

Technical Note

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cc
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Subject Work Stage 4 Drainage Calculations Summary

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This technical note has been prepared to summarise the calculations which support the work stage 4 drainage design for the Victoria North Infrastructure Works project.

1. Surface water

The surface water calculations are split into catchments which have been taken from the sitewide drainage strategy (MNG-ARP-SW-FN-GX-0008). The catchments are shown in Figure 1. Note that greenfield extents indicated in Figure 1 refer only to land which is not actively drained and do not indicate previously undeveloped land.

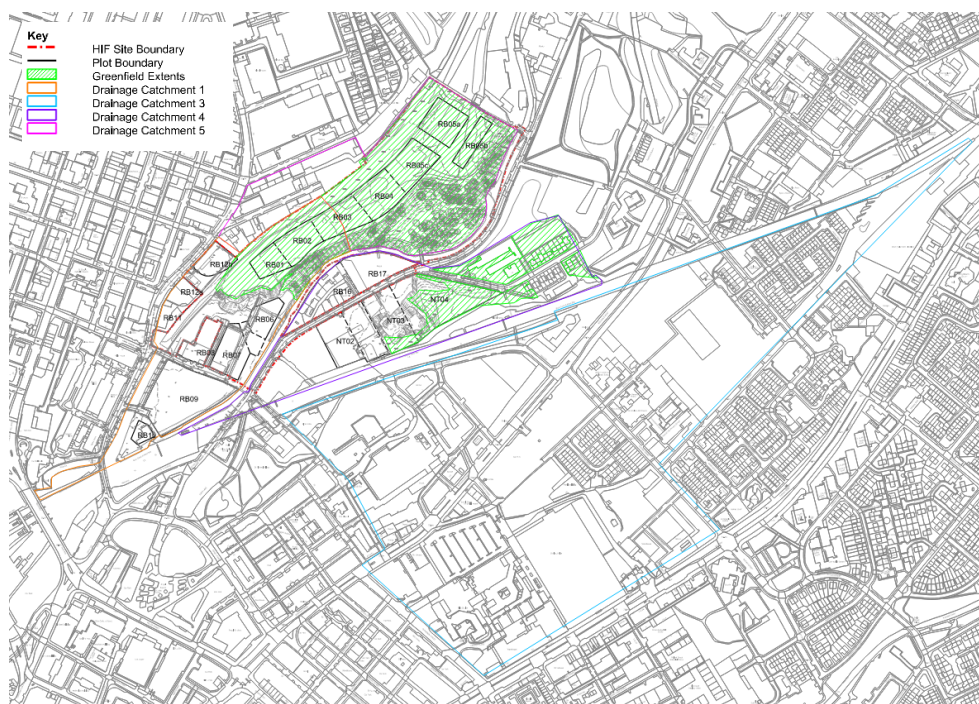


Figure 1 Existing drainage catchments

1.1 Discharge restrictions

Discharge restrictions have been agreed with the LLFA (MCC), the Environment Agency and the on-plot developer. As all outfalls are new connections to the River Irk, a greenfield (Qbar) restriction is applied up to the 30-year event and a 100-year greenfield restriction is applied for the 100-year event. The resulting discharge restrictions are as follows:

- 30-year storm = **14 l/s/ha** (catchments 1, 3 and 4)
- 30-year storm = **13.3 l/s/ha** (catchment 5)
- 100-year storm = **22 l/s/ha** (all catchments)

1.2 Network modelling

The storm water networks have been modelled to achieve the discharge restrictions presented above. The network is designed with minimum cover of 0.9m for non-trafficked areas, 1.2m for trafficked areas and minimum 2.0m connections from the development plots, as agreed with the on-plot developer. All networks are modelled using the MicroDrainage Network modules.

The drainage networks can be separated into three distinct networks, each with a separate outfall. Plots are represented by a storage volume as determined through a MicroDrainage Source Control calculation for each plot area to achieve the required discharge restriction, a complex flow control to achieve the variable discharge restriction between 30-year and 100-year events and, in some cases, a non-return valve. The assumptions which Arup have made for these elements are presented in the calculations appended, however these are not to be delivered under the HIF scheme and are included only to represent the holistic network. Plot restrictions for plots which have been hydraulically modelled are shown in Table 1.

Table 1 Plot Restrictions

Plot restrictions				
Plot	Area (ha)	Catchment	30-year restriction (l/s)	100-year restriction (l/s)
RB01	0.287	1	4.0	6.3
RB02	0.326	1	4.6	7.2
RB03	0.404	5	5.4	8.9
RB04	0.414	5	5.5	9.1
RB05a	0.366	5	4.9	8.1
RB05b	0.239	5	3.2	5.3
RB05c	0.407	5	5.4	9.0
RB06	0.347	1	4.9	7.6
RB07	0.377	1	5.3	8.3
RB08	0.461	1	6.5	10.1
RB11	0.156	1	2.2	3.4
RB12a	0.164	1	2.3	3.6
RB12b	0.235	1	3.3	5.2

A combination of complex flow controls and single flow controls are utilised across each network to achieve the required restrictions at the outfalls. All storage structures on the networks have a flow control at their outlet (orifices or Hydro-Brakes). Plateau West and Plateau East networks also feature flow controls both at the edge of the plateau (prior to the network dropping down the hillside) and also immediately before the outfall. This was necessary to control flows on the Plateau and utilise all storage within the network efficiently prior to discharging. Complex controls are used in some cases to achieve the variable discharge requirement. In some places the head/flow relationship is such that a single vortex flow control has been shown to effectively control flows under both return periods and so a second flow control is not required. No overflow structures have been modelled here as part of the network, however these will also be provided in design to mitigate the risk resulting from potential blockage of a control structure.

The network has been designed to minimise flooding during the 100-year storm as much as possible, and any flooding is designed such that it will stay within the site boundary. No flooding occurs within the network for the 30-year storm event. The model network results are split into 3no. surface water zones and are shown in Appendix 1 – Appendix 3. Note that layouts shown provide a representation of the network for modelling purposes only and pipe numbers do not directly correspond with drainage drawings due to the need for additional ‘dummy’ pipes included for modelling purposes. For full proposed layouts refer to drainage drawings VNIF-ARP-00-YYY-DR-CD-0010 and 0011.

1.3 Channel Drain Calculations

Channel Drain Sizes are calculated based on Aco MultiDrain parts with reference to pages 33-35 of the Aco MultiDrain PPD brochure. These are not included in the hydraulic model and so sizing calculations are presented below.

1.3.1 Plateau West: Channel Drain Sizing Calculations

Active Travel Route 1: Linear Channel 01W-03W

Length: 91.7m

Catchment Area: 875m²

Channel Drain Specification: Aco MultiDrain M200D No. 0.0J Constant depth channel, 0%

Active Travel route 2: Linear Channel 04W-08W

Length: 56.9m

Catchment Area: 480m²

Channel Drain Specification: Aco MultiDrain M150D No. 0.0J Constant depth channel, 0%

Active Travel route 3: Linear Channel 09W-18W

Length: 93.5m

Catchment Area: 501m²

Channel Drain Specification: Aco MultiDrain M150D No. 0.0J Constant depth channel, 0%

Active Travel route 4: Linear Channel 19W-20W

Length: 38.8m

Catchment Area: 220m²

Channel Drain Specification: Aco MultiDrain M100D 0.0J constant depth channel, 0%

Active Travel route 5: Linear Channel 21aW, 21bW, 22W

Length: 39.5m

Catchment Area: 200m²

Channel Drain Specification: Aco MultiDrain M150D No 0.0J Constant depth channel, 0%

Top of Terraces: Linear Channel 23W-24W

Length: 20.1m

Catchment Area: 380m²

Channel Drain Specification: Aco MultiDrain M150D No. 0.0J Constant depth channel, 0%

Viaduct: Linear Channel 25W

Length: 25.3m

Catchment Area: 400m²

Channel Drain Specification: Aco MultiDrain M150D No. 0.0J Constant depth channel, 0%

Bottom of Terraces: Linear Channel 26W

Length: 29.5m

Catchment Area: 533m²

Channel Drain Specification: Aco MultiDrain M150D No. 0.0J Constant depth channel, 0%

1.3.2 Plateau East: Channel Drain Sizing Calculations

Top of St Catherine's Wood: Linear Channel 1E-7E

Length: 40m

Catchment Area: 1240m²

Channel Drain Specification: Aco MultiDrain M200D No. 0.0J Constant depth channel, 0%

1.3.3 Union Walk: Channel drain Sizing Calculations

Union Walk South: Linear Channel 01S-03S

Length: 20.7m

Catchment Area: 1190m²

Channel Drain Specification: Aco MultiDrain M200D No. 0.0J Constant depth channel, 0%

Union Walk North: Linear Channel 04S

Length: 36.5m

Catchment Area: 400m²

Channel Drain Specification: Aco MultiDrain M150D No. 0.0J Constant depth channel, 0%

1.4 Attenuation Tank Structural Calculations

A summary of the tanks included in the surface water networks is given below. All tanks are to be Polystorm-R units or similar approved which have a manufacturer specified vertical structural capacity of 610kN/m².

Table 2 Tank Summary

Network	Tank description	Size	Min cover (m)	Max cover (m)
Plateau West	Red Bank Terrace North	55m ² (10x5.5m) x 0.8m depth	1.220	1.316
Plateau West	Red Bank Terrace South	42m ² (14x3m) x 0.8m depth	1.377	1.910
Union Walk	Union Walk North	45m ² (15x3m) x 0.4m depth	1.422	1.683

Union Walk	Union Walk South	93m ² (31x3m) x 0.4m depth	0.585	1.450
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Under the load case CP-U as defined in the Polystorm System Recommended Installation Details for loads under 6,000Kg, all tanks are within the minimum recommended cover depth (no dynamic factor applied as speeds will be lower than 15mph as specified in CIRIA C737).

Table 3 Polystorm-R Manufacturer Minimum Recommended Cover Depths

Polystorm Unit	Surcharge Load Type	NTA	LA	CP-R (≤ 3,000 Kg)	CP-U (≤ 6,000 Kg)		CP-LDV (≤ 9,000 Kg)	
	Unfactored Load @ GL [kN/m ²]	N/A	62	250	500	625	577	865
	Inc. Dynamic Load Factor		1	1	1	1.25	1	1.5
	Assumed load distribution [1 in]		2	2	2		2	
Polystorm-R (PSM1A)	ULS	-	N/A	0.069	0.180	0.225	0.236	0.341
	SLS (0.5mm vertical deflection)	-	0.115	0.507	0.800	0.918	0.995	1.270
	SLS (1.0mm vertical deflection)	-	0.037	0.300	0.507	0.591	0.637	0.831
	Recommended	0.500	0.500	0.500	0.510	0.920	0.640	1.270

2. Foul Water

The foul network has been modelled based on the unit numbers provided by FEC on 12/06/2022. Plots RB05a and RB05c were grouped together so two checks have been done to test that pipes are sized accordingly assuming a singular grouped discharge from the plot furthest upstream and that self-cleansing velocities are achieved based on the previous split between these plots. These scenarios are denoted by (1) and (2) respectfully in Table 4. Foul drainage runs have been designed to not exceed 75% capacity as stated in the DCG to provide capacity for further future provisions.

2.1 Foul water generation

In line with the Sewerage Sector Design and Construction Guidance v2-1, a peak flow rate of 0.05l/s/dwelling and 0.6l/s/ha for non-residential land use have been applied, giving the flow rates shown in Table 4

Table 4 Foul Flow Rates

Plot	Housing units	Commercial sqm	Clubhouse sqm	School/GP sqm	Total non-resi sqm	Foul generation l/s
RB01	239	1132	0	0	1132	12.02
RB02	176	679	0	0	679	8.84
RB03	189	0	0	0	0	9.45
RB04	203	0	0	0	0	10.15
RB05a (1)	416	0	1335	0	1335	20.88
RB05a (2)	214	0	0	0	0	10.70
RB05b	0	0	0	1824	1824	0.11
RB05c (1)	0	0	0	0	0	0.00
RB05c (2)	202	0	0	0	0	10.10
RB06	285	0	1824	0	1824	14.36
RB07	Drained to separate network					
RB08	Drained to separate network					
RB09	Drained to separate network					
RB10	Drained to separate network					
RB11	Drained to separate network					
RB12a	Drained to separate network					
RB12b	134	0	0	0	0	6.70

2.2 Network Modelling

Details of the foul network are shown in Appendix D. The network has been designed to carry the flows shown above and discharge to existing combined sewers. Plot connections are set at a minimum of 1.5m deep, as agreed with the on-plot developer. Minimum depths for trafficked areas are set as 1.2m and for non-trafficked areas is 0.9m. A minimum self-cleansing velocity of 0.75m/s at 1/3 design flow has been achieved across the foul network in line with the Sewerage Sector Design and Construction Guidance.

A.1 Appendix A Plateau West Surface Water Modelling Report

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Page 1: Network Design Details

Page 6: Area Summary

Page 7: Outfall Details

Page 7: Simulation Criteria

Page 8: Online Controls

Page 21: Storage Structures

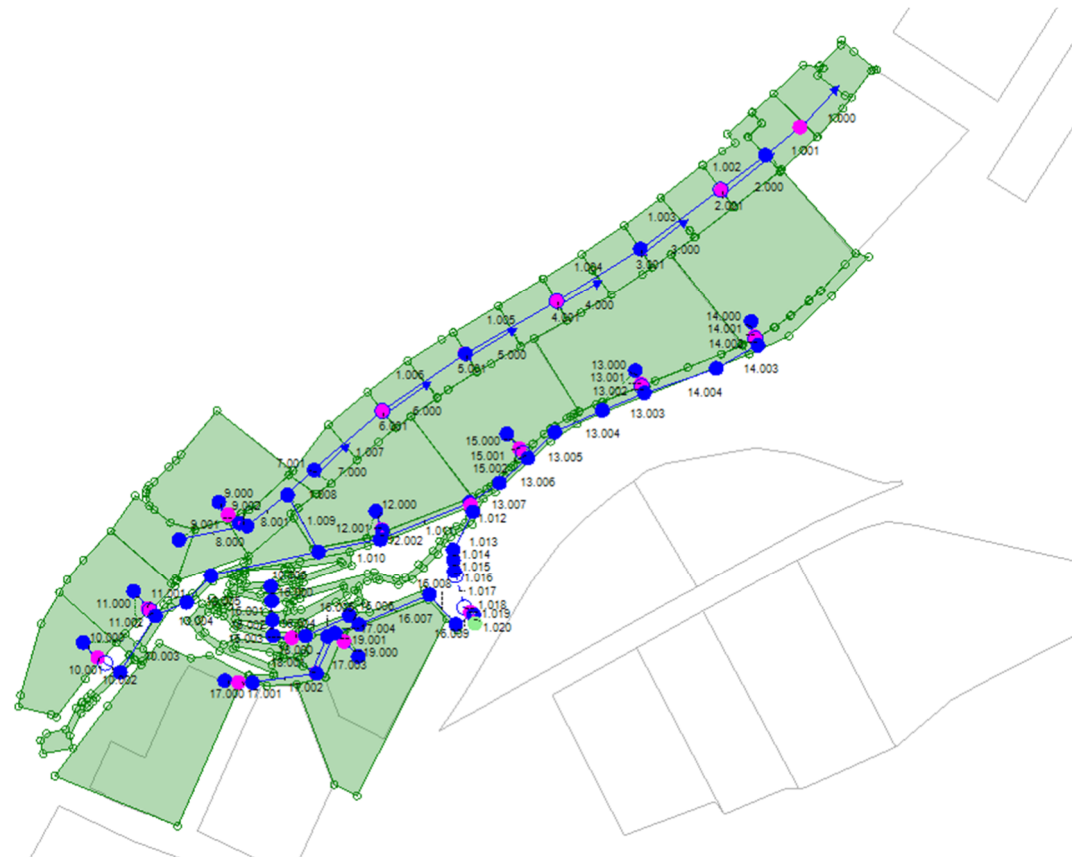
Page 25: 1-Year Summary Results

Page 29: 30-Year Summary Results

Page 33: 100-Year Summary Results

Page 37: Surcharged Outfall Details

Page 38: 30-Year Surcharged Summary Results



- NOTES:
- Unadopted network indicated by **green** highlighted entries
 - Pipe numbers may differ from drawings due to dummy pipes included for modelling
 - On-plot pipes and flow controls are redacted as Arup are not providing on-plot design. Assumed storage volumes and results for on-plot sections are not redacted

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Network 2020.1.3

Page 1



STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)

1

PIMP (%)

100

M5-60 (mm)

18.000

Add Flow / Climate Change (%)

0

Ratio R

0.357

Minimum Backdrop Height (m)

0.000

Maximum Rainfall (mm/hr)

50

Maximum Backdrop Height (m)

0.000

Maximum Time of Concentration (mins)

30

Min Design Depth for Optimisation (m)

0.900

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)

100

Designed with Level Soffits

Network Design Table for Storm

« - 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	23.276	0.169	137.7	0.041	5.00	0.0	1.130	o	-4	Pipe/Conduit		
1.001	24.781	0.995	24.9	0.069	0.00	0.0	1.130	o	100	Pipe/Conduit		
1.002	28.061	0.188	149.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit		
2.000	29.972	0.242	123.9	0.068	8.00	0.0	1.130	o	-4	Pipe/Conduit		
2.001	2.664	0.765	3.5	0.081	0.00	0.0	1.130	o	100	Pipe/Conduit		
1.003	49.121	0.328	149.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
3.000	25.209	0.196	128.6	0.065	8.00	0.0	1.130	o	-4	Pipe/Conduit		
3.001	1.799	0.739	2.4	0.062	0.00	0.0	1.130	o	100	Pipe/Conduit		
1.004	49.326	0.326	151.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit		
4.000	22.608	0.160	141.3	0.062	8.00	0.0	1.130	o	-4	Pipe/Conduit		
4.001	1.316	0.708	1.9	0.058	0.00	0.0	1.130	o	100	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	42.87	6.06	43.154	0.041	0.0	0.0	0.0	0.37	0.74	4.8
1.001	41.95	6.35	42.935	0.111	0.0	0.0	0.0	1.40	11.04	12.6
1.002	40.29	6.92	41.815	0.111	0.0	0.0	0.0	0.82	14.5	12.6
2.000	34.77	9.29	42.809	0.068	0.0	0.0	0.0	0.39	0.84	6.4
2.001	34.75	9.30	42.517	0.148	0.0	0.0	0.0	3.77	29.6	14.0
1.003	33.31	10.07	41.627	0.259	0.0	0.0	0.0	1.07	42.4	23.4
3.000	35.14	9.11	42.409	0.065	0.0	0.0	0.0	0.38	0.74	6.2
3.001	35.12	9.11	42.163	0.127	0.0	0.0	0.0	4.51	35.4	12.1
1.004	32.00	10.84	41.299	0.386	0.0	0.0	0.0	1.06	42.2	33.4
4.000	35.27	9.04	42.016	0.062	0.0	0.0	0.0	0.36	0.74	5.9
4.001	35.26	9.04	41.806	0.120	0.0	0.0	0.0	5.16	40.5	11.5

«-4 represents pipe too restrict permeable

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-4 represents 50mm pipe to act as restrictions from permeable paving

- NOTES:
- Unadopted network indicated by **green** highlighted entries
 - Pipe numbers may differ from drawings due to dummy pipes included for modelling
 - On-plot pipes and flow controls are redacted as Arup are not providing on-plot design. Assumed storage volumes and results for on-plot sections are not redacted

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XP Solutions	Network 2020.1.3	

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
1.005	52.361	0.346	151.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	⚠
5.000	26.155	0.205	127.6	0.062	8.00	0.0	1.130	o	-4	Pipe/Conduit	⚠
5.001	2.196	0.647	3.4	0.058	0.00	0.0	0.600	o	100	Pipe/Conduit	⚠
1.006	49.996	0.329	152.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	⚠
6.000	26.159	0.187	139.7	0.057	8.00	0.0	1.130	o	-4	Pipe/Conduit	⚠
6.001	1.612	0.604	2.7	0.058	0.00	0.0	1.130	o	100	Pipe/Conduit	⚠
1.007	44.583	0.293	152.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	⚠
7.000	20.021	0.076	263.4	0.056	8.00	0.0	1.130	o	-4	Pipe/Conduit	⚠
7.001	2.450	0.633	3.9	0.056	0.00	0.0	1.130	o	100	Pipe/Conduit	⚠
1.008	19.233	0.393	48.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	⚠
8.000	32.167	0.883	36.4	0.090	5.00	0.0	0.600	o	225	Pipe/Conduit	⚠
9.000				0.235	15.00						⚠
9.001				0.000	0.00						⚠
9.002	3.283	0.069	47.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	⚠
8.001	27.325	0.253	108.0	0.056	0.00	0.0	0.600	o	225	Pipe/Conduit	⚠
1.009	29.442	1.165	25.3	0.071	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)
1.005	30.73	11.67	40.973	0.506	0.0	0.0	0.0	1.06	42.2	42.1
5.000	35.06	9.14	41.654	0.062	0.0	0.0	0.0	0.38	0.7	5.9
5.001	35.05	9.15	41.399	0.120	0.0	0.0	0.0	4.23	33.2	11.4
1.006	29.64	12.45	40.627	0.626	0.0	0.0	0.0	1.06	42.1	50.3
6.000	34.95	9.20	41.264	0.057	0.0	0.0	0.0	0.36	0.7	5.4
6.001	34.94	9.20	41.027	0.115	0.0	0.0	0.0	4.31	33.8	10.9
1.007	28.77	13.16	40.298	0.741	0.0	0.0	0.0	1.06	42.0	57.7
7.000	34.82	9.27	40.889	0.056	0.0	0.0	0.0	0.26	0.5	5.3
7.001	34.79	9.28	40.763	0.113	0.0	0.0	0.0	3.57	28.1	10.6
1.008	28.56	13.33	40.005	0.854	0.0	0.0	0.0	1.87	74.5	66.0
8.000	45.67	5.25	41.435	0.090	0.0	0.0	0.0	2.18	86.5	11.1
9.000				0.235						
9.001				0.235						
9.002	26.52	15.24	40.621	0.235	0.0	0.0	0.0	1.90	75.6	17.0
8.001	26.17	15.60	40.552	0.381	0.0	0.0	0.0	1.26	50.0	27.0
1.009	25.99	15.79	39.612	1.306	0.0	0.0	0.0	2.61	103.9	91.9

