

Technical Note

Project title Victoria North Infrastructure Works
Job number 282022
File reference VNIF-ARP-00-YYY-FN-CD-0001
cc
Prepared by Emily Stoddart
Date 02 September 2022
Subject Surface Water Outfall Locations & Invert Levels Agreement

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1. Introduction

Arup have been commissioned by BAM to produce the drainage design for the Victoria North Infrastructure Works. This note summarises the surface water outfall locations to the River Irk and outlines the supporting calculations for the outfalls to agree the proposed invert levels in line with United Utilities' technical guidance principles.

2. River Levels

The site is situated in areas of flood zones 2 and 3. As part of a separate package of work (the Victoria North River Works Scheme) flood mitigation measures are being explored and the river flood level is expected to drop from the existing level. At the time of writing, the extent of river works improvements which can be achieved is not yet defined, and therefore the most conservative case of river levels is presented, assuming no river improvement works are delivered.

2.1 River Modelling

As part of the River Works scheme, a hydraulic model has been developed in conjunction with the Environment Agency (EA). The model has been run with the proposed infrastructure works only (excluding the river works) to determine the resulting river levels for the 30-year case, this model has been technically reviewed by the EA.

3. Outfalls

There are 3n.o. new surface water outfalls to the River Irk which are seeking for adoption by United Utilities, as shown in Figure 1. An additional outfall is proposed which is not to be adopted, no further detail on this outfall is given within this note.

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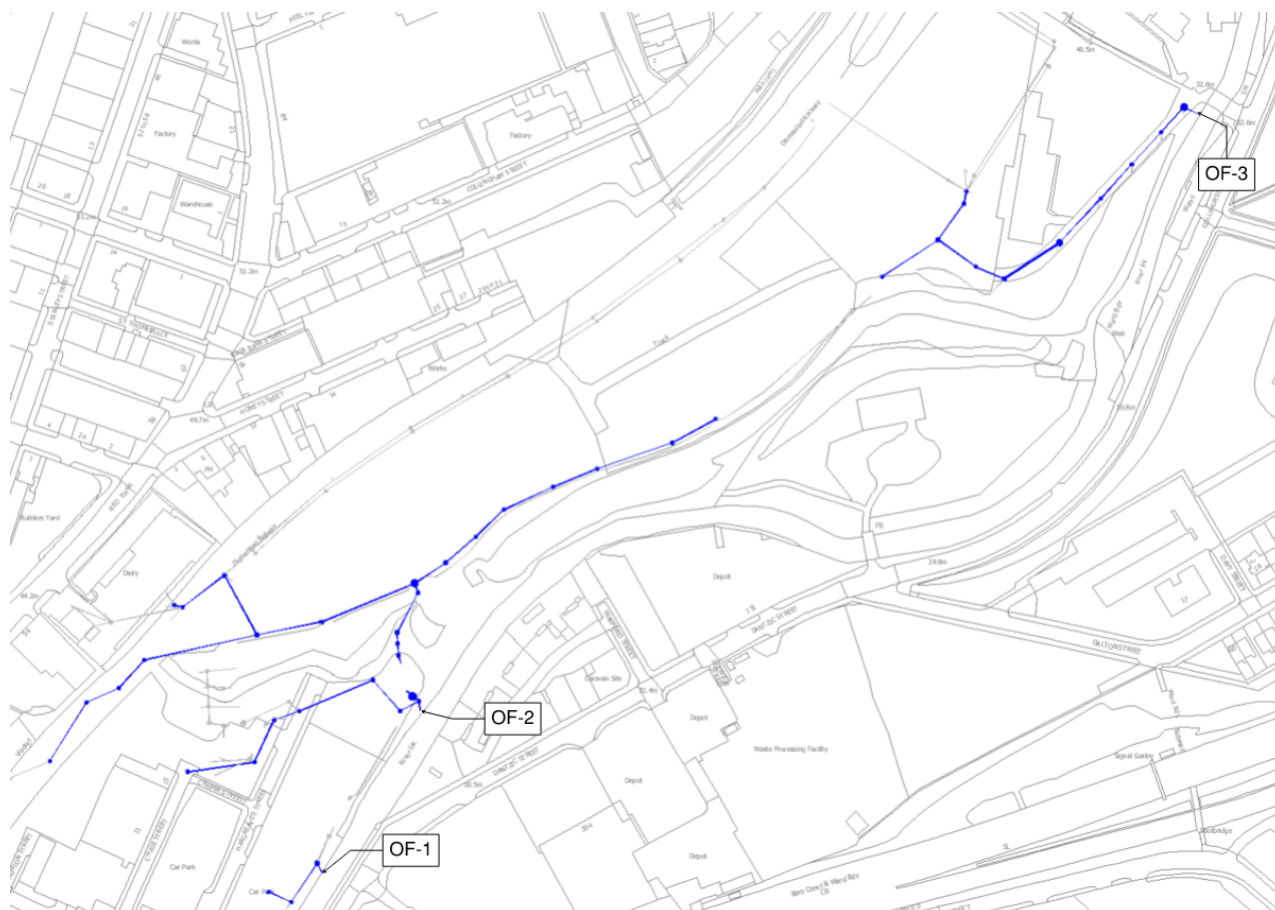


Figure 1 Adoptable Surface Water Network Layout and Outfall Locations

A summary of the outfall levels and peak river levels at each location is shown in Table 1.

Table 1 Outfall levels summary

Outfall	Type	Invert Level (mAOD)	Soffit Level (mAOD)	Cover Level (mAOD)	Peak River Level (mAOD)
OF-1	Headwall	27.757	27.982	28.400	30.600
OF-2	Headwall	28.014	28.314	29.000	30.610
OF-3	Core through river wall	31.600	31.900	32.000 (Top of Wall)	31.550

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The invert levels of 2n.o. outfalls are below the 30-year peak river level as determined by the EA river model. As the peak river level is modelled to be above the bank level in these locations, it is not possible to locate the outfalls above the 30-year river level while maintaining pipe cover.

