

T.R. Collier & Associates Limited

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Rochester House
275 Baddow Road
Chelmsford Essex
CM2 7QA

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DESIGN INFORMATION

Job No: 3852	Date: 18/02/2019	Sheet: 1	By: CE
Job Title: UNIT 200 Ruscote Avenue, Banbury			
Client: GRAFTONGATE DEVELOPMENTS		Architect: U.M.C. Architects	
Relevant British Standards, Codes of Practice and Design Standards: B.S. 8301 Code of Practice for Building Drainage B.S. EN 12056 Drainage to Paved Areas Environment Agency PPG3 CIRIA Technical Note 100 Design & Analysis of Urban Storm Drainage - Wallingford 1-4 B.S. EN 1433 : 2002 Drainage Channels for Vehicle Areas		Building Usage: All Pipe Design Surface Water Drainage Petrol Interceptors Attenuation Design Attenuation Design Drainage Channels	
Additional Specific Regulations: Surface Water Attenuation Design Based on F.E.H Rainfall figures			
Special Considerations: Surface Water Attenuation Design Criteria = 1 in 100 Year Storm Returns + 30% Climate Change Surface Water Discharge - 2.3 ltrs/sec (Taken from Flood Risk Assessment)			

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QUALITY ASSURANCE PROCEDURE

Rev.	Date	Checked	Pages	Rev.	Date	Checked	Pages
0	18/02/18	TRC					

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Micro Drainage Source Control 2018.1

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 1361 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	8.449	0.449	0.0	2.0	2.0	122.8	O K
30 min Summer	8.585	0.585	0.0	2.0	2.0	160.1	O K
60 min Summer	8.724	0.724	0.0	2.0	2.0	198.0	O K
120 min Summer	8.833	0.833	0.0	2.0	2.0	228.0	O K
180 min Summer	8.899	0.899	0.0	2.0	2.0	245.9	O K
240 min Summer	8.943	0.943	0.0	2.1	2.1	257.9	O K
360 min Summer	8.995	0.995	0.0	2.1	2.1	272.2	O K
480 min Summer	9.018	1.018	0.0	2.1	2.1	278.6	O K
600 min Summer	9.024	1.024	0.0	2.1	2.1	280.3	O K
720 min Summer	9.020	1.020	0.0	2.1	2.1	279.1	O K
960 min Summer	8.992	0.992	0.0	2.1	2.1	271.3	O K
1440 min Summer	8.920	0.920	0.0	2.0	2.0	251.8	O K
2160 min Summer	8.828	0.828	0.0	2.0	2.0	226.5	O K
2880 min Summer	8.755	0.755	0.0	2.0	2.0	206.6	O K
4320 min Summer	8.639	0.639	0.0	2.0	2.0	174.7	O K
5760 min Summer	8.531	0.531	0.0	2.0	2.0	145.2	O K
7200 min Summer	8.446	0.446	0.0	2.0	2.0	122.0	O K
8640 min Summer	8.383	0.383	0.0	2.0	2.0	104.8	O K
10080 min Summer	8.335	0.335	0.0	2.0	2.0	91.7	O K
15 min Winter	8.504	0.504	0.0	2.0	2.0	137.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	142.617	0.0	125.0	23
30 min Summer	93.363	0.0	161.6	38
60 min Summer	58.389	0.0	204.9	68
120 min Summer	34.403	0.0	241.3	126
180 min Summer	25.279	0.0	266.0	186
240 min Summer	20.302	0.0	284.9	246
360 min Summer	14.863	0.0	312.8	364
480 min Summer	11.861	0.0	328.2	484
600 min Summer	9.922	0.0	330.9	602
720 min Summer	8.556	0.0	330.8	722
960 min Summer	6.737	0.0	327.6	956
1440 min Summer	4.768	0.0	316.3	1174
2160 min Summer	3.348	0.0	422.8	1560
2880 min Summer	2.607	0.0	439.2	1964
4320 min Summer	1.845	0.0	466.1	2808
5760 min Summer	1.457	0.0	491.0	3584
7200 min Summer	1.231	0.0	518.3	4320
8640 min Summer	1.082	0.0	547.0	5024
10080 min Summer	0.978	0.0	576.9	5752
15 min Winter	142.617	0.0	140.0	23

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Summary of Results for 100 year Return Period (+30%)