- NOTES:
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XP Solutions						Network 2020.1.3					

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
10.000				0.156	15.00						
10.001				0.000	0.00						
10.002	8.838	0.054	163.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
10.003	32.883	0.206	160.0	0.031	0.00	0.0	0.600	o	225	Pipe/Conduit	
11.000				0.164	15.00						
11.001				0.000	0.00						
11.002	3.940	0.034	115.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
10.004	16.800	0.112	149.5	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
10.005	18.030	0.112	161.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
10.006	54.656	0.322	169.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.010	31.150	0.186	167.2	0.063	0.00	0.0	0.600	o	300	Pipe/Conduit	
12.000				0.287	15.00						
12.001				0.000	0.00						
12.002	4.712	0.023	204.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.011	47.897	0.417	114.9	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
13.000				0.404	15.00						
13.001				0.000	0.00						
13.002	3.561	0.027	131.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
14.000				0.414	15.00						
14.001				0.000	0.00						
14.002	3.574	0.027	132.4	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)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
10.000										
10.001										
10.002	26.40	15.36	37.829	0.156	0.0	0.0	0.0	1.02	40.5	11.3
10.003	25.89	15.89	37.775	0.187	0.0	0.0	0.0	1.03	41.0	13.1
11.000										
11.001										
11.002	26.55	15.20	37.603	0.164	0.0	0.0	0.0	1.21	48.3	11.8
10.004	25.65	16.16	37.569	0.386	0.0	0.0	0.0	1.07	42.4	26.8
10.005	25.39	16.45	37.457	0.386	0.0	0.0	0.0	1.03	40.9	26.8
10.006	24.61	17.36	37.345	0.386	0.0	0.0	0.0	1.00	39.8	26.8
1.010	24.27	17.79	36.948	1.755	0.0	0.0	0.0	1.21	85.8	115.4
12.000										
12.001										
12.002	26.52	15.23	37.698	0.287	0.0	0.0	0.0	1.19	36.2	20.7
1.011	23.90	18.26	36.687	2.042	0.0	0.0	0.0	1.69	186.6	132.2
13.000										
13.001										
13.002	26.61	15.15	35.935	0.404	0.0	0.0	0.0	1.37	96.7	29.2
14.000										
14.001										
14.002	26.57	15.18	38.933	0.414	0.0	0.0	0.0	1.13	45.1	29.9

Pipes are blocked
restrict flow
provide flow
within network

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Pipe sizes are based on restricted flow rates provided by flow controls within the network

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XP Solutions	Network 2020.1.3	

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
16.005	24.272	0.769	31.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
16.006	6.916	0.062	111.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
17.000				0.458	15.00						
17.001	12.853	0.043	299.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
17.002	28.789	0.120	239.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
18.000	17.203	0.031	557.6	0.071	5.00	0.0	0.600	o	150	Pipe/Conduit	
18.001	2.327	0.244	9.5	0.066	0.00	0.0	0.600	o	225	Pipe/Conduit	
17.003	21.878	0.091	240.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
19.000				0.347	15.00						
19.001	8.346	0.206	40.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
17.004	12.527	0.051	245.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
16.007	37.916	0.156	243.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
16.008	19.637	0.080	245.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
16.009	9.972	0.041	243.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.020	4.336	0.042	103.2	0.000	0.00	0.0	0.600	o	300	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)
16.005	44.33	5.62	30.480	0.152	0.0	0.0	0.0	2.34	92.9	18.9
16.006	44.01	5.71	29.711	0.152	0.0	0.0	0.0	1.24	49.2	18.9
17.000										
17.001	26.47	15.29	28.638	0.458	0.0	0.0	0.0	0.90	63.9	33.1
17.002	26.02	15.76	28.595	0.458	0.0	0.0	0.0	1.01	71.4	33.1
18.000	44.11	5.68	28.825	0.071	0.0	0.0	0.0	0.42	7.4	8.4
18.001	44.07	5.69	28.794	0.136	0.0	0.0	0.0	4.26	169.5	16.3
17.003	25.68	16.12	28.475	0.595	0.0	0.0	0.0	1.01	71.4	41.4
19.000										
19.001	26.56	15.19	29.589	0.347	0.0	0.0	0.0	2.06	92.0	25.0
17.004	25.49	16.33	28.384	0.942	0.0	0.0	0.0	1.00	70.6	65.0
16.007	24.95	16.96	28.333	1.094	0.0	0.0	0.0	1.00	71.0	73.9
16.008	24.67	17.29	28.177	1.094	0.0	0.0	0.0	1.00	70.6	73.9
16.009	24.54	17.45	28.097	1.094	0.0	0.0	0.0	1.00	70.9	73.9
1.020	23.47	18.83	28.056	4.420	0.0	0.0	0.0	1.55	109.4	281.0

Pipe sizes are based on restricted flow rates provided by flow controls within the network

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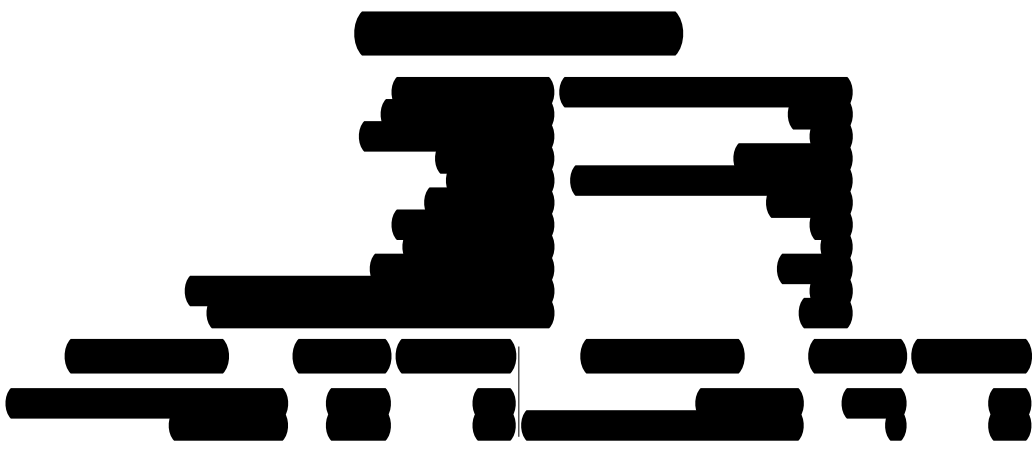
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Micro
Drainage

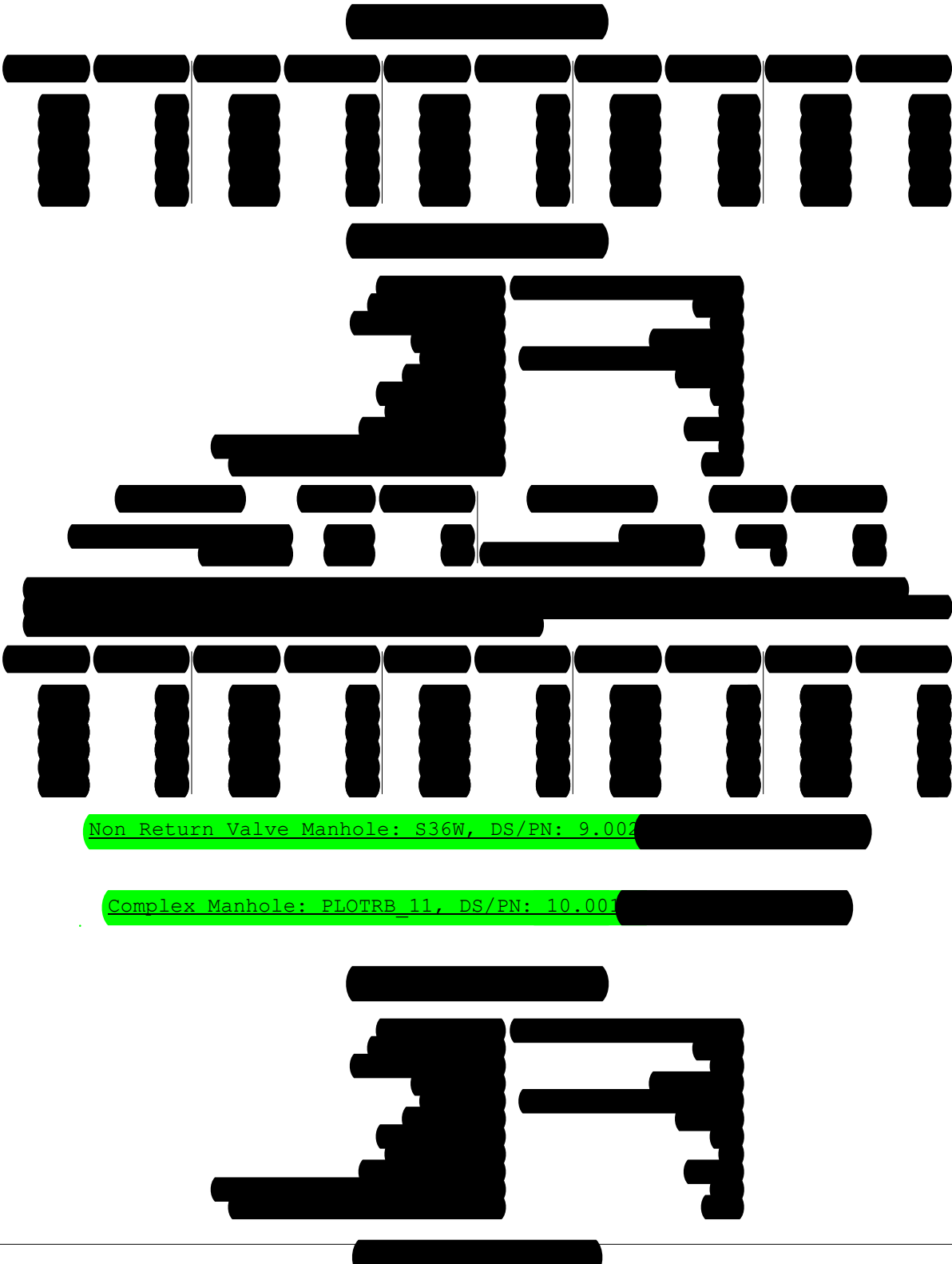
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Network 2020.1.3		
<u>Online Controls for Storm</u>		
Orifice Manhole: S1W, DS/PN: 1.001, Volume (m³): 0.8		
Diameter (m) 0.015 Discharge Coefficient 0.600 Invert Level (m) 42.935		
Orifice Manhole: S3W, DS/PN: 2.001, Volume (m³): 0.8		
Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 42.517		
Orifice Manhole: S4W, DS/PN: 3.001, Volume (m³): 0.8		
Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 42.163		
Orifice Manhole: S6W, DS/PN: 4.001, Volume (m³): 0.8		
Diameter (m) 0.015 Discharge Coefficient 0.600 Invert Level (m) 41.806		
Orifice Manhole: S7W, DS/PN: 5.001, Volume (m³): 0.8		
Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 41.399		
Orifice Manhole: S9W, DS/PN: 6.001, Volume (m³): 0.8		
Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 41.027		
Orifice Manhole: S11W, DS/PN: 7.001, Volume (m³): 0.8		
Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 40.763		
Complex Manhole: PLOT_RB12k		
		
er than a Hydro-Brake Optimum® be utilised		
then these storage routing calculations will be invalidated		
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NOTES:

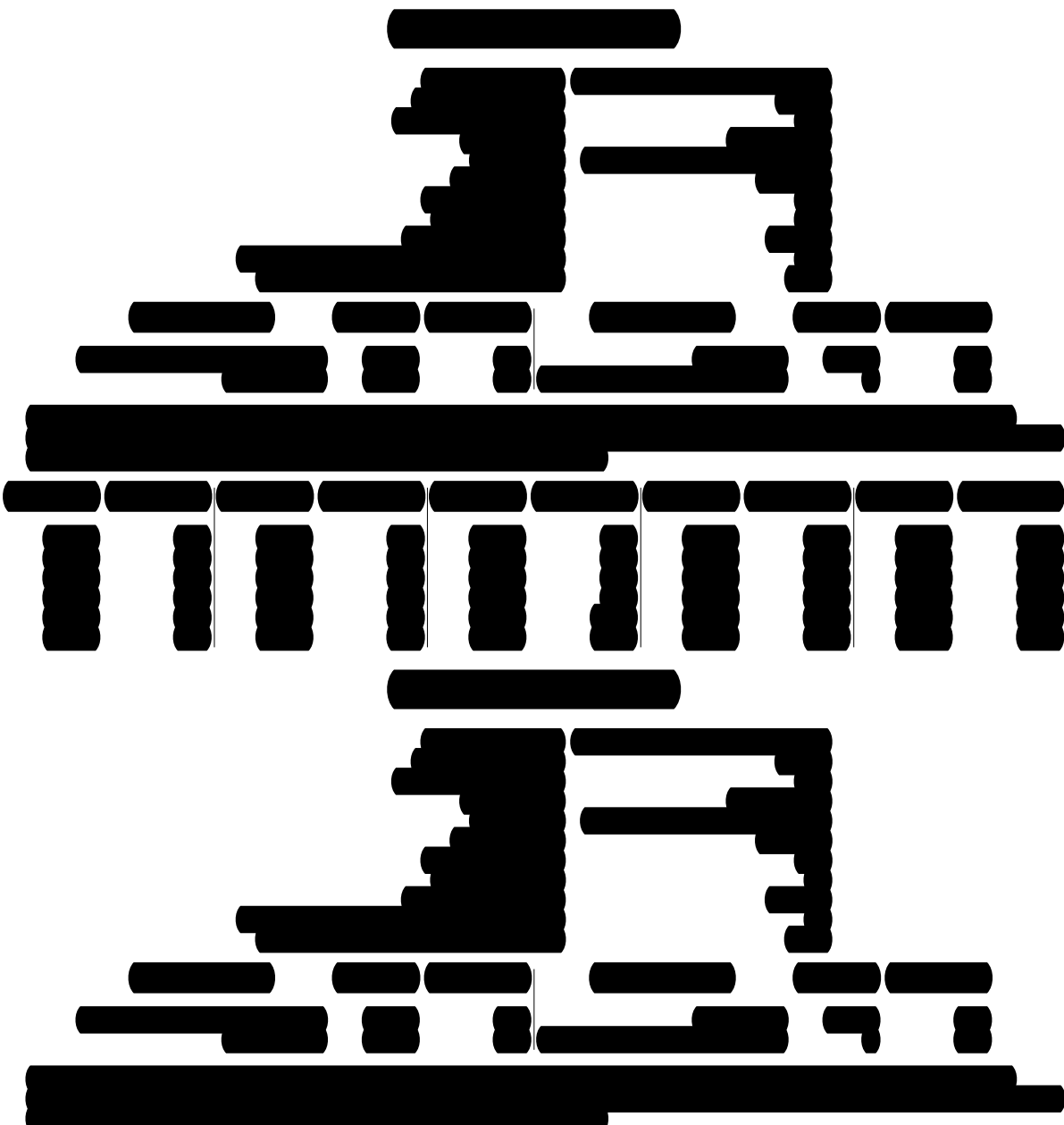
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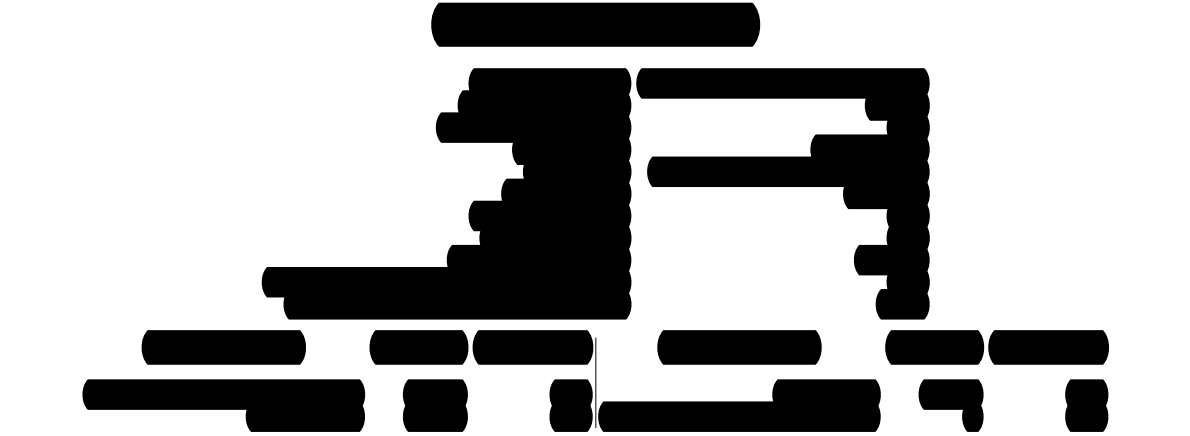
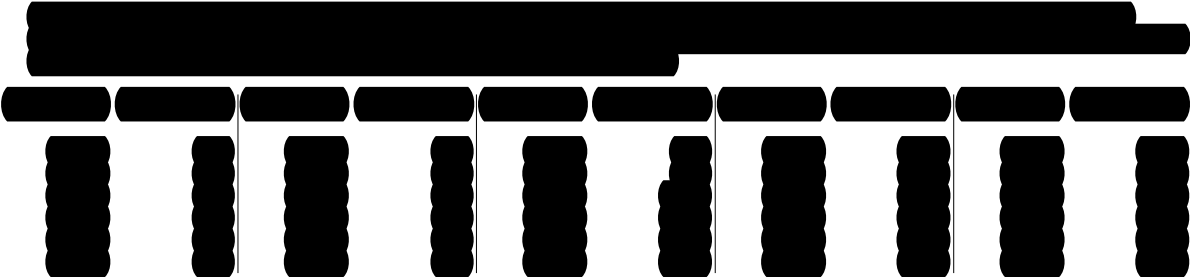
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Non Return Valve Manhole: DUMMY12, DS/PN: [REDACTED] Complex Manhole: PLOTRB_01, DS/PN: 12.001 [REDACTED] 		
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Non Return Valve Manhole: DUMMY20, DS/PN: 12.002		
Complex Manhole: PLOTRB_03, DS/PN: 13.001		
		
		
		
		

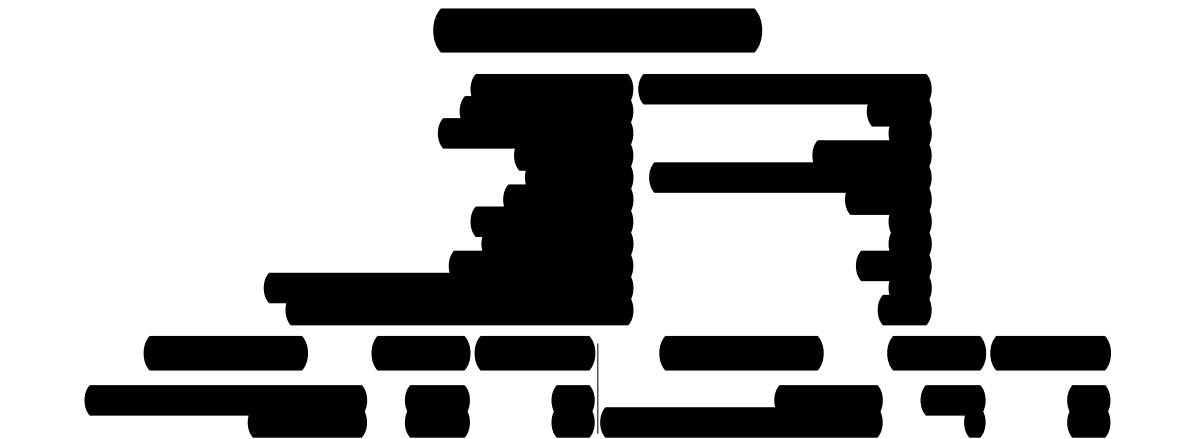
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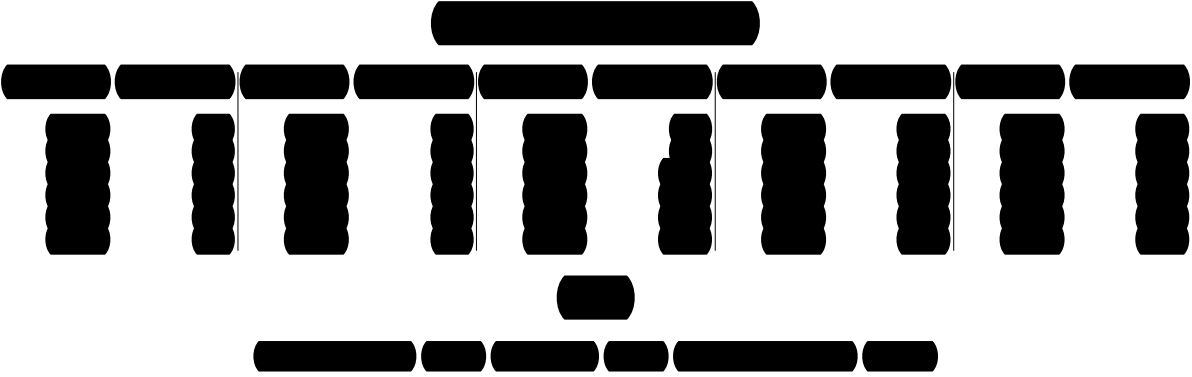
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Non Return Valve Manhole: DUMMY14, DS/PN: 14.002		
Complex Manhole: PLOTRB_02, DS/PN: 15.001		
		
er than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated		
		

NOTES:

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Non Return Valve Manhole: DUMMY18, DS/PN: 15.002

Complex Manhole: S29W, DS/PN: 1.012, Volume (m³): 26.1

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0145-1000-1020-1000
Design Head (m)	1.020
Design Flow (l/s)	10.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	145
Invert Level (m)	35.358
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.020	10.0	Kick-Flo®	0.685	8.3
Flush-Flo™	0.310	10.0	Mean Flow over Head Range	-	8.6

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	5.2	0.800	8.9	2.000	13.7	4.000	19.1	7.000	25.0
0.200	9.7	1.000	9.9	2.200	14.4	4.500	20.2	7.500	25.9
0.300	10.0	1.200	10.8	2.400	15.0	5.000	21.3	8.000	26.7
0.400	9.9	1.400	11.6	2.600	15.6	5.500	22.3	8.500	27.5
0.500	9.7	1.600	12.4	3.000	16.7	6.000	23.2	9.000	28.2
0.600	9.2	1.800	13.1	3.500	17.9	6.500	24.1	9.500	29.0