The drainage network has been modelled with the outfalls surcharged to the hydrograph of critical 30-year river levels at each outfall location. The hydrographs are shown in Figures 2, 3 and 4.

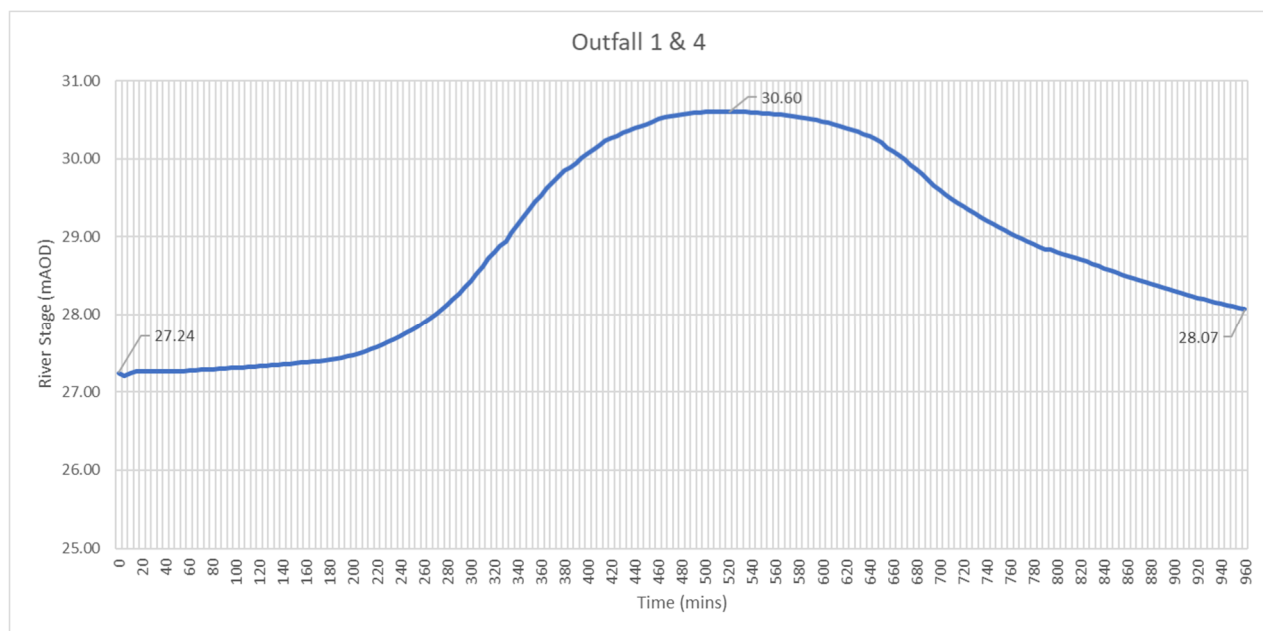


Figure 2 30-year hydrograph for critical storm in river at OF-1

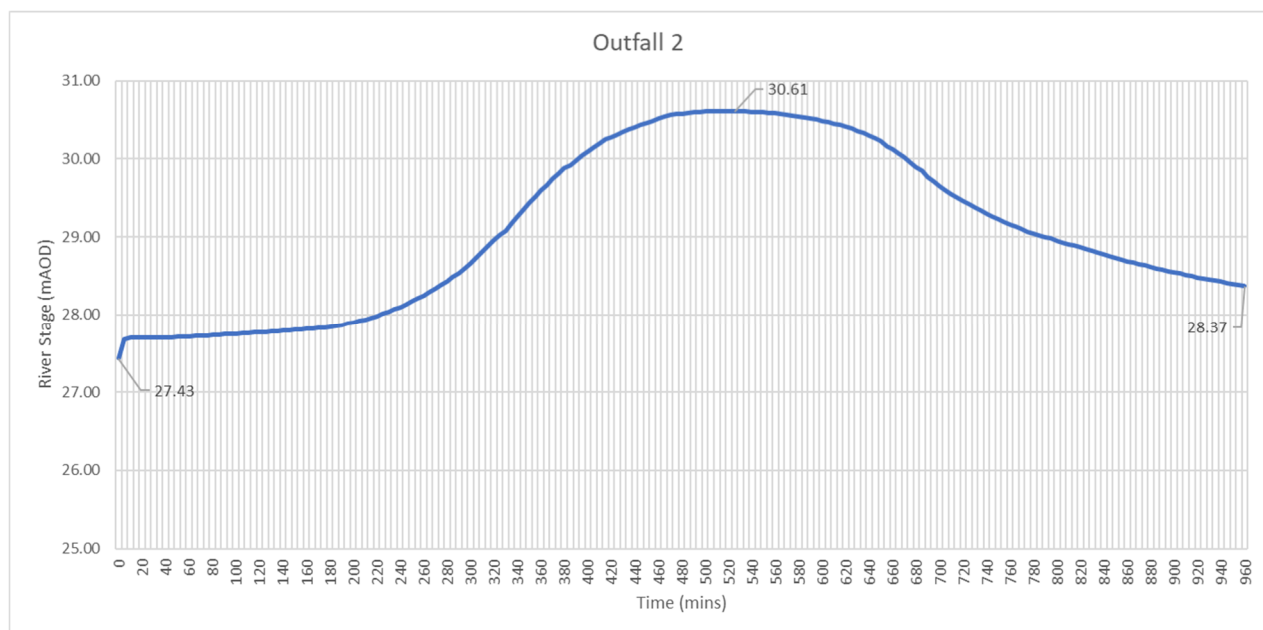


Figure 3 30-year hydrograph for critical storm in river at OF-2

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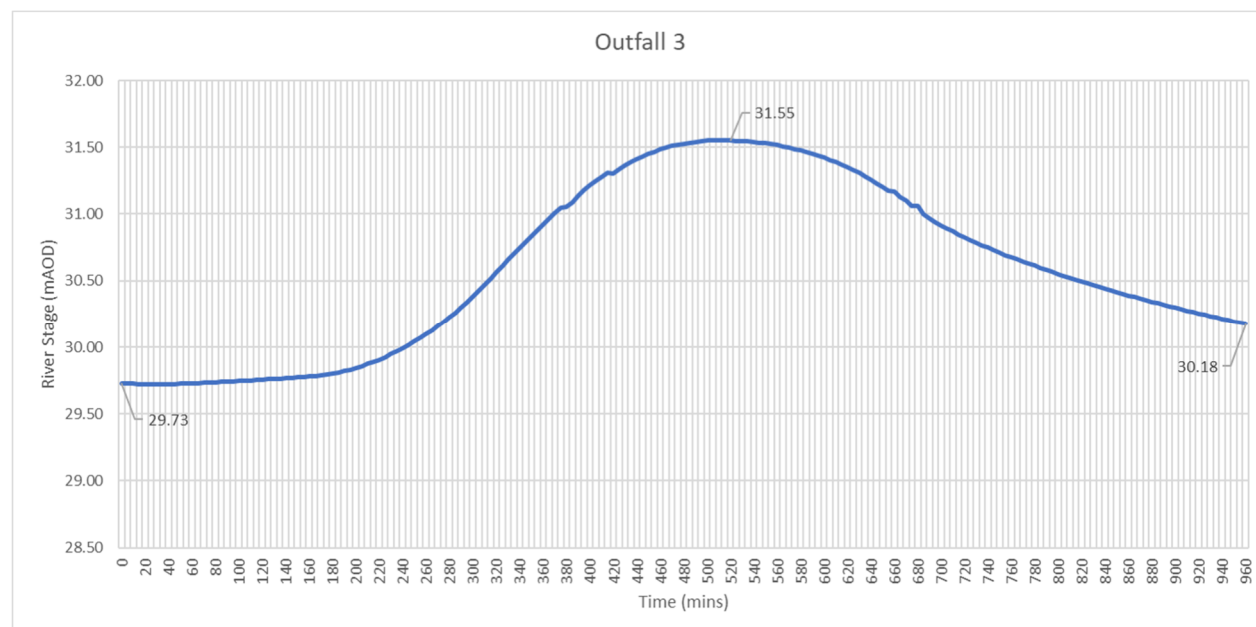


Figure 4 30-year hydrograph for critical storm in river at OF-3

The calculation summary for each network is attached which show that no flooding occurs during the 30-year storm under surcharged