0.000	0.0	0.5	0.5	0.0	O K
5760 min Summer	21.850	0.000	0.0	0.5	0.5	0.0	O K
7200 min Summer	21.850	0.000	0.0	0.5	0.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	41.252	0.0	2.0	0
30 min Summer	27.339	0.0	4.9	0
60 min Summer	17.456	0.0	13.5	0
120 min Summer	10.869	0.0	20.2	0
180 min Summer	8.143	0.0	24.3	0
240 min Summer	6.626	0.0	27.5	0
360 min Summer	4.951	0.0	32.1	0
480 min Summer	4.025	0.0	35.5	0
600 min Summer	3.427	0.0	38.1	0
720 min Summer	3.006	0.0	40.2	0
960 min Summer	2.439	0.0	43.1	0
1440 min Summer	1.818	0.0	46.0	0
2160 min Summer	1.356	0.0	67.5	0
2880 min Summer	1.101	0.0	70.1	0
4320 min Summer	0.821	0.0	69.8	0
5760 min Summer	0.664	0.0	85.3	0
7200 min Summer	0.563	0.0	84.0	0

Cascade Summary of Results for Faversham Perm. Paving NEW.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	21.850	0.000	0.0	0.4	0.4	0.0	O K
10080 min Summer	21.850	0.000	0.0	0.4	0.4	0.0	O K
15 min Winter	21.850	0.000	0.0	0.0	0.0	0.0	O K
30 min Winter	21.850	0.000	0.0	0.1	0.1	0.0	O K
60 min Winter	21.850	0.000	0.0	0.2	0.2	0.0	O K
120 min Winter	21.850	0.000	0.0	0.3	0.3	0.0	O K
180 min Winter	21.850	0.000	0.0	0.4	0.4	0.0	O K
240 min Winter	21.850	0.000	0.0	0.4	0.4	0.0	O K
360 min Winter	21.850	0.000	0.0	0.5	0.5	0.0	O K
480 min Winter	21.850	0.000	0.0	0.5	0.5	0.0	O K
600 min Winter	21.850	0.000	0.0	0.5	0.5	0.0	O K
720 min Winter	21.850	0.000	0.0	0.6	0.6	0.0	O K
960 min Winter	21.850	0.000	0.0	0.6	0.6	0.0	O K
1440 min Winter	21.850	0.000	0.0	0.6	0.6	0.0	O K
2160 min Winter	21.850	0.000	0.0	0.6	0.6	0.0	O K
2880 min Winter	21.850	0.000	0.0	0.6	0.6	0.0	O K
4320 min Winter	21.850	0.000	0.0	0.6	0.6	0.0	O K
5760 min Winter	21.850	0.000	0.0	0.5	0.5	0.0	O K
7200 min Winter	21.850	0.000	0.0	0.5	0.5	0.0	O K
8640 min Winter	21.850	0.000	0.0	0.5	0.5	0.0	O K
10080 min Winter	21.850	0.000	0.0	0.4	0.4	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.493	0.0	81.5	0
10080 min Summer	0.440	0.0	78.8	0
15 min Winter	41.252	0.0	3.0	0
30 min Winter	27.339	0.0	6.6	0
60 min Winter	17.456	0.0	16.9	0
120 min Winter	10.869	0.0	24.6	0
180 min Winter	8.143	0.0	29.4	0
240 min Winter	6.626	0.0	33.0	0
360 min Winter	4.951	0.0	38.4	0
480 min Winter	4.025	0.0	42.3	0
600 min Winter	3.427	0.0	45.4	0
720 min Winter	3.006	0.0	47.9	0
960 min Winter	2.439	0.0	51.3	0
1440 min Winter	1.818	0.0	54.9	0
2160 min Winter	1.356	0.0	79.8	0
2880 min Winter	1.101	0.0	83.3	0
4320 min Winter	0.821	0.0	84.1	0
5760 min Winter	0.664	0.0	102.9	0
7200 min Winter	0.563	0.0	102.8	0
8640 min Winter	0.493	0.0	101.2	0
10080 min Winter	0.440	0.0	98.3	0

Cascade Rainfall Details for Faversham Perm. Paving NEW.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.396	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Pipe Network

Volume in Pipe Network (m³)	400	Dia of Outfall Pipe (m)	0.1
Slope of Outfall Pipe (1:X)	100	Roughness of Outfall Pipe (mm)	0.600

