

7 Museum Street  
Ipswich  
Suffolk IP1 1HQ

IA21/085 HILL HOUSE LANE  
NEEDHAM MARKET  
ADOPTABLE DRAINAGE CALCULATION



Date 01/06/2021

Designed by JBB

File IA21-085-SITE 3D REV D NEW.MDX

Checked by

Micro Drainage

Network 2020.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.900	Add Flow / Climate Change (%)	0
Ratio R	0.411	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Surface Network 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.647	4-8	0.305

Total Area Contributing (ha) = 0.952

Total Pipe Volume (m³) = 22.859

Network Design Table for Surface Network 1

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
1.000	67.020	1.489	45.0	0.074	5.00	0.0	0.600	o	150	Pipe/Conduit		
1.001	9.645	0.281	34.3	0.011	0.00	0.0	0.600	o	225	Pipe/Conduit		
1.002	10.990	0.220	50.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
1.003	29.948	0.330	90.8	0.048	0.00	0.0	0.600	o	225	Pipe/Conduit		
1.004	16.570	0.260	63.7	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit		
1.005	14.994	0.375	40.0	0.043	0.00	0.0	0.600	o	225	Pipe/Conduit		
2.000	16.693	0.572	29.2	0.048	5.00	0.0	0.600	o	150	Pipe/Conduit		
2.001	9.512	0.371	25.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit		
2.002	10.789	0.392	27.5	0.006	0.00	0.0	0.600	o	150	Pipe/Conduit		
2.003	19.363	0.553	35.0	0.014	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)
1.000	50.00	5.74	34.524	0.074	0.0	0.0	0.0	1.50	26.6	10.0
1.001	50.00	5.81	32.960	0.085	0.0	0.0	0.0	2.24	89.1	11.6
1.002	50.00	5.91	32.679	0.085	0.0	0.0	0.0	1.86	73.8	11.6
1.003	50.00	6.28	32.459	0.134	0.0	0.0	0.0	1.37	54.6	18.1
1.004	50.00	6.44	32.129	0.152	0.0	0.0	0.0	1.64	65.2	20.6
1.005	50.00	6.57	31.869	0.195	0.0	0.0	0.0	2.07	82.5	26.4
2.000	50.00	5.15	35.098	0.048	0.0	0.0	0.0	1.87	33.1	6.5
2.001	50.00	5.23	34.526	0.048	0.0	0.0	0.0	2.00	35.3	6.5
2.002	50.00	5.32	34.155	0.054	0.0	0.0	0.0	1.93	34.0	7.3
2.003	50.00	5.51	33.763	0.068	0.0	0.0	0.0	1.71	30.2	9.2

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Network Design Table for Surface Network 1

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
3.000	13.307	0.133	100.1	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
3.001	10.688	0.107	99.9	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	
3.002	13.143	0.131	100.3	0.085	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.004	11.836	0.053	223.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.005	27.302	0.103	264.8	0.049	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.006	28.498	0.285	100.0	0.038	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.007	12.566	0.419	30.0	0.077	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.006	26.958	1.797	15.0	0.015	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.007	11.332	1.090	10.4	0.067	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.008	20.251	0.182	111.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
4.000	13.227	0.088	150.3	0.157	5.00	0.0	0.600	o	225	Pipe/Conduit	
4.001	15.405	0.103	149.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
4.002	13.481	0.184	73.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.000	27.525	0.215	128.0	0.129	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.009	14.021	0.094	149.2	0.029	0.00	0.0	0.600	o	375	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)
3.000	50.00	5.22	32.800	0.000	0.0	0.0	0.0	1.00	17.8	0.0
3.001	50.00	5.36	32.592	0.042	0.0	0.0	0.0	1.31	52.0	5.8
3.002	50.00	5.50	32.410	0.128	0.0	0.0	0.0	1.57	111.0	17.3
2.004	50.00	5.70	32.279	0.195	0.0	0.0	0.0	1.05	74.1	26.4
2.005	50.00	6.17	32.226	0.245	0.0	0.0	0.0	0.96	68.0	33.1
2.006	50.00	6.47	32.123	0.283	0.0	0.0	0.0	1.57	111.1	38.3
2.007	50.00	6.55	31.838	0.360	0.0	0.0	0.0	2.88	203.6	48.7
1.006	50.00	6.68	31.419	0.570	0.0	0.0	0.0	4.08	288.4	77.2
1.007	50.00	6.71	29.622	0.637	0.0	0.0	0.0	4.90	346.6	86.3
1.008	50.00	6.91	28.457	0.637	0.0	0.0	0.0	1.72	189.6	86.3
4.000	50.00	5.21	28.800	0.157	0.0	0.0	0.0	1.06	42.3	21.3
4.001	50.00	5.41	28.637	0.157	0.0	0.0	0.0	1.28	90.7	21.3
4.002	50.00	5.53	28.534	0.157	0.0	0.0	0.0	1.84	130.1	21.3
5.000	50.00	5.40	28.640	0.129	0.0	0.0	0.0	1.15	45.9	17.4
1.009	50.00	7.07	28.275	0.952	0.0	0.0	0.0	1.48	163.6	128.9

