

Shape Consulting Engineers		Page 0
Amber House Green Lane, Old Swan Liverpool, L13 7GD	Dye House SW Hydraulic Calcs	
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 2

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	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 2

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.323	4-8	0.142

Total Area Contributing (ha) = 0.465

Total Pipe Volume (m³) = 96.722

Network Design Table for Surface Network 2

« - Indicates pipe capacity < flow

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	19.977	0.307	65.1	0.025	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	7.649	0.118	64.8	0.025	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	16.578	0.263	63.0	0.025	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	24.058	0.335	71.8	0.025	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	12.580	0.139	90.5	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	5.278	0.013	400.0	0.025	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.006	6.252	0.016	400.0	0.025	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.007	6.056	0.015	400.0	0.025	0.00	0.0	0.600	o	1050	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.27	52.148	0.025	0.0	0.0	0.0	1.25	22.1	3.4
1.001	50.00	5.37	51.841	0.050	0.0	0.0	0.0	1.25	22.1	6.8
1.002	50.00	5.59	51.723	0.075	0.0	0.0	0.0	1.27	22.4	10.2
1.003	50.00	5.92	51.460	0.100	0.0	0.0	0.0	1.19	21.0	13.5
1.004	50.00	6.08	51.050	0.125	0.0	0.0	0.0	1.37	54.7	16.9
1.005	49.87	6.13	50.086	0.150	0.0	0.0	0.0	1.72	1486.6	20.3
1.006	49.63	6.19	50.073	0.175	0.0	0.0	0.0	1.72	1486.6	23.5
1.007	49.41	6.25	50.058	0.200	0.0	0.0	0.0	1.72	1486.6	26.8

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Network Design Table for Surface Network 2

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
1.008	17.904	0.045	400.0	0.025	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.009	11.422	0.029	400.0	0.025	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.010	12.122	0.030	404.1	0.030	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.011	25.796	0.064	403.1	0.030	0.00	0.0	0.600	o	1050	Pipe/Conduit	
2.000	8.684	0.058	150.0	0.025	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	10.375	0.069	150.0	0.025	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.002	7.124	0.047	150.0	0.025	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.003	8.475	0.141	60.1	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.004	21.451	0.726	29.5	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.012	22.425	0.056	400.4	0.030	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.013	12.333	0.061	202.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.008	48.76	6.42	50.043	0.225	0.0	0.0	0.0	1.72	1486.6	29.7
1.009	48.36	6.53	49.998	0.250	0.0	0.0	0.0	1.72	1486.6	32.7
1.010	47.94	6.65	49.969	0.280	0.0	0.0	0.0	1.71	1479.1	36.4
1.011	47.07	6.90	49.939	0.310	0.0	0.0	0.0	1.71	1480.9	39.5
2.000	50.00	5.18	51.817	0.025	0.0	0.0	0.0	0.82	14.5	3.4
2.001	50.00	5.39	51.759	0.050	0.0	0.0	0.0	0.82	14.5	6.8
2.002	50.00	5.53	51.690	0.075	0.0	0.0	0.0	0.82	14.5	10.2
2.003	50.00	5.62	51.568	0.100	0.0	0.0	0.0	1.69	67.2	13.5
2.004	50.00	5.76	51.427	0.125	0.0	0.0	0.0	2.42	96.1	16.9
1.012	46.34	7.12	49.875	0.465	0.0	0.0	0.0	1.72	1485.8	58.4
1.013	45.62	7.34	49.819	0.465	0.0	0.0	0.0	0.92	36.4	58.4

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Manhole Schedules for Surface Network 2