Time Area Diagram

Total Area (ha) 0.296

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.000	4	8	0.296

Cascade Model Details for Faversham Perm. Paving NEW.SRCX

Storage is Online Cover Level (m) 22.380

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.09300	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	296.4
Max Percolation (l/s)	823.3	Slope (1:X)	80.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	21.850	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0049-1000-0840-1000
Design Head (m)	0.840
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	49
Invert Level (m)	21.540
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.840	1.0
Flush-Flo™	0.214	0.9
Kick-Flo®	0.435	0.7
Mean Flow over Head Range	-	0.8

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	0.8	1.200	1.2	3.000	1.8	7.000	2.6
0.200	0.9	1.400	1.3	3.500	1.9	7.500	2.7
0.300	0.9	1.600	1.3	4.000	2.0	8.000	2.8
0.400	0.8	1.800	1.4	4.500	2.1	8.500	2.9
0.500	0.8	2.000	1.5	5.000	2.2	9.000	3.0
0.600	0.9	2.200	1.5	5.500	2.3	9.500	3.0
0.800	1.0	2.400	1.6	6.000	2.4		
1.000	1.1	2.600	1.7	6.500	2.5		

Cascade Summary of Results for Faversham Perm. Paving NEW.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	Faversham-New Pond-Design 2.SRCX	(None)

Half Drain Time : 25 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	21.850	0.000	0.0	0.3	0.3	0.0	O K
30 min Summer	21.850	0.000	0.0	0.5	0.5	0.0	O K
60 min Summer	21.850	0.000	0.0	0.7	0.7	0.0	O K
120 min Summer	21.879	0.029	0.1	0.9	0.9	0.1	O K
180 min Summer	21.901	0.051	0.2	0.9	1.1	0.3	O K
240 min Summer	21.920	0.070	0.3	0.9	1.1	0.6	O K
360 min Summer	21.949	0.099	0.4	0.9	1.2	1.2	O K
480 min Summer	21.970	0.120	0.5	0.9	1.3	1.7	O K
600 min Summer	21.982	0.132	0.5	0.9	1.3	2.1	O K
720 min Summer	21.989	0.139	0.6	0.9	1.3	2.3	O K
960 min Summer	21.994	0.144	0.6	0.9	1.4	2.5	O K
1440 min Summer	21.997	0.147	0.6	0.9	1.4	2.6	O K
2160 min Summer	21.994	0.144	0.6	0.9	1.4	2.5	O K
2880 min Summer	21.988	0.138	0.6	0.9	1.3	2.3	O K
4320 min Summer	21.965	0.115	0.5	0.9	1.2	1.6	O K
5760 min Summer	21.931	0.081	0.3	0.9	1.2	0.8	O K
7200 min Summer	21.907	0.057	0.2	0.9	1.1	0.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	100.901	0.0	18.4	0
30 min Summer	65.363	0.0	28.2	0
60 min Summer	40.257	0.0	54.0	0
120 min Summer	23.976	0.0	68.0	178
180 min Summer	17.608	0.0	76.7	222
240 min Summer	14.115	0.0	83.1	290
360 min Summer	10.313	0.0	92.2	428
480 min Summer	8.243	0.0	98.6	552
600 min Summer	6.924	0.0	103.5	654
720 min Summer	6.002	0.0	107.2	746
960 min Summer	4.788	0.0	112.6	948
1440 min Summer	3.477	0.0	117.6	1142
2160 min Summer	2.523	0.0	156.2	1556
2880 min Summer	2.007	0.0	161.0	1936
4320 min Summer	1.454	0.0	161.9	2708
5760 min Summer	1.158	0.0	189.2	3592
7200 min Summer	0.970	0.0	190.3	4352

