

Appendix D

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**Surface Water Design**



**Summary of Results for 100 year Return Period (+30%)**

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	32.7	32.7	100.3597	0.3597	2360.1	0 K
30 Summer	40.4	40.4	100.4732	0.4732	3104.8	0 K
60 Summer	79.9	79.9	100.5802	0.5802	3809.3	0 K
120 Summer	131.5	131.5	100.6698	0.6698	4396.0	0 K
180 Summer	154.2	154.2	100.7068	0.7068	4637.3	0 K
240 Summer	160.2	160.2	100.7158	0.7158	4697.4	0 K
360 Summer	168.1	168.1	100.7278	0.7278	4775.5	0 K
480 Summer	172.7	172.7	100.7348	0.7348	4821.3	0 K
600 Summer	174.3	174.3	100.7373	0.7373	4837.5	0 K
720 Summer	174.0	174.0	100.7368	0.7368	4834.8	0 K
960 Summer	170.1	170.1	100.7308	0.7308	4797.6	0 K
1440 Summer	157.9	157.9	100.7123	0.7123	4674.1	0 K
2160 Summer	138.7	138.7	100.6818	0.6818	4476.3	0 K
2880 Summer	123.0	123.0	100.6558	0.6558	4304.5	0 K
4320 Summer	98.8	98.8	100.6158	0.6158	4039.8	0 K
5760 Summer	81.8	81.8	100.5843	0.5843	3834.5	0 K
7200 Summer	70.0	70.0	100.5592	0.5592	3669.0	0 K
8640 Summer	60.3	60.3	100.5387	0.5387	3535.5	0 K
10080 Summer	52.1	52.1	100.5212	0.5212	3421.5	0 K
15 Winter	36.2	36.2	100.4042	0.4042	2654.7	0 K
30 Winter	56.3	56.3	100.5303	0.5302	3481.3	0 K
60 Winter	118.5	118.5	100.6483	0.6483	4253.2	0 K
120 Winter	177.6	177.6	100.7423	0.7423	4871.3	0 K
180 Winter	202.3	202.3	100.7798	0.7798	5117.9	0 K
240 Winter	207.9	207.9	100.7883	0.7883	5173.4	0 K
360 Winter	214.9	214.9	100.7988	0.7988	5243.7	0 K
480 Winter	215.5	215.5	100.7998	0.7998	5247.8	0 K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	98.68	42
30 Summer	64.79	55
60 Summer	40.51	80
120 Summer	24.46	132
180 Summer	17.96	184
240 Summer	14.34	218
360 Summer	10.42	276
480 Summer	8.30	340
600 Summer	6.96	408
720 Summer	6.02	474
960 Summer	4.78	610
1440 Summer	3.46	874
2160 Summer	2.49	1264
2880 Summer	1.98	1648
4320 Summer	1.42	2404
5760 Summer	1.12	3184
7200 Summer	0.94	3968
8640 Summer	0.81	4760
10080 Summer	0.71	5552
15 Winter	98.68	41
30 Winter	64.79	54
60 Winter	40.51	78
120 Winter	24.46	128
180 Winter	17.96	180
240 Winter	14.34	212
360 Winter	10.42	282
480 Winter	8.30	356

Edgbaston House  
3 Duchess Place  
Birmingham B16 8NH

Heyford Park  
Surface Water Storage  
NE Catchment



Date 20-07-07  
File HEY PK SW STORAGE NE COMPLEX F...