conditions. As the river level is above cover at the end of the network in some cases, a sealed chamber is specified at outfall 2 and all outfalls feature non-return valves.

4. Conclusion

Two of the three new outfalls to the River Irk have invert below the modelled peak 30-year river level. The network model shows that with these outfalls surcharged to the river hydrograph, no flooding occurs during the 30-year storm event. The outflow from each outfall is also shown to be sufficient to drain the site effectively under the surcharged condition.

DOCUMENT CHECKING

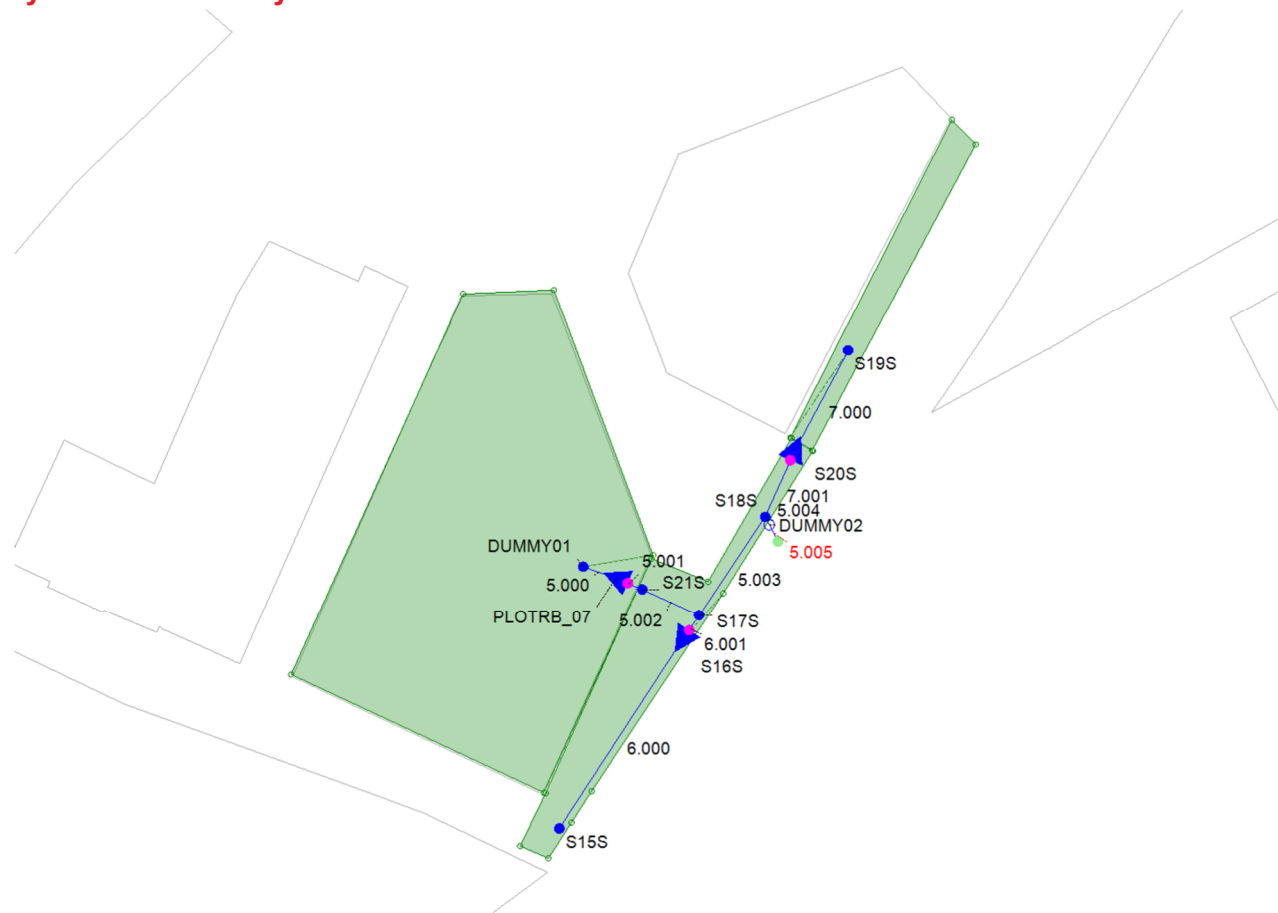
	Prepared by	Checked by	Approved by
Name	Emily Stoddart	Drew Hunter	Michael Wilton
Signature			

