

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Council Boundary
- Main River
- Ordinary Watercourse
- Culvert
- Flood Defence (AIMS)
- Area Benefiting from Flood Defence
- Flood Storage Area
- Flood Zone 2 (0.1 AEP)
- Flood Zone 3 (1% AEP fluvial and 0.5% AEP tidal)
- Flood Zone 3b (5% AEP)

NOTES

1. Flood Zone 2 and Flood Zone 3 are taken from the Environment Agency's Flood Map for Planning. This Environment Agency Flood Zone data defines the extent of flooding from rivers and the sea without considering the presence of flood defences. The reason for this approach is to make an allowance for the residual flood risk in the event of a failure or breach/overlapping of the flood defences. This approach raises the awareness of flood risk in defended areas and helps to ensure that this is not discounted as part of development, but is managed appropriately.

2. Flood Zone 3b is defined using modelled extents for the 5% AEP fluvial event where modelled data was available.

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Purpose of Issue: **FINAL**

Client:

Project Title:
SOUTH ESSEX LEVEL 1 SFRA

Drawing Title:
FLUVIAL AND TIDAL FLOOD ZONES

Drawn KLD	Checked JW	Approved CP	Date 20/04/2018
AECOM Internal Project No. 60532482		Scale @ A3 1:52,000	

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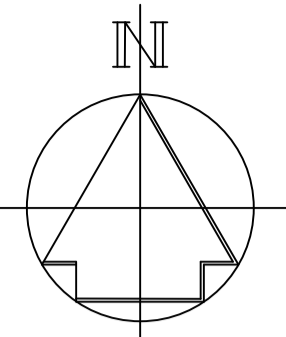
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Drawing Number: **FIGURE 4.1** Rev: **1**





Appendix F - Drainage Strategy and Exceedance Flood Routes



Ex FWMH9501
CL 27.04
IL 24.60
(Anglian Records)

Legend

Drainage

- Proposed Foul Sewer ---
- Proposed Surface Water Sewer ---
- Proposed SW Sewer Diversion ---
- Existing SW Sewer to be Abandoned -x-x-
- Permeable Paving (Type C no infiltration)
- Geocellular Attenuation Tank

Other Symbols

- Site Boundary ---
- Existing Services ---

General Notes

An existing surface water sewer serving part of Landon Links and part of the existing site runs east and then south through the site. This existing sewer is assumed to be a Highway Drain. It is proposed to divert this sewer to run west to east within the main access road - as shown by the thick purple dashed line.

At least 1000m² of the existing site's access road (cross-hatched orange) appears to be drained into this sewer (to be confirmed). This will all be removed as part of the redevelopment. Due to constraints imposed by shallow existing sewers elsewhere, it is not possible for part of the new development to be drained to the new attenuation/flow control system.

Instead approx 600m² (shaded light blue) is to be drained via the diverted Highway Drain. Due to the shallow depth of the existing Highway Drainage (to be confirmed) it is not possible to provide flow control/attenuation to this small area of run-off. However it is noted that this area of run-off is less than the existing situation, thereby reducing the flow rate and volume of run-off generated by this part of the development.

All subject to agreement with Highways (or the owner of sewer if this is not a Highway Drain).

Proposed 1000 connection from upper catchment to existing manhole at northern end of watercourse. Allow for remedial works to existing drainage downstream of this location; a broken pipe is indicated and this requires further investigation.

Yellow shading indicates permeable block paving to parking bays. This is a Type C (no infiltration) system with minimum 200mm thick OGCR sub-base. This sub-base is used for treatment and conveyance only, i.e. it does not contribute significantly to the attenuation system.

Parking bay to front of sub-station is not to be permeable construction unless agreed otherwise with electric service provider.

Flow Control Upper Catchment
12000 flow control chamber
CL 29.275
IL 27.425
Max discharge 2.5 l/s at 1.325m head.

SW Tank L2
Size 436x0.4m deep
Volume 165m³
GL 28.500 to 29.000
Top 27.150
Base 26.750

SW Tank L1
Size 776m² x 0.8m deep
Volume 590m³
GL 27.900 to 28.500
Top 27.150
Base 26.350.