Designed By DS  
Checked By

Micro Drainage

Source Control W.10.4 net

**Summary of Results for 100 year Return Period (+30%)**

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m <sup>3</sup> )	Status
600 Winter	212.2	212.2	100.7948	0.7948	5215.4	0 K
720 Winter	207.0	207.0	100.7868	0.7868	5165.2	0 K
960 Winter	195.1	195.1	100.7688	0.7688	5045.8	0 K
1440 Winter	171.0	171.0	100.7323	0.7323	4807.4	0 K
2160 Winter	142.4	142.4	100.6878	0.6878	4513.4	0 K
2880 Winter	121.5	121.5	100.6533	0.6533	4289.2	0 K
4320 Winter	93.0	93.0	100.6063	0.6063	3978.8	0 K
5760 Winter	75.4	75.4	100.5707	0.5707	3746.9	0 K
7200 Winter	63.2	63.2	100.5447	0.5447	3576.6	0 K
8640 Winter	53.5	53.5	100.5242	0.5242	3440.1	0 K
10080 Winter	43.8	43.8	100.5037	0.5037	3306.4	0 K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	6.96	428
720 Winter	6.02	500
960 Winter	4.78	640
1440 Winter	3.46	912
2160 Winter	2.49	1308
2880 Winter	1.98	1696
4320 Winter	1.42	2476
5760 Winter	1.12	3256
7200 Winter	0.94	4056
8640 Winter	0.81	4928
10080 Winter	0.71	5864

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**Rainfall Details**

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	20.000	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

**Pipe Network**

Volume in Pipe Network (m <sup>3</sup> )	50	Dia of Outfall Pipe (m)	0.800
Slope of Outfall Pipe (1: x)	100.0	Roughness of Outfall Pipe	0.600

**Time / Area Diagram**

Total Area (ha) = 10.225

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	1.000	8	12	2.000	16	20	1.225	24	28	1.000
4	8	2.000	12	16	2.000	20	24	1.000			

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NE Catchment



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**Tank/Pond Details**

Invert Level (m) 100.000 Ground Level (m) 101.000

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.00	6563.5	0.50	6563.5	1.00	6563.5	1.50	13964.8	2.00	13964.8	2.50	13964.8
0.10	6563.5	0.60	6563.5	1.10	13964.8	1.60	13964.8	2.10	13964.8		
0.20	6563.5	0.70	6563.5	1.20	13964.8	1.70	13964.8	2.20	13964.8		
0.30	6563.5	0.80	6563.5	1.30	13964.8	1.80	13964.8	2.30	13964.8		
0.40	6563.5	0.90	6563.5	1.40	13964.8	1.90	13964.8	2.40	13964.8		

**Complex Outflow Control**

CCF Filename Heyford Park NE Complex Control 01.CCF

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.03	2.1	0.33	29.9	1.00	353.1	2.20	1046.4	4.75	1604.7	7.75	2061.0
0.05	4.2	0.35	31.9	1.10	422.3	2.30	1084.2	5.00	1647.0	8.00	2095.5
0.08	6.3	0.38	33.9	1.20	490.6	2.40	1113.7	5.25	1687.6	8.25	2129.1
0.10	8.4	0.40	35.9	1.30	558.7	2.50	1143.1	5.50	1728.2	8.50	2162.6
0.13	10.9	0.43	37.4	1.40	623.6	2.75	1208.9	5.75	1767.3	8.75	2195.3
0.15	13.4	0.45	39.0	1.50	688.5	3.00	1269.3	6.00	1806.5	9.00	2227.9
0.18	15.9	0.48	40.5	1.60	748.5	3.25	1324.2	6.25	1844.3	9.25	2259.7
0.20	18.4	0.50	42.0	1.70	808.4	3.50	1377.2	6.50	1882.1	9.50	2291.5
0.23	20.8	0.60	89.3	1.80	862.2	3.75	1425.2	6.75	1918.8		
0.25	23.1	0.70	149.8	1.90	915.9	4.00	1473.2	7.00	1955.4		
0.28	25.5	0.80	215.7	2.00	962.3	4.25	1517.8	7.25	1991.0		
0.30	27.9	0.90	283.7	2.10	1008.6	4.50	1562.4	7.50	2026.5		