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	53.566	1.418	Open Manhole	1200	1.000	52.148	150				
S2	53.228	1.387	Open Manhole	1200	1.001	51.841	150	1.000	51.841	150	
S3	53.123	1.400	Open Manhole	1200	1.002	51.723	150	1.001	51.723	150	
S4	52.861	1.401	Open Manhole	1200	1.003	51.460	150	1.002	51.460	150	
S5	52.467	1.417	Open Manhole	1200	1.004	51.050	225	1.003	51.125	150	
S6	52.278	2.192	Open Manhole	2100	1.005	50.086	1050	1.004	50.911	225	
S7	52.188	2.115	Open Manhole	2100	1.006	50.073	1050	1.005	50.073	1050	
S8	52.077	2.020	Open Manhole	2100	1.007	50.058	1050	1.006	50.058	1050	
S9	51.993	1.950	Open Manhole	2100	1.008	50.043	1050	1.007	50.043	1050	
S10	52.123	2.125	Open Manhole	2100	1.009	49.998	1050	1.008	49.998	1050	
S11	52.254	2.285	Open Manhole	2100	1.010	49.969	1050	1.009	49.969	1050	
S12	52.765	2.826	Open Manhole	2100	1.011	49.939	1050	1.010	49.939	1050	
S13	53.206	1.389	Open Manhole	1200	2.000	51.817	150				
S14	53.299	1.540	Open Manhole	1200	2.001	51.759	150	2.000	51.759	150	
S15	53.385	1.695	Open Manhole	1200	2.002	51.690	150	2.001	51.690	150	
S16	53.428	1.860	Open Manhole	1200	2.003	51.568	225	2.002	51.643	150	
S17	53.484	2.057	Open Manhole	1200	2.004	51.427	225	2.003	51.427	225	
S18	53.602	3.727	Open Manhole	2100	1.012	49.875	1050	1.011	49.875	1050	
S19 HB	52.451	2.632	Open Manhole	2400	1.013	49.819	225	2.004	50.700	225	
S20 HW	50.167	0.409	Open Manhole	900 x 675		OUTFALL		1.012	49.819	1050	
								1.013	49.758	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	345866.739	392812.379	345866.739	392812.379	Required	
S2	345867.190	392792.407	345867.190	392792.407	Required	
S3	345870.955	392785.749	345870.955	392785.749	Required	
S4	345873.197	392769.324	345873.197	392769.324	Required	
S5	345870.293	392745.442	345870.293	392745.442	Required	
S6	345874.098	392733.451	345874.098	392733.451	Required	

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Manhole Schedules for Surface Network 2

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S7	345874.530	392728.190	345874.530	392728.190	Required	
S8	345871.792	392722.570	345871.792	392722.570	Required	
S9	345866.748	392719.219	345866.748	392719.219	Required	
S10	345849.633	392713.958	345849.633	392713.958	Required	
S11	345838.212	392713.814	345838.212	392713.814	Required	
S12	345826.502	392716.949	345826.502	392716.949	Required	
S13	345777.120	392768.470	345777.120	392768.470	Required	
S14	345784.409	392763.750	345784.409	392763.750	Required	
S15	345779.370	392754.681	345779.370	392754.681	Required	
S16	345780.353	392747.625	345780.353	392747.625	Required	
S17	345786.040	392741.341	345786.040	392741.341	Required	
S18	345804.486	392730.392	345804.486	392730.392	Required	
S19 HB	345816.280	392749.465	345816.280	392749.465	Required	
S20 HW	345826.419	392756.486			No Entry	

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PIPELINE SCHEDULES for Surface Network 2

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	53.566	52.148	1.268	Open Manhole	1200
1.001	o	150	S2	53.228	51.841	1.237	Open Manhole	1200
1.002	o	150	S3	53.123	51.723	1.250	Open Manhole	1200
1.003	o	150	S4	52.861	51.460	1.251	Open Manhole	1200
1.004	o	225	S5	52.467	51.050	1.192	Open Manhole	1200
1.005	o	1050	S6	52.278	50.086	1.142	Open Manhole	2100
1.006	o	1050	S7	52.188	50.073	1.064	Open Manhole	2100
1.007	o	1050	S8	52.077	50.058	0.970	Open Manhole	2100
1.008	o	1050	S9	51.993	50.043	0.900	Open Manhole	2100
1.009	o	1050	S10	52.123	49.998	1.075	Open Manhole	2100
1.010	o	1050	S11	52.254	49.969	1.235	Open Manhole	2100
1.011	o	1050	S12	52.765	49.939	1.776	Open Manhole	2100
2.000	o	150	S13	53.206	51.817	1.239	Open Manhole	1200
2.001	o	150	S14	53.299	51.759	1.390	Open Manhole	1200
2.002	o	150	S15	53.385	51.690	1.545	Open Manhole	1200
2.003	o	225	S16	53.428	51.568	1.635	Open Manhole	1200
2.004	o	225	S17	53.484	51.427	1.832	Open Manhole	1200
1.012	o	1050	S18	53.602	49.875	2.677	Open Manhole	2100
1.013	o	225	S19 HB	52.451	49.819	2.407	Open Manhole	2400