Weir

Discharge Coef 0.544 Width (m) 0.103 Invert Level (m) 36.378

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Complex Manhole: S34W, DS/PN: 1.019, Volume (m³): 14.8

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0235-3300-1860-3300
Design Head (m)	1.860
Design Flow (l/s)	33.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	235
Invert Level (m)	29.283
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.860	33.0	Kick-Flo®	1.205	26.8
Flush-Flo™	0.550	33.0	Mean Flow over Head Range	-	28.5

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	7.8	0.800	32.2	2.000	34.2	4.000	47.7	7.000	62.5
0.200	23.7	1.000	30.7	2.200	35.8	4.500	50.5	7.500	64.7
0.300	31.0	1.200	27.0	2.400	37.3	5.000	53.1	8.000	66.7
0.400	32.4	1.400	28.8	2.600	38.7	5.500	55.6	8.500	68.7
0.500	32.9	1.600	30.7	3.000	41.5	6.000	58.0	9.000	70.7
0.600	32.9	1.800	32.5	3.500	44.7	6.500	60.3	9.500	72.6

Weir

Discharge Coef 0.544 Width (m) 0.077 Invert Level (m) 31.143

Hydro-Brake® Optimum Manhole: S41W, DS/PN: 16.004, Volume (m³): 3.2

Unit Reference	MD-SHE-0114-8000-2200-8000
Design Head (m)	2.200
Design Flow (l/s)	8.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	114
Invert Level (m)	30.500
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)	2.200	8.0	Kick-Flo®	1.021	5.6
Flush-Flo™	0.498	7.0	Mean Flow over Head Range	-	6.5

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

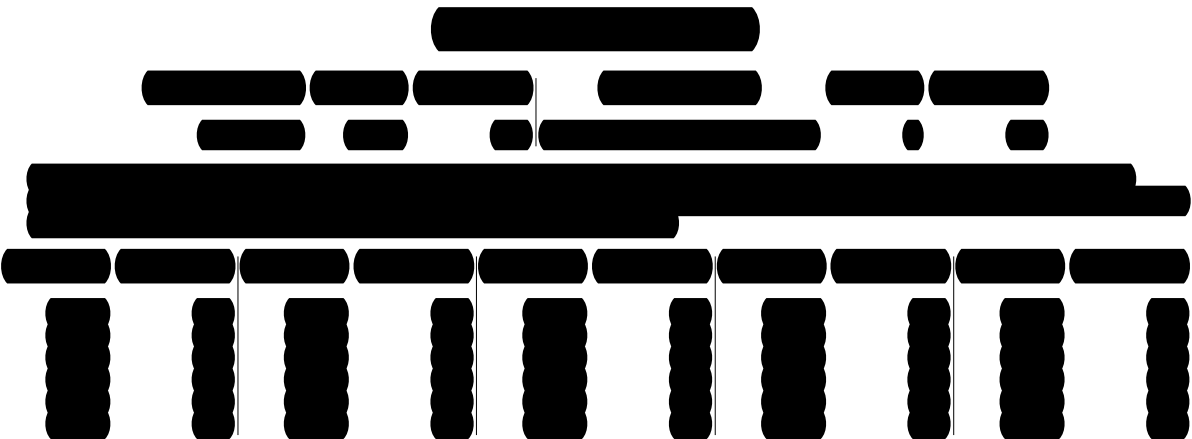
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Hydro-Brake® Optimum Manhole: S51W, DS/PN: 18.001, Volume (m³): 5.8

Unit Reference	MD-SHE-0131-1000-2000-1000	
Design Head (m)	2.000	
Design Flow (l/s)	10.0	
Flush-Flo™	Calculated	
Objective	Minimise upstream storage	
Application	Surface	
Sump Available	Yes	
Diameter (mm)	131	
Invert Level (m)	28.794	
Minimum Outlet Pipe Diameter (mm)	150	
Suggested Manhole Diameter (mm)	1500	

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	10.0	Kick-Flo®	1.167	7.8
Flush-Flo™	0.569	9.8	Mean Flow over Head Range	-	8.7

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	4.7	0.800	9.6	2.000	10.0	4.000	13.9	7.000	18.1
0.200	8.3	1.000	9.0	2.200	10.5	4.500	14.7	7.500	18.7
0.300	9.2	1.200	7.9	2.400	10.9	5.000	15.4	8.000	19.3
0.400	9.6	1.400	8.5	2.600	11.3	5.500	16.2	8.500	19.9
0.500	9.8	1.600	9.0	3.000	12.1	6.000	16.8	9.000	20.5
0.600	9.8	1.800	9.5	3.500	13.0	6.500	17.5	9.500	21.0

Complex Manhole: PLOTRB_06, DS/PN: 19.001



NOTES:

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<u>Storage Structures for Storm</u>		
<u>Porous Car Park Manhole: DUMMY01, DS/PN: 1.000</u>		
Infiltration Coefficient Base (m/hr)	0.00000	Width (m) 11.4
Membrane Percolation (mm/hr)	5000	Length (m) 19.1
Max Percolation (1/s)	302.4	Slope (1:X) 139.5
Safety Factor	2.0	Depression Storage (mm) 5
Porosity	0.30	Evaporation (mm/day) 3
Invert Level (m)	43.154	Cap Volume Depth (m) 0.500
<u>Porous Car Park Manhole: S1W, DS/PN: 1.001</u>		
Infiltration Coefficient Base (m/hr)	0.00000	Width (m) 12.5
Membrane Percolation (mm/hr)	5000	Length (m) 23.3
Max Percolation (1/s)	404.5	Slope (1:X) 139.5
Safety Factor	2.0	Depression Storage (mm) 5
Porosity	0.30	Evaporation (mm/day) 3
Invert Level (m)	42.985	Cap Volume Depth (m) 0.500
<u>Porous Car Park Manhole: DUMMY02, DS/PN: 2.000</u>		
Infiltration Coefficient Base (m/hr)	0.00000	Width (m) 10.3
Membrane Percolation (mm/hr)	5000	Length (m) 24.0
Max Percolation (1/s)	343.3	Slope (1:X) 123.9
Safety Factor	2.0	Depression Storage (mm) 5
Porosity	0.30	Evaporation (mm/day) 3
Invert Level (m)	42.809	Cap Volume Depth (m) 0.500
<u>Porous Car Park Manhole: S3W, DS/PN: 2.001</u>		
Infiltration Coefficient Base (m/hr)	0.00000	Width (m) 9.2
Membrane Percolation (mm/hr)	1000	Length (m) 28.8
Max Percolation (1/s)	73.6	Slope (1:X) 123.9
Safety Factor	2.0	Depression Storage (mm) 5
Porosity	0.30	Evaporation (mm/day) 3
Invert Level (m)	42.567	Cap Volume Depth (m) 0.500
<u>Porous Car Park Manhole: DUMMY03, DS/PN: 3.000</u>		
Infiltration Coefficient Base (m/hr)	0.00000	Width (m) 11.4
Membrane Percolation (mm/hr)	5000	Length (m) 22.8
Max Percolation (1/s)	361.0	Slope (1:X) 128.8
Safety Factor	2.0	Depression Storage (mm) 5
Porosity	0.30	Evaporation (mm/day) 3
Invert Level (m)	42.409	Cap Volume Depth (m) 0.500
<u>Porous Car Park Manhole: S4W, DS/PN: 3.001</u>		
Infiltration Coefficient Base (m/hr)	0.00000	Width (m) 7.9
Membrane Percolation (mm/hr)	5000	Length (m) 24.7
Max Percolation (1/s)	271.0	Slope (1:X) 128.8
Safety Factor	2.0	Depression Storage (mm) 5
Porosity	0.30	Evaporation (mm/day) 3
Invert Level (m)	42.213	Cap Volume Depth (m) 0.500
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NOTES:

- Unadopted network indicated by **green** highlighted entries
- Pipe numbers may differ from drawings due to dummy pipes included for modelling
- On-plot pipes and flow controls are redacted as Arup are not providing on-plot design. Assumed storage volumes and results for on-plot sections are not redacted

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Network 2020.1.3																																																																																																																																																																		
Porous Car Park Manhole: DUMMY04, DS/PN: 4.000 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>10.5</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>5000</td><td>Length (m)</td><td>25.5</td></tr><tr><td>Max Percolation (l/s)</td><td>371.9</td><td>Slope (1:X)</td><td>142.9</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>42.016</td><td>Cap Volume Depth (m)</td><td>5.000</td></tr></table> Porous Car Park Manhole: S6W, DS/PN: 4.001 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>10.5</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>26.1</td></tr><tr><td>Max Percolation (l/s)</td><td>76.1</td><td>Slope (1:X)</td><td>142.9</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>41.858</td><td>Cap Volume Depth (m)</td><td>0.500</td></tr></table> Porous Car Park Manhole: DUMMY05, DS/PN: 5.000 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>7.8</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>5000</td><td>Length (m)</td><td>26.5</td></tr><tr><td>Max Percolation (l/s)</td><td>287.1</td><td>Slope (1:X)</td><td>127.6</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>41.654</td><td>Cap Volume Depth (m)</td><td>0.500</td></tr></table> Porous Car Park Manhole: S7W, DS/PN: 5.001 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>10.5</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>22.6</td></tr><tr><td>Max Percolation (l/s)</td><td>65.9</td><td>Slope (1:X)</td><td>127.6</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>41.449</td><td>Cap Volume Depth (m)</td><td>0.500</td></tr></table> Porous Car Park Manhole: DUMMY06, DS/PN: 6.000 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>10.8</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>5000</td><td>Length (m)</td><td>22.5</td></tr><tr><td>Max Percolation (l/s)</td><td>337.5</td><td>Slope (1:X)</td><td>140.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>41.264</td><td>Cap Volume Depth (m)</td><td>0.500</td></tr></table> Porous Car Park Manhole: S9W, DS/PN: 6.001 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>7.8</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>5000</td><td>Length (m)</td><td>25.4</td></tr><tr><td>Max Percolation (l/s)</td><td>275.2</td><td>Slope (1:X)</td><td>140.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>41.077</td><td>Cap Volume Depth (m)</td><td>0.500</td></tr></table> Porous Car Park Manhole: DUMMY07, DS/PN: 7.000 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Porosity</td><td>0.30</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>5000</td><td>Invert Level (m)</td><td>40.889</td></tr><tr><td>Max Percolation (l/s)</td><td>374.5</td><td>Width (m)</td><td>10.7</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Length (m)</td><td>25.2</td></tr></table>			Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.5	Membrane Percolation (mm/hr)	5000	Length (m)	25.5	Max Percolation (l/s)	371.9	Slope (1:X)	142.9	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	42.016	Cap Volume Depth (m)	5.000	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.5	Membrane Percolation (mm/hr)	1000	Length (m)	26.1	Max Percolation (l/s)	76.1	Slope (1:X)	142.9	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	41.858	Cap Volume Depth (m)	0.500	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.8	Membrane Percolation (mm/hr)	5000	Length (m)	26.5	Max Percolation (l/s)	287.1	Slope (1:X)	127.6	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	41.654	Cap Volume Depth (m)	0.500	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.5	Membrane Percolation (mm/hr)	1000	Length (m)	22.6	Max Percolation (l/s)	65.9	Slope (1:X)	127.6	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	41.449	Cap Volume Depth (m)	0.500	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.8	Membrane Percolation (mm/hr)	5000	Length (m)	22.5	Max Percolation (l/s)	337.5	Slope (1:X)	140.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	41.264	Cap Volume Depth (m)	0.500	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.8	Membrane Percolation (mm/hr)	5000	Length (m)	25.4	Max Percolation (l/s)	275.2	Slope (1:X)	140.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	41.077	Cap Volume Depth (m)	0.500	Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Membrane Percolation (mm/hr)	5000	Invert Level (m)	40.889	Max Percolation (l/s)	374.5	Width (m)	10.7	Safety Factor	2.0	Length (m)	25.2
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- NOTES:
- Unadopted network indicated by green highlighted entries
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XP Solutions		
Designed by Drew.Hunter		
Checked by		
Network 2020.1.3		

Porous Car Park Manhole: DUMMY07, DS/PN: 7.000

Slope (1:X)263.4Evaporation (mm/day)3

Depression Storage (mm)5Cap Volume Depth (m)0.500

Porous Car Park Manhole: S11W, DS/PN: 7.001

Infiltration Coefficient Base (m/hr)0.00000Width (m)10.0

Membrane Percolation (mm/hr)5000Length (m)18.3

Max Percolation (1/s)254.2Slope (1:X)263.4

Safety Factor2.0Depression Storage (mm)5

Porosity0.30Evaporation (mm/day)3

Invert Level (m)40.813Cap Volume Depth (m)0.500

Tank or Pond Manhole: PLOT_RB12b, DS/PN: 9.001

Depth (m)Area (m²)Depth (m)Area (m²)Depth (m)Area (m²)

0.000160.01.000160.01.0010.0

Tank or Pond Manhole: PLOT_RB11, DS/PN: 10.001

Depth (m)Area (m²)Depth (m)Area (m²)Depth (m)Area (m²)

0.000100.01.000100.01.0010.0

Tank or Pond Manhole: PLOT_RB12a, DS/PN: 11.001

Depth (m)Area (m²)Depth (m)Area (m²)Depth (m)Area (m²)

0.00080.01.00080.01.0010.0

Tank or Pond Manhole: PLOT_RB01, DS/PN: 12.001

Depth (m)Area (m²)Depth (m)Area (m²)Depth (m)Area (m²)

0.000142.01.000142.01.0010.0

Tank or Pond Manhole: PLOT_RB03, DS/PN: 13.001

Depth (m)Area (m²)Depth (m)Area (m²)Depth (m)Area (m²)

0.000247.01.000247.01.0010.0

Assumed on-plot storage volumes

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NOTES:

- Unadopted network indicated by **green** highlighted entries
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- On-plot pipes and flow controls are redacted as Arup are not providing on-plot design. Assumed storage volumes and results for on-plot sections are not redacted

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Tank or Pond Manhole: PLOTRB_04, DS/PN: 14.001 <table><tr><td>Depth (m)</td><td>Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td></tr><tr><td>0.000</td><td>236.0</td><td>1.000</td><td>236.0</td><td>1.001</td><td>0.0</td></tr></table> Tank or Pond Manhole: PLOTRB_02, DS/PN: 15.001 <table><tr><td>Depth (m)</td><td>Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td></tr><tr><td>0.000</td><td>191.0</td><td>1.000</td><td>191.0</td><td>1.001</td><td>0.0</td></tr></table> Tank or Pond Manhole: S34W, DS/PN: 1.019 Invert Level (m) 30.840 Adoptab <table><tr><td>Depth (m)</td><td>Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td></tr><tr><td>0.000</td><td>126.0</td><td>0.660</td><td>246.5</td><td>0.661</td><td>0.0</td></tr></table> Cellular Storage Manhole: S41W, DS/PN: 16.004 <table><tr><td>Invert Level (m)</td><td>31.000</td><td>Safety Factor</td><td>2.0</td></tr><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Porosity</td><td>0.95</td></tr><tr><td>Infiltration Coefficient Side (m/hr)</td><td>0.00000</td><td></td><td></td></tr></table> <table><tr><td>Depth (m)</td><td>Area (m²)</td><td>Inf. Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td><td>Inf. Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td><td>Inf. Area (m²)</td></tr><tr><td>0.000</td><td>33.0</td><td>0.0</td><td>1.200</td><td>33.0</td><td>0.0</td><td>1.201</td><td>0.0</td><td>0.0</td></tr></table> Tank or Pond Manhole: PLOTRB_08, DS/PN: 17.001 <table><tr><td>Depth (m)</td><td>Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td></tr><tr><td>0.000</td><td>200.0</td><td>1.000</td><td>200.0</td><td>1.001</td><td>0.0</td></tr></table> Cellular Storage Manhole: S51W, DS/PN: 18.001 <table><tr><td>Invert Level (m)</td><td>28.794</td><td>Safety Factor</td><td>2.0</td></tr><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Porosity</td><td>0.95</td></tr><tr><td>Infiltration Coefficient Side (m/hr)</td><td>0.00000</td><td></td><td></td></tr></table> <table><tr><td>Depth (m)</td><td>Area (m²)</td><td>Inf. Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td><td>Inf. Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td><td>Inf. Area (m²)</td></tr><tr><td>0.000</td><td>39.0</td><td>0.0</td><td>0.800</td><td>39.0</td><td>0.0</td><td>0.801</td><td>0.0</td><td>0.0</td></tr></table> Tank or Pond Manhole: PLOTRB_06, DS/PN: 19.001 <table><tr><td>Depth (m)</td><td>Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td><td>Depth (m)</td><td>Area (m²)</td></tr><tr><td>0.000</td><td>199.0</td><td>1.000</td><td>199.0</td><td>1.001</td><td>0.0</td></tr></table> ©1982-2020 Innovyze			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	236.0	1.000	236.0	1.001	0.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	191.0	1.000	191.0	1.001	0.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	126.0	0.660	246.5	0.661	0.0	Invert Level (m)	31.000	Safety Factor	2.0	Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95	Infiltration Coefficient Side (m/hr)	0.00000			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	33.0	0.0	1.200	33.0	0.0	1.201	0.0	0.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	200.0	1.000	200.0	1.001	0.0	Invert Level (m)	28.794	Safety Factor	2.0	Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95	Infiltration Coefficient Side (m/hr)	0.00000			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	39.0	0.0	0.800	39.0	0.0	0.801	0.0	0.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	199.0	1.000	199.0	1.001	0.0
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Infiltration Coefficient Side (m/hr)	0.00000																																																																																																																									
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																																																																																		
0.000	33.0	0.0	1.200	33.0	0.0	1.201	0.0	0.0																																																																																																																		
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																																																																																																					
0.000	200.0	1.000	200.0	1.001	0.0																																																																																																																					
Invert Level (m)	28.794	Safety Factor	2.0																																																																																																																							
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95																																																																																																																							
Infiltration Coefficient Side (m/hr)	0.00000																																																																																																																									
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																																																																																		
0.000	39.0	0.0	0.800	39.0	0.0	0.801	0.0	0.0																																																																																																																		
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																																																																																																					
0.000	199.0	1.000	199.0	1.001	0.0																																																																																																																					

Adoptable basin

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The Arup Campus
Blyth Gate
Solihull B90 8AE

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File Plateau West WS4 V8.MDX

XP Solutions

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Designed by Drew.Hunter
Checked by

Network 2020.1.3

1 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 28

Number of Storage Structures 26

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm)

18.000 Cv (Summer) 0.750

Region England and Wales

Ratio R 0.357 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)

300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status OFF

DVD Status OFF

Inertia Status OFF

Profile(s)

Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 720, 1440

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)
1.000	DUMMY01	120 Winter	1	+0%	1/15 Winter				43.240
1.001	S1W	1440 Winter	1	+0%	1/15 Winter	100/1440 Winter			43.214
1.002	S2W	1440 Winter	1	+0%					41.828
2.000	DUMMY02	120 Winter	1	+0%	1/15 Winter				42.949
2.001	S3W	360 Winter	1	+0%	1/15 Winter				42.786
1.003	J1	480 Winter	1	+0%					41.652
3.000	DUMMY03	120 Winter	1	+0%	1/15 Winter				42.537
3.001	S4W	360 Winter	1	+0%	1/15 Winter				42.408
1.004	S5W	360 Winter	1	+0%					41.332
4.000	DUMMY04	240 Winter	1	+0%	1/15 Winter				42.138
4.001	S6W	1440 Winter	1	+0%	1/15 Winter				42.107
1.005	J2	480 Winter	1	+0%					41.007
5.000	DUMMY05	120 Winter	1	+0%	1/15 Winter				41.799
5.001	S7W	480 Winter	1	+0%	1/15 Winter				41.655
1.006	S8W	480 Winter	1	+0%					40.667
6.000	DUMMY06	120 Winter	1	+0%	1/15 Winter				41.379
6.001	S9W	480 Winter	1	+0%	1/15 Winter				41.285
1.007	J3	480 Winter	1	+0%					40.342
7.000	DUMMY07	720 Winter	1	+0%	1/15 Winter				40.992
7.001	S11W	720 Winter	1	+0%	1/15 Winter				40.979
1.008	S12W	480 Winter	1	+0%					40.040
8.000	S13W	15 Winter	1	+0%					41.490
9.000	DUMMY08	30 Winter	1	+0%	30/30 Winter				40.877
9.001	PLOT_RB12b	120 Winter	1	+0%	30/30 Winter				40.827
9.002	S36W	120 Winter	1	+0%	100/30 Winter				40.666
8.001	S14W	15 Winter	1	+0%	100/15 Winter				40.645
1.009	S15W	15 Winter	1	+0%	100/15 Winter				39.688
10.000	DUMMY09	30 Winter	1	+0%	30/60 Winter				38.027
10.001	PLOT_RB_11	120 Winter	1	+0%	30/30 Winter				37.995
10.002	DUMMY10	120 Winter	1	+0%					37.867
10.003	S16W	15 Winter	1	+0%	100/15 Winter				37.820
11.000	DUMMY11	30 Winter	1	+0%	30/60 Winter				37.817
11.001	PLOT_RB_12a	120 Winter	1	+0%	30/15 Winter				37.785

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NOTES:

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Ove Arup & Partners International Ltd								Page 26	
The Arup Campus Blyth Gate Solihull B90 8AE									
Date 27/09/2022 10:49 File Plateau West WS4 V8.MDX				Designed by Drew.Hunter Checked by					
XP Solutions				Network 2020.1.3					
<u>1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>									
PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	DUMMY01	0.036	0.000	0.92		55	0.7	SURCHARGED	1
1.001	S1W	0.179	0.000	0.02		801	0.2	SURCHARGED	
1.002	S2W	-0.137	0.000	0.02			0.2	OK	
2.000	DUMMY02	0.090	0.000	0.96		73	0.7	SURCHARGED	
2.001	S3W	0.169	0.000	0.04		181	0.9	SURCHARGED	
1.003	J1	-0.200	0.000	0.03			1.2	OK*	
3.000	DUMMY03	0.078	0.000	0.95		73	0.7	SURCHARGED	
3.001	S4W	0.145	0.000	0.04		168	0.9	SURCHARGED	
1.004	S5W	-0.192	0.000	0.05			2.1	OK	
4.000	DUMMY04	0.072	0.000	0.93		118	0.7	SURCHARGED	
4.001	S6W	0.201	0.000	0.01		875	0.3	SURCHARGED	
1.005	J2	-0.191	0.000	0.06			2.3	OK*	
5.000	DUMMY05	0.095	0.000	1.00		64	0.7	SURCHARGED	
5.001	S7W	0.156	0.000	0.03		196	0.6	SURCHARGED	
1.006	S8W	-0.185	0.000	0.07			3.0	OK	
6.000	DUMMY06	0.065	0.000	0.94		71	0.7	SURCHARGED	
6.001	S9W	0.158	0.000	0.03		210	0.6	SURCHARGED	
1.007	J3	-0.181	0.000	0.09			3.6	OK*	
7.000	DUMMY07	0.053	0.000	0.76		301	0.4	SURCHARGED	
7.001	S11W	0.116	0.000	0.02		512	0.4	SURCHARGED	
1.008	S12W	-0.190	0.000	0.06			4.0	OK	
8.000	S13W	-0.170	0.000	0.13			10.8	OK	
9.000	DUMMY08	-0.117	0.000	0.47			15.4	OK	
9.001	PLOT_RB12b	-0.100	0.000	0.08			3.3	OK	
9.002	S36W	-0.180	0.000	0.09			3.3	OK	
8.001	S14W	-0.132	0.000	0.36			16.5	OK	
1.009	S15W	-0.149	0.000	0.25			24.2	OK	
10.000	DUMMY09	-0.142	0.000	0.29			10.2	OK	
10.001	PLOTRE_11	-0.113	0.000	0.07			2.2	OK	
10.002	DUMMY10	-0.187	0.000	0.07			2.2	OK*	
10.003	S16W	-0.180	0.000	0.09			3.2	OK	
11.000	DUMMY11	-0.150	0.000	0.24			10.7	OK	
11.001	PLOTRE_12a	-0.085	0.000	0.08			2.3	OK	

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The Arup Campus Blyth Gate Solihull B90 8AE					Designed by Drew.Hunter Checked by						
Date 27/09/2022 10:49 File Plateau West WS4 V8.MDX											
XP Solutions					Network 2020.1.3						
<u>1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>											
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)	
11.002	DUMMY12	60 Winter	1	+0%					37.645	-0.183	
10.004	S17W	60 Winter	1	+0%	100/15 Winter				37.634	-0.160	
10.005	S18W	60 Winter	1	+0%	100/15 Winter				37.523	-0.159	
10.006	S19W	60 Winter	1	+0%	100/15 Winter				37.409	-0.161	
1.010	S20W	15 Winter	1	+0%	30/15 Winter				37.091	-0.157	
12.000	DUMMY19	30 Winter	1	+0%	30/15 Winter				37.897	-0.103	
12.001	PLOTRE_01	120 Winter	1	+0%	30/15 Winter				37.879	-0.067	
12.002	DUMMY20	120 Winter	1	+0%					37.770	-0.153	
1.011	S21W	15 Winter	1	+0%	30/15 Winter				36.806	-0.255	
13.000	DUMMY15	1440 Winter	1	+0%	1/1440 Winter				36.342	0.042	
13.001	PLOTRE_03	1440 Winter	1	+0%	1/720 Winter				36.342	0.080	
13.002	DUMMY16	360 Winter	1	+0%					36.235	0.000	
14.000	DUMMY13	60 Winter	1	+0%	1/15 Winter				40.039	0.814	
14.001	PLOTRE_04	60 Winter	1	+0%	1/15 Winter				40.034	0.849	
14.002	DUMMY14	480 Winter	1	+0%					38.998	-0.160	
14.003	S22W	15 Winter	1	+0%					38.956	-0.175	
14.004	S23W	15 Winter	1	+0%					38.095	-0.172	
13.003	S24W	60 Winter	1	+0%	1/15 Winter				36.702	0.384	
13.004	S25W	60 Winter	1	+0%	1/15 Winter				36.691	0.597	
13.005	S26W	60 Winter	1	+0%	1/15 Winter				36.680	0.715	
15.000	DUMMY17	480 Winter	1	+0%	30/15 Winter				36.589	-0.035	
15.001	PLOTRE_02	480 Winter	1	+0%	1/240 Winter				36.588	0.019	
15.002	DUMMY18	120 Winter	1	+0%					36.528	0.000	
13.006	S27W	60 Winter	1	+0%	1/15 Winter				36.669	0.796	
13.007	S28W	60 Winter	1	+0%	1/15 Winter				36.660	0.898	
1.012	S29W	60 Winter	1	+0%	1/15 Winter				36.650	0.992	
1.013	S30W	60 Winter	1	+0%	100/15 Winter				35.174	-0.207	
1.014	S31W	60 Winter	1	+0%	100/15 Winter				32.641	-0.177	
1.015	S32W	60 Winter	1	+0%	30/15 Winter				31.342	-0.177	
1.016	S33W	60 Winter	1	+0%	30/15 Winter				31.120	-0.140	
1.017	63	60 Winter	1	+0%					31.060	-0.252	
1.018	DUMMY08	60 Winter	1	+0%	100/15 Winter				30.928	-0.279	
1.019	S34W	60 Winter	1	+0%	1/30 Winter				29.745	0.237	
16.000	S37W	15 Winter	1	+0%					36.768	-0.125	
16.001	S38W	15 Winter	1	+0%					34.485	-0.115	
16.002	S39W	15 Winter	1	+0%	100/15 Winter				32.504	-0.093	
16.003	S40W	15 Winter	1	+0%	100/15 Winter				31.354	-0.142	
16.004	S41W	15 Winter	1	+0%	1/15 Winter				31.081	0.356	
16.005	S42W	15 Winter	1	+0%					30.523	-0.182	
16.006	S43W	15 Winter	1	+0%					29.779	-0.157	
17.000	DUMMY21	30 Winter	1	+0%	30/15 Winter				28.840	-0.152	
17.001	PLOTRE_08	120 Winter	1	+0%	30/30 Winter				28.816	-0.122	
17.002	S47W	120 Winter	1	+0%					28.658	-0.237	
18.000	S50W	15 Winter	1	+0%	1/15 Winter				28.984	0.009	
18.001	S51W	30 Winter	1	+0%	30/15 Winter				28.924	-0.095	
17.003	S48W	60 Winter	1	+0%					28.561	-0.214	
19.000	DUMMY22W	30 Winter	1	+0%	30/15 Winter				29.781	-0.085	
19.001	PLOTRE_06	120 Winter	1	+0%	30/30 Winter				29.722	-0.092	
17.004	S49W	60 Winter	1	+0%					28.493	-0.191	
16.007	S44W	60 Winter	1	+0%					28.455	-0.178	
16.008	S45W	60 Winter	1	+0%	100/60 Winter				28.328	-0.149	
16.009	S46W	60 Winter	1	+0%	100/30 Winter				28.294	-0.103	
1.020	S35W	60 Winter	1	+0%	100/15 Winter				28.279	-0.077	
	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded			
11.002	DUMMY12	0.000	0.08			2.3	OK*				
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NOTES:

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The Arup Campus Blyth Gate Solihull B90 8AE								
Date 27/09/2022 10:49				Designed by Drew.Hunter				
File Plateau West WS4 V8.MDX				Checked by				
XP Solutions				Network 2020.1.3				
<u>1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>								
PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
10.004	S17W	0.000	0.18			6.9	OK	
10.005	S18W	0.000	0.19			6.9	OK	
10.006	S19W	0.000	0.18			6.9	OK	
1.010	S20W	0.000	0.45			35.5	OK	
12.000	DUMMY19	0.000	0.58			18.8	OK	
12.001	PLOTRE_01	0.000	0.22			3.7	OK	
12.002	DUMMY20	0.000	0.22			3.7	OK	
1.011	S21W	0.000	0.22			35.8	OK	
13.000	DUMMY15	0.000	0.05			3.0	SURCHARGED	
13.001	PLOTRE_03	0.000	0.07			4.3	SURCHARGED	
13.002	DUMMY16	0.000	0.06			3.9	SURCHARGED*	
14.000	DUMMY13	0.000	0.77			23.1	SURCHARGED	
14.001	PLOTRE_04	0.000	0.18			5.5	SURCHARGED	
14.002	DUMMY14	0.000	0.18			5.5	OK*	
14.003	S22W	0.000	0.11			10.2	OK	
14.004	S23W	0.000	0.13			10.2	OK	
13.003	S24W	0.000	0.13			10.0	SURCHARGED	
13.004	S25W	0.000	0.17			9.2	SURCHARGED	
13.005	S26W	0.000	0.16			8.1	SURCHARGED	
15.000	DUMMY17	0.000	0.16			5.3	OK	
15.001	PLOTRE_02	0.000	0.17			3.7	SURCHARGED	
15.002	DUMMY18	0.000	0.19			3.5	SURCHARGED*	
13.006	S27W	0.000	0.13			9.3	SURCHARGED	
13.007	S28W	0.000	0.13			9.2	SURCHARGED	
1.012	S29W	0.000	0.36			36.1	SURCHARGED	
1.013	S30W	0.000	0.21			36.1	OK	
1.014	S31W	0.000	0.35			36.1	OK	
1.015	S32W	0.000	0.35			36.1	OK	
1.016	S33W	0.000	0.71			36.1	OK	
1.017	63	0.000	0.40			36.1	OK*	
1.018	DUMMY08	0.000	0.31			36.0	OK*	
1.019	S34W	0.000	0.75			32.8	SURCHARGED*	6
16.000	S37W	0.000	0.06			3.2	OK	
16.001	S38W	0.000	0.12			5.6	OK	
16.002	S39W	0.000	0.31			11.3	OK	
16.003	S40W	0.000	0.29			15.9	OK	
16.004	S41W	0.000	0.45		8	7.0	SURCHARGED	
16.005	S42W	0.000	0.08			7.0	OK	
16.006	S43W	0.000	0.20			7.0	OK	
17.000	DUMMY21	0.000	0.49			30.0	OK	
17.001	PLOTRE_08	0.000	0.12			6.3	OK	
17.002	S47W	0.000	0.10			6.3	OK	
18.000	S50W	0.000	1.22			8.3	SURCHARGED	
18.001	S51W	0.000	0.11		18	6.4	OK	
17.003	S48W	0.000	0.18			11.5	OK	
19.000	DUMMY22W	0.000	0.71			22.8	OK	
19.001	PLOTRE_06	0.000	0.07			4.6	OK	
17.004	S49W	0.000	0.28			15.9	OK	
16.007	S44W	0.000	0.35			22.9	OK	
16.008	S45W	0.000	0.37			22.8	OK	
16.009	S46W	0.000	0.41			22.8	OK	
1.020	S35W	0.000	0.91			55.6	OK	

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The Arup Campus Blyth Gate Solihull B90 8AE									
Date 27/09/2022 10:49				Designed by Drew.Hunter					
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XP Solutions				Network 2020.1.3					
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>									
PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	DUMMY01	0.182	0.000	0.50		832	0.4	SURCHARGED	1
1.001	S1W	0.341	0.000	0.03		1620	0.3	SURCHARGED	
1.002	S2W	-0.135	0.000	0.02			0.3	OK	
2.000	DUMMY02	0.240	0.000	0.93		217	0.7	SURCHARGED	
2.001	S3W	0.331	0.000	0.05		365	1.2	SURCHARGED	
1.003	J1	-0.198	0.000	0.04			1.5	OK*	
3.000	DUMMY03	0.219	0.000	0.92		214	0.7	SURCHARGED	
3.001	S4W	0.300	0.000	0.05		340	1.2	SURCHARGED	
1.004	S5W	-0.187	0.000	0.07			2.7	OK	
4.000	DUMMY04	0.225	0.000	0.55		918	0.4	SURCHARGED	
4.001	S6W	0.371	0.000	0.01			0.3	SURCHARGED	
1.005	J2	-0.186	0.000	0.07			3.0	OK*	
5.000	DUMMY05	0.247	0.000	0.95		215	0.7	SURCHARGED	
5.001	S7W	0.315	0.000	0.04		469	0.8	SURCHARGED	
1.006	S8W	-0.179	0.000	0.09			3.8	OK	
6.000	DUMMY06	0.200	0.000	0.90		244	0.6	SURCHARGED	
6.001	S9W	0.316	0.000	0.04		504	0.8	SURCHARGED	
1.007	J3	-0.176	0.000	0.11			4.6	OK*	
7.000	DUMMY07	0.214	0.000	0.73		583	0.4	SURCHARGED	
7.001	S11W	0.272	0.000	0.02			0.5	SURCHARGED	
1.008	S12W	-0.184	0.000	0.08			5.1	OK	
8.000	S13W	-0.136	0.000	0.33			26.4	OK	
9.000	DUMMY08	0.045	0.000	0.43			13.9	SURCHARGED	
9.001	PLOT_RB12b	0.109	0.000	0.08			3.3	SURCHARGED	
9.002	S36W	-0.144	0.000	0.09			3.5	OK	
8.001	S14W	-0.051	0.000	0.93			43.3	OK	
1.009	S15W	-0.086	0.000	0.68			66.1	OK	
10.000	DUMMY09	0.038	0.000	0.41			14.3	SURCHARGED	
10.001	PLOTRE_11	0.097	0.000	0.07			2.2	SURCHARGED	
10.002	DUMMY10	-0.185	0.000	0.07			2.2	OK*	
10.003	S16W	-0.146	0.000	0.26			9.6	OK	
11.000	DUMMY11	0.102	0.000	0.35			15.3	SURCHARGED	
11.001	PLOTRE_12a	0.196	0.000	0.08			2.3	SURCHARGED	

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The Arup Campus Blyth Gate Solihull B90 8AE					Micro Drainage					
Date 27/09/2022 10:49 File Plateau West WS4 V8.MDX										
XP Solutions					Network 2020.1.3					
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm										
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)
11.002	DUMMY12	15 Winter	30	+0%					37.683	-0.145
10.004	S17W	15 Winter	30	+0%	100/15 Winter				37.689	-0.106
10.005	S18W	15 Winter	30	+0%	100/15 Winter				37.577	-0.105
10.006	S19W	15 Winter	30	+0%	100/15 Winter				37.461	-0.109
1.010	S20W	15 Winter	30	+0%	30/15 Winter				37.346	0.098
12.000	DUMMY19	240 Winter	30	+0%	30/15 Winter				38.164	0.164
12.001	PLOTRB_01	240 Winter	30	+0%	30/15 Winter				38.160	0.214
12.002	DUMMY20	240 Winter	30	+0%					37.772	-0.151
1.011	S21W	30 Winter	30	+0%	30/15 Winter				37.121	0.059
13.000	DUMMY15	1440 Winter	30	+0%	1/1440 Winter				36.681	0.381
13.001	PLOTRB_03	1440 Winter	30	+0%	1/720 Winter				36.680	0.418
13.002	DUMMY16	30 Winter	30	+0%					36.235	0.000
14.000	DUMMY13	30 Winter	30	+0%	1/15 Winter				40.311	1.086
14.001	PLOTRB_04	120 Winter	30	+0%	1/15 Winter				40.282	1.097
14.002	DUMMY14	720 Winter	30	+0%					38.998	-0.160
14.003	S22W	15 Winter	30	+0%					38.976	-0.155
14.004	S23W	15 Winter	30	+0%					38.116	-0.151
13.003	S24W	30 Winter	30	+0%	1/15 Winter				37.150	0.832
13.004	S25W	30 Winter	30	+0%	1/15 Winter				37.125	1.030
13.005	S26W	30 Winter	30	+0%	1/15 Winter				37.099	1.134
15.000	DUMMY17	360 Winter	30	+0%	30/15 Winter				36.823	0.199
15.001	PLOTRB_02	360 Winter	30	+0%	1/240 Winter				36.818	0.249
15.002	DUMMY18	15 Winter	30	+0%					36.528	0.000
13.006	S27W	30 Winter	30	+0%	1/15 Winter				37.074	1.201
13.007	S28W	30 Winter	30	+0%	1/15 Winter				37.050	1.288
1.012	S29W	30 Winter	30	+0%	1/15 Winter				37.026	1.368
1.013	S30W	30 Winter	30	+0%	100/15 Winter				35.250	-0.131
1.014	S31W	30 Winter	30	+0%	100/15 Winter				32.818	0.000
1.015	S32W	30 Winter	30	+0%	30/15 Winter				31.670	0.151
1.016	S33W	30 Winter	30	+0%	30/15 Winter				31.406	0.146
1.017	63	30 Winter	30	+0%					31.312	0.000
1.018	DUMMY08	120 Winter	30	+0%	100/15 Winter				31.164	-0.043
1.019	S34W	120 Winter	30	+0%	1/30 Winter				31.159	1.651
16.000	S37W	15 Winter	30	+0%					36.782	-0.111
16.001	S38W	15 Winter	30	+0%					34.509	-0.091
16.002	S39W	15 Winter	30	+0%	100/15 Winter				32.558	-0.039
16.003	S40W	30 Winter	30	+0%	100/15 Winter				31.488	-0.008
16.004	S41W	30 Winter	30	+0%	1/15 Winter				31.479	0.754
16.005	S42W	60 Winter	30	+0%					30.523	-0.182
16.006	S43W	120 Winter	30	+0%					29.779	-0.157
17.000	DUMMY21	120 Winter	30	+0%	30/15 Winter				29.134	0.142
17.001	PLOTRB_08	120 Winter	30	+0%	30/30 Winter				29.132	0.194
17.002	S47W	720 Winter	30	+0%					28.658	-0.237
18.000	S50W	15 Winter	30	+0%	1/15 Winter				29.271	0.296
18.001	S51W	30 Winter	30	+0%	30/15 Winter				29.154	0.135
17.003	S48W	30 Winter	30	+0%					28.577	-0.198
19.000	DUMMY22W	240 Winter	30	+0%	30/15 Winter				29.968	0.102
19.001	PLOTRB_06	240 Winter	30	+0%	30/30 Winter				29.963	0.149
17.004	S49W	30 Winter	30	+0%					28.508	-0.176
16.007	S44W	60 Winter	30	+0%					28.467	-0.166
16.008	S45W	60 Winter	30	+0%	100/60 Winter				28.342	-0.135
16.009	S46W	60 Winter	30	+0%	100/30 Winter				28.307	-0.090
1.020	S35W	120 Winter	30	+0%	100/15 Winter				28.290	-0.066
Flooded Half Drain Pipe										
PN	US/MH Name	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded		
11.002	DUMMY12	0.000	0.08			2.4	OK*			
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The Arup Campus Blyth Gate Solihull B90 8AE								
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Designed by Drew.Hunter Checked by								
XP Solutions		Network 2020.1.3						
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm								
PN	US/MH Name	Flooded Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
10.004	S17W	0.000	0.53			20.1	OK	
10.005	S18W	0.000	0.55			20.3	OK	
10.006	S19W	0.000	0.51			19.5	OK	
1.010	S20W	0.000	1.24			97.0	SURCHARGED	
12.000	DUMMY19	0.000	0.52			16.9	SURCHARGED	
12.001	PLOTRE_01	0.000	0.23			4.0	SURCHARGED	
12.002	DUMMY20	0.000	0.24			4.0	OK	
1.011	S21W	0.000	0.48			76.9	SURCHARGED	
13.000	DUMMY15	0.000	0.10			6.3	SURCHARGED	
13.001	PLOTRE_03	0.000	0.09			5.3	SURCHARGED	
13.002	DUMMY16	0.000	0.00			0.0	SURCHARGED*	
14.000	DUMMY13	0.000	2.19			65.5	SURCHARGED	
14.001	PLOTRE_04	0.000	0.18			5.5	SURCHARGED	
14.002	DUMMY14	0.000	0.18			5.5	OK*	
14.003	S22W	0.000	0.21			19.3	OK	
14.004	S23W	0.000	0.24			19.3	OK	
13.003	S24W	0.000	0.29			22.1	SURCHARGED	
13.004	S25W	0.000	0.37			20.5	SURCHARGED	
13.005	S26W	0.000	0.38			19.4	SURCHARGED	
15.000	DUMMY17	0.000	0.43			14.2	SURCHARGED	
15.001	PLOTRE_02	0.000	0.20			4.5	SURCHARGED	
15.002	DUMMY18	0.000	0.02			0.4	SURCHARGED*	
13.006	S27W	0.000	0.33			24.2	SURCHARGED	
13.007	S28W	0.000	0.33			23.7	SURCHARGED	
1.012	S29W	0.000	1.04			103.7	SURCHARGED	
1.013	S30W	0.000	0.61			103.8	OK	
1.014	S31W	0.000	1.00			102.9	OK	
1.015	S32W	0.000	1.01			103.0	SURCHARGED	
1.016	S33W	0.000	2.03			102.9	SURCHARGED	
1.017	63	0.000	1.14			102.7	FLOOD RISK*	
1.018	DUMMY08	0.000	0.58			68.1	OK*	
1.019	S34W	0.000	0.76			33.4	FLOOD RISK*	6
16.000	S37W	0.000	0.15			7.9	OK	
16.001	S38W	0.000	0.33			15.3	OK	
16.002	S39W	0.000	0.89			33.1	OK	
16.003	S40W	0.000	0.66			35.9	OK	
16.004	S41W	0.000	0.45		25	7.0	SURCHARGED	
16.005	S42W	0.000	0.08			7.0	OK	
16.006	S43W	0.000	0.20			7.0	OK	
17.000	DUMMY21	0.000	0.70			42.7	SURCHARGED	
17.001	PLOTRE_08	0.000	0.12			6.4	SURCHARGED	
17.002	S47W	0.000	0.10			6.4	OK	
18.000	S50W	0.000	2.78			19.0	SURCHARGED	
18.001	S51W	0.000	0.16		20	9.5	SURCHARGED	
17.003	S48W	0.000	0.25			15.8	OK	
19.000	DUMMY22W	0.000	0.63			20.4	SURCHARGED	
19.001	PLOTRE_06	0.000	0.08			4.9	SURCHARGED	
17.004	S49W	0.000	0.36			20.7	OK	
16.007	S44W	0.000	0.41			27.2	OK	
16.008	S45W	0.000	0.44			27.1	OK	
16.009	S46W	0.000	0.49			27.1	OK	
1.020	S35W	0.000	0.97			59.2	OK	
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The Arup Campus Blyth Gate Solihull B90 8AE									
Date 27/09/2022 10:49 File Plateau West WS4 V8.MDX				Designed by Drew.Hunter Checked by					
XP Solutions				Network 2020.1.3					