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5. Appendix A Union Walk Outfall OF-1

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



- 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			
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)
5.005		28.400	27.757	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)
5	27.240	165	27.380	325	28.800	485
10	27.200	170	27.390	330	28.880	490
15	27.240	175	27.390	335	28.940	495
20	27.260	180	27.400	340	29.060	500
25	27.260	185	27.410	345	29.160	505
30	27.260	190	27.420	350	29.260	510
35	27.260	195	27.440	355	29.350	515
40	27.260	200	27.460	360	29.440	520
45	27.260	205	27.480	365	29.530	525
50	27.260	210	27.500	370	29.610	530
55	27.270	215	27.520	375	29.700	535
60	27.270	220	27.550	380	29.780	540
65	27.270	225	27.580	385	29.850	545
70	27.280	230	27.610	390	29.890	550
75	27.280	235	27.640	395	29.950	555
80	27.290	240	27.680	400	30.010	560
85	27.290	245	27.720	405	30.070	565
90	27.300	250	27.760	410	30.120	570
95	27.300	255	27.800	415	30.180	575
100	27.310	260	27.850	420	30.240	580
105	27.310	265	27.900	425	30.260	585
110	27.320	270	27.950	430	30.290	590
115	27.320	275	28.000	435	30.330	595
120	27.330	280	28.060	440	30.360	600
125	27.330	285	28.130	445	30.390	605
130	27.340	290	28.200	450	30.420	610
135	27.340	295	28.270	455	30.440	615
140	27.350	300	28.350	460	30.470	620
145	27.350	305	28.430	465	30.510	625
150	27.360	310	28.520	470	30.530	630
155	27.370	315	28.620	475	30.550	635
160	27.370	320	28.720	480	30.560	640
645	30.290	805	28.800	650	30.250	810
655	30.210	815	28.750	660	30.140	820
665	30.100	825	28.710	670	30.050	830
675	29.990	835	28.660	680	29.920	840
685	29.860	845	28.600	690	29.800	850
695	29.730	855	28.540	700	29.660	860
705	29.600	865	28.490	710	29.540	870
715	29.480	875	28.440	720	29.430	880
725	29.390	885	28.390	730	29.340	890
735	29.290	895	28.340	740	29.250	900
745	29.200	905	28.300	750	29.160	910
755	29.130	915	28.260	760	29.090	920
765	29.050	925	28.220	770	29.010	930
775	28.970	935	28.180	780	28.940	940
785	28.900	945	28.140	790	28.870	950
795	28.840	955	28.100	800	28.830	960

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<u>1 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) 27 Inlet Coeffiecient 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 Storage Structures 3								
Number of Online Controls 4 Number of Time/Area Diagrams 0								
Number of Offline Controls 0 Number of Real Time Controls 0								
<u>Synthetic Rainfall Details</u>								
Rainfall Model FSR Ratio R 0.357								
Region England and Wales Cv (Summer) 0.750								
M5-60 (mm) 18.000 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.
5.000	DUMMY01	720 Winter	1	+0%	30/15 Winter			
5.001	PLOTRE_07	720 Winter	1	+0%	1/720 Winter			
5.002	S21S	720 Winter	1	+0%	1/720 Winter			
6.000	S15S	1440 Winter	1	+0%	1/360 Winter			
6.001	S16S	1440 Winter	1	+0%	1/360 Winter			
5.003	S17S	720 Winter	1	+0%	1/240 Winter			
7.000	S19S	15 Winter	1	+0%	30/15 Winter			
7.001	S20S	1440 Winter	1	+0%				
5.004	S18S	720 Winter	1	+0%	1/240 Winter			
5.005	DUMMY02	240 Winter	1	+0%				
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
5.000	DUMMY01	28.534	-0.027	0.000	0.13			4.6	OK
5.001	PLOTRB_07	28.534	0.037	0.000	0.14			5.3	SURCHARGED
5.002	S21S	28.543	0.122	0.000	0.08			5.4	SURCHARGED
6.000	S15S	28.561	0.311	0.000	0.01			0.1	SURCHARGED
6.001	S16S	28.561	0.381	0.000	0.04		341	1.3	SURCHARGED
5.003	S17S	28.543	0.398	0.000	0.29			10.5	SURCHARGED
7.000	S19S	29.166	-0.063	0.000	0.63			4.3	OK
7.001	S20S	28.910	-0.284	0.000	0.00			0.0	OK
5.004	S18S	28.543	0.529	0.000	0.79			23.6	SURCHARGED
5.005	DUMMY02	28.004	0.000	0.000	0.20			5.9	SURCHARGED*

PN	US/MH Name	Level Exceeded
5.000	DUMMY01	
5.001	PLOTRB_07	
5.002	S21S	
6.000	S15S	
6.001	S16S	
5.003	S17S	
7.000	S19S	
7.001	S20S	
5.004	S18S	
5.005	DUMMY02	

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

Simulation Criteria

Areal Reduction Factor 1.000
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
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.000