Flow Control Lower Catchment
Replace existing chamber with 12000 flow control chamber
CL 28.050
IL 26.250
Max discharge 4.4 l/s at 1.150m head.

SW Tank U1
Size 344m² x 0.8m deep
Volume 261m³
GL 30.000 to 30.600
Top 28.650
Base 27.850

SW Tank U2
Size 9x17x 0.8m deep
Volume 116m³
GL 29.500 to 30.000
Top 28.750
Base 27.950

Proposed foul sewer crosses line of existing watercourse. Subject to receipt of full survey of watercourse to check that this is possible.

Further investigations required to existing watercourse along boundary between upper and lower catchment to determine any inlets and outlets. Levels and alignment of watercourse are also required between existing concrete headwall to the south and existing manhole to the north.

Proposed 2250 foul water connection between site and existing adopted FW manhole 0301 in A176 Nether Mayne. Subject to S106 agreement with Anglian Water.

Further investigations required upstream of existing adopted manhole 0354 to determine if it connects as assumed to SW sewers in the site.

Proposed outfall from lower catchment to existing watercourse. Replace existing 2250 outfall with 1000 outfall. Depth of watercourse is not known. IL of proposed headwall needs to be 26.050 or lower. If watercourse is too shallow then connection to be made direct to existing adopted manhole 0354 (IL 25.61) adjacent to A176 Nether Mayne.

Further investigations required to existing watercourse along lower catchment's eastern boundary to determine any inlets and outlets.

REV DATE DESCRIPTION BY CHK'D

PRELIMINARY



TITLE:

Drainage Strategy

PROJECT:

Car Park 14, Basildon

SCALE: 1:5000A1 DATE: March 2021 DRAWN: CH CHK'D: PAJT

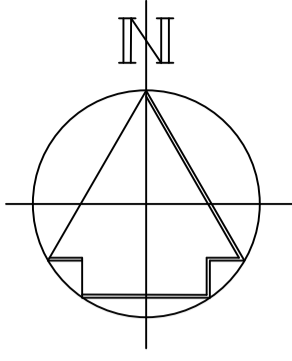
DRG NO. 14279-TDA-XX-XX-DR-C-25101

REV. TDA PROJECT NUMBER. 14279



Engineering at its Best

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Legend

- Exceedance Flood Path ←
- Temporary Surface Water Flooding
- Site Boundary

General Notes

The surface water drainage system has been designed for the 1 in 100 year +40% climate change. Temporary surface water flooding and flood routes only occur if storm event is exceeded or if there is a blockage.



REV DATE DESCRIPTION BY CHK'D

PRELIMINARY



TITLE:

Exceedance Flood Routes

PROJECT:

Car Park 14, Basildon

SCALE: 1:500@A1 DATE: March 2021 DRAWN: CH CHK'D: PAJT

DRG NO. 14279-TDA-XX-XX-DR-C-25102

REV. TDA PROJECT NUMBER. 14279





Appendix G - Surface Water Drainage Calculations

Sheridan House Hartfield Road
Forest Row
East Sussex RH18 5EA



Date 22/03/2021 15:58
File

Designed by pat
Checked by

XP Solutions Source Control 2019.1

ICP SUDS Mean Annual Flood

Input

Return Period (years)	2	Soil	0.450
Area (ha)	2.380	Urban	0.000
SAAR (mm)	582	Region Number	Region 6

Results 1/s

QBAR Rural	8.4
QBAR Urban	8.4

Q2 years 7.4

Q1 year	7.2
Q30 years	19.1
Q100 years	26.9

Tully De'Ath Ltd		Page 1
Sheridan House Hartfield Road Forest Row East Sussex RH18 5EA		14279 Chapel Gate, Basildon
Date 23/03/2021 10:44 File 14279 Upper Catchment.SRCX		Designed by PAJT Checked by
XP Solutions		Source Control 2019.1