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Manhole Schedules for Surface Network 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	Pipe Out PN	Invert Level (m)	Diameter (mm)	Pipes In PN	Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	35.979	1.455	Open Manhole	1350	1.000	34.524	150				
S2	34.418	1.458	Open Manhole	1350	1.001	32.960	225	1.000	33.035	150	
S3	34.268	1.589	Open Manhole	1350	1.002	32.679	225	1.001	32.679	225	
S4	34.088	1.629	Open Manhole	1200	1.003	32.459	225	1.002	32.459	225	
S5	33.587	1.458	Open Manhole	1200	1.004	32.129	225	1.003	32.129	225	
S6	33.303	1.434	Open Manhole	1200	1.005	31.869	225	1.004	31.869	225	
S7	36.616	1.518	Open Manhole	1350	2.000	35.098	150				
S8	35.996	1.470	Open Manhole	1350	2.001	34.526	150	2.000	34.526	150	
S9	35.587	1.432	Open Manhole	1350	2.002	34.155	150	2.001	34.155	150	
S10	35.134	1.371	Open Manhole	1350	2.003	33.763	150	2.002	33.763	150	
S11	33.700	0.900	Open Manhole	900 x 675	3.000	32.800	150				
S12	33.950	1.358	Open Manhole	1200	3.001	32.592	225	3.000	32.667	150	
S13	34.261	1.851	Open Manhole	1200	3.002	32.410	300	3.001	32.485	225	
S14	34.626	2.347	Open Manhole	1200	2.004	32.279	300	2.003	33.210	150	781
								3.002	32.279	300	
S15	34.856	2.630	Open Manhole	1200	2.005	32.226	300	2.004	32.226	300	
S16	34.442	2.319	Open Manhole	1200	2.006	32.123	300	2.005	32.123	300	
S17	33.622	1.784	Open Manhole	1200	2.007	31.838	300	2.006	31.838	300	
S18	33.043	1.624	Open Manhole	1200	1.006	31.419	300	1.005	31.494	225	
								2.007	31.419	300	
S19	31.236	1.614	Open Manhole	1350	1.007	29.622	300	1.006	29.622	300	
S20	29.900	1.443	Open Manhole	1350	1.008	28.457	375	1.007	28.532	300	
S21	30.340	1.540	Open Manhole	1350	4.000	28.800	225				
S22	29.530	0.893	Open Manhole	1350	4.001	28.637	300	4.000	28.712	225	
S23	30.356	1.822	Open Manhole	1350	4.002	28.534	300	4.001	28.534	300	
PS51	29.900	1.260	Open Manhole	1200	5.000	28.640	225				
S24	29.900	1.625	Open Manhole	1350	1.009	28.275	375	1.008	28.275	375	
								4.002	28.350	300	
								5.000	28.425	225	
S25	29.500	1.319	Open Manhole	1350		OUTFALL		1.009	28.181	375	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	608184.638	255610.507	608184.638	255610.507	Required	
S2	608238.265	255650.705	608238.265	255650.705	Required	
S3	608243.126	255659.035	608243.126	255659.035	Required	
S4	608241.792	255669.945	608241.792	255669.945	Required	

