

Arun Crematorium

Design Calculations

13591 - Proposed Surface Water Network

13591-CRH-XX-XX-CA-C-0007

Rev P1

Date: 08/04/22

Project No: 13591

Engineer: J. Adams

Checked: A. Higgins

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XP Solutions	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model	
Return Period (years)	100
FEH Rainfall Version	1999
Site Location GB 498000 101400 SU 98000 01400	
C (1km)	-0.026
D1 (1km)	0.390
D2 (1km)	0.244
D3 (1km)	0.410
E (1km)	0.311
F (1km)	2.320
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.414	4-8	0.160

Total Area Contributing (ha) = 0.574

Total Pipe Volume (m³) = 358.988

Network Design Table for Storm

- Indicates pipe length does not match coordinates
« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	31.570	0.450	70.2	0.073	4.00	0.0	0.600		o	225	Pipe/Conduit	
1.001	40.605	0.370	109.7	0.006	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.34	4.150	0.073	0.0	0.0	0.0	1.56	62.2	9.9
1.001	50.00	4.88	3.700	0.079	0.0	0.0	0.0	1.25	49.6	10.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.002	18.245	0.210	86.9	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	🔒
2.000	40.430	0.400	101.1	0.067	4.00	0.0	0.600		o	225	Pipe/Conduit	🔒
3.000	17.120	0.290	59.0	0.009	4.00	0.0	0.600		o	225	Pipe/Conduit	🔒
2.001	8.720	0.180	48.4	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	🔒
1.003	32.050	0.320	100.2	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	🔒
1.004	25.000#	0.200	125.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	🔒
4.000	5.500#	0.050	110.0	0.045	4.00	0.0	0.600		o	150	Pipe/Conduit	🔒
5.000	24.900	0.550	45.3	0.006	4.00	0.0		0.045 4 \=/		500	1:4 Swale	🔒
6.000	7.040	0.180	39.1	0.020	4.00	0.0	0.600		o	150	Pipe/Conduit	🔒
7.000	8.390	0.280	30.0	0.018	4.00	0.0	0.600		o	150	Pipe/Conduit	🔒
5.001	38.945	0.330	118.0	0.000	0.00	0.0		0.045 4 \=/		500	1:4 Swale	🔒
8.000	7.220	0.100	72.2	0.027	4.00	0.0	0.600		o	150	Pipe/Conduit	🔒
9.000	8.270	0.100	82.7	0.025	4.00	0.0	0.600		o	150	Pipe/Conduit	🔒
5.002	25.500	0.200	127.5	0.021	0.00	0.0	0.600		o	225	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.002	50.00	5.10	3.330	0.079	0.0	0.0	0.0	1.40	55.8	10.7
2.000	50.00	4.52	3.700	0.067	0.0	0.0	0.0	1.30	51.7	9.1
3.000	50.00	4.17	3.590	0.009	0.0	0.0	0.0	1.71	67.8	1.2
2.001	50.00	4.60	3.300	0.076	0.0	0.0	0.0	1.88	74.9	10.3
1.003	50.00	5.50	3.120	0.155	0.0	0.0	0.0	1.31	51.9	21.0
1.004	50.00	5.86	2.800	0.155	0.0	0.0	0.0	1.17	46.4	21.0
4.000	50.00	4.10	3.550	0.045	0.0	0.0	0.0	0.96	16.9	6.1
5.000	50.00	4.60	3.800	0.006	0.0	0.0	0.0	0.69	113.5	0.8
6.000	50.00	4.07	3.500	0.020	0.0	0.0	0.0	1.61	28.5	2.7
7.000	50.00	4.08	3.600	0.018	0.0	0.0	0.0	1.85	32.6	2.4
5.001	50.00	6.13	3.250	0.044	0.0	0.0	0.0	0.43	70.3	6.0
8.000	50.00	4.10	3.100	0.027	0.0	0.0	0.0	1.18	20.9	3.7
9.000	50.00	4.12	3.100	0.025	0.0	0.0	0.0	1.11	19.5	3.4
5.002	50.00	6.50	2.920	0.117	0.0	0.0	0.0	1.16	46.0	15.8

