

Thorogood House
34 Tolworth Close
Surbiton
Surrey
KT6 7EW

Tel: 0208 339 7899
Fax: 0208 339 7898
E-mail: info@lanmor.co.uk
Internet: www.lanmor.co.uk

Mr T Roberts
Progress Planning
1st Floor
10-12 The Broadway
Wycombe End
Beaconsfield
HP9 1ND

Our Ref: 201345/ml/KL/03

22 May 2023

Dear Tom

KINGSTON BRIDGE HOUSE

Further to your recent email we have reviewed the comments from LLFA on the information they require and updated the drainage design to include the permeable areas of landscaping etc. The permeable paving has been redesigned to accommodate any runoff from the permeable areas adjacent during times when the landscaped areas are saturated.

This has resulted in the subbase of the paving area increasing to 600mm deep. The proposed discharge has been restricted by a orifice in the final manhole to limit the discharge to 1 l/s. The microdrainage calculations for the paving and landscaped areas are enclosed. The green/blue roofs on the building are unaffected by these changes.

For ease the storage requirements, depth of water and storage provided in the paving are tabulated below.

Permeable Paving			
Return Period	Storage Required	Depth of Water	Storage Provided
1 in 1 year	17.3 m ³	0.123m	112 m ³
1 in 30 year	52.2 m ³	0.312m	112 m ³
1 in 100 year	71.9 m ³	0.418m	112 m ³
1 in 100 +40%	108.2 m ³	0.617m	112 m ³

The permeable paving has been designed with a 600mm thick sub-base for attenuation. The above demonstrates that the paving is cable of storing runoff all return periods up to and including the 1 in 100 year plus 40% allowance for climate change.

I trust the above is sufficient for the LLFA to review the strategy and remove their objection, however if you require further information please let me know.

Yours sincerely

Kevin Lang

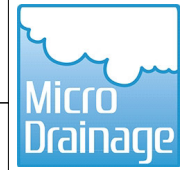
Summary of Results for 1 year Return Period

Half Drain Time : 383 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	99.271	0.021	0.0	0.1	0.1	0.7	O K
30 min Summer	99.295	0.045	0.0	0.2	0.2	3.2	O K
60 min Summer	99.313	0.063	0.0	0.3	0.3	6.2	O K
120 min Summer	99.331	0.081	0.0	0.3	0.3	9.5	O K
180 min Summer	99.341	0.091	0.0	0.4	0.4	11.3	O K
240 min Summer	99.347	0.097	0.0	0.4	0.4	12.5	O K
360 min Summer	99.352	0.102	0.0	0.4	0.4	13.4	O K
480 min Summer	99.354	0.104	0.0	0.4	0.4	13.9	O K
600 min Summer	99.356	0.106	0.0	0.4	0.4	14.2	O K
720 min Summer	99.357	0.107	0.0	0.4	0.4	14.4	O K
960 min Summer	99.358	0.108	0.0	0.4	0.4	14.5	O K
1440 min Summer	99.356	0.106	0.0	0.4	0.4	14.1	O K
2160 min Summer	99.350	0.100	0.0	0.4	0.4	13.0	O K
2880 min Summer	99.343	0.093	0.0	0.4	0.4	11.7	O K
4320 min Summer	99.330	0.080	0.0	0.3	0.3	9.4	O K
5760 min Summer	99.320	0.070	0.0	0.3	0.3	7.6	O K
7200 min Summer	99.313	0.063	0.0	0.3	0.3	6.2	O K
8640 min Summer	99.307	0.057	0.0	0.3	0.3	5.0	O K
10080 min Summer	99.301	0.051	0.0	0.3	0.3	4.1	O K
15 min Winter	99.282	0.032	0.0	0.2	0.2	1.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	31.271	0.0	1.0	77
30 min Summer	20.316	0.0	4.0	78
60 min Summer	12.800	0.0	7.3	96
120 min Summer	7.899	0.0	11.1	138
180 min Summer	5.927	0.0	13.4	186
240 min Summer	4.828	0.0	15.1	242
360 min Summer	3.597	0.0	17.5	344
480 min Summer	2.909	0.0	19.1	402
600 min Summer	2.468	0.0	20.4	466
720 min Summer	2.157	0.0	21.3	530
960 min Summer	1.744	0.0	22.8	666
1440 min Summer	1.294	0.0	24.4	938
2160 min Summer	0.960	0.0	25.4	1344
2880 min Summer	0.776	0.0	25.3	1736
4320 min Summer	0.575	0.0	24.7	2508
5760 min Summer	0.465	0.0	23.8	3240
7200 min Summer	0.395	0.0	23.0	3968
8640 min Summer	0.345	0.0	22.2	4672
10080 min Summer	0.308	0.0	21.4	5368
15 min Winter	31.271	0.0	2.2	71

Thorogood House
34 Tolworth Close
Surbition Surrey KT6 7EW



Date 22/05/2023 21:25
File Paving.srcx

Designed by Kunal
Checked by

XP Solutions

Source Control 2015.1

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
30 min Winter	99.304	0.054	0.0	0.3	0.3	4.6	O K
60 min Winter	99.323	0.073	0.0	0.3	0.3	8.1	O K
120 min Winter	99.343	0.093	0.0	0.4	0.4	11.8	O K
180 min Winter	99.355	0.105	0.0	0.4	0.4	13.9	O K
240 min Winter	99.362	0.112	0.0	0.4	0.4	15.3	O K
360 min Winter	99.369	0.119	0.0	0.4	0.4	16.5	O K
480 min Winter	99.371	0.121	0.0	0.4	0.4	16.9	O K
600 min Winter	99.372	0.122	0.0	0.4	0.4	17.1	O K
720 min Winter	99.373	0.123	0.0	0.4	0.4	17.3	O K
960 min Winter	99.372	0.122	0.0	0.4	0.4	17.2	O K
1440 min Winter	99.367	0.117	0.0	0.4	0.4	16.3	O K
2160 min Winter	99.357	0.107	0.0	0.4	0.4	14.4	O K
2880 min Winter	99.346	0.096	0.0	0.4	0.4	12.4	O K
4320 min Winter	99.328	0.078	0.0	0.3	0.3	8.9	O K
5760 min Winter	99.314	0.064	0.0	0.3	0.3	6.4	O K
7200 min Winter	99.304	0.054	0.0	0.3	0.3	4.6	O K
8640 min Winter	99.296	0.046	0.0	0.2	0.2	3.3	O K
10080 min Winter	99.290	0.040	0.0	0.2	0.2	2.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	20.316	0.0	5.6	79
60 min Winter	12.800	0.0	9.4	98
120 min Winter	7.899	0.0	13.5	140
180 min Winter	5.927	0.0	16.2	186
240 min Winter	4.828	0.0	18.2	240
360 min Winter	3.597	0.0	20.9	350
480 min Winter	2.909	0.0	22.9	444
600 min Winter	2.468	0.0	24.3	490
720 min Winter	2.157	0.0	25.5	564
960 min Winter	1.744	0.0	27.3	714
1440 min Winter	1.294	0.0	29.5	1012
2160 min Winter	0.960	0.0	31.1	1440
2880 min Winter	0.776	0.0	31.6	1848
4320 min Winter	0.575	0.0	30.9	2632
5760 min Winter	0.465	0.0	30.0	3352
7200 min Winter	0.395	0.0	28.9	4040
8640 min Winter	0.345	0.0	27.5	4752
10080 min Winter	0.308	0.0	26.2	5368