Cascade Summary of Results for Faversham Perm. Paving NEW.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	21.893	0.043	0.2	0.9	1.0	0.2	O K
10080 min Summer	21.879	0.029	0.1	0.9	0.9	0.1	O K
15 min Winter	21.850	0.000	0.0	0.4	0.4	0.0	O K
30 min Winter	21.850	0.000	0.0	0.7	0.7	0.0	O K
60 min Winter	21.863	0.013	0.0	0.9	0.9	0.0	O K
120 min Winter	21.911	0.061	0.3	0.9	1.1	0.5	O K
180 min Winter	21.945	0.095	0.4	0.9	1.2	1.1	O K
240 min Winter	21.972	0.122	0.5	0.9	1.3	1.8	O K
360 min Winter	22.001	0.151	0.6	0.9	1.4	2.7	O K
480 min Winter	22.017	0.167	0.7	0.9	1.5	3.4	O K
600 min Winter	22.028	0.178	0.7	0.9	1.5	3.8	O K
720 min Winter	22.036	0.186	0.8	0.9	1.6	4.1	O K
960 min Winter	22.041	0.191	0.8	0.9	1.6	4.4	O K
1440 min Winter	22.040	0.190	0.8	0.9	1.6	4.3	O K
2160 min Winter	22.032	0.182	0.8	0.9	1.5	4.0	O K
2880 min Winter	22.018	0.168	0.7	0.9	1.5	3.4	O K
4320 min Winter	21.987	0.137	0.6	0.9	1.3	2.3	O K
5760 min Winter	21.944	0.094	0.4	0.9	1.2	1.1	O K
7200 min Winter	21.907	0.057	0.2	0.9	1.1	0.4	O K
8640 min Winter	21.887	0.037	0.1	0.9	1.0	0.2	O K
10080 min Winter	21.869	0.019	0.0	0.9	0.9	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.840	0.0	189.0	5112
10080 min Summer	0.743	0.0	185.6	5928
15 min Winter	100.901	0.0	22.4	0
30 min Winter	65.363	0.0	33.7	0
60 min Winter	40.257	0.0	63.1	82
120 min Winter	23.976	0.0	79.1	184
180 min Winter	17.608	0.0	89.0	298
240 min Winter	14.115	0.0	96.3	364
360 min Winter	10.313	0.0	106.7	470
480 min Winter	8.243	0.0	114.1	566
600 min Winter	6.924	0.0	119.7	670
720 min Winter	6.002	0.0	124.1	760
960 min Winter	4.788	0.0	130.3	948
1440 min Winter	3.477	0.0	136.4	1208
2160 min Winter	2.523	0.0	179.6	1640
2880 min Winter	2.007	0.0	185.7	2092
4320 min Winter	1.454	0.0	188.0	2828
5760 min Winter	1.158	0.0	219.0	3752
7200 min Winter	0.970	0.0	221.6	4520
8640 min Winter	0.840	0.0	221.5	5200
10080 min Winter	0.743	0.0	218.8	6016

Cascade Rainfall Details for Faversham Perm. Paving NEW.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	26.250	Shortest Storm (mins)	15
Ratio R	0.396	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Pipe Network

Volume in Pipe Network (m³)	400	Dia of Outfall Pipe (m)	0.1
Slope of Outfall Pipe (1:X)	100	Roughness of Outfall Pipe (mm)	0.600

Time Area Diagram

Total Area (ha) 0.296

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.000	4	8	0.296

Cascade Model Details for Faversham Perm. Paving NEW.SRCX

Storage is Online Cover Level (m) 22.380

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.09300	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	296.4
Max Percolation (l/s)	823.3	Slope (1:X)	80.0
Safety Factor	5.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	21.850	Membrane Depth (m)	0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0049-1000-0840-1000
Design Head (m)	0.840
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	49
Invert Level (m)	21.540
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.840	1.0
Flush-Flo™	0.214	0.9
Kick-Flo®	0.435	0.7
Mean Flow over Head Range	-	0.8

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	0.8	1.200	1.2	3.000	1.8	7.000	2.6
0.200	0.9	1.400	1.3	3.500	1.9	7.500	2.7
0.300	0.9	1.600	1.3	4.000	2.0	8.000	2.8
0.400	0.8	1.800	1.4	4.500	2.1	8.500	2.9
0.500	0.8	2.000	1.5	5.000	2.2	9.000	3.0
0.600	0.9	2.200	1.5	5.500	2.3	9.500	3.0
0.800	1.0	2.400	1.6	6.000	2.4		
1.000	1.1	2.600	1.7	6.500	2.5		

Appendix C – Surface Water Maintenance Plan

Report

Surface Water Maintenance Plan

North Kent Crematorium, Faversham

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46 Felaw Street
Ipswich, IP2 8PN
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17/05/2023
Project Reference: 65204882
Document Reference: 65204882-SWE-ZZ-XX-RP-C-0002
Revision: [1]
Prepared For: Memoria Ltd

Status / Revisions

Rev.	Date	Reason for issue	Prepared		Reviewed		Approved	
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Table of contents

1 Introduction

This Surface Water Maintenance Plan (SWMP) sets out the principles for the long term management and maintenance for the surface water Sustainable Drainage Systems (SuDS) installed at the North Kent Crematorium development site, to ensure that robust inspection is in accordance with the maintenance programme, and is undertaken to ensure optimum performance of the surface water drainage system with continued maintenance for the lifetime of the development to prevent the increase in risk of flooding on and off site.