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
DVD Status
Inertia Status

OFF
OFF
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.
5.000	DUMMY01	720 Winter	30	+0%	30/15 Winter			
5.001	PLOTRE_07	720 Winter	30	+0%	1/720 Winter			
5.002	S21S	720 Winter	30	+0%	1/720 Winter			
6.000	S15S	720 Winter	30	+0%	1/360 Winter			
6.001	S16S	720 Winter	30	+0%	1/360 Winter			
5.003	S17S	720 Winter	30	+0%	1/240 Winter			
7.000	S19S	15 Winter	30	+0%	30/15 Winter			
7.001	S20S	1440 Winter	30	+0%				
5.004	S18S	720 Winter	30	+0%	1/240 Winter			
5.005	DUMMY02	240 Winter	30	+0%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
5.000	DUMMY01	29.030	0.469	0.000	0.28		9.8	SURCHARGED
5.001	PLOTRB_07	29.030	0.533	0.000	0.15		5.8	SURCHARGED
5.002	S21S	29.045	0.624	0.000	0.09		5.9	SURCHARGED
6.000	S15S	29.065	0.815	0.000	0.01		0.1	SURCHARGED
6.001	S16S	29.065	0.885	0.000	0.04	462	1.3	FLOOD RISK
5.003	S17S	29.046	0.901	0.000	0.30		10.9	SURCHARGED
7.000	S19S	29.272	0.043	0.000	1.54		10.4	SURCHARGED
7.001	S20S	29.091	-0.103	0.000	0.01		0.2	OK
5.004	S18S	29.046	1.032	0.000	0.80		23.8	SURCHARGED
5.005	DUMMY02	28.004	0.000	0.000	0.21		6.4	SURCHARGED*

PN

US/MH
Name

Level
Exceeded

5.000

DUMMY01

5.001

PLOTRB_07

5.002

S21S

6.000

S15S

6.001

S16S

5.003

S17S

7.000

S19S

7.001

S20S

5.004

S18S

5.005

DUMMY02

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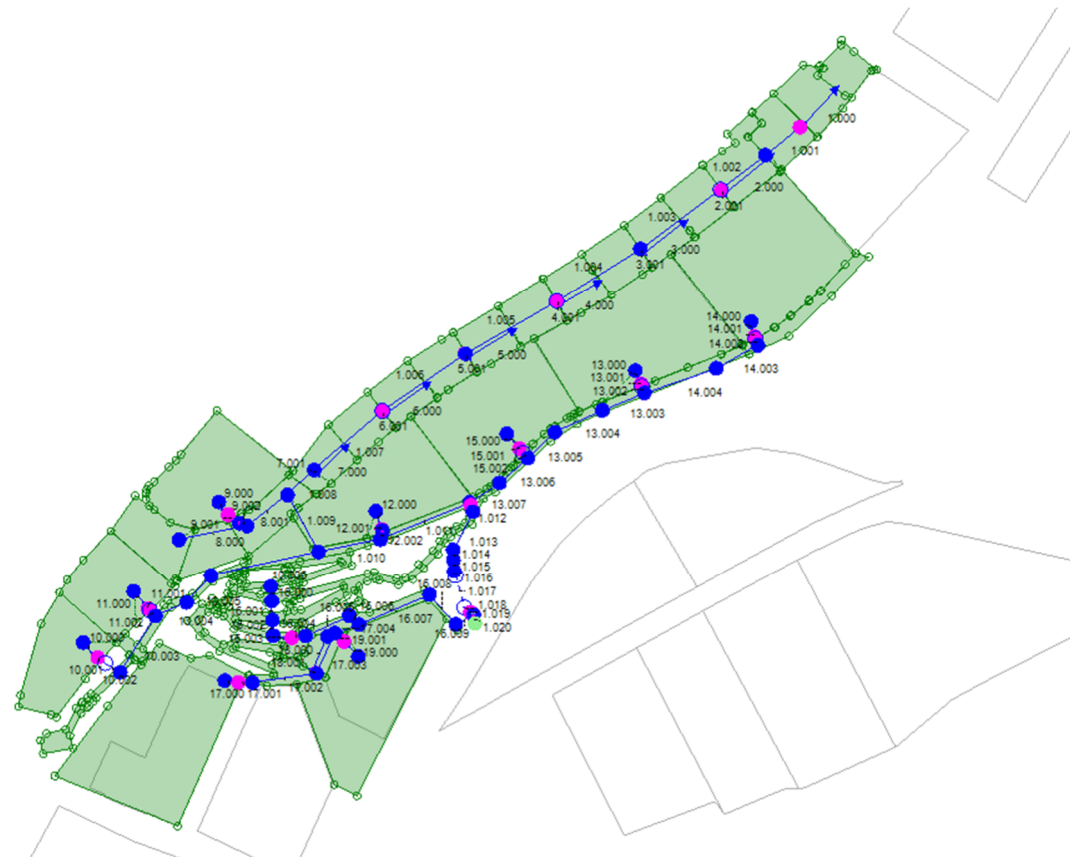
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6. Appendix B West Network OF-2

Subject	Stage 4 Hydraulic Modelling Summary - Plateau West
Job No/Ref	Victoria North Infrastructure Works
Date	2 August 2022

Plateau West Hydraulic Model Layout



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

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 26

Number of Online Controls 28

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.357

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 18.000 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)
1.000	DUMMY01	1440 Winter	30	+0%	30/15 Winter				43.387
1.001	S1W	1440 Winter	30	+0%	30/15 Winter				43.376
1.002	S2W	1440 Winter	30	+0%					41.830
2.000	DUMMY02	240 Winter	30	+0%	30/15 Winter				43.099
2.001	S3W	360 Winter	30	+0%	30/15 Winter				42.948
1.003	J1	360 Winter	30	+0%					41.656
3.000	DUMMY03	240 Winter	30	+0%	30/15 Winter				42.678
3.001	S4W	360 Winter	30	+0%	30/15 Winter				42.563
1.004	S5W	360 Winter	30	+0%					41.336
4.000	DUMMY04	1440 Winter	30	+0%	30/15 Winter				42.291
4.001	S6W	1440 Winter	30	+0%	30/15 Winter				42.277
1.005	J2	480 Winter	30	+0%					41.012
5.000	DUMMY05	240 Winter	30	+0%	30/15 Winter				41.951
5.001	S7W	480 Winter	30	+0%	30/15 Winter				41.814
1.006	S8W	360 Winter	30	+0%					40.673
6.000	DUMMY06	240 Winter	30	+0%	30/15 Winter				41.514
6.001	S9W	480 Winter	30	+0%	30/15 Winter				41.443
1.007	J3	360 Winter	30	+0%					40.348
7.000	DUMMY07	720 Winter	30	+0%	30/15 Winter				41.153