**Summary of Results for 100 year Return Period (+30%)**

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	31.6	31.6	100.3517	0.3517	2286.0	0 K
30 Summer	39.2	39.2	100.4642	0.4642	3016.8	0 K
60 Summer	71.8	71.8	100.5723	0.5722	3718.7	0 K
120 Summer	116.8	116.8	100.6618	0.6618	4300.5	0 K
180 Summer	137.5	137.5	100.7003	0.7003	4549.7	0 K
240 Summer	143.6	143.6	100.7108	0.7108	4617.3	0 K
360 Summer	150.3	150.3	100.7223	0.7223	4692.2	0 K
480 Summer	154.7	154.7	100.7298	0.7298	4740.5	0 K
600 Summer	156.4	156.4	100.7328	0.7328	4761.2	0 K
720 Summer	156.7	156.7	100.7333	0.7333	4763.1	0 K
960 Summer	154.1	154.1	100.7288	0.7288	4734.7	0 K
1440 Summer	144.2	144.2	100.7118	0.7118	4623.4	0 K
2160 Summer	128.0	128.0	100.6828	0.6828	4434.6	0 K
2880 Summer	114.1	114.1	100.6568	0.6568	4265.7	0 K
4320 Summer	92.0	92.0	100.6158	0.6158	4000.7	0 K
5760 Summer	76.5	76.5	100.5833	0.5833	3790.4	0 K
7200 Summer	65.7	65.7	100.5577	0.5577	3622.4	0 K
8640 Summer	56.6	56.6	100.5362	0.5362	3484.6	0 K
10080 Summer	48.8	48.8	100.5177	0.5177	3362.5	0 K
15 Winter	35.0	35.0	100.3952	0.3952	2568.8	0 K
30 Winter	49.5	49.5	100.5192	0.5192	3374.2	0 K
60 Winter	104.1	104.1	100.6383	0.6383	4146.1	0 K
120 Winter	157.3	157.3	100.7343	0.7343	4769.4	0 K
180 Winter	180.6	180.6	100.7743	0.7743	5029.0	0 K
240 Winter	186.1	186.1	100.7838	0.7838	5092.7	0 K
360 Winter	192.5	192.5	100.7948	0.7948	5164.9	0 K
480 Winter	194.0	194.0	100.7973	0.7973	5180.6	0 K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	98.68	42
30 Summer	64.79	55
60 Summer	40.51	80
120 Summer	24.46	134
180 Summer	17.96	188
240 Summer	14.34	230
360 Summer	10.42	284
480 Summer	8.30	348
600 Summer	6.96	414
720 Summer	6.02	482
960 Summer	4.78	618
1440 Summer	3.46	884
2160 Summer	2.49	1276
2880 Summer	1.98	1660
4320 Summer	1.42	2432
5760 Summer	1.12	3192
7200 Summer	0.94	3976
8640 Summer	0.81	4768
10080 Summer	0.71	5568
15 Winter	98.68	41
30 Winter	64.79	55
60 Winter	40.51	78
120 Winter	24.46	130
180 Winter	17.96	182
240 Winter	14.34	228
360 Winter	10.42	286
480 Winter	8.30	362

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Heyford Park  
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NW Catchment



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Source Control W.10.4 net

**Summary of Results for 100 year Return Period (+30%)**

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m <sup>3</sup> )	Status
600 Winter	191.9	191.9	100.7938	0.7938	5158.2	0 K
720 Winter	188.4	188.4	100.7878	0.7878	5116.4	0 K
960 Winter	178.5	178.5	100.7708	0.7708	5009.0	0 K
1440 Winter	158.4	158.4	100.7363	0.7363	4783.5	0 K
2160 Winter	132.9	132.9	100.6918	0.6918	4495.7	0 K
2880 Winter	114.3	114.3	100.6573	0.6573	4270.5	0 K
4320 Winter	88.0	88.0	100.6083	0.6083	3953.1	0 K
5760 Winter	71.6	71.6	100.5717	0.5718	3715.4	0 K
7200 Winter	60.0	60.0	100.5443	0.5442	3536.8	0 K
8640 Winter	50.5	50.5	100.5217	0.5217	3390.9	0 K
10080 Winter	41.1	41.1	100.4967	0.4967	3226.1	0 K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	6.96	434
720 Winter	6.02	508
960 Winter	4.78	648
1440 Winter	3.46	924
2160 Winter	2.49	1324
2880 Winter	1.98	1716
4320 Winter	1.42	2508
5760 Winter	1.12	3296
7200 Winter	0.94	4112
8640 Winter	0.81	4952
10080 Winter	0.71	5960



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 Micro Drainage

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 NW Catchment  
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 Source Control W.10.4 net



**Rainfall Details**

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	20.000	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

**Pipe Network**

Volume in Pipe Network (m <sup>3</sup> )	50	Dia of Outfall Pipe (m)	0.800
Slope of Outfall Pipe (1: x)	100.0	Roughness of Outfall Pipe	0.600

**Time / Area Diagram**

Total Area (ha) = 9.924

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	1.000	8	12	2.000	16	20	1.924	24	28	1.000
4	8	1.000	12	16	2.000	20	24	1.000			

Edgbaston House  
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Heyford Park  
Surface Water Storage  
NW Catchment



Date 20-07-07  
File HEY PK SW STORAGE NW COMPLEX F...