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof


Area (m ²)	1129	Evaporation (mm/day)	5
Depression Storage (mm)	5	Decay Coefficient	0.050

Time (mins)		Area	Time (mins)		Area	Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)	From:	To:	(ha)
0	4	0.020516	32	36	0.004142	64	68	0.000836	96	100	0.000169
4	8	0.016797	36	40	0.003391	68	72	0.000685	100	104	0.000138
8	12	0.013752	40	44	0.002777	72	76	0.000561	104	108	0.000113
12	16	0.011260	44	48	0.002273	76	80	0.000459	108	112	0.000093
16	20	0.009219	48	52	0.001861	80	84	0.000376	112	116	0.000076
20	24	0.007547	52	56	0.001524	84	88	0.000308	116	120	0.000062
24	28	0.006179	56	60	0.001248	88	92	0.000252			
28	32	0.005059	60	64	0.001021	92	96	0.000206			

Time Area Diagram

Total Area (ha) 0.062

Time (mins)	Area
From: To:	(ha)
0	4 0.062

Lanmor Consulting Ltd		Page 4
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW		
Date 22/05/2023 21:25 File Paving.srcx	Designed by Kunal Checked by	
XP Solutions	Source Control 2015.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr) 0.00000	Width (m) 14.0
Membrane Percolation (mm/hr) 1000	Length (m) 44.0
Max Percolation (l/s) 171.1	Slope (1:X) 750.0
Safety Factor 2.0	Depression Storage (mm) 5
Porosity 0.30	Evaporation (mm/day) 3
Invert Level (m) 99.250	Cap Volume Depth (m) 0.600

Orifice Outflow Control

Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 99.250

Thorogood House
34 Tolworth Close
Surbition Surrey KT6 7EW

Date 22/05/2023 21:25
File Paving.srcx

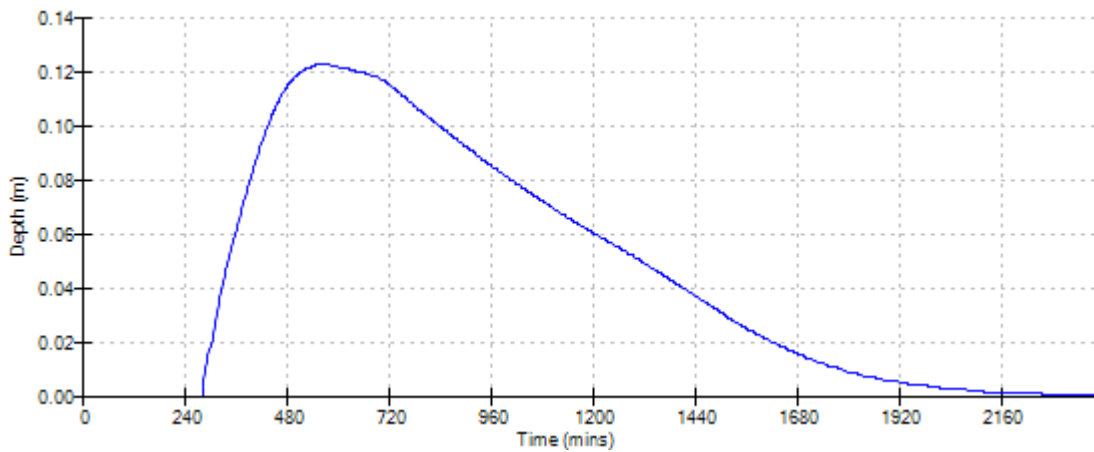
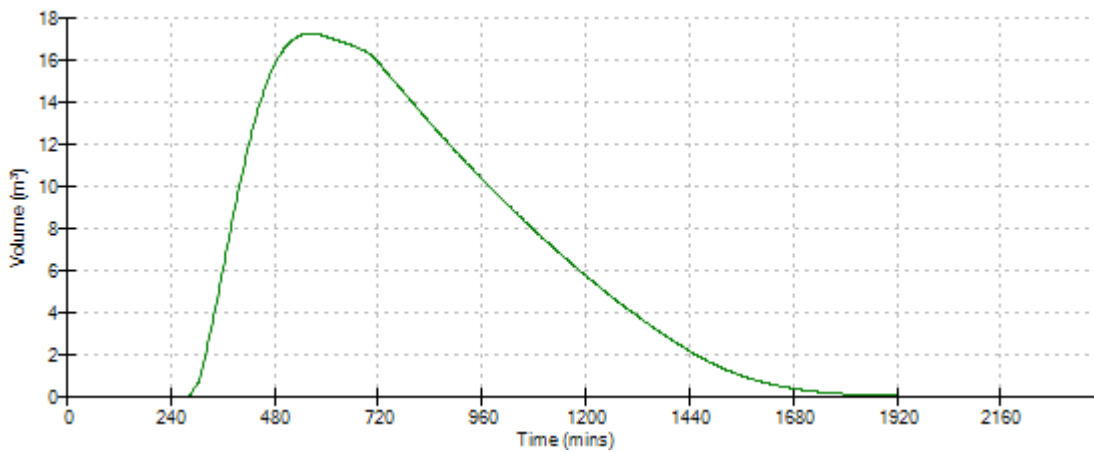
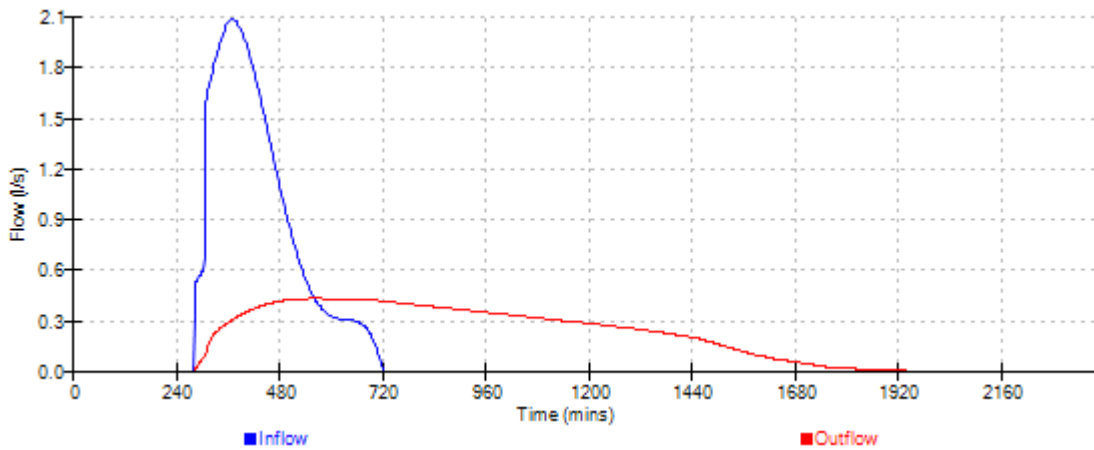
Designed by Kunal
Checked by