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	19.977	65.1	S2	53.228	51.841	1.237	Open Manhole	1200
1.001	7.649	64.8	S3	53.123	51.723	1.250	Open Manhole	1200
1.002	16.578	63.0	S4	52.861	51.460	1.251	Open Manhole	1200
1.003	24.058	71.8	S5	52.467	51.125	1.192	Open Manhole	1200
1.004	12.580	90.5	S6	52.278	50.911	1.142	Open Manhole	2100
1.005	5.278	400.0	S7	52.188	50.073	1.065	Open Manhole	2100
1.006	6.252	400.0	S8	52.077	50.058	0.970	Open Manhole	2100
1.007	6.056	400.0	S9	51.993	50.043	0.900	Open Manhole	2100
1.008	17.904	400.0	S10	52.123	49.998	1.075	Open Manhole	2100
1.009	11.422	400.0	S11	52.254	49.969	1.235	Open Manhole	2100
1.010	12.122	404.1	S12	52.765	49.939	1.776	Open Manhole	2100
1.011	25.796	403.1	S18	53.602	49.875	2.677	Open Manhole	2100
2.000	8.684	150.0	S14	53.299	51.759	1.390	Open Manhole	1200
2.001	10.375	150.0	S15	53.385	51.690	1.545	Open Manhole	1200
2.002	7.124	150.0	S16	53.428	51.643	1.635	Open Manhole	1200
2.003	8.475	60.1	S17	53.484	51.427	1.832	Open Manhole	1200
2.004	21.451	29.5	S18	53.602	50.700	2.677	Open Manhole	2100
1.012	22.425	400.4	S19 HB	52.451	49.819	1.582	Open Manhole	2400
1.013	12.333	202.2	S20 HW	50.167	49.758	0.184	Open Manhole	900 x 675

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Network Classifications for Surface Network 2

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
1.000	S1	150	1.237	1.268	Unclassified	1200	0	1.268	Unclassified
1.001	S2	150	1.237	1.250	Unclassified	1200	0	1.237	Unclassified
1.002	S3	150	1.250	1.251	Unclassified	1200	0	1.250	Unclassified
1.003	S4	150	1.192	1.251	Unclassified	1200	0	1.251	Unclassified
1.004	S5	225	1.142	1.192	Unclassified	1200	0	1.192	Unclassified
1.005	S6	1050	1.065	1.142	Unclassified	2100	0	1.142	Unclassified
1.006	S7	1050	0.970	1.064	Unclassified	2100	0	1.064	Unclassified
1.007	S8	1050	0.900	0.970	Unclassified	2100	0	0.970	Unclassified
1.008	S9	1050	0.900	1.075	Unclassified	2100	0	0.900	Unclassified
1.009	S10	1050	1.075	1.235	Unclassified	2100	0	1.075	Unclassified
1.010	S11	1050	1.235	1.776	Unclassified	2100	0	1.235	Unclassified
1.011	S12	1050	1.776	2.677	Unclassified	2100	0	1.776	Unclassified
2.000	S13	150	1.239	1.390	Unclassified	1200	0	1.239	Unclassified
2.001	S14	150	1.390	1.545	Unclassified	1200	0	1.390	Unclassified
2.002	S15	150	1.545	1.635	Unclassified	1200	0	1.545	Unclassified
2.003	S16	225	1.635	1.832	Unclassified	1200	0	1.635	Unclassified
2.004	S17	225	1.832	2.677	Unclassified	1200	0	1.832	Unclassified
1.012	S18	1050	1.582	2.677	Unclassified	2100	0	2.677	Unclassified
1.013	S19 HB	225	0.184	2.407	Unclassified	2400	0	2.407	Unclassified

Free Flowing Outfall Details for Surface Network 2

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.013	S20 HW	50.167	49.758	0.000	900	675

Simulation Criteria for Surface Network 2

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 Offline Controls	0
Number of Online Controls	1	Number of Time/Area Diagrams	0
		Number of Storage Structures	2
		Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for Surface Network 2

