


**APPENDIX F**  
**SWALE A CASCADE DESIGN RESULTS**

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 1A	
Date 17/01/2014 11:40 File 12796 Lake A Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 1A.srcx

<b>Upstream Structures</b>	<b>Outflow To</b>	<b>Overflow To</b>
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(None)	12796 - Filter Drain 3A.srcx	(None)
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Half Drain Time : 1 minutes.

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Σ Outflow (l/s)</b>	<b>Max Volume (m³)</b>	<b>Status</b>
15 min Summer	161.178	0.428	0.5	21.2	21.7	0.9	O K
30 min Summer	161.143	0.393	0.5	19.2	19.7	0.7	O K
60 min Summer	161.086	0.336	0.4	14.4	14.7	0.5	O K
120 min Summer	161.043	0.293	0.3	9.6	9.9	0.4	O K
180 min Summer	161.022	0.272	0.3	7.3	7.6	0.3	O K
240 min Summer	161.005	0.255	0.3	5.9	6.2	0.3	O K
360 min Summer	160.986	0.236	0.2	4.3	4.6	0.2	O K
480 min Summer	160.977	0.227	0.2	3.4	3.7	0.2	O K
600 min Summer	160.972	0.222	0.2	2.9	3.1	0.2	O K
720 min Summer	160.967	0.217	0.2	2.5	2.7	0.2	O K
960 min Summer	160.958	0.208	0.2	1.9	2.1	0.2	O K
1440 min Summer	160.949	0.199	0.2	1.4	1.6	0.2	O K
2160 min Summer	160.941	0.191	0.2	1.0	1.2	0.2	O K
2880 min Summer	160.936	0.186	0.2	0.8	0.9	0.1	O K
4320 min Summer	160.929	0.179	0.2	0.5	0.7	0.1	O K
5760 min Summer	160.925	0.175	0.2	0.4	0.5	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
15 min Summer	116.192	10
30 min Summer	77.964	18
60 min Summer	49.937	32
120 min Summer	30.897	62
180 min Summer	22.993	92
240 min Summer	18.515	122
360 min Summer	13.595	184
480 min Summer	10.918	242
600 min Summer	9.202	298
720 min Summer	7.998	362
960 min Summer	6.405	476
1440 min Summer	4.674	728
2160 min Summer	3.404	1068
2880 min Summer	2.715	1416
4320 min Summer	1.970	2196
5760 min Summer	1.567	2936

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 1A



Date 17/01/2014 11:40  
File 12796 Lake A Casc...

Designed By Mark Craddock  
Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 1A.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	160.922	0.172	0.2	0.3	0.4	0.1	O K
8640 min Summer	160.919	0.169	0.2	0.2	0.4	0.1	O K
10080 min Summer	160.917	0.167	0.1	0.2	0.3	0.1	O K
15 min Winter	161.180	0.430	0.5	21.3	21.8	0.9	O K
30 min Winter	161.110	0.360	0.4	17.1	17.5	0.6	O K
60 min Winter	161.060	0.310	0.3	11.5	11.8	0.4	O K
120 min Winter	161.020	0.270	0.3	7.1	7.4	0.3	O K
180 min Winter	160.997	0.247	0.2	5.3	5.5	0.3	O K
240 min Winter	160.985	0.235	0.2	4.3	4.5	0.2	O K
360 min Winter	160.974	0.224	0.2	3.1	3.3	0.2	O K
480 min Winter	160.966	0.216	0.2	2.4	2.6	0.2	O K
600 min Winter	160.960	0.210	0.2	2.0	2.2	0.2	O K
720 min Winter	160.955	0.205	0.2	1.8	2.0	0.2	O K
960 min Winter	160.949	0.199	0.2	1.4	1.6	0.2	O K
1440 min Winter	160.941	0.191	0.2	1.0	1.2	0.2	O K
2160 min Winter	160.934	0.184	0.2	0.7	0.8	0.1	O K
2880 min Winter	160.929	0.179	0.2	0.5	0.7	0.1	O K
4320 min Winter	160.924	0.174	0.2	0.3	0.5	0.1	O K
5760 min Winter	160.919	0.169	0.2	0.2	0.4	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3544
8640 min Summer	1.134	4400
10080 min Summer	1.004	5000
15 min Winter	116.192	10
30 min Winter	77.964	17
60 min Winter	49.937	32
120 min Winter	30.897	62
180 min Winter	22.993	94
240 min Winter	18.515	122
360 min Winter	13.595	180
480 min Winter	10.918	244
600 min Winter	9.202	308
720 min Winter	7.998	362
960 min Winter	6.405	476
1440 min Winter	4.674	730
2160 min Winter	3.404	1088
2880 min Winter	2.715	1440
4320 min Winter	1.970	2144
5760 min Winter	1.567	2880

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 1A



Date 17/01/2014 11:40

Designed By Mark Craddock

File 12796 Lake A Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 1A.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	160.916	0.166	0.1	0.2	0.3	0.1	O K
8640 min Winter	160.914	0.164	0.1	0.1	0.3	0.1	O K
10080 min Winter	160.912	0.162	0.1	0.1	0.3	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3576
8640 min Winter	1.134	4408
10080 min Winter	1.004	5224

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Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 1A.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.041

<b>Time (mins)</b>	<b>Area (ha)</b>
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0-4	0.041
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Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 1A.srcx


Storage is Online Cover Level (m) 161.500

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.18000	Trench Length (m)	48.0
Infiltration Coefficient Side (m/hr)	0.18000	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	46.0
Invert Level (m)	160.750	Cap Volume Depth (m)	0.750
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.750

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	20.0	Coefficient of Contraction	0.600
Length (m)	1.000	Upstream Invert Level (m)	160.900
Roughness k (mm)	0.600		

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1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 2A	
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Micro Drainage		Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 2A.srcx


**Upstream Structures**                      **Outflow To**                      **Overflow To**

(None)    12796 - Filter Drain 3A.srcx                      (None)

Half Drain Time : 0 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	160.741	0.491	0.6	24.2	24.8	1.0	Flood Risk
30 min Summer	160.701	0.451	0.5	22.3	22.8	0.9	Flood Risk
60 min Summer	160.609	0.359	0.4	17.0	17.3	0.5	O K
120 min Summer	160.559	0.309	0.3	11.3	11.6	0.4	O K
180 min Summer	160.534	0.284	0.3	8.6	8.9	0.3	O K
240 min Summer	160.519	0.269	0.2	7.0	7.2	0.3	O K
360 min Summer	160.495	0.245	0.2	5.1	5.3	0.2	O K
480 min Summer	160.484	0.234	0.2	4.1	4.3	0.2	O K
600 min Summer	160.477	0.227	0.2	3.4	3.6	0.2	O K
720 min Summer	160.473	0.223	0.2	3.0	3.2	0.2	O K
960 min Summer	160.465	0.215	0.2	2.3	2.5	0.2	O K
1440 min Summer	160.454	0.204	0.2	1.7	1.8	0.2	O K
2160 min Summer	160.446	0.196	0.2	1.2	1.4	0.1	O K
2880 min Summer	160.440	0.190	0.2	0.9	1.1	0.1	O K
4320 min Summer	160.433	0.183	0.1	0.7	0.8	0.1	O K
5760 min Summer	160.428	0.178	0.1	0.5	0.6	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	10
30 min Summer	77.964	18
60 min Summer	49.937	32
120 min Summer	30.897	62
180 min Summer	22.993	92
240 min Summer	18.515	122
360 min Summer	13.595	182
480 min Summer	10.918	240
600 min Summer	9.202	302
720 min Summer	7.998	360
960 min Summer	6.405	488
1440 min Summer	4.674	734
2160 min Summer	3.404	1084
2880 min Summer	2.715	1436
4320 min Summer	1.970	2192
5760 min Summer	1.567	2840

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1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 2A	
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Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 2A.srcx

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
7200 min Summer	160.425	0.175	0.1	0.4	0.5	0.1	O K
8640 min Summer	160.423	0.173	0.1	0.3	0.5	0.1	O K
10080 min Summer	160.421	0.171	0.1	0.3	0.4	0.1	O K
15 min Winter	160.745	0.495	0.6	24.4	25.0	1.0	Flood Risk
30 min Winter	160.654	0.404	0.4	19.9	20.3	0.7	O K
60 min Winter	160.579	0.329	0.3	13.5	13.8	0.5	O K
120 min Winter	160.533	0.283	0.3	8.5	8.7	0.3	O K
180 min Winter	160.510	0.260	0.2	6.3	6.5	0.3	O K
240 min Winter	160.494	0.244	0.2	5.0	5.2	0.2	O K
360 min Winter	160.479	0.229	0.2	3.7	3.8	0.2	O K
480 min Winter	160.472	0.222	0.2	2.9	3.1	0.2	O K
600 min Winter	160.466	0.216	0.2	2.4	2.6	0.2	O K
720 min Winter	160.461	0.211	0.2	2.1	2.3	0.2	O K
960 min Winter	160.454	0.204	0.2	1.7	1.8	0.2	O K
1440 min Winter	160.445	0.195	0.2	1.2	1.3	0.1	O K
2160 min Winter	160.438	0.188	0.2	0.8	1.0	0.1	O K
2880 min Winter	160.433	0.183	0.1	0.6	0.8	0.1	O K
4320 min Winter	160.427	0.177	0.1	0.4	0.6	0.1	O K
5760 min Winter	160.423	0.173	0.1	0.3	0.4	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3624
8640 min Summer	1.134	4296
10080 min Summer	1.004	5088
15 min Winter	116.192	10
30 min Winter	77.964	18
60 min Winter	49.937	32
120 min Winter	30.897	62
180 min Winter	22.993	92
240 min Winter	18.515	124
360 min Winter	13.595	186
480 min Winter	10.918	244
600 min Winter	9.202	302
720 min Winter	7.998	362
960 min Winter	6.405	480
1440 min Winter	4.674	712
2160 min Winter	3.404	1092
2880 min Winter	2.715	1416
4320 min Winter	1.970	2120
5760 min Winter	1.567	2840

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 2A



Date 17/01/2014 11:42  
File 12796 Lake A Casc...

Designed By Mark Craddock  
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Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 2A.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max <math>\Sigma</math> Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	160.419	0.169	0.1	0.2	0.4	0.1	O K
8640 min Winter	160.417	0.167	0.1	0.2	0.3	0.1	O K
10080 min Winter	160.415	0.165	0.1	0.2	0.3	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3560
8640 min Winter	1.134	4336
10080 min Winter	1.004	5008

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 2A



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File 12796 Lake A Casc...

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Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 2A.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.048

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.048
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1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 2A



Date 17/01/2014 11:42  
File 12796 Lake A Casc...

Designed By Mark Craddock  
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Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 2A.srcx


Storage is Online Cover Level (m) 161.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.18000	Trench Length (m)	94.0
Infiltration Coefficient Side (m/hr)	0.18000	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	41.0
Invert Level (m)	160.250	Cap Volume Depth (m)	0.750
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.750

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	20.0	Coefficient of Contraction	0.600
Length (m)	1.800	Upstream Invert Level (m)	160.400
Roughness k (mm)	0.600		

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1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 3A	
Date 17/01/2014 11:42 File 12796 Lake A Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	


Cascade Summary of Results for 12796 - Filter Drain 3A.srcx

Upstream Structures	Outflow To	Overflow To
12796 - Filter Drain 1A.srcx 12796 - Filter Drain 2A.srcx	12796 - Filter Drain 4A.srcx	(None)

Half Drain Time : 0 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max $\Sigma$ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	158.783	0.508	0.5	52.4	52.8	0.6	O K
30 min Summer	158.746	0.471	0.4	48.2	48.6	0.5	O K
60 min Summer	158.687	0.412	0.3	36.1	36.4	0.4	O K
120 min Summer	158.628	0.353	0.3	24.1	24.4	0.3	O K
180 min Summer	158.597	0.322	0.2	18.4	18.6	0.2	O K
240 min Summer	158.573	0.298	0.2	14.9	15.1	0.2	O K
360 min Summer	158.549	0.274	0.2	11.0	11.2	0.2	O K
480 min Summer	158.537	0.262	0.2	8.7	8.9	0.1	O K
600 min Summer	158.529	0.254	0.2	7.3	7.5	0.1	O K
720 min Summer	158.520	0.245	0.2	6.2	6.4	0.1	O K
960 min Summer	158.509	0.234	0.2	5.0	5.1	0.1	O K
1440 min Summer	158.496	0.221	0.1	3.5	3.7	0.1	O K
2160 min Summer	158.483	0.208	0.1	2.5	2.6	0.1	O K
2880 min Summer	158.477	0.202	0.1	1.9	2.1	0.1	O K
4320 min Summer	158.467	0.192	0.1	1.3	1.4	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	11
30 min Summer	77.964	18
60 min Summer	49.937	32
120 min Summer	30.897	62
180 min Summer	22.993	92
240 min Summer	18.515	122
360 min Summer	13.595	180
480 min Summer	10.918	244
600 min Summer	9.202	300
720 min Summer	7.998	360
960 min Summer	6.405	480
1440 min Summer	4.674	732
2160 min Summer	3.404	1076
2880 min Summer	2.715	1464
4320 min Summer	1.970	2192

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1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 3A	
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Micro Drainage		Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 3A.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
5760 min Summer	158.460	0.185	0.1	0.9	1.0	0.1	O K
7200 min Summer	158.456	0.181	0.1	0.7	0.8	0.1	O K
8640 min Summer	158.452	0.177	0.1	0.6	0.7	0.1	O K
10080 min Summer	158.449	0.174	0.1	0.5	0.6	0.1	O K
15 min Winter	158.788	0.513	0.5	52.9	53.3	0.6	O K
30 min Winter	158.721	0.446	0.4	43.0	43.4	0.5	O K
60 min Winter	158.652	0.377	0.3	28.8	29.1	0.3	O K
120 min Winter	158.595	0.320	0.2	18.0	18.2	0.2	O K
180 min Winter	158.563	0.288	0.2	13.4	13.6	0.2	O K
240 min Winter	158.548	0.273	0.2	10.8	11.0	0.2	O K
360 min Winter	158.532	0.257	0.2	7.8	7.9	0.1	O K
480 min Winter	158.519	0.244	0.2	6.1	6.3	0.1	O K
600 min Winter	158.510	0.235	0.2	5.1	5.3	0.1	O K
720 min Winter	158.504	0.229	0.2	4.4	4.6	0.1	O K
960 min Winter	158.496	0.221	0.1	3.5	3.7	0.1	O K
1440 min Winter	158.483	0.208	0.1	2.4	2.6	0.1	O K
2160 min Winter	158.473	0.198	0.1	1.7	1.8	0.1	O K
2880 min Winter	158.467	0.192	0.1	1.3	1.4	0.1	O K
4320 min Winter	158.459	0.184	0.1	0.8	0.9	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
5760 min Summer	1.567	2856
7200 min Summer	1.311	3576
8640 min Summer	1.134	4344
10080 min Summer	1.004	4992
15 min Winter	116.192	11
30 min Winter	77.964	18
60 min Winter	49.937	32
120 min Winter	30.897	62
180 min Winter	22.993	92
240 min Winter	18.515	122
360 min Winter	13.595	178
480 min Winter	10.918	248
600 min Winter	9.202	290
720 min Winter	7.998	360
960 min Winter	6.405	500
1440 min Winter	4.674	726
2160 min Winter	3.404	1084
2880 min Winter	2.715	1500
4320 min Winter	1.970	2204

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 3A



Date 17/01/2014 11:42

Designed By Mark Craddock

File 12796 Lake A Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 3A.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Σ Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
5760 min Winter	158.452	0.177	0.1	0.6	0.7	0.1	O K
7200 min Winter	158.448	0.173	0.1	0.4	0.6	0.1	O K
8640 min Winter	158.445	0.170	0.1	0.3	0.5	0.1	O K
10080 min Winter	158.443	0.168	0.1	0.3	0.4	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
5760 min Winter	1.567	2792
7200 min Winter	1.311	3744
8640 min Winter	1.134	4192
10080 min Winter	1.004	4896

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 3A



Date 17/01/2014 11:42

Designed By Mark Craddock

File 12796 Lake A Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 3A.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.015

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.015
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1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 3A



Date 17/01/2014 11:42  
File 12796 Lake A Casc...