XP Solutions

Source Control 2015.1

Event: 720 min Winter



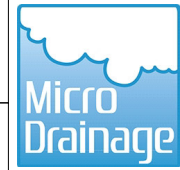
Summary of Results for 30 year Return Period

Half Drain Time : 713 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	99.356	0.106	0.0	0.4	0.4	14.1	O K
30 min Summer	99.393	0.143	0.0	0.5	0.5	21.1	O K
60 min Summer	99.433	0.183	0.0	0.5	0.5	28.3	O K
120 min Summer	99.472	0.222	0.0	0.6	0.6	35.5	O K
180 min Summer	99.492	0.242	0.0	0.6	0.6	39.3	O K
240 min Summer	99.504	0.254	0.0	0.6	0.6	41.6	O K
360 min Summer	99.516	0.266	0.0	0.7	0.7	43.8	O K
480 min Summer	99.521	0.271	0.0	0.7	0.7	44.6	O K
600 min Summer	99.521	0.271	0.0	0.7	0.7	44.7	O K
720 min Summer	99.522	0.272	0.0	0.7	0.7	44.8	O K
960 min Summer	99.521	0.271	0.0	0.7	0.7	44.6	O K
1440 min Summer	99.515	0.265	0.0	0.7	0.7	43.5	O K
2160 min Summer	99.501	0.251	0.0	0.6	0.6	41.0	O K
2880 min Summer	99.486	0.236	0.0	0.6	0.6	38.1	O K
4320 min Summer	99.456	0.206	0.0	0.6	0.6	32.7	O K
5760 min Summer	99.430	0.180	0.0	0.5	0.5	27.9	O K
7200 min Summer	99.409	0.159	0.0	0.5	0.5	23.9	O K
8640 min Summer	99.391	0.141	0.0	0.5	0.5	20.7	O K
10080 min Summer	99.376	0.126	0.0	0.4	0.4	17.9	O K
15 min Winter	99.371	0.121	0.0	0.4	0.4	16.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	76.734	0.0	15.8	74
30 min Summer	49.733	0.0	23.1	85
60 min Summer	30.811	0.0	30.9	104
120 min Summer	18.530	0.0	38.9	146
180 min Summer	13.620	0.0	43.6	194
240 min Summer	10.901	0.0	46.9	246
360 min Summer	7.944	0.0	51.6	362
480 min Summer	6.344	0.0	55.1	480
600 min Summer	5.326	0.0	57.8	538
720 min Summer	4.615	0.0	59.9	598
960 min Summer	3.679	0.0	63.2	722
1440 min Summer	2.670	0.0	66.2	992
2160 min Summer	1.936	0.0	71.3	1404
2880 min Summer	1.540	0.0	73.2	1812
4320 min Summer	1.114	0.0	74.0	2596
5760 min Summer	0.885	0.0	72.8	3360
7200 min Summer	0.740	0.0	70.9	4112
8640 min Summer	0.640	0.0	69.0	4848
10080 min Summer	0.565	0.0	67.2	5568
15 min Winter	76.734	0.0	18.8	75

Thorogood House
34 Tolworth Close
Surbition Surrey KT6 7EW



Date 22/05/2023 21:24
File Paving.srcx

Designed by Kunal
Checked by

XP Solutions

Source Control 2015.1

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	99.413	0.163	0.0	0.5	0.5	24.8	O K
60 min Winter	99.457	0.207	0.0	0.6	0.6	32.9	O K
120 min Winter	99.501	0.251	0.0	0.6	0.6	41.0	O K
180 min Winter	99.525	0.275	0.0	0.7	0.7	45.4	O K
240 min Winter	99.539	0.289	0.0	0.7	0.7	48.0	O K
360 min Winter	99.554	0.304	0.0	0.7	0.7	50.7	O K
480 min Winter	99.560	0.310	0.0	0.7	0.7	51.9	O K
600 min Winter	99.562	0.312	0.0	0.7	0.7	52.2	O K
720 min Winter	99.560	0.310	0.0	0.7	0.7	52.0	O K
960 min Winter	99.557	0.307	0.0	0.7	0.7	51.4	O K
1440 min Winter	99.547	0.297	0.0	0.7	0.7	49.5	O K
2160 min Winter	99.525	0.275	0.0	0.7	0.7	45.4	O K
2880 min Winter	99.502	0.252	0.0	0.6	0.6	41.1	O K
4320 min Winter	99.459	0.209	0.0	0.6	0.6	33.2	O K
5760 min Winter	99.424	0.174	0.0	0.5	0.5	26.8	O K
7200 min Winter	99.396	0.146	0.0	0.5	0.5	21.6	O K
8640 min Winter	99.374	0.124	0.0	0.4	0.4	17.5	O K
10080 min Winter	99.356	0.106	0.0	0.4	0.4	14.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	49.733	0.0	26.9	86
60 min Winter	30.811	0.0	35.8	106
120 min Winter	18.530	0.0	44.7	148
180 min Winter	13.620	0.0	50.0	194
240 min Winter	10.901	0.0	53.8	246
360 min Winter	7.944	0.0	59.2	356
480 min Winter	6.344	0.0	63.1	468
600 min Winter	5.326	0.0	66.2	574
720 min Winter	4.615	0.0	68.6	670
960 min Winter	3.679	0.0	72.1	762
1440 min Winter	2.670	0.0	74.0	1068
2160 min Winter	1.936	0.0	82.6	1516
2880 min Winter	1.540	0.0	85.1	1944
4320 min Winter	1.114	0.0	87.2	2768
5760 min Winter	0.885	0.0	87.1	3552
7200 min Winter	0.740	0.0	85.8	4320
8640 min Winter	0.640	0.0	83.7	5032
10080 min Winter	0.565	0.0	81.3	5752

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof


Area (m ²)	1129	Evaporation (mm/day)	5
Depression Storage (mm)	5	Decay Coefficient	0.050

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:	From:	To:
0	4	32	36	64	68	96	100
	0.020516		0.004142		0.000836		0.000169
4	8	36	40	68	72	100	104
	0.016797		0.003391		0.000685		0.000138
8	12	40	44	72	76	104	108
	0.013752		0.002777		0.000561		0.000113
12	16	44	48	76	80	108	112
	0.011260		0.002273		0.000459		0.000093
16	20	48	52	80	84	112	116
	0.009219		0.001861		0.000376		0.000076
20	24	52	56	84	88	116	120
	0.007547		0.001524		0.000308		0.000062
24	28	56	60	88	92		
	0.006179		0.001248		0.000252		
28	32	60	64	92	96		
	0.005059		0.001021		0.000206		

