Surface Water Drainage Sizing

for

BOURNEMOUTH

Data produced from Masterdain Surface water program on 21/02/08.

Index page for data sheets

Hydrological data for Bournemouth

Data:-

FSR values

Location = BOURNEMOUTH Grid reference = SZ0991

M5-60 (mm) = 19.0 SAAR (mm/yr) = 800

r = 0.34 Soil = 0.15

Long reference = 409091 Area = England and Wales

Hydrological area = 7 Hydrological zone = 7

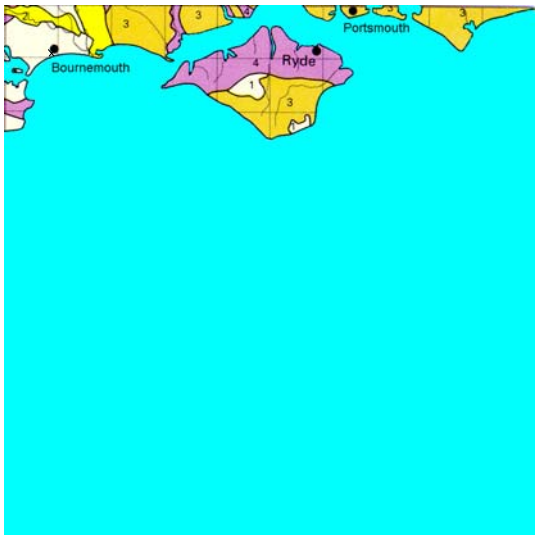
Soil classification for WRAP type 1
i) Well drained permeable sandy or loam soils and shallower analogues over highly permeable limestone, chalk, sandstone or related drifts;
ii) Earthy peat soils drained by dykes and pumps;
iii) Less permeable loamy over clayey soils on plateaux adjacent to very permeable soils in valleys.

FEH values

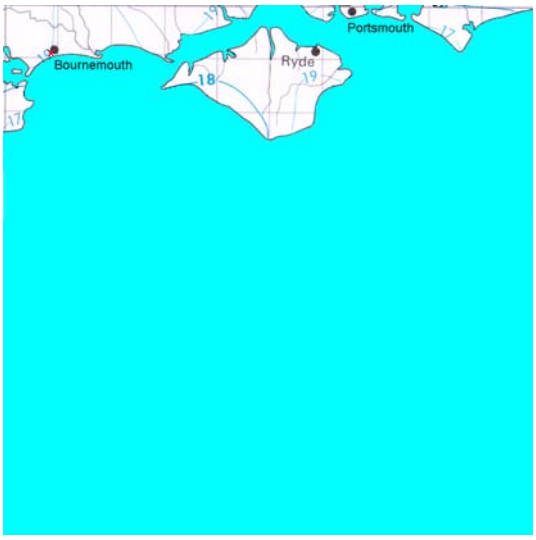
No FEH data available in this file.

MasterDrain
Hydrology 5.75

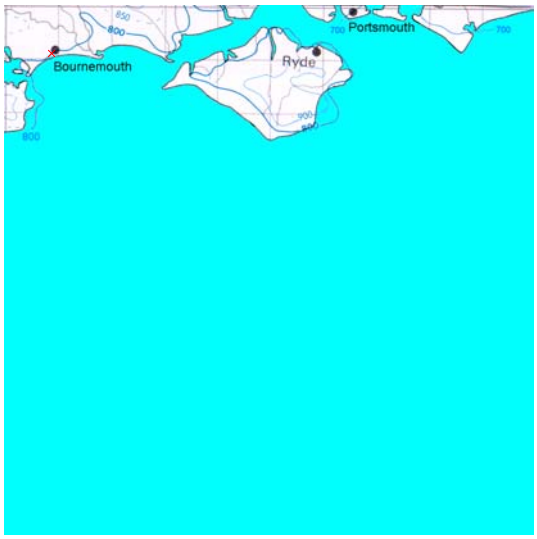
Company				Project	
Demonstration version					
Item				Job Ref	Sheet no.
Hydrological data for BOURNEMOUTH (maps)					2
Calc. by	Date	Checked by	Date	Approved by	Date
IJ	21/02/08				