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap.	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	DUMMY01	0.588	0.000	0.52	1328	0.4	FLOOD RISK	1
1.001	S1W	0.740	0.226	0.04		0.4	FLOOD	
1.002	S2W	-0.133	0.000	0.03		0.4	OK	
2.000	DUMMY02	0.528	0.000	0.92	452	0.7	FLOOD RISK	
2.001	S3W	0.702	0.000	0.07		1.7	FLOOD RISK	
1.003	J1	-0.193	0.000	0.05		2.0	OK*	
3.000	DUMMY03	0.468	0.000	0.96		0.7	FLOOD RISK	
3.001	S4W	0.572	0.000	0.06		1.5	FLOOD RISK	
1.004	S5W	-0.180	0.000	0.09		3.6	OK	
4.000	DUMMY04	0.586	0.000	0.57	1365	0.4	FLOOD RISK	
4.001	S6W	0.730	0.000	0.02		0.4	FLOOD RISK	
1.005	J2	-0.179	0.000	0.09		3.9	OK*	
5.000	DUMMY05	0.525	0.000	0.92	443	0.7	FLOOD RISK	
5.001	S7W	0.637	0.000	0.05		1.1	FLOOD RISK	
1.006	S8W	-0.173	0.000	0.12		5.0	OK	
6.000	DUMMY06	0.456	0.000	0.86		0.6	FLOOD RISK	
6.001	S9W	0.599	0.000	0.05		1.1	FLOOD RISK	
1.007	J3	-0.168	0.000	0.14		6.1	OK*	
7.000	DUMMY07	0.583	0.000	1.01		0.5	FLOOD RISK	
7.001	S11W	0.621	0.000	0.03		0.7	FLOOD RISK	
1.008	S12W	-0.104	0.000	0.07		5.0	OK	
8.000	S13W	-0.100	0.000	0.59		47.8	OK	
9.000	DUMMY08	0.355	0.000	0.78		25.5	SURCHARGED	
9.001	PLOT_RB12b	0.417	0.000	0.13		5.4	SURCHARGED	
9.002	S36W	0.004	0.000	0.17		6.2	SURCHARGED	
8.001	S14W	0.437	0.000	1.65		76.5	SURCHARGED	
1.009	S15W	0.289	0.000	1.11		107.7	SURCHARGED	
10.000	DUMMY09	0.358	0.000	0.47		16.5	SURCHARGED	
10.001	PLOT RB_11	0.415	0.000	0.11		3.5	FLOOD RISK	
10.002	DUMMY10	0.000	0.000	0.19		6.1	SURCHARGED*	
10.003	S16W	0.450	0.000	0.43		15.7	SURCHARGED	
11.000	DUMMY11	0.535	0.000	0.40		17.7	SURCHARGED	
11.001	PLOT RB_12a	0.627	0.000	0.12		3.5	SURCHARGED	

0.225m3 of permeable can be captured and discharged downstream of permeable structures - exceedance VNIF-ARP -CD-0019

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0.225m3 of flooding at permeable paving to be captured on-site and discharged to downstream permeable paving structures - refer to exceedance drawing VNIF-ARP-00-YYY-DR -CD-0019

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The Arup Campus Blyth Gate Solihull B90 8AE										
Date 27/09/2022 10:49 File Plateau West WS4 V8.MDX										
XP Solutions					Designed by Drew.Hunter Checked by Network 2020.1.3					
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm										
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
11.002	DUMMY12	15 Winter	100	+40%					37.828	0.000
10.004	S17W	15 Winter	100	+40%	100/15 Winter				38.425	0.631
10.005	S18W	15 Winter	100	+40%	100/15 Winter				38.389	0.707
10.006	S19W	15 Winter	100	+40%	100/15 Winter				38.354	0.784
1.010	S20W	15 Winter	100	+40%	30/15 Winter				38.299	1.051
12.000	DUMMY19	240 Winter	100	+40%	30/15 Winter				38.596	0.596
12.001	PLOTRE_01	240 Winter	100	+40%	30/15 Winter				38.590	0.644
12.002	DUMMY20	240 Winter	100	+40%					37.792	-0.131
1.011	S21W	15 Winter	100	+40%	30/15 Winter				37.754	0.692
13.000	DUMMY15	720 Winter	100	+40%	1/1440 Winter				37.639	1.339
13.001	PLOTRE_03	720 Winter	100	+40%	1/720 Winter				37.636	1.374
13.002	DUMMY16	15 Winter	100	+40%					36.235	0.000
14.000	DUMMY13	30 Winter	100	+40%	1/15 Winter				40.944	1.719
14.001	PLOTRE_04	240 Winter	100	+40%	1/15 Winter				40.650	1.465
14.002	DUMMY14	240 Winter	100	+40%					39.018	-0.140
14.003	S22W	15 Winter	100	+40%					38.996	-0.135
14.004	S23W	15 Winter	100	+40%					38.139	-0.128
13.003	S24W	15 Winter	100	+40%	1/15 Winter				37.639	1.321
13.004	S25W	15 Winter	100	+40%	1/15 Winter				37.604	1.510
13.005	S26W	15 Winter	100	+40%	1/15 Winter				37.567	1.602
15.000	DUMMY17	480 Winter	100	+40%	30/15 Winter				37.265	0.641
15.001	PLOTRE_02	480 Winter	100	+40%	1/240 Winter				37.259	0.690
15.002	DUMMY18	15 Winter	100	+40%					36.528	0.000
13.006	S27W	15 Winter	100	+40%	1/15 Winter				37.528	1.656
13.007	S28W	15 Winter	100	+40%	1/15 Winter				37.490	1.728
1.012	S29W	15 Winter	100	+40%	1/15 Winter				37.452	1.794
1.013	S30W	15 Winter	100	+40%	100/15 Winter				35.467	0.085
1.014	S31W	15 Winter	100	+40%	100/15 Winter				33.335	0.517
1.015	S32W	15 Winter	100	+40%	30/15 Winter				32.521	1.002
1.016	S33W	15 Winter	100	+40%	30/15 Winter				31.735	0.475
1.017	63	15 Winter	100	+40%					31.312	0.000
1.018	DUMMY08	30 Winter	100	+40%	100/15 Winter				31.263	0.056
1.019	S34W	60 Winter	100	+40%	1/30 Winter				31.374	1.866
16.000	S37W	15 Winter	100	+40%					36.797	-0.096
16.001	S38W	15 Winter	100	+40%					34.534	-0.066
16.002	S39W	15 Winter	100	+40%	100/15 Winter				33.355	0.758
16.003	S40W	60 Winter	100	+40%	100/15 Winter				32.264	0.768
16.004	S41W	60 Winter	100	+40%	1/15 Winter				32.253	1.528
16.005	S42W	60 Winter	100	+40%					30.523	-0.182
16.006	S43W	60 Winter	100	+40%					29.780	-0.156
17.000	DUMMY21	240 Winter	100	+40%	30/15 Winter				29.622	0.630
17.001	PLOTRE_08	240 Winter	100	+40%	30/30 Winter				29.618	0.680
17.002	S47W	240 Winter	100	+40%					28.673	-0.222
18.000	S50W	15 Winter	100	+40%	1/15 Winter				29.967	0.992
18.001	S51W	60 Winter	100	+40%	30/15 Winter				29.823	0.804
17.003	S48W	120 Winter	100	+40%					28.607	-0.168
19.000	DUMMY22W	30 Winter	100	+40%	30/15 Winter				30.393	0.527
19.001	PLOTRE_06	240 Winter	100	+40%	30/30 Winter				30.326	0.512
17.004	S49W	120 Winter	100	+40%					28.570	-0.114
16.007	S44W	120 Winter	100	+40%					28.548	-0.085
16.008	S45W	120 Winter	100	+40%	100/60 Winter				28.502	0.025
16.009	S46W	120 Winter	100	+40%	100/30 Winter				28.467	0.070
1.020	S35W	120 Winter	100	+40%	100/15 Winter				28.444	0.088
Flooded Half Drain Pipe US/MH Volume Flow / Overflow Time Flow Level PN Name (m³) Cap. (l/s) (mins) (l/s) Status Exceeded										
11.002	DUMMY12	0.000	0.15			4.4	SURCHARGED*			
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The Arup Campus Blyth Gate Solihull B90 8AE								
Date 27/09/2022 10:49				Designed by Drew.Hunter				
File Plateau West WS4 V8.MDX				Checked by				
XP Solutions				Network 2020.1.3				
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>								
PN	US/MH Name	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded	
10.004	S17W	0.000	0.75		28.5	SURCHARGED		
10.005	S18W	0.000	0.85		31.2	SURCHARGED		
10.006	S19W	0.000	0.89		33.9	SURCHARGED		
1.010	S20W	0.000	1.78		139.0	SURCHARGED		
12.000	DUMMY19	0.000	0.94		30.8	SURCHARGED		
12.001	PLOTRE_01	0.000	0.35		6.2	SURCHARGED		
12.002	DUMMY20	0.000	0.37		6.2	OK		
1.011	S21W	0.000	0.86		138.6	SURCHARGED		
13.000	DUMMY15	0.000	0.31		19.1	SURCHARGED		
13.001	PLOTRE_03	0.000	0.15		9.0	SURCHARGED		
13.002	DYMMY16	0.000	0.00		0.0	SURCHARGED*		
14.000	DUMMY13	0.000	3.98		118.9	SURCHARGED		
14.001	PLOTRE_04	0.000	0.31		9.1	SURCHARGED		
14.002	DUMMY14	0.000	0.31		9.1	OK*		
14.003	S22W	0.000	0.34		31.1	OK		
14.004	S23W	0.000	0.39		31.1	OK		
13.003	S24W	0.000	0.55		41.4	SURCHARGED		
13.004	S25W	0.000	0.64		35.9	SURCHARGED		
13.005	S26W	0.000	0.66		33.4	SURCHARGED		
15.000	DUMMY17	0.000	0.63		20.9	SURCHARGED		
15.001	PLOTRE_02	0.000	0.27		6.0	SURCHARGED		
15.002	DUMMY18	0.000	0.24		4.5	SURCHARGED*		
13.006	S27W	0.000	0.58		42.7	SURCHARGED		
13.007	S28W	0.000	0.55		40.2	SURCHARGED		
1.012	S29W	0.000	1.80		179.2	SURCHARGED		
1.013	S30W	0.000	1.05		179.1	SURCHARGED		
1.014	S31W	0.000	1.74		178.5	SURCHARGED		
1.015	S32W	0.000	1.75		178.2	SURCHARGED		
1.016	S33W	0.000	3.51		177.8	FLOOD RISK		
1.017	63	0.000	1.98		177.8	FLOOD RISK*		
1.018	DUMMY08	0.000	1.49		174.9	FLOOD RISK*		
1.019	S34W	0.000	1.32		58.2	FLOOD		
16.000	S37W	0.000	0.28		14.2	OK		
16.001	S38W	0.000	0.59		27.6	OK		
16.002	S39W	0.000	1.52		56.5	SURCHARGED		
16.003	S40W	0.000	0.78		42.5	SURCHARGED		
16.004	S41W	0.000	0.46	58	7.2	SURCHARGED		
16.005	S42W	0.000	0.08		7.2	OK		
16.006	S43W	0.000	0.20		7.2	OK		
17.000	DUMMY21	0.000	0.80		49.3	SURCHARGED		
17.001	PLOTRE_08	0.000	0.19		10.0	SURCHARGED		
17.002	S47W	0.000	0.15		10.0	OK		
18.000	S50W	0.000	4.81		32.8	SURCHARGED		
18.001	S51W	0.000	0.17	42	9.8	SURCHARGED		
17.003	S48W	0.000	0.31		19.7	OK		
19.000	DUMMY22W	0.000	3.08		99.1	SURCHARGED		
19.001	PLOTRE_06	0.000	0.12		7.9	SURCHARGED		
17.004	S49W	0.000	0.48		27.5	OK		
16.007	S44W	0.000	0.53		34.5	OK		
16.008	S45W	0.000	0.56		34.6	SURCHARGED		
16.009	S46W	0.000	0.62		34.6	SURCHARGED		
1.020	S35W	0.000	1.56		95.5	SURCHARGED*		

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0.0m3 so no flooding

NOTES:

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Ove Arup & Partners International Ltd									Page 38	
The Arup Campus Blyth Gate Solihull B90 8AE										
Date 27/09/2022 10:54										
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XP Solutions					Network 2020.1.3					
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</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 28 Number of Storage Structures 26 Number of Real Time Controls 0										
<u>Synthetic Rainfall Details</u>										
Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750										
Region England and Wales Ratio R 0.357 Cv (Winter) 0.840										
Margin for Flood Risk Warning (mm) 300.0										
Analysis Timestep 2.5 Second Increment (Extended)										
DTS Status OFF										
DVD Status OFF										
Inertia Status OFF										
Profile(s) Winter										
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 720, 1440										
Return Period(s) (years) 30										
Climate Change (%) 0										
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)
1.000	DUMMY01	1440 Winter	30	+0%	30/15 Winter				43.386	0.182
1.001	S1W	1440 Winter	30	+0%	30/15 Winter				43.376	0.341
1.002	S2W	1440 Winter	30	+0%	30/15 Winter				41.830	-0.135
2.000	DUMMY02	240 Winter	30	+0%	30/15 Winter				43.099	0.240
2.001	S3W	360 Winter	30	+0%	30/15 Winter				42.948	0.331
1.003	J1	360 Winter	30	+0%	30/15 Winter				41.654	-0.198
3.000	DUMMY03	240 Winter	30	+0%	30/15 Winter				42.678	0.219
3.001	S4W	360 Winter	30	+0%	30/15 Winter				42.563	0.300
1.004	S5W	360 Winter	30	+0%	30/15 Winter				41.337	-0.187
4.000	DUMMY04	1440 Winter	30	+0%	30/15 Winter				42.291	0.225
4.001	S6W	1440 Winter	30	+0%	30/15 Winter				42.277	0.371
1.005	J2	480 Winter	30	+0%	30/15 Winter				41.012	-0.186
5.000	DUMMY05	240 Winter	30	+0%	30/15 Winter				41.951	0.247
5.001	S7W	480 Winter	30	+0%	30/15 Winter				41.814	0.315
1.006	S8W	360 Winter	30	+0%	30/15 Winter				40.673	-0.179
6.000	DUMMY06	240 Winter	30	+0%	30/15 Winter				41.514	0.200
6.001	S9W	480 Winter	30	+0%	30/15 Winter				41.443	0.316
1.007	J3	360 Winter	30	+0%	30/15 Winter				40.347	-0.176
7.000	DUMMY07	720 Winter	30	+0%	30/15 Winter				41.153	0.214
7.001	S11W	480 Winter	30	+0%	30/15 Winter				41.135	0.272
1.008	S12W	360 Winter	30	+0%	30/15 Winter				40.046	-0.184
8.000	S13W	15 Winter	30	+0%	30/15 Winter				41.524	-0.136
9.000	DUMMY08	240 Winter	30	+0%	30/30 Winter				41.039	0.045
9.001	PLOT_RB12b	240 Winter	30	+0%	30/30 Winter				41.036	0.109
9.002	S36W	30 Winter	30	+0%	30/30 Winter				40.702	-0.144
8.001	S14W	15 Winter	30	+0%	30/30 Winter				40.726	-0.051
1.009	S15W	15 Winter	30	+0%	30/30 Winter				39.751	-0.086
10.000	DUMMY09	120 Winter	30	+0%	30/60 Winter				38.207	0.038
10.001	PLOTRE_11	120 Winter	30	+0%	30/30 Winter				38.205	0.097
10.002	DUMMY10	30 Winter	30	+0%	30/30 Winter				37.869	-0.185
10.003	S16W	15 Winter	30	+0%	30/30 Winter				37.854	-0.146
11.000	DUMMY11	120 Winter	30	+0%	30/60 Winter				38.069	0.102
11.001	PLOTRE_12a	120 Winter	30	+0%	30/15 Winter				38.066	0.196

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The Arup Campus Blyth Gate Solihull B90 8AE		
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	DUMMY01	0.000	0.50	832	0.4	SURCHARGED	
1.001	S1W	0.000	0.03	1620	0.3	SURCHARGED	
1.002	S2W	0.000	0.02		0.3	OK	
2.000	DUMMY02	0.000	0.93	217	0.7	SURCHARGED	
2.001	S3W	0.000	0.05	365	1.2	SURCHARGED	
1.003	J1	0.000	0.04		1.5	OK*	
3.000	DUMMY03	0.000	0.92	214	0.7	SURCHARGED	
3.001	S4W	0.000	0.05	340	1.2	SURCHARGED	
1.004	S5W	0.000	0.07		2.7	OK	
4.000	DUMMY04	0.000	0.55	918	0.4	SURCHARGED	
4.001	S6W	0.000	0.01		0.3	SURCHARGED	
1.005	J2	0.000	0.07		3.0	OK*	
5.000	DUMMY05	0.000	0.95	215	0.7	SURCHARGED	
5.001	S7W	0.000	0.04	469	0.8	SURCHARGED	
1.006	S8W	0.000	0.09		3.8	OK	
6.000	DUMMY06	0.000	0.90	244	0.6	SURCHARGED	
6.001	S9W	0.000	0.04	504	0.8	SURCHARGED	
1.007	J3	0.000	0.11		4.6	OK*	
7.000	DUMMY07	0.000	0.73	583	0.4	SURCHARGED	
7.001	S11W	0.000	0.02		0.5	SURCHARGED	
1.008	S12W	0.000	0.08		5.1	OK	
8.000	S13W	0.000	0.33		26.4	OK	
9.000	DUMMY08	0.000	0.43		13.9	SURCHARGED	
9.001	PLOT RB12b	0.000	0.08		3.3	SURCHARGED	
9.002	S36W	0.000	0.09		3.5	OK	
8.001	S14W	0.000	0.93		43.3	OK	
1.009	S15W	0.000	0.68		66.1	OK	
10.000	DUMMY09	0.000	0.41		14.3	SURCHARGED	
10.001	PLOT RB_11	0.000	0.07		2.2	SURCHARGED	
10.002	DUMMY10	0.000	0.07		2.2	OK*	
10.003	S16W	0.000	0.26		9.6	OK	
11.000	DUMMY11	0.000	0.35		15.3	SURCHARGED	
11.001	PLOT RB_12a	0.000	0.08		2.3	SURCHARGED	

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The Arup Campus Blyth Gate Solihull B90 8AE											
Date 27/09/2022 10:54 File Plateau West WS4 V8 sur...					Designed by Drew.Hunter Checked by						
XP Solutions					Network 2020.1.3						
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm											
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)	
11.002	DUMMY12	15 Winter	30	+0%					37.683	-0.145	
10.004	S17W	15 Winter	30	+0%					37.689	-0.106	
10.005	S18W	15 Winter	30	+0%					37.577	-0.105	
10.006	S19W	15 Winter	30	+0%					37.461	-0.109	
1.010	S20W	15 Winter	30	+0%	30/15 Winter				37.346	0.098	
12.000	DUMMY19	240 Winter	30	+0%	30/15 Winter				38.164	0.164	
12.001	FLOTRE_01	240 Winter	30	+0%	30/15 Winter				38.160	0.214	
12.002	DUMMY20	240 Winter	30	+0%					37.772	-0.151	
1.011	S21W	30 Winter	30	+0%	30/15 Winter				37.121	0.059	
13.000	DUMMY15	1440 Winter	30	+0%	30/30 Winter				36.681	0.381	
13.001	FLOTRE_03	1440 Winter	30	+0%	30/60 Winter				36.680	0.418	
13.002	DUMMY16	30 Winter	30	+0%					36.235	0.000	
14.000	DUMMY13	30 Winter	30	+0%	30/15 Winter				40.311	1.086	
14.001	FLOTRE_04	120 Winter	30	+0%	30/15 Winter				40.282	1.097	
14.002	DUMMY14	720 Winter	30	+0%					38.998	-0.160	
14.003	S22W	15 Winter	30	+0%					38.976	-0.155	
14.004	S23W	15 Winter	30	+0%					38.116	-0.151	
13.003	S24W	30 Winter	30	+0%	30/15 Winter				37.150	0.832	
13.004	S25W	30 Winter	30	+0%	30/15 Winter				37.125	1.030	
13.005	S26W	30 Winter	30	+0%	30/15 Winter				37.099	1.134	
15.000	DUMMY17	360 Winter	30	+0%	30/15 Winter				36.823	0.199	
15.001	FLOTRE_02	360 Winter	30	+0%	30/30 Winter				36.818	0.249	
15.002	DUMMY18	15 Winter	30	+0%					36.528	0.000	
13.006	S27W	30 Winter	30	+0%	30/15 Winter				37.074	1.201	
13.007	S28W	30 Winter	30	+0%	30/15 Winter				37.050	1.288	
1.012	S29W	30 Winter	30	+0%	30/15 Winter				37.026	1.368	
1.013	S30W	30 Winter	30	+0%					35.250	-0.131	
1.014	S31W	30 Winter	30	+0%					32.818	0.000	
1.015	S32W	30 Winter	30	+0%	30/15 Winter				31.670	0.151	
1.016	S33W	30 Winter	30	+0%	30/15 Winter				31.406	0.146	
1.017	63	30 Winter	30	+0%					31.312	0.000	
1.018	DUMMY08	120 Winter	30	+0%					31.164	-0.043	
1.019	S34W	120 Winter	30	+0%	30/15 Winter				31.159	1.651	
16.000	S37W	15 Winter	30	+0%					36.782	-0.111	
16.001	S38W	15 Winter	30	+0%					34.509	-0.091	
16.002	S39W	15 Winter	30	+0%					32.558	-0.039	
16.003	S40W	30 Winter	30	+0%					31.488	-0.008	
16.004	S41W	30 Winter	30	+0%	30/15 Winter				31.479	0.754	
16.005	S42W	720 Winter	30	+0%					30.632	-0.073	
16.006	S43W	720 Winter	30	+0%	30/240 Winter				30.629	0.693	
17.000	DUMMY21	720 Winter	30	+0%	30/15 Winter				30.743	1.751	
17.001	FLOTRE_08	720 Winter	30	+0%	30/30 Winter				30.742	1.804	
17.002	S47W	720 Winter	30	+0%	30/240 Winter				30.639	1.744	
18.000	S50W	720 Winter	30	+0%	30/15 Winter				30.664	1.689	
18.001	S51W	720 Winter	30	+0%	30/15 Winter				30.661	1.642	
17.003	S48W	720 Winter	30	+0%	30/240 Winter				30.634	1.859	
19.000	DUMMY22W	720 Winter	30	+0%	30/15 Winter				30.426	0.560	
19.001	FLOTRE_06	720 Winter	30	+0%	30/30 Winter				30.424	0.610	
17.004	S49W	720 Winter	30	+0%	30/240 Winter				30.628	1.944	
16.007	S44W	720 Winter	30	+0%	30/240 Winter				30.627	1.994	
16.008	S45W	720 Winter	30	+0%	30/240 Winter				30.625	2.148	
16.009	S46W	720 Winter	30	+0%	30/240 Winter				30.623	2.226	
1.020	S35W	240 Winter	30	+0%	30/240 Winter				30.191	1.835	
Flooded Half Drain Pipe											
PN	US/MH Name	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded			
11.002	DUMMY12	0.000	0.08			2.4	OK*				