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XP Solutions	Network 2020.1	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
10.000	8.660	0.800	10.8	0.006	4.00	0.0	0.600		o	150	Pipe/Conduit	
5.003	2.000#	0.120	16.7	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
11.000	7.000#	0.150	46.7	0.018	4.00	0.0	0.600		o	150	Pipe/Conduit	
12.000	7.000#	0.050	140.0	0.052	4.00	0.0	0.600		o	150	Pipe/Conduit	
13.000	10.260	0.130	78.9	0.025	4.00	0.0	0.600		o	150	Pipe/Conduit	
13.001	6.320	0.020	316.0	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
13.002	14.190	0.150	94.6	0.012	0.00	0.0		0.045	4 \=/	500	1:4 Swale	
14.000	7.735	0.100	77.4	0.020	4.00	0.0	0.600		o	150	Pipe/Conduit	
13.003	24.460	0.250	97.8	0.000	0.00	0.0		0.045	4 \=/	500	1:4 Swale	
15.000	19.620	0.200	98.1	0.053	4.00	0.0	0.600		o	225	Pipe/Conduit	
15.001	20.520	0.200	102.6	0.011	0.00	0.0	0.600		o	225	Pipe/Conduit	
15.002	8.180	0.250	32.7	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
13.004	14.690	0.335	43.9	0.000	0.00	0.0		0.045	4 \=/	225	1:4 Swale	
16.000	7.765	0.150	51.8	0.030	4.00	0.0	0.600		o	150	Pipe/Conduit	
13.005	27.400#	0.320	85.6	0.030	0.00	0.0	0.600		o	225	Pipe/Conduit	
1.005	6.395	0.600	10.7	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
10.000	50.00	4.05	3.600	0.006	0.0	0.0	0.0	3.08	54.4	0.8
5.003	50.00	6.51	2.720	0.123	0.0	0.0	0.0	3.22	128.1	16.7
11.000	50.00	4.08	3.600	0.018	0.0	0.0	0.0	1.48	26.1	2.4
12.000	50.00	4.14	2.900	0.052	0.0	0.0	0.0	0.85	15.0	7.0
13.000	50.00	4.15	3.800	0.025	0.0	0.0	0.0	1.13	20.0	3.4
13.001	50.00	4.34	3.670	0.025	0.0	0.0	0.0	0.56	9.9	3.4
13.002	50.00	4.84	3.650	0.037	0.0	0.0	0.0	0.48	78.5	5.0
14.000	50.00	4.11	3.600	0.020	0.0	0.0	0.0	1.14	20.2	2.7
13.003	50.00	5.71	3.500	0.057	0.0	0.0	0.0	0.47	77.2	7.7
15.000	50.00	4.25	3.900	0.053	0.0	0.0	0.0	1.32	52.5	7.2
15.001	50.00	4.51	3.700	0.064	0.0	0.0	0.0	1.29	51.3	8.7
15.002	50.00	4.57	3.500	0.064	0.0	0.0	0.0	2.30	91.3	8.7
13.004	50.00	6.09	3.250	0.121	0.0	0.0	0.0	0.65	80.1	16.4
16.000	50.00	4.09	3.150	0.030	0.0	0.0	0.0	1.40	24.8	4.1
13.005	50.00	6.41	2.920	0.181	0.0	0.0	0.0	1.41	56.2	24.5
1.005	50.00	6.54	2.600	0.574	0.0	0.0	0.0	3.10	54.9«	77.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.006	5.370	0.500	10.7	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.006	50.00	6.57	2.000	0.574	0.0	0.0	0.0	3.09	54.6«	77.7

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.073	0.073	0.073
1.001	-	-	100	0.006	0.006	0.006
1.002	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.067	0.067	0.067
3.000	-	-	100	0.009	0.009	0.009
2.001	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.045	0.045	0.045
5.000	-	-	100	0.006	0.006	0.006
6.000	-	-	100	0.020	0.020	0.020
7.000	-	-	100	0.018	0.018	0.018
5.001	-	-	100	0.000	0.000	0.000
8.000	-	-	100	0.027	0.027	0.027
9.000	-	-	100	0.025	0.025	0.025
5.002	-	-	100	0.021	0.021	0.021
10.000	-	-	100	0.006	0.006	0.006
5.003	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.018	0.018	0.018
12.000	-	-	100	0.052	0.052	0.052
13.000	-	-	100	0.025	0.025	0.025
13.001	-	-	100	0.000	0.000	0.000
13.002	-	-	100	0.012	0.012	0.012
14.000	-	-	100	0.020	0.020	0.020
13.003	-	-	100	0.000	0.000	0.000
15.000	-	-	100	0.053	0.053	0.053
15.001	-	-	100	0.011	0.011	0.011
15.002	-	-	100	0.000	0.000	0.000
13.004	-	-	100	0.000	0.000	0.000
16.000	-	-	100	0.030	0.030	0.030
13.005	-	-	100	0.030	0.030	0.030
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.574	0.574	0.574