Hydro-Brake® Optimum Manhole: S19 HB, DS/PN: 1.013, Volume (m³): 29.4

Unit Reference	MD-SHE-0094-5000-1800-5000
Design Head (m)	1.800
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	94
Invert Level (m)	49.819
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)	1.800	5.0	Kick-Flo®	0.838	3.5
Flush-Flo™	0.411	4.4	Mean Flow over Head Range	-	4.1

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)
0.100	3.0	1.200	4.1	3.000	6.3	7.000	9.5
0.200	4.0	1.400	4.4	3.500	6.8	7.500	9.8
0.300	4.3	1.600	4.7	4.000	7.3	8.000	10.1
0.400	4.4	1.800	5.0	4.500	7.7	8.500	10.4
0.500	4.4	2.000	5.2	5.000	8.1	9.000	10.7
0.600	4.3	2.200	5.5	5.500	8.4	9.500	11.0
0.800	3.7	2.400	5.7	6.000	8.8		
1.000	3.8	2.600	5.9	6.500	9.1		

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Storage Structures for Surface Network 2

Cellular Storage Manhole: S18, DS/PN: 1.012

Invert Level (m) 51.150 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	64.0	64.0	0.900	0.0	96.0
0.800	64.0	96.0			

Cellular Storage Manhole: S19 HB, DS/PN: 1.013

Invert Level (m) 51.150 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	56.0	56.0	0.900	0.0	84.8
0.800	56.0	84.8			

Manhole Headloss for Surface Network 2

PN	US/MH Name	US/MH Headloss
1.000	S1	0.500
1.001	S2	0.500
1.002	S3	0.500
1.003	S4	0.500
1.004	S5	0.500
1.005	S6	0.500
1.006	S7	0.500
1.007	S8	0.500
1.008	S9	0.500
1.009	S10	0.500
1.010	S11	0.500
1.011	S12	0.500
2.000	S13	0.500
2.001	S14	0.500
2.002	S15	0.500
2.003	S16	0.500
2.004	S17	0.500
1.012	S18	0.500
1.013	S19 HB	0.500

Shape Consulting Engineers

Amber House

Green Lane, Old Swan

Liverpool, L13 7GD

Date 21/02/2023 13:49

File

Dye House

SW Hydraulic Calcs

Designed by EJC

Checked by

Innovyze

Network 2019.1

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

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 2

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750

Region England and Wales Ratio R 0.400 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, 240, 360, 480, 960, 1440

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 40

										Water Surcharged
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)
1.000	S1	15 Winter	1	+0%	100/15 Summer				52.189	-0.109
1.001	S2	15 Winter	1	+0%	30/15 Summer				51.901	-0.090
1.002	S3	15 Winter	1	+0%	30/15 Summer				51.794	-0.079
1.003	S4	15 Winter	1	+0%	30/15 Summer				51.545	-0.065
1.004	S5	15 Winter	1	+0%	100/15 Summer				51.138	-0.137
1.005	S6	60 Winter	1	+0%	30/120 Winter				50.378	-0.758
1.006	S7	60 Winter	1	+0%	30/120 Winter				50.378	-0.745
1.007	S8	60 Winter	1	+0%	30/120 Winter				50.378	-0.730
1.008	S9	60 Winter	1	+0%	30/120 Winter				50.378	-0.714
1.009	S10	60 Winter	1	+0%	30/120 Winter				50.378	-0.669
1.010	S11	60 Winter	1	+0%	30/120 Winter				50.379	-0.640
1.011	S12	60 Winter	1	+0%	30/120 Winter				50.379	-0.610
2.000	S13	15 Winter	1	+0%	30/15 Summer				51.871	-0.096
2.001	S14	15 Winter	1	+0%	30/15 Summer				51.835	-0.075
2.002	S15	15 Winter	1	+0%	30/15 Summer				51.789	-0.052
2.003	S16	15 Winter	1	+0%	100/120 Winter				51.641	-0.152
2.004	S17	15 Winter	1	+0%	100/60 Winter				51.489	-0.162
1.012	S18	60 Winter	1	+0%	30/60 Winter				50.379	-0.546
1.013	S19 HB	60 Winter	1	+0%	1/15 Summer				50.379	0.335

Flooded

Pipe

US/MH

Volume

Flow / Overflow

Flow

Level

PN

Name

(m³)

Cap.