Time Area Diagram

Total Area (ha) 0.062

Time (mins)	Area (ha)
From:	To:
0	4
	0.062

Lanmor Consulting Ltd		Page 4
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW		
Date 22/05/2023 21:24 File Paving.srcx	Designed by Kunal Checked by	
XP Solutions	Source Control 2015.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr) 0.00000	Width (m) 14.0
Membrane Percolation (mm/hr) 1000	Length (m) 44.0
Max Percolation (l/s) 171.1	Slope (1:X) 750.0
Safety Factor 2.0	Depression Storage (mm) 5
Porosity 0.30	Evaporation (mm/day) 3
Invert Level (m) 99.250	Cap Volume Depth (m) 0.600

Orifice Outflow Control

Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 99.250

Thorogood House
34 Tolworth Close
Surbition Surrey KT6 7EW

Date 22/05/2023 21:24
File Paving.srcx

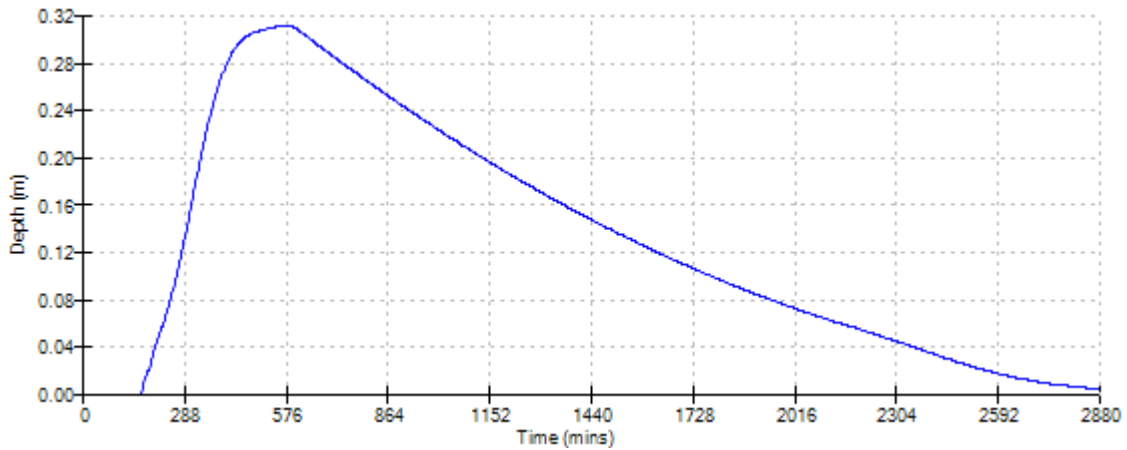
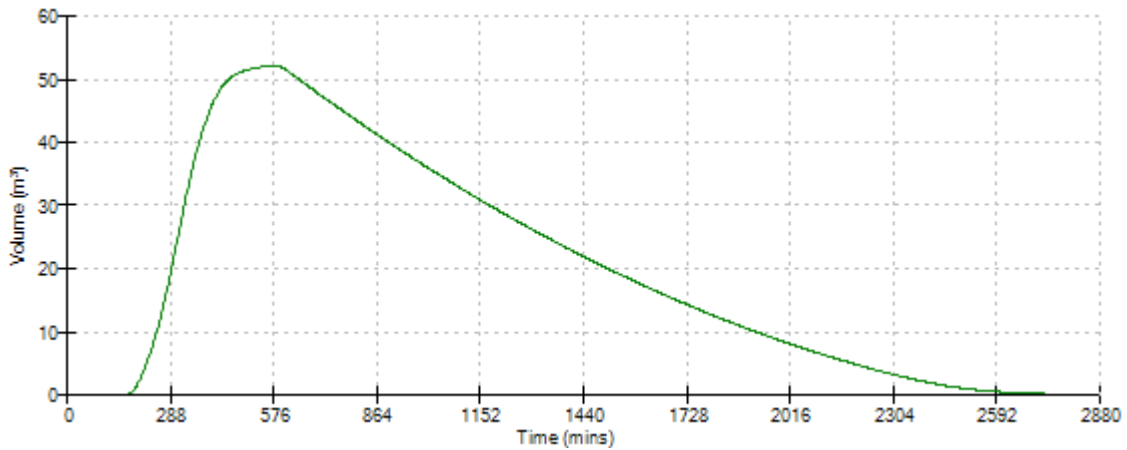
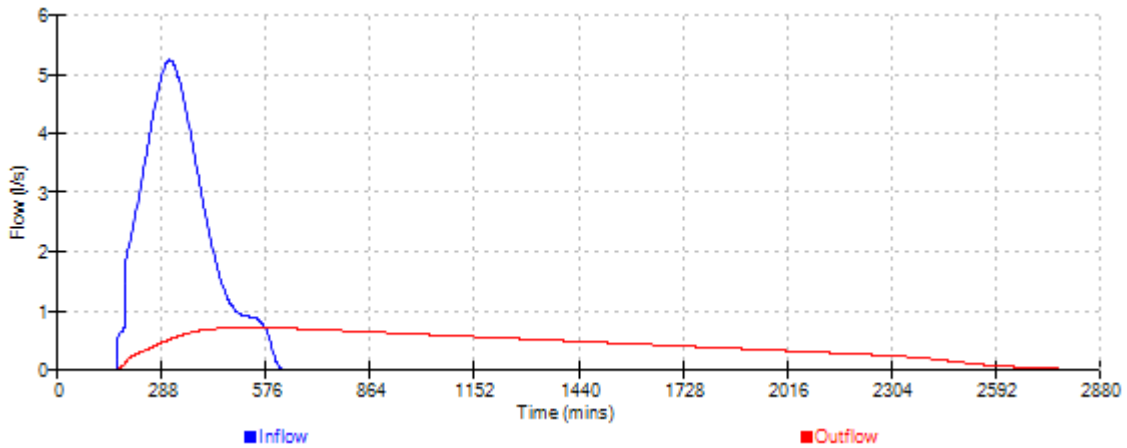
Designed by Kunal
Checked by



XP Solutions

Source Control 2015.1

Event: 600 min Winter



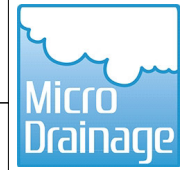
Summary of Results for 100 year Return Period