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

Half Drain Time : 1314 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	28.166	0.316	0.0	2.2	2.2	134.5	O K
30 min Summer	28.244	0.394	0.0	2.2	2.2	171.6	O K
60 min Summer	28.318	0.468	0.0	2.2	2.2	206.5	O K
120 min Summer	28.422	0.572	0.0	2.2	2.2	255.5	O K
180 min Summer	28.485	0.635	0.0	2.3	2.3	285.1	O K
240 min Summer	28.526	0.676	0.0	2.3	2.3	304.8	O K
360 min Summer	28.573	0.723	0.0	2.3	2.3	326.9	O K
480 min Summer	28.593	0.743	0.0	2.4	2.4	336.4	O K
600 min Summer	28.598	0.748	0.0	2.4	2.4	338.8	O K
720 min Summer	28.594	0.744	0.0	2.4	2.4	336.9	O K
960 min Summer	28.570	0.720	0.0	2.3	2.3	325.3	O K
1440 min Summer	28.503	0.653	0.0	2.3	2.3	293.5	O K
2160 min Summer	28.431	0.581	0.0	2.2	2.2	259.6	O K
2880 min Summer	28.377	0.527	0.0	2.2	2.2	234.4	O K
4320 min Summer	28.292	0.442	0.0	2.2	2.2	194.1	O K
5760 min Summer	28.222	0.372	0.0	2.2	2.2	161.2	O K
7200 min Summer	28.165	0.315	0.0	2.2	2.2	134.1	O K
8640 min Summer	28.114	0.264	0.0	2.2	2.2	110.2	O K
10080 min Summer	28.068	0.218	0.0	2.2	2.2	88.1	O K
15 min Winter	28.166	0.316	0.0	2.2	2.2	134.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	168.826	0.0	137.1	23
30 min Summer	108.421	0.0	167.3	37
60 min Summer	66.077	0.0	214.6	68
120 min Summer	41.747	0.0	271.0	126
180 min Summer	31.666	0.0	308.7	186
240 min Summer	25.861	0.0	336.1	246
360 min Summer	19.183	0.0	354.9	364
480 min Summer	15.355	0.0	356.9	484
600 min Summer	12.839	0.0	358.7	602
720 min Summer	11.052	0.0	360.3	722
960 min Summer	8.664	0.0	362.8	960
1440 min Summer	6.074	0.0	361.8	1214
2160 min Summer	4.220	0.0	493.5	1576
2880 min Summer	3.256	0.0	507.7	1964
4320 min Summer	2.264	0.0	529.8	2772
5760 min Summer	1.757	0.0	548.0	3584
7200 min Summer	1.452	0.0	566.0	4392
8640 min Summer	1.247	0.0	583.5	5184
10080 min Summer	1.100	0.0	600.7	5952
15 min Winter	168.826	0.0	137.1	23


Tully De'Ath Ltd		Page 2
Sheridan House Hartfield Road Forest Row East Sussex RH18 5EA		14279 Chapel Gate, Basildon
Date 23/03/2021 10:44 File 14279 Upper Catchment.SRCX		Designed by PAJT Checked by
XP Solutions		Source Control 2019.1



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

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
30 min Winter	28.245	0.395	0.0	2.2	2.2	171.7	O K
60 min Winter	28.319	0.469	0.0	2.2	2.2	206.7	O K
120 min Winter	28.423	0.573	0.0	2.2	2.2	255.9	O K
180 min Winter	28.486	0.636	0.0	2.3	2.3	285.8	O K
240 min Winter	28.529	0.679	0.0	2.3	2.3	305.7	O K
360 min Winter	28.576	0.726	0.0	2.3	2.3	328.4	O K
480 min Winter	28.598	0.748	0.0	2.4	2.4	338.4	O K
600 min Winter	28.604	0.754	0.0	2.4	2.4	341.4	O K
720 min Winter	28.602	0.752	0.0	2.4	2.4	340.2	O K
960 min Winter	28.581	0.731	0.0	2.3	2.3	330.6	O K
1440 min Winter	28.514	0.664	0.0	2.3	2.3	298.7	O K
2160 min Winter	28.430	0.580	0.0	2.2	2.2	259.5	O K
2880 min Winter	28.365	0.515	0.0	2.2	2.2	228.3	O K
4320 min Winter	28.250	0.400	0.0	2.2	2.2	174.4	O K
5760 min Winter	28.153	0.303	0.0	2.2	2.2	128.5	O K
7200 min Winter	28.066	0.216	0.0	2.2	2.2	87.3	O K
8640 min Winter	27.978	0.128	0.0	2.2	2.2	45.6	O K
10080 min Winter	27.905	0.055	0.0	2.2	2.2	18.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	108.421	0.0	167.2	37
60 min Winter	66.077	0.0	214.6	66
120 min Winter	41.747	0.0	271.1	124
180 min Winter	31.666	0.0	308.5	182
240 min Winter	25.861	0.0	335.9	242
360 min Winter	19.183	0.0	354.2	358
480 min Winter	15.355	0.0	356.0	474
600 min Winter	12.839	0.0	357.6	590
720 min Winter	11.052	0.0	358.9	702
960 min Winter	8.664	0.0	360.6	926
1440 min Winter	6.074	0.0	358.9	1332
2160 min Winter	4.220	0.0	493.6	1648
2880 min Winter	3.256	0.0	507.8	2108
4320 min Winter	2.264	0.0	529.7	2984
5760 min Winter	1.757	0.0	547.4	3856
7200 min Winter	1.452	0.0	565.7	4680
8640 min Winter	1.247	0.0	583.7	5192
10080 min Winter	1.100	0.0	600.5	5744