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Micro Drainage

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	Overflow Act.
7.001	S11W	480 Winter	30	+0%	30/15 Winter			
1.008	S12W	360 Winter	30	+0%				
8.000	S13W	15 Winter	30	+0%				
9.000	DUMMY08	240 Winter	30	+0%	30/30 Winter			
9.001	PLOT_RBI2b	240 Winter	30	+0%	30/30 Winter			
9.002	S36W	30 Winter	30	+0%				
8.001	S14W	15 Winter	30	+0%				
1.009	S15W	15 Winter	30	+0%				
10.000	DUMMY09	120 Winter	30	+0%	30/60 Winter			
10.001	PLOTRB_11	120 Winter	30	+0%	30/30 Winter			
10.002	DUMMY10	30 Winter	30	+0%				
10.003	S16W	15 Winter	30	+0%				
11.000	DUMMY11	120 Winter	30	+0%	30/60 Winter			
11.001	PLOTRB_12a	120 Winter	30	+0%	30/15 Winter			
11.002	DUMMY12	15 Winter	30	+0%				
10.004	S17W	15 Winter	30	+0%				
10.005	S18W	15 Winter	30	+0%				
10.006	S19W	15 Winter	30	+0%				
1.010	S20W	15 Winter	30	+0%	30/15 Winter			
12.000	DUMMY19	240 Winter	30	+0%	30/15 Winter			
12.001	PLOTRB_01	240 Winter	30	+0%	30/15 Winter			
12.002	DUMMY20	240 Winter	30	+0%				
1.011	S21W	30 Winter	30	+0%	30/15 Winter			
13.000	DUMMY15	720 Winter	30	+0%	30/30 Winter			
13.001	PLOTRB_03	720 Winter	30	+0%	30/60 Winter			
13.002	DUMMY16	30 Winter	30	+0%				
14.000	DUMMY13	30 Winter	30	+0%	30/15 Winter			
14.001	PLOTRB_04	120 Winter	30	+0%	30/15 Winter			
14.002	DUMMY14	720 Winter	30	+0%				
14.003	S22W	15 Winter	30	+0%				
14.004	S23W	15 Winter	30	+0%				
13.003	S24W	30 Winter	30	+0%	30/15 Winter			
13.004	S25W	30 Winter	30	+0%	30/15 Winter			
13.005	S26W	30 Winter	30	+0%	30/15 Winter			
15.000	DUMMY17	360 Winter	30	+0%	30/15 Winter			
15.001	PLOTRB_02	360 Winter	30	+0%	30/30 Winter			
15.002	DUMMY18	15 Winter	30	+0%				
13.006	S27W	30 Winter	30	+0%	30/15 Winter			
13.007	S28W	30 Winter	30	+0%	30/15 Winter			
1.012	S29W	30 Winter	30	+0%	30/15 Winter			
1.013	S30W	30 Winter	30	+0%				
1.014	S31W	30 Winter	30	+0%				
1.015	S32W	30 Winter	30	+0%	30/15 Winter			
1.016	S33W	30 Winter	30	+0%	30/15 Winter			
1.017	63	15 Winter	30	+0%				
1.018	DUMMY08	15 Winter	30	+0%	30/15 Winter			
1.019	S34W	120 Winter	30	+0%	30/15 Winter			
16.000	S37W	15 Winter	30	+0%				