Designed By Mark Craddock  
Checked By

Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 3A.srcx


Storage is Online Cover Level (m) 159.100

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.27000	Trench Length (m)	48.0
Infiltration Coefficient Side (m/hr)	0.27000	Pipe Diameter (m)	0.225
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	21.0
Invert Level (m)	158.275	Cap Volume Depth (m)	0.825
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.825

Pipe Outflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	12.0	Coefficient of Contraction	0.600
Length (m)	1.800	Upstream Invert Level (m)	158.425
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 4A	
Date 31/01/2014 10:15 File	Designed By Mark Craddock Checked By	
Micro Drainage		Source Control W.12.4


Cascade Summary of Results for 12796 - Filter Drain 4A.srcx

Upstream Structures	Outflow To	Overflow To
12796 - Filter Drain 3A.srcx	12796 - SWALE A.srcx	(None)
12796 - Filter Drain 1A.srcx		
12796 - Filter Drain 2A.srcx		

Half Drain Time : 2 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 <sup>3</sup> )	Status
15 min Summer	157.716	0.541	2.9	55.7	58.7	5.4	Flood Risk
30 min Summer	157.677	0.502	2.8	51.7	54.5	5.0	O K
60 min Summer	157.604	0.429	2.5	39.6	42.1	4.3	O K
120 min Summer	157.538	0.363	2.3	26.1	28.4	3.6	O K
180 min Summer	157.505	0.330	2.2	19.5	21.7	3.2	O K
240 min Summer	157.477	0.302	2.1	15.5	17.6	2.9	O K
360 min Summer	157.449	0.274	2.0	11.0	13.0	2.6	O K
480 min Summer	157.435	0.260	1.9	8.4	10.4	2.4	O K
600 min Summer	157.425	0.250	1.9	6.7	8.7	2.3	O K
720 min Summer	157.415	0.240	1.9	5.6	7.5	2.2	O K
960 min Summer	157.401	0.226	1.8	4.1	5.9	2.0	O K
1440 min Summer	157.383	0.208	1.8	2.5	4.2	1.8	O K
2160 min Summer	157.366	0.191	1.7	1.3	3.0	1.6	O K
2880 min Summer	157.353	0.178	1.7	0.6	2.3	1.5	O K
4320 min Summer	157.313	0.138	1.5	0.0	1.5	1.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	11
30 min Summer	77.964	19
60 min Summer	49.937	34
120 min Summer	30.897	64
180 min Summer	22.993	94
240 min Summer	18.515	124
360 min Summer	13.595	184
480 min Summer	10.918	242
600 min Summer	9.202	306
720 min Summer	7.998	364
960 min Summer	6.405	486
1440 min Summer	4.674	728
2160 min Summer	3.404	1092
2880 min Summer	2.715	1448
4320 min Summer	1.970	2204

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 4A	
Date 31/01/2014 10:15 File	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 4A.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max $\Sigma$ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
5760 min Summer	157.223	0.048	1.2	0.0	1.2	0.4	O K
7200 min Summer	157.213	0.038	0.9	0.0	0.9	0.3	O K
8640 min Summer	157.206	0.031	0.7	0.0	0.7	0.3	O K
10080 min Summer	157.201	0.026	0.6	0.0	0.6	0.2	O K
15 min Winter	157.722	0.547	2.9	56.4	59.3	5.5	Flood Risk
30 min Winter	157.642	0.467	2.7	47.5	50.1	4.7	O K
60 min Winter	157.566	0.391	2.4	31.7	34.1	3.9	O K
120 min Winter	157.503	0.328	2.2	19.2	21.3	3.2	O K
180 min Winter	157.466	0.291	2.1	13.8	15.9	2.8	O K
240 min Winter	157.448	0.273	2.0	10.8	12.8	2.6	O K
360 min Winter	157.430	0.255	1.9	7.4	9.3	2.4	O K
480 min Winter	157.413	0.238	1.9	5.5	7.3	2.2	O K
600 min Winter	157.403	0.228	1.8	4.4	6.2	2.1	O K
720 min Winter	157.396	0.221	1.8	3.5	5.3	2.0	O K
960 min Winter	157.383	0.208	1.8	2.4	4.2	1.8	O K
1440 min Winter	157.366	0.191	1.7	1.2	2.9	1.6	O K
2160 min Winter	157.346	0.171	1.6	0.4	2.0	1.4	O K
2880 min Winter	157.314	0.139	1.5	0.0	1.5	1.1	O K
4320 min Winter	157.217	0.042	1.0	0.0	1.0	0.4	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
5760 min Summer	1.567	2912
7200 min Summer	1.311	3584
8640 min Summer	1.134	4384
10080 min Summer	1.004	5056
15 min Winter	116.192	11
30 min Winter	77.964	18
60 min Winter	49.937	34
120 min Winter	30.897	64
180 min Winter	22.993	94
240 min Winter	18.515	124
360 min Winter	13.595	184
480 min Winter	10.918	244
600 min Winter	9.202	304
720 min Winter	7.998	364
960 min Winter	6.405	484
1440 min Winter	4.674	718
2160 min Winter	3.404	1088
2880 min Winter	2.715	1472
4320 min Winter	1.970	2152

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 4A



Date 31/01/2014 10:15  
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Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 4A.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
5760 min Winter	157.206	0.031	0.7	0.0	0.7	0.3	O K
7200 min Winter	157.198	0.023	0.6	0.0	0.6	0.2	O K
8640 min Winter	157.194	0.019	0.5	0.0	0.5	0.2	O K
10080 min Winter	157.190	0.015	0.4	0.0	0.4	0.1	O K
			<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>		
			5760 min Winter	1.567	2944		
			7200 min Winter	1.311	3608		
			8640 min Winter	1.134	4312		
			10080 min Winter	1.004	5024		

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 4A



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Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 4A.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.019

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.019
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1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 4A



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Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 4A.srcx


Storage is Online Cover Level (m) 158.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.27000	Trench Length (m)	46.0
Infiltration Coefficient Side (m/hr)	0.27000	Pipe Diameter (m)	0.225
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	0.0
Invert Level (m)	157.175	Cap Volume Depth (m)	0.825
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.825

Pipe Outflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	10.0	Coefficient of Contraction	0.600
Length (m)	20.000	Upstream Invert Level (m)	157.325
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 5A	
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Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 5A.srcx


<b>Upstream Structures</b>	<b>Outflow To</b>	<b>Overflow To</b>
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(None) 12796 - Filter Drain 6A.srcx (None)

Half Drain Time : 0 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max $\Sigma$ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	159.088	0.338	0.5	14.5	15.1	0.5	O K
30 min Summer	159.071	0.321	0.5	12.7	13.2	0.5	O K
60 min Summer	159.041	0.291	0.4	9.3	9.8	0.4	O K
120 min Summer	159.008	0.258	0.4	6.1	6.5	0.3	O K
180 min Summer	158.990	0.240	0.3	4.7	5.0	0.2	O K
240 min Summer	158.980	0.230	0.3	3.8	4.1	0.2	O K
360 min Summer	158.970	0.220	0.3	2.7	3.0	0.2	O K
480 min Summer	158.961	0.211	0.3	2.1	2.4	0.2	O K
600 min Summer	158.955	0.205	0.3	1.8	2.1	0.2	O K
720 min Summer	158.951	0.201	0.3	1.5	1.8	0.2	O K
960 min Summer	158.945	0.195	0.3	1.1	1.4	0.2	O K
1440 min Summer	158.936	0.186	0.3	0.8	1.0	0.1	O K
2160 min Summer	158.930	0.180	0.2	0.5	0.8	0.1	O K
2880 min Summer	158.925	0.175	0.2	0.4	0.6	0.1	O K
4320 min Summer	158.918	0.168	0.2	0.2	0.4	0.1	O K
5760 min Summer	158.914	0.164	0.2	0.1	0.4	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	10
30 min Summer	77.964	17
60 min Summer	49.937	32
120 min Summer	30.897	62
180 min Summer	22.993	92
240 min Summer	18.515	122
360 min Summer	13.595	184
480 min Summer	10.918	240
600 min Summer	9.202	298
720 min Summer	7.998	360
960 min Summer	6.405	476
1440 min Summer	4.674	712
2160 min Summer	3.404	1088
2880 min Summer	2.715	1420
4320 min Summer	1.970	2128
5760 min Summer	1.567	2880

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 5A	
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Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 5A.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	158.911	0.161	0.2	0.1	0.3	0.1	O K
8640 min Summer	158.909	0.159	0.2	0.0	0.3	0.1	O K
10080 min Summer	158.906	0.156	0.2	0.0	0.2	0.1	O K
15 min Winter	159.088	0.338	0.5	14.6	15.1	0.5	O K
30 min Winter	159.057	0.307	0.5	11.1	11.6	0.4	O K
60 min Winter	159.023	0.273	0.4	7.4	7.8	0.3	O K
120 min Winter	158.988	0.238	0.3	4.6	4.9	0.2	O K
180 min Winter	158.976	0.226	0.3	3.3	3.7	0.2	O K
240 min Winter	158.970	0.220	0.3	2.7	3.0	0.2	O K
360 min Winter	158.957	0.207	0.3	1.9	2.2	0.2	O K
480 min Winter	158.950	0.200	0.3	1.5	1.7	0.2	O K
600 min Winter	158.946	0.196	0.3	1.2	1.5	0.2	O K
720 min Winter	158.942	0.192	0.3	1.0	1.3	0.2	O K
960 min Winter	158.936	0.186	0.3	0.8	1.0	0.1	O K
1440 min Winter	158.929	0.179	0.2	0.5	0.7	0.1	O K
2160 min Winter	158.923	0.173	0.2	0.3	0.6	0.1	O K
2880 min Winter	158.918	0.168	0.2	0.2	0.4	0.1	O K
4320 min Winter	158.912	0.162	0.2	0.1	0.3	0.1	O K
5760 min Winter	158.909	0.159	0.2	0.0	0.3	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3560
8640 min Summer	1.134	4400
10080 min Summer	1.004	5128
15 min Winter	116.192	10
30 min Winter	77.964	17
60 min Winter	49.937	32
120 min Winter	30.897	62
180 min Winter	22.993	92
240 min Winter	18.515	120
360 min Winter	13.595	184
480 min Winter	10.918	248
600 min Winter	9.202	298
720 min Winter	7.998	358
960 min Winter	6.405	466
1440 min Winter	4.674	714
2160 min Winter	3.404	1084
2880 min Winter	2.715	1444
4320 min Winter	1.970	2220
5760 min Winter	1.567	2880

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 5A



Date 17/01/2014 11:44

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File 12796 Lake A Casc...

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Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 5A.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	158.904	0.154	0.2	0.0	0.2	0.1	O K
8640 min Winter	158.892	0.142	0.2	0.0	0.2	0.1	O K
10080 min Winter	158.878	0.128	0.2	0.0	0.2	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3616
8640 min Winter	1.134	4384
10080 min Winter	1.004	5080

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 5A



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Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 5A.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.027

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.027
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1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 5A



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Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 5A.srcx


Storage is Online Cover Level (m) 159.500

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.27000	Trench Length (m)	34.0
Infiltration Coefficient Side (m/hr)	0.27000	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	45.0
Invert Level (m)	158.750	Cap Volume Depth (m)	0.750
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.750

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	10.0	Coefficient of Contraction	0.600
Length (m)	4.800	Upstream Invert Level (m)	158.900
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 6A	
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Micro Drainage		Source Control W.12.4


Cascade Summary of Results for 12796 - Filter Drain 6A.srcx

<b>Upstream Structures</b>	<b>Outflow To</b>	<b>Overflow To</b>
12796 - Filter Drain 5A.srcx	12796 - SWALE A.srcx	(None)

Half Drain Time : 0 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max $\Sigma$ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	157.986	0.386	0.8	38.2	39.0	0.9	O K
30 min Summer	157.903	0.303	0.6	35.7	36.3	0.5	O K
60 min Summer	157.676	0.076	0.1	27.8	27.9	0.0	O K
120 min Summer	157.600	0.000	0.0	18.8	18.8	0.0	O K
180 min Summer	157.600	0.000	0.0	14.4	14.4	0.0	O K
240 min Summer	157.600	0.000	0.0	11.6	11.6	0.0	O K
360 min Summer	157.600	0.000	0.0	8.4	8.4	0.0	O K
480 min Summer	157.600	0.000	0.0	6.8	6.8	0.0	O K
600 min Summer	157.600	0.000	0.0	5.7	5.7	0.0	O K
720 min Summer	157.600	0.000	0.0	4.9	4.9	0.0	O K
960 min Summer	157.600	0.000	0.0	3.9	3.9	0.0	O K
1440 min Summer	157.600	0.000	0.0	2.8	2.8	0.0	O K
2160 min Summer	157.600	0.000	0.0	2.0	2.0	0.0	O K
2880 min Summer	157.600	0.000	0.0	1.5	1.5	0.0	O K
4320 min Summer	157.600	0.000	0.0	1.1	1.1	0.0	O K
5760 min Summer	157.600	0.000	0.0	0.8	0.8	0.0	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	11
30 min Summer	77.964	18
60 min Summer	49.937	32
120 min Summer	30.897	0
180 min Summer	22.993	0
240 min Summer	18.515	0
360 min Summer	13.595	0
480 min Summer	10.918	0
600 min Summer	9.202	0
720 min Summer	7.998	0
960 min Summer	6.405	0
1440 min Summer	4.674	0
2160 min Summer	3.404	0
2880 min Summer	2.715	0
4320 min Summer	1.970	0
5760 min Summer	1.567	0

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 6A	
Date 31/01/2014 10:16 File	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 6A.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	157.600	0.000	0.0	0.6	0.6	0.0	O K
8640 min Summer	157.600	0.000	0.0	0.5	0.5	0.0	O K
10080 min Summer	157.600	0.000	0.0	0.4	0.4	0.0	O K
15 min Winter	157.997	0.397	0.9	38.5	39.4	1.0	O K
30 min Winter	157.805	0.205	0.4	32.5	32.9	0.2	O K
60 min Winter	157.600	0.000	0.0	22.4	22.4	0.0	O K
120 min Winter	157.600	0.000	0.0	14.0	14.0	0.0	O K
180 min Winter	157.600	0.000	0.0	10.4	10.4	0.0	O K
240 min Winter	157.600	0.000	0.0	8.3	8.3	0.0	O K
360 min Winter	157.600	0.000	0.0	6.1	6.1	0.0	O K
480 min Winter	157.600	0.000	0.0	4.8	4.8	0.0	O K
600 min Winter	157.600	0.000	0.0	4.0	4.0	0.0	O K
720 min Winter	157.600	0.000	0.0	3.5	3.5	0.0	O K
960 min Winter	157.600	0.000	0.0	2.7	2.7	0.0	O K
1440 min Winter	157.600	0.000	0.0	1.9	1.9	0.0	O K
2160 min Winter	157.600	0.000	0.0	1.4	1.4	0.0	O K
2880 min Winter	157.600	0.000	0.0	1.1	1.1	0.0	O K
4320 min Winter	157.600	0.000	0.0	0.7	0.7	0.0	O K
5760 min Winter	157.600	0.000	0.0	0.5	0.5	0.0	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	0
8640 min Summer	1.134	0
10080 min Summer	1.004	0
15 min Winter	116.192	11
30 min Winter	77.964	18
60 min Winter	49.937	0
120 min Winter	30.897	0
180 min Winter	22.993	0
240 min Winter	18.515	0
360 min Winter	13.595	0
480 min Winter	10.918	0
600 min Winter	9.202	0
720 min Winter	7.998	0
960 min Winter	6.405	0
1440 min Winter	4.674	0
2160 min Winter	3.404	0
2880 min Winter	2.715	0
4320 min Winter	1.970	0
5760 min Winter	1.567	0

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 6A



Date 31/01/2014 10:16  
File

Designed By Mark Craddock  
Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 6A.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	157.600	0.000	0.0	0.4	0.4	0.0	O K
8640 min Winter	157.600	0.000	0.0	0.3	0.3	0.0	O K
10080 min Winter	157.600	0.000	0.0	0.3	0.3	0.0	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	0
8640 min Winter	1.134	0
10080 min Winter	1.004	0

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 6A



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Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 6A.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.052

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.052
-----	-------

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 6A



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Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 6A.srcx


Storage is Online Cover Level (m) 158.500

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.27000	Trench Length (m)	103.0
Infiltration Coefficient Side (m/hr)	0.27000	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	59.0
Invert Level (m)	157.600	Cap Volume Depth (m)	0.900
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.900

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	10.0	Coefficient of Contraction	0.600
Length (m)	10.000	Upstream Invert Level (m)	157.250
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 7A	
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Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 7A.srcx


**Upstream                      Outflow To                      Overflow To**  
**Structures**

(None)    12796 - SWALE A.srcx                      (None)

Half Drain Time : 1 minutes.