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Manhole Schedules for Surface Network 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S5	608223.544	255693.690	608223.544	255693.690	Required	
S6	608210.532	255703.948	608210.532	255703.948	Required	
S7	608149.005	255622.908	608149.005	255622.908	Required	
S8	608135.145	255632.212	608135.145	255632.212	Required	
S9	608130.589	255640.561	608130.589	255640.561	Required	
S10	608129.284	255651.271	608129.284	255651.271	Required	
S11	608103.534	255689.249	608103.534	255689.249	Required	
S12	608111.301	255678.445	608111.301	255678.445	Required	
S13	608120.098	255672.374	608120.098	255672.374	Required	
S14	608133.070	255670.260	608133.070	255670.260	Required	
S15	608144.902	255669.950	608144.902	255669.950	Required	
S16	608167.281	255685.589	608167.281	255685.589	Required	
S17	608190.035	255702.748	608190.035	255702.748	Required	
S18	608198.123	255712.364	608198.123	255712.364	Required	
S19	608211.157	255735.962	608211.157	255735.962	Required	
S20	608206.600	255746.338	608206.600	255746.338	Required	
S21	608245.914	255744.982	608245.914	255744.982	Required	
S22	608235.238	255752.791	608235.238	255752.791	Required	

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MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S23	608220.636	255757.698	608220.636	255757.698	Required	
PS51	608189.162	255748.541	608189.162	255748.541	Required	
S24	608210.223	255766.262	608210.223	255766.262	Required	
S25	608215.053	255779.425			No Entry	

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PIPELINE SCHEDULES for Surface Network 1

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	150	S1	35.979	34.524	1.305	Open Manhole	1350
1.001	o	225	S2	34.418	32.960	1.233	Open Manhole	1350
1.002	o	225	S3	34.268	32.679	1.364	Open Manhole	1350
1.003	o	225	S4	34.088	32.459	1.404	Open Manhole	1200
1.004	o	225	S5	33.587	32.129	1.233	Open Manhole	1200
1.005	o	225	S6	33.303	31.869	1.209	Open Manhole	1200
2.000	o	150	S7	36.616	35.098	1.368	Open Manhole	1350
2.001	o	150	S8	35.996	34.526	1.320	Open Manhole	1350
2.002	o	150	S9	35.587	34.155	1.282	Open Manhole	1350
2.003	o	150	S10	35.134	33.763	1.221	Open Manhole	1350
3.000	o	150	S11	33.700	32.800	0.750	Open Manhole	900 x 675
3.001	o	225	S12	33.950	32.592	1.133	Open Manhole	1200
3.002	o	300	S13	34.261	32.410	1.551	Open Manhole	1200
2.004	o	300	S14	34.626	32.279	2.047	Open Manhole	1200
2.005	o	300	S15	34.856	32.226	2.330	Open Manhole	1200
2.006	o	300	S16	34.442	32.123	2.019	Open Manhole	1200
2.007	o	300	S17	33.622	31.838	1.484	Open Manhole	1200
1.006	o	300	S18	33.043	31.419	1.324	Open Manhole	1200
1.007	o	300	S19	31.236	29.622	1.314	Open Manhole	1350
1.008	o	375	S20	29.900	28.457	1.068	Open Manhole	1350