Designed By DS  
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Micro Drainage

Source Control W.10.4 net

**Tank/Pond Details**

Invert Level (m) 100.000 Ground Level (m) 101.000

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.00	6496.9	0.50	6496.9	1.00	6496.9	1.50	7734.4	2.00	7734.4	2.50	7734.4
0.10	6496.9	0.60	6496.9	1.10	7734.4	1.60	7734.4	2.10	7734.4		
0.20	6496.9	0.70	6496.9	1.20	7734.4	1.70	7734.4	2.20	7734.4		
0.30	6496.9	0.80	6496.9	1.30	7734.4	1.80	7734.4	2.30	7734.4		
0.40	6496.9	0.90	6496.9	1.40	7734.4	1.90	7734.4	2.40	7734.4		

**Complex Outflow Control**

CCF Filename Heyford Park NW Complex Control 01.CCF

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.03	2.1	0.33	29.5	1.00	316.0	2.20	884.7	4.75	1341.2	7.75	1728.0
0.05	4.2	0.35	31.4	1.10	376.3	2.30	911.4	5.00	1377.1	8.00	1757.1
0.08	6.2	0.38	33.4	1.20	435.0	2.40	935.0	5.25	1411.6	8.25	1785.4
0.10	8.3	0.40	35.4	1.30	493.5	2.50	958.4	5.50	1446.1	8.50	1813.7
0.13	10.8	0.43	36.9	1.40	548.4	2.75	1011.9	5.75	1479.3	8.75	1841.2
0.15	13.2	0.45	38.4	1.50	603.2	3.00	1061.0	6.00	1512.5	9.00	1868.7
0.18	15.7	0.48	39.8	1.60	652.8	3.25	1106.0	6.25	1544.6	9.25	1895.5
0.20	18.2	0.50	41.3	1.70	702.2	3.50	1149.6	6.50	1576.7	9.50	1922.3
0.23	20.5	0.60	83.6	1.80	745.1	3.75	1189.8	6.75	1607.7		
0.25	22.8	0.70	137.3	1.90	787.9	4.00	1229.9	7.00	1638.7		
0.28	25.2	0.80	195.6	2.00	823.0	4.25	1267.6	7.25	1668.8		
0.30	27.5	0.90	255.4	2.10	857.9	4.50	1305.3	7.50	1698.8		