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Σ Outflow (l/s)</b>	<b>Max Volume (m³)</b>	<b>Status</b>	
15 min Summer	156.610	0.210		2.0	17.1	19.0	2.0	O K
30 min Summer	156.597	0.197		1.9	15.6	17.5	1.9	O K
60 min Summer	156.561	0.161		1.8	11.5	13.3	1.5	O K
120 min Summer	156.524	0.124		1.6	7.5	9.1	1.1	O K
180 min Summer	156.500	0.100		1.5	5.5	7.1	0.9	O K
240 min Summer	156.486	0.086		1.5	4.3	5.8	0.8	O K
360 min Summer	156.472	0.072		1.4	2.9	4.3	0.7	O K
480 min Summer	156.460	0.060		1.4	2.1	3.5	0.6	O K
600 min Summer	156.452	0.052		1.3	1.6	2.9	0.5	O K
720 min Summer	156.447	0.047		1.3	1.3	2.5	0.4	O K
960 min Summer	156.441	0.041		1.1	1.0	2.1	0.4	O K
1440 min Summer	156.433	0.033		0.9	0.6	1.5	0.3	O K
2160 min Summer	156.426	0.026		0.7	0.4	1.1	0.2	O K
2880 min Summer	156.422	0.022		0.6	0.3	0.9	0.2	O K
4320 min Summer	156.417	0.017		0.4	0.2	0.6	0.2	O K
5760 min Summer	156.414	0.014		0.4	0.1	0.5	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
15 min Summer	116.192	11
30 min Summer	77.964	18
60 min Summer	49.937	34
120 min Summer	30.897	64
180 min Summer	22.993	94
240 min Summer	18.515	124
360 min Summer	13.595	184
480 min Summer	10.918	244
600 min Summer	9.202	304
720 min Summer	7.998	360
960 min Summer	6.405	484
1440 min Summer	4.674	722
2160 min Summer	3.404	1088
2880 min Summer	2.715	1444
4320 min Summer	1.970	2152
5760 min Summer	1.567	2936

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 7A	
Date 31/01/2014 10:17 File	Designed By Mark Craddock Checked By	
Micro Drainage		Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 7A.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	156.412	0.012	0.3	0.1	0.4	0.1	O K
8640 min Summer	156.411	0.011	0.3	0.1	0.4	0.1	O K
10080 min Summer	156.410	0.010	0.3	0.1	0.3	0.1	O K
15 min Winter	156.614	0.214	2.0	17.5	19.5	2.1	O K
30 min Winter	156.583	0.183	1.9	14.0	15.9	1.7	O K
60 min Winter	156.541	0.141	1.7	9.3	11.0	1.3	O K
120 min Winter	156.500	0.100	1.5	5.5	7.0	0.9	O K
180 min Winter	156.481	0.081	1.5	3.8	5.3	0.7	O K
240 min Winter	156.471	0.071	1.4	2.8	4.2	0.7	O K
360 min Winter	156.455	0.055	1.4	1.8	3.1	0.5	O K
480 min Winter	156.447	0.047	1.3	1.3	2.5	0.4	O K
600 min Winter	156.442	0.042	1.1	1.0	2.1	0.4	O K
720 min Winter	156.438	0.038	1.0	0.8	1.9	0.3	O K
960 min Winter	156.432	0.032	0.9	0.6	1.5	0.3	O K
1440 min Winter	156.426	0.026	0.7	0.4	1.1	0.2	O K
2160 min Winter	156.420	0.020	0.5	0.3	0.8	0.2	O K
2880 min Winter	156.417	0.017	0.4	0.2	0.6	0.2	O K
4320 min Winter	156.413	0.013	0.3	0.1	0.5	0.1	O K
5760 min Winter	156.411	0.011	0.3	0.1	0.4	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3648
8640 min Summer	1.134	4256
10080 min Summer	1.004	5048
15 min Winter	116.192	11
30 min Winter	77.964	18
60 min Winter	49.937	34
120 min Winter	30.897	64
180 min Winter	22.993	94
240 min Winter	18.515	124
360 min Winter	13.595	184
480 min Winter	10.918	246
600 min Winter	9.202	308
720 min Winter	7.998	366
960 min Winter	6.405	490
1440 min Winter	4.674	718
2160 min Winter	3.404	1092
2880 min Winter	2.715	1468
4320 min Winter	1.970	2152
5760 min Winter	1.567	2864

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 7A



Date 31/01/2014 10:17  
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Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 7A.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Σ Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	156.410	0.010	0.3	0.1	0.3	0.1	O K
8640 min Winter	156.408	0.008	0.2	0.0	0.3	0.1	O K
10080 min Winter	156.408	0.008	0.2	0.0	0.2	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3600
8640 min Winter	1.134	4400
10080 min Winter	1.004	4976

1 Market Place Mews  
 Henley-on-Thames  
 RG9 2AH

12796 Alton Towers  
 Lodge Accom Scheme  
 Filter Drain 7A



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Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 7A.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.039

<b>Time</b>	<b>Area</b>
<b>(mins)</b>	<b>(ha)</b>

0-4	0.039
-----	-------

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 7A



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Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 7A.srcx


Storage is Online Cover Level (m) 157.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.27000	Trench Length (m)	51.0
Infiltration Coefficient Side (m/hr)	0.27000	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	0.0
Invert Level (m)	156.400	Cap Volume Depth (m)	0.750
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.750

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	9.0	Coefficient of Contraction	0.600
Length (m)	6.000	Upstream Invert Level (m)	156.400
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 8A	
Date 31/01/2014 10:18 File	Designed By Mark Cradduck Checked By	
Micro Drainage		Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 8A.srcx


**Upstream                      Outflow To                      Overflow To**  
**Structures**

(None)    12796 - SWALE A.srcx                      (None)

Half Drain Time : 1 minutes.

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Σ Outflow (l/s)</b>	<b>Max Volume (m³)</b>	<b>Status</b>	
15 min Summer	156.162	0.412		0.8	20.3	21.1	1.4	O K
30 min Summer	156.136	0.386		0.8	18.8	19.6	1.2	O K
60 min Summer	156.083	0.333		0.6	14.0	14.7	0.9	O K
120 min Summer	156.042	0.292		0.5	9.5	10.0	0.7	O K
180 min Summer	156.021	0.271		0.5	7.2	7.7	0.6	O K
240 min Summer	156.004	0.254		0.4	5.8	6.3	0.5	O K
360 min Summer	155.985	0.235		0.4	4.3	4.7	0.4	O K
480 min Summer	155.977	0.227		0.4	3.4	3.8	0.4	O K
600 min Summer	155.971	0.221		0.4	2.8	3.2	0.4	O K
720 min Summer	155.966	0.216		0.4	2.4	2.8	0.3	O K
960 min Summer	155.957	0.207		0.3	1.9	2.2	0.3	O K
1440 min Summer	155.948	0.198		0.3	1.3	1.6	0.3	O K
2160 min Summer	155.938	0.188		0.3	0.9	1.2	0.3	O K
2880 min Summer	155.933	0.183		0.3	0.7	0.9	0.2	O K
4320 min Summer	155.926	0.176		0.3	0.4	0.7	0.2	O K
5760 min Summer	155.921	0.171		0.3	0.3	0.5	0.2	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
15 min Summer	116.192	11
30 min Summer	77.964	18
60 min Summer	49.937	32
120 min Summer	30.897	62
180 min Summer	22.993	92
240 min Summer	18.515	122
360 min Summer	13.595	182
480 min Summer	10.918	246
600 min Summer	9.202	300
720 min Summer	7.998	360
960 min Summer	6.405	488
1440 min Summer	4.674	722
2160 min Summer	3.404	1100
2880 min Summer	2.715	1444
4320 min Summer	1.970	2200
5760 min Summer	1.567	2848

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 8A	
Date 31/01/2014 10:18 File	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 8A.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	155.917	0.167	0.3	0.2	0.5	0.2	O K
8640 min Summer	155.914	0.164	0.3	0.1	0.4	0.2	O K
10080 min Summer	155.912	0.162	0.2	0.1	0.3	0.2	O K
15 min Winter	156.166	0.416	0.9	20.5	21.4	1.4	O K
30 min Winter	156.110	0.360	0.7	17.1	17.8	1.1	O K
60 min Winter	156.060	0.310	0.6	11.4	12.0	0.8	O K
120 min Winter	156.020	0.270	0.5	7.1	7.6	0.6	O K
180 min Winter	155.997	0.247	0.4	5.2	5.7	0.5	O K
240 min Winter	155.984	0.234	0.4	4.2	4.6	0.4	O K
360 min Winter	155.973	0.223	0.4	3.0	3.4	0.4	O K
480 min Winter	155.965	0.215	0.4	2.4	2.7	0.3	O K
600 min Winter	155.958	0.208	0.3	1.9	2.3	0.3	O K
720 min Winter	155.954	0.204	0.3	1.7	2.0	0.3	O K
960 min Winter	155.947	0.197	0.3	1.3	1.6	0.3	O K
1440 min Winter	155.938	0.188	0.3	0.9	1.2	0.3	O K
2160 min Winter	155.931	0.181	0.3	0.6	0.9	0.2	O K
2880 min Winter	155.926	0.176	0.3	0.4	0.7	0.2	O K
4320 min Winter	155.919	0.169	0.3	0.2	0.5	0.2	O K
5760 min Winter	155.914	0.164	0.3	0.1	0.4	0.2	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3544
8640 min Summer	1.134	4248
10080 min Summer	1.004	5112
15 min Winter	116.192	11
30 min Winter	77.964	18
60 min Winter	49.937	32
120 min Winter	30.897	62
180 min Winter	22.993	94
240 min Winter	18.515	124
360 min Winter	13.595	188
480 min Winter	10.918	246
600 min Winter	9.202	302
720 min Winter	7.998	360
960 min Winter	6.405	482
1440 min Winter	4.674	720
2160 min Winter	3.404	1080
2880 min Winter	2.715	1424
4320 min Winter	1.970	2196
5760 min Winter	1.567	2856

1 Market Place Mews  
 Henley-on-Thames  
 RG9 2AH

12796 Alton Towers  
 Lodge Accom Scheme  
 Filter Drain 8A



Date 31/01/2014 10:18  
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 Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 8A.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Winter	155.911	0.161	0.2	0.1	0.3	0.2	O K
8640 min Winter	155.908	0.158	0.2	0.0	0.3	0.2	O K
10080 min Winter	155.905	0.155	0.2	0.0	0.3	0.2	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Winter	1.311	3656
8640 min Winter	1.134	4400
10080 min Winter	1.004	5136

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 8A



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Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 8A.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.042

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.042
-----	-------

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 8A



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Cascade Model Details for 12796 - Filter Drain 8A.srcx


Storage is Online Cover Level (m) 156.500

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.18000	Trench Length (m)	43.0
Infiltration Coefficient Side (m/hr)	0.18000	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	80.0
Invert Level (m)	155.750	Cap Volume Depth (m)	0.750
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.750

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	7.0	Coefficient of Contraction	0.600
Length (m)	12.000	Upstream Invert Level (m)	155.900
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Swale A	
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Micro Drainage	Source Control W.12.4	


Cascade Summary of Results for 12796 - SWALE A.srcx

Upstream Structures	Outflow To	Overflow To
12796 - Filter Drain 4A.srcx	(None)	(None)
12796 - Filter Drain 3A.srcx		
12796 - Filter Drain 1A.srcx		
12796 - Filter Drain 2A.srcx		
12796 - Filter Drain 6A.srcx		
12796 - Filter Drain 5A.srcx		
12796 - Filter Drain 7A.srcx		
12796 - Filter Drain 8A.srcx		

Half Drain Time : 99 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	154.572	0.572	9.0	62.7	Flood Risk
30 min Summer	154.648	0.648	10.2	79.8	Flood Risk
60 min Summer	154.690	0.690	10.9	90.4	Flood Risk
120 min Summer	154.703	0.703	11.2	93.6	Flood Risk
180 min Summer	154.693	0.693	11.0	91.0	Flood Risk
240 min Summer	154.675	0.675	10.7	86.5	Flood Risk
360 min Summer	154.638	0.638	10.0	77.4	Flood Risk
480 min Summer	154.603	0.603	9.5	69.5	Flood Risk
600 min Summer	154.571	0.571	8.9	62.5	Flood Risk
720 min Summer	154.542	0.542	8.4	56.5	Flood Risk
960 min Summer	154.490	0.490	7.6	46.5	O K
1440 min Summer	154.406	0.406	6.3	32.4	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	18
30 min Summer	77.964	32
60 min Summer	49.937	54
120 min Summer	30.897	88
180 min Summer	22.993	122
240 min Summer	18.515	156
360 min Summer	13.595	224
480 min Summer	10.918	290
600 min Summer	9.202	356
720 min Summer	7.998	418
960 min Summer	6.405	542
1440 min Summer	4.674	782

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Swale A	
Date 31/01/2014 10:13 File	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - SWALE A.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m <sup>3</sup> )	Status
2160 min Summer	154.314	0.314	4.8	19.9	O K
2880 min Summer	154.248	0.248	3.8	12.8	O K
4320 min Summer	154.165	0.165	2.6	6.0	O K
5760 min Summer	154.127	0.127	2.1	3.8	O K
7200 min Summer	154.100	0.100	1.7	2.5	O K
8640 min Summer	154.080	0.080	1.4	1.7	O K
10080 min Summer	154.065	0.065	1.2	1.2	O K
15 min Winter	154.613	0.613	9.6	71.6	Flood Risk
30 min Winter	154.694	0.694	11.0	91.3	Flood Risk
60 min Winter	154.742	0.742	11.8	104.1	Flood Risk
120 min Winter	154.752	0.752	12.0	106.7	Flood Risk
180 min Winter	154.735	0.735	11.7	102.2	Flood Risk
240 min Winter	154.710	0.710	11.3	95.3	Flood Risk
360 min Winter	154.656	0.656	10.4	81.7	Flood Risk
480 min Winter	154.607	0.607	9.5	70.4	Flood Risk
600 min Winter	154.563	0.563	8.8	60.8	Flood Risk
720 min Winter	154.523	0.523	8.1	52.7	Flood Risk
960 min Winter	154.453	0.453	7.0	39.9	O K
1440 min Winter	154.344	0.344	5.3	23.7	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
2160 min Summer	3.404	1144
2880 min Summer	2.715	1500
4320 min Summer	1.970	2208
5760 min Summer	1.567	2936
7200 min Summer	1.311	3672
8640 min Summer	1.134	4392
10080 min Summer	1.004	5136
15 min Winter	116.192	18
30 min Winter	77.964	32
60 min Winter	49.937	58
120 min Winter	30.897	94
180 min Winter	22.993	132
240 min Winter	18.515	168
360 min Winter	13.595	240
480 min Winter	10.918	308
600 min Winter	9.202	374
720 min Winter	7.998	440
960 min Winter	6.405	564
1440 min Winter	4.674	806

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Swale A



Date 31/01/2014 10:13  
File

Designed By Mark Craddock  
Checked By


Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - SWALE A.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
2160 min Winter	154.236	0.236	3.7	11.6	O K
2880 min Winter	154.169	0.169	2.7	6.3	O K
4320 min Winter	154.113	0.113	1.8	3.1	O K
5760 min Winter	154.080	0.080	1.4	1.7	O K
7200 min Winter	154.059	0.059	1.1	1.0	O K
8640 min Winter	154.048	0.048	0.9	0.8	O K
10080 min Winter	154.044	0.044	0.8	0.7	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
2160 min Winter	3.404	1152
2880 min Winter	2.715	1500
4320 min Winter	1.970	2204
5760 min Winter	1.567	2936
7200 min Winter	1.311	3664
8640 min Winter	1.134	4384
10080 min Winter	1.004	5144

Simpson Associates		Page 4
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Swale A	
Date 31/01/2014 10:13 File	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Rainfall Details for 12796 - SWALE A.srcx


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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.070

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.070
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Simpson Associates		Page 5
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Swale A	
Date 31/01/2014 10:13 File	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Model Details for 12796 - SWALE A.srcx


Storage is Online Cover Level (m) 154.800

Infiltration Basin Structure

Invert Level (m) 154.000 Safety Factor 2.0  
 Infiltration Coefficient Base (m/hr) 0.27000 Porosity 1.00  
 Infiltration Coefficient Side (m/hr) 0.27000

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	7.0	0.800	294.0

**APPENDIX G**  
**SWALE B CASCADE DESIGN RESULTS**

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 1B	
Date 17/01/2014 12:08 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 1B.srcx


**Upstream Structures                      Outflow To                      Overflow To**

(None)    12796 - Filter Drain 2B.srcx                      (None)

Half Drain Time : 3 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	159.349	1.049	4.2	145.4	149.5	33.6	Flood Risk
30 min Summer	159.323	1.023	4.1	142.2	146.3	32.9	Flood Risk
60 min Summer	159.136	0.836	3.6	116.8	120.3	27.2	O K
120 min Summer	158.987	0.687	3.2	83.5	86.6	22.5	O K
180 min Summer	158.939	0.639	3.1	64.3	67.3	20.8	O K
240 min Summer	158.915	0.615	3.0	51.9	54.9	20.0	O K
360 min Summer	158.841	0.541	2.8	37.0	39.7	17.3	O K
480 min Summer	158.799	0.499	2.7	29.5	32.2	15.7	O K
600 min Summer	158.774	0.474	2.6	25.1	27.7	14.7	O K
720 min Summer	158.762	0.462	2.6	21.6	24.2	14.3	O K
960 min Summer	158.746	0.446	2.5	16.9	19.4	13.7	O K
1440 min Summer	158.720	0.420	2.5	11.7	14.1	12.7	O K
2160 min Summer	158.698	0.398	2.4	7.9	10.3	11.9	O K
2880 min Summer	158.684	0.384	2.4	5.9	8.2	11.4	O K
4320 min Summer	158.666	0.366	2.3	3.7	6.0	10.8	O K
5760 min Summer	158.654	0.354	2.3	2.5	4.7	10.3	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	11
30 min Summer	77.964	19
60 min Summer	49.937	34
120 min Summer	30.897	64
180 min Summer	22.993	94
240 min Summer	18.515	124
360 min Summer	13.595	186
480 min Summer	10.918	246
600 min Summer	9.202	306
720 min Summer	7.998	364
960 min Summer	6.405	486
1440 min Summer	4.674	730
2160 min Summer	3.404	1096
2880 min Summer	2.715	1460
4320 min Summer	1.970	2148
5760 min Summer	1.567	2856

Simpson Associates				Page 2			
1 Market Place Mews Henley-on-Thames RG9 2AH		12796 Alton Towers Lodge Accom Scheme Filter Drain 1B					
Date 17/01/2014 12:08 File 12796 Lake B Casc...		Designed By Mark Craddock Checked By					
Micro Drainage				Source Control W.12.4			
<u>Cascade Summary of Results for 12796 - Filter Drain 1B.srcx</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Σ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	158.645	0.345	2.3	1.7	4.0	10.0	O K
8640 min Summer	158.636	0.336	2.2	1.2	3.4	9.7	O K
10080 min Summer	158.629	0.329	2.2	0.8	3.1	9.5	O K
15 min Winter	159.380	1.080	4.2	149.1	153.3	34.6	Flood Risk
30 min Winter	159.263	0.963	3.9	134.5	138.4	31.1	Flood Risk
60 min Winter	159.040	0.740	3.3	100.6	104.0	24.2	O K
120 min Winter	158.938	0.638	3.1	63.6	66.6	20.8	O K
180 min Winter	158.907	0.607	3.0	47.1	50.1	19.7	O K
240 min Winter	158.843	0.543	2.8	37.0	39.7	17.3	O K
360 min Winter	158.782	0.482	2.6	26.8	29.5	15.0	O K
480 min Winter	158.761	0.461	2.6	21.3	23.9	14.2	O K
600 min Winter	158.748	0.448	2.5	17.6	20.2	13.8	O K
720 min Winter	158.739	0.439	2.5	15.0	17.5	13.4	O K
960 min Winter	158.719	0.419	2.5	11.5	14.0	12.7	O K
1440 min Winter	158.698	0.398	2.4	7.8	10.2	11.9	O K
2160 min Winter	158.678	0.378	2.4	5.1	7.5	11.2	O K
2880 min Winter	158.666	0.366	2.3	3.7	6.0	10.7	O K
4320 min Winter	158.649	0.349	2.3	2.1	4.3	10.2	O K
5760 min Winter	158.635	0.335	2.2	1.2	3.4	9.7	O K
Storm Event	Rain (mm/hr)	Time-Peak (mins)					
7200 min Summer	1.311	3584					
8640 min Summer	1.134	4352					
10080 min Summer	1.004	5056					
15 min Winter	116.192	11					
30 min Winter	77.964	19					
60 min Winter	49.937	34					
120 min Winter	30.897	64					
180 min Winter	22.993	92					
240 min Winter	18.515	126					
360 min Winter	13.595	186					
480 min Winter	10.918	244					
600 min Winter	9.202	302					
720 min Winter	7.998	364					
960 min Winter	6.405	490					
1440 min Winter	4.674	732					
2160 min Winter	3.404	1096					
2880 min Winter	2.715	1444					
4320 min Winter	1.970	2188					
5760 min Winter	1.567	2936					
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1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 1B



Date 17/01/2014 12:08

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 1B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	158.625	0.325	2.2	0.7	2.9	9.3	O K
8640 min Winter	158.619	0.319	2.2	0.3	2.5	9.1	O K
10080 min Winter	158.604	0.304	2.2	0.0	2.2	8.7	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3672
8640 min Winter	1.134	4360
10080 min Winter	1.004	5136

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 1B



Date 17/01/2014 12:08

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 1B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.370

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.370
-----	-------

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 1B



Date 17/01/2014 12:08

Designed By Mark Craddock

File 12796 Lake B Casc...