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	67.020	45.0	S2	34.418	33.035	1.233	Open Manhole	1350
1.001	9.645	34.3	S3	34.268	32.679	1.364	Open Manhole	1350
1.002	10.990	50.0	S4	34.088	32.459	1.404	Open Manhole	1200
1.003	29.948	90.8	S5	33.587	32.129	1.233	Open Manhole	1200
1.004	16.570	63.7	S6	33.303	31.869	1.209	Open Manhole	1200
1.005	14.994	40.0	S18	33.043	31.494	1.324	Open Manhole	1200
2.000	16.693	29.2	S8	35.996	34.526	1.320	Open Manhole	1350
2.001	9.512	25.6	S9	35.587	34.155	1.282	Open Manhole	1350
2.002	10.789	27.5	S10	35.134	33.763	1.221	Open Manhole	1350
2.003	19.363	35.0	S14	34.626	33.210	1.266	Open Manhole	1200
3.000	13.307	100.1	S12	33.950	32.667	1.133	Open Manhole	1200
3.001	10.688	99.9	S13	34.261	32.485	1.551	Open Manhole	1200
3.002	13.143	100.3	S14	34.626	32.279	2.047	Open Manhole	1200
2.004	11.836	223.3	S15	34.856	32.226	2.330	Open Manhole	1200
2.005	27.302	264.8	S16	34.442	32.123	2.019	Open Manhole	1200
2.006	28.498	100.0	S17	33.622	31.838	1.484	Open Manhole	1200
2.007	12.566	30.0	S18	33.043	31.419	1.324	Open Manhole	1200
1.006	26.958	15.0	S19	31.236	29.622	1.314	Open Manhole	1350
1.007	11.332	10.4	S20	29.900	28.532	1.068	Open Manhole	1350
1.008	20.251	111.3	S24	29.900	28.275	1.250	Open Manhole	1350

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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)
4.000	o	225	S21	30.340	28.800	1.315	Open Manhole	1350
4.001	o	300	S22	29.530	28.637	0.593	Open Manhole	1350
4.002	o	300	S23	30.356	28.534	1.522	Open Manhole	1350
5.000	o	225	PS51	29.900	28.640	1.035	Open Manhole	1200
1.009	o	375	S24	29.900	28.275	1.250	Open Manhole	1350

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)
4.000	13.227	150.3	S22	29.530	28.712	0.593	Open Manhole	1350
4.001	15.405	149.6	S23	30.356	28.534	1.522	Open Manhole	1350
4.002	13.481	73.1	S24	29.900	28.350	1.250	Open Manhole	1350
5.000	27.525	128.0	S24	29.900	28.425	1.250	Open Manhole	1350
1.009	14.021	149.2	S25	29.500	28.181	0.944	Open Manhole	1350

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Area Summary for Surface Network 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.074	0.074	0.074
1.001	User	-	100	0.011	0.011	0.011
1.002	-	-	100	0.000	0.000	0.000
1.003	User	-	100	0.028	0.028	0.028
	User	-	100	0.013	0.013	0.041
	User	-	100	0.007	0.007	0.048
1.004	User	-	100	0.018	0.018	0.018
1.005	User	-	100	0.024	0.024	0.024
	User	-	100	0.019	0.019	0.043
2.000	User	-	100	0.048	0.048	0.048
2.001	-	-	100	0.000	0.000	0.000
2.002	User	-	100	0.006	0.006	0.006
2.003	User	-	100	0.014	0.014	0.014
3.000	-	-	100	0.000	0.000	0.000
3.001	User	-	100	0.042	0.042	0.042
3.002	User	-	100	0.064	0.064	0.064
	User	-	100	0.021	0.021	0.085
2.004	-	-	100	0.000	0.000	0.000
2.005	User	-	100	0.010	0.010	0.010
	User	-	100	0.004	0.004	0.014
	User	-	100	0.020	0.020	0.034
	User	-	100	0.015	0.015	0.049
2.006	User	-	100	0.014	0.014	0.014
	User	-	100	0.013	0.013	0.027
	User	-	100	0.011	0.011	0.038
2.007	User	-	100	0.050	0.050	0.050
	User	-	100	0.027	0.027	0.077
1.006	User	-	100	0.015	0.015	0.015
1.007	User	-	100	0.044	0.044	0.044
	User	-	100	0.023	0.023	0.067
1.008	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.157	0.157	0.157
4.001	-	-	100	0.000	0.000	0.000
4.002	-	-	100	0.000	0.000	0.000
5.000	User	-	100	0.091	0.091	0.091
	User	-	100	0.015	0.015	0.105
	User	-	100	0.023	0.023	0.129
1.009	-	-	100	0.029	0.029	0.029
				Total	Total	Total
				0.952	0.952	0.952