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.006 Outfall	4.000	1.500	0.000	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 9 Number of Real Time Controls 0

Synthetic Rainfall Details

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Synthetic Rainfall Details

Rainfall Model	FEH	E (1km)	0.311
Return Period (years)	100	F (1km)	2.320
FEH Rainfall Version	1999	Summer Storms	Yes
Site Location	GB 498000 101400 SU 98000 01400	Winter Storms	No
C (1km)	-0.026	Cv (Summer)	0.750
D1 (1km)	0.390	Cv (Winter)	0.840
D2 (1km)	0.244	Storm Duration (mins)	30
D3 (1km)	0.410		

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Online Controls for Storm

Complex Manhole: Gabion HW, DS/PN: 1.005, Volume (m³): 2.9

Orifice

Diameter (m) 0.001 Discharge Coefficient 0.600 Invert Level (m) 2.600

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0074-2000-0500-2000
Design Head (m)	0.500
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	74
Invert Level (m)	3.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	2.0	Kick-Flo®	0.342	1.7
Flush-Flo™	0.149	2.0	Mean Flow over Head Range	-	1.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.9	0.800	2.5	2.000	3.8	4.000	5.2	7.000	6.8
0.200	2.0	1.000	2.7	2.200	3.9	4.500	5.5	7.500	7.1
0.300	1.8	1.200	3.0	2.400	4.1	5.000	5.8	8.000	7.3
0.400	1.8	1.400	3.2	2.600	4.3	5.500	6.1	8.500	7.5
0.500	2.0	1.600	3.4	3.000	4.6	6.000	6.3	9.000	7.8
0.600	2.2	1.800	3.6	3.500	4.9	6.500	6.6	9.500	8.0

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Storage Structures for Storm

Porous Car Park Manhole: RE5, DS/PN: 6.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	33.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.500	Membrane Depth (mm)	150

Porous Car Park Manhole: RE2, DS/PN: 7.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	33.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.600	Membrane Depth (mm)	150

Porous Car Park Manhole: RE6, DS/PN: 8.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	15.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	41.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.100	Membrane Depth (mm)	150

Porous Car Park Manhole: RE3, DS/PN: 9.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	15.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	41.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.100	Membrane Depth (mm)	150

Porous Car Park Manhole: RE1, DS/PN: 11.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.5
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	29.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.600	Membrane Depth (mm)	150

Porous Car Park Manhole: SW15, DS/PN: 12.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	24.5
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	68.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	2.900	Membrane Depth (mm)	150

Porous Car Park Manhole: RE7, DS/PN: 14.000

Infiltration Coefficient Base (m/hr)	0.00000	Max Percolation (l/s)	31.9
Membrane Percolation (mm/hr)	1000	Safety Factor	2.0

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Porous Car Park Manhole: RE7, DS/PN: 14.000

Porosity	0.30	Slope (1:X)	0.0
Invert Level (m)	3.600	Depression Storage (mm)	0
Width (m)	11.5	Evaporation (mm/day)	0
Length (m)	10.0	Membrane Depth (mm)	150

Porous Car Park Manhole: RE8, DS/PN: 16.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	18.5
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	51.4	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	3.150	Membrane Depth (mm)	150

Tank or Pond Manhole: Gabion HW, DS/PN: 1.005

Invert Level (m) 3.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1400.0	0.500	1680.0

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2 year Return Period 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 * 10m³/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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 9 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 498000 101400 SU 98000 01400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