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Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 1B.srcx


Storage is Online Cover Level (m) 159.500

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	95.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.300
Safety Factor	2.0	Pipe Depth above Invert (m)	0.300
Porosity	0.30	Slope (1:X)	0.0
Invert Level (m)	158.300	Cap Volume Depth (m)	1.200
Trench Width (m)	1.0	Cap Infiltration Depth (m)	1.200

Pipe Outflow Control

Diameter (m)	0.300	Entry Loss Coefficient	0.500
Slope (1:X)	60.0	Coefficient of Contraction	0.600
Length (m)	1.800	Upstream Invert Level (m)	158.600
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 2B	
Date 17/01/2014 12:10 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage		Source Control W.12.4


Cascade Summary of Results for 12796 - Filter Drain 2B.srcx

<b>Upstream Structures</b>	<b>Outflow To</b>	<b>Overflow To</b>
12796 - Filter Drain 1B.srcx	12796 - Filter Drain 3B.srcx	(None)

Half Drain Time : 1 minutes.

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
15 min Summer	157.338	1.038	0.8	144.0	144.8	5.1	Flood Risk
30 min Summer	157.324	1.024	0.8	142.4	143.2	5.0	Flood Risk
60 min Summer	157.150	0.850	0.6	118.8	119.5	3.5	O K
120 min Summer	156.991	0.691	0.5	87.1	87.6	2.3	O K
180 min Summer	156.926	0.626	0.4	66.7	67.1	1.8	O K
240 min Summer	156.888	0.588	0.4	54.6	55.0	1.6	O K
360 min Summer	156.833	0.533	0.3	38.4	38.7	1.3	O K
480 min Summer	156.798	0.498	0.3	30.7	31.0	1.1	O K
600 min Summer	156.777	0.477	0.3	26.1	26.4	1.0	O K
720 min Summer	156.764	0.464	0.3	22.3	22.6	0.9	O K
960 min Summer	156.748	0.448	0.3	17.5	17.8	0.9	O K
1440 min Summer	156.723	0.423	0.2	12.1	12.3	0.8	O K
2160 min Summer	156.700	0.400	0.2	8.2	8.5	0.7	O K
2880 min Summer	156.686	0.386	0.2	6.0	6.2	0.6	O K
4320 min Summer	156.667	0.367	0.2	3.8	4.0	0.6	O K
5760 min Summer	156.655	0.355	0.2	2.5	2.7	0.5	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
15 min Summer	116.192	12
30 min Summer	77.964	20
60 min Summer	49.937	34
120 min Summer	30.897	64
180 min Summer	22.993	94
240 min Summer	18.515	124
360 min Summer	13.595	184
480 min Summer	10.918	244
600 min Summer	9.202	302
720 min Summer	7.998	368
960 min Summer	6.405	486
1440 min Summer	4.674	734
2160 min Summer	3.404	1076
2880 min Summer	2.715	1452
4320 min Summer	1.970	2152
5760 min Summer	1.567	2848

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 2B	
Date 17/01/2014 12:10 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 2B.srcx

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
7200 min Summer	156.645	0.345	0.2	1.7	1.9	0.5	O K
8640 min Summer	156.635	0.335	0.2	1.2	1.4	0.5	O K
10080 min Summer	156.628	0.328	0.2	0.8	1.0	0.4	O K
15 min Winter	157.375	1.075	0.9	148.5	149.3	5.5	Flood Risk
30 min Winter	157.282	0.982	0.8	137.0	137.7	4.6	Flood Risk
60 min Winter	157.055	0.755	0.5	103.8	104.3	2.7	O K
120 min Winter	156.924	0.624	0.4	65.9	66.3	1.8	O K
180 min Winter	156.870	0.570	0.3	49.3	49.6	1.5	O K
240 min Winter	156.833	0.533	0.3	38.4	38.7	1.3	O K
360 min Winter	156.785	0.485	0.3	27.9	28.1	1.0	O K
480 min Winter	156.763	0.463	0.3	21.9	22.2	0.9	O K
600 min Winter	156.750	0.450	0.3	18.2	18.5	0.9	O K
720 min Winter	156.741	0.441	0.2	15.6	15.8	0.8	O K
960 min Winter	156.722	0.422	0.2	11.9	12.2	0.7	O K
1440 min Winter	156.699	0.399	0.2	8.1	8.3	0.7	O K
2160 min Winter	156.679	0.379	0.2	5.2	5.4	0.6	O K
2880 min Winter	156.667	0.367	0.2	3.7	3.9	0.6	O K
4320 min Winter	156.649	0.349	0.2	2.1	2.2	0.5	O K
5760 min Winter	156.635	0.335	0.2	1.2	1.3	0.5	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3648
8640 min Summer	1.134	4384
10080 min Summer	1.004	5128
15 min Winter	116.192	12
30 min Winter	77.964	20
60 min Winter	49.937	34
120 min Winter	30.897	64
180 min Winter	22.993	94
240 min Winter	18.515	126
360 min Winter	13.595	184
480 min Winter	10.918	246
600 min Winter	9.202	300
720 min Winter	7.998	360
960 min Winter	6.405	488
1440 min Winter	4.674	718
2160 min Winter	3.404	1088
2880 min Winter	2.715	1424
4320 min Winter	1.970	2200
5760 min Winter	1.567	2928

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 2B



Date 17/01/2014 12:10

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 2B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	156.625	0.325	0.2	0.6	0.8	0.4	O K
8640 min Winter	156.617	0.317	0.2	0.2	0.4	0.4	O K
10080 min Winter	156.529	0.229	0.1	0.0	0.1	0.2	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3584
8640 min Winter	1.134	4368
10080 min Winter	1.004	5192

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 2B



Date 17/01/2014 12:10  
File 12796 Lake B Casc...

Designed By Mark Craddock  
Checked By

Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 2B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.015

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.015
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1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 2B



Date 17/01/2014 12:10

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 2B.srcx


Storage is Online Cover Level (m) 157.500

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	40.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.300
Safety Factor	2.0	Pipe Depth above Invert (m)	0.300
Porosity	0.30	Slope (1:X)	27.0
Invert Level (m)	156.300	Cap Volume Depth (m)	1.200
Trench Width (m)	1.0	Cap Infiltration Depth (m)	1.200

Pipe Outflow Control

Diameter (m)	0.300	Entry Loss Coefficient	0.500
Slope (1:X)	40.0	Coefficient of Contraction	0.600
Length (m)	4.800	Upstream Invert Level (m)	156.600
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 3B	
Date 17/01/2014 12:11 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage		Source Control W.12.4


Cascade Summary of Results for 12796 - Filter Drain 3B.srcx

Upstream Structures	Outflow To	Overflow To
12796 - Filter Drain 2B.srcx	12796 - Filter Drain 14B.srcx	(None)
12796 - Filter Drain 1B.srcx		

Half Drain Time : 0 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 <sup>3</sup> )	Status
15 min Summer	154.419	1.069	0.5	145.4	145.9	3.0	Flood Risk
30 min Summer	154.422	1.072	0.5	145.8	146.3	3.0	Flood Risk
60 min Summer	154.241	0.891	0.4	121.9	122.3	2.1	O K
120 min Summer	154.095	0.745	0.3	90.5	90.8	1.5	O K
180 min Summer	154.034	0.684	0.3	70.0	70.2	1.2	O K
240 min Summer	154.003	0.653	0.2	56.8	57.0	1.1	O K
360 min Summer	153.974	0.624	0.2	40.7	41.0	1.0	O K
480 min Summer	153.906	0.556	0.2	32.9	33.1	0.8	O K
600 min Summer	153.874	0.524	0.2	27.4	27.6	0.7	O K
720 min Summer	153.855	0.505	0.2	25.0	25.2	0.6	O K
960 min Summer	153.820	0.470	0.2	18.2	18.4	0.5	O K
1440 min Summer	153.796	0.446	0.1	12.6	12.8	0.5	O K
2160 min Summer	153.772	0.422	0.1	8.5	8.6	0.4	O K
2880 min Summer	153.758	0.408	0.1	6.3	6.4	0.4	O K
4320 min Summer	153.739	0.389	0.1	4.0	4.1	0.3	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	13
30 min Summer	77.964	20
60 min Summer	49.937	34
120 min Summer	30.897	64
180 min Summer	22.993	94
240 min Summer	18.515	124
360 min Summer	13.595	188
480 min Summer	10.918	246
600 min Summer	9.202	306
720 min Summer	7.998	364
960 min Summer	6.405	488
1440 min Summer	4.674	726
2160 min Summer	3.404	1080
2880 min Summer	2.715	1456
4320 min Summer	1.970	2180

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 3B	
Date 17/01/2014 12:11 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 3B.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max $\Sigma$ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
5760 min Summer	153.726	0.376	0.1	2.6	2.8	0.3	O K
7200 min Summer	153.717	0.367	0.1	1.8	2.0	0.3	O K
8640 min Summer	153.707	0.357	0.1	1.3	1.4	0.3	O K
10080 min Summer	153.699	0.349	0.1	0.9	1.0	0.3	O K
15 min Winter	154.473	1.123	0.5	151.8	152.4	3.3	Flood Risk
30 min Winter	154.383	1.033	0.5	140.9	141.4	2.8	Flood Risk
60 min Winter	154.162	0.812	0.3	108.5	108.9	1.7	O K
120 min Winter	154.031	0.681	0.3	68.6	68.9	1.2	O K
180 min Winter	153.993	0.643	0.2	51.8	52.0	1.1	O K
240 min Winter	153.973	0.623	0.2	40.1	40.3	1.0	O K
360 min Winter	153.883	0.533	0.2	28.9	29.1	0.7	O K
480 min Winter	153.849	0.499	0.2	24.2	24.3	0.6	O K
600 min Winter	153.823	0.473	0.2	19.1	19.3	0.5	O K
720 min Winter	153.814	0.464	0.1	16.3	16.5	0.5	O K
960 min Winter	153.795	0.445	0.1	12.4	12.6	0.5	O K
1440 min Winter	153.771	0.421	0.1	8.4	8.5	0.4	O K
2160 min Winter	153.751	0.401	0.1	5.5	5.6	0.4	O K
2880 min Winter	153.738	0.388	0.1	3.9	4.0	0.3	O K
4320 min Winter	153.721	0.371	0.1	2.2	2.3	0.3	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
5760 min Summer	1.567	2880
7200 min Summer	1.311	3672
8640 min Summer	1.134	4272
10080 min Summer	1.004	5040
15 min Winter	116.192	13
30 min Winter	77.964	20
60 min Winter	49.937	34
120 min Winter	30.897	64
180 min Winter	22.993	94
240 min Winter	18.515	126
360 min Winter	13.595	172
480 min Winter	10.918	240
600 min Winter	9.202	310
720 min Winter	7.998	360
960 min Winter	6.405	480
1440 min Winter	4.674	738
2160 min Winter	3.404	1072
2880 min Winter	2.715	1392
4320 min Winter	1.970	2212

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 3B



Date 17/01/2014 12:11

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 3B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
5760 min Winter	153.706	0.356	0.1	1.2	1.3	0.3	O K
7200 min Winter	153.695	0.345	0.1	0.7	0.8	0.3	O K
8640 min Winter	153.687	0.337	0.1	0.3	0.4	0.3	O K
10080 min Winter	153.673	0.323	0.1	0.0	0.1	0.2	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
5760 min Winter	1.567	2856
7200 min Winter	1.311	3568
8640 min Winter	1.134	4320
10080 min Winter	1.004	5136

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 3B



Date 17/01/2014 12:11

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File 12796 Lake B Casc...

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Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 3B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.017

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.017
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1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 3B



Date 17/01/2014 12:11

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File 12796 Lake B Casc...

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Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 3B.srcx


Storage is Online Cover Level (m) 154.550

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	52.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.300
Safety Factor	2.0	Pipe Depth above Invert (m)	0.300
Porosity	0.30	Slope (1:X)	15.0
Invert Level (m)	153.350	Cap Volume Depth (m)	1.200
Trench Width (m)	1.0	Cap Infiltration Depth (m)	1.200

Pipe Outflow Control

Diameter (m)	0.300	Entry Loss Coefficient	0.500
Slope (1:X)	150.0	Coefficient of Contraction	0.600
Length (m)	4.000	Upstream Invert Level (m)	153.670
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 4B	
Date 17/01/2014 12:13 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 4B.srcx

<b>Upstream Structures</b>	<b>Outflow To</b>	<b>Overflow To</b>
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(None) 12796 - Filter Drain 5B.srcx (None)

Half Drain Time : 0 minutes.

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
15 min Summer	161.004	0.504	0.2	49.2	49.4	0.8	O K
30 min Summer	160.974	0.474	0.2	43.6	43.8	0.7	O K
60 min Summer	160.917	0.417	0.2	31.9	32.0	0.5	O K
120 min Summer	160.864	0.364	0.1	21.4	21.5	0.4	O K
180 min Summer	160.832	0.332	0.1	16.2	16.3	0.3	O K
240 min Summer	160.811	0.311	0.1	13.2	13.3	0.3	O K
360 min Summer	160.792	0.292	0.1	9.7	9.8	0.2	O K
480 min Summer	160.782	0.282	0.1	7.8	7.9	0.2	O K
600 min Summer	160.773	0.273	0.1	6.6	6.7	0.2	O K
720 min Summer	160.765	0.265	0.1	5.7	5.8	0.2	O K
960 min Summer	160.755	0.255	0.1	4.5	4.6	0.2	O K
1440 min Summer	160.744	0.244	0.1	3.3	3.4	0.2	O K
2160 min Summer	160.733	0.233	0.1	2.5	2.5	0.1	O K
2880 min Summer	160.727	0.227	0.1	1.9	2.0	0.1	O K
4320 min Summer	160.719	0.219	0.1	1.4	1.5	0.1	O K
5760 min Summer	160.714	0.214	0.1	1.1	1.2	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	10
30 min Summer	77.964	17
60 min Summer	49.937	32
120 min Summer	30.897	62
180 min Summer	22.993	92
240 min Summer	18.515	122
360 min Summer	13.595	184
480 min Summer	10.918	240
600 min Summer	9.202	300
720 min Summer	7.998	358
960 min Summer	6.405	478
1440 min Summer	4.674	726
2160 min Summer	3.404	1100
2880 min Summer	2.715	1432
4320 min Summer	1.970	2172
5760 min Summer	1.567	2912

Cascade Summary of Results for 12796 - Filter Drain 4B.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	160.710	0.210	0.1	0.9	1.0	0.1	O K
8640 min Summer	160.707	0.207	0.1	0.8	0.8	0.1	O K
10080 min Summer	160.704	0.204	0.1	0.7	0.7	0.1	O K
15 min Winter	161.005	0.505	0.2	49.3	49.5	0.8	O K
30 min Winter	160.945	0.445	0.2	37.7	37.9	0.6	O K
60 min Winter	160.884	0.384	0.1	25.2	25.3	0.4	O K
120 min Winter	160.830	0.330	0.1	15.8	16.0	0.3	O K
180 min Winter	160.803	0.303	0.1	11.8	12.0	0.3	O K
240 min Winter	160.792	0.292	0.1	9.7	9.8	0.2	O K
360 min Winter	160.777	0.277	0.1	7.0	7.1	0.2	O K
480 min Winter	160.764	0.264	0.1	5.6	5.7	0.2	O K
600 min Winter	160.757	0.257	0.1	4.7	4.8	0.2	O K
720 min Winter	160.751	0.251	0.1	4.1	4.2	0.2	O K
960 min Winter	160.744	0.244	0.1	3.3	3.4	0.1	O K
1440 min Winter	160.732	0.232	0.1	2.4	2.5	0.1	O K
2160 min Winter	160.724	0.224	0.1	1.7	1.8	0.1	O K
2880 min Winter	160.718	0.218	0.1	1.4	1.4	0.1	O K
4320 min Winter	160.712	0.212	0.1	1.0	1.1	0.1	O K
5760 min Winter	160.707	0.207	0.1	0.8	0.8	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3536
8640 min Summer	1.134	4248
10080 min Summer	1.004	4976
15 min Winter	116.192	10
30 min Winter	77.964	17
60 min Winter	49.937	32
120 min Winter	30.897	62
180 min Winter	22.993	92
240 min Winter	18.515	122
360 min Winter	13.595	184
480 min Winter	10.918	238
600 min Winter	9.202	304
720 min Winter	7.998	356
960 min Winter	6.405	496
1440 min Winter	4.674	712
2160 min Winter	3.404	1044
2880 min Winter	2.715	1436
4320 min Winter	1.970	2164
5760 min Winter	1.567	2800

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 4B



Date 17/01/2014 12:13

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 4B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	160.703	0.203	0.1	0.6	0.7	0.1	O K
8640 min Winter	160.700	0.200	0.1	0.5	0.6	0.1	O K
10080 min Winter	160.699	0.199	0.1	0.5	0.5	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3728
8640 min Winter	1.134	4240
10080 min Winter	1.004	5056

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 4B



Date 17/01/2014 12:13  
File 12796 Lake B Casc...