Tully De'Ath Ltd		Page 3
Sheridan House Hartfield Road Forest Row East Sussex RH18 5EA	14279 Chapel Gate, Basildon	
Date 23/03/2021 10:44 File 14279 Upper Catchment.SRCX	Designed by PAJT Checked by	
XP Solutions	Source Control 2019.1	


Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 569923 188369 TQ 69923 88369
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.325

Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.163	4	8	0.162

Tully De'Ath Ltd		Page 4
Sheridan House Hartfield Road Forest Row East Sussex RH18 5EA	14279 Chapel Gate, Basildon	
Date 23/03/2021 10:44 File 14279 Upper Catchment.SRCX	Designed by PAJT Checked by	
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Model Details

Storage is Online Cover Level (m) 29.500

Cellular Storage Structure

Invert Level (m) 27.850 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	344.0	344.0	0.801	153.0	408.2
0.100	344.0	408.2	0.900	153.0	408.2
0.101	497.0	408.2	0.901	0.1	408.2
0.800	497.0	408.2			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0070-2500-1325-2500
 Design Head (m) 1.325
 Design Flow (l/s) 2.5
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 70
 Invert Level (m) 27.425
 Minimum Outlet Pipe Diameter (mm) 100
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.325	2.5
Flush-Flo™	0.311	2.2
Kick-Flo®	0.630	1.8
Mean Flow over Head Range	-	2.0

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	2.4	3.000	3.6	7.000	5.4
0.200	2.1	1.400	2.6	3.500	3.9	7.500	5.6
0.300	2.2	1.600	2.7	4.000	4.2	8.000	5.8
0.400	2.2	1.800	2.9	4.500	4.4	8.500	5.9
0.500	2.1	2.000	3.0	5.000	4.6	9.000	6.1
0.600	1.9	2.200	3.1	5.500	4.8	9.500	6.2
0.800	2.0	2.400	3.3	6.000	5.0		
1.000	2.2	2.600	3.4	6.500	5.2		