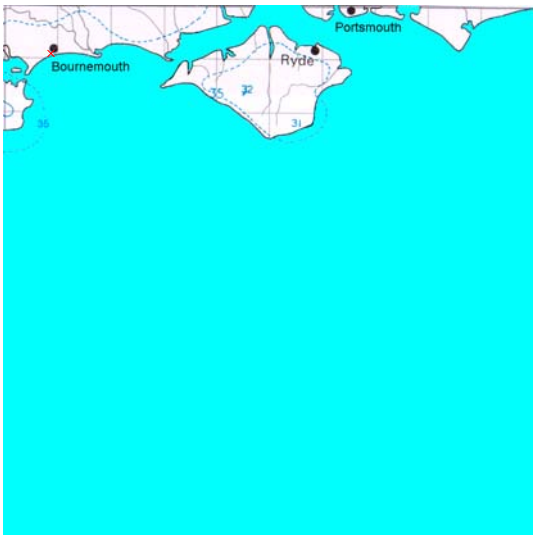
<- Soil



M5-60 ->



<- SAAR



r x 100 ->

Rainfall data for Bournemouth

MasterDrain Hydrology 5.75

Company	Project	
Demonstration version		
Item	**Job Ref**	**Sheet no.**
FSR Rainfall intensities for BOURNEMOUTH		1