This SWMP is referenced to the SuDS technical guidance *CIRIA Report C753 The SuDS Manual (2015)* with specific sections:

- A description of the SuDS component and its use
- Maintenance requirements and frequencies
- Inspection requirements and frequencies.

Those responsible for the maintenance of the surface water drainage system will follow the relevant health and safety legislation for all activities listed in this SWMP, including working within confined spaces and working alone with all relevant risk assessments undertaken before the maintenance activity is undertaken.

2 SuDS Layout and Design

The proposed surface water drainage design is shown on Drainage Layouts 65204882-SWE-ZZ-XX-DR-C-0100 to 0102. Surface water runoff from building roof area is directed via downpipes to sewers and into the attenuation pond for storage. Surface water runoff from the impermeable part of the road, car park and pedestrian footpaths and service yard is directed via gullies and channel drains to sewers that discharge to the attenuation pond for storage and water quality treatment before discharging to the watercourse at a restricted rate. Surface water runoff within the permeable car park areas directly permeates through the porous car park surfacing to the porous granular sub-base beneath for storage and partial infiltration and discharged to the attenuation pond for storage and water quality treatment before discharging to the watercourse at a restricted rate.

3 Channel Drains

The channel drains within the drainage network provide surface water drainage to the external areas and connect to storm sewers which are directed via manhole chambers to the attenuation pond. Silt and contaminants within the surface water flows are trapped within the silt sumps of the channel drains, and silt can accumulate within the invert of the channel drains themselves. Maintenance and inspection of the channel drains can be undertaken by lifting the channel drain gratings where possible and covers to the silt traps. To allow the channel drains to operate efficiently, the following will be required:

Maintenance requirements and frequencies

- Channel drain inlets, outlets and channel drain invert and channel drain grating to be jet washed on an annual basis to remove silt and debris.

Inspection requirements and frequencies

- Inspect channel drain inlets, outlets, channel drain silt sumps, and channel drain invert for the accumulation of debris and for blockages on a monthly basis or as required.

4 Gully Chambers

The gullies within the drainage network provide surface water drainage to the external areas to connect to private storm sewers which are directed via manhole chambers to the SuDS attenuation pond. Silt and contaminants within the surface water flows are trapped within the sumps of the gully chambers so that this silt does not continue towards downstream SuDS components. To allow the gully chambers to trap silt efficiently the following will be required:

Maintenance requirements and frequencies

- Gully chamber sumps to be emptied on an annual basis of silt using suction pumping to a storage tanker for removal off site and jet washed if necessary, with the gully outlet temporarily blocked off to prevent silt transfer to the sewers.

Inspection requirements and frequencies

- Inspect gully chamber outlets for blockages and clear if required on a monthly basis or as required.

5 Manhole Chambers

The manhole chambers within the drainage network provide access for inspection and maintenance for the sewers that direct surface water from drained areas to the storage SuDS. Silt and contaminants within the surface water flows are trapped within the sumps of the manhole chambers so that this silt does not continue towards the downstream SuDS components. To allow the manhole chambers to trap silt efficiently, the following will be required:

Maintenance requirements and frequencies

- Manhole chambers sumps to be emptied of silt on an annual basis using pumping to a storage tanker for removal off site by a licenced contractor and jet washed with the manhole chamber outlets temporarily blocked off to prevent silt transfer to the sewers.

Inspection requirements and frequencies

- Inspect manhole chamber inlets and outlets for blockages and damage and clear if required on a monthly basis or as required.

6 External Areas

The external areas such as the carpark bays, concrete service yard, access road and footways can accumulate silt and debris that could be washed into the gullies and channel drains or clog up the porous paving surface. To maintain the efficient performance of the main surface water drainage, the following will be required;

Maintenance requirements and frequencies

- External areas to be mechanically cleansed of silt and debris by a truck mounted sweeper and or jet washed with outlets to channel drains and gullies temporarily blocked off to prevent the transfer of sit and debris to the sewer system. Channel drains and gully chambers to be cleansed before removing the temporary stops to the outlets. External area cleaning to be undertaken on an annual basis.

Inspection requirements and frequencies

- Inspect external areas on a monthly basis.
- Accidental spillages of petrol / oil should be cleaned up immediately. Spillages to be contained within external areas by temporarily stopping up the relevant gully and channel drain outlets, blocking off routes to drains, until the spillage can be removed off site by a licenced contractor.
- The use of de-icing salts in the winter to prevent ice build-up on the external areas is to be kept to an absolute minimum and proprietary detergents are not to be used for cleaning external surfaces.

