

70064036_CROWN STREET - BLUE ROOF CALCULATION - PHASES
A, C & B EXTERNAL AREAS. DETAILED CALCS FOR BLUE ROOF BY
WATERSHED (REF: BLUE ROOF DRAINAGE STRATEGY REV 01)

WSP Group Ltd

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Date 05/05/2021 13:46
File CROWN ST_BLUE ROOF FINA...

Designed by UKSMM003
Checked by

XP Solutions

Source Control 2018.1

Micro Drainage

Summary of Results for 100 year Return Period (+40%)

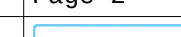
Half Drain Time : 389 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	32.119	0.079	0.0	3.2	3.2	148.8	Flood Risk
30 min Summer	32.145	0.105	0.0	4.9	4.9	196.2	Flood Risk
60 min Summer	32.171	0.131	0.0	7.0	7.0	245.1	Flood Risk
120 min Summer	32.195	0.155	0.0	9.0	9.0	290.9	Flood Risk
180 min Summer	32.207	0.167	0.0	10.0	10.0	312.5	Flood Risk
240 min Summer	32.213	0.173	0.0	10.5	10.5	323.1	Flood Risk
360 min Summer	32.217	0.177	0.0	10.9	10.9	331.0	Flood Risk
480 min Summer	32.219	0.179	0.0	11.0	11.0	335.9	Flood Risk
600 min Summer	32.221	0.181	0.0	11.1	11.1	338.1	Flood Risk
720 min Summer	32.221	0.181	0.0	11.1	11.1	338.6	Flood Risk
960 min Summer	32.220	0.180	0.0	11.0	11.0	336.1	Flood Risk
1440 min Summer	32.214	0.174	0.0	10.6	10.6	325.3	Flood Risk
2160 min Summer	32.203	0.163	0.0	9.7	9.7	305.9	Flood Risk
2880 min Summer	32.194	0.154	0.0	8.9	8.9	287.7	Flood Risk
4320 min Summer	32.178	0.138	0.0	7.6	7.6	258.0	Flood Risk
5760 min Summer	32.166	0.126	0.0	6.6	6.6	235.8	Flood Risk
7200 min Summer	32.157	0.117	0.0	5.8	5.8	218.5	Flood Risk
8640 min Summer	32.149	0.109	0.0	5.2	5.2	204.6	Flood Risk
10080 min Summer	32.143	0.103	0.0	4.7	4.7	193.2	Flood Risk
15 min Winter	32.129	0.089	0.0	3.8	3.8	166.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.382	0.0	101.9	81
30 min Summer	79.333	0.0	148.4	92
60 min Summer	50.812	0.0	230.9	114
120 min Summer	31.498	0.0	292.9	156
180 min Summer	23.499	0.0	331.0	200
240 min Summer	18.972	0.0	358.2	244
360 min Summer	13.913	0.0	396.2	310
480 min Summer	11.171	0.0	425.5	376
600 min Summer	9.415	0.0	448.8	442
720 min Summer	8.183	0.0	468.4	510
960 min Summer	6.552	0.0	499.6	644
1440 min Summer	4.782	0.0	542.8	908
2160 min Summer	3.483	0.0	630.6	1296
2880 min Summer	2.778	0.0	668.1	1672
4320 min Summer	2.016	0.0	715.9	2420
5760 min Summer	1.604	0.0	790.9	3160
7200 min Summer	1.343	0.0	824.8	3896
8640 min Summer	1.160	0.0	850.2	4624
10080 min Summer	1.025	0.0	866.6	5368
15 min Winter	118.382	0.0	118.3	81

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KEY DESIGN PARAMETERS:
MAXIMUM ALLOWABLE DISCHARGE - 12 L/S
TOTAL DRAINED IMPERMEABLE AREA - 6970 SQ METRES

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Summary of Results for 100 year Return Period (+40%)

Storm Event			Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status	
30 min	Winter		32.157	0.117	0.0	5.8	5.8	219.0	Flood	Risk
60 min	Winter		32.186	0.146	0.0	8.3	8.3	273.3	Flood	Risk
120 min	Winter		32.213	0.173	0.0	10.6	10.6	324.5	Flood	Risk
180 min	Winter		32.226	0.186	0.0	11.3	11.3	349.1	Flood	Risk
240 min	Winter		32.233	0.193	0.0	11.6	11.6	361.6	Flood	Risk
360 min	Winter		32.237	0.197	0.0	11.8	11.8	369.3	Flood	Risk
480 min	Winter		32.239	0.199	0.0	11.9	11.9	371.9	Flood	Risk
600 min	Winter		32.238	0.198	0.0	11.8	11.8	371.3	Flood	Risk
720 min	Winter		32.237	0.197	0.0	11.8	11.8	368.5	Flood	Risk
960 min	Winter		32.232	0.192	0.0	11.6	11.6	359.1	Flood	Risk
1440 min	Winter		32.219	0.179	0.0	11.0	11.0	335.9	Flood	Risk
2160 min	Winter		32.203	0.163	0.0	9.7	9.7	305.4	Flood	Risk
2880 min	Winter		32.190	0.150	0.0	8.6	8.6	280.4	Flood	Risk
4320 min	Winter		32.170	0.130	0.0	6.9	6.9	243.5	Flood	Risk
5760 min	Winter		32.156	0.116	0.0	5.8	5.8	218.0	Flood	Risk
7200 min	Winter		32.146	0.106	0.0	5.0	5.0	199.1	Flood	Risk
8640 min	Winter		32.138	0.098	0.0	4.3	4.3	184.1	Flood	Risk
10080 min	Winter		32.131	0.091	0.0	3.9	3.9	170.5	Flood	Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	79.333	0.0	171.0	92
60 min Winter	50.812	0.0	262.1	114
120 min Winter	31.498	0.0	331.7	156
180 min Winter	23.499	0.0	374.4	202
240 min Winter	18.972	0.0	405.0	248
360 min Winter	13.913	0.0	447.7	328
480 min Winter	11.171	0.0	480.5	398
600 min Winter	9.415	0.0	506.9	472
720 min Winter	8.183	0.0	528.9	544
960 min Winter	6.552	0.0	564.2	688
1440 min Winter	4.782	0.0	613.3	960
2160 min Winter	3.483	0.0	708.9	1356
2880 min Winter	2.778	0.0	751.3	1740
4320 min Winter	2.016	0.0	806.3	2496
5760 min Winter	1.604	0.0	887.4	3248
7200 min Winter	1.343	0.0	925.9	4000
8640 min Winter	1.160	0.0	955.1	4768
10080 min Winter	1.025	0.0	974.8	5480