**Summary of Results for 100 year Return Period (+30%)**

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	37.8	37.8	100.3382	0.3382	1773.0	0 K
30 Summer	42.3	42.3	100.4452	0.4452	2334.8	0 K
60 Summer	60.2	60.2	100.5498	0.5497	2884.0	0 K
120 Summer	96.8	96.8	100.6448	0.6448	3379.7	0 K
180 Summer	109.8	109.8	100.6743	0.6743	3535.0	0 K
240 Summer	113.5	113.5	100.6828	0.6828	3580.8	0 K
360 Summer	117.7	117.7	100.6923	0.6923	3630.1	0 K
480 Summer	120.1	120.1	100.6978	0.6978	3658.2	0 K
600 Summer	120.6	120.6	100.6988	0.6988	3664.9	0 K
720 Summer	120.1	120.1	100.6978	0.6978	3657.8	0 K
960 Summer	116.8	116.8	100.6903	0.6903	3620.5	0 K
1440 Summer	107.6	107.6	100.6693	0.6693	3510.0	0 K
2160 Summer	93.3	93.3	100.6368	0.6368	3339.1	0 K
2880 Summer	80.8	80.8	100.6083	0.6083	3189.0	0 K
4320 Summer	63.4	63.4	100.5592	0.5592	2931.9	0 K
5760 Summer	50.1	50.1	100.5197	0.5197	2724.5	0 K
7200 Summer	42.7	42.7	100.4677	0.4677	2451.8	0 K
8640 Summer	41.6	41.6	100.4157	0.4157	2181.2	0 K
10080 Summer	40.0	40.0	100.3767	0.3767	1975.5	0 K
15 Winter	40.2	40.2	100.3802	0.3802	1993.5	0 K
30 Winter	44.0	44.0	100.5017	0.5017	2630.5	0 K
60 Winter	84.1	84.1	100.6158	0.6158	3229.8	0 K
120 Winter	128.1	128.1	100.7148	0.7148	3749.2	0 K
180 Winter	142.9	142.9	100.7458	0.7458	3911.8	0 K
240 Winter	146.7	146.7	100.7538	0.7538	3952.9	0 K
360 Winter	151.0	151.0	100.7628	0.7628	3999.0	0 K
480 Winter	151.2	151.2	100.7633	0.7633	4001.7	0 K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	98.68	37
30 Summer	64.79	51
60 Summer	40.51	78
120 Summer	24.46	132
180 Summer	17.96	186
240 Summer	14.34	226
360 Summer	10.42	282
480 Summer	8.30	346
600 Summer	6.96	414
720 Summer	6.02	482
960 Summer	4.78	618
1440 Summer	3.46	888
2160 Summer	2.49	1288
2880 Summer	1.98	1688
4320 Summer	1.42	2480
5760 Summer	1.12	3304
7200 Summer	0.94	4120
8640 Summer	0.81	4848
10080 Summer	0.71	5552
15 Winter	98.68	37
30 Winter	64.79	51
60 Winter	40.51	76
120 Winter	24.46	128
180 Winter	17.96	182
240 Winter	14.34	228
360 Winter	10.42	284
480 Winter	8.30	360

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Surface Water Storage  
SE Catchment



Date 20-07-07  
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Source Control W.10.4 net

**Summary of Results for 100 year Return Period (+30%)**

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m <sup>3</sup> )	Status
600 Winter	148.9	148.9	100.7583	0.7583	3976.1	0 K
720 Winter	145.3	145.3	100.7508	0.7508	3936.6	0 K
960 Winter	136.7	136.7	100.7328	0.7328	3841.9	0 K
1440 Winter	119.2	119.2	100.6958	0.6958	3649.7	0 K
2160 Winter	99.0	99.0	100.6498	0.6498	3406.4	0 K
2880 Winter	83.2	83.2	100.6138	0.6138	3217.1	0 K
4320 Winter	62.1	62.1	100.5553	0.5552	2912.6	0 K
5760 Winter	45.7	45.7	100.5067	0.5067	2658.4	0 K
7200 Winter	41.8	41.8	100.4252	0.4252	2230.3	0 K
8640 Winter	39.4	39.4	100.3657	0.3657	1918.5	0 K
10080 Winter	36.8	36.8	100.3212	0.3212	1683.5	0 K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	6.96	434
720 Winter	6.02	506
960 Winter	4.78	650
1440 Winter	3.46	930
2160 Winter	2.49	1340
2880 Winter	1.98	1756
4320 Winter	1.42	2600
5760 Winter	1.12	3528
7200 Winter	0.94	4272
8640 Winter	0.81	5000
10080 Winter	0.71	5656

Edgbaston House  
3 Duchess Place  
Birmingham B16 8NH

Heyford Park  
Surface Water Storage  
SE Catchment



Date 20-07-07  
File HEY PK SW STORAGE SE Complex FC ...