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The Arup Campus Blyth Gate Solihull B90 8AE								
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XP Solutions				Network 2020.1.3				
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>								
PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
10.004	S17W	0.000	0.53			20.1	OK	
10.005	S18W	0.000	0.55			20.3	OK	
10.006	S19W	0.000	0.51			19.5	OK	
1.010	S20W	0.000	1.24			97.0	SURCHARGED	
12.000	DUMMY19	0.000	0.52			16.9	SURCHARGED	
12.001	PLOTRE_01	0.000	0.23			4.0	SURCHARGED	
12.002	DUMMY20	0.000	0.24			4.0	OK	
1.011	S21W	0.000	0.48			76.9	SURCHARGED	
13.000	DUMMY15	0.000	0.10			6.3	SURCHARGED	
13.001	PLOTRE_03	0.000	0.09			5.3	SURCHARGED	
13.002	DUMMY16	0.000	0.00			0.0	SURCHARGED*	
14.000	DUMMY13	0.000	2.19			65.5	SURCHARGED	
14.001	PLOTRE_04	0.000	0.18			5.5	SURCHARGED	
14.002	DUMMY14	0.000	0.18			5.5	OK*	
14.003	S22W	0.000	0.21			19.3	OK	
14.004	S23W	0.000	0.24			19.3	OK	
13.003	S24W	0.000	0.29			22.1	SURCHARGED	
13.004	S25W	0.000	0.37			20.5	SURCHARGED	
13.005	S26W	0.000	0.38			19.4	SURCHARGED	
15.000	DUMMY17	0.000	0.43			14.2	SURCHARGED	
15.001	PLOTRE_02	0.000	0.20			4.5	SURCHARGED	
15.002	DUMMY18	0.000	0.02			0.4	SURCHARGED*	
13.006	S27W	0.000	0.33			24.2	SURCHARGED	
13.007	S28W	0.000	0.33			23.7	SURCHARGED	
1.012	S29W	0.000	1.04			103.7	SURCHARGED	
1.013	S30W	0.000	0.61			103.8	OK	
1.014	S31W	0.000	1.00			102.9	OK	
1.015	S32W	0.000	1.01			103.0	SURCHARGED	
1.016	S33W	0.000	2.03			102.9	SURCHARGED	
1.017	63	0.000	1.14			102.7	FLOOD RISK*	
1.018	DUMMY08	0.000	0.58			68.1	OK*	
1.019	S34W	0.000	0.76			33.4	FLOOD RISK*	
16.000	S37W	0.000	0.15			7.9	OK	
16.001	S38W	0.000	0.33			15.3	OK	
16.002	S39W	0.000	0.89			33.1	OK	
16.003	S40W	0.000	0.66			35.9	OK	
16.004	S41W	0.000	0.45		25	7.0	SURCHARGED	
16.005	S42W	0.000	0.05			4.1	OK	
16.006	S43W	0.000	0.12			4.1	SURCHARGED	
17.000	DUMMY21	0.000	0.19			11.8	SURCHARGED	
17.001	PLOTRE_08	0.000	0.16			8.4	SURCHARGED	
17.002	S47W	0.000	0.13			8.7	FLOOD RISK	
18.000	S50W	0.000	0.23			1.6	SURCHARGED	
18.001	S51W	0.000	0.08		276	4.7	SURCHARGED	
17.003	S48W	0.000	0.19			11.9	SURCHARGED	
19.000	DUMMY22W	0.000	0.29			9.2	SURCHARGED	
19.001	PLOTRE_06	0.000	0.12			7.9	SURCHARGED	
17.004	S49W	0.000	0.33			18.8	SURCHARGED	
16.007	S44W	0.000	0.29			18.9	SURCHARGED	
16.008	S45W	0.000	0.39			23.9	SURCHARGED	
16.009	S46W	0.000	0.61			34.1	SURCHARGED	
1.020	S35W	0.000	0.93			57.3	FLOOD	5

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0.0m3 so no flooding

Job number 282022
Date 02 September 2022

A.2 Appendix B Plateau East Surface Water Modelling Report

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Page 4: Outfall Details

Page 5: Surcharged Outfall Details

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Page 21: 100-Year Summary Results

Stage 4 Hydraulic Modelling Summary - Plateau East
Victoria North Infrastructure Works
2 August 2022

- NOTES:
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File WS4_Plateau East V5.MDX	Checked by	
XP Solutions	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales			
Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	40
Ratio R	0.357	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)	150

Designed with Level Soffits

Network Design Table for Storm

« - 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	20.492	0.150	136.6	0.055	8.00	0.0	1.130	o	-4	Pipe/Conduit	⚠
1.001	13.683	0.544	25.2	0.049	0.00	0.0	1.130	o	100	Pipe/Conduit	⚠
1.002	25.502	0.229	111.4	0.000	0.00	0.0	1.130	o	225	Pipe/Conduit	⚠
2.000	24.811	0.210	118.1	0.026	8.00	0.0	0.600	o	-4	Pipe/Conduit	⚠
2.001	1.271	0.496	2.6	0.052	0.00	0.0	1.130	o	100	Pipe/Conduit	⚠
1.003	44.985	0.350	128.5	0.000	0.00	0.0	1.130	o	225	Pipe/Conduit	⚠
3.000	18.976	0.076	249.7	0.047	8.00	0.0	1.130	o	-4	Pipe/Conduit	⚠
3.001	3.909	0.609	6.4	0.055	0.00	0.0	0.600	o	100	Pipe/Conduit	⚠
1.004	9.598	0.056	171.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	⚠
4.000	30.876	0.219	141.0	0.027	8.00	0.0	1.130	o	-4	Pipe/Conduit	⚠
4.001	31.068	0.219	141.9	0.052	0.00	0.0	1.130	o	-4	Pipe/Conduit	⚠

-4 represents 50mm pipe to act as restrictions from permeable paving

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	35.50	8.93	42.905	0.055	0.0	0.0	2.1	0.37	0.7	7.3
1.001	35.17	9.09	42.705	0.103	0.0	0.0	3.9	1.40	11.0	13.8
1.002	34.43	9.46	42.036	0.103	0.0	0.0	3.9	1.13	45.1	13.8
2.000	35.48	8.94	42.695	0.026	0.0	0.0	1.0	0.44	0.9	3.5
2.001	35.47	8.94	42.435	0.078	0.0	0.0	3.0	4.39	34.5	10.4
1.003	33.13	10.17	41.807	0.181	0.0	0.0	6.5	1.06	42.0	22.7
3.000	35.01	9.17	42.317	0.047	0.0	0.0	1.8	0.27	0.5	6.2
3.001	34.97	9.19	42.191	0.101	0.0	0.0	3.8	3.07	24.1	13.4
1.004	32.90	10.31	41.382	0.282	0.0	0.0	10.1	1.20	84.7	35.2
4.000	34.52	9.42	42.607	0.027	0.0	0.0	1.0	0.36	0.7	3.5
4.001	31.99	10.85	42.388	0.079	0.0	0.0	2.7	0.36	0.7	9.6

- NOTES:
- Unadopted network indicated by **green** highlighted entries
 - Pipe numbers may differ from drawings due to dummy pipes included for modelling
 - On-plot pipes and flow controls are redacted as Arup are not providing on-plot design. Assumed storage volumes and results for on-plot sections are not redacted

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The Arup Campus Blyth Gate Solihull B90 8AE		
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XP Solutions	Network 2020.1.3	

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
4.002	1.384	0.593	2.3	0.056	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.005	62.764	0.365	172.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.006	6.872	0.055	124.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.000	29.055	0.210	138.4	0.057	8.00	0.0	1.130	o	4	Pipe/Conduit	
5.001	28.936	0.219	132.1	0.060	0.00	0.0	1.130	o	100	Pipe/Conduit	
5.002	9.701	0.594	16.3	0.063	0.00	0.0	0.600	o	100	Pipe/Conduit	
6.000				0.366	15.00						
6.001				0.000	0.00						
6.002	12.176	0.151	80.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.007	7.516	0.041	183.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.008	21.182	0.140	151.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
7.000				0.407	15.00						
7.001				0.000	0.00						
7.002	8.640	0.119	72.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
7.003	31.396	0.232	135.3	0.068	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.009	21.992	0.110	199.9	0.056	0.00	0.0	0.600	o	450	Pipe/Conduit	
8.000				0.239	15.00						
8.001				0.000	0.00						
8.002	5.368	0.065	83.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.010	14.615	0.086	169.9	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)
4.002	31.98	10.86	42.119	0.135	0.0	0.0	4.7	5.10	40.1	16.3
1.005	30.64	11.73	41.326	0.417	0.0	0.0	13.8	1.20	84.5	48.4
1.006	30.52	11.81	40.962	0.417	0.0	0.0	13.8	1.41	99.3	48.4
5.000	34.71	9.32	43.142	0.057	0.0	0.0	2.1	0.37	0.74	7.4
5.001	33.23	10.12	42.929	0.116	0.0	0.0	4.2	0.61	4.84	14.7
5.002	33.08	10.20	42.710	0.179	0.0	0.0	6.4	1.92	15.14	22.5
6.000										
6.001										
6.002	26.44	15.31	41.133	0.366	0.0	0.0	10.6	1.46	57.9	37.0
1.007	26.35	15.41	40.832	0.962	0.0	0.0	27.5	1.33	147.4	96.1
1.008	26.12	15.65	40.791	0.962	0.0	0.0	27.5	1.47	162.4	96.1
7.000										
7.001										
7.002	26.53	15.23	40.062	0.407	0.0	0.0	11.8	1.54	61.1	41.2
7.003	26.08	15.69	39.943	0.475	0.0	0.0	13.4	1.12	44.64	47.0
1.009	25.84	15.95	39.486	1.493	0.0	0.0	41.8	1.43	228.1	146.3
8.000										
8.001										
8.002	26.57	15.18	40.666	0.239	0.0	0.0	6.9	1.44	57.1	24.2
1.010	25.70	16.11	39.376	1.732	0.0	0.0	48.2	1.56	247.6	168.8

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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)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.011	31.314	0.137	228.6	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
1.012	28.578	0.326	87.7	0.015	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.013	22.057	0.735	30.0	0.026	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.014	20.749	0.883	23.5	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.015	15.969	0.526	30.4	0.015	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.016	7.074	0.147	48.1	0.012	0.00	0.0	0.600	o	300	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)
1.011	25.44	16.39	38.990	1.732	0.0	0.0	48.2	1.85	815.9	168.8
1.012	25.19	16.67	38.853	1.747	0.0	0.0	48.2	1.68	118.8«	168.8
1.013	25.08	16.80	36.715	1.774	0.0	0.0	48.2	2.88	203.6	168.8
1.014	24.99	16.91	34.480	1.791	0.0	0.0	48.5	3.26	230.2	169.7
1.015	24.91	17.00	32.273	1.805	0.0	0.0	48.7	2.86	202.4	170.5
1.016	24.87	17.05	31.747	1.817	0.0	0.0	49.0	2.27	160.7«	171.3

Pipe sizes are based on restricted flow rates provided by flow controls within the network

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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	0.055	0.055	0.055
1.001	User	-	100	0.049	0.049	0.049
1.002	-	-	100	0.000	0.000	0.000
2.000	User	-	100	0.026	0.026	0.026
2.001	User	-	100	0.052	0.052	0.052
1.003	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.047	0.047	0.047
3.001	User	-	100	0.055	0.055	0.055
1.004	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.027	0.027	0.027
4.001	User	-	100	0.052	0.052	0.052
4.002	User	-	100	0.056	0.056	0.056
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
5.000	User	-	100	0.057	0.057	0.057
5.001	User	-	100	0.060	0.060	0.060
5.002	User	-	100	0.063	0.063	0.063
6.000	User	-	100	0.366	0.366	0.366
6.001	-	-	100	0.000	0.000	0.000
6.002	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
7.000	User	-	100	0.407	0.407	0.407
7.001	-	-	100	0.000	0.000	0.000
7.002	-	-	100	0.000	0.000	0.000
7.003	User	-	100	0.068	0.068	0.068
1.009	User	-	100	0.056	0.056	0.056
8.000	User	-	100	0.239	0.239	0.239
8.001	-	-	100	0.000	0.000	0.000
8.002	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.000	0.000	0.000
1.012	User	-	100	0.015	0.015	0.015
1.013	User	-	100	0.026	0.026	0.026
1.014	User	-	100	0.017	0.017	0.017
1.015	User	-	100	0.015	0.015	0.015
1.016	User	-	100	0.012	0.012	0.012
				Total	Total	Total
				1.817	1.817	1.817

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	----------	--------

1.016 32.000 31.600 0.000 0 0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
5	29.730	40	29.720	75	29.730	110	29.750	145	29.770	180	29.790	215	29.870
10	29.730	45	29.720	80	29.730	115	29.750	150	29.770	185	29.800	220	29.890
15	29.730	50	29.720	85	29.740	120	29.750	155	29.770	190	29.810	225	29.910
20	29.720	55	29.720	90	29.740	125	29.750	160	29.780	195	29.820	230	29.930
25	29.720	60	29.730	95	29.740	130	29.760	165	29.780	200	29.830	235	29.950
30	29.720	65	29.730	100	29.740	135	29.760	170	29.780	205	29.840	240	29.970
35	29.720	70	29.730	105	29.740	140	29.760	175	29.790	210	29.860	245	29.990

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Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
250	30.020	355	30.830	460	31.470	565	31.520	670	31.130	775	30.640	880	30.350
255	30.040	360	30.880	465	31.490	570	31.510	675	31.100	780	30.630	885	30.340
260	30.070	365	30.920	470	31.500	575	31.500	680	31.060	785	30.610	890	30.330
265	30.100	370	30.970	475	31.510	580	31.490	685	31.060	790	30.600	895	30.320
270	30.130	375	31.010	480	31.520	585	31.480	690	31.000	795	30.580	900	30.310
275	30.160	380	31.040	485	31.530	590	31.460	695	30.970	800	30.570	905	30.300
280	30.190	385	31.050	490	31.540	595	31.450	700	30.940	805	30.550	910	30.290
285	30.220	390	31.090	495	31.540	600	31.440	705	30.910	810	30.540	915	30.280
290	30.260	395	31.130	500	31.550	605	31.420	710	30.890	815	30.520	920	30.260
295	30.300	400	31.180	505	31.550	610	31.410	715	30.870	820	30.510	925	30.250
300	30.340	405	31.220	510	31.550	615	31.390	720	30.850	825	30.490	930	30.240
305	30.380	410	31.250	515	31.550	620	31.370	725	30.820	830	30.480	935	30.230
310	30.430	415	31.280	520	31.550	625	31.350	730	30.800	835	30.470	940	30.220
315	30.470	420	31.310	525	31.550	630	31.330	735	30.790	840	30.450	945	30.210
320	30.510	425	31.300	530	31.550	635	31.310	740	30.770	845	30.440	950	30.200
325	30.560	430	31.340	535	31.550	640	31.280	745	30.750	850	30.430	955	30.190
330	30.610	435	31.370	540	31.540	645	31.260	750	30.730	855	30.410	960	30.190
335	30.660	440	31.390	545	31.540	650	31.230	755	30.710	860	30.400		
340	30.700	445	31.410	550	31.540	655	31.200	760	30.690	865	30.390		
345	30.750	450	31.430	555	31.530	660	31.180	765	30.680	870	30.380		
350	30.790	455	31.450	560	31.520	665	31.170	770	30.660	875	30.370		

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	13	Number of Storage Structures	15	Number of Real Time Controls	0

Synthetic Rainfall Details

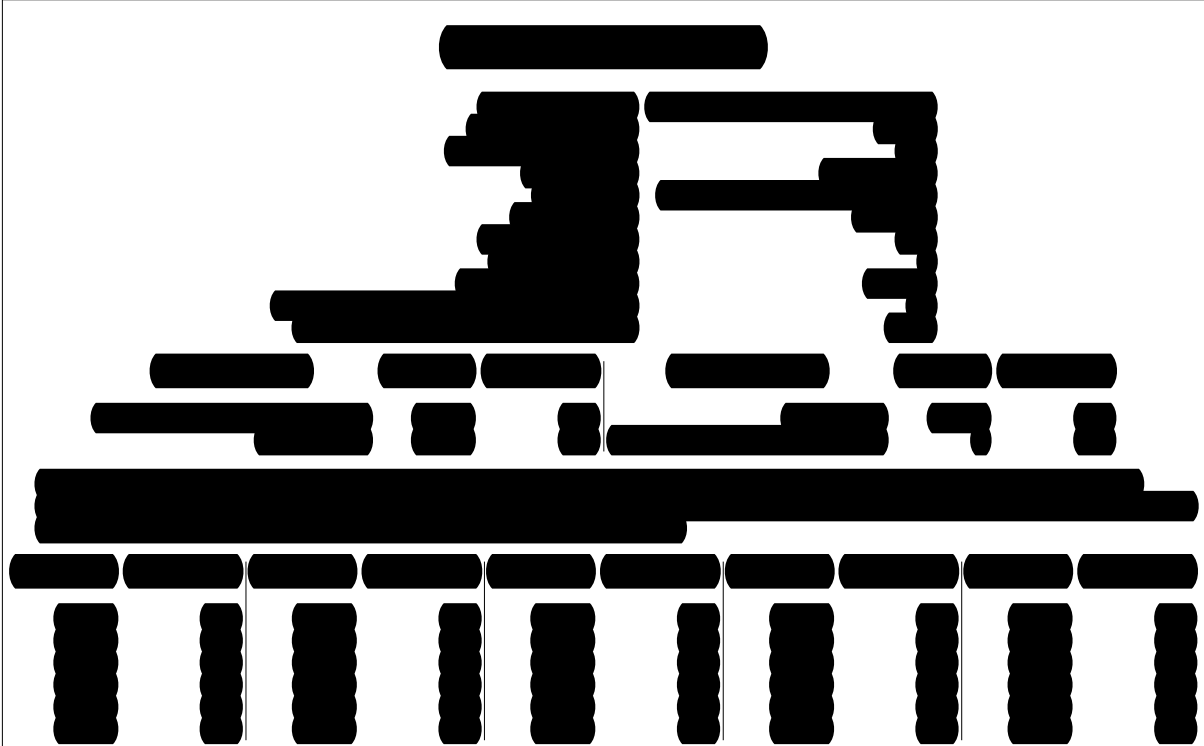
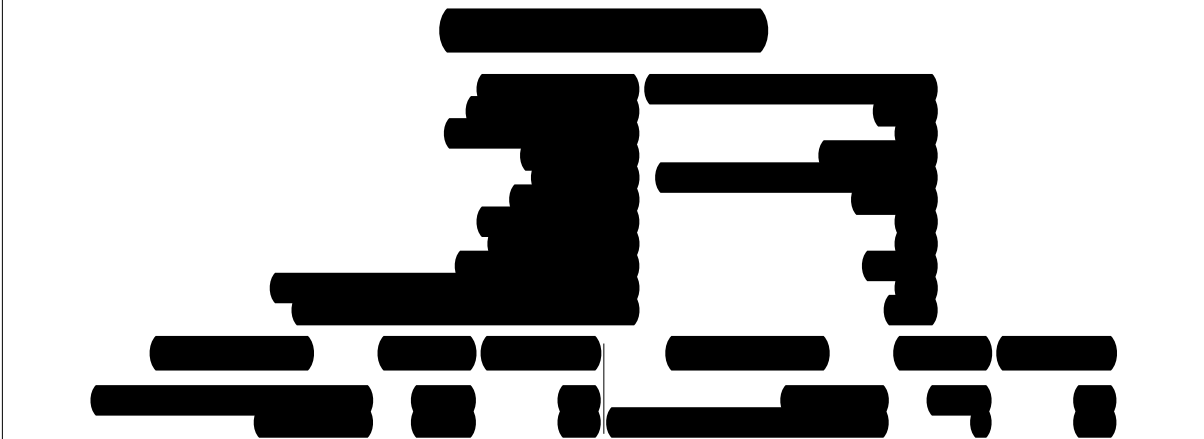
Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840

NOTES:

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The Arup Campus Blyth Gate Solihull B90 8AE		
Date 27/09/2022 10:56 File WS4_Plateau East V5.MDX	Designed by Drew.Hunter Checked by	
XP Solutions	Network 2020.1.3	
Online Controls for Storm		
Orifice Manhole: S1E, DS/PN: 1.001, Volume (m³): 0.8		
Diameter (m) 0.015 Discharge Coefficient 0.600 Invert Level (m) 42.705		
Orifice Manhole: S4E, DS/PN: 2.001, Volume (m³): 0.8		
Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 42.483		
Orifice Manhole: S5E, DS/PN: 3.001, Volume (m³): 0.8		
Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 42.195		
Orifice Manhole: S7E, DS/PN: 4.002, Volume (m³): 1.0		
Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 42.119		
Orifice Manhole: S10E, DS/PN: 5.002, Volume (m³): 0.9		
Diameter (m) 0.030 Discharge Coefficient 0.600 Invert Level (m) 42.710		
Complex Manhole: PLOTRB_05a, DS/PN: 6.001,		

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XP Solutions	Network 2020.1.3	
 Non Return Valve Manhole: DUMMY07, DS/PN: 6.002 Complex Manhole: PLOTRB_05c, DS/PN: 7.001  than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated		
		