Tully De'Ath Ltd		Page 1
Sheridan House Hartfield Road Forest Row East Sussex RH18 5EA		14279 Chapel Gate, Basildon
Date 23/03/2021 10:41 File 14279 Lower Catchment.SRCX		Designed by PAJT Checked by
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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1369 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	26.715	0.365	0.0	4.4	4.4	268.9	O K
30 min Summer	26.816	0.466	0.0	4.4	4.4	343.4	O K
60 min Summer	26.911	0.561	0.0	4.4	4.4	413.7	O K
120 min Summer	27.030	0.680	0.0	4.4	4.4	513.5	O K
180 min Summer	27.083	0.733	0.0	4.4	4.4	574.4	O K
240 min Summer	27.118	0.768	0.0	4.4	4.4	615.1	O K
360 min Summer	27.175	0.825	0.0	4.4	4.4	662.4	O K
480 min Summer	27.228	0.878	0.0	4.4	4.4	684.1	O K
600 min Summer	27.246	0.896	0.0	4.4	4.4	691.8	O K
720 min Summer	27.245	0.895	0.0	4.4	4.4	691.2	O K
960 min Summer	27.208	0.858	0.0	4.4	4.4	675.9	O K
1440 min Summer	27.123	0.773	0.0	4.4	4.4	620.1	O K
2160 min Summer	27.058	0.708	0.0	4.4	4.4	545.4	O K
2880 min Summer	27.009	0.659	0.0	4.4	4.4	489.3	O K
4320 min Summer	26.881	0.531	0.0	4.4	4.4	391.8	O K
5760 min Summer	26.779	0.429	0.0	4.4	4.4	316.3	O K
7200 min Summer	26.699	0.349	0.0	4.4	4.4	257.5	O K
8640 min Summer	26.634	0.284	0.0	4.4	4.4	209.3	O K
10080 min Summer	26.581	0.231	0.0	4.4	4.4	170.1	O K
15 min Winter	26.715	0.365	0.0	4.4	4.4	268.9	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	168.826	0.0	274.1	23
30 min Summer	108.421	0.0	352.1	37
60 min Summer	66.077	0.0	429.1	68
120 min Summer	41.747	0.0	542.1	126
180 min Summer	31.666	0.0	617.1	186
240 min Summer	25.861	0.0	671.8	246
360 min Summer	19.183	0.0	690.2	366
480 min Summer	15.355	0.0	687.7	484
600 min Summer	12.839	0.0	684.6	604
720 min Summer	11.052	0.0	681.4	722
960 min Summer	8.664	0.0	674.3	962
1440 min Summer	6.074	0.0	659.1	1344
2160 min Summer	4.220	0.0	986.8	1672
2880 min Summer	3.256	0.0	1015.6	2052
4320 min Summer	2.264	0.0	1059.3	2812
5760 min Summer	1.757	0.0	1096.2	3568
7200 min Summer	1.452	0.0	1131.6	4320
8640 min Summer	1.247	0.0	1166.6	5016
10080 min Summer	1.100	0.0	1201.0	5752
15 min Winter	168.826	0.0	273.9	23

Tully De'Ath Ltd		Page 2
Sheridan House Hartfield Road Forest Row East Sussex RH18 5EA	14279 Chapel Gate, Basildon	
Date 23/03/2021 10:41 File 14279 Lower Catchment.SRCX	Designed by PAJT Checked by	
XP Solutions	Source Control 2019.1	

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

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
30 min Winter	26.816	0.466	0.0	4.4	4.4	343.5	O K
60 min Winter	26.911	0.561	0.0	4.4	4.4	413.8	O K
120 min Winter	27.031	0.681	0.0	4.4	4.4	514.1	O K
180 min Winter	27.084	0.734	0.0	4.4	4.4	575.2	O K
240 min Winter	27.119	0.769	0.0	4.4	4.4	616.3	O K
360 min Winter	27.180	0.830	0.0	4.4	4.4	664.3	O K
480 min Winter	27.234	0.884	0.0	4.4	4.4	686.7	O K
600 min Winter	27.254	0.904	0.0	4.4	4.4	695.2	O K
720 min Winter	27.255	0.905	0.0	4.4	4.4	695.5	O K
960 min Winter	27.222	0.872	0.0	4.4	4.4	681.8	O K
1440 min Winter	27.130	0.780	0.0	4.4	4.4	628.8	O K
2160 min Winter	27.054	0.704	0.0	4.4	4.4	541.2	O K
2880 min Winter	26.990	0.640	0.0	4.4	4.4	472.0	O K
4320 min Winter	26.812	0.462	0.0	4.4	4.4	340.5	O K
5760 min Winter	26.677	0.327	0.0	4.4	4.4	241.0	O K
7200 min Winter	26.576	0.226	0.0	4.4	4.4	166.7	O K
8640 min Winter	26.502	0.152	0.0	4.3	4.3	112.4	O K
10080 min Winter	26.450	0.100	0.0	4.2	4.2	73.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	108.421	0.0	352.1	37
60 min Winter	66.077	0.0	429.1	66
120 min Winter	41.747	0.0	542.4	124
180 min Winter	31.666	0.0	617.3	184
240 min Winter	25.861	0.0	671.8	242
360 min Winter	19.183	0.0	689.3	360
480 min Winter	15.355	0.0	686.5	476
600 min Winter	12.839	0.0	683.1	590
720 min Winter	11.052	0.0	679.6	706
960 min Winter	8.664	0.0	672.1	932
1440 min Winter	6.074	0.0	656.8	1370
2160 min Winter	4.220	0.0	987.2	1716
2880 min Winter	3.256	0.0	1015.3	2168
4320 min Winter	2.264	0.0	1059.4	2984
5760 min Winter	1.757	0.0	1095.4	3744
7200 min Winter	1.452	0.0	1131.7	4464
8640 min Winter	1.247	0.0	1166.8	5104
10080 min Winter	1.100	0.0	1201.1	5752