Designed By DS  
Checked By

Micro Drainage

Source Control W.10.4 net

**Rainfall Details**

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	20.000	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

**Pipe Network**

Volume in Pipe Network (m <sup>3</sup> )	50	Dia of Outfall Pipe (m)	0.800
Slope of Outfall Pipe (1: x)	100.0	Roughness of Outfall Pipe	0.600

**Time / Area Diagram**

Total Area (ha) = 7.791

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	1.000	8	12	2.000	16	20	1.000
4	8	1.000	12	16	1.791	20	24	1.000

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Checked By

Micro Drainage

Source Control W.10.4 net

**Tank/Pond Details**

Invert Level (m) 100.000 Ground Level (m) 101.000

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.00	5243.8	0.50	5243.8	1.00	5243.8	1.50	14172.3	2.00	14172.3	2.50	14172.3
0.10	5243.8	0.60	5243.8	1.10	14172.3	1.60	14172.3	2.10	14172.3		
0.20	5243.8	0.70	5243.8	1.20	14172.3	1.70	14172.3	2.20	14172.3		
0.30	5243.8	0.80	5243.8	1.30	14172.3	1.80	14172.3	2.30	14172.3		
0.40	5243.8	0.90	5243.8	1.40	14172.3	1.90	14172.3	2.40	14172.3		

**Complex Outflow Control**

CCF Filename Heyford Park SE Complex Control 01.CCF

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.03	2.4	0.33	37.0	1.00	269.0	2.20	716.5	4.75	1081.7	7.75	1398.0
0.05	4.7	0.35	38.5	1.10	319.5	2.30	736.7	5.00	1111.2	8.00	1421.8
0.08	7.1	0.38	39.9	1.20	367.9	2.40	755.2	5.25	1139.5	8.25	1444.8
0.10	9.4	0.40	41.3	1.30	416.7	2.50	773.6	5.50	1167.7	8.50	1467.8
0.13	13.0	0.43	41.8	1.40	461.3	2.75	815.6	5.75	1194.9	8.75	1490.2
0.15	16.6	0.45	42.4	1.50	506.0	3.00	854.3	6.00	1222.1	9.00	1512.5
0.18	20.2	0.48	42.9	1.60	545.1	3.25	890.2	6.25	1248.4	9.25	1534.3
0.20	23.9	0.50	43.4	1.70	584.1	3.50	925.3	6.50	1274.6	9.50	1556.0
0.23	26.8	0.60	77.2	1.80	616.2	3.75	957.9	6.75	1299.9		
0.25	29.7	0.70	121.1	1.90	648.2	4.00	990.5	7.00	1325.3		
0.28	32.7	0.80	168.7	2.00	672.3	4.25	1021.4	7.25	1349.8		
0.30	35.6	0.90	218.7	2.10	696.3	4.50	1052.2	7.50	1374.3		

**Summary of Results for 100 year Return Period (+30%)**

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	40.9	40.9	100.3657	0.3657	3075.5	0 K
30 Summer	51.8	51.8	100.4817	0.4817	4051.6	0 K
60 Summer	113.3	113.3	100.5892	0.5893	4958.2	0 K
120 Summer	186.3	186.3	100.6768	0.6768	5691.8	0 K
180 Summer	211.2	211.2	100.7053	0.7053	5931.4	0 K
240 Summer	220.1	220.1	100.7148	0.7148	6011.6	0 K
360 Summer	235.2	235.2	100.7308	0.7308	6145.2	0 K
480 Summer	241.3	241.3	100.7373	0.7373	6200.2	0 K
600 Summer	242.7	242.7	100.7388	0.7388	6216.1	0 K
720 Summer	241.8	241.8	100.7378	0.7378	6208.2	0 K
960 Summer	235.6	235.6	100.7313	0.7313	6152.7	0 K
1440 Summer	217.3	217.3	100.7118	0.7118	5986.1	0 K
2160 Summer	190.1	190.1	100.6813	0.6813	5729.4	0 K
2880 Summer	167.9	167.9	100.6553	0.6553	5512.4	0 K
4320 Summer	134.5	134.5	100.6163	0.6163	5183.5	0 K
5760 Summer	111.0	111.0	100.5857	0.5858	4928.4	0 K
7200 Summer	95.2	95.2	100.5622	0.5622	4729.1	0 K
8640 Summer	82.4	82.4	100.5433	0.5432	4569.0	0 K
10080 Summer	71.7	71.7	100.5272	0.5272	4433.6	0 K
15 Winter	45.6	45.6	100.4122	0.4122	3466.3	0 K
30 Winter	79.4	79.4	100.5387	0.5387	4530.4	0 K
60 Winter	168.3	168.3	100.6558	0.6558	5516.1	0 K
120 Winter	251.7	251.7	100.7483	0.7483	6295.2	0 K
180 Winter	279.4	279.4	100.7778	0.7778	6541.6	0 K
240 Winter	291.2	291.2	100.7903	0.7903	6648.8	0 K
<b>360 Winter</b>	<b>300.2</b>	<b>300.2</b>	<b>100.7998</b>	<b>0.7998</b>	<b>6727.2</b>	<b>0 K</b>
480 Winter	299.2	299.2	100.7988	0.7988	6719.7	0 K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	98.68	45
30 Summer	64.79	59
60 Summer	40.51	82
120 Summer	24.46	134
180 Summer	17.96	184
240 Summer	14.34	216
360 Summer	10.42	274
480 Summer	8.30	338
600 Summer	6.96	406
720 Summer	6.02	474
960 Summer	4.78	606
1440 Summer	3.46	868
2160 Summer	2.49	1256
2880 Summer	1.98	1632
4320 Summer	1.42	2392
5760 Summer	1.12	3144
7200 Summer	0.94	3912
8640 Summer	0.81	4680
10080 Summer	0.71	5464
15 Winter	98.68	45
30 Winter	64.79	57
60 Winter	40.51	80
120 Winter	24.46	130
180 Winter	17.96	180
240 Winter	14.34	208
<b>360 Winter</b>	<b>10.42</b>	<b>280</b>
480 Winter	8.30	354