						Water	Surcharged	Flooded			
	US/MH					Level	Depth	Volume	Overflow	Maximum	Discharge
PN	Name	Event				(m)	(m)	(m³)	(l/s)	Vol (m³)	Vol (m³)
1.000	SW1	15 minute	2 year	Winter	I+0%	4.223	-0.152	0.000		0.019	5.822
1.001	SW2	15 minute	2 year	Winter	I+0%	3.784	-0.141	0.000		0.061	6.312
1.002	SW3	15 minute	2 year	Winter	I+0%	3.411	-0.144	0.000		0.080	6.330
2.000	SW18	15 minute	2 year	Winter	I+0%	3.776	-0.149	0.000		0.020	5.342
3.000	SW20	15 minute	2 year	Winter	I+0%	3.615	-0.200	0.000		0.006	0.718
2.001	SW19	15 minute	2 year	Winter	I+0%	3.373	-0.152	0.000		0.096	6.077
1.003	SW4	15 minute	2 year	Winter	I+0%	3.241	-0.104	0.000		0.183	12.439
1.004	SW5	15 minute	2 year	Winter	I+0%	3.087	0.062	0.000		0.743	11.992
4.000	SW14	15 minute	2 year	Summer	I+0%	3.633	-0.067	0.000		0.022	3.203
5.000	Gabion HW	15 minute	2 year	Winter	I+0%	3.809	-0.691	0.000		0.001	0.479
6.000	RE5	30 minute	2 year	Winter	I+0%	3.526	-0.124	0.000		0.957	1.958
7.000	RE2	30 minute	2 year	Winter	I+0%	3.623	-0.127	0.000		0.840	1.790
5.001	SW6	15 minute	2 year	Winter	I+0%	3.284	-0.686	0.000		0.016	3.425
8.000	RE6	30 minute	2 year	Winter	I+0%	3.133	-0.117	0.000		1.507	2.423
9.000	RE3	30 minute	2 year	Winter	I+0%	3.132	-0.118	0.000		1.446	2.200
5.002	SW7	1440 minute	2 year	Winter	I+0%	3.083	-0.062	0.000		1.691	39.553
10.000	RE4	15 minute	2 year	Winter	I+0%	3.615	-0.135	0.000		0.003	0.479
5.003	SW8	1440 minute	2 year	Winter	I+0%	3.082	0.137	0.000		1.060	40.502
11.000	RE1	30 minute	2 year	Winter	I+0%	3.627	-0.123	0.000		0.842	1.774
12.000	SW15	1440 minute	2 year	Winter	I+0%	3.082	0.032	0.000		13.445	8.056
13.000	SW16	15 minute	2 year	Winter	I+0%	3.851	-0.099	0.000		0.013	1.995
13.001	SW17	15 minute	2 year	Summer	I+0%	3.751	-0.069	0.000		0.053	1.783
13.002	Swale	15 minute	2 year	Winter	I+0%	3.691	-0.809	0.000		0.031	2.962
14.000	RE7	30 minute	2 year	Winter	I+0%	3.630	-0.120	0.000		1.052	1.873
13.003	SW9	15 minute	2 year	Winter	I+0%	3.544	-0.606	0.000		0.164	4.431
15.000	SW11	15 minute	2 year	Winter	I+0%	3.969	-0.156	0.000		0.018	4.227
15.001	SW12	15 minute	2 year	Winter	I+0%	3.775	-0.150	0.000		0.067	5.110
15.002	SW13	15 minute	2 year	Winter	I+0%	3.560	-0.165	0.000		0.055	5.124
13.004	Swale	15 minute	2 year	Winter	I+0%	3.326	-1.174	0.000		0.297	9.573
16.000	RE8	30 minute	2 year	Winter	I+0%	3.181	-0.119	0.000		1.739	2.643

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	SW1		13.3	OK
1.001	SW2		13.7	OK
1.002	SW3		13.9	OK
2.000	SW18		12.1	OK
3.000	SW20		1.6	OK
2.001	SW19		13.6	OK
1.003	SW4		27.2	OK
1.004	SW5		26.6	SURCHARGED
4.000	SW14		8.2	OK
5.000	Gabion HW		1.1	OK
6.000	RE5	17	1.8	OK
7.000	RE2	17	1.6	OK
5.001	SW6		3.9	OK
8.000	RE6	20	2.0	OK
9.000	RE3	20	1.7	OK
5.002	SW7		1.1	OK
10.000	RE4		1.1	OK
5.003	SW8		1.1	SURCHARGED
11.000	RE1	17	1.6	OK
12.000	SW15		0.3	FLOOD RISK
13.000	SW16		4.6	OK
13.001	SW17		4.6	OK
13.002	Swale		6.3	OK
14.000	RE7	18	1.6	OK
13.003	SW9		7.3	OK
15.000	SW11		9.7	OK
15.001	SW12		11.2	OK
15.002	SW13		11.1	OK
13.004	Swale		18.3	OK
16.000	RE8	20	2.1	OK