Free Flowing Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
1.009	S25	29.500	28.181	0.000	1350	0



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Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m <sup>3</sup> /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 3    Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.900	Storm Duration (mins)	30
Ratio R	0.411		

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Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: S24, DS/PN: 1.009, Volume (m³): 6.3

Unit Reference MD-SHE-0111-5600-1000-5600  
 Design Head (m) 1.000  
 Design Flow (l/s) 5.6  
 Flush-Flo™ Calculated  
 Objective Minimise upstream storage  
 Application Surface  
 Sump Available Yes  
 Diameter (mm) 111  
 Invert Level (m) 28.275  
 Minimum Outlet Pipe Diameter (mm) 150  
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.6	Kick-Flo®	0.641	4.6
Flush-Flo™	0.294	5.6	Mean Flow over Head Range	-	4.9

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)	Depth (m)	Flow (l/s)
0.100	3.9	0.800	5.0	2.000	7.7	4.000	10.7	7.000	14.0
0.200	5.4	1.000	5.6	2.200	8.1	4.500	11.4	7.500	14.5
0.300	5.6	1.200	6.1	2.400	8.4	5.000	11.9	8.000	15.0
0.400	5.5	1.400	6.6	2.600	8.8	5.500	12.5	8.500	15.4
0.500	5.3	1.600	7.0	3.000	9.4	6.000	13.0	9.000	15.8
0.600	4.9	1.800	7.4	3.500	10.1	6.500	13.5	9.500	16.2

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Storage Structures for Surface Network 1

Cellular Storage Manhole: S20, DS/PN: 1.008

Invert Level (m) 28.457 Safety Factor 5.0  
Infiltration Coefficient Base (m/hr) 0.00180 Porosity 0.95  
Infiltration Coefficient Side (m/hr) 0.00180

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	210.0	200.0	0.800	210.0	248.0	0.900	0.0	248.0

Cellular Storage Manhole: S21, DS/PN: 4.000

Invert Level (m) 28.800 Safety Factor 5.0  
Infiltration Coefficient Base (m/hr) 0.00180 Porosity 0.95  
Infiltration Coefficient Side (m/hr) 0.00180

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	119.0	119.0	0.800	119.0	157.4	0.900	0.0	157.4

Infiltration Basin Manhole: S24, DS/PN: 1.009

Invert Level (m) 28.275 Safety Factor 5.0  
Infiltration Coefficient Base (m/hr) 0.00180 Porosity 1.00  
Infiltration Coefficient Side (m/hr) 0.00180

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	165.3	0.401	250.4	0.801	345.8	1.201	451.3
0.101	185.7	0.501	273.3	0.901	371.2	1.301	479.3
0.201	206.6	0.601	296.8	1.001	397.2	1.401	507.9
0.301	228.2	0.701	321.0	1.101	423.9	1.500	536.9

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000  
Hot Start (mins) 0 MADD Factor \* 10m<sup>3</sup>/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 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.600 Cv (Summer) 0.750  
Region England and Wales Ratio R 0.411 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF  
Analysis Timestep Fine Inertia Status OFF  
DTS Status ON