Calc. by	Date	Checked by	Date	Approved by	Date
IJ	21/02/08				

Mins\Yrs	1	2	5	10	20	30	50	100	200	500
1	73.5	93.6	120.8	136.5	154.2	165.6	181.1	204.6	231.1	271.5
2	64.5	82.1	106.0	120.2	136.3	146.7	160.9	182.4	206.7	244.0
3	57.7	73.5	95.0	108.0	122.8	132.4	145.5	165.5	188.2	223.1
4	51.6	66.8	86.3	98.4	112.2	121.2	133.5	152.2	173.6	206.4
5	47.4	61.4	79.4	90.7	103.7	112.1	123.7	141.4	161.6	192.8
6	43.9	56.9	73.6	84.3	96.6	104.6	115.6	132.4	151.7	181.5
7	41.0	53.1	68.8	78.9	90.6	98.2	108.7	124.8	143.2	171.8
8	38.6	49.9	64.6	74.3	85.4	92.7	102.8	118.2	135.9	163.5
9	36.4	47.1	61.0	70.3	81.0	88.0	97.6	112.5	129.6	156.2
10	34.5	44.7	57.9	66.8	77.0	83.8	93.1	107.4	123.9	149.7
11	32.8	42.5	55.1	63.7	73.6	80.1	89.1	102.9	118.9	144.0
12	31.9	41.1	52.6	60.9	70.4	76.7	85.3	98.7	114.2	138.5
13	30.5	39.4	50.4	58.3	67.5	73.6	81.9	94.9	109.8	133.3
14	29.3	37.8	48.3	56.0	64.9	70.7	78.8	91.3	105.8	128.6
15	28.2	36.4	46.5	53.9	62.5	68.2	76.0	88.1	102.2	124.2
16	27.2	35.0	44.8	52.0	60.3	65.8	73.4	85.2	98.8	120.2
17	26.2	33.8	43.3	50.3	58.3	63.6	71.0	82.4	95.7	116.5
18	25.4	32.7	41.9	48.6	56.5	61.6	68.8	79.9	92.8	113.1
19	24.6	31.7	40.6	47.1	54.8	59.8	66.8	77.6	90.1	109.9
20	23.8	30.7	39.3	45.7	53.2	58.1	64.9	75.4	87.6	106.9
21	23.1	29.9	38.2	44.4	51.7	56.4	63.1	73.3	85.3	104.1
22	22.5	29.0	37.2	43.2	50.3	54.9	61.4	71.4	83.1	101.5
23	21.9	28.2	36.2	42.1	49.0	53.5	59.8	69.6	81.0	99.0
24	21.3	27.5	35.2	41.0	47.7	52.2	58.4	67.9	79.1	96.7
25	20.8	26.8	34.4	40.0	46.6	50.9	57.0	66.3	77.3	94.5
26	20.3	26.2	33.5	39.1	45.5	49.7	55.7	64.8	75.5	92.4
27	19.8	25.6	32.8	38.2	44.5	48.6	54.4	63.4	73.9	90.4
28	19.4	25.0	32.0	37.3	43.5	47.6	53.2	62.1	72.3	88.5
29	19.0	24.5	31.3	36.5	42.6	46.6	52.1	60.8	70.8	86.8
30	18.6	23.9	30.7	35.7	41.7	45.6	51.1	59.5	69.4	85.0
31	18.8	23.7	30.0	35.0	40.8	44.7	50.0	58.4	68.1	83.4
32	18.4	23.3	29.4	34.3	40.0	43.8	49.1	57.3	66.8	81.9
33	18.0	22.8	28.9	33.7	39.3	43.0	48.2	56.2	65.6	80.4
34	17.7	22.4	28.3	33.0	38.5	42.2	47.3	55.2	64.4	79.0
35	17.4	22.0	27.8	32.4	37.9	41.4	46.4	54.2	63.3	77.6
36	17.0	21.6	27.3	31.9	37.2	40.7	45.6	53.3	62.2	76.3
37	16.7	21.2	26.8	31.3	36.5	40.0	44.8	52.4	61.1	75.0
38	16.5	20.8	26.3	30.8	35.9	39.3	44.1	51.5	60.1	73.8
39	16.2	20.5	25.9	30.3	35.3	38.7	43.4	50.7	59.2	72.7
40	15.9	20.1	25.5	29.8	34.8	38.1	42.7	49.9	58.3	71.5
41	15.7	19.8	25.1	29.3	34.2	37.5	42.0	49.1	57.4	70.5
42	15.4	19.5	24.7	28.8	33.7	36.9	41.4	48.4	56.5	69.4
43	15.2	19.2	24.3	28.4	33.2	36.4	40.8	47.6	55.7	68.4
44	14.9	18.9	23.9	28.0	32.7	35.8	40.2	47.0	54.9	67.4
45	14.7	18.6	23.6	27.6	32.2	35.3	39.6	46.3	54.1	66.5
46	14.5	18.4	23.3	27.2	31.8	34.8	39.0	45.6	53.4	65.6
47	14.3	18.1	22.9	26.8	31.3	34.3	38.5	45.0	52.6	64.7
48	14.1	17.9	22.6	26.4	30.9	33.9	38.0	44.4	51.9	63.9
49	13.9	17.6	22.3	26.1	30.5	33.4	37.5	43.8	51.3	63.0
50	13.7	17.4	22.0	25.7	30.1	33.0	37.0	43.3	50.6	62.2
51	13.6	17.2	21.7	25.4	29.7	32.5	36.5	42.7	50.0	61.4
52	13.4	16.9	21.4	25.1	29.3	32.1	36.1	42.2	49.3	60.7
53	13.2	16.7	21.2	24.8	29.0	31.7	35.6	41.7	48.7	59.9
54	13.1	16.5	20.9	24.5	28.6	31.3	35.2	41.2	48.1	59.2
55	12.9	16.3	20.6	24.2	28.3	31.0	34.8	40.7	47.6	58.5
56	12.7	16.1	20.4	23.9	27.9	30.6	34.4	40.2	47.0	57.9
57	12.6	15.9	20.2	23.6	27.6	30.2	34.0	39.7	46.5	57.2
58	12.4	15.7	19.9	23.3	27.3	29.9	33.6	39.3	46.0	56.6
59	12.3	15.6	19.7	23.0	27.0	29.6	33.2	38.8	45.4	55.9
60	12.2	15.4	19.5	22.8	26.7	29.2	32.8	38.4	44.9	55.3
61	12.0	15.2	19.3	22.5	26.4	28.9	32.5	38.0	44.5	54.7
62	11.9	15.1	19.1	22.3	26.1	28.6	32.1	37.6	44.0	54.2
63	11.8	14.9	18.8	22.1	25.8	28.3	31.8	37.2	43.5	53.6
64	11.6	14.7	18.6	21.8	25.5	28.0	31.4	36.8	43.1	53.0
65	11.5	14.6	18.5	21.6	25.3	27.7	31.1	36.4	42.6	52.5
66	11.4	14.4	18.3	21.4	25.0	27.4	30.8	36.1	42.2	52.0
67	11.3	14.3	18.1	21.2	24.8	27.2	30.5	35.7	41.8	51.5