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The Arup Campus Blyth Gate Solihull B90 8AE				Designed by Emily.Stoddart Checked by					
Date 25/08/2022 12:20 File Plateau West WS4_comple...									
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	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
7.001	S11W	41.135	0.272	0.000	0.02			0.5	SURCHARGED
1.008	S12W	40.045	-0.185	0.000	0.07			5.1	OK
8.000	S13W	41.525	-0.135	0.000	0.33			26.2	OK
9.000	DUMMY08	41.039	0.045	0.000	0.43			13.9	SURCHARGED
9.001	PLOT_RB12b	41.036	0.096	0.000	0.08			3.3	SURCHARGED
9.002	S36W	40.699	-0.147	0.000	0.09			3.5	OK
8.001	S14W	40.722	-0.055	0.000	0.90			43.1	OK
1.009	S15W	39.755	-0.082	0.000	0.71			65.8	OK
10.000	DUMMY09	38.207	0.038	0.000	0.41			14.3	SURCHARGED
10.001	PLOTRE_11	38.205	0.097	0.000	0.07			2.2	SURCHARGED
10.002	DUMMY10	37.869	-0.185	0.000	0.07			2.2	OK*
10.003	S16W	37.854	-0.146	0.000	0.26			9.6	OK
11.000	DUMMY11	38.069	0.102	0.000	0.35			15.3	SURCHARGED
11.001	PLOTRE_12a	38.066	0.196	0.000	0.08			2.3	SURCHARGED
11.002	DUMMY12	37.683	-0.145	0.000	0.08			2.4	OK*
10.004	S17W	37.689	-0.106	0.000	0.53			20.1	OK
10.005	S18W	37.577	-0.105	0.000	0.55			20.3	OK
10.006	S19W	37.461	-0.109	0.000	0.51			19.5	OK
1.010	S20W	37.345	0.097	0.000	1.24			96.9	SURCHARGED
12.000	DUMMY19	38.164	0.164	0.000	0.52			16.9	SURCHARGED
12.001	PLOTRE_01	38.160	0.214	0.000	0.23			4.0	SURCHARGED
12.002	DUMMY20	37.772	-0.151	0.000	0.24			4.0	OK
1.011	S21W	37.121	0.060	0.000	0.48			76.9	SURCHARGED
13.000	DUMMY15	36.658	0.358	0.000	0.17			10.6	SURCHARGED
13.001	PLOTRE_03	36.657	0.395	0.000	0.09			5.4	SURCHARGED
13.002	DYMMY16	36.235	0.000	0.000	0.00			0.0	SURCHARGED*
14.000	DUMMY13	40.311	1.086	0.000	2.19			65.5	SURCHARGED
14.001	PLOTRE_04	40.282	1.097	0.000	0.18			5.5	SURCHARGED
14.002	DUMMY14	38.998	-0.160	0.000	0.18			5.5	OK*
14.003	S22W	38.977	-0.154	0.000	0.22			19.3	OK
14.004	S23W	38.193	-0.152	0.000	0.23			19.3	OK
13.003	S24W	37.151	0.944	0.000	0.41			22.1	SURCHARGED
13.004	S25W	37.126	1.032	0.000	0.36			20.3	SURCHARGED
13.005	S26W	37.100	1.135	0.000	0.38			19.3	SURCHARGED
15.000	DUMMY17	36.824	0.200	0.000	0.43			14.2	SURCHARGED
15.001	PLOTRE_02	36.819	0.250	0.000	0.20			4.5	SURCHARGED
15.002	DUMMY18	36.528	0.000	0.000	0.02			0.4	SURCHARGED*
13.006	S27W	37.075	1.202	0.000	0.33			24.1	SURCHARGED
13.007	S28W	37.050	1.288	0.000	0.33			23.9	SURCHARGED
1.012	S29W	37.027	1.369	0.000	0.97			103.9	SURCHARGED
1.013	S30W	35.252	-0.129	0.000	0.62			103.9	OK
1.014	S31W	32.818	0.000	0.000	1.00			103.0	OK
1.015	S32W	32.001	0.482	0.000	0.99			101.4	SURCHARGED
1.016	S33W	31.761	0.501	0.000	1.99			100.7	FLOOD RISK
1.017	63	31.312	0.000	0.000	1.04			93.6	FLOOD RISK*
1.018	DUMMY08	31.263	0.281	0.000	3.26			93.4	FLOOD RISK*
1.019	S34W	31.158	1.650	0.000	0.76			33.4	FLOOD RISK*
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Water Level	Surcharged Depth	Flooded Volume	Flow / Cap.	Overflow	Half Drain Time	Pipe Flow	Status
		(m)	(m)	(m³)		(l/s)	(mins)	(l/s)	
16.000	S37W	36.782	-0.111	0.000	0.15			7.9	OK

PN

US/MH
Name

Level
Exceeded

7.001

S11W

1.008

S12W

8.000

S13W

9.000

DUMMY08

9.001

PLOT_RB12b

9.002

S36W

8.001

S14W

1.009

S15W

10.000

DUMMY09

10.001

PLOTRB_11

10.002

DUMMY10

10.003

S16W

11.000

DUMMY11

11.001

PLOTRB_12a

11.002

DUMMY12

10.004

S17W

10.005

S18W

10.006

S19W

1.010

S20W

12.000

DUMMY19

12.001

PLOTRB_01

12.002

DUMMY20

1.011

S21W

13.000

DUMMY15

13.001

PLOTRB_03

13.002

DYMMY16

14.000

DUMMY13

14.001

PLOTRB_04

14.002

DUMMY14

14.003

S22W

14.004

S23W

13.003

S24W

13.004

S25W

13.005

S26W

15.000

DUMMY17

15.001

PLOTRB_02

15.002

DUMMY18

13.006

S27W

13.007

S28W

1.012

S29W

1.013

S30W

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- NOTES:
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Date 25/08/2022 12:20	Designed by Emily.Stoddart	
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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>		

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XP Solutions		Network 2020.1.3																																																												
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm <table border="1"> <thead> <tr> <th>PN</th> <th>US/MH Name</th> <th>Level Exceeded</th> </tr> </thead> <tbody> <tr><td>16.001</td><td>S38W</td><td></td></tr> <tr><td>16.002</td><td>S39W</td><td></td></tr> <tr><td>16.003</td><td>S40W</td><td></td></tr> <tr><td>16.004</td><td>S41W</td><td></td></tr> <tr><td>16.005</td><td>S42W</td><td></td></tr> <tr><td>16.006</td><td>S43W</td><td></td></tr> <tr><td>17.000</td><td>DUMMY21</td><td></td></tr> <tr><td>17.001</td><td>PLOTRE_08</td><td></td></tr> <tr><td>17.002</td><td>S47W</td><td></td></tr> <tr><td>18.000</td><td>S50W</td><td></td></tr> <tr><td>18.001</td><td>S51W</td><td></td></tr> <tr><td>17.003</td><td>S48W</td><td></td></tr> <tr><td>19.000</td><td>DUMMY22W</td><td></td></tr> <tr><td>19.001</td><td>PLOTRE_06</td><td></td></tr> <tr><td>17.004</td><td>S49W</td><td></td></tr> <tr><td>16.007</td><td>S44W</td><td></td></tr> <tr><td>16.008</td><td>S45W</td><td></td></tr> <tr><td>16.009</td><td>S46W</td><td></td></tr> <tr><td>1.020</td><td>S35W</td><td>5</td></tr> </tbody> </table>			PN	US/MH Name	Level Exceeded	16.001	S38W		16.002	S39W		16.003	S40W		16.004	S41W		16.005	S42W		16.006	S43W		17.000	DUMMY21		17.001	PLOTRE_08		17.002	S47W		18.000	S50W		18.001	S51W		17.003	S48W		19.000	DUMMY22W		19.001	PLOTRE_06		17.004	S49W		16.007	S44W		16.008	S45W		16.009	S46W		1.020	S35W	5
PN	US/MH Name	Level Exceeded																																																												
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16.009	S46W																																																													
1.020	S35W	5																																																												
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Job number 282022
Date 02 September 2022