(l/s)

(l/s)

Status

Exceeded

1.000

S1

0.000

0.17

3.4

OK

1.001

S2

0.000

0.33

6.4

OK

1.002

S3

0.000

0.45

9.4

OK

1.003

S4

0.000

0.62

12.3

OK

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

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m ³)	Flow / Overflow Cap. (l/s)	Flow (l/s)			
1.004	S5	0.000	0.32	15.2		OK	
1.005	S6	0.000	0.01	9.8		OK	
1.006	S7	0.000	0.02	10.4		OK	
1.007	S8	0.000	0.02	10.9		OK	
1.008	S9	0.000	0.01	11.3		OK	
1.009	S10	0.000	0.01	10.0		OK	
1.010	S11	0.000	0.01	9.2		OK	
1.011	S12	0.000	0.01	8.1		OK	
2.000	S13	0.000	0.27	3.5		OK	
2.001	S14	0.000	0.50	6.4		OK	
2.002	S15	0.000	0.76	9.4		OK	
2.003	S16	0.000	0.23	12.3		OK	
2.004	S17	0.000	0.17	15.2		OK	
1.012	S18	0.000	0.01	11.6		OK	
1.013	S19 HB	0.000	0.14	4.4	SURCHARGED		

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<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 2</u> <u>Simulation Criteria</u> 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 2 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750 Region England and Wales Ratio R 0.400 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, 240, 360, 480, 960, 1440 Return Period(s) (years) 1, 30, 100 Climate Change (%) 0, 0, 40																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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Innovyze	Network 2019.1	

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

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m ³)	Flow / Overflow Cap. (l/s)	Flow (l/s)			
1.004	S5	0.000	0.73	34.4		OK	
1.005	S6	0.000	0.02	14.8	SURCHARGED		
1.006	S7	0.000	0.02	14.9	SURCHARGED		
1.007	S8	0.000	0.02	14.7	SURCHARGED		
1.008	S9	0.000	0.02	14.6	SURCHARGED		
1.009	S10	0.000	0.02	10.1	SURCHARGED		
1.010	S11	0.000	0.01	8.7	SURCHARGED		
1.011	S12	0.000	0.01	6.9	SURCHARGED		
2.000	S13	0.000	0.66	8.3	SURCHARGED		
2.001	S14	0.000	1.23	15.9	SURCHARGED		
2.002	S15	0.000	1.93	23.9	SURCHARGED		
2.003	S16	0.000	0.60	32.0	OK		
2.004	S17	0.000	0.46	40.2	OK		
1.012	S18	0.000	0.01	13.2	SURCHARGED		
1.013	S19 HB	0.000	0.14	4.4	SURCHARGED		