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<u>Storage Structures for Storm</u> <u>Porous Car Park Manhole: DUMMY01, DS/PN: 1.000</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>11.1</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>5000</td><td>Length (m)</td><td>29.7</td></tr><tr><td>Max Percolation (1/s)</td><td>457.9</td><td>Slope (1:X)</td><td>141.9</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>42.953</td><td>Cap Volume Depth (m)</td><td>0.500</td></tr></table> <u>Porous Car Park Manhole: S1E, DS/PN: 1.001</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>8.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>27.0</td></tr><tr><td>Max Percolation (1/s)</td><td>60.0</td><td>Slope (1:X)</td><td>141.9</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>42.761</td><td>Cap Volume Depth (m)</td><td>0.500</td></tr></table> <u>Porous Car Park Manhole: DUMMY02, DS/PN: 2.000</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>6.4</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>5000</td><td>Length (m)</td><td>8.7</td></tr><tr><td>Max Percolation (1/s)</td><td>77.3</td><td>Slope (1:X)</td><td>110.5</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>42.746</td><td>Cap Volume Depth (m)</td><td>0.500</td></tr></table> <u>Porous Car Park Manhole: S4E, DS/PN: 2.001</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width 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(m)</td><td>42.335</td><td>Cap Volume Depth (m)</td><td>0.500</td></tr></table> <u>Porous Car Park Manhole: S5E, DS/PN: 3.001</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>4.4</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>5000</td><td>Length (m)</td><td>24.1</td></tr><tr><td>Max Percolation (1/s)</td><td>147.3</td><td>Slope (1:X)</td><td>207.7</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>42.245</td><td>Cap Volume Depth (m)</td><td>0.500</td></tr></table>			Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.1	Membrane Percolation (mm/hr)	5000	Length (m)	29.7	Max Percolation (1/s)	457.9	Slope (1:X)	141.9	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	42.953	Cap Volume Depth (m)	0.500	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.0	Membrane Percolation (mm/hr)	1000	Length (m)	27.0	Max Percolation (1/s)	60.0	Slope (1:X)	141.9	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	42.761	Cap Volume Depth (m)	0.500	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.4	Membrane Percolation (mm/hr)	5000	Length (m)	8.7	Max Percolation (1/s)	77.3	Slope (1:X)	110.5	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	42.746	Cap Volume Depth (m)	0.500	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.4	Membrane Percolation (mm/hr)	5000	Length (m)	23.7	Max Percolation (1/s)	243.6	Slope (1:X)	110.5	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	42.533	Cap Volume Depth (m)	0.500	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.7	Membrane Percolation (mm/hr)	5000	Length (m)	22.8	Max Percolation (1/s)	338.8	Slope (1:X)	207.7	Safety 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©1982-2020 Innovyze																																																																																																																																																		

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(mm/hr)</td><td>5000</td><td>Length (m)</td><td>29.7</td></tr><tr><td>Max Percolation (l/s)</td><td>226.9</td><td>Slope (1:X)</td><td>138.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>43.180</td><td>Cap Volume Depth (m)</td><td>0.500</td></tr></table> Porous Car Park Manhole: DUMMY08, DS/PN: 5.001 <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>9.5</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>5000</td><td>Length (m)</td><td>29.1</td></tr><tr><td>Max Percolation (l/s)</td><td>384.0</td><td>Slope (1:X)</td><td>138.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>42.969</td><td>Cap Volume Depth 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(m/hr)	0.00000	Width (m)	8.2	Membrane Percolation (mm/hr)	5000	Length (m)	29.5	Max Percolation (l/s)	336.0	Slope (1:X)	134.6	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	42.388	Cap Volume Depth (m)	0.500	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.8	Membrane Percolation (mm/hr)	1000	Length (m)	30.5	Max Percolation (l/s)	66.1	Slope (1:X)	139.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	42.169	Cap Volume Depth (m)	0.500	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.5	Membrane Percolation (mm/hr)	5000	Length (m)	29.7	Max Percolation (l/s)	226.9	Slope (1:X)	138.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	43.180	Cap Volume Depth (m)	0.500	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.5	Membrane Percolation (mm/hr)	5000	Length (m)	29.1	Max Percolation (l/s)	384.0	Slope (1:X)	138.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	42.969	Cap Volume Depth (m)	0.500	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.7	Membrane Percolation (mm/hr)	5000	Length (m)	29.7	Max Percolation (l/s)	358.9	Slope (1:X)	130.3	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	42.743	Cap Volume Depth (m)	0.500
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Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.7																																																																																																																																															
Membrane Percolation (mm/hr)	5000	Length (m)	29.7																																																																																																																																															
Max Percolation (l/s)	358.9	Slope (1:X)	130.3																																																																																																																																															
Safety Factor	2.0	Depression Storage (mm)	5																																																																																																																																															
Porosity	0.30	Evaporation (mm/day)	3																																																																																																																																															
Invert Level (m)	42.743	Cap Volume Depth (m)	0.500																																																																																																																																															
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Network 2020.1.3																																						
Tank or Pond Manhole: PLOTRB_05a, DS/PN: 6.001 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>150.0</td><td>1.000</td><td>150.0</td><td>1.001</td><td>0.0</td></tr></table> Tank or Pond Manhole: PLOTRB_05c, DS/PN: 7.001 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>180.0</td><td>1.000</td><td>180.0</td><td>1.001</td><td>0.0</td></tr></table> Tank or Pond Manhole: PLOTRB_05b, DS/PN: 8.001 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>180.0</td><td>1.000</td><td>180.0</td><td>1.001</td><td>0.0</td></tr></table> Assumed on-plot s volumes			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	150.0	1.000	150.0	1.001	0.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	180.0	1.000	180.0	1.001	0.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	180.0	1.000	180.0	1.001	0.0
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																	
0.000	150.0	1.000	150.0	1.001	0.0																																	
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																	
0.000	180.0	1.000	180.0	1.001	0.0																																	
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																	
0.000	180.0	1.000	180.0	1.001	0.0																																	
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<u>1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>									
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 13 Number of Storage Structures 15 Number of Real Time Controls 0									
Synthetic Rainfall Details									
Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750									
Region England and Wales Ratio R 0.357 Cv (Winter) 0.840									
Margin for Flood Risk Warning (mm) 300.0									
Analysis Timestep 2.5 Second Increment (Extended)									
DTS Status OFF									
DVD Status OFF									
Inertia Status OFF									
Profile(s) Winter									
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 720, 1440									
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)
1.000	DUMMY01	120 Winter	1	+0%	1/15 Winter				43.050
1.001	S1E	720 Winter	1	+0%	1/15 Winter				43.017
1.002	S2E	720 Winter	1	+0%					42.043
2.000	DUMMY02	30 Winter	1	+0%	1/15 Winter				42.826
2.001	S4E	240 Winter	1	+0%	1/15 Winter	100/240 Winter			42.734
1.003	J1	240 Winter	1	+0%					41.829
3.000	DUMMY03	120 Winter	1	+0%	1/15 Winter				42.425
3.001	S5E	120 Winter	1	+0%	1/15 Winter				42.390
1.004	S6E	240 Winter	1	+0%					41.417
4.000	DUMMY05	60 Winter	1	+0%	1/15 Winter				42.691
4.001	DUMMY04	240 Winter	1	+0%	1/15 Winter				42.555
4.002	S7E	480 Winter	1	+0%	1/15 Winter				42.392
1.005	J2	240 Winter	1	+0%					41.360
1.006	S8E	240 Winter	1	+0%					41.001
5.000	DUMMY09	60 Winter	1	+0%	1/15 Winter				43.326
5.001	DUMMY08	360 Winter	1	+0%	1/240 Winter				43.040
5.002	S10E	360 Winter	1	+0%	1/15 Winter				43.026
6.000	DUMMY06	30 Winter	1	+0%	30/15 Winter				41.416
6.001	PLOTRB_05a	120 Winter	1	+0%	30/15 Winter				41.393
6.002	DUMMY07	120 Winter	1	+0%					41.180
1.007	S9E	240 Winter	1	+0%					40.904
1.008	S11E	240 Winter	1	+0%					40.851
7.000	DUMMY10	30 Winter	1	+0%	30/15 Winter				40.416
7.001	PLOTRB_05c	120 Winter	1	+0%	30/15 Winter				40.327
7.002	DUMMY11	120 Winter	1	+0%					40.111
7.003	S20E	60 Winter	1	+0%	100/30 Winter				40.006
1.009	S12E	120 Winter	1	+0%	30/120 Winter				39.577
8.000	DUMMY12	30 Winter	1	+0%	30/240 Winter				40.887
8.001	PLOTRB_05b	240 Winter	1	+0%	30/60 Winter				40.822
8.002	DUMMY13	240 Winter	1	+0%					40.710
1.010	S13E	120 Winter	1	+0%	30/120 Winter				39.477
1.011	S14E	240 Winter	1	+0%	30/60 Winter				39.355
1.012	S15E	240 Winter	1	+0%	1/60 Winter				39.353
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XP Solutions				Network 2020.1.3										
<u>30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</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 13 Number of Storage Structures 15 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750 Region England and Wales Ratio R 0.357 Cv (Winter) 0.840 Margin for Flood Risk Warning (mm) 300.0 Analysis Timestep 2.5 Second Increment (Extended) DTS Status OFF DVD Status OFF Inertia Status OFF Profile(s) Winter Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 720, 1440 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)					
1.000	DUMMY01	720 Winter	30	+0%	1/15 Winter				43.188					
1.001	S1E	720 Winter	30	+0%	1/15 Winter				43.175					
1.002	S2E	720 Winter	30	+0%					42.044					
2.000	DUMMY02	120 Winter	30	+0%	1/15 Winter				42.986					
2.001	S4E	240 Winter	30	+0%	1/15 Winter	100/240 Winter			42.903					
1.003	J1	360 Winter	30	+0%					41.831					
3.000	DUMMY03	240 Winter	30	+0%	1/15 Winter				42.555					
3.001	S5E	120 Winter	30	+0%	1/15 Winter				42.555					
1.004	S6E	240 Winter	30	+0%					41.421					
4.000	DUMMY05	120 Winter	30	+0%	1/15 Winter				42.828					
4.001	DUMMY04	360 Winter	30	+0%	1/15 Winter				42.704					
4.002	S7E	720 Winter	30	+0%	1/15 Winter				42.541					
1.005	J2	240 Winter	30	+0%					41.364					
1.006	S8E	240 Winter	30	+0%					41.007					
5.000	DUMMY09	120 Winter	30	+0%	1/15 Winter				43.488					
5.001	DUMMY08	480 Winter	30	+0%	1/240 Winter				43.212					
5.002	S10E	480 Winter	30	+0%	1/15 Winter				43.196					
6.000	DUMMY06	120 Winter	30	+0%	30/15 Winter				41.744					
6.001	FLOTRE_05a	240 Winter	30	+0%	30/15 Winter				41.740					
6.002	DUMMY07	360 Winter	30	+0%					41.180					
1.007	S9E	720 Winter	30	+0%					40.908					
1.008	S11E	720 Winter	30	+0%					40.854					
7.000	DUMMY10	240 Winter	30	+0%	30/15 Winter				40.654					
7.001	FLOTRE_05c	240 Winter	30	+0%	30/15 Winter				40.649					
7.002	DUMMY11	360 Winter	30	+0%					40.114					
7.003	S20E	360 Winter	30	+0%	100/30 Winter				40.093					
1.009	S12E	360 Winter	30	+0%	30/120 Winter				40.075					
8.000	DUMMY12	240 Winter	30	+0%	30/240 Winter				41.017					
8.001	FLOTRE_05b	240 Winter	30	+0%	30/60 Winter				41.014					
8.002	DUMMY13	360 Winter	30	+0%					40.710					
1.010	S13E	360 Winter	30	+0%	30/120 Winter				40.069					
1.011	S14E	360 Winter	30	+0%	30/60 Winter				40.062					
1.012	S15E	360 Winter	30	+0%	1/60 Winter				40.059					

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.013	S16E	15 Winter	30	+0%					36.789	-0.226
1.014	S17E	15 Winter	30	+0%					34.557	-0.223
1.015	S18E	30 Winter	30	+0%	100/15 Winter				32.447	-0.126
1.016	S19E	30 Winter	30	+0%	30/15 Winter				32.427	0.380

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.013	S16E	0.000	0.14			24.6	OK	
1.014	S17E	0.000	0.15			30.1	OK	
1.015	S18E	0.000	0.18			30.1	OK	
1.016	S19E	0.000	0.25			23.9	SURCHARGED	

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The Arup Campus Blyth Gate Solihull B90 8AE																																							
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XP Solutions				Network 2020.1.3																																			
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u> <u>Simulation Criteria</u> <table><tr><td>Areal Reduction Factor</td><td>1.000</td><td>Additional Flow - % of Total Flow</td><td>0.000</td></tr><tr><td>Hot Start (mins)</td><td>0</td><td>MADD Factor * 10m³/ha Storage</td><td>2.000</td></tr><tr><td>Hot Start Level (mm)</td><td>0</td><td>Inlet Coefficient</td><td>0.800</td></tr><tr><td>Manhole Headloss Coeff (Global)</td><td>0.500</td><td>Flow per Person per Day (l/per/day)</td><td>0.000</td></tr><tr><td>Foul Sewage per hectare (l/s)</td><td>0.000</td><td></td><td></td></tr></table> Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 13 Number of Storage Structures 15 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> <table><tr><td>Rainfall Model</td><td>FSR M5-60 (mm)</td><td>18.000</td><td>Cv (Summer)</td><td>0.750</td></tr><tr><td>Region England and Wales</td><td>Ratio R</td><td>0.357</td><td>Cv (Winter)</td><td>0.840</td></tr></table> Margin for Flood Risk Warning (mm) 300.0 Analysis Timestep 2.5 Second Increment (Extended) DTS Status OFF DVD Status OFF Inertia Status OFF Profile(s) Winter Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 720, 1440 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.										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			Rainfall Model	FSR M5-60 (mm)	18.000	Cv (Summer)	0.750	Region England and Wales	Ratio R	0.357	Cv (Winter)	0.840
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																																						
Rainfall Model	FSR M5-60 (mm)	18.000	Cv (Summer)	0.750																																			
Region England and Wales	Ratio R	0.357	Cv (Winter)	0.840																																			
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)																														
1.000	DUMMY01	1440 Winter	100	+40%	1/15 Winter				43.441																														
1.001	S1E	1440 Winter	100	+40%	1/15 Winter				43.427																														
1.002	S2E	1440 Winter	100	+40%					42.046																														
2.000	DUMMY02	240 Winter	100	+40%	1/15 Winter				43.353																														
2.001	S4E	240 Winter	100	+40%	1/15 Winter	100/240 Winter			43.282																														
1.003	J1	360 Winter	100	+40%					41.835																														
3.000	DUMMY03	240 Winter	100	+40%	1/15 Winter				42.775																														
3.001	S5E	120 Winter	100	+40%	1/15 Winter				42.938																														
1.004	S6E	120 Winter	100	+40%					41.428																														
4.000	DUMMY05	120 Winter	100	+40%	1/15 Winter				43.073																														
4.001	DUMMY04	480 Winter	100	+40%	1/15 Winter				42.962																														
4.002	S7E	720 Winter	100	+40%	1/15 Winter				42.791																														
1.005	J2	120 Winter	100	+40%					41.370																														
1.006	S8E	240 Winter	100	+40%					41.123																														
5.000	DUMMY09	240 Winter	100	+40%	1/15 Winter				43.776																														
5.001	DUMMY08	480 Winter	100	+40%	1/240 Winter				43.498																														
5.002	S10E	480 Winter	100	+40%	1/15 Winter				43.479																														
6.000	DUMMY06	240 Winter	100	+40%	30/15 Winter				43.378																														
6.001	PLOTRE_05a	240 Winter	100	+40%	30/15 Winter				43.371																														
6.002	DUMMY07	240 Winter	100	+40%					41.195																														
1.007	S9E	240 Winter	100	+40%					41.121																														
1.008	S11E	240 Winter	100	+40%					41.117																														
7.000	DUMMY10	240 Winter	100	+40%	30/15 Winter				42.295																														
7.001	PLOTRE_05c	240 Winter	100	+40%	30/15 Winter				42.286																														
7.002	DUMMY11	30 Winter	100	+40%					40.287																														
7.003	S20E	240 Winter	100	+40%	100/30 Winter				41.132																														
1.009	S12E	240 Winter	100	+40%	30/120 Winter				41.108																														
8.000	DUMMY12	240 Winter	100	+40%	30/240 Winter				41.365																														
8.001	PLOTRE_05b	240 Winter	100	+40%	30/60 Winter				41.363																														
8.002	DUMMY13	120 Winter	100	+40%					40.891																														

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	DUMMY01	0.486	0.000	0.49		1300	0.4	FLOOD RISK	
1.001	S1E	0.622	0.000	0.04			0.4	FLOOD RISK	
1.002	S2E	-0.215	0.000	0.01			0.4	OK	
2.000	DUMMY02	0.608	0.000	0.84		213	0.7	FLOOD RISK	
2.001	S4E	0.747	0.326	0.06			1.2	FLOOD	1
1.003	J1	-0.197	0.000	0.04			1.5	OK*	
3.000	DUMMY03	0.408	0.000	1.62			0.9	SURCHARGED	
3.001	S5E	0.647	0.000	0.11		136	2.2	FLOOD RISK	
1.004	S6E	-0.254	0.000	0.06			3.5	OK	
4.000	DUMMY05	0.416	0.000	1.06			0.8	SURCHARGED	
4.001	DUMMY04	0.524	0.000	0.97			0.7	FLOOD RISK	
4.002	S7E	0.572	0.000	0.05			1.1	FLOOD RISK	
1.005	J2	-0.256	0.000	0.05			4.4	OK*	
1.006	S8E	-0.139	0.000	0.09			5.4	OK	
5.000	DUMMY09	0.584	0.000	1.33			0.9	FLOOD RISK	
5.001	DUMMY08	0.469	0.000	0.38		484	1.8	FLOOD RISK	
5.002	S10E	0.669	0.000	0.12			1.6	FLOOD RISK	
6.000	DUMMY06	1.878	0.000	1.16			39.1	FLOOD RISK	
6.001	PLOTRB_05a	1.928	0.000	0.21			8.5	FLOOD RISK	
6.002	DUMMY07	-0.163	0.000	0.17			8.5	OK	
1.007	S9E	-0.086	0.000	0.15			14.8	OK	
1.008	S11E	-0.049	0.000	0.11			15.3	OK	
7.000	DUMMY10	1.765	0.000	0.80			43.7	SURCHARGED	
7.001	PLOTRB_05c	1.905	0.000	0.20			8.8	SURCHARGED	
7.002	DUMMY11	0.000	0.000	0.12			5.7	SURCHARGED*	
7.003	S20E	0.964	0.000	0.29			12.3	SURCHARGED	
1.009	S12E	1.172	0.000	0.13			25.1	SURCHARGED	
8.000	DUMMY12	0.354	0.000	0.69			25.8	SURCHARGED	
8.001	PLOTRB_05b	0.423	0.000	0.16			5.1	SURCHARGED	
8.002	DUMMY13	0.000	0.000	0.14			5.2	SURCHARGED*	

0.316m3 of permeable
be captured
and discharge
downstream
permeable
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-CD-0019

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0.316m3 of flooding at permeable paving to be captured on-site and discharged to downstream permeable paving structures - refer to exceedance drawing VNIF-ARP-00-YYY-DR-CD-0019

- On-plot pipes and flow controls are redacted as Arup are not providing on-plot design. Assumed storage volumes and results for on-plot sections are not redacted

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Job number 282022
Date 02 September 2022

A.3 Appendix C Union Walk Surface Water Modelling Report

Contents:

Page 1: Network Design Details

Page 2: Area Summary

Page 2: Outfall Details

Page 3: Online Controls

Page 5: Storage Structures

Page 6: 1-Year Summary Results

Page 7: 30-Year Summary Results

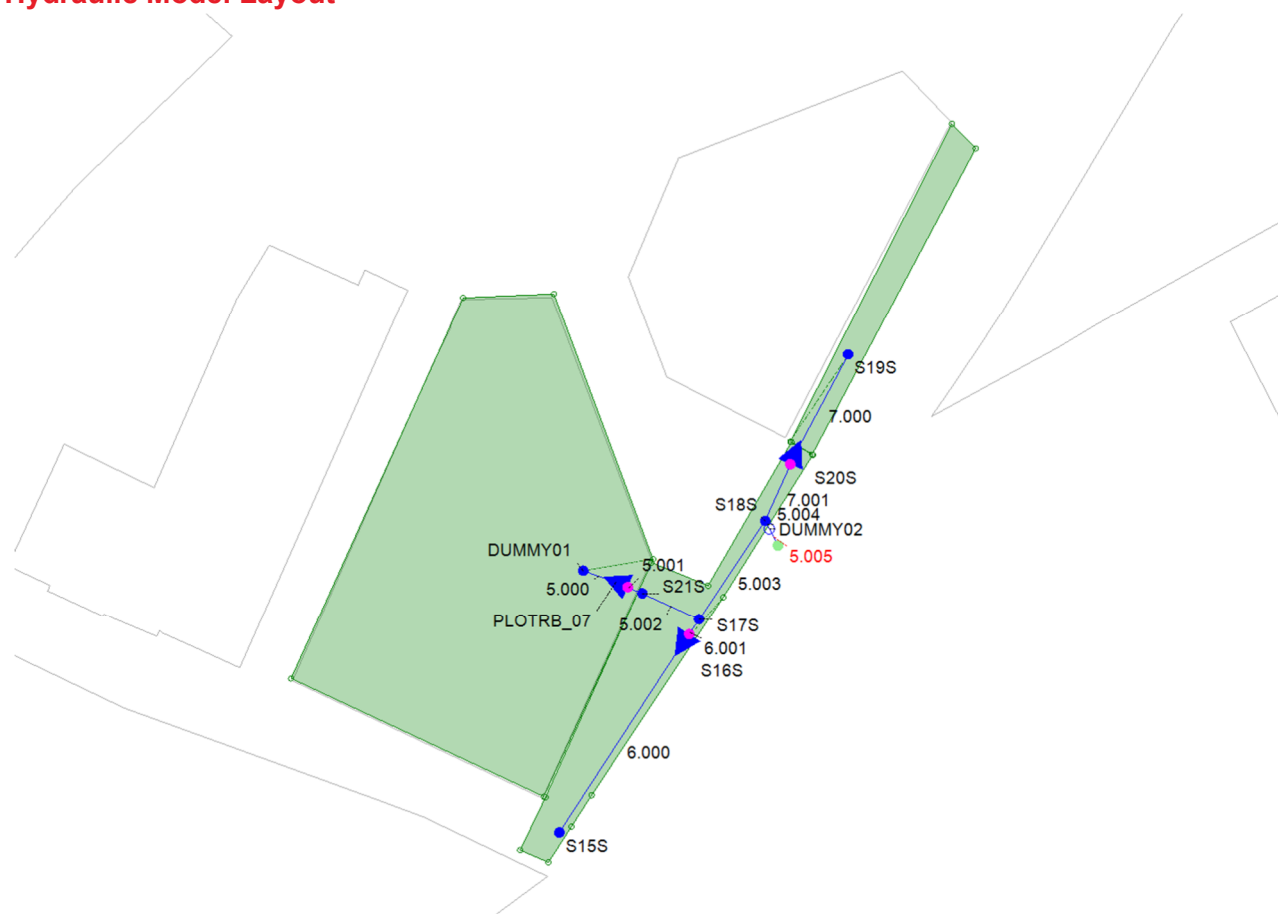
Page 8: 100-Year Summary Results

Page 9: Surcharged Outfall Details

Page 11: 30-Year Surcharged Summary Results

Subject	Stage 4 Hydraulic Modelling Summary - Union Walk
Job No/Ref	282022 Victoria North Infrastructure Works
Date	3 August 2022