Tully De'Ath Ltd		Page 3
Sheridan House Hartfield Road Forest Row East Sussex RH18 5EA	14279 Chapel Gate, Basildon	
Date 23/03/2021 10:41 File 14279 Lower Catchment.SRCX	Designed by PAJT Checked by	
XP Solutions	Source Control 2019.1	


Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 569923 188369 TQ 69923 88369
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.650

Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.325	4	8	0.325

Tully De'Ath Ltd		Page 4
Sheridan House Hartfield Road Forest Row East Sussex RH18 5EA	14279 Chapel Gate, Basildon	
Date 23/03/2021 10:41 File 14279 Lower Catchment.SRCX	Designed by PAJT Checked by	
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Model Details

Storage is Online Cover Level (m) 28.500

Cellular Storage Structure

Invert Level (m) 26.350 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	776.0	776.0	0.801	436.0	919.6
0.650	776.0	919.6	1.050	436.0	919.6
0.651	1212.0	919.6	1.051	0.1	919.6
0.800	1212.0	919.6			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0097-4400-1150-4400
 Design Head (m) 1.150
 Design Flow (l/s) 4.4
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 97
 Invert Level (m) 26.250
 Minimum Outlet Pipe Diameter (mm) 150
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.150	4.4
Flush-Flo™	0.339	4.4
Kick-Flo®	0.709	3.5
Mean Flow over Head Range	-	3.8

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	3.2	1.200	4.5	3.000	6.9	7.000	10.3
0.200	4.2	1.400	4.8	3.500	7.4	7.500	10.6
0.300	4.4	1.600	5.1	4.000	7.9	8.000	10.9
0.400	4.3	1.800	5.4	4.500	8.3	8.500	11.3
0.500	4.2	2.000	5.7	5.000	8.8	9.000	11.6
0.600	4.0	2.200	5.9	5.500	9.2	9.500	11.9
0.800	3.7	2.400	6.2	6.000	9.5		
1.000	4.1	2.600	6.4	6.500	9.9		



Appendix H - Drainage Assessment Form



SuDS Water quantity and Quality – LLFA Technical Assessment Proforma

Introduction

This proforma identifies the information required by Essex LLFA to enable technical assessment the Designers approach to water quantity and water quality as part of SuDS design approach in compliance with Essex SuDS Design Guide.

Completion of the proforma will also allow for technical assessment against Non-statutory technical standards (NSTS) for Sustainable Drainage. The proforma will accompany the site specific Flood Risk Assessment and Drainage Strategy submitted as part of the planning application.

Please complete this form in full for full applications and the coloured sections for outline applications. This will help us identify what information has been included and will assist with a smoother and quicker application.

Instructions for use

Use the units defined for input of figures

Numbers in brackets refer to accompanying notes.

Wherem³m³/m² are noted – both values should be filled in.