7 Permeable Paving

The permeable paving to the car park areas around the development can accumulate silt and debris that could affect the free draining surfaces. To maintain the efficient performance of the permeable paving, the following will be required;

Maintenance requirements and frequencies

- External areas to be mechanically cleansed of silt and debris by a truck mounted sweeper and or jet washed with any gully outlets temporarily blocked off to prevent the transfer of sit and debris to the porous storage sub-base underneath. Permeable paving area cleaning to be undertaken on an annual basis.

Inspection requirements and frequencies

- Inspect external areas on an annual basis.
- Accidental spillages of petrol / oil should be cleaned up immediately.
- The use of de-icing salts in the winter to prevent ice build-up on the external areas is to be kept to an absolute minimum.
- Proprietary detergents are not to be used for cleaning the permeable paving.

8 SuDS attenuation Pond

The attenuation pond is designed to store storm water run-off before discharging at a restricted rate. The pond is a very low maintenance SuDS component, however to ensure continued optimum operation, all SuDS components upstream of the pond must be maintained to prevent silt transferring to the SuDS pond. The pond should be checked for debris build up around the headwalls and within the pond, and silt/debris build up removed from the base of the pond using an excavator and lorry for disposal. To ensure that the pond continues to provide the correct storage volume and work efficiently, the following will be required:

Maintenance requirements and frequencies

- The inlets / outlets at the headwalls to the pond are to be mechanically brushed or jet washed annually using the nearest upstream manhole chamber from the SuDS pond.

Inspection requirements and frequencies

- Inspect inlets, outlets for blockages and clear if required on a monthly basis or as required.
- Inspect annually for silt/debris build up in the base of the SuDS pond.

9 Headwalls

To ensure continued optimum operation for these headwall structures, the following will be required:

Maintenance requirements and frequencies

- Vegetation, mud and silt to be removed from around the discharge pipes within the headwalls every six months.

Inspection requirements and frequencies

- Inspect outlet pipes within the headwalls and remove blockages as required every six months.

10 Filter Drains and Swales

Filter drains receive and direct storm water run-off from external areas before directing it to the attention pond for storage. Swales receive, store and direct storm water run-off the road surface before discharging to the watercourse. The swales will allow surface water runoff to partially infiltrate into the ground below. Filter drains and swales provide water quality treatment by filtering out pollutants from the received storm water run-off. Swales are very low maintenance SuDS components compared to filter trenches. To ensure continued optimum operation of both SuDS components, the following is required:

Maintenance requirements and frequencies

- Filter drains require inspection and very effective maintenance and treatment of upstream components to minimise the risk of blockages due to debris and build-up of silt.
- The inlets to the swale are to be mechanically brushed or jet washed annually.
- The grass is to be mown frequently and any accumulated rubbish to be removed as required.

Inspection requirements and frequencies

- Inspection of the inlets and outlet headwalls to be checked for blockages and cleared if required on an annual basis.

11 Hydrobrake Flow Controls

The Hydrobrakes provide restricted surface water discharge rates from the porous granular sub-base storage and into the attenuation pond. Flows from the attenuation pond to the watercourse are also restricted by a hydrobrake. Hydrobrake chambers allow access for inspection and checking. Hydrobrakes are non-mechanical and are of low maintenance. However, to ensure that they operate efficiently the following will be required:

Maintenance requirements and frequencies

- Surfaces within the hydrobrake chamber to be mechanically brushed or jet washed annually.

Inspection requirements and frequencies

- Inspect inlets and outlet of the hydrobrake for blockages and cleared if required on a monthly basis or as required.
- Inspect the hydrobrake for evidence of physical damage on a monthly basis or as required.

12 Maintenance Responsibility

Maintenance of the above surface water drainage features will be the responsibility of Memoria Ltd.

A log of all inspections should be maintained and be made available for examination by the relevant authorities.

Reference should be made to the Health and Safety File before starting any maintenance and or inspection work for the surface water drainage system.

Risk Assessments for maintenance of SuDS components to be undertaken before the start of maintenance and inspection works.

Maintenance and inspection of the surface water drainage system will follow the relevant health and safety legislation for all activities undertaken above.

The proposed surface water drainage shown on drawings 65204882-SWE-ZZ-XX-DR-C-0100 to 0102 should be referenced before the start of any maintenance and or inspection work for the surface water drainage system.