Edgbaston House  
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Heyford Park  
Surface Water Storage  
SW Catchment



Date 20-07-07  
File HEY PK SW STORAGE SW COMPLEX F...

Designed By DS  
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Micro Drainage

Source Control W.10.4 net

**Summary of Results for 100 year Return Period (+30%)**

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m <sup>3</sup> )	Status
600 Winter	293.6	293.6	100.7928	0.7928	6667.8	0 K
720 Winter	285.6	285.6	100.7843	0.7843	6596.1	0 K
960 Winter	267.2	267.2	100.7648	0.7648	6433.3	0 K
1440 Winter	232.3	232.3	100.7278	0.7278	6121.3	0 K
2160 Winter	191.9	191.9	100.6833	0.6833	5745.5	0 K
2880 Winter	163.2	163.2	100.6498	0.6498	5464.3	0 K
4320 Winter	124.2	124.2	100.6043	0.6043	5081.7	0 K
5760 Winter	100.9	100.9	100.5707	0.5707	4800.1	0 K
7200 Winter	84.4	84.4	100.5462	0.5462	4596.8	0 K
8640 Winter	72.0	72.0	100.5277	0.5277	4439.1	0 K
10080 Winter	60.9	60.9	100.5112	0.5112	4300.2	0 K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	6.96	426
720 Winter	6.02	498
960 Winter	4.78	636
1440 Winter	3.46	904
2160 Winter	2.49	1296
2880 Winter	1.98	1680
4320 Winter	1.42	2444
5760 Winter	1.12	3232
7200 Winter	0.94	4024
8640 Winter	0.81	4848
10080 Winter	0.71	5760



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Source Control W.10.4 net

#### Rainfall Details

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	20.000	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.400	Longest Storm (mins)	10080		

#### Pipe Network

Volume in Pipe Network (m <sup>3</sup> )	50	Dia of Outfall Pipe (m)	0.800
Slope of Outfall Pipe (1: x)	100.0	Roughness of Outfall Pipe	0.600

#### Time / Area Diagram

Total Area (ha) = 13.284

Time (mins) from:	Time (mins) to:	Area (ha)	Time (mins) from:	Time (mins) to:	Area (ha)	Time (mins) from:	Time (mins) to:	Area (ha)	Time (mins) from:	Time (mins) to:	Area (ha)
0	4	1.000	8	12	2.000	16	20	2.000	24	28	1.000
4	8	1.284	12	16	3.000	20	24	2.000	28	32	1.000

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 Date 20-07-07  
 File HEY PK SW STORAGE SW COMPLEX F...  
 Micro Drainage

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 SW Catchment  
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 Checked By  
 Source Control W.10.4 net



