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Bessemer Road Welwyn Garden City Hertfordshire AL7 1HE	Havant Catchment C and D	
Date 06/08/2021 File SW Network 2 (updated).MDX	Designed by sudeep.chongbang Checked by	
XP Solutions	Network 2017.1.2	

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)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.004	17.311	0.042	412.2	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.000	24.873	0.102	243.9	0.026	4.00	0.0	0.600	o	300	Pipe/Conduit	
4.000	20.015	0.200	100.1	0.121	4.00	0.0	0.600	o	150	Pipe/Conduit	
3.001	26.365	0.108	244.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.000	5.013	0.033	151.9	0.058	4.00	0.0	0.600	o	300	Pipe/Conduit	
5.001	20.238	0.215	94.1	0.058	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.002	28.553	0.117	244.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
6.000	19.387	0.396	49.0	0.113	4.00	0.0	0.600	o	150	Pipe/Conduit	
7.000	9.830	0.914	10.8	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	
3.003	4.900	0.020	245.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.000	18.199	0.332	54.8	0.239	4.00	0.0	0.600	o	225	Pipe/Conduit	
8.001	25.657	0.105	244.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	6.215	0.015	414.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.006	19.353	0.050	387.1	0.000	0.00	0.0	0.600	o	450	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)
1.004	39.79	6.92	13.080	1.197	0.0	0.0	0.0	1.00	158.3	128.9
3.000	50.00	4.41	13.013	0.026	0.0	0.0	0.0	1.00	70.9	3.6
4.000	50.00	4.33	13.261	0.121	0.0	0.0	0.0	1.00	17.7	16.4
3.001	48.57	4.85	12.911	0.147	0.0	0.0	0.0	1.00	70.8	19.4
5.000	50.00	4.07	13.051	0.058	0.0	0.0	0.0	1.27	90.0	7.8
5.001	50.00	4.27	13.018	0.115	0.0	0.0	0.0	1.62	114.6	15.6
3.002	46.08	5.33	12.803	0.263	0.0	0.0	0.0	1.00	70.8	32.8
6.000	50.00	4.22	13.232	0.113	0.0	0.0	0.0	1.44	25.5	15.2
7.000	50.00	4.05	13.750	0.000	0.0	0.0	0.0	3.09	54.6	0.0
3.003	45.69	5.41	12.686	0.375	0.0	0.0	0.0	1.00	70.7	46.4
8.000	50.00	4.17	13.103	0.239	0.0	0.0	0.0	1.77	70.4	32.3
8.001	49.54	4.69	12.771	0.239	0.0	0.0	0.0	0.83	33.1	32.3
1.005	39.45	7.02	12.655	1.810	0.0	0.0	0.0	0.99	157.8	193.4
1.006	38.49	7.33	12.640	1.810	0.0	0.0	0.0	1.03	163.4	193.4