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

							Water	Surcharged	Flooded			
	US/MH						Level	Depth	Volume	Overflow	Maximum	Discharge
PN	Name	Event					(m)	(m)	(m³)	(l/s)	Vol (m³)	Vol (m³)
13.005	SW10	1440 minute	2 year	Winter	I+0%		3.083	-0.062	0.000		0.482	61.988
1.005	Gabion HW	1440 minute	2 year	Winter	I+0%		3.082	0.332	0.000		118.673	143.210
1.006	SW20	1440 minute	2 year	Winter	I+0%		2.019	-0.131	0.000		0.017	143.155

PN	US/MH Name	Half Drain Pipe		Status
		Time (mins)	Flow (l/s)	
13.005	SW10		1.8	OK
1.005	Gabion HW		1.7	SURCHARGED
1.006	SW20		1.7	OK

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30 year Return Period 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 * 10m³/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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 9 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 498000 101400 SU 98000 01400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

							Water	Surcharged	Flooded			
	US/MH						Level	Depth	Volume	Overflow	Maximum	Discharge
PN	Name	Event					(m)	(m)	(m³)	(l/s)	Vol (m³)	Vol (m³)
1.000	SW1	15 minute	30 year	Winter	I+0%	4.260	-0.115	0.000			0.030	12.304
1.001	SW2	15 minute	30 year	Winter	I+0%	3.832	-0.093	0.000			0.137	13.315
1.002	SW3	15 minute	30 year	Winter	I+0%	3.598	0.043	0.000			0.723	13.315
2.000	SW18	15 minute	30 year	Winter	I+0%	3.816	-0.109	0.000			0.031	11.293
3.000	SW20	15 minute	30 year	Winter	I+0%	3.625	-0.190	0.000			0.008	1.517
2.001	SW19	15 minute	30 year	Winter	I+0%	3.572	0.047	0.000			1.039	12.810
1.003	SW4	15 minute	30 year	Winter	I+0%	3.547	0.202	0.000			1.140	26.125
1.004	SW5	15 minute	30 year	Winter	I+0%	3.260	0.235	0.000			1.297	25.526
4.000	SW14	15 minute	30 year	Summer	I+0%	3.722	0.022	0.000			0.047	6.772
5.000	Gabion HW	15 minute	30 year	Winter	I+0%	3.819	-0.681	0.000			0.004	1.012
6.000	RE5	15 minute	30 year	Winter	I+0%	3.546	-0.104	0.000			1.666	3.306
7.000	RE2	15 minute	30 year	Winter	I+0%	3.641	-0.109	0.000			1.469	2.997
5.001	SW6	15 minute	30 year	Winter	I+0%	3.310	-0.660	0.000			0.030	7.331
8.000	RE6	30 minute	30 year	Winter	I+0%	3.158	-0.092	0.000			2.607	5.636
9.000	RE3	30 minute	30 year	Winter	I+0%	3.156	-0.094	0.000			2.520	5.166
5.002	SW7	960 minute	30 year	Winter	I+0%	3.144	-0.001	0.000			3.447	59.972
10.000	RE4	15 minute	30 year	Winter	I+0%	3.621	-0.129	0.000			0.005	1.012
5.003	SW8	960 minute	30 year	Winter	I+0%	3.143	0.198	0.000			1.153	62.083
11.000	RE1	15 minute	30 year	Winter	I+0%	3.646	-0.104	0.000			1.469	2.984
12.000	SW15	960 minute	30 year	Winter	I+0%	3.143	0.093	0.000			17.963	13.952
13.000	SW16	15 minute	30 year	Winter	I+0%	3.879	-0.071	0.000			0.021	4.214
13.001	SW17	15 minute	30 year	Summer	I+0%	3.822	0.002	0.000			0.132	3.763
13.002	Swale	15 minute	30 year	Winter	I+0%	3.715	-0.785	0.000			0.052	6.236
14.000	RE7	15 minute	30 year	Winter	I+0%	3.652	-0.098	0.000			1.806	3.235
13.003	SW9	15 minute	30 year	Winter	I+0%	3.571	-0.579	0.000			0.272	9.479
15.000	SW11	15 minute	30 year	Winter	I+0%	4.003	-0.122	0.000			0.028	8.933
15.001	SW12	15 minute	30 year	Winter	I+0%	3.817	-0.108	0.000			0.131	10.787
15.002	SW13	15 minute	30 year	Winter	I+0%	3.592	-0.133	0.000			0.087	10.787
13.004	Swale	15 minute	30 year	Winter	I+0%	3.362	-1.138	0.000			0.542	20.259
16.000	RE8	15 minute	30 year	Winter	I+0%	3.224	-0.076	0.000			4.153	4.670