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<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 2</u> <u>Simulation Criteria</u> 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 2 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750 Region England and Wales Ratio R 0.400 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, 240, 360, 480, 960, 1440 Return Period(s) (years) 1, 30, 100 Climate Change (%) 0, 0, 40																																																																																																																																																																																																																																																										
<table><tr><th colspan="8"></th><th>Water</th><th>Surcharged</th></tr><tr><th></th><th>US/MH</th><th></th><th>Return</th><th>Climate</th><th>First (X)</th><th>First (Y)</th><th>First (Z)</th><th>Overflow</th><th>Level</th><th>Depth</th></tr><tr><th>PN</th><th>Name</th><th>Storm</th><th>Period</th><th>Change</th><th>Surcharge</th><th>Flood</th><th>Overflow</th><th>Act.</th><th>(m)</th><th>(m)</th></tr><tr><td>1.000</td><td>S1</td><td>15 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>53.289</td><td>0.991</td></tr><tr><td>1.001</td><td>S2</td><td>15 Winter</td><td>100</td><td>+40%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>53.204</td><td>1.213</td></tr><tr><td>1.002</td><td>S3</td><td>15 Winter</td><td>100</td><td>+40%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>53.074</td><td>1.201</td></tr><tr><td>1.003</td><td>S4</td><td>15 Winter</td><td>100</td><td>+40%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>52.563</td><td>0.953</td></tr><tr><td>1.004</td><td>S5</td><td>240 Winter</td><td>100</td><td>+40%</td><td>100/15 Summer</td><td></td><td></td><td></td><td>51.984</td><td>0.709</td></tr><tr><td>1.005</td><td>S6</td><td>240 Winter</td><td>100</td><td>+40%</td><td>30/120 Winter</td><td></td><td></td><td></td><td>51.982</td><td>0.846</td></tr><tr><td>1.006</td><td>S7</td><td>240 Winter</td><td>100</td><td>+40%</td><td>30/120 Winter</td><td></td><td></td><td></td><td>51.982</td><td>0.858</td></tr><tr><td>1.007</td><td>S8</td><td>240 Winter</td><td>100</td><td>+40%</td><td>30/120 Winter</td><td></td><td></td><td></td><td>51.982</td><td>0.874</td></tr><tr><td>1.008</td><td>S9</td><td>240 Winter</td><td>100</td><td>+40%</td><td>30/120 Winter</td><td></td><td></td><td></td><td>51.982</td><td>0.889</td></tr><tr><td>1.009</td><td>S10</td><td>240 Winter</td><td>100</td><td>+40%</td><td>30/120 Winter</td><td></td><td></td><td></td><td>51.982</td><td>0.934</td></tr><tr><td>1.010</td><td>S11</td><td>240 Winter</td><td>100</td><td>+40%</td><td>30/120 Winter</td><td></td><td></td><td></td><td>51.982</td><td>0.963</td></tr><tr><td>1.011</td><td>S12</td><td>240 Winter</td><td>100</td><td>+40%</td><td>30/120 Winter</td><td></td><td></td><td></td><td>51.982</td><td>0.993</td></tr><tr><td>2.000</td><td>S13</td><td>15 Winter</td><td>100</td><td>+40%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>52.671</td><td>0.704</td></tr><tr><td>2.001</td><td>S14</td><td>15 Winter</td><td>100</td><td>+40%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>52.603</td><td>0.693</td></tr><tr><td>2.002</td><td>S15</td><td>15 Winter</td><td>100</td><td>+40%</td><td>30/15 Summer</td><td></td><td></td><td></td><td>52.301</td><td>0.460</td></tr><tr><td>2.003</td><td>S16</td><td>240 Winter</td><td>100</td><td>+40%</td><td>100/120 Winter</td><td></td><td></td><td></td><td>51.987</td><td>0.194</td></tr><tr><td>2.004</td><td>S17</td><td>240 Winter</td><td>100</td><td>+40%</td><td>100/60 Winter</td><td></td><td></td><td></td><td>51.985</td><td>0.334</td></tr><tr><td>1.012</td><td>S18</td><td>240 Winter</td><td>100</td><td>+40%</td><td>30/60 Winter</td><td></td><td></td><td></td><td>51.982</td><td>1.057</td></tr><tr><td>1.013</td><td>S19 HB</td><td>240 Winter</td><td>100</td><td>+40%</td><td>1/15 Summer</td><td></td><td></td><td></td><td>51.982</td><td>1.938</td></tr></table>																		Water	Surcharged		US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	1.000	S1	15 Winter	100	+40%	100/15 Summer				53.289	0.991	1.001	S2	15 Winter	100	+40%	30/15 Summer				53.204	1.213	1.002	S3	15 Winter	100	+40%	30/15 Summer				53.074	1.201	1.003	S4	15 Winter	100	+40%	30/15 Summer				52.563	0.953	1.004	S5	240 Winter	100	+40%	100/15 Summer				51.984	0.709	1.005	S6	