Designed By Mark Craddock  
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Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 4B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.088

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.088
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1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 4B



Date 17/01/2014 12:13

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 4B.srcx


Storage is Online Cover Level (m) 161.500

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	96.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.225
Safety Factor	2.0	Pipe Depth above Invert (m)	0.175
Porosity	0.30	Slope (1:X)	27.0
Invert Level (m)	160.500	Cap Volume Depth (m)	1.000
Trench Width (m)	0.6	Cap Infiltration Depth (m)	1.000

Pipe Outflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	40.0	Coefficient of Contraction	0.600
Length (m)	12.000	Upstream Invert Level (m)	160.675
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 5B	
Date 17/01/2014 12:14 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage		Source Control W.12.4


Cascade Summary of Results for 12796 - Filter Drain 5B.srcx

<b>Upstream Structures</b>	<b>Outflow To</b>	<b>Overflow To</b>
12796 - Filter Drain 4B.srcx	12796 - Filter Drain 11B.srcx	(None)

Half Drain Time : 1 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	157.333	0.933	1.2	133.9	135.1	6.8	Flood Risk
30 min Summer	157.256	0.856	1.1	123.3	124.4	5.7	Flood Risk
60 min Summer	157.087	0.687	0.8	93.8	94.6	3.6	O K
120 min Summer	156.991	0.591	0.6	63.4	64.0	2.6	O K
180 min Summer	156.942	0.542	0.5	48.4	48.9	2.1	O K
240 min Summer	156.912	0.512	0.5	39.3	39.8	1.9	O K
360 min Summer	156.866	0.466	0.4	29.1	29.5	1.5	O K
480 min Summer	156.843	0.443	0.4	23.4	23.8	1.3	O K
600 min Summer	156.830	0.430	0.4	19.7	20.1	1.2	O K
720 min Summer	156.821	0.421	0.4	17.1	17.4	1.2	O K
960 min Summer	156.806	0.406	0.4	13.6	13.9	1.1	O K
1440 min Summer	156.784	0.384	0.3	9.8	10.1	1.0	O K
2160 min Summer	156.769	0.369	0.3	7.1	7.4	0.9	O K
2880 min Summer	156.757	0.357	0.3	5.6	5.9	0.8	O K
4320 min Summer	156.744	0.344	0.3	4.0	4.3	0.8	O K
5760 min Summer	156.736	0.336	0.3	3.1	3.4	0.7	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	11
30 min Summer	77.964	18
60 min Summer	49.937	32
120 min Summer	30.897	62
180 min Summer	22.993	92
240 min Summer	18.515	122
360 min Summer	13.595	182
480 min Summer	10.918	242
600 min Summer	9.202	300
720 min Summer	7.998	358
960 min Summer	6.405	476
1440 min Summer	4.674	724
2160 min Summer	3.404	1068
2880 min Summer	2.715	1420
4320 min Summer	1.970	2164
5760 min Summer	1.567	2912

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 5B	
Date 17/01/2014 12:14 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 5B.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max $\Sigma$ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	156.730	0.330	0.3	2.6	2.9	0.7	O K
8640 min Summer	156.726	0.326	0.3	2.2	2.5	0.7	O K
10080 min Summer	156.722	0.322	0.3	1.9	2.2	0.7	O K
15 min Winter	157.344	0.944	1.2	135.3	136.5	7.0	Flood Risk
30 min Winter	157.173	0.773	0.9	110.9	111.8	4.6	O K
60 min Winter	157.030	0.630	0.7	75.7	76.3	3.0	O K
120 min Winter	156.940	0.540	0.5	47.6	48.2	2.1	O K
180 min Winter	156.895	0.495	0.5	35.5	36.0	1.7	O K
240 min Winter	156.864	0.464	0.4	28.6	29.1	1.5	O K
360 min Winter	156.834	0.434	0.4	20.9	21.3	1.3	O K
480 min Winter	156.821	0.421	0.4	16.9	17.3	1.2	O K
600 min Winter	156.809	0.409	0.4	14.1	14.4	1.1	O K
720 min Winter	156.798	0.398	0.4	12.2	12.5	1.0	O K
960 min Winter	156.784	0.384	0.3	9.7	10.0	1.0	O K
1440 min Winter	156.768	0.368	0.3	7.0	7.4	0.9	O K
2160 min Winter	156.753	0.353	0.3	5.1	5.4	0.8	O K
2880 min Winter	156.744	0.344	0.3	4.0	4.3	0.8	O K
4320 min Winter	156.733	0.333	0.3	2.8	3.1	0.7	O K
5760 min Winter	156.725	0.325	0.3	2.2	2.4	0.7	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3544
8640 min Summer	1.134	4280
10080 min Summer	1.004	5096
15 min Winter	116.192	11
30 min Winter	77.964	18
60 min Winter	49.937	32
120 min Winter	30.897	62
180 min Winter	22.993	92
240 min Winter	18.515	124
360 min Winter	13.595	184
480 min Winter	10.918	242
600 min Winter	9.202	304
720 min Winter	7.998	358
960 min Winter	6.405	492
1440 min Winter	4.674	718
2160 min Winter	3.404	1096
2880 min Winter	2.715	1448
4320 min Winter	1.970	2140
5760 min Winter	1.567	2840

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 5B



Date 17/01/2014 12:14

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 5B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max <math>\Sigma</math> Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	156.721	0.321	0.3	1.8	2.0	0.7	O K
8640 min Winter	156.716	0.316	0.3	1.5	1.8	0.6	O K
10080 min Winter	156.712	0.312	0.3	1.3	1.6	0.6	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3496
8640 min Winter	1.134	4376
10080 min Winter	1.004	5008

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 5B



Date 17/01/2014 12:14

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 5B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.179

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.179
-----	-------

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 5B



Date 17/01/2014 12:14  
File 12796 Lake B Casc...

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Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 5B.srcx


Storage is Online Cover Level (m) 157.500

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	105.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.300
Safety Factor	2.0	Pipe Depth above Invert (m)	0.300
Porosity	0.30	Slope (1:X)	53.0
Invert Level (m)	156.400	Cap Volume Depth (m)	1.100
Trench Width (m)	0.8	Cap Infiltration Depth (m)	1.100

Pipe Outflow Control

Diameter (m)	0.300	Entry Loss Coefficient	0.500
Slope (1:X)	20.0	Coefficient of Contraction	0.600
Length (m)	5.500	Upstream Invert Level (m)	156.675
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 6B	
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Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 6B.srcx


**Upstream Structures                      Outflow To                      Overflow To**

(None)    12796 - Filter Drain 11B.srcx                      (None)

Half Drain Time : 0 minutes.

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
15 min Summer	157.909	0.659	0.4	64.4	64.8	1.7	O K
30 min Summer	157.836	0.586	0.3	57.7	58.1	1.4	O K
60 min Summer	157.722	0.472	0.3	43.3	43.6	0.9	O K
120 min Summer	157.652	0.402	0.2	28.9	29.1	0.6	O K
180 min Summer	157.618	0.368	0.2	22.1	22.3	0.5	O K
240 min Summer	157.594	0.344	0.2	17.9	18.1	0.4	O K
360 min Summer	157.561	0.311	0.1	13.2	13.3	0.3	O K
480 min Summer	157.547	0.297	0.1	10.6	10.7	0.3	O K
600 min Summer	157.538	0.288	0.1	8.9	9.0	0.3	O K
720 min Summer	157.532	0.282	0.1	7.8	7.9	0.3	O K
960 min Summer	157.520	0.270	0.1	6.2	6.3	0.2	O K
1440 min Summer	157.505	0.255	0.1	4.5	4.6	0.2	O K
2160 min Summer	157.493	0.243	0.1	3.3	3.4	0.2	O K
2880 min Summer	157.485	0.235	0.1	2.6	2.7	0.2	O K
4320 min Summer	157.476	0.226	0.1	1.9	2.0	0.2	O K
5760 min Summer	157.470	0.220	0.1	1.5	1.6	0.2	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	10
30 min Summer	77.964	18
60 min Summer	49.937	32
120 min Summer	30.897	62
180 min Summer	22.993	92
240 min Summer	18.515	122
360 min Summer	13.595	182
480 min Summer	10.918	244
600 min Summer	9.202	306
720 min Summer	7.998	366
960 min Summer	6.405	480
1440 min Summer	4.674	732
2160 min Summer	3.404	1064
2880 min Summer	2.715	1452
4320 min Summer	1.970	2192
5760 min Summer	1.567	2896

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 6B	
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Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 6B.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	157.466	0.216	0.1	1.2	1.3	0.2	O K
8640 min Summer	157.463	0.213	0.1	1.1	1.1	0.1	O K
10080 min Summer	157.460	0.210	0.1	0.9	1.0	0.1	O K
15 min Winter	157.912	0.662	0.4	64.6	65.1	1.7	O K
30 min Winter	157.769	0.519	0.3	50.9	51.2	1.1	O K
60 min Winter	157.679	0.429	0.2	34.3	34.6	0.7	O K
120 min Winter	157.615	0.365	0.2	21.6	21.7	0.5	O K
180 min Winter	157.582	0.332	0.2	16.1	16.3	0.4	O K
240 min Winter	157.560	0.310	0.1	13.0	13.1	0.3	O K
360 min Winter	157.541	0.291	0.1	9.6	9.7	0.3	O K
480 min Winter	157.531	0.281	0.1	7.7	7.8	0.3	O K
600 min Winter	157.522	0.272	0.1	6.4	6.5	0.3	O K
720 min Winter	157.514	0.264	0.1	5.6	5.7	0.2	O K
960 min Winter	157.504	0.254	0.1	4.5	4.6	0.2	O K
1440 min Winter	157.493	0.243	0.1	3.3	3.4	0.2	O K
2160 min Winter	157.482	0.232	0.1	2.3	2.4	0.2	O K
2880 min Winter	157.476	0.226	0.1	1.9	2.0	0.2	O K
4320 min Winter	157.468	0.218	0.1	1.3	1.4	0.2	O K
5760 min Winter	157.462	0.212	0.1	1.0	1.1	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3632
8640 min Summer	1.134	4248
10080 min Summer	1.004	4968
15 min Winter	116.192	10
30 min Winter	77.964	18
60 min Winter	49.937	32
120 min Winter	30.897	62
180 min Winter	22.993	92
240 min Winter	18.515	124
360 min Winter	13.595	182
480 min Winter	10.918	244
600 min Winter	9.202	302
720 min Winter	7.998	360
960 min Winter	6.405	480
1440 min Winter	4.674	718
2160 min Winter	3.404	1104
2880 min Winter	2.715	1440
4320 min Winter	1.970	2188
5760 min Winter	1.567	2832

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 6B



Date 17/01/2014 12:14

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 6B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max <math>\Sigma</math> Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	157.460	0.210	0.1	0.9	1.0	0.1	O K
8640 min Winter	157.456	0.206	0.1	0.7	0.8	0.1	O K
10080 min Winter	157.453	0.203	0.1	0.6	0.7	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3632
8640 min Winter	1.134	4376
10080 min Winter	1.004	5024

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 6B



Date 17/01/2014 12:14  
File 12796 Lake B Casc...

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Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 6B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.120

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.120
-----	-------

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 6B



Date 17/01/2014 12:14  
File 12796 Lake B Casc...

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Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 6B.srcx


Storage is Online Cover Level (m) 158.250

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	90.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.225
Safety Factor	2.0	Pipe Depth above Invert (m)	0.175
Porosity	0.30	Slope (1:X)	35.0
Invert Level (m)	157.250	Cap Volume Depth (m)	1.000
Trench Width (m)	0.6	Cap Infiltration Depth (m)	1.000

Pipe Outflow Control

Diameter (m)	0.225	Entry Loss Coefficient	0.500
Slope (1:X)	15.0	Coefficient of Contraction	0.600
Length (m)	12.000	Upstream Invert Level (m)	157.425
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 7B	
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Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 7B.srcx


**Upstream Structures                      Outflow To                      Overflow To**

(None)    12796 - Filter Drain 11B.srcx                      (None)

Half Drain Time : 6 minutes.

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
15 min Summer	157.037	0.287	0.9	8.9	9.7	3.0	O K
30 min Summer	157.043	0.293	0.9	9.6	10.5	3.1	O K
60 min Summer	157.025	0.275	0.8	7.6	8.4	2.8	O K
120 min Summer	156.996	0.246	0.8	5.2	6.0	2.5	O K
180 min Summer	156.982	0.232	0.8	3.9	4.7	2.3	O K
240 min Summer	156.973	0.223	0.8	3.0	3.8	2.2	O K
360 min Summer	156.960	0.210	0.7	2.1	2.8	2.1	O K
480 min Summer	156.952	0.202	0.7	1.6	2.3	2.0	O K
600 min Summer	156.946	0.196	0.7	1.2	1.9	1.9	O K
720 min Summer	156.941	0.191	0.7	1.0	1.7	1.8	O K
960 min Summer	156.933	0.183	0.7	0.7	1.4	1.8	O K
1440 min Summer	156.921	0.171	0.7	0.3	1.0	1.6	O K
2160 min Summer	156.874	0.124	0.6	0.0	0.6	1.2	O K
2880 min Summer	156.819	0.069	0.5	0.0	0.5	0.6	O K
4320 min Summer	156.791	0.041	0.4	0.0	0.4	0.4	O K
5760 min Summer	156.783	0.033	0.3	0.0	0.3	0.3	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	11
30 min Summer	77.964	19
60 min Summer	49.937	34
120 min Summer	30.897	64
180 min Summer	22.993	94
240 min Summer	18.515	124
360 min Summer	13.595	184
480 min Summer	10.918	244
600 min Summer	9.202	306
720 min Summer	7.998	368
960 min Summer	6.405	488
1440 min Summer	4.674	736
2160 min Summer	3.404	1128
2880 min Summer	2.715	1472
4320 min Summer	1.970	2200
5760 min Summer	1.567	2936

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 7B	
Date 17/01/2014 12:16 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 7B.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	156.777	0.027	0.3	0.0	0.3	0.3	O K
8640 min Summer	156.774	0.024	0.2	0.0	0.2	0.2	O K
10080 min Summer	156.771	0.021	0.2	0.0	0.2	0.2	O K
15 min Winter	157.045	0.295	0.9	9.8	10.7	3.1	O K
30 min Winter	157.038	0.288	0.9	9.0	9.9	3.0	O K
60 min Winter	157.010	0.260	0.8	6.3	7.1	2.7	O K
120 min Winter	156.981	0.231	0.8	3.9	4.6	2.3	O K
180 min Winter	156.970	0.220	0.8	2.7	3.5	2.2	O K
240 min Winter	156.960	0.210	0.7	2.1	2.8	2.1	O K
360 min Winter	156.948	0.198	0.7	1.3	2.1	1.9	O K
480 min Winter	156.940	0.190	0.7	1.0	1.7	1.8	O K
600 min Winter	156.934	0.184	0.7	0.7	1.4	1.8	O K
720 min Winter	156.930	0.180	0.7	0.5	1.2	1.7	O K
960 min Winter	156.922	0.172	0.7	0.3	1.0	1.6	O K
1440 min Winter	156.896	0.146	0.7	0.0	0.7	1.4	O K
2160 min Winter	156.803	0.053	0.5	0.0	0.5	0.5	O K
2880 min Winter	156.791	0.041	0.4	0.0	0.4	0.4	O K
4320 min Winter	156.780	0.030	0.3	0.0	0.3	0.3	O K
5760 min Winter	156.774	0.024	0.2	0.0	0.2	0.2	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3592
8640 min Summer	1.134	4344
10080 min Summer	1.004	5040
15 min Winter	116.192	12
30 min Winter	77.964	19
60 min Winter	49.937	34
120 min Winter	30.897	64
180 min Winter	22.993	94
240 min Winter	18.515	124
360 min Winter	13.595	186
480 min Winter	10.918	244
600 min Winter	9.202	308
720 min Winter	7.998	370
960 min Winter	6.405	492
1440 min Winter	4.674	792
2160 min Winter	3.404	1112
2880 min Winter	2.715	1452
4320 min Winter	1.970	2164
5760 min Winter	1.567	2936

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 7B



Date 17/01/2014 12:16

Designed By Mark Craddock

File 12796 Lake B Casc...