Profile(s) Summer and Winter  
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960,  
1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
Return Period(s) (years) 1, 30, 100  
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m <sup>3</sup> )
1.000	S1	15 Winter	1	+0%	100/15 Summer				34.591	-0.083	0.000
1.001	S2	15 Winter	1	+0%	100/15 Summer				33.020	-0.164	0.000
1.002	S3	15 Winter	1	+0%	100/15 Summer				32.746	-0.158	0.000
1.003	S4	15 Winter	1	+0%	100/15 Summer				32.551	-0.133	0.000
1.004	S5	15 Winter	1	+0%	100/15 Summer				32.220	-0.134	0.000
1.005	S6	15 Winter	1	+0%	100/15 Summer				31.960	-0.134	0.000
2.000	S7	15 Winter	1	+0%	100/15 Summer				35.146	-0.102	0.000
2.001	S8	15 Winter	1	+0%	100/15 Summer				34.574	-0.102	0.000
2.002	S9	15 Winter	1	+0%	100/15 Summer				34.206	-0.099	0.000
2.003	S10	15 Winter	1	+0%	100/15 Summer				33.822	-0.091	0.000
3.000	S11	15 Summer	1	+0%	100/15 Summer				32.800	-0.150	0.000
3.001	S12	15 Winter	1	+0%	100/15 Summer				32.644	-0.173	0.000
3.002	S13	15 Winter	1	+0%	30/15 Summer				32.494	-0.216	0.000
2.004	S14	15 Winter	1	+0%	30/15 Summer				32.415	-0.164	0.000
2.005	S15	15 Winter	1	+0%	30/15 Summer				32.377	-0.149	0.000
2.006	S16	15 Winter	1	+0%	100/15 Summer				32.245	-0.178	0.000
2.007	S17	15 Winter	1	+0%	100/15 Summer				31.944	-0.194	0.000
1.006	S18	15 Winter	1	+0%	100/15 Summer				31.525	-0.194	0.000
1.007	S19	15 Winter	1	+0%	100/15 Summer				29.733	-0.189	0.000
1.008	S20	240 Winter	1	+0%	30/60 Winter				28.622	-0.210	0.000
4.000	S21	30 Winter	1	+0%	100/15 Summer				28.872	-0.153	0.000
4.001	S22	30 Winter	1	+0%	30/180 Winter				28.703	-0.234	0.000
4.002	S23	240 Winter	1	+0%	30/60 Winter				28.621	-0.213	0.000
5.000	PS51	15 Winter	1	+0%	30/15 Winter				28.745	-0.120	0.000
1.009	S24	240 Winter	1	+0%	30/15 Summer				28.620	-0.030	0.000

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Flow / Overflow Cap.	Half Drain		Pipe Flow (l/s)	Status	Level Exceeded
			Time (mins)	Overflow (l/s)			
1.000	S1	0.41			10.8	OK	
1.001	S2	0.16			12.1	OK	
1.002	S3	0.19			12.0	OK	
1.003	S4	0.34			17.5	OK	
1.004	S5	0.34			19.7	OK	
1.005	S6	0.34			24.6	OK	
2.000	S7	0.23			6.9	OK	
2.001	S8	0.22			6.8	OK	
2.002	S9	0.25			7.7	OK	
2.003	S10	0.33			9.4	OK	
3.000	S11	0.00			0.0	OK	
3.001	S12	0.12			5.2	OK	
3.002	S13	0.17			15.6	OK	
2.004	S14	0.42			25.0	OK	
2.005	S15	0.50			30.4	OK	
2.006	S16	0.35			34.8	OK	
2.007	S17	0.27			43.2	OK	
1.006	S18	0.27			69.7	OK	
1.007	S19	0.29			77.1	OK	
1.008	S20	0.10		152	15.4	OK	
4.000	S21	0.23		23	8.3	OK	
4.001	S22	0.11			8.3	OK	
4.002	S23	0.04			4.2	OK	
5.000	PS51	0.43			18.4	OK	
1.009	S24	0.05		232	5.6	OK	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000  
Hot Start (mins) 0 MADD Factor \* 10m<sup>3</sup>/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 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.600 Cv (Summer) 0.750  
Region England and Wales Ratio R 0.411 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF  
Analysis Timestep Fine Inertia Status OFF  
DTS Status ON

Profile(s) Summer and Winter  
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960,  
1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
Return Period(s) (years) 1, 30, 100  
Climate Change (%) 0, 0, 40