Site details

1.1 Planning application reference (if known)

1.2 Site name Chapelgate, Basildon

1.3 Total application site area ⁽¹⁾ 2.38 ha

1.4 Predevelopment use ⁽⁴⁾ Mixed

1.5 Post development use Residential

If other, please sepcify

1.6 Urban creep applicable Yes if yes, factor applied: 10% to roof areas of houses

1.7 Proposed design life / planning application life 60

1.8 Method(s) of discharge: ⁽⁵⁾

Reuse Infiltration Hybrid Waterbody Storm sewer Combined sewer

1.9 Is discharge direct to estuary / sea No

1.10 Have agreements in principle (where applicable) for discharge been provided No



SuDS Water quantity and Quality – LLFA Technical Assessment

Calculation inputs

2.1	Area within site which is drained by SuDS ⁽²⁾	20,120	m ²
2.2	Impermeable area drained pre development ⁽³⁾	7,000	m ²
2.3	Impermeable area drained post development ⁽³⁾	9,750	m ²
2.4	Additional impermeable area (2.3 minus 2.2)	2,750	m ²
2.5	Method for assessing greenfield runoff rate	ICP SuDS (based on IHT124)	
2.6	Method for assessing brownfield runoff rate	Modified Rational Method	
2.7	Coefficient of runoff (Cv) ⁽⁶⁾	1.0	
2.8	Source of rainfall data (FEH Preferred)	FEH	
2.9	Climate change factor applied	40	%

Attenuation (positive outlet)

2.10 Drainage outlet at risk of drowning (tidal locking, elevated water levels in watercourse/sewer)
 Note: Vortex controls require conditions of free discharge to operate as per manufacturers specification.

2.11	Invert level at final outlet	mAOD	
2.12	Design level used for surcharge water level at point of discharge ⁽¹⁶⁾		mAOD

Infiltration (Discharge to Ground)

2.13	Have infiltration tests been undertaken	Yes	
2.14	If yes, which method has been used		
2.15	Infiltration rate (where applicable)	Negligible	m/s
2.16	Depth to highest known ground water table		mAOD
2.17	If there are multiple infiltration features please specify where they can be found in the FRA		
2.18	Depth of infiltration feature		mAOD
2.19	Factor of safety used for sizing infiltration storage		



SuDS Water quantity and Quality – LLFA Technical Assessment Proforma

Calculation outputs

Sections 3 and 4 refer to site where storage is provided by full attenuation or partial infiltration. Where all flows are infiltrated to ground go straight to Section 6.

3.0 Greenfield runoff rates (incl. Urban Creep)

3.1	1 in 1 year rainfall	l/s/ha, 7.2	l/s for the site
3.2	1 in 30 year rainfall	l/s/ha, 19.1	l/s for the site
3.3	1 in 100 year rainfall + CCA	l/s/ha, 37.7	l/s for the site

4.0 Brownfield runoff rates (incl. Urban Creep)

4.1	1 in 1 year rainfall	l/s/ha, 50	l/s for the site
4.2	1 in 30 year rainfall	l/s/ha, 144	l/s for the site
4.3	1 in 100 year rainfall + CCA	l/s/ha, 268	l/s for the site

5.0 Proposed maximum rate of runoff from site (incl. Urban Creep) ⁽⁷⁾

5.1	1 in 1 year rainfall	l/s/ha, 6.9	l/s for the site
5.2	1 in 30 year rainfall	l/s/ha, 6.9	l/s for the site
5.3	1 in 100 year rainfall + CCA	l/s/ha, 6.9	l/s for the site

6.0 Attenuation storage to manage flow rates from site (incl. Climate Change Allowance (CCA) and Urban Creep)

6.1	Storage - 1 in 100 year + CCA ⁽⁹⁾	1132	m ³ 0.116	m ³ /m ²
6.2	50% storage drain down time 1 in 30 years	11		hours

7.0 Controlling volume of runoff from the site ⁽¹⁰⁾

7.1	Pre development runoff volume ⁽¹²⁾ (development area)		m ³ for the site
7.2	Post development runoff volume (unmitigated) ⁽¹²⁾		m ³ for the site
7.3	Volume to be controlled (5.2 - 5.1)		m ³ for the site



Essex County Council

7.4 Volume control provided by:

- Interception losses⁽¹³⁾ m³
 - Rain harvesting ⁽¹⁴⁾ m³
 - Infiltration m³
 - Attenuation m³
 - Separate volume designated as long term storage⁽¹⁵⁾ m³
- 7.5 Total volume control (sum of inputs for 5.4) m³ ₍₁₇₎

8.0 Site storage volumes (full infiltration only)

- 8.1 Storage - 1 in 30 year + CCA ⁽⁸⁾ m³ m³/m² (of developed impermeable area)
- 8.2 Storage - 1 in 100 year + CCA ⁽¹¹⁾ m³ m³/m²

SuDS Water quantity and Quality – LLFA Technical Assessment Proforma

Design Inputs

Proposed site use Residential

Pollution hazard category (see C753 Table 26.2) Low and Very Low

High risk area defined as area storing fuels chemicals, refuelling area, washdown area, loading bay.