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Model Details

Storage is Online Cover Level (m) 32.300

Cellular Storage Structure

Invert Level (m) 32.040 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.78
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	2400.0	0.0	0.201	0.0	0.0
0.200	2400.0	0.0			

Orifice Outflow Control

Diameter (m) 0.124 Discharge Coefficient 0.600 Invert Level (m) 32.040

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70064036_CROWN STREET - BASMENT PUMP CALCULATION -
RUNOFF FROM BASEMENT RAMP ONLY.

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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)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.363	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	250	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.300
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

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
1.000	10.000	0.125	80.0	0.014	4.00	0.0	0.600	o	100	Pipe/Conduit		🚧
1.001	5.000	0.010	500.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit		🚧

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	146.97	4.19	25.990	0.014	0.0	0.0	0.0	0.86	6.8	5.6
1.001	144.82	4.38	24.390	0.014	0.0	0.0	0.0	0.44	7.8	5.6

KEY DESIGN PARAMETERS:
MAXIMUM ALLOWABLE DISCHARGE - 2 L/S
TOTAL DRAINED IMPERMEABLE AREA - 140 SQ METRES

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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	-	-	100	0.014	0.014	0.014
1.001	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.014	0.014	0.014

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.363		

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XP Solutions	Network 2019.1																																																																			
Online Controls for Storm																																																																				
Level Controlled Pump Manhole: 2, DS/PN: 1.001, Volume (m³): 0.1																																																																				
Invert Level (m) 24.390 Cut In Height (m) 0.700 Cut Out Height (m) 0.300																																																																				
<table><tr><td>Depth (m)</td><td>Outflow (l/s)</td><td>Depth (m)</td><td>Outflow (l/s)</td><td>Depth (m)</td><td>Outflow (l/s)</td></tr><tr><td>0.200</td><td>0.0000</td><td>2.200</td><td>2.0000</td><td>4.200</td><td>2.0000</td></tr><tr><td>0.400</td><td>1.0000</td><td>2.400</td><td>2.0000</td><td>4.400</td><td>2.0000</td></tr><tr><td>0.600</td><td>2.0000</td><td>2.600</td><td>2.0000</td><td>4.600</td><td>2.0000</td></tr><tr><td>0.800</td><td>2.0000</td><td>2.800</td><td>2.0000</td><td>4.800</td><td>2.0000</td></tr><tr><td>1.000</td><td>2.0000</td><td>3.000</td><td>2.0000</td><td>5.000</td><td>2.0000</td></tr><tr><td>1.200</td><td>2.0000</td><td>3.200</td><td>2.0000</td><td>5.200</td><td>2.0000</td></tr><tr><td>1.400</td><td>2.0000</td><td>3.400</td><td>2.0000</td><td>5.400</td><td>2.0000</td></tr><tr><td>1.600</td><td>2.0000</td><td>3.600</td><td>2.0000</td><td>5.600</td><td>2.0000</td></tr><tr><td>1.800</td><td>2.0000</td><td>3.800</td><td>2.0000</td><td>5.800</td><td>2.0000</td></tr><tr><td>2.000</td><td>2.0000</td><td>4.000</td><td>2.0000</td><td>6.000</td><td>2.0000</td></tr></table>			Depth (m)	Outflow (l/s)	Depth (m)	Outflow (l/s)	Depth (m)	Outflow (l/s)	0.200	0.0000	2.200	2.0000	4.200	2.0000	0.400	1.0000	2.400	2.0000	4.400	2.0000	0.600	2.0000	2.600	2.0000	4.600	2.0000	0.800	2.0000	2.800	2.0000	4.800	2.0000	1.000	2.0000	3.000	2.0000	5.000	2.0000	1.200	2.0000	3.200	2.0000	5.200	2.0000	1.400	2.0000	3.400	2.0000	5.400	2.0000	1.600	2.0000	3.600	2.0000	5.600	2.0000	1.800	2.0000	3.800	2.0000	5.800	2.0000	2.000	2.0000	4.000	2.0000	6.000	2.0000
Depth (m)	Outflow (l/s)	Depth (m)	Outflow (l/s)	Depth (m)	Outflow (l/s)																																																															
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