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Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 7B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Σ Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	156.770	0.020	0.2	0.0	0.2	0.2	O K
8640 min Winter	156.767	0.017	0.2	0.0	0.2	0.2	O K
10080 min Winter	156.765	0.015	0.2	0.0	0.2	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3632
8640 min Winter	1.134	4320
10080 min Winter	1.004	4976

1 Market Place Mews  
 Henley-on-Thames  
 RG9 2AH

12796 Alton Towers  
 Lodge Accom Scheme  
 Filter Drain 7B



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Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 7B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.026

**Time    Area**  
**(mins)    (ha)**

0-4    0.026

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 7B



Date 17/01/2014 12:16

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File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 7B.srcx


Storage is Online Cover Level (m) 157.500

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	52.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	0.0
Invert Level (m)	156.750	Cap Volume Depth (m)	0.750
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.750

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	12.0	Coefficient of Contraction	0.600
Length (m)	5.000	Upstream Invert Level (m)	156.900
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 8B	
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Micro Drainage		Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 8B.srcx


**Upstream Structures                      Outflow To                      Overflow To**

(None)    12796 - Filter Drain 9B.srcx                      (None)

Half Drain Time : 0 minutes.

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
15 min Summer	157.773	0.523	0.3	25.6	25.9	0.9	Flood Risk
30 min Summer	157.721	0.471	0.2	23.3	23.5	0.7	Flood Risk
60 min Summer	157.616	0.366	0.2	17.6	17.8	0.4	O K
120 min Summer	157.563	0.313	0.1	11.7	11.9	0.3	O K
180 min Summer	157.537	0.287	0.1	8.9	9.0	0.2	O K
240 min Summer	157.522	0.272	0.1	7.3	7.4	0.2	O K
360 min Summer	157.498	0.248	0.1	5.3	5.4	0.2	O K
480 min Summer	157.486	0.236	0.1	4.3	4.4	0.2	O K
600 min Summer	157.479	0.229	0.1	3.7	3.7	0.1	O K
720 min Summer	157.475	0.225	0.1	3.2	3.3	0.1	O K
960 min Summer	157.468	0.218	0.1	2.5	2.6	0.1	O K
1440 min Summer	157.456	0.206	0.1	1.8	1.9	0.1	O K
2160 min Summer	157.448	0.198	0.1	1.3	1.4	0.1	O K
2880 min Summer	157.442	0.192	0.1	1.0	1.1	0.1	O K
4320 min Summer	157.436	0.186	0.1	0.8	0.8	0.1	O K
5760 min Summer	157.432	0.182	0.1	0.6	0.6	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
15 min Summer	116.192	10
30 min Summer	77.964	18
60 min Summer	49.937	32
120 min Summer	30.897	62
180 min Summer	22.993	92
240 min Summer	18.515	122
360 min Summer	13.595	184
480 min Summer	10.918	242
600 min Summer	9.202	298
720 min Summer	7.998	362
960 min Summer	6.405	486
1440 min Summer	4.674	714
2160 min Summer	3.404	1064
2880 min Summer	2.715	1452
4320 min Summer	1.970	2132
5760 min Summer	1.567	2848

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1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 8B	
Date 17/01/2014 12:16 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 8B.srcx

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
7200 min Summer	157.429	0.179	0.1	0.5	0.6	0.1	O K
8640 min Summer	157.426	0.176	0.1	0.4	0.5	0.1	O K
10080 min Summer	157.425	0.175	0.1	0.4	0.4	0.1	O K
15 min Winter	157.777	0.527	0.3	25.8	26.1	0.9	Flood Risk
30 min Winter	157.668	0.418	0.2	20.6	20.8	0.5	O K
60 min Winter	157.583	0.333	0.1	14.0	14.1	0.3	O K
120 min Winter	157.536	0.286	0.1	8.8	8.9	0.2	O K
180 min Winter	157.513	0.263	0.1	6.5	6.6	0.2	O K
240 min Winter	157.497	0.247	0.1	5.2	5.3	0.2	O K
360 min Winter	157.481	0.231	0.1	3.9	3.9	0.2	O K
480 min Winter	157.474	0.224	0.1	3.1	3.2	0.1	O K
600 min Winter	157.469	0.219	0.1	2.6	2.7	0.1	O K
720 min Winter	157.463	0.213	0.1	2.3	2.3	0.1	O K
960 min Winter	157.456	0.206	0.1	1.8	1.9	0.1	O K
1440 min Winter	157.448	0.198	0.1	1.3	1.4	0.1	O K
2160 min Winter	157.440	0.190	0.1	1.0	1.0	0.1	O K
2880 min Winter	157.436	0.186	0.1	0.8	0.8	0.1	O K
4320 min Winter	157.430	0.180	0.1	0.5	0.6	0.1	O K
5760 min Winter	157.426	0.176	0.1	0.4	0.5	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3648
8640 min Summer	1.134	4384
10080 min Summer	1.004	5104
15 min Winter	116.192	10
30 min Winter	77.964	18
60 min Winter	49.937	32
120 min Winter	30.897	62
180 min Winter	22.993	92
240 min Winter	18.515	124
360 min Winter	13.595	180
480 min Winter	10.918	240
600 min Winter	9.202	300
720 min Winter	7.998	370
960 min Winter	6.405	488
1440 min Winter	4.674	728
2160 min Winter	3.404	1072
2880 min Winter	2.715	1472
4320 min Winter	1.970	2192
5760 min Winter	1.567	2872

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 8B



Date 17/01/2014 12:16

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 8B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max <math>\Sigma</math> Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	157.424	0.174	0.1	0.3	0.4	0.1	O K
8640 min Winter	157.422	0.172	0.1	0.3	0.3	0.1	O K
10080 min Winter	157.419	0.169	0.1	0.2	0.3	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3608
8640 min Winter	1.134	4472
10080 min Winter	1.004	4952

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 8B



Date 17/01/2014 12:16

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File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 8B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.049

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.049
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1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 8B



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Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 8B.srcx


Storage is Online Cover Level (m) 158.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	60.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	30.0
Invert Level (m)	157.250	Cap Volume Depth (m)	0.750
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.750

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	12.0	Coefficient of Contraction	0.600
Length (m)	4.800	Upstream Invert Level (m)	157.400
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 9B	
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Micro Drainage		Source Control W.12.4


Cascade Summary of Results for 12796 - Filter Drain 9B.srcx

<b>Upstream Structures</b>	<b>Outflow To</b>	<b>Overflow To</b>
12796 - Filter Drain 8B.srcx	12796 - Filter Drain 11B.srcx	(None)

Half Drain Time : 4 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	156.897	0.647	1.6	30.5	32.1	7.5	Flood Risk
30 min Summer	156.881	0.631	1.6	29.9	31.5	7.3	Flood Risk
60 min Summer	156.759	0.509	1.3	25.0	26.4	6.0	Flood Risk
120 min Summer	156.638	0.388	1.1	18.5	19.7	4.6	O K
180 min Summer	156.599	0.349	1.1	14.2	15.3	4.2	O K
240 min Summer	156.580	0.330	1.0	11.5	12.5	3.9	O K
360 min Summer	156.562	0.312	1.0	8.3	9.3	3.7	O K
480 min Summer	156.556	0.306	1.0	6.6	7.6	3.6	O K
600 min Summer	156.551	0.301	1.0	5.2	6.2	3.6	O K
720 min Summer	156.528	0.278	1.0	4.4	5.4	3.3	O K
960 min Summer	156.500	0.250	0.9	3.4	4.4	2.9	O K
1440 min Summer	156.473	0.223	0.9	2.3	3.1	2.5	O K
2160 min Summer	156.453	0.203	0.8	1.5	2.4	2.2	O K
2880 min Summer	156.442	0.192	0.8	1.0	1.8	2.1	O K
4320 min Summer	156.429	0.179	0.8	0.5	1.3	1.9	O K
5760 min Summer	156.420	0.170	0.8	0.2	1.0	1.8	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	12
30 min Summer	77.964	19
60 min Summer	49.937	34
120 min Summer	30.897	64
180 min Summer	22.993	94
240 min Summer	18.515	124
360 min Summer	13.595	184
480 min Summer	10.918	244
600 min Summer	9.202	306
720 min Summer	7.998	368
960 min Summer	6.405	488
1440 min Summer	4.674	734
2160 min Summer	3.404	1084
2880 min Summer	2.715	1456
4320 min Summer	1.970	2176
5760 min Summer	1.567	2920

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 9B	
Date 17/01/2014 12:17 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 9B.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	156.411	0.161	0.8	0.1	0.9	1.7	O K
8640 min Summer	156.377	0.127	0.7	0.0	0.7	1.3	O K
10080 min Summer	156.329	0.079	0.6	0.0	0.6	0.8	O K
15 min Winter	156.934	0.684	1.6	31.8	33.4	7.9	Flood Risk
30 min Winter	156.855	0.605	1.5	28.9	30.4	7.0	Flood Risk
60 min Winter	156.690	0.440	1.2	21.8	23.0	5.2	O K
120 min Winter	156.599	0.349	1.1	14.2	15.2	4.2	O K
180 min Winter	156.573	0.323	1.0	10.4	11.4	3.8	O K
240 min Winter	156.562	0.312	1.0	8.2	9.2	3.7	O K
360 min Winter	156.553	0.303	1.0	5.9	6.9	3.6	O K
480 min Winter	156.527	0.277	1.0	4.4	5.3	3.3	O K
600 min Winter	156.505	0.255	0.9	3.6	4.6	2.9	O K
720 min Winter	156.490	0.240	0.9	3.0	3.9	2.7	O K
960 min Winter	156.471	0.221	0.9	2.3	3.1	2.5	O K
1440 min Winter	156.452	0.202	0.8	1.4	2.3	2.2	O K
2160 min Winter	156.438	0.188	0.8	0.8	1.7	2.0	O K
2880 min Winter	156.429	0.179	0.8	0.5	1.3	1.9	O K
4320 min Winter	156.415	0.165	0.8	0.2	0.9	1.8	O K
5760 min Winter	156.381	0.131	0.7	0.0	0.7	1.4	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3672
8640 min Summer	1.134	4408
10080 min Summer	1.004	5136
15 min Winter	116.192	12
30 min Winter	77.964	20
60 min Winter	49.937	34
120 min Winter	30.897	64
180 min Winter	22.993	92
240 min Winter	18.515	124
360 min Winter	13.595	180
480 min Winter	10.918	248
600 min Winter	9.202	308
720 min Winter	7.998	372
960 min Winter	6.405	476
1440 min Winter	4.674	736
2160 min Winter	3.404	1068
2880 min Winter	2.715	1452
4320 min Winter	1.970	2196
5760 min Winter	1.567	2976

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 9B



Date 17/01/2014 12:17  
File 12796 Lake B Casc...

Designed By Mark Craddock  
Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 9B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Σ Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	156.310	0.060	0.6	0.0	0.6	0.6	O K
8640 min Winter	156.294	0.044	0.5	0.0	0.5	0.5	O K
10080 min Winter	156.289	0.039	0.4	0.0	0.4	0.4	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3672
8640 min Winter	1.134	4272
10080 min Winter	1.004	4984

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 9B



Date 17/01/2014 12:17

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File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 9B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.036

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.036
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1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 9B



Date 17/01/2014 12:17

Designed By Mark Craddock

File 12796 Lake B Casc...

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Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 9B.srcx


Storage is Online Cover Level (m) 157.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	59.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	0.0
Invert Level (m)	156.250	Cap Volume Depth (m)	0.750
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.750

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	150.0	Coefficient of Contraction	0.600
Length (m)	1.000	Upstream Invert Level (m)	156.400
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 10B	
Date 17/01/2014 12:18 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 10B.srcx


<b>Upstream Structures</b>	<b>Outflow To</b>	<b>Overflow To</b>
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(None) 12796 - Filter Drain 12B.srcx (None)

Half Drain Time : 0 minutes.

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Σ Outflow (l/s)</b>	<b>Max Volume (m³)</b>	<b>Status</b>
15 min Summer	156.613	0.363	0.1	15.8	15.9	0.3	O K
30 min Summer	156.597	0.347	0.1	14.0	14.1	0.2	O K
60 min Summer	156.571	0.321	0.1	9.9	10.0	0.2	O K
120 min Summer	156.556	0.306	0.1	6.6	6.6	0.2	O K
180 min Summer	156.551	0.301	0.1	5.0	5.1	0.2	O K
240 min Summer	156.520	0.270	0.1	4.2	4.3	0.1	O K
360 min Summer	156.492	0.242	0.1	3.0	3.1	0.1	O K
480 min Summer	156.479	0.229	0.1	2.5	2.6	0.1	O K
600 min Summer	156.468	0.218	0.0	2.1	2.1	0.1	O K
720 min Summer	156.461	0.211	0.0	1.8	1.9	0.1	O K
960 min Summer	156.453	0.203	0.0	1.5	1.6	0.1	O K
1440 min Summer	156.442	0.192	0.0	1.0	1.1	0.1	O K
2160 min Summer	156.435	0.185	0.0	0.7	0.8	0.1	O K
2880 min Summer	156.432	0.182	0.0	0.6	0.6	0.1	O K
4320 min Summer	156.427	0.177	0.0	0.4	0.5	0.1	O K
5760 min Summer	156.424	0.174	0.0	0.3	0.4	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
15 min Summer	116.192	10
30 min Summer	77.964	17
60 min Summer	49.937	32
120 min Summer	30.897	62
180 min Summer	22.993	92
240 min Summer	18.515	124
360 min Summer	13.595	184
480 min Summer	10.918	242
600 min Summer	9.202	298
720 min Summer	7.998	368
960 min Summer	6.405	490
1440 min Summer	4.674	734
2160 min Summer	3.404	1100
2880 min Summer	2.715	1424
4320 min Summer	1.970	2204
5760 min Summer	1.567	2856

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 10B	
Date 17/01/2014 12:18 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 10B.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	156.421	0.171	0.0	0.3	0.3	0.1	O K
8640 min Summer	156.419	0.169	0.0	0.2	0.3	0.0	O K
10080 min Summer	156.417	0.167	0.0	0.2	0.2	0.0	O K
15 min Winter	156.611	0.361	0.1	15.7	15.8	0.3	O K
30 min Winter	156.584	0.334	0.1	12.1	12.2	0.2	O K
60 min Winter	156.563	0.313	0.1	8.4	8.4	0.2	O K
120 min Winter	156.551	0.301	0.1	5.0	5.1	0.2	O K
180 min Winter	156.509	0.259	0.1	3.8	3.9	0.1	O K
240 min Winter	156.492	0.242	0.1	3.0	3.1	0.1	O K
360 min Winter	156.474	0.224	0.1	2.4	2.4	0.1	O K
480 min Winter	156.461	0.211	0.0	1.8	1.9	0.1	O K
600 min Winter	156.453	0.203	0.0	1.5	1.6	0.1	O K
720 min Winter	156.448	0.198	0.0	1.3	1.4	0.1	O K
960 min Winter	156.442	0.192	0.0	1.0	1.1	0.1	O K
1440 min Winter	156.436	0.186	0.0	0.8	0.8	0.1	O K
2160 min Winter	156.430	0.180	0.0	0.5	0.6	0.1	O K
2880 min Winter	156.427	0.177	0.0	0.4	0.5	0.1	O K
4320 min Winter	156.422	0.172	0.0	0.3	0.3	0.1	O K
5760 min Winter	156.419	0.169	0.0	0.2	0.3	0.1	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3560
8640 min Summer	1.134	4360
10080 min Summer	1.004	5040
15 min Winter	116.192	10
30 min Winter	77.964	17
60 min Winter	49.937	30
120 min Winter	30.897	64
180 min Winter	22.993	88
240 min Winter	18.515	122
360 min Winter	13.595	198
480 min Winter	10.918	232
600 min Winter	9.202	294
720 min Winter	7.998	356
960 min Winter	6.405	498
1440 min Winter	4.674	748
2160 min Winter	3.404	1092
2880 min Winter	2.715	1460
4320 min Winter	1.970	2196
5760 min Winter	1.567	2864

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 10B



Date 17/01/2014 12:18

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 10B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	156.417	0.167	0.0	0.2	0.2	0.0	O K
8640 min Winter	156.415	0.165	0.0	0.2	0.2	0.0	O K
10080 min Winter	156.414	0.164	0.0	0.1	0.2	0.0	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3552
8640 min Winter	1.134	4344
10080 min Winter	1.004	4648

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 10B



Date 17/01/2014 12:18  
File 12796 Lake B Casc...