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	8.657	0.657	0.0	2.0	2.0	179.8	O K
60 min Winter	8.814	0.814	0.0	2.0	2.0	222.6	O K
120 min Winter	8.939	0.939	0.0	2.1	2.1	256.9	O K
180 min Winter	9.015	1.015	0.0	2.1	2.1	277.8	O K
240 min Winter	9.067	1.067	0.0	2.2	2.2	292.1	O K
360 min Winter	9.132	1.132	0.0	2.2	2.2	309.6	O K
480 min Winter	9.163	1.163	0.0	2.3	2.3	318.3	O K
600 min Winter	9.176	1.176	0.0	2.3	2.3	321.7	O K
720 min Winter	9.176	1.176	0.0	2.3	2.3	321.8	O K
960 min Winter	9.155	1.155	0.0	2.3	2.3	316.0	O K
1440 min Winter	9.075	1.075	0.0	2.2	2.2	294.2	O K
2160 min Winter	8.962	0.962	0.0	2.1	2.1	263.1	O K
2880 min Winter	8.865	0.865	0.0	2.0	2.0	236.7	O K
4320 min Winter	8.701	0.701	0.0	2.0	2.0	191.9	O K
5760 min Winter	8.544	0.544	0.0	2.0	2.0	148.9	O K
7200 min Winter	8.407	0.407	0.0	2.0	2.0	111.4	O K
8640 min Winter	8.314	0.314	0.0	2.0	2.0	85.8	O K
10080 min Winter	8.245	0.245	0.0	2.0	2.0	67.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	93.363	0.0	164.2	37
60 min Winter	58.389	0.0	229.4	66
120 min Winter	34.403	0.0	270.3	124
180 min Winter	25.279	0.0	297.9	182
240 min Winter	20.302	0.0	319.1	242
360 min Winter	14.863	0.0	335.4	358
480 min Winter	11.861	0.0	337.6	474
600 min Winter	9.922	0.0	337.5	588
720 min Winter	8.556	0.0	336.6	702
960 min Winter	6.737	0.0	333.5	924
1440 min Winter	4.768	0.0	324.8	1330
2160 min Winter	3.348	0.0	473.6	1652
2880 min Winter	2.607	0.0	491.9	2112
4320 min Winter	1.845	0.0	522.1	3028
5760 min Winter	1.457	0.0	550.0	3920
7200 min Winter	1.231	0.0	580.7	4608
8640 min Winter	1.082	0.0	612.6	5272
10080 min Winter	0.978	0.0	646.1	5952

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Micro Drainage Source Control 2018.1

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 445145 241449	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.468

Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.234	4	8	0.234

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Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 8.000 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	288.0	288.0	1.300	0.0	374.4
1.200	288.0	374.4			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0068-2300-1250-2300
 Design Head (m) 1.250
 Design Flow (l/s) 2.3
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 68
 Invert Level (m) 7.950
 Minimum Outlet Pipe Diameter (mm) 100
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.250	2.3
Flush-Flo™	0.301	2.0
Kick-Flo®	0.610	1.7
Mean Flow over Head Range	-	1.9

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	1.7	1.200	2.3	3.000	3.4	7.000	5.1
0.200	2.0	1.400	2.4	3.500	3.7	7.500	5.3
0.300	2.0	1.600	2.6	4.000	3.9	8.000	5.4
0.400	2.0	1.800	2.7	4.500	4.2	8.500	5.6
0.500	1.9	2.000	2.9	5.000	4.4	9.000	5.8
0.600	1.7	2.200	3.0	5.500	4.6	9.500	5.9
0.800	1.9	2.400	3.1	6.000	4.8		
1.000	2.1	2.600	3.2	6.500	4.9		

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Micro Drainage Network 2018.1.1

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	375	DSW 2	95.730	94.575	0.780	Open Manhole	1500
1.001	o	375	PI	95.740	94.355	0.910	Open Manhole	1800
2.000	o	375	DSW 3	95.730	94.820	0.535	Open Manhole	1500
2.001	o	450	DSW 4	95.600	94.655	0.495	Open Manhole	1800
2.002	o	450	DSW 5	95.400	94.440	0.510	Open Manhole	1800
2.003	o	600	DSW 6	95.500	94.170	0.730	Open Manhole	1800
2.004	o	600	PI	95.550	93.980	0.870	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	22.000	183.3	PI	95.740	94.455	0.910	Open Manhole	1800
1.001	8.000	200.0	Tank Inlet 1	95.740	94.315	0.950	Open Manhole	0
2.000	18.000	200.0	DSW 4	95.600	94.730	0.495	Open Manhole	1800
2.001	43.000	200.0	DSW 5	95.400	94.440	0.510	Open Manhole	1800
2.002	24.000	200.0	DSW 6	95.500	94.320	0.730	Open Manhole	1800
2.003	18.000	200.0	PI	95.550	94.080	0.870	Open Manhole	1800
2.004	12.000	400.0	Ext MH	95.750	93.950	1.100	Open Manhole	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	30	Winter Storms	No
FEH Rainfall Version	2013	Cv (Summer)	0.750
Site Location	GB 505624 162321	Cv (Winter)	0.840
Data Type	Point Storm	Duration (mins)	30

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Micro Drainage Network 2018.1.1

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.409
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.700	Cv (Winter)	0.840
Margin for Flood Risk Warning (mm)	100.0	DVD Status	OFF
Analysis Timestep		Fine Inertia Status	OFF
DTS Status			ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	DSW 2	15 Winter	100	+30%	100/15 Summer				95.155
1.001	PI	15 Winter	100	+30%	30/15 Winter				94.890
2.000	DSW 3	15 Winter	100	+30%	100/15 Summer				95.472
2.001	DSW 4	15 Winter	100	+30%	100/15 Summer				95.326
2.002	DSW 5	15 Winter	100	+30%	100/15 Summer				95.125
2.003	DSW 6	15 Winter	100	+30%	100/15 Winter				94.795
2.004	PI	15 Winter	100	+30%	100/15 Summer				94.648

PN	US/MH Name	Surcharged		Flooded		Pipe		Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	
1.000	DSW 2	0.205	0.000	1.46		183.5	SURCHARGED	
1.001	PI	0.160	0.000	1.86		183.2	SURCHARGED	
2.000	DSW 3	0.277	0.000	1.27		148.2	SURCHARGED	
2.001	DSW 4	0.221	0.000	0.96		195.7	SURCHARGED	
2.002	DSW 5	0.235	0.000	1.66		314.4	SURCHARGED	
2.003	DSW 6	0.025	0.000	1.03		357.4	SURCHARGED	
2.004	PI	0.068	0.000	1.80		355.0	SURCHARGED	