MasterDrain Hydrology 5.75

Company	Project	
Demonstration version		
Item	**Job Ref**	**Sheet no.**
FSR Rainfall intensities for BOURNEMOUTH		2

Calc. by	Date	Checked by	Date	Approved by	Date
IJ	21/02/08				

Mins\Yrs	1	2	5	10	20	30	50	100	200	500
68	11.2	14.1	17.9	21.0	24.5	26.9	30.2	35.4	41.4	51.0
69	11.1	14.0	17.7	20.7	24.3	26.6	29.9	35.0	41.0	50.5
70	11.0	13.9	17.6	20.5	24.1	26.4	29.6	34.7	40.6	50.0
71	11.2	13.9	17.4	20.3	23.8	26.1	29.3	34.3	40.2	49.5
72	11.1	13.8	17.2	20.2	23.6	25.9	29.1	34.0	39.8	49.1
73	11.0	13.6	17.1	20.0	23.4	25.6	28.8	33.7	39.5	48.6
74	10.9	13.5	16.9	19.8	23.2	25.4	28.5	33.4	39.1	48.2
75	10.8	13.4	16.7	19.6	23.0	25.2	28.3	33.1	38.8	47.7
76	10.7	13.3	16.6	19.4	22.7	24.9	28.0	32.8	38.4	47.3
77	10.6	13.2	16.4	19.3	22.5	24.7	27.8	32.5	38.1	46.9
78	10.5	13.0	16.3	19.1	22.4	24.5	27.5	32.2	37.7	46.5
79	10.4	12.9	16.2	18.9	22.2	24.3	27.3	32.0	37.4	46.1
80	10.3	12.8	16.0	18.8	22.0	24.1	27.1	31.7	37.1	45.7
81	10.2	12.7	15.9	18.6	21.8	23.9	26.8	31.4	36.8	45.3
82	10.1	12.6	15.8	18.4	21.6	23.7	26.6	31.2	36.5	44.9
83	10.1	12.5	15.6	18.3	21.4	23.5	26.4	30.9	36.2	44.6
84	10.0	12.4	15.5	18.1	21.2	23.3	26.2	30.7	35.9	44.2
85	9.9	12.3	15.4	18.0	21.1	23.1	26.0	30.4	35.6	43.9
86	9.8	12.2	15.2	17.9	20.9	22.9	25.8	30.2	35.3	43.5
87	9.7	12.1	15.1	17.7	20.7	22.8	25.6	29.9	35.0	43.2
88	9.7	12.0	15.0	17.6	20.6	22.6	25.4	29.7	34.8	42.8
89	9.6	11.9	14.9	17.4	20.4	22.4	25.2	29.5	34.5	42.5
90	9.5	11.8	14.8	17.3	20.3	22.2	25.0	29.2	34.2	42.2
91	9.4	11.7	14.7	17.2	20.1	22.1	24.8	29.0	34.0	41.9
92	9.4	11.6	14.6	17.0	20.0	21.9	24.6	28.8	33.7	41.5
93	9.3	11.6	14.5	16.9	19.8	21.7	24.4	28.6	33.5	41.2
94	9.2	11.5	14.3	16.8	19.7	21.6	24.2	28.4	33.2	40.9
95	9.2	11.4	14.2	16.7	19.5	21.4	24.1	28.2	33.0	40.6
96	9.1	11.3	14.1	16.6	19.4	21.3	23.9	28.0	32.7	40.3
97	9.0	11.2	14.0	16.4	19.2	21.1	23.7	27.8	32.5	40.1
98	9.0	11.1	13.9	16.3	19.1	21.0	23.5	27.6	32.3	39.8
99	8.9	11.1	13.8	16.2	19.0	20.8	23.4	27.4	32.1	39.5
100	8.8	11.0	13.7	16.1	18.8	20.7	23.2	27.2	31.8	39.2
110	8.3	10.3	12.9	15.1	17.6	19.3	21.7	25.4	29.8	36.7
120	7.8	9.7	12.1	14.2	16.6	18.2	20.4	23.9	28.0	34.5
130	7.4	9.2	11.5	13.4	15.7	17.2	19.3	22.6	26.5	32.6
140	7.0	8.7	10.9	12.7	14.9	16.3	18.3	21.4	25.1	30.9
160	6.6	8.0	9.9	11.6	13.5	14.8	16.7	19.5	22.8	28.0
180	6.1	7.4	9.1	10.7	12.5	13.6	15.3	17.9	20.9	25.6
210	5.4	6.6	8.2	9.5	11.1	12.2	13.7	15.9	18.6	22.8
240	4.9	6.0	7.4	8.7	10.1	11.1	12.4	14.4	16.8	20.5
270	4.7	5.6	6.8	8.0	9.3	10.1	11.3	13.2	15.3	18.7
300	4.3	5.2	6.4	7.4	8.6	9.4	10.5	12.2	14.2	17.3
330	4.1	4.9	5.9	6.9	8.0	8.7	9.8	11.3	13.2	16.1
360	3.8	4.6	5.6	6.5	7.5	8.2	9.2	10.6	12.3	15.0
390	3.6	4.3	5.3	6.1	7.1	7.7	8.6	10.0	11.6	14.1
420	3.4	4.1	5.0	5.8	6.7	7.3	8.2	9.5	11.0	13.3