**Tank/Pond Details**

Invert Level (m) 100.000 Ground Level (m) 101.000

Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )
0.00	8412.2	0.50	8412.2	1.00	8412.2	1.50	14758.2	2.00	14758.2	2.50	14758.2
0.10	8412.2	0.60	8412.2	1.10	14758.2	1.60	14758.2	2.10	14758.2		
0.20	8412.2	0.70	8412.2	1.20	14758.2	1.70	14758.2	2.20	14758.2		
0.30	8412.2	0.80	8412.2	1.30	14758.2	1.80	14758.2	2.30	14758.2		
0.40	8412.2	0.90	8412.2	1.40	14758.2	1.90	14758.2	2.40	14758.2		

**Complex Outflow Control**

CCF Filename Heyford Park SW Complex Control 01.CCF

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.03	2.5	0.33	36.6	1.00	499.9	2.20	1648.6	4.75	2735.6	7.75	3480.3
0.05	5.0	0.35	39.3	1.10	602.4	2.30	1728.4	5.00	2806.1	8.00	3536.7
0.08	7.5	0.38	41.9	1.20	705.5	2.40	1799.9	5.25	2872.6	8.25	3591.7
0.10	10.0	0.40	44.6	1.30	808.4	2.50	1871.4	5.50	2939.1	8.50	3646.6
0.13	13.0	0.43	46.8	1.40	910.0	2.75	2021.7	5.75	3002.7	8.75	3700.3
0.15	16.1	0.45	49.0	1.50	1011.5	3.00	2142.5	6.00	3066.3	9.00	3754.0
0.18	19.1	0.48	51.2	1.60	1109.8	3.25	2243.4	6.25	3127.7	9.25	3806.4
0.20	22.1	0.50	53.4	1.70	1207.9	3.50	2340.4	6.50	3189.1	9.50	3858.9
0.23	25.1	0.60	120.5	1.80	1301.2	3.75	2426.1	6.75	3248.6		
0.25	28.0	0.70	206.2	1.90	1394.5	4.00	2511.9	7.00	3308.1		
0.28	31.0	0.80	300.4	2.00	1481.6	4.25	2588.4	7.25	3366.0		
0.30	33.9	0.90	398.7	2.10	1568.7	4.50	2665.0	7.50	3423.9		

## IH124 - Heyford Park

### Rural

AREA	From site map	8.52	km <sup>2</sup>
SAAR <sub>4170</sub>	From FEH CD-ROM	686	mm
SOIL	From FSR WRAP maps	0.45	Enter fraction of catchment covered by each WRAP class:
			1    2    3    4    5
			0    0    0    1    0

**QBAR<sub>rural</sub>**                      **2.676**                      m<sup>3</sup>/s

Growth curve Location from FSR: **6**

Return period (years)	Design flow (m <sup>3</sup> /s)	Specific runoff (l/s/ha)
2	2.35	2.76
2.33	2.53	2.97
5	3.42	4.02
10	4.32	5.08
20	5.36	6.29
25	5.73	6.73
30	6.05	7.10
50	7.01	8.23
75	7.87	9.24
<b>100</b>	<b>8.53</b>	<b>10.01</b>
150	9.54	11.20
200	10.33	12.12

### \*Urban

URBAN	From OS maps	0.5	
CWI	From FSR Vol.4 Fig. 3.7	99	mm
CIND	CIRIA guidance 1993	39	
NC	CIRIA guidance 1993	0.76	
	Urban factor (calculated)	2.07	

**QBAR<sub>urban</sub>**                      **5.534**                      m<sup>3</sup>/s

Return period (years)	Design flow (m <sup>3</sup> /s)	Specific runoff (l/s/ha)
2	4.86	5.70
2.33	5.23	6.13
5	7.08	8.31
10	8.94	10.50
20	11.09	13.01
25	11.85	13.91
30	12.51	14.68
50	14.50	17.02
75	16.27	19.10
<b>100</b>	<b>17.64</b>	<b>20.70</b>
150	19.74	23.16
200	21.36	25.07

# ARUP

Checked JR (Arup) on  
06/07/07

\*Rural calculation substituted for Urban calculation as urban extent (Existing Impermeable Surface) is greater than 30%