Half Drain Time : 851 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	99.394	0.144	0.0	0.5	0.5	21.2	O K
30 min Summer	99.445	0.195	0.0	0.6	0.6	30.6	O K
60 min Summer	99.498	0.248	0.0	0.6	0.6	40.4	O K
120 min Summer	99.550	0.300	0.0	0.7	0.7	50.0	O K
180 min Summer	99.577	0.327	0.0	0.7	0.7	55.0	O K
240 min Summer	99.592	0.342	0.0	0.7	0.7	57.8	O K
360 min Summer	99.608	0.358	0.0	0.8	0.8	60.7	O K
480 min Summer	99.614	0.364	0.0	0.8	0.8	61.9	O K
600 min Summer	99.615	0.365	0.0	0.8	0.8	62.0	O K
720 min Summer	99.614	0.364	0.0	0.8	0.8	61.9	O K
960 min Summer	99.611	0.361	0.0	0.8	0.8	61.4	O K
1440 min Summer	99.602	0.352	0.0	0.8	0.8	59.7	O K
2160 min Summer	99.584	0.334	0.0	0.7	0.7	56.3	O K
2880 min Summer	99.564	0.314	0.0	0.7	0.7	52.6	O K
4320 min Summer	99.526	0.276	0.0	0.7	0.7	45.6	O K
5760 min Summer	99.493	0.243	0.0	0.6	0.6	39.5	O K
7200 min Summer	99.465	0.215	0.0	0.6	0.6	34.4	O K
8640 min Summer	99.442	0.192	0.0	0.6	0.6	30.0	O K
10080 min Summer	99.422	0.172	0.0	0.5	0.5	26.3	O K
15 min Winter	99.414	0.164	0.0	0.5	0.5	24.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	99.621	0.0	23.2	77
30 min Summer	65.104	0.0	32.2	87
60 min Summer	40.510	0.0	43.6	108
120 min Summer	24.352	0.0	54.1	150
180 min Summer	17.844	0.0	60.2	196
240 min Summer	14.229	0.0	64.3	248
360 min Summer	10.307	0.0	70.2	362
480 min Summer	8.201	0.0	74.4	482
600 min Summer	6.863	0.0	77.6	584
720 min Summer	5.931	0.0	79.9	630
960 min Summer	4.707	0.0	82.3	754
1440 min Summer	3.394	0.0	82.6	1012
2160 min Summer	2.444	0.0	95.3	1428
2880 min Summer	1.934	0.0	97.9	1836
4320 min Summer	1.388	0.0	99.8	2636
5760 min Summer	1.096	0.0	99.4	3408
7200 min Summer	0.913	0.0	97.5	4176
8640 min Summer	0.785	0.0	94.9	4928
10080 min Summer	0.691	0.0	92.5	5648
15 min Winter	99.621	0.0	27.0	78

Thorogood House
34 Tolworth Close
Surbition Surrey KT6 7EW



Date 22/05/2023 21:23
File Paving.srcx

Designed by Kunal
Checked by

XP Solutions

Source Control 2015.1

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
30 min Winter	99.472	0.222	0.0	0.6	0.6	35.5	O K
60 min Winter	99.531	0.281	0.0	0.7	0.7	46.5	O K
120 min Winter	99.589	0.339	0.0	0.7	0.7	57.3	O K
180 min Winter	99.620	0.370	0.0	0.8	0.8	62.9	O K
240 min Winter	99.638	0.388	0.0	0.8	0.8	66.2	O K
360 min Winter	99.657	0.407	0.0	0.8	0.8	69.8	O K
480 min Winter	99.666	0.416	0.0	0.8	0.8	71.4	O K
600 min Winter	99.668	0.418	0.0	0.8	0.8	71.9	O K
720 min Winter	99.667	0.417	0.0	0.8	0.8	71.7	O K
960 min Winter	99.661	0.411	0.0	0.8	0.8	70.5	O K
1440 min Winter	99.648	0.398	0.0	0.8	0.8	68.1	O K
2160 min Winter	99.620	0.370	0.0	0.8	0.8	62.9	O K
2880 min Winter	99.590	0.340	0.0	0.7	0.7	57.5	O K
4320 min Winter	99.536	0.286	0.0	0.7	0.7	47.4	O K
5760 min Winter	99.491	0.241	0.0	0.6	0.6	39.0	O K
7200 min Winter	99.454	0.204	0.0	0.6	0.6	32.2	O K
8640 min Winter	99.424	0.174	0.0	0.5	0.5	26.7	O K
10080 min Winter	99.399	0.149	0.0	0.5	0.5	22.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	65.104	0.0	35.9	89
60 min Winter	40.510	0.0	50.0	108
120 min Winter	24.352	0.0	61.8	150
180 min Winter	17.844	0.0	68.6	196
240 min Winter	14.229	0.0	73.3	248
360 min Winter	10.307	0.0	79.8	358
480 min Winter	8.201	0.0	84.3	472
600 min Winter	6.863	0.0	87.3	582
720 min Winter	5.931	0.0	89.2	686
960 min Winter	4.707	0.0	91.2	790
1440 min Winter	3.394	0.0	91.3	1088
2160 min Winter	2.444	0.0	109.4	1540
2880 min Winter	1.934	0.0	112.8	1980
4320 min Winter	1.388	0.0	116.1	2812
5760 min Winter	1.096	0.0	116.7	3616
7200 min Winter	0.913	0.0	115.9	4392
8640 min Winter	0.785	0.0	114.1	5112
10080 min Winter	0.691	0.0	111.7	5856

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof


Area (m ²)	1129	Evaporation (mm/day)	5
Depression Storage (mm)	5	Decay Coefficient	0.050

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:	From:	To:
0	4	32	36	64	68	96	100
	0.020516		0.004142		0.000836		0.000169
4	8	36	40	68	72	100	104
	0.016797		0.003391		0.000685		0.000138
8	12	40	44	72	76	104	108
	0.013752		0.002777		0.000561		0.000113
12	16	44	48	76	80	108	112
	0.011260		0.002273		0.000459		0.000093
16	20	48	52	80	84	112	116
	0.009219		0.001861		0.000376		0.000076
20	24	52	56	84	88	116	120
	0.007547		0.001524		0.000308		0.000062
24	28	56	60	88	92		
	0.006179		0.001248		0.000252		
28	32	60	64	92	96		
	0.005059		0.001021		0.000206		

Time Area Diagram

Total Area (ha) 0.062

Time (mins)	Area (ha)
From:	To:
0	4
	0.062

Lanmor Consulting Ltd		Page 4
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW		
Date 22/05/2023 21:23 File Paving.srcx	Designed by Kunal Checked by	
XP Solutions	Source Control 2015.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr) 0.00000	Width (m) 14.0
Membrane Percolation (mm/hr) 1000	Length (m) 44.0
Max Percolation (l/s) 171.1	Slope (1:X) 750.0
Safety Factor 2.0	Depression Storage (mm) 5
Porosity 0.30	Evaporation (mm/day) 3
Invert Level (m) 99.250	Cap Volume Depth (m) 0.600