Designed By Mark Craddock  
Checked By

Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 10B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.028

<b>Time (mins)</b>	<b>Area (ha)</b>
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0-4	0.028
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1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 10B



Date 17/01/2014 12:18

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 10B.srcx


Storage is Online Cover Level (m) 157.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	56.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	19.0
Invert Level (m)	156.250	Cap Volume Depth (m)	0.750
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.750

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	150.0	Coefficient of Contraction	0.600
Length (m)	1.000	Upstream Invert Level (m)	156.400
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 11B	
Date 31/01/2014 10:43 File	Designed By Mark Craddock Checked By	
Micro Drainage		Source Control W.12.4


Cascade Summary of Results for 12796 - Filter Drain 11B.srcx

Upstream Structures	Outflow To	Overflow To
12796 - Filter Drain 5B.srcx	12796 - Swale B.srcx	(None)
12796 - Filter Drain 4B.srcx		
12796 - Filter Drain 6B.srcx		
12796 - Filter Drain 7B.srcx		
12796 - Filter Drain 9B.srcx		
12796 - Filter Drain 8B.srcx		
12796 - Filter Drain 10B.srcx		

Half Drain Time : 10 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	156.311	1.111	8.2	120.5	128.7	80.9	Flood Risk
30 min Summer	156.421	1.221	8.8	135.6	144.4	90.6	Flood Risk
60 min Summer	156.387	1.187	8.6	131.1	139.7	87.7	Flood Risk
120 min Summer	156.242	1.042	7.9	109.8	117.7	74.3	Flood Risk
180 min Summer	156.157	0.957	7.5	92.2	99.7	65.8	O K
240 min Summer	156.106	0.906	7.2	76.0	83.2	60.6	O K
360 min Summer	156.043	0.843	6.9	56.1	63.0	54.1	O K
480 min Summer	156.004	0.804	6.7	44.3	51.0	50.2	O K
600 min Summer	155.973	0.773	6.6	36.3	42.8	47.1	O K
720 min Summer	155.949	0.749	6.4	31.0	37.4	44.6	O K
960 min Summer	155.920	0.720	6.3	24.0	30.2	41.7	O K
1440 min Summer	155.891	0.691	6.1	15.4	21.6	38.8	O K
2160 min Summer	155.857	0.657	6.0	9.4	15.3	35.4	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	14
30 min Summer	77.964	21
60 min Summer	49.937	38
120 min Summer	30.897	66
180 min Summer	22.993	96
240 min Summer	18.515	126
360 min Summer	13.595	186
480 min Summer	10.918	248
600 min Summer	9.202	308
720 min Summer	7.998	368
960 min Summer	6.405	490
1440 min Summer	4.674	734
2160 min Summer	3.404	1100

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 11B	
Date 31/01/2014 10:43 File	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 11B.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max $\Sigma$ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
2880 min Summer	155.836	0.636	5.9	6.0	11.9	33.4	O K
4320 min Summer	155.805	0.605	5.7	2.6	8.3	30.5	O K
5760 min Summer	155.768	0.568	5.5	0.3	5.8	27.0	O K
7200 min Summer	155.679	0.479	4.9	0.0	4.9	19.3	O K
8640 min Summer	155.623	0.423	4.2	0.0	4.2	15.1	O K
10080 min Summer	155.582	0.382	3.7	0.0	3.7	12.2	O K
15 min Winter	156.405	1.205	8.7	133.5	142.2	89.2	Flood Risk
30 min Winter	156.473	1.273	9.0	142.2	151.3	95.0	Flood Risk
60 min Winter	156.362	1.162	8.5	127.7	136.2	85.5	Flood Risk
120 min Winter	156.170	0.970	7.5	96.4	103.9	67.1	O K
180 min Winter	156.094	0.894	7.2	72.2	79.3	59.4	O K
240 min Winter	156.047	0.847	6.9	57.5	64.4	54.6	O K
360 min Winter	155.991	0.791	6.6	40.3	47.0	48.9	O K
480 min Winter	155.950	0.750	6.4	31.1	37.5	44.7	O K
600 min Winter	155.924	0.724	6.3	25.3	31.6	42.1	O K
720 min Winter	155.910	0.710	6.2	21.0	27.3	40.6	O K
960 min Winter	155.890	0.690	6.1	15.3	21.4	38.7	O K
1440 min Winter	155.856	0.656	6.0	9.2	15.1	35.3	O K
2160 min Winter	155.826	0.626	5.8	4.9	10.7	32.5	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
2880 min Summer	2.715	1468
4320 min Summer	1.970	2200
5760 min Summer	1.567	2952
7200 min Summer	1.311	3680
8640 min Summer	1.134	4408
10080 min Summer	1.004	5136
15 min Winter	116.192	14
30 min Winter	77.964	22
60 min Winter	49.937	38
120 min Winter	30.897	68
180 min Winter	22.993	98
240 min Winter	18.515	128
360 min Winter	13.595	188
480 min Winter	10.918	250
600 min Winter	9.202	308
720 min Winter	7.998	368
960 min Winter	6.405	490
1440 min Winter	4.674	734
2160 min Winter	3.404	1100

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 11B



Date 31/01/2014 10:43  
File

Designed By Mark Craddock  
Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 11B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
2880 min Winter	155.805	0.605	5.7	2.6	8.3	30.5	O K
4320 min Winter	155.740	0.540	5.4	0.0	5.4	24.5	O K
5760 min Winter	155.627	0.427	4.3	0.0	4.3	15.3	O K
7200 min Winter	155.564	0.364	3.5	0.0	3.5	11.2	O K
8640 min Winter	155.518	0.318	3.0	0.0	3.0	8.5	O K
10080 min Winter	155.483	0.283	2.6	0.0	2.6	6.7	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
2880 min Winter	2.715	1464
4320 min Winter	1.970	2292
5760 min Winter	1.567	2960
7200 min Winter	1.311	3672
8640 min Winter	1.134	4408
10080 min Winter	1.004	5144

1 Market Place Mews  
 Henley-on-Thames  
 RG9 2AH

12796 Alton Towers  
 Lodge Accom Scheme  
 Filter Drain 11B



Date 31/01/2014 10:43  
 File

Designed By Mark Craddock  
 Checked By

Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 11B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.102

<b>Time</b>	<b>Area</b>
<b>(mins)</b>	<b>(ha)</b>

0-4	0.102
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1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 11B



Date 31/01/2014 10:43  
File

Designed By Mark Craddock  
Checked By

Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 11B.srcx


Storage is Online Cover Level (m) 156.500

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	176.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.300
Safety Factor	2.0	Pipe Depth above Invert (m)	0.450
Porosity	0.30	Slope (1:X)	350.0
Invert Level (m)	155.200	Cap Volume Depth (m)	1.300
Trench Width (m)	1.6	Cap Infiltration Depth (m)	1.300

Pipe Outflow Control

Diameter (m)	0.300	Entry Loss Coefficient	0.500
Slope (1:X)	10.0	Coefficient of Contraction	0.600
Length (m)	12.000	Upstream Invert Level (m)	155.750
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 12B	
Date 17/01/2014 12:20 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	


Cascade Summary of Results for 12796 - Filter Drain 12B.srcx

<b>Upstream Structures</b>	<b>Outflow To</b>	<b>Overflow To</b>
12796 - Filter Drain 10B.srcx	12796 - Filter Drain 13B.srcx	(None)

Half Drain Time : 5 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max $\Sigma$ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	157.686	0.436	1.5	21.6	23.1	6.2	O K
30 min Summer	157.693	0.443	1.5	21.9	23.4	6.3	O K
60 min Summer	157.630	0.380	1.4	18.5	19.8	5.4	O K
120 min Summer	157.573	0.323	1.2	12.9	14.2	4.6	O K
180 min Summer	157.544	0.294	1.2	9.7	10.9	4.2	O K
240 min Summer	157.526	0.276	1.2	7.8	8.9	3.9	O K
360 min Summer	157.501	0.251	1.1	5.6	6.7	3.5	O K
480 min Summer	157.486	0.236	1.1	4.4	5.5	3.2	O K
600 min Summer	157.478	0.228	1.1	3.5	4.6	3.1	O K
720 min Summer	157.473	0.223	1.0	3.0	4.0	3.0	O K
960 min Summer	157.462	0.212	1.0	2.2	3.2	2.9	O K
1440 min Summer	157.448	0.198	1.0	1.3	2.3	2.6	O K
2160 min Summer	157.435	0.185	1.0	0.7	1.7	2.4	O K
2880 min Summer	157.425	0.175	0.9	0.4	1.3	2.3	O K
4320 min Summer	157.391	0.141	0.9	0.0	0.9	1.8	O K
5760 min Summer	157.318	0.068	0.7	0.0	0.7	0.9	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	12
30 min Summer	77.964	19
60 min Summer	49.937	34
120 min Summer	30.897	64
180 min Summer	22.993	94
240 min Summer	18.515	124
360 min Summer	13.595	186
480 min Summer	10.918	244
600 min Summer	9.202	306
720 min Summer	7.998	366
960 min Summer	6.405	488
1440 min Summer	4.674	732
2160 min Summer	3.404	1080
2880 min Summer	2.715	1464
4320 min Summer	1.970	2208
5760 min Summer	1.567	2936

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 12B	
Date 17/01/2014 12:20 File 12796 Lake B Casc...	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 12B.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	157.295	0.045	0.6	0.0	0.6	0.6	O K
8640 min Summer	157.289	0.039	0.5	0.0	0.5	0.5	O K
10080 min Summer	157.284	0.034	0.5	0.0	0.5	0.4	O K
15 min Winter	157.712	0.462	1.5	22.9	24.4	6.6	Flood Risk
30 min Winter	157.675	0.425	1.5	21.0	22.5	6.1	O K
60 min Winter	157.599	0.349	1.3	15.8	17.1	5.0	O K
120 min Winter	157.545	0.295	1.2	9.7	10.9	4.2	O K
180 min Winter	157.520	0.270	1.1	7.1	8.2	3.8	O K
240 min Winter	157.501	0.251	1.1	5.6	6.7	3.5	O K
360 min Winter	157.481	0.231	1.1	3.9	4.9	3.2	O K
480 min Winter	157.472	0.222	1.0	2.9	4.0	3.0	O K
600 min Winter	157.464	0.214	1.0	2.3	3.3	2.9	O K
720 min Winter	157.457	0.207	1.0	1.9	2.9	2.8	O K
960 min Winter	157.448	0.198	1.0	1.3	2.3	2.6	O K
1440 min Winter	157.435	0.185	1.0	0.7	1.7	2.4	O K
2160 min Winter	157.421	0.171	0.9	0.3	1.2	2.2	O K
2880 min Winter	157.405	0.155	0.9	0.0	0.9	2.0	O K
4320 min Winter	157.299	0.049	0.7	0.0	0.7	0.6	O K
5760 min Winter	157.289	0.039	0.5	0.0	0.5	0.5	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3648
8640 min Summer	1.134	4336
10080 min Summer	1.004	5048
15 min Winter	116.192	12
30 min Winter	77.964	19
60 min Winter	49.937	34
120 min Winter	30.897	64
180 min Winter	22.993	94
240 min Winter	18.515	124
360 min Winter	13.595	184
480 min Winter	10.918	242
600 min Winter	9.202	308
720 min Winter	7.998	368
960 min Winter	6.405	486
1440 min Winter	4.674	732
2160 min Winter	3.404	1084
2880 min Winter	2.715	1504
4320 min Winter	1.970	2188
5760 min Winter	1.567	2920

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 12B



Date 17/01/2014 12:20

Designed By Mark Craddock

File 12796 Lake B Casc...

Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 12B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max <math>\Sigma</math> Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	157.282	0.032	0.5	0.0	0.5	0.4	O K
8640 min Winter	157.277	0.027	0.4	0.0	0.4	0.3	O K
10080 min Winter	157.274	0.024	0.3	0.0	0.3	0.3	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3672
8640 min Winter	1.134	4392
10080 min Winter	1.004	5072

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 12B



Date 17/01/2014 12:20  
File 12796 Lake B Casc...

Designed By Mark Craddock  
Checked By

Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 12B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.034

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.034
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1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 12B



Date 17/01/2014 12:20  
File 12796 Lake B Casc...

Designed By Mark Craddock  
Checked By

Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 12B.srcx


Storage is Online Cover Level (m) 158.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	71.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	0.0
Invert Level (m)	157.250	Cap Volume Depth (m)	0.750
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.750

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	12.0	Coefficient of Contraction	0.600
Length (m)	6.000	Upstream Invert Level (m)	157.400
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 13B	
Date 31/01/2014 10:44 File	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	


Cascade Summary of Results for 12796 - Filter Drain 13B.srcx

<b>Upstream Structures</b>	<b>Outflow To</b>	<b>Overflow To</b>
12796 - Filter Drain 12B.srcx	12796 - Swale B.srcx	(None)

Half Drain Time : 2 minutes.

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max Σ Outflow (l/s)</b>	<b>Max Volume (m³)</b>	<b>Status</b>
15 min Summer	156.600	0.350	0.7	15.9	16.6	2.7	O K
30 min Summer	156.614	0.364	0.7	17.5	18.2	2.8	O K
60 min Summer	156.590	0.340	0.7	14.8	15.5	2.6	O K
120 min Summer	156.550	0.300	0.6	10.3	10.9	2.3	O K
180 min Summer	156.527	0.277	0.6	7.9	8.5	2.1	O K
240 min Summer	156.509	0.259	0.6	6.2	6.8	1.9	O K
360 min Summer	156.485	0.235	0.6	4.3	4.8	1.7	O K
480 min Summer	156.475	0.225	0.6	3.2	3.8	1.6	O K
600 min Summer	156.468	0.218	0.6	2.5	3.1	1.6	O K
720 min Summer	156.459	0.209	0.5	2.0	2.6	1.5	O K
960 min Summer	156.448	0.198	0.5	1.3	1.9	1.4	O K
1440 min Summer	156.429	0.179	0.5	0.5	1.0	1.2	O K
2160 min Summer	156.406	0.156	0.5	0.0	0.5	1.1	O K
2880 min Summer	156.344	0.094	0.4	0.0	0.4	0.6	O K
4320 min Summer	156.295	0.045	0.3	0.0	0.3	0.3	O K
5760 min Summer	156.286	0.036	0.3	0.0	0.3	0.2	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
15 min Summer	116.192	12
30 min Summer	77.964	19
60 min Summer	49.937	34
120 min Summer	30.897	64
180 min Summer	22.993	94
240 min Summer	18.515	126
360 min Summer	13.595	186
480 min Summer	10.918	246
600 min Summer	9.202	308
720 min Summer	7.998	368
960 min Summer	6.405	490
1440 min Summer	4.674	738
2160 min Summer	3.404	1124
2880 min Summer	2.715	1496
4320 min Summer	1.970	2172
5760 min Summer	1.567	2904

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 13B	
Date 31/01/2014 10:44 File	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 13B.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
7200 min Summer	156.280	0.030	0.2	0.0	0.2	0.2	O K
8640 min Summer	156.276	0.026	0.2	0.0	0.2	0.2	O K
10080 min Summer	156.273	0.023	0.2	0.0	0.2	0.2	O K
15 min Winter	156.619	0.369	0.7	17.8	18.6	2.8	O K
30 min Winter	156.614	0.364	0.7	17.5	18.2	2.8	O K
60 min Winter	156.572	0.322	0.7	12.7	13.4	2.5	O K
120 min Winter	156.528	0.278	0.6	8.0	8.6	2.1	O K
180 min Winter	156.502	0.252	0.6	5.7	6.3	1.9	O K
240 min Winter	156.486	0.236	0.6	4.3	4.9	1.7	O K
360 min Winter	156.471	0.221	0.6	2.8	3.4	1.6	O K
480 min Winter	156.459	0.209	0.5	2.0	2.5	1.5	O K
600 min Winter	156.450	0.200	0.5	1.5	2.0	1.4	O K
720 min Winter	156.443	0.193	0.5	1.1	1.6	1.4	O K
960 min Winter	156.432	0.182	0.5	0.6	1.1	1.3	O K
1440 min Winter	156.411	0.161	0.5	0.1	0.6	1.1	O K
2160 min Winter	156.328	0.078	0.4	0.0	0.4	0.5	O K
2880 min Winter	156.295	0.045	0.3	0.0	0.3	0.3	O K
4320 min Winter	156.283	0.033	0.2	0.0	0.2	0.2	O K
5760 min Winter	156.276	0.026	0.2	0.0	0.2	0.2	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
7200 min Summer	1.311	3616
8640 min Summer	1.134	4408
10080 min Summer	1.004	5008
15 min Winter	116.192	12
30 min Winter	77.964	20
60 min Winter	49.937	36
120 min Winter	30.897	64
180 min Winter	22.993	96
240 min Winter	18.515	126
360 min Winter	13.595	182
480 min Winter	10.918	248
600 min Winter	9.202	308
720 min Winter	7.998	370
960 min Winter	6.405	500
1440 min Winter	4.674	736
2160 min Winter	3.404	1144
2880 min Winter	2.715	1460
4320 min Winter	1.970	2160
5760 min Winter	1.567	2864

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 13B



Date 31/01/2014 10:44  
File

Designed By Mark Craddock  
Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 13B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Max <math>\Sigma</math> Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
7200 min Winter	156.272	0.022	0.2	0.0	0.2	0.1	O K
8640 min Winter	156.269	0.019	0.1	0.0	0.1	0.1	O K
10080 min Winter	156.267	0.017	0.1	0.0	0.1	0.1	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
7200 min Winter	1.311	3632
8640 min Winter	1.134	4392
10080 min Winter	1.004	5024