**WARNING: Half Drain Time has not been calculated as the structure is too full.**

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Surcharged Flooded		
									Level (m)	Depth (m)	Volume (m <sup>3</sup> )
1.000	S1	15 Winter	30	+0%	100/15 Summer				34.655	-0.019	0.000
1.001	S2	15 Winter	30	+0%	100/15 Summer				33.059	-0.126	0.000
1.002	S3	15 Winter	30	+0%	100/15 Summer				32.788	-0.116	0.000
1.003	S4	15 Winter	30	+0%	100/15 Summer				32.629	-0.055	0.000
1.004	S5	15 Winter	30	+0%	100/15 Summer				32.298	-0.056	0.000
1.005	S6	15 Winter	30	+0%	100/15 Summer				32.043	-0.051	0.000
2.000	S7	15 Winter	30	+0%	100/15 Summer				35.178	-0.070	0.000
2.001	S8	15 Winter	30	+0%	100/15 Summer				34.606	-0.070	0.000
2.002	S9	15 Winter	30	+0%	100/15 Summer				34.243	-0.062	0.000
2.003	S10	15 Winter	30	+0%	100/15 Summer				33.871	-0.042	0.000
3.000	S11	15 Summer	30	+0%	100/15 Summer				32.800	-0.150	0.000
3.001	S12	15 Winter	30	+0%	100/15 Summer				32.739	-0.078	0.000
3.002	S13	15 Winter	30	+0%	30/15 Summer				32.719	0.009	0.000
2.004	S14	15 Winter	30	+0%	30/15 Summer				32.682	0.103	0.000
2.005	S15	15 Winter	30	+0%	30/15 Summer				32.607	0.081	0.000
2.006	S16	15 Winter	30	+0%	100/15 Summer				32.355	-0.068	0.000
2.007	S17	15 Winter	30	+0%	100/15 Summer				32.031	-0.106	0.000
1.006	S18	15 Winter	30	+0%	100/15 Summer				31.612	-0.107	0.000
1.007	S19	15 Winter	30	+0%	100/15 Summer				29.829	-0.093	0.000
1.008	S20	360 Winter	30	+0%	30/60 Winter				28.979	0.147	0.000
4.000	S21	360 Winter	30	+0%	100/15 Summer				28.979	-0.046	0.000
4.001	S22	360 Winter	30	+0%	30/180 Winter				28.978	0.041	0.000
4.002	S23	360 Winter	30	+0%	30/60 Winter				28.978	0.144	0.000
5.000	PS51	360 Winter	30	+0%	30/15 Winter				28.978	0.113	0.000
1.009	S24	360 Winter	30	+0%	30/15 Summer				28.977	0.328	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	0.99			25.7	OK	
1.001	S2	0.40			29.5	OK	
1.002	S3	0.47			29.5	OK	
1.003	S4	0.90			45.9	OK	
1.004	S5	0.90			52.4	OK	
1.005	S6	0.93			67.2	OK	
2.000	S7	0.55			17.0	OK	
2.001	S8	0.54			16.8	OK	
2.002	S9	0.62			19.0	OK	
2.003	S10	0.84			23.9	OK	
3.000	S11	0.00			0.0	OK	
3.001	S12	0.35			15.5	OK	
3.002	S13	0.48			43.3	SURCHARGED	
2.004	S14	1.13			67.8	SURCHARGED	
2.005	S15	1.36			83.3	SURCHARGED	
2.006	S16	0.93			93.8	OK	
2.007	S17	0.73			118.2	OK	
1.006	S18	0.73			190.0	OK	
1.007	S19	0.81			211.7	OK	
1.008	S20	0.09			13.9	SURCHARGED	
4.000	S21	0.20		222	7.3	OK	
4.001	S22	0.09			7.1	SURCHARGED	
4.002	S23	0.06			6.6	SURCHARGED	
5.000	PS51	0.14			6.0	SURCHARGED	
1.009	S24	0.05			5.6	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000  
Hot Start (mins) 0 MADD Factor \* 10m<sup>3</sup>/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 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.600 Cv (Summer) 0.750  
Region England and Wales Ratio R 0.411 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF  
Analysis Timestep Fine Inertia Status OFF  
DTS Status ON

Profile(s) Summer and Winter  
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960,  
1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
Return Period(s) (years) 1, 30, 100  
Climate Change (%) 0, 0, 40