Rainfall depths for BOURNEMOUTH at standard return periods in mm

Time\Yrs	1	2	5	10	20	30	50	100	200	500
3 min	2.9	3.7	4.7	5.4	6.1	6.6	7.3	8.3	9.4	11.2
30 min	9.3	12.0	15.3	17.9	20.8	22.8	25.5	29.8	34.7	42.5
1 hr	12.2	15.4	19.5	22.8	26.7	29.2	32.8	38.4	44.9	55.3
2 hr	15.6	19.4	24.2	28.4	33.2	36.4	40.9	47.9	56.0	69.0
5 hr	21.7	26.1	31.8	36.9	42.9	46.9	52.4	60.9	70.8	86.4
10 hr	26.5	31.8	38.8	44.8	51.7	56.2	62.5	72.2	83.4	100.8
24 hr	35.0	41.4	49.7	56.8	65.0	70.2	77.5	88.6	101.3	120.9
48 hr	45.0	51.5	60.4	68.4	77.5	83.3	91.3	103.4	117.1	138.0
5 day	59.9	67.5	78.1	87.2	97.3	103.8	112.6	125.7	140.3	162.3

The above figures are calculated in accordance with the protocol set out in the 'Wallingford Procedure' from data derived from the Wallingford maps :-

M5-60min	= 19.00	r	= 0.34
WRAP	= 1	SAAR	= 800
NG ref	= SZ0991	Soil index	= 0.15

Data printed on 21/02/08 from Masterdrain Hydrology program

Surface water drainage data file

MasterDrain
SW 10.85

Company: Demonstration Version			Project: Bona Homes
Item: Data file printout of COLLEGE.SW		Job Ref: 08/0045	Sheet no.: 1
Principal Engineer: A McCutcheon	Drainage Engineer: J Greene		
Calc. by	Date: 21/02/08	Checked by	Date
		Approved by	Date