1. Union Walk Hydraulic Model Layout

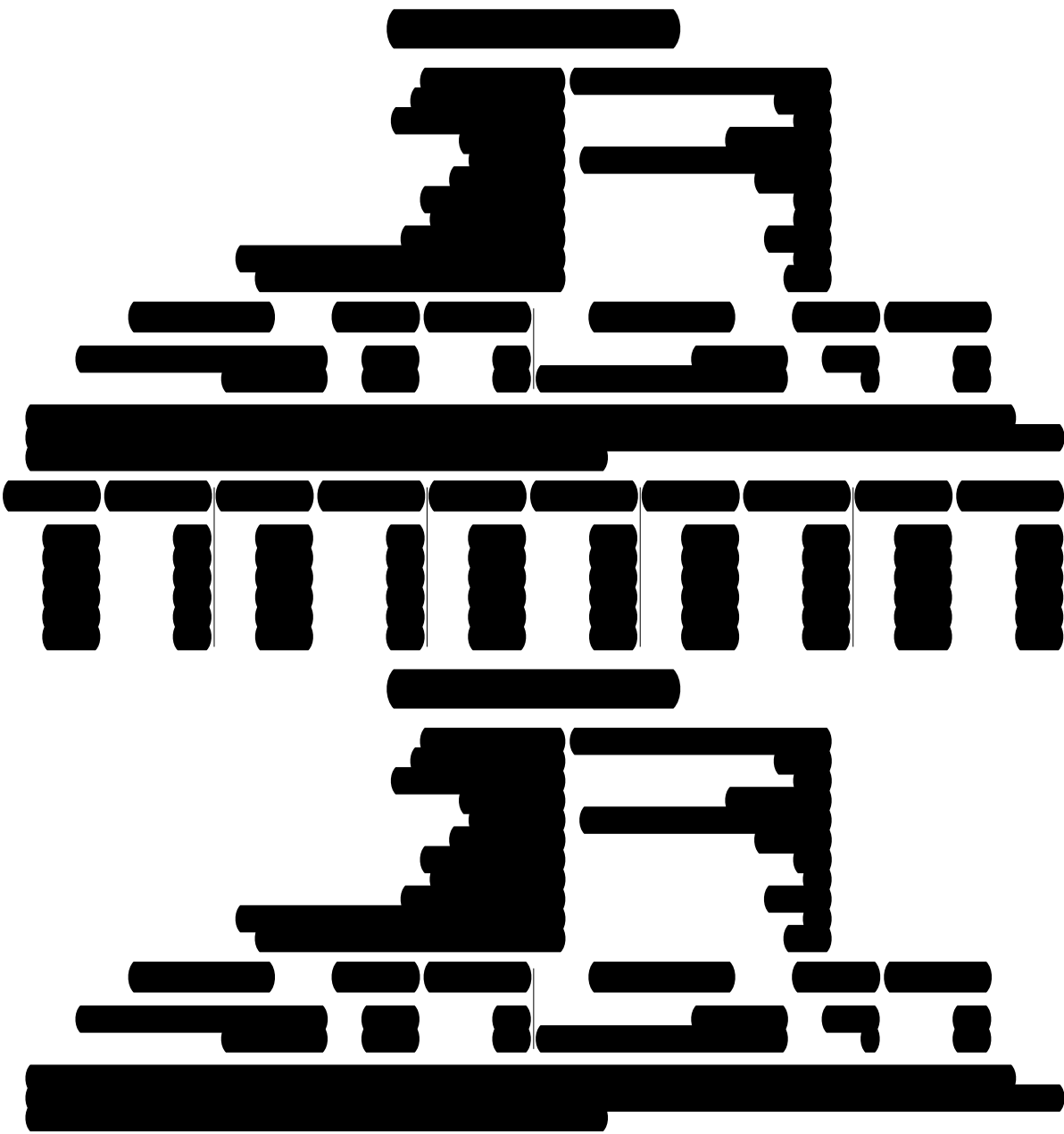


- On-plot pipes and flow controls are redacted as Arup are not providing on-plot design. Assumed storage volumes and results for on-plot sections are not redacted

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NOTES:

- Unadopted network indicated by **green** highlighted entries
- Pipe numbers may differ from drawings due to dummy pipes included for modelling
- On-plot pipes and flow controls are redacted as Arup are not providing on-plot design. Assumed storage volumes and results for on-plot sections are not redacted

Ove Arup & Partners International Ltd		Page 3
The Arup Campus Blyth Gate Solihull B90 8AE		
Date 28/09/2022 09:45 File Red Bank Terraces WS4 V...		
Designed by Drew.Hunter Checked by		
XP Solutions		
Network 2020.1.3		
<u>Online Controls for Storm</u> Complex Manhole: PLOTB_07, DS/PN: 5.001 		
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- NOTES:
- Unadopted network indicated by green highlighted entries
 - Pipe numbers may differ from drawings due to dummy pipes included for modelling
 - On-plot pipes and flow controls are redacted as Arup are not providing on-plot design. Assumed storage volumes and results for on-plot sections are not redacted

Ove Arup & Partners International Ltd		Page 4
The Arup Campus Blyth Gate Solihull B90 8AE		
Date 28/09/2022 09:45	Designed by Drew.Hunter	
File Red Bank Terraces WS4 V...	Checked by	
XP Solutions		Network 2020.1.3



Hydro-Brake® Optimum Manhole: S16S, DS/PN: 6.001, Volume (m³): 2.9

Unit Reference	MD-SHE-0056-1500-1112-1500
Design Head (m)	1.112
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	56
Invert Level (m)	27.955
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points		Head (m)	Flow (l/s)	Control Points		Head (m)	Flow (l/s)
Design Point (Calculated)		1.112	1.5	Kick-Flo®		0.501	1.0
Flush-Flo™		0.247	1.3	Mean Flow over Head Range		-	1.2

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	1.1	0.800	1.3	2.000	2.0	4.000	2.7	7.000	3.5
0.200	1.3	1.000	1.4	2.200	2.0	4.500	2.8	7.500	3.6
0.300	1.3	1.200	1.6	2.400	2.1	5.000	3.0	8.000	3.7
0.400	1.2	1.400	1.7	2.600	2.2	5.500	3.1	8.500	3.8
0.500	1.1	1.600	1.8	3.000	2.4	6.000	3.2	9.000	3.9
0.600	1.1	1.800	1.9	3.500	2.5	6.500	3.4	9.500	4.0

Orifice Manhole: S20S, DS/PN: 7.001, Volume (m³): 2.3

Diameter (m)	0.025	Discharge Coefficient	0.600	Invert Level (m)	29.044
--------------	-------	-----------------------	-------	------------------	--------

Non Return Valve Manhole: DUMMY02, DS/PN: 5.005, Volume (m³): 0.0



NOTES:

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- On-plot pipes and flow controls are redacted as Arup are not providing on-plot design. Assumed storage volumes and results for on-plot sections are not redacted

Ove Arup & Partners International Ltd		Page 5																																																
The Arup Campus Blyth Gate Solihull B90 8AE																																																		
Date 28/09/2022 09:45 File Red Bank Terraces WS4 V...	Designed by Drew.Hunter Checked by																																																	
XP Solutions Network 2020.1.3																																																		
Storage Structures for Storm Tank or Pond Manhole: PLOTRB_07, DS/PN: 5.001 Invert Level (m) 28.272 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>170.0</td><td>1.000</td><td>170.0</td><td>1.001</td><td>0.0</td></tr></tbody></table> Cellular Storage Manhole: S16S, DS/PN: 6.001 Invert Level (m) 27.955 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>93.0</td><td>0.0</td><td>0.400</td><td>93.0</td><td>0.0</td><td>0.401</td><td>0.0</td><td>0.0</td></tr></tbody></table> Cellular Storage Manhole: S20S, DS/PN: 7.001 Invert Level (m) 28.658 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>45.0</td><td>0.0</td><td>0.400</td><td>45.0</td><td>0.0</td><td>0.401</td><td>0.0</td><td>0.0</td></tr></tbody></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	170.0	1.000	170.0	1.001	0.0	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	93.0	0.0	0.400	93.0	0.0	0.401	0.0	0.0	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	45.0	0.0	0.400	45.0	0.0	0.401	0.0	0.0
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																													
0.000	170.0	1.000	170.0	1.001	0.0																																													
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																										
0.000	93.0	0.0	0.400	93.0	0.0	0.401	0.0	0.0																																										
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																										
0.000	45.0	0.0	0.400	45.0	0.0	0.401	0.0	0.0																																										
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NOTES:

- Unadopted network indicated by **green** highlighted entries
- Pipe numbers may differ from drawings due to dummy pipes included for modelling
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Ove Arup & Partners International Ltd								Page 6		
The Arup Campus Blyth Gate Solihull B90 8AE										
Date 28/09/2022 09:45				Designed by Drew.Hunter						
File Red Bank Terraces WS4 V...				Checked by						
XP Solutions				Network 2020.1.3						
<u>1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>										
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)		27		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		4		Number of Storage Structures		3		Number of Real Time Controls 0		
Synthetic Rainfall Details										
Rainfall Model		FSR M5-60 (mm)		18.000		Cv (Summer)		0.750		
Region England and Wales		Ratio R		0.357		Cv (Winter)		0.840		
Margin for Flood Risk Warning (mm)								300.0		
Analysis Timestep		2.5 Second Increment		(Extended)						
DTS Status								OFF		
DVD Status								OFF		
Inertia Status								OFF		
Profile(s)								Winter		
Duration(s) (mins)		15, 30, 60, 120, 240, 360, 480, 720, 1440								
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) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
5.000										
5.001	PLOTRE 07	120 Winter	1	+0%	30/15 Winter				28.442	-0.055
5.002	S21S	60 Winter	1	+0%					28.237	-0.184
6.000	S15S	240 Winter	1	+0%	100/60 Winter				28.044	-0.206
6.001	S16S	240 Winter	1	+0%	100/30 Winter				28.044	-0.136
5.003	S17S	120 Winter	1	+0%					27.980	-0.165
7.000	S19S	15 Winter	1	+0%	30/15 Winter				29.166	-0.063
7.001	S20S	1440 Winter	1	+0%	100/120 Winter				28.898	-0.296
5.004	S18S	120 Winter	1	+0%					27.857	-0.157
5.005	DUMMY02	120 Winter	1	+0%					27.846	-0.157
Flooded										
PN	US/MH Name	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded			
5.000										
5.001	PLOTRE 07	0.000	0.14		5.3	OK				
5.002	S21S	0.000	0.08		5.3	OK				
6.000	S15S	0.000	0.01		0.1	OK				
6.001	S16S	0.000	0.02	161	0.6	OK				
5.003	S17S	0.000	0.16		5.9	OK				
7.000	S19S	0.000	0.63		4.3	OK				
7.001	S20S	0.000	0.00		0.0	OK				
5.004	S18S	0.000	0.20		5.9	OK				
5.005	DUMMY02	0.000	0.20		5.9	OK*				
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- Unadopted network indicated by **green** highlighted entries
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Ove Arup & Partners International Ltd							Page 2			
The Arup Campus Blyth Gate Solihull B90 8AE										
Date 27/09/2022 11:01										
File Red Bank Terraces WS4 V...										
Designed by Drew.Hunter										
Checked by										
XP Solutions					Network 2020.1.3					
<u>1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>										
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)			27		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 Online Controls			4		Number of Storage Structures		3			
					Number of Time/Area Diagrams		0			
					Number of Real Time Controls		0			
Synthetic Rainfall Details										
Rainfall Model			FSR M5-60 (mm)		18.000		Cv (Summer) 0.750			
Region England and Wales			Ratio R		0.357		Cv (Winter) 0.840			
Margin for Flood Risk Warning (mm)							300.0			
Analysis Timestep			2.5 Second Increment (Extended)							
DTS Status					OFF					
DVD Status					OFF					
Inertia Status					OFF					
Profile(s)					Winter					
Duration(s) (mins)			15, 30, 60, 120, 240, 360, 480, 720, 1440							
Return Period(s) (years)					1, 30					
Climate Change (%)					0, 0					
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)
5.000										
5.001	PLOTRE 07	720 Winter	1	+0%	1/720 Winter				28.534	0.037
5.002	S21S	720 Winter	1	+0%	1/720 Winter				28.543	0.122
6.000	S15S	1440 Winter	1	+0%	1/360 Winter				28.561	0.311
6.001	S16S	1440 Winter	1	+0%	1/360 Winter				28.561	0.381
5.003	S17S	720 Winter	1	+0%	1/240 Winter				28.543	0.398
7.000	S19S	15 Winter	1	+0%	30/15 Winter				29.166	-0.063
7.001	S20S	1440 Winter	1	+0%					28.910	-0.284
5.004	S18S	720 Winter	1	+0%	1/240 Winter				28.543	0.529
5.005	DUMMY02	240 Winter	1	+0%					28.004	0.000
PN	US/MH Name	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded			
5.000										
5.001	PLOTRE 07	0.000	0.14		5.3	SURCHARGED				
5.002	S21S	0.000	0.08		5.4	SURCHARGED				
6.000	S15S	0.000	0.01		0.1	SURCHARGED				
6.001	S16S	0.000	0.04	341	1.3	SURCHARGED				
5.003	S17S	0.000	0.29		10.5	SURCHARGED				
7.000	S19S	0.000	0.63		4.3	OK				
7.001	S20S	0.000	0.00		0.0	OK				
5.004	S18S	0.000	0.79		23.6	SURCHARGED				
5.005	DUMMY02	0.000	0.20		5.9	SURCHARGED*				

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The Arup Campus
Blyth Gate
Solihull B90 8AE

Date 27/09/2022 11:01
File Red Bank Terraces WS4 V...

XP Solutions

Page 3



Designed by Drew.Hunter
Checked by

Network 2020.1.3

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

Simulation Criteria

Areal Reduction Factor 1.000
Hot Start (mins) 0
Hot Start Level (mm) 27
Manhole Headloss Coeff (Global) 0.500
Foul Sewage per hectare (l/s) 0.000

Additional Flow - % of Total Flow 0.000
MADD Factor * 10m³/ha Storage 2.000
Inlet Coefficient 0.800
Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0
Number of Online Controls 4

Number of Offline Controls 0
Number of Storage Structures 3

Number of Time/Area Diagrams 0
Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm)
Region England and Wales

18.000 Cv (Summer) 0.750
Ratio R 0.357 Cv (Winter) 0.840

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

Profile(s) Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 720, 1440
Return Period(s) (years) 1, 30
Climate Change (%) 0, 0

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)

5.000

5.001

PLOTRE 07

720 Winter

30

+0%

1/720 Winter

29.030

0.533

5.002

S21S

720 Winter

30

+0%

1/720 Winter

29.045

0.624

6.000

S15S

720 Winter

30

+0%

1/360 Winter

29.065

0.815

6.001

S16S

720 Winter

30

+0%

1/360 Winter

29.065

0.885

5.003

S17S

720 Winter

30

+0%

1/240 Winter

29.046

0.901

7.000

S19S

15 Winter

30

+0%

30/15 Winter

29.272

0.043

7.001

S20S

1440 Winter

30

+0%

29.091

-0.103

5.004

S18S

720 Winter

30

+0%

1/240 Winter

29.046

1.032

5.005

DUMMY02

240 Winter

30

+0%

28.004

0.000

PN

US/MH Name

Flooded Volume (m³)

Flow / Cap. (l/s)

Overflow (l/s)

Half Drain Time (mins)

Pipe Flow (l/s)

Status

Level Exceeded

5.000

5.001

PLOTRE 07

0.000

0.15

5.8

SURCHARGED

5.002

S21S

0.000

0.09

5.9

SURCHARGED

6.000

S15S

0.000

0.01

0.1

SURCHARGED

6.001

S16S

0.000

0.04

462

1.3

FLOOD RISK

5.003

S17S

0.000

0.30

10.9

SURCHARGED

7.000

S19S

0.000

1.54

10.4

SURCHARGED

7.001

S20S

0.000

0.01

0.2

OK

5.004

S18S

0.000

0.80

23.8

SURCHARGED

5.005

DUMMY02

0.000

0.21

6.4

SURCHARGED*

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Job number 282022
Date 02 September 2022

A.4 Appendix D Foul Network Modelling Report

Ove Arup & Partners International Ltd		Page 1
The Arup Campus Blyth Gate Solihull B90 8AE		
Date 28/09/2022 10:03 File Stage 4 Foul.MDX	Designed by Drew.Hunter Checked by	
XP Solutions Network 2020.1.3		

FOUL SEWERAGE DESIGN

Design Criteria for Foul

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	1.000
Flow Per Person (l/per/day)	500.00	Maximum Backdrop Height (m)	1.500
Persons per House	8.62	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.60	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	1.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	22.141	0.695	31.9	0.000	416	0.0	1.500	o	225	Pipe/Conduit	
F1.001	19.493	0.260	75.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.002	17.600	0.339	51.9	0.182	0	0.0	1.500	o	225	Pipe/Conduit	
F1.003	30.299	1.107	27.4	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.004	39.942	0.860	46.4	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.005	38.549	1.156	33.3	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.006	25.434	0.763	33.3	0.000	203	0.0	1.500	o	225	Pipe/Conduit	
F1.007	23.019	0.883	26.1	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F2.000	18.157	0.454	40.0	0.068	176	0.0	1.500	o	150	Pipe/Conduit	
F2.001	22.670	0.667	34.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F2.002	40.849	0.341	119.8	0.000	189	0.0	1.500	o	225	Pipe/Conduit	
F1.008	14.731	1.473	10.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.009	8.559	0.865	9.9	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.010	4.130	0.403	10.2	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F3.000	6.970	0.240	29.0	0.000	134	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	E Area (ha)	E Base Flow (l/s)	E Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	41.914	0.000	0.0	416	0.0	78	1.71	2.04	81.0	20.8
F1.001	41.219	0.000	0.0	416	0.0	98	1.25	1.33	52.7	20.8
F1.002	40.959	0.182	0.0	416	0.0	89	1.43	1.60	63.4	20.9
F1.003	40.620	0.182	0.0	416	0.0	75	1.81	2.20	87.4	20.9
F1.004	39.513	0.182	0.0	416	0.0	86	1.49	1.69	67.1	20.9
F1.005	38.653	0.182	0.0	416	0.0	79	1.68	1.99	79.2	20.9
F1.006	37.497	0.182	0.0	619	0.0	98	1.87	1.99	79.2	31.0
F1.007	36.734	0.182	0.0	619	0.0	91	2.05	2.25	89.6	31.0
F2.000	36.688	0.068	0.0	176	0.0	62	1.27	1.39	24.5	8.8
F2.001	36.234	0.068	0.0	176	0.0	59	1.35	1.51	26.6	8.8
F2.002	35.492	0.068	0.0	365	0.0	104	1.01	1.05	41.7	18.2
F1.008	35.151	0.250	0.0	984	0.0	90	3.30	3.64	144.8	49.2
F1.009	32.178	0.250	0.0	984	0.0	90	3.31	3.66	145.6	49.2
F1.010	29.594	0.250	0.0	984	0.0	91	3.26	3.60	143.0	49.2
F3.000	39.774	0.000	0.0	134	0.0	49	1.32	1.63	28.8	6.7

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XP Solutions	Network 2020.1.3	

Designed by Drew.Hunter
Checked by

Network 2020.1.3

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F3.001	22.318	1.137	19.6	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F4.000	53.500	1.708	31.3	0.113	239	0.0	1.500	o	150	Pipe/Conduit	
F3.002	19.484	1.117	17.4	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F3.003	8.982	0.448	20.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F3.004	8.494	0.425	20.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F3.005	15.407	0.772	20.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F3.006	13.329	0.858	15.5	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F5.000	9.504	0.097	98.0	0.182	285	0.0	1.500	o	225	Pipe/Conduit	
F5.001	17.338	0.177	98.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F5.002	13.915	0.143	97.3	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F3.007	3.806	0.092	41.4	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	E Area (ha)	E Base Flow (l/s)	E Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F3.001	39.534	0.000	0.0	134	0.0	44	1.52	1.98	35.1	6.7
F4.000	38.455	0.113	0.0	239	0.0	69	1.51	1.57	27.7	12.0
F3.002	36.672	0.113	0.0	373	0.0	63	2.06	2.76	109.6	18.7
F3.003	34.055	0.113	0.0	373	0.0	65	1.96	2.57	102.2	18.7
F3.004	32.475	0.113	0.0	373	0.0	65	1.96	2.57	102.4	18.7
F3.005	30.550	0.113	0.0	373	0.0	65	1.96	2.58	102.4	18.7
F3.006	29.778	0.113	0.0	373	0.0	61	2.15	2.92	116.1	18.7
F5.000	29.337	0.182	0.0	285	0.0	86	1.02	1.16	46.1	14.3
F5.001	29.240	0.182	0.0	285	0.0	86	1.02	1.16	46.1	14.3
F5.002	29.063	0.182	0.0	285	0.0	86	1.03	1.16	46.3	14.3
F3.007	28.920	0.295	0.0	658	0.0	108	1.75	1.79	71.1	33.0

Free Flowing Outfall Details for Foul

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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F1.010	FO1	29.344	29.191	0.000	0	0
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Free Flowing Outfall Details for Foul

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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F3.007	F	0.000	28.828	0.000	0	0
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Job number 282022
Date 02 September 2022

DOCUMENT CHECKING

	Prepared by	Checked by	Approved by
Name	Emily Stoddart	Ryan Griffiths	Michael Wilton
Signature			