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S24	15.439	1.639	Open Manhole	1350	1.000	13.800	375				
S25	15.439	1.815	Open Manhole	1350	1.001	13.624	375	1.000	13.624	375	
S26	15.439	1.999	Open Manhole	1350	1.002	13.440	375	1.001	13.440	375	
S27	15.428	2.155	Open Manhole	1350	1.003	13.273	375	1.002	13.273	375	
S30	15.390	1.575	Open Manhole	1350	2.000	13.815	375				
S31	15.390	1.821	Open Manhole	1350	2.001	13.569	375	2.000	13.569	375	
S32	15.382	1.985	Open Manhole	1350	2.002	13.397	375	2.001	13.397	375	
S33	15.349	2.069	Open Manhole	1350	2.003	13.280	375	2.002	13.280	375	
S28	15.265	2.185	Open Manhole	1350	1.004	13.080	450	1.003	13.080	375	
								2.003	13.107	375	
PPIC1	14.917	1.904	Open Manhole	1200	3.000	13.013	300				
PPIC8	14.467	1.206	Open Manhole	1200	4.000	13.261	150				
PPIC2	14.961	2.050	Open Manhole	1200	3.001	12.911	300	3.000	12.911	300	
								4.000	13.061	150	
S34	14.551	1.500	Open Manhole	1200	5.000	13.051	300				
PPIC4	14.496	1.478	Open Manhole	1200	5.001	13.018	300	5.000	13.018	300	
PPIC3	14.989	2.186	Open Manhole	1200	3.002	12.803	300	3.001	12.803	300	
								5.001	12.803	300	
PPIC15	14.582	1.350	Open Manhole	1200	6.000	13.232	150				
PPIC16	15.300	1.550	Open Manhole	1200	7.000	13.750	150				
PPIC17	15.018	2.332	Open Manhole	1200	3.003	12.686	300	3.002	12.686	300	
								6.000	12.836	150	
								7.000	12.836	150	
PPIC11	14.622	1.519	Open Manhole	1200	8.000	13.103	225				
PPIC12	14.993	2.222	Open Manhole	1200	8.001	12.771	225	8.000	12.771	225	
TANK	15.036	2.381	Open Manhole	1350	1.005	12.655	450	1.004	13.038	450	383
								3.003	12.666	300	
								8.001	12.666	225	
S29	14.900	2.260	Open Manhole	1350	1.006	12.640	450	1.005	12.640	450	
	13.730	1.140	Open Manhole	1500		OUTFALL		1.006	12.590	450	

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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	User	-	100	0.075	0.075	0.075
1.001	User	-	100	0.159	0.159	0.159
1.002	User	-	100	0.189	0.189	0.189
1.003	User	-	100	0.158	0.158	0.158
2.000	User	-	100	0.076	0.076	0.076
2.001	User	-	100	0.160	0.160	0.160
2.002	User	-	100	0.187	0.187	0.187
2.003	User	-	100	0.158	0.158	0.158
	User	-	100	0.033	0.033	0.192
1.004	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.026	0.026	0.026
4.000	-	-	100	0.121	0.121	0.121
3.001	-	-	100	0.000	0.000	0.000
5.000	User	-	100	0.052	0.052	0.052
	User	-	100	0.006	0.006	0.058
5.001	User	-	100	0.058	0.058	0.058
3.002	-	-	100	0.000	0.000	0.000
6.000	User	-	100	0.113	0.113	0.113
7.000	-	-	100	0.000	0.000	0.000
3.003	-	-	100	0.000	0.000	0.000
8.000	User	-	100	0.109	0.109	0.109
	User	-	100	0.130	0.130	0.239
8.001	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.810	1.810	1.810

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)
1.006		13.730	12.590	12.590	1500	0

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 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.387
Return Period (years)	2	E (1km)	0.310
FEH Rainfall Version	1999	F (1km)	2.252
Site Location	GB 472400 107400 SU 72400 07400	Summer Storms	Yes
C (1km)	-0.029	Winter Storms	Yes
D1 (1km)	0.457	Cv (Summer)	0.750
D2 (1km)	0.295	Cv (Winter)	0.840

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Synthetic Rainfall Details

Storm Duration (mins) 30

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S29, DS/PN: 1.006, Volume (m³): 4.0

Unit Reference	MD-SHE-0435-1400-2500-1400
Design Head (m)	2.500
Design Flow (l/s)	140.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	435
Invert Level (m)	12.640
Minimum Outlet Pipe Diameter (mm)	450
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.500	140.0	Kick-Flo®	1.730	117.0
Flush-Flo™	0.801	140.0	Mean Flow over Head Range	-	119.1

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	11.6	0.800	140.0	2.000	125.6	4.000	176.1	7.000	231.5
0.200	42.0	1.000	138.9	2.200	131.6	4.500	186.5	7.500	239.5
0.300	82.8	1.200	136.4	2.400	137.2	5.000	196.4	8.000	247.2
0.400	122.0	1.400	132.7	2.600	142.7	5.500	205.7	8.500	254.7
0.500	134.8	1.600	125.5	3.000	153.0	6.000	214.7	9.000	261.9
0.600	138.0	1.800	119.3	3.500	165.0	6.500	223.3	9.500	269.0