Orifice Outflow Control

Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 99.250

Thorogood House
34 Tolworth Close
Surbition Surrey KT6 7EW

Date 22/05/2023 21:23
File Paving.srcx

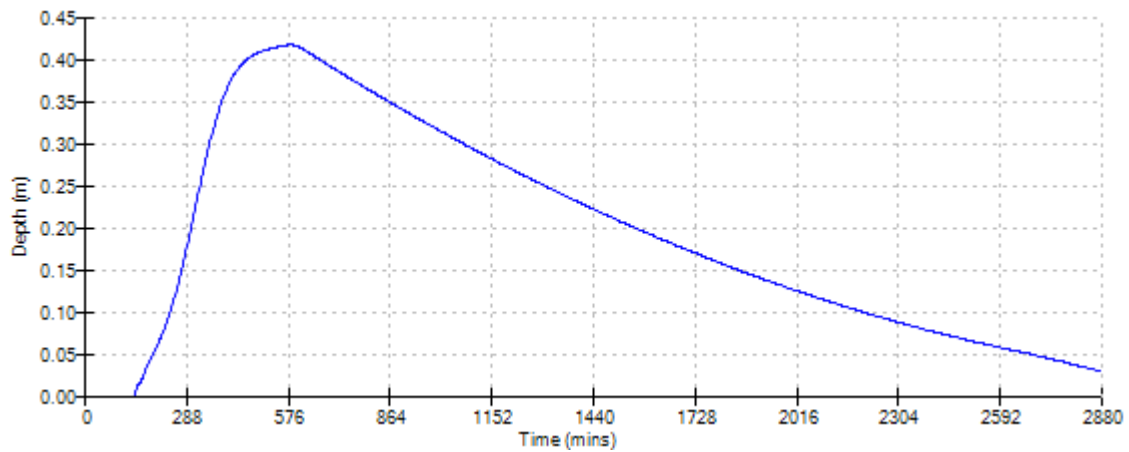
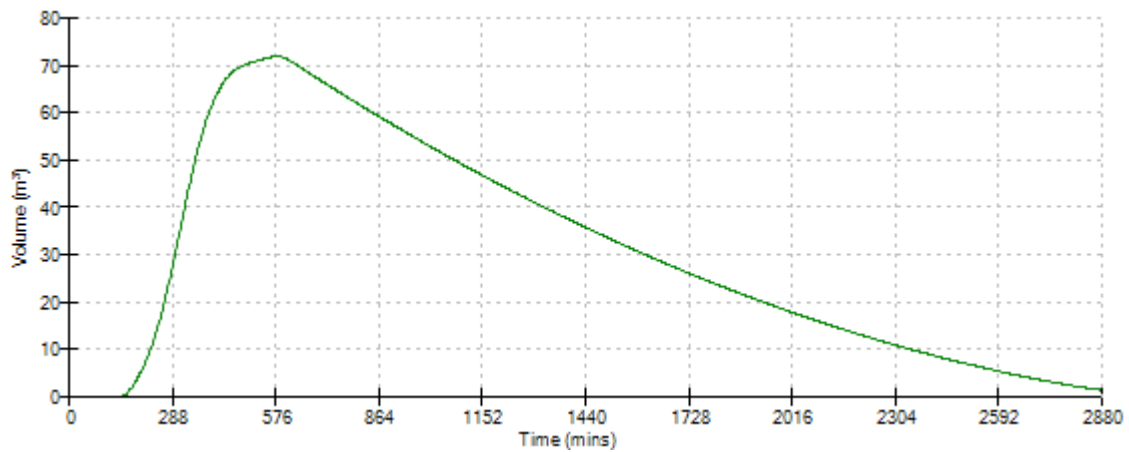
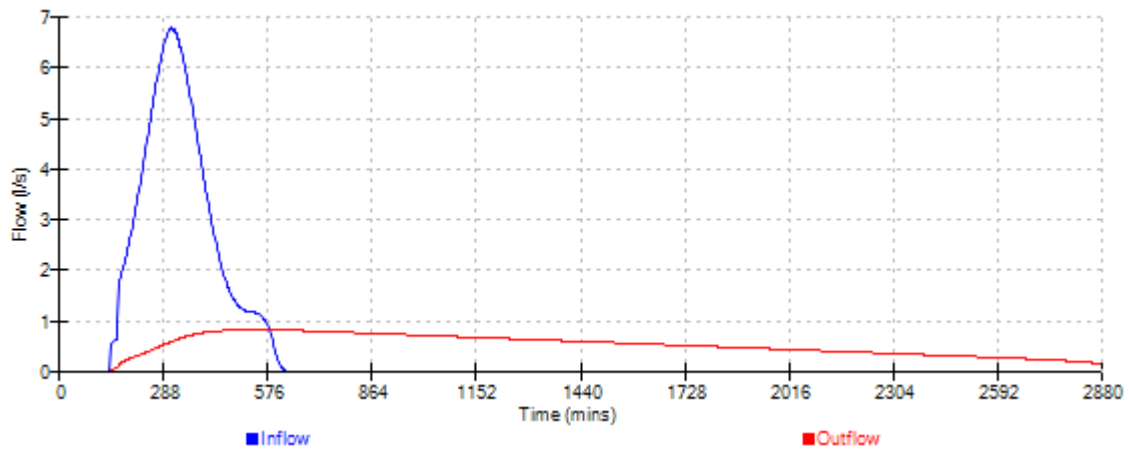
Designed by Kunal
Checked by



XP Solutions

Source Control 2015.1

Event: 600 min Winter



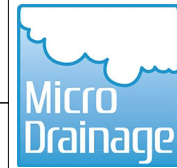
Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1051 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.461	0.211	0.0	0.6	0.6	33.6	O K
30 min Summer	99.533	0.283	0.0	0.7	0.7	47.0	O K
60 min Summer	99.608	0.358	0.0	0.8	0.8	60.8	O K
120 min Summer	99.682	0.432	0.0	0.8	0.8	74.4	O K
180 min Summer	99.721	0.471	0.0	0.9	0.9	81.6	Flood Risk
240 min Summer	99.744	0.494	0.0	0.9	0.9	85.8	Flood Risk
360 min Summer	99.769	0.519	0.0	0.9	0.9	90.6	Flood Risk
480 min Summer	99.782	0.532	0.0	0.9	0.9	92.9	Flood Risk
600 min Summer	99.787	0.537	0.0	0.9	0.9	93.7	Flood Risk
720 min Summer	99.786	0.536	0.0	0.9	0.9	93.7	Flood Risk
960 min Summer	99.783	0.533	0.0	0.9	0.9	93.1	Flood Risk
1440 min Summer	99.773	0.523	0.0	0.9	0.9	91.2	Flood Risk
2160 min Summer	99.751	0.501	0.0	0.9	0.9	87.2	Flood Risk
2880 min Summer	99.726	0.476	0.0	0.9	0.9	82.6	Flood Risk
4320 min Summer	99.677	0.427	0.0	0.8	0.8	73.5	O K
5760 min Summer	99.633	0.383	0.0	0.8	0.8	65.3	O K
7200 min Summer	99.595	0.345	0.0	0.8	0.8	58.3	O K
8640 min Summer	99.562	0.312	0.0	0.7	0.7	52.3	O K
10080 min Summer	99.534	0.284	0.0	0.7	0.7	47.0	O K
15 min Winter	99.490	0.240	0.0	0.6	0.6	38.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	139.469	0.0	34.6	80
30 min Summer	91.145	0.0	43.0	91
60 min Summer	56.713	0.0	64.9	110
120 min Summer	34.093	0.0	79.6	152
180 min Summer	24.982	0.0	87.9	200
240 min Summer	19.920	0.0	93.3	252
360 min Summer	14.430	0.0	99.6	364
480 min Summer	11.481	0.0	103.5	482
600 min Summer	9.608	0.0	106.1	600
720 min Summer	8.303	0.0	107.8	702
960 min Summer	6.590	0.0	109.5	808
1440 min Summer	4.752	0.0	108.9	1054
2160 min Summer	3.421	0.0	141.4	1468
2880 min Summer	2.707	0.0	146.6	1876
4320 min Summer	1.944	0.0	151.7	2684
5760 min Summer	1.535	0.0	154.6	3472
7200 min Summer	1.278	0.0	154.9	4256
8640 min Summer	1.099	0.0	154.0	5016
10080 min Summer	0.968	0.0	152.1	5752
15 min Winter	139.469	0.0	38.2	81