Design Outputs

List order of SuDS techniques proposed for treatment Permeable block paving (Type C no infiltration) to parking bays. Biodiverse roofs to flats Blocks A, C and lower part of B.

Note that gully pots, pipes and tanks are not accepted by Essex LLFA as a form of treatment (for justification see C753 Section 4.1, Table 26.15 and Box B.2)

Are very high pollution risk areas drained separate from SuDS to foul system No

Other

Please include any other information that is relevant to your application



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SuDS Water quantity and Quality – LLFA Technical Assessment Proforma

Notes

1. All area with the proposed application site boundary to be included.
2. The site area which is positively drained includes all green areas which drain to the SuDS system and area of surface SuDS features. It excludes large open green spaces which do not drain to the SuDS system.
3. Impermeable area should be measured pre and post development. Impermeable surfaces include, roofs, pavements, driveways and paths where runoff is conveyed to the drainage system.
4. Predevelopment use may impact on the allowable discharge rate. The LLFA will seek for reduction in flow rates to GF (Essex SuDS Design Guide).
5. Runoff may be discharge via one or more methods.
6. Sewers for Adoption 6th Edition recommends a Cv of 100% when designing drainage for impermeable area (assumes no loss of runoff from impermeable surfaces) and 0% for permeable areas. Where lower Cv's are used the applicant should justify the selection of Cv.
7. It is Essex County Council's preference that discharge rates for all events up to the 1 in 100 year event plus climate change are limited to the 1 in 1 greenfield rate. This is also considered to mitigate the increased runoff volumes that occur with the introduction of impermeable surfaces. If discharge rates are limited to a range of matched greenfield flows then it is necessary to provide additional mitigation of increased runoff volumes by the provision of Long-term Storage.
8. Storage for the 1 in 30 year must be fully contained within the SuDS components. Note that standing water within SuDS components such as ponds, basins and swales is not classified as flooding. Storage should be calculated for the critical duration rainfall event.
9. Runoff generated from rainfall events up to the 1 in 100 year will not be allowed to leave the site in an uncontrolled way. Temporary flooding of designated areas to shallow depths and velocities may be acceptable.
10. The following information should only be provided if increased runoff volumes are not mitigated by limiting all discharge rates back to the greenfield 1 in 1 year rate.
11. Climate change is specified as 40% increase to rainfall intensity, unless otherwise agreed with the LLFA / EA.
12. To be determined using the 100 year return period 6 hour duration winter rainfall event.
13. Where Source Control is provided Interception losses will occur. An allowance of 5mm rainfall depth can be subtracted from the net inflow to the storage calculation where interception losses are demonstrated. The Applicant should demonstrate use of subcatchments and source control techniques. Further information is available in the SuDS Design Guide.
14. Please refer to Rain harvesting BS for guidance on available storage.
15. Flows within long term storage areas should be infiltrated to the ground or discharged at low flow rate of maximum 2 l/s/ha.
16. Careful consideration should be used for calculations where flow control / storage is likely to be influenced by surcharged sewer or peak levels within a watercourse. Outlets can be tidally locked where discharge is direct to estuary or sea. Calculations should demonstrate that risk of downed outlet has been taken into consideration. Vortex controls require conditions of free discharge to operate as per specification.
17. In controlling the volume of runoff the total volume from mitigation measures should be greater than or equal to the additional volume generated.

Feasibility Research

EIA, **Flood Risk & Transportation**
Assessment

Urban Planning and
Design

Integrated Transport
Solutions

Infrastructure
Development

Structural Design

Eco and MMC
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