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 13B



Date 31/01/2014 10:44  
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Checked By

Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 13B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.021

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.021
-----	-------

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 13B



Date 31/01/2014 10:44  
File

Designed By Mark Craddock  
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Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 13B.srcx


Storage is Online Cover Level (m) 157.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	38.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.150
Porosity	0.30	Slope (1:X)	0.0
Invert Level (m)	156.250	Cap Volume Depth (m)	0.750
Trench Width (m)	0.6	Cap Infiltration Depth (m)	0.750

Pipe Outflow Control

Diameter (m)	0.150	Entry Loss Coefficient	0.500
Slope (1:X)	9.0	Coefficient of Contraction	0.600
Length (m)	15.000	Upstream Invert Level (m)	156.400
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 14B	
Date 31/01/2014 10:41 File	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	


Cascade Summary of Results for 12796 - Filter Drain 14B.srcx

Upstream Structures	Outflow To	Overflow To
12796 - Filter Drain 3B.srcx	12796 - Swale B.srcx	(None)
12796 - Filter Drain 2B.srcx		
12796 - Filter Drain 1B.srcx		

Half Drain Time : 11 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	153.553	0.753	9.2	101.4	110.6	86.6	O K
30 min Summer	153.654	0.854	9.7	119.4	129.1	97.9	O K
60 min Summer	153.680	0.880	9.9	123.2	133.0	100.8	O K
120 min Summer	153.594	0.794	9.4	110.1	119.5	91.2	O K
180 min Summer	153.526	0.726	9.0	92.6	101.7	83.6	O K
240 min Summer	153.483	0.683	8.8	77.1	85.9	78.6	O K
360 min Summer	153.440	0.640	8.5	57.2	65.8	73.6	O K
480 min Summer	153.420	0.620	8.4	45.1	53.5	71.2	O K
600 min Summer	153.407	0.607	8.4	35.0	43.4	69.6	O K
720 min Summer	153.375	0.575	8.2	26.8	35.0	65.7	O K
960 min Summer	153.314	0.514	7.8	21.5	29.4	58.0	O K
1440 min Summer	153.251	0.451	7.5	13.9	21.4	50.1	O K
2160 min Summer	153.201	0.401	7.2	8.4	15.6	43.9	O K
2880 min Summer	153.172	0.372	7.0	4.3	11.4	40.3	O K
4320 min Summer	153.040	0.240	6.3	0.0	6.3	25.5	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	16
30 min Summer	77.964	23
60 min Summer	49.937	38
120 min Summer	30.897	68
180 min Summer	22.993	98
240 min Summer	18.515	128
360 min Summer	13.595	188
480 min Summer	10.918	248
600 min Summer	9.202	312
720 min Summer	7.998	378
960 min Summer	6.405	494
1440 min Summer	4.674	738
2160 min Summer	3.404	1100
2880 min Summer	2.715	1472
4320 min Summer	1.970	2288

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Filter Drain 14B	
Date 31/01/2014 10:41 File	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Filter Drain 14B.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max $\Sigma$ Outflow (l/s)	Max Volume (m <sup>3</sup> )	Status
5760 min Summer	152.883	0.083	5.4	0.0	5.4	8.8	O K
7200 min Summer	152.843	0.043	4.5	0.0	4.5	4.6	O K
8640 min Summer	152.835	0.035	3.7	0.0	3.7	3.7	O K
10080 min Summer	152.828	0.028	3.0	0.0	3.0	3.0	O K
15 min Winter	153.624	0.824	9.6	114.9	124.5	94.6	O K
<b>30 min Winter</b>	<b>153.727</b>	<b>0.927</b>	<b>10.1</b>	<b>129.8</b>	<b>139.9</b>	<b>106.0</b>	<b>Flood Risk</b>
60 min Winter	153.686	0.886	9.9	124.1	134.0	101.6	O K
120 min Winter	153.542	0.742	9.1	97.8	107.0	85.4	O K
180 min Winter	153.476	0.676	8.7	74.0	82.7	77.7	O K
240 min Winter	153.443	0.643	8.6	58.8	67.4	73.9	O K
360 min Winter	153.415	0.615	8.4	41.1	49.5	70.5	O K
480 min Winter	153.400	0.600	8.3	28.1	36.4	68.7	O K
600 min Winter	153.337	0.537	8.0	23.8	31.8	60.8	O K
720 min Winter	153.299	0.499	7.8	20.0	27.7	56.1	O K
960 min Winter	153.253	0.453	7.5	14.5	22.0	50.3	O K
1440 min Winter	153.201	0.401	7.2	8.4	15.6	43.9	O K
2160 min Winter	153.165	0.365	7.0	3.5	10.5	39.5	O K
2880 min Winter	153.116	0.316	6.7	0.2	7.0	33.7	O K
4320 min Winter	152.849	0.049	5.1	0.0	5.1	5.2	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
5760 min Summer	1.567	2944
7200 min Summer	1.311	3624
8640 min Summer	1.134	4368
10080 min Summer	1.004	5080
15 min Winter	116.192	16
<b>30 min Winter</b>	<b>77.964</b>	<b>24</b>
60 min Winter	49.937	40
120 min Winter	30.897	68
180 min Winter	22.993	98
240 min Winter	18.515	128
360 min Winter	13.595	188
480 min Winter	10.918	264
600 min Winter	9.202	318
720 min Winter	7.998	376
960 min Winter	6.405	494
1440 min Winter	4.674	754
2160 min Winter	3.404	1112
2880 min Winter	2.715	1588
4320 min Winter	1.970	2196

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 14B



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Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Filter Drain 14B.srcx

<b>Storm Event</b>	<b>Max Level (m)</b>	<b>Max Depth (m)</b>	<b>Max Infiltration (l/s)</b>	<b>Max Control (l/s)</b>	<b>Σ Outflow (l/s)</b>	<b>Max Volume (m<sup>3</sup>)</b>	<b>Status</b>
5760 min Winter	152.834	0.034	3.6	0.0	3.6	3.6	O K
7200 min Winter	152.825	0.025	2.7	0.0	2.7	2.7	O K
8640 min Winter	152.819	0.019	2.0	0.0	2.0	2.0	O K
10080 min Winter	152.815	0.015	1.5	0.0	1.5	1.6	O K

<b>Storm Event</b>	<b>Rain (mm/hr)</b>	<b>Time-Peak (mins)</b>
5760 min Winter	1.567	2936
7200 min Winter	1.311	3576
8640 min Winter	1.134	4376
10080 min Winter	1.004	5064

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 14B



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Checked By

Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Filter Drain 14B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.260

<b>Time (mins)</b>	<b>Area (ha)</b>
------------------------	----------------------

0-4	0.260
-----	-------

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Filter Drain 14B



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Designed By Mark Craddock  
Checked By

Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Filter Drain 14B.srcx


Storage is Online Cover Level (m) 154.000

Filter Drain Structure

Infiltration Coefficient Base (m/hr)	0.10100	Trench Length (m)	197.0
Infiltration Coefficient Side (m/hr)	0.10100	Pipe Diameter (m)	0.300
Safety Factor	2.0	Pipe Depth above Invert (m)	0.300
Porosity	0.30	Slope (1:X)	0.0
Invert Level (m)	152.800	Cap Volume Depth (m)	1.200
Trench Width (m)	1.8	Cap Infiltration Depth (m)	1.200

Pipe Outflow Control

Diameter (m)	0.300	Entry Loss Coefficient	0.500
Slope (1:X)	80.0	Coefficient of Contraction	0.600
Length (m)	1.000	Upstream Invert Level (m)	153.100
Roughness k (mm)	0.600		

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Swale B	
Date 31/01/2014 10:38 File	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	


Cascade Summary of Results for 12796 - Swale B.srcx

Upstream Structures	Outflow To	Overflow To
12796 - Filter Drain 14B.srcx	(None)	(None)
12796 - Filter Drain 3B.srcx		
12796 - Filter Drain 2B.srcx		
12796 - Filter Drain 1B.srcx		
12796 - Filter Drain 11B.srcx		
12796 - Filter Drain 5B.srcx		
12796 - Filter Drain 4B.srcx		
12796 - Filter Drain 6B.srcx		
12796 - Filter Drain 7B.srcx		
12796 - Filter Drain 9B.srcx		
12796 - Filter Drain 8B.srcx		
12796 - Filter Drain 10B.srcx		
12796 - Filter Drain 13B.srcx		
12796 - Filter Drain 12B.srcx		

Half Drain Time : 210 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m <sup>3</sup> )	Status
15 min Summer	153.506	0.706	11.3	149.8	O K
30 min Summer	153.680	0.880	14.2	229.3	O K
60 min Summer	153.811	1.011	16.5	300.5	Flood Risk
120 min Summer	153.880	1.080	17.7	342.1	Flood Risk
180 min Summer	153.884	1.084	17.8	344.1	Flood Risk
240 min Summer	153.872	1.072	17.6	336.9	Flood Risk
360 min Summer	153.837	1.037	17.0	315.6	Flood Risk
480 min Summer	153.798	0.998	16.3	293.0	Flood Risk
600 min Summer	153.758	0.958	15.6	270.7	Flood Risk

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.192	39
30 min Summer	77.964	49
60 min Summer	49.937	72
120 min Summer	30.897	122
180 min Summer	22.993	154
240 min Summer	18.515	188
360 min Summer	13.595	256
480 min Summer	10.918	322
600 min Summer	9.202	390

Simpson Associates		Page 2
1 Market Place Mews Henley-on-Thames RG9 2AH	12796 Alton Towers Lodge Accom Scheme Swale B	
Date 31/01/2014 10:38 File	Designed By Mark Craddock Checked By	
Micro Drainage	Source Control W.12.4	

Cascade Summary of Results for 12796 - Swale B.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m <sup>3</sup> )	Status
720 min Summer	153.718	0.918	14.9	249.2	Flood Risk
960 min Summer	153.641	0.841	13.6	209.9	O K
1440 min Summer	153.497	0.697	11.1	146.1	O K
2160 min Summer	153.315	0.515	8.2	81.8	O K
2880 min Summer	153.161	0.361	5.8	41.8	O K
4320 min Summer	152.934	0.134	2.3	7.1	O K
5760 min Summer	152.833	0.033	0.6	0.8	O K
7200 min Summer	152.822	0.022	0.3	0.5	O K
8640 min Summer	152.820	0.020	0.3	0.4	O K
10080 min Summer	152.818	0.018	0.2	0.4	O K
15 min Winter	153.578	0.778	12.5	180.8	O K
30 min Winter	153.760	0.960	15.6	271.6	Flood Risk
60 min Winter	153.901	1.101	18.1	354.6	Flood Risk
120 min Winter	153.979	1.179	19.5	405.5	Flood Risk
180 min Winter	153.980	1.180	19.5	406.1	Flood Risk
240 min Winter	153.963	1.163	19.2	394.9	Flood Risk
360 min Winter	153.914	1.114	18.3	363.1	Flood Risk
480 min Winter	153.858	1.058	17.4	328.5	Flood Risk
600 min Winter	153.800	1.000	16.3	294.3	Flood Risk

Storm Event	Rain (mm/hr)	Time-Peak (mins)
720 min Summer	7.998	454
960 min Summer	6.405	584
1440 min Summer	4.674	834
2160 min Summer	3.404	1196
2880 min Summer	2.715	1556
4320 min Summer	1.970	2240
5760 min Summer	1.567	2984
7200 min Summer	1.311	3624
8640 min Summer	1.134	4408
10080 min Summer	1.004	5104
15 min Winter	116.192	39
30 min Winter	77.964	49
60 min Winter	49.937	72
120 min Winter	30.897	122
180 min Winter	22.993	164
240 min Winter	18.515	198
360 min Winter	13.595	272
480 min Winter	10.918	346
600 min Winter	9.202	416

1 Market Place Mews  
 Henley-on-Thames  
 RG9 2AH

12796 Alton Towers  
 Lodge Accom Scheme  
 Swale B



Date 31/01/2014 10:38  
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 Checked By

Micro Drainage

Source Control W.12.4

Cascade Summary of Results for 12796 - Swale B.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
720 min Winter	153.742	0.942	15.3	261.8	Flood Risk
960 min Winter	153.629	0.829	13.4	204.3	O K
1440 min Winter	153.426	0.626	10.0	118.8	O K
2160 min Winter	153.177	0.377	6.0	45.3	O K
2880 min Winter	152.957	0.157	2.7	9.2	O K
4320 min Winter	152.823	0.023	0.3	0.5	O K
5760 min Winter	152.820	0.020	0.3	0.4	O K
7200 min Winter	152.817	0.017	0.2	0.3	O K
8640 min Winter	152.816	0.016	0.2	0.3	O K
10080 min Winter	152.814	0.014	0.2	0.3	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
720 min Winter	7.998	484
960 min Winter	6.405	616
1440 min Winter	4.674	870
2160 min Winter	3.404	1228
2880 min Winter	2.715	1556
4320 min Winter	1.970	2204
5760 min Winter	1.567	2936
7200 min Winter	1.311	3568
8640 min Winter	1.134	4376
10080 min Winter	1.004	4984

1 Market Place Mews  
Henley-on-Thames  
RG9 2AH

12796 Alton Towers  
Lodge Accom Scheme  
Swale B



Date 31/01/2014 10:38  
File

Designed By Mark Craddock  
Checked By

Micro Drainage

Source Control W.12.4

Cascade Rainfall Details for 12796 - Swale B.srcx

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)	19.000	Shortest Storm (mins)	15
Ratio R	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 0.028

<b>Time</b>	<b>Area</b>
<b>(mins)</b>	<b>(ha)</b>

0-4	0.028
-----	-------

1 Market Place Mews  
 Henley-on-Thames  
 RG9 2AH

12796 Alton Towers  
 Lodge Accom Scheme  
 Swale B



Date 31/01/2014 10:38  
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Micro Drainage

Source Control W.12.4

Cascade Model Details for 12796 - Swale B.srcx

Storage is Online Cover Level (m) 154.000

Infiltration Basin Structure

Invert Level (m) 152.800 Safety Factor 2.0  
 Infiltration Coefficient Base (m/hr) 0.18000 Porosity 1.00  
 Infiltration Coefficient Side (m/hr) 0.18000

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.000	15.0	1.200	685.0

**APPENDIX H  
SEVERN TRENT CORRESPONDENCE**

Reference	Revision	Client	Date	Author
12796/MC/FRA		Merlin Entertainment Group	31 January 2014	MC



Simpson Associates  
8 Friday Street  
Henley-on-Thames  
Oxfordshire  
RG9 1AH

Ftao Alex Bone

3<sup>rd</sup> December 2013

Dear Sirs,

**Proposed Development at Alton Towers, Alton, Staffordshire**

I refer to your Development Enquiry Request together with your covering letter dated 18<sup>th</sup> November 2013 in respect of the above site involving a 680 bed holiday accommodation.

Please find enclosed the sewer records that are included in the fee together with the Supplementary Guidance Notes (SGN) referred to below.

**FOUL WATER DRAINAGE DISCHARGES**

**Public Foul Water Sewer (FWS) or Combined Water Sewer (CWS) Discharges**

It is understood that foul water only is required to discharge to the public sewerage system and that this will discharge to the on-site existing private Sewage Pumping Station (SPS), situated in the southeast of the Alton Towers site.

This SPS has a 150mm dia Rising Main (RM) and pumps directly to the inlet works at Alton Sewage Treatment Works (STW) located to the southwest of the site.

It is also understood that the on-site private SPS will remain unchanged and it is proposed to provide additional storage only to accommodate the increased flows, which will result in slightly more frequent pumping events.

Providing the pumping rate from the existing private SPS remains unaltered then sewage treatment is not expected to be affected.

**Severn Trent Water**

**Severn Trent Water Ltd**  
Regis Road  
Wolverhampton  
WV6 8RU

Tel: 01902 793871

Fax: 01902 793971

[www.stwater.co.uk](http://www.stwater.co.uk)

[net.dev.west@severntrent.co.uk](mailto:net.dev.west@severntrent.co.uk)

Contact: Jim Wincott

Your ref:

Our ref: WT34673 & SAP813038E

### **SURFACE WATER DRAINAGE DISCHARGES**

The Water Companies requirement in respect of surface water drainage is contained in the Supplementary Guidance Notes (SGN) enclosed.

### **Soakaway Discharges**

As you may know Soakaways are the preferred method of surface water disposal, but if these are inappropriate site investigation evidence is required to be furnished.

### **Public Storm Water Sewer (SWS) or Combined Water Sewer (CWS) Discharges**

As there are no public Storm Water Sewers (SWS) in the vicinity and a surface water discharge is not required, it is presumed surface water runoff will outfall to on-site facilities.

### **S106 Sewer Connections**

For any new connections (including the re-use of existing connections – indirect ) to the public sewerage system, you will need to submit a Section 106 application form. Our New Connections department are responsible for handling all such enquiries and applications. To contact them for an application form and associated guidance notes please call 0800 7076600 or download from [www.stwater.co.uk](http://www.stwater.co.uk).

### **Reference**

Please quote WT34673 and SAP 8130388 in any future correspondence (including e-mails) with STW Limited. Please note that 'Development Enquiry' responses are only valid for 6 months from the date of this letter.

Yours faithfully,

A handwritten signature in blue ink, appearing to read 'Jim Wincott'.

Jim Wincott  
Waste Water Services - Asset Protection (West)