Thorogood House
 34 Tolworth Close
 Surbition Surrey KT6 7EW



Date 22/05/2023 21:22
 File Paving.srcx

Designed by Kunal
 Checked by

XP Solutions

Source Control 2015.1

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 Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	99.571	0.321	0.0	0.7	0.7	53.8	O K
60 min Winter	99.654	0.404	0.0	0.8	0.8	69.3	O K
120 min Winter	99.737	0.487	0.0	0.9	0.9	84.6	Flood Risk
180 min Winter	99.782	0.532	0.0	0.9	0.9	92.8	Flood Risk
240 min Winter	99.808	0.558	0.0	1.0	1.0	97.8	Flood Risk
360 min Winter	99.839	0.589	0.0	1.0	1.0	103.5	Flood Risk
480 min Winter	99.855	0.605	0.0	1.0	1.0	106.4	Flood Risk
600 min Winter	99.864	0.614	0.0	1.0	1.0	107.8	Flood Risk
720 min Winter	99.867	0.617	0.0	1.0	1.0	108.2	Flood Risk
960 min Winter	99.860	0.610	0.0	1.0	1.0	107.2	Flood Risk
1440 min Winter	99.843	0.593	0.0	1.0	1.0	104.2	Flood Risk
2160 min Winter	99.811	0.561	0.0	1.0	1.0	98.3	Flood Risk
2880 min Winter	99.775	0.525	0.0	0.9	0.9	91.6	Flood Risk
4320 min Winter	99.704	0.454	0.0	0.9	0.9	78.5	Flood Risk
5760 min Winter	99.643	0.393	0.0	0.8	0.8	67.1	O K
7200 min Winter	99.591	0.341	0.0	0.7	0.7	57.5	O K
8640 min Winter	99.547	0.297	0.0	0.7	0.7	49.5	O K
10080 min Winter	99.510	0.260	0.0	0.6	0.6	42.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	91.145	0.0	46.9	92
60 min Winter	56.713	0.0	73.8	112
120 min Winter	34.093	0.0	90.0	154
180 min Winter	24.982	0.0	98.5	200
240 min Winter	19.920	0.0	103.5	250
360 min Winter	14.430	0.0	109.7	360
480 min Winter	11.481	0.0	113.8	474
600 min Winter	9.608	0.0	116.4	588
720 min Winter	8.303	0.0	118.2	696
960 min Winter	6.590	0.0	119.9	902
1440 min Winter	4.752	0.0	119.0	1122
2160 min Winter	3.421	0.0	161.0	1580
2880 min Winter	2.707	0.0	167.3	2024
4320 min Winter	1.944	0.0	171.6	2892
5760 min Winter	1.535	0.0	178.4	3696
7200 min Winter	1.278	0.0	179.9	4488
8640 min Winter	1.099	0.0	180.0	5272
10080 min Winter	0.968	0.0	179.2	6048

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.411	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Green Roof


Area (m ²)	1129	Evaporation (mm/day)	5
Depression Storage (mm)	5	Decay Coefficient	0.050

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:	From:	To:
0	4	32	36	64	68	96	100
	0.020516		0.004142		0.000836		0.000169
4	8	36	40	68	72	100	104
	0.016797		0.003391		0.000685		0.000138
8	12	40	44	72	76	104	108
	0.013752		0.002777		0.000561		0.000113
12	16	44	48	76	80	108	112
	0.011260		0.002273		0.000459		0.000093
16	20	48	52	80	84	112	116
	0.009219		0.001861		0.000376		0.000076
20	24	52	56	84	88	116	120
	0.007547		0.001524		0.000308		0.000062
24	28	56	60	88	92		
	0.006179		0.001248		0.000252		
28	32	60	64	92	96		
	0.005059		0.001021		0.000206		

Time Area Diagram

Total Area (ha) 0.062

Time (mins)	Area (ha)
From:	To:
0	4
	0.062

Lanmor Consulting Ltd		Page 4
Thorogood House 34 Tolworth Close Surbition Surrey KT6 7EW		
Date 22/05/2023 21:22 File Paving.srcx	Designed by Kunal Checked by	
XP Solutions	Source Control 2015.1	

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr) 0.00000	Width (m) 14.0
Membrane Percolation (mm/hr) 1000	Length (m) 44.0
Max Percolation (l/s) 171.1	Slope (1:X) 750.0
Safety Factor 2.0	Depression Storage (mm) 5
Porosity 0.30	Evaporation (mm/day) 3
Invert Level (m) 99.250	Cap Volume Depth (m) 0.600