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Half Drain Pipe		Status
		Time (mins)	Flow (l/s)	
1.000	SW1		28.1	OK
1.001	SW2		29.5	OK
1.002	SW3		25.5	SURCHARGED
2.000	SW18		25.6	OK
3.000	SW20		3.5	OK
2.001	SW19		24.5	SURCHARGED
1.003	SW4		46.5	SURCHARGED
1.004	SW5		46.2	SURCHARGED
4.000	SW14		17.4	SURCHARGED
5.000	Gabion HW		2.3	OK
6.000	RE5	10	5.0	OK
7.000	RE2	10	4.6	OK
5.001	SW6		11.0	OK
8.000	RE6	15	5.6	OK
9.000	RE3	16	5.0	OK
5.002	SW7		2.5	OK
10.000	RE4		2.3	OK
5.003	SW8		2.6	SURCHARGED
11.000	RE1	10	4.6	OK
12.000	SW15		0.6	FLOOD RISK
13.000	SW16		9.7	OK
13.001	SW17		9.7	SURCHARGED
13.002	Swale		14.3	OK
14.000	RE7	10	4.5	OK
13.003	SW9		17.4	OK
15.000	SW11		20.5	OK
15.001	SW12		24.5	OK
15.002	SW13		24.3	OK
13.004	Swale		41.8	OK
16.000	RE8	9	9.2	OK

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Event	Water Surcharged			Flooded Volume (m³)	Overflow (l/s)	Maximum Vol (m³)	Discharge Vol (m³)
			Level (m)	Depth (m)	Level (m)				
13.005	SW10	15 minute 30 year Winter I+0%	3.245	0.100	0.000			2.746	29.660
1.005	Gabion HW	960 minute 30 year Winter I+0%	3.143	0.393	0.000			208.065	176.035
1.006	SW20	960 minute 30 year Winter I+0%	2.020	-0.130	0.000			0.018	175.963

PN	US/MH Name	Half Drain		Pipe Flow (l/s)	Status
		Time (mins)	Time (mins)		
13.005	SW10			43.2	SURCHARGED
1.005	Gabion HW			2.0	SURCHARGED
1.006	SW20			2.0	OK

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100 year Return Period 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 * 10m³/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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 9 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Catchment
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 498000 101400 SU 98000 01400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