240 Winter	100	+40%	30/120 Winter				51.982	0.846	1.006	S7	240 Winter	100	+40%	30/120 Winter				51.982	0.858	1.007	S8	240 Winter	100	+40%	30/120 Winter				51.982	0.874	1.008	S9	240 Winter	100	+40%	30/120 Winter				51.982	0.889	1.009	S10	240 Winter	100	+40%	30/120 Winter				51.982	0.934	1.010	S11	240 Winter	100	+40%	30/120 Winter				51.982	0.963	1.011	S12	240 Winter	100	+40%	30/120 Winter				51.982	0.993	2.000	S13	15 Winter	100	+40%	30/15 Summer				52.671	0.704	2.001	S14	15 Winter	100	+40%	30/15 Summer				52.603	0.693	2.002	S15	15 Winter	100	+40%	30/15 Summer				52.301	0.460	2.003	S16	240 Winter	100	+40%	100/120 Winter				51.987	0.194	2.004	S17	240 Winter	100	+40%	100/60 Winter				51.985	0.334	1.012	S18	240 Winter	100	+40%	30/60 Winter				51.982	1.057	1.013	S19 HB	240 Winter	100	+40%	1/15 Summer				51.982	1.938
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1.003	S4	15 Winter	100	+40%	30/15 Summer				52.563	0.953																																																																																																																																																																																																																																																
1.004	S5	240 Winter	100	+40%	100/15 Summer				51.984	0.709																																																																																																																																																																																																																																																
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1.006	S7	240 Winter	100	+40%	30/120 Winter				51.982	0.858																																																																																																																																																																																																																																																
1.007	S8	240 Winter	100	+40%	30/120 Winter				51.982	0.874																																																																																																																																																																																																																																																
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<table><tr><th colspan="3"></th><th>Flooded</th><th colspan="2">Pipe</th><th colspan="2"></th></tr><tr><th></th><th>US/MH</th><th>Volume</th><th>Flow /</th><th>Overflow</th><th>Flow</th><th></th><th>Level</th></tr><tr><th>PN</th><th>Name</th><th>(m³)</th><th>Cap.</th><th>(l/s)</th><th>(l/s)</th><th>Status</th><th>Exceeded</th></tr><tr><td>1.000</td><td>S1</td><td>0.000</td><td>0.53</td><td></td><td>11.0</td><td>FLOOD RISK</td><td></td></tr><tr><td>1.001</td><td>S2</td><td>0.000</td><td>1.05</td><td></td><td>20.1</td><td>FLOOD RISK</td><td></td></tr><tr><td>1.002</td><td>S3</td><td>0.000</td><td>1.40</td><td></td><td>29.2</td><td>FLOOD RISK</td><td></td></tr><tr><td>1.003</td><td>S4</td><td>0.000</td><td>1.94</td><td></td><td>38.7</td><td>FLOOD RISK</td><td></td></tr></table>													Flooded	Pipe					US/MH	Volume	Flow /	Overflow	Flow		Level	PN	Name	(m³)	Cap.	(l/s)	(l/s)	Status	Exceeded	1.000	S1	0.000	0.53		11.0	FLOOD RISK		1.001	S2	0.000	1.05		20.1	FLOOD RISK		1.002	S3	0.000	1.40		29.2	FLOOD RISK		1.003	S4	0.000	1.94		38.7	FLOOD RISK																																																																																																																																																																																										
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Shape Consulting Engineers		Page 13
Amber House Green Lane, Old Swan Liverpool, L13 7GD	Dye House SW Hydraulic Calcs	
Date 21/02/2023 13:49 File	Designed by EJC Checked by	
Innovyze	Network 2019.1	

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

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m ³)	Flow / Overflow Cap. (l/s)	Flow (l/s)			
1.004	S5	0.000	0.30	14.1	SURCHARGED		
1.005	S6	0.000	0.02	15.4	FLOOD RISK		
1.006	S7	0.000	0.02	16.7	FLOOD RISK		
1.007	S8	0.000	0.03	18.3	FLOOD RISK		
1.008	S9	0.000	0.02	19.9	FLOOD RISK		
1.009	S10	0.000	0.03	21.5	FLOOD RISK		
1.010	S11	0.000	0.03	23.7	FLOOD RISK		
1.011	S12	0.000	0.03	25.9	SURCHARGED		
2.000	S13	0.000	1.13	14.3	SURCHARGED		
2.001	S14	0.000	2.08	26.9	SURCHARGED		
2.002	S15	0.000	3.22	39.9	SURCHARGED		
2.003	S16	0.000	0.22	11.8	SURCHARGED		
2.004	S17	0.000	0.17	14.7	SURCHARGED		
1.012	S18	0.000	0.02	22.9	SURCHARGED		
1.013	S19 HB	0.000	0.17	5.4	SURCHARGED		