Orifice Outflow Control

Diameter (m) 0.025 Discharge Coefficient 0.600 Invert Level (m) 99.250

Thorogood House
34 Tolworth Close
Surbition Surrey KT6 7EW

Date 22/05/2023 21:22
File Paving.srcx

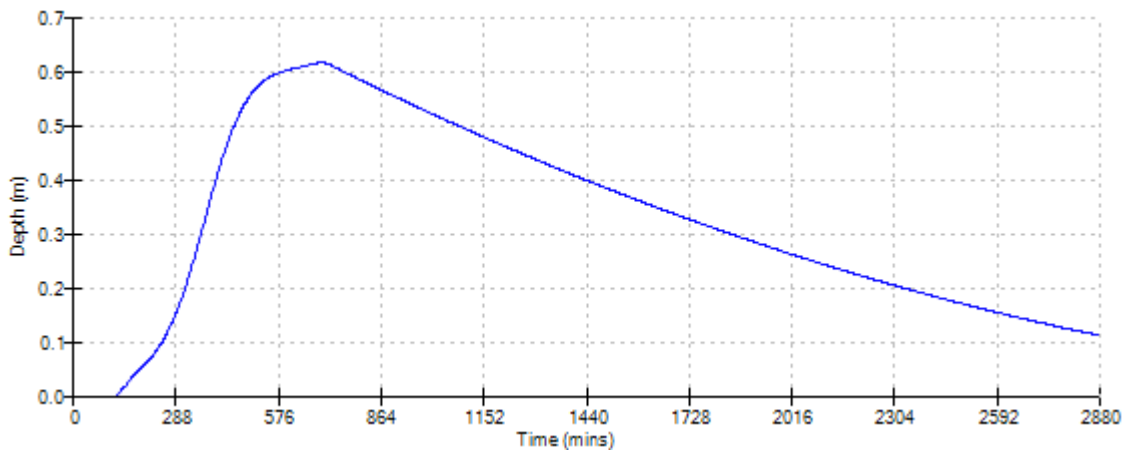
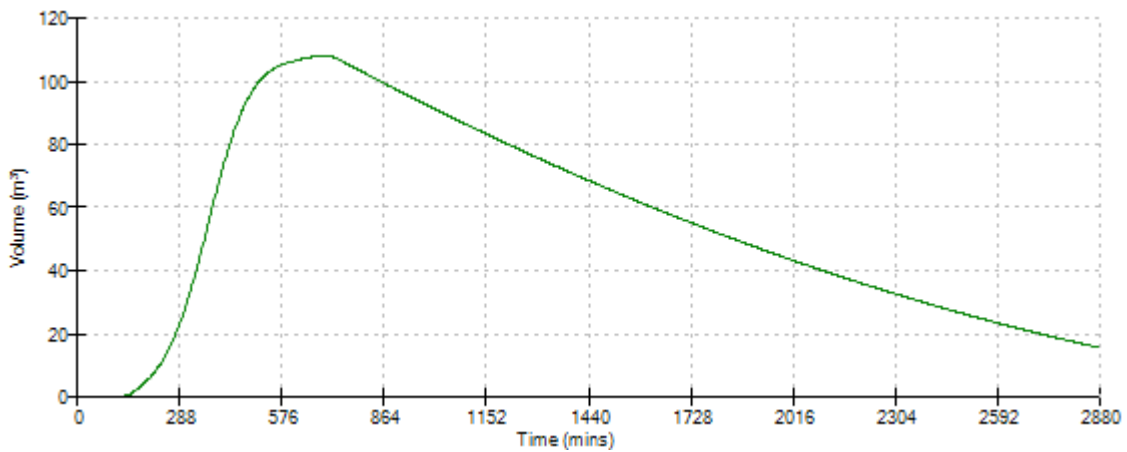
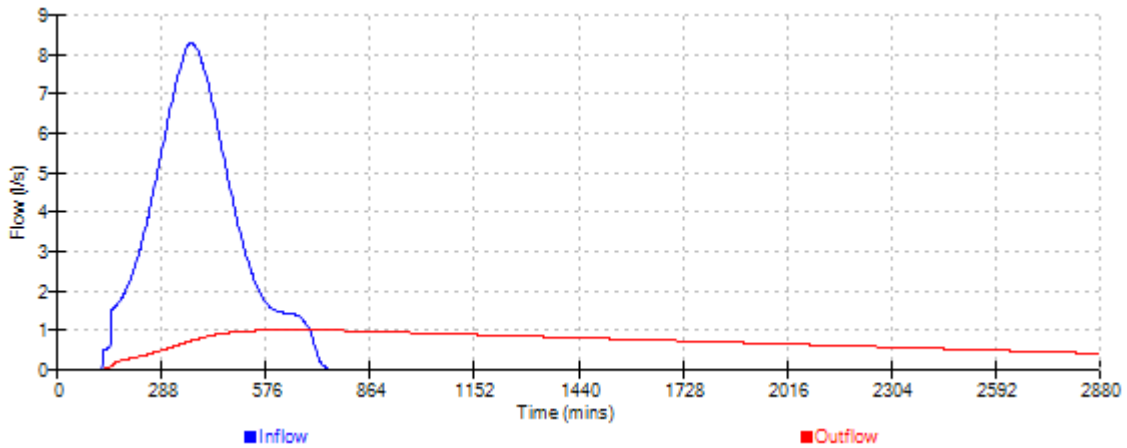
Designed by Kunal
Checked by



XP Solutions

Source Control 2015.1

Event: 720 min Winter



1. Project & Site Details	Project / Site Name (including sub-catchment / stage / phase where appropriate)	Kingston Bridge House
	Address & post code	at Kingston Bridge house, Church Road, Hampton Wick, KT1 4AG
	OS Grid ref. (Easting, Northing)	E 517487 N 169400
	LPA reference (if applicable)	
	Brief description of proposed work	Conversion of existing building from student accommodation to residential apartments
	Total site Area	2,780 m ²
	Total existing impervious area	2,550 m ²
	Total proposed impervious area	0 m ²
	Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	no
	Existing drainage connection type and location	Sewer
	Designer Name	
	Designer Position	
	Designer Company	

2. Proposed Discharge Arrangements	2a. Infiltration Feasibility		
	Superficial geology classification	Kempton Park Gravels	
	Bedrock geology classification	London Clay	
	Site infiltration rate	-	m/s
	Depth to groundwater level	-	m below ground level
	Is infiltration feasible?	No	
	2b. Drainage Hierarchy		
		<i>Feasible (Y/N)</i>	<i>Proposed (Y/N)</i>
	1 store rainwater for later use	Y	Y
	2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
	3 attenuate rainwater in ponds or open water features for gradual release	N	N
	4 attenuate rainwater by storing in tanks or sealed water features for gradual release	N	N
	5 discharge rainwater direct to a watercourse	N	N
	6 discharge rainwater to a surface water sewer/drain	Y	Y
	7 discharge rainwater to the combined sewer.	N	N
2c. Proposed Discharge Details			
Proposed discharge location	Existing connection to sewer		
Has the owner/regulator of the discharge location been consulted?	No		

3a. Discharge Rates & Required Storage				
	Greenfield (GF) runoff rate (l/s)	Existing discharge rate (l/s)	Required storage for GF rate (m ³)	Proposed discharge rate (l/s)
Qbar	0.4			
1 in 1	0.4	26.1	24	0.6
1 in 30	1	51.1	52	1.2
1 in 100	1.3	51.2	68	1.3
1 in 100 + CC			99	1.6
Climate change allowance used		40%		
3b. Principal Method of Flow Control		orifice		
3c. Proposed SuDS Measures				
	Catchment area (m ²)	Plan area (m ²)	Storage vol. (m ³)	
Rainwater harvesting	0		0	
Infiltration systems	0		0	
Green roofs	1031	1031	206	
Blue roofs	0	0	0	
Filter strips	0	0	0	
Filter drains	0	0	0	
Bioretention / tree pits	1129	1129	0	
Pervious pavements	620	620	112	
Swales	0	0	0	
Basins/ponds	0	0	0	
Attenuation tanks	0		0	
Total	2780	2780	318	

3. Drainage Strategy

4a. Discharge & Drainage Strategy		Page/section of drainage report
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results		section 2.2
Drainage hierarchy (2b)		section 4.2
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location		Appendix B
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations		section 4
Proposed SuDS measures & specifications (3b)		section 4.2
4b. Other Supporting Details		Page/section of drainage report
Detailed Development Layout		Appendix C
Detailed drainage design drawings, including exceedance flow routes		n/a
Detailed landscaping plans		Appendix C
Maintenance strategy		section 5
Demonstration of how the proposed SuDS measures improve:		n/a
a) water quality of the runoff?		Greenroof / permeable paving
b) biodiversity?		Greenroof
c) amenity?		

4. Supporting Information