7. Appendix C East Network OF-3

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

- 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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The Arup Campus Blyth Gate Solihull B90 8AE											
Date 02/08/2022 12:03				Designed by Emily.Stoddart							
File WS4_Plateau East_comple...				Checked by							
XP Solutions				Network 2020.1.3							
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)
5	29.730	165	29.780	325	30.560	485	31.530	645	31.260	805	30.550
10	29.730	170	29.780	330	30.610	490	31.540	650	31.230	810	30.540
15	29.730	175	29.790	335	30.660	495	31.540	655	31.200	815	30.520
20	29.720	180	29.790	340	30.700	500	31.550	660	31.180	820	30.510
25	29.720	185	29.800	345	30.750	505	31.550	665	31.170	825	30.490
30	29.720	190	29.810	350	30.790	510	31.550	670	31.130	830	30.480
35	29.720	195	29.820	355	30.830	515	31.550	675	31.100	835	30.470
40	29.720	200	29.830	360	30.880	520	31.550	680	31.060	840	30.450
45	29.720	205	29.840	365	30.920	525	31.550	685	31.060	845	30.440
50	29.720	210	29.860	370	30.970	530	31.550	690	31.000	850	30.430
55	29.720	215	29.870	375	31.010	535	31.550	695	30.970	855	30.410
60	29.730	220	29.890	380	31.040	540	31.540	700	30.940	860	30.400
65	29.730	225	29.910	385	31.050	545	31.540	705	30.910	865	30.390
70	29.730	230	29.930	390	31.090	550	31.540	710	30.890	870	30.380
75	29.730	235	29.950	395	31.130	555	31.530	715	30.870	875	30.370
80	29.730	240	29.970	400	31.180	560	31.520	720	30.850	880	30.350
85	29.740	245	29.990	405	31.220	565	31.520	725	30.820	885	30.340
90	29.740	250	30.020	410	31.250	570	31.510	730	30.800	890	30.330
95	29.740	255	30.040	415	31.280	575	31.500	735	30.790	895	30.320
100	29.740	260	30.070	420	31.310	580	31.490	740	30.770	900	30.310
105	29.740	265	30.100	425	31.300	585	31.480	745	30.750	905	30.300
110	29.750	270	30.130	430	31.340	590	31.460	750	30.730	910	30.290
115	29.750	275	30.160	435	31.370	595	31.450	755	30.710	915	30.280
120	29.750	280	30.190	440	31.390	600	31.440	760	30.690	920	30.260
125	29.750	285	30.220	445	31.410	605	31.420	765	30.680	925	30.250
130	29.760	290	30.260	450	31.430	610	31.410	770	30.660	930	30.240
135	29.760	295	30.300	455	31.450	615	31.390	775	30.640	935	30.230
140	29.760	300	30.340	460	31.470	620	31.370	780	30.630	940	30.220
145	29.770	305	30.380	465	31.490	625	31.350	785	30.610	945	30.210
150	29.770	310	30.430	470	31.500	630	31.330	790	30.600	950	30.200
155	29.770	315	30.470	475	31.510	635	31.310	795	30.580	955	30.190
160	29.780	320	30.510	480	31.520	640	31.280	800	30.570	960	30.190
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The Arup Campus Blyth Gate Solihull B90 8AE								
Date 02/08/2022 12:03	Designed by Emily.Stoddart							
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XP Solutions								
Network 2020.1.3								
30 year Return Period Summary of Critical Results by Maximum Outflow (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 Storage Structures 15								
Number of Online Controls 13 Number of Time/Area Diagrams 0								
Number of Offline Controls 0 Number of Real Time Controls 0								
Synthetic Rainfall Details								
Rainfall Model FSR Ratio R 0.357								
Region England and Wales Cv (Summer) 0.750								
M5-60 (mm) 18.000 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) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	DUMMY01	15	Winter	30	+0%	1/15	Winter	
1.001	S1E	1440	Winter	30	+0%	1/15	Winter	
1.002	S2E	1440	Winter	30	+0%			
2.000	DUMMY02	15	Winter	30	+0%	1/15	Winter	
2.001	S4E	240	Winter	30	+0%	1/15	Winter	100/240
1.003	J1	360	Winter	30	+0%			
3.000	DUMMY03	240	Winter	30	+0%	1/15	Winter	
3.001	S5E	120	Winter	30	+0%	1/15	Winter	
1.004	S6E	240	Winter	30	+0%			
4.000	DUMMY05	30	Winter	30	+0%	1/15	Winter	
4.001	DUMMY04	60	Winter	30	+0%	1/15	Winter	
4.002	S7E	720	Winter	30	+0%	1/15	Winter	
1.005	J2	240	Winter	30	+0%			
1.006	S8E	240	Winter	30	+0%			
5.000	DUMMY09	30	Winter	30	+0%	1/15	Winter	
5.001	DUMMY08	120	Winter	30	+0%	1/15	Winter	100/480
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Micro Drainage

XP Solutions

Network 2020.1.3

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

PN	US/MH Name	Status	Level Exceeded
5.002	S10E	SURCHARGED	3
6.000	DUMMY06	SURCHARGED	
6.001	PLOTRB_05a	SURCHARGED	
6.002	DUMMY07	OK	
1.007	S9E	OK	
1.008	S11E	OK	
7.000	DUMMY10	SURCHARGED	
7.001	PLOTRB_05c	SURCHARGED	
7.002	DUMMY11	OK*	
7.003	S20E	OK	
1.009	S12E	OK	
8.000	DUMMY12	OK	
8.001	PLOTRB_05b	SURCHARGED	
8.002	DUMMY13	OK*	
1.010	S13E	OK	
1.011	S14E	OK	
1.012	S15E	SURCHARGED	
1.013	S16E	OK	
1.014	S17E	OK	
1.015	S18E	OK	
1.016	S19E	SURCHARGED	

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