Entry No.	Section No.	Length m	Fall mm	Gradient 1 in	Imp. m2	Perv. m2	Up GL m	Up Crn m	Up Ref. m	X ref	Y ref	Dwn GL m	Dwn Crn m	Dwn Ref.	Pref diam	+/- l/s	Restrict l/s
1 I	1.01	20.0	166	120	200	0	12.00	10.65	SW1.01			12.00	10.48	SW1.02	0	0.0	0.0
2 I	1.02	60.0	500	120	400	0	12.00	10.48	SW1.02			12.00	9.98	SW1.03	0	0.0	0.0
3 B	2.01	17.0	680	25	400	0	12.00	10.65	SW2.01			12.00	9.98	SW1.03	0	0.0	0.0
4 I	1.03	40.0	333	120	300	0	12.00	9.98	SW1.03			12.00	9.65	SW1.04	0	0.0	0.0
5 B	3.01	20.0	166	120	200	0	12.00	10.65	SW3.01			12.00	10.48	SW3.02	0	0.0	0.0
6 B	3.02	60.0	833	72	500	0	12.00	10.48	SW3.02			12.00	9.65	SW1.04	0	0.0	0.0
7 B	4.01	32.0	266	120	800	0	12.00	10.65	SW4.01			12.00	10.38	SW4.02	0	0.0	0.0
8 S1	5.01	25.0	265	94	625	0	12.00	10.65	SW5.01			12.00	10.38	SW4.02	0	0.0	0.0
9 B	4.02	45.0	375	120	0	0	12.00	10.38	SW4.02			12.00	10.01	SW4.03	0	0.0	0.0
10 B	4.03	12.0	352	34	800	0	12.00	10.01	SW4.03			12.00	9.65	SW1.04	0	0.0	0.0
11 I	1.04	20.0	111	180	0	0	12.00	9.65	SW1.04			12.00	9.54	SW1.05	0	0.0	0.0
12 B	6.01	75.0	1041	72	2400	0	12.00	10.57	SW6.01			12.00	9.54	SW1.05	0	0.0	0.0
13 I	1.05	65.0	270	240	0	0	12.00	9.54	SW1.05			12.00	9.27	SW1.06	0	0.0	0.0
14 B	7.01	75.0	1315	57	2000	0	12.00	10.57	SW7.01			12.00	9.27	SW1.06	0	0.0	0.0
15 B	8.01	75.0	1315	57	2300	0	12.00	10.57	SW8.01			12.00	9.27	SW1.06	0	0.0	0.0
16 I	1.06	40.0	166	240	0	0	12.00	9.27	SW1.06			12.00	9.10	SW1.07	0	0.0	0.0
17 B	9.01	15.0	83	180	3000	0	12.00	10.57	SW9.01			12.00	10.49	SW9.02	0	0.0	0.0
18 B	9.02	30.0	166	180	625	0	12.00	10.49	SW9.02			12.00	10.32	SW9.03	0	0.0	0.0
19 B	9.03	20.0	111	180	0	0	12.00	10.32	SW9.03			12.00	10.21	SW9.04	0	0.0	0.0
20 S1	10.01	25.0	438	57	625	0	12.00	10.65	SW10.01			12.00	10.21	SW9.04	0	0.0	0.0
21 B	9.04	25.0	1136	22	0	0	12.00	10.21	SW9.04			12.00	9.10	SW1.07	0	0.0	0.0
22 I	1.07	10.0	31	320	0	0	12.00	9.10	SW1.07			12.00	9.07	Outfall	0	0.0	0.0

Surface water sizing (2 years)

MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes	
Item: Calculations (2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 1
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene			
Calc. by:	Date: 21/02/08	Checked by:	Date:	Approved by:	Date:
Location: BOURNEMOUTH	Nat. Grid ref: SZ0991	M5-60: 19	r: 0.34	WRAP: 1	SAAR: 800