							Water	Surcharged	Flooded			
	US/MH						Level	Depth	Volume	Overflow	Maximum	Discharge
PN	Name	Event					(m)	(m)	(m³)	(l/s)	Vol (m³)	Vol (m³)
1.000	SW1	15 minute	100 year	Winter	I+40%	4.695	0.320	0.000			0.153	21.622
1.001	SW2	15 minute	100 year	Winter	I+40%	4.500	0.575	0.380			1.834	23.406
1.002	SW3	15 minute	100 year	Winter	I+40%	4.327	0.772	0.000			1.871	23.406
2.000	SW18	15 minute	100 year	Winter	I+40%	4.496	0.571	0.000			0.224	19.850
3.000	SW20	15 minute	100 year	Winter	I+40%	4.309	0.494	0.000			0.202	2.668
2.001	SW19	15 minute	100 year	Winter	I+40%	4.300	0.775	0.000			2.522	22.518
1.003	SW4	15 minute	100 year	Winter	I+40%	4.230	0.885	0.000			1.337	45.927
1.004	SW5	15 minute	100 year	Winter	I+40%	3.571	0.546	0.000			1.467	45.135
4.000	SW14	15 minute	100 year	Winter	I+40%	3.883	0.183	0.000			0.093	13.336
5.000	Gabion HW	15 minute	100 year	Winter	I+40%	3.826	-0.674	0.000			0.006	1.779
6.000		RE5	15 minute	100 year	Winter	I+40%	3.568	-0.082	0.000		2.478	5.850
7.000		RE2	15 minute	100 year	Winter	I+40%	3.660	-0.090	0.000		2.169	5.289
5.001		SW6	15 minute	100 year	Winter	I+40%	3.334	-0.636	0.000		0.044	12.926
8.000	RE6	960 minute	100 year	Winter	I+40%	3.262	0.012	0.000			7.315	19.916
9.000	RE3	960 minute	100 year	Winter	I+40%	3.262	0.012	0.000			7.315	18.115
5.002	SW7	960 minute	100 year	Winter	I+40%	3.261	0.116	0.000			9.889	90.826
10.000	RE4	15 minute	100 year	Winter	I+40%	3.629	-0.121	0.000			0.007	1.779
5.003	SW8	960 minute	100 year	Winter	I+40%	3.260	0.315	0.000			1.209	95.070
11.000	RE1	15 minute	100 year	Winter	I+40%	3.668	-0.082	0.000			2.173	5.275
12.000	SW15	960 minute	100 year	Winter	I+40%	3.261	0.211	0.000			22.151	24.298
13.000	SW16	15 minute	100 year	Winter	I+40%	3.993	0.043	0.000			0.053	7.409
13.001	SW17	15 minute	100 year	Winter	I+40%	3.875	0.055	0.000			0.203	7.409
13.002	Swale	15 minute	100 year	Winter	I+40%	3.736	-0.764	0.000			0.070	10.965
14.000	RE7	15 minute	100 year	Winter	I+40%	3.679	-0.071	0.000			2.732	5.773
13.003	SW9	15 minute	100 year	Winter	I+40%	3.595	-0.555	0.000			0.375	16.737
15.000	SW11	15 minute	100 year	Winter	I+40%	4.047	-0.078	0.000			0.040	15.707
15.001	SW12	15 minute	100 year	Winter	I+40%	3.871	-0.054	0.000			0.290	18.967
15.002	SW13	15 minute	100 year	Winter	I+40%	3.628	-0.097	0.000			0.170	18.967
13.004	Swale	15 minute	100 year	Winter	I+40%	3.419	-1.081	0.000			1.513	35.699
16.000	RE8	30 minute	100 year	Winter	I+40%	3.367	0.067	0.000			12.099	11.206

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	SW1		46.0	FLOOD RISK
1.001	SW2		40.5	FLOOD
1.002	SW3		35.0	FLOOD RISK
2.000	SW18		39.3	FLOOD RISK
3.000	SW20		5.3	SURCHARGED
2.001	SW19		36.5	SURCHARGED
1.003	SW4		70.0	FLOOD RISK
1.004	SW5		69.3	SURCHARGED
4.000	SW14		30.5	SURCHARGED
5.000	Gabion HW		4.1	OK
6.000	RE5	8	10.2	OK
7.000	RE2	8	9.3	OK
5.001	SW6		22.4	OK
8.000	RE6		0.8	FLOOD RISK
9.000	RE3		0.7	FLOOD RISK
5.002	SW7		3.5	SURCHARGED
10.000	RE4		4.1	OK
5.003	SW8		3.7	SURCHARGED
11.000	RE1	8	9.3	OK
12.000	SW15		1.5	FLOOD RISK
13.000	SW16		16.9	SURCHARGED
13.001	SW17		16.8	SURCHARGED
13.002	Swale		24.8	OK
14.000	RE7	9	9.3	OK
13.003	SW9		32.6	OK
15.000	SW11		36.0	OK
15.001	SW12		43.1	OK
15.002	SW13		42.6	OK
13.004	Swale		70.1	OK
16.000	RE8	11	15.1	FLOOD RISK

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Raven House 29 Linkfield Lane Surrey RH1 1SS	13591-Arun Crem Proposed SW Network Rev P1	
Date 08/04/2022	Designed by JA	
File 13591-CRH-XX-XX-CA-C-0007-P1_F...	Checked by AJH	
XP Solutions		Network 2020.1

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Event	Water	Surcharged	Flooded	Overflow (l/s)	Maximum Vol (m ³)	Discharge Vol (m ³)
			Level (m)	Depth (m)	Volume (m ³)			
13.005	SW10	15 minute 100 year Winter I+40%	3.407	0.262	0.000		7.629	52.356
1.005	Gabion HW	960 minute 100 year Winter I+40%	3.260	0.510	0.000		384.821	186.174
1.006	SW20	60 minute 100 year Summer I+40%	2.020	-0.130	0.000		0.018	10.506

PN	US/MH Name	Half Drain	Pipe	Status
		Time (mins)	Flow (l/s)	
13.005	SW10		55.6	SURCHARGED
1.005	Gabion HW		2.0	SURCHARGED
1.006	SW20		2.0	OK