**WARNING: Half Drain Time has not been calculated as the structure is too full.**

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m <sup>3</sup> )
1.000	S1	15 Winter	100	+40%	100/15 Summer				35.967	1.293	0.000
1.001	S2	15 Winter	100	+40%	100/15 Summer				33.357	0.172	0.000
1.002	S3	15 Winter	100	+40%	100/15 Summer				33.284	0.380	0.000
1.003	S4	15 Winter	100	+40%	100/15 Summer				33.207	0.523	0.000
1.004	S5	15 Winter	100	+40%	100/15 Summer				32.807	0.453	0.000
1.005	S6	15 Winter	100	+40%	100/15 Summer				32.510	0.416	0.000
2.000	S7	15 Winter	100	+40%	100/15 Summer				35.308	0.060	0.000
2.001	S8	15 Winter	100	+40%	100/15 Summer				34.870	0.194	0.000
2.002	S9	15 Winter	100	+40%	100/15 Summer				34.622	0.317	0.000
2.003	S10	15 Winter	100	+40%	100/15 Summer				34.293	0.380	0.000
3.000	S11	15 Winter	100	+40%	100/15 Summer				33.635	0.685	0.000
3.001	S12	15 Winter	100	+40%	100/15 Summer				33.649	0.832	0.000
3.002	S13	15 Winter	100	+40%	30/15 Summer				33.622	0.912	0.000
2.004	S14	15 Winter	100	+40%	30/15 Summer				33.558	0.979	0.000
2.005	S15	15 Winter	100	+40%	30/15 Summer				33.425	0.899	0.000
2.006	S16	15 Winter	100	+40%	100/15 Summer				33.048	0.625	0.000
2.007	S17	15 Winter	100	+40%	100/15 Summer				32.517	0.379	0.000
1.006	S18	15 Winter	100	+40%	100/15 Summer				32.018	0.299	0.000
1.007	S19	15 Winter	100	+40%	100/15 Summer				30.201	0.279	0.000
1.008	S20	480 Winter	100	+40%	30/60 Winter				29.461	0.629	0.000
4.000	S21	480 Winter	100	+40%	100/15 Summer				29.461	0.436	0.000
4.001	S22	480 Winter	100	+40%	30/180 Winter				29.460	0.523	0.000
4.002	S23	480 Winter	100	+40%	30/60 Winter				29.459	0.625	0.000
5.000	PS51	480 Winter	100	+40%	30/15 Winter				29.460	0.595	0.000
1.009	S24	480 Winter	100	+40%	30/15 Summer				29.459	0.809	0.000



7 Museum Street  
Ipswich  
Suffolk IP1 1HQ

IA21/085 HILL HOUSE LANE  
NEEDHAM MARKET  
ADOPTABLE DRAINAGE CALCULATION



Date 01/06/2021

Designed by JBB

File IA21-085-SITE 3D REV D NEW.MDX

Checked by

Micro Drainage

Network 2020.1

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	1.31			34.2	FLOOD RISK	
1.001	S2	0.56			41.1	SURCHARGED	
1.002	S3	0.72			45.0	SURCHARGED	
1.003	S4	1.14			57.9	SURCHARGED	
1.004	S5	1.16			67.1	SURCHARGED	
1.005	S6	1.16			84.2	SURCHARGED	
2.000	S7	0.96			29.4	SURCHARGED	
2.001	S8	0.85			26.5	SURCHARGED	
2.002	S9	0.93			28.5	SURCHARGED	
2.003	S10	1.23			34.8	SURCHARGED	
3.000	S11	0.18			2.9	FLOOD RISK	
3.001	S12	0.49			21.6	SURCHARGED	
3.002	S13	0.73			66.4	SURCHARGED	
2.004	S14	1.61			96.4	SURCHARGED	
2.005	S15	1.96			120.0	SURCHARGED	
2.006	S16	1.38			138.2	SURCHARGED	
2.007	S17	1.07			172.9	SURCHARGED	
1.006	S18	1.01			261.9	SURCHARGED	
1.007	S19	1.12			292.9	SURCHARGED	
1.008	S20	0.16			25.3	SURCHARGED	
4.000	S21	0.23			8.3	SURCHARGED	
4.001	S22	0.11			8.0	FLOOD RISK	
4.002	S23	0.07			7.7	SURCHARGED	
5.000	PS51	0.20			8.5	SURCHARGED	
1.009	S24	0.05			6.1	SURCHARGED	