Entry No.	Section No.	Diam mm	Fall mm	Grad 1 in	Length m	Flow l/s	Pipe cap full l/s	Depth of flow %	H.M.D.	Proport. area%	Veloc. m/s	Proport. vel. m/s	Time of flow s	Time of conc m	Rain mm/hr	Pipe vol	System vol
1	1.01	150	166	120	20.0	2.2	16.1	19.6	0.47	13.55	0.91	0.55	21.9	5.87	57.2	0.35	0.35
2	1.02	150	500	120	60.0	6.1	16.1	40.5	0.86	37.67	0.91	0.83	65.8	6.96	53.1	1.06	1.41
3	2.01	150	680	25	17.0	4.4	35.7	18.5	0.45	12.45	2.02	1.19	8.4	5.64	58.2	0.30	1.71
4	1.03	150	333	120	40.0	12.6	16.1	73.1	1.20	77.91	0.91	1.03	43.8	7.69	50.7	0.71	2.42
5	3.01	150	166	120	20.0	2.2	16.1	19.6	0.47	13.55	0.91	0.55	21.9	5.87	57.2	0.35	2.77
6	3.02	150	833	72	60.0	7.2	20.9	37.9	0.82	34.48	1.18	1.04	50.7	6.71	54.0	1.06	3.83
7	4.01	150	266	120	32.0	8.6	16.1	53.1	1.04	53.33	0.91	0.94	35.1	6.08	56.3	0.57	4.40
8	5.01	150	265	94	25.0	6.8	18.3	40.0	0.86	37.29	1.03	0.93	24.2	5.90	57.1	0.44	4.84
9	4.02	150	375	120	45.0	14.5	16.1	84.4	1.21	89.79	0.91	1.04	49.3	6.91	53.3	0.80	5.64
10	4.03	150	352	34	12.0	22.4	30.5	69.1	1.18	73.46	1.73	1.93	6.9	7.02	52.8	0.21	5.85
11	1.04	225	111	180	20.0	33.4	38.5	81.1	1.22	86.70	0.97	1.10	20.7	8.04	49.6	0.80	6.64
12	6.01	225	1041	72	75.0	25.4	61.2	43.5	0.91	41.48	1.54	1.45	48.7	6.31	55.4	2.98	9.63
13	1.05	300	270	240	65.0	52.7	71.2	69.5	1.18	74.08	1.01	1.13	64.6	9.11	46.6	4.59	14.22
14	7.01	150	1315	57	75.0	21.0	23.5	83.5	1.22	89.15	1.33	1.52	56.3	6.44	55.0	1.33	15.55
15	8.01	225	1315	57	75.0	24.5	68.9	38.8	0.84	35.56	1.73	1.54	43.3	6.22	55.8	2.98	18.53
16	1.06	300	166	240	40.0	70.6	71.2	100.0	1.00	100.00	1.01	1.01	39.7	9.77	45.0	2.83	21.36
17	9.01	225	83	180	15.0	33.0	38.5	80.1	1.22	85.83	0.97	1.10	15.5	5.76	57.7	0.60	21.95
18	9.02	225	166	180	30.0	38.4	38.5	100.0	1.00	100.00	0.97	0.97	31.0	6.28	55.6	1.19	23.15
19	9.03	225	111	180	20.0	37.5	38.5	94.1	1.16	97.58	0.97	1.07	20.7	6.62	54.3	0.80	23.94
20	10.01	150	438	57	25.0	6.9	23.5	33.3	0.74	29.13	1.33	1.09	18.8	5.81	57.5	0.44	24.38
21	9.04	225	1136	22	25.0	43.6	111.2	41.7	0.88	39.17	2.80	2.58	8.9	6.77	53.7	0.99	25.38
22	1.07	400	31	320	10.0	106.2	131.4	75.4	1.21	80.83	1.05	1.19	9.6	9.93	44.6	1.26	26.63

MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes	
Item: Calculations (2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 2
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Summary notes	
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date

Data summary for printout

Design data

Maximum rainfall rate allowed = unlimited
Urban creep factor (%) = 0
Minimum velocity (m/s) = 0.76
Pipe roughness factor (mm) = 0.60
Return period = 2
Growth period (years) = 0
Percentage gradient = 80%
Maximum depth of flow = 100%

System data

System volume (m³) = 27
Final Rainfall rate (mm/hr) = 44.64
Total fall of index run (m) = 1.58
Total permeable area (Ha) = 0.0
Time of concentration (mins) = 9.93
Outfall diameter (mm) = 400
Total flow rate (l/s) = 106.24
Total length of index run (m) = 255.0
Total impermeable area (Ha) = 1.5175
Time of entry (mins) = 5.5
Percentage impermeable area = 100.00

Calculated variables

Routing coefficient (Cr) = 1.3
UCWI = 86.00
Percentage runoff (combined) = 72.66 (see note 1 below).
Volumetric coefficient (Cv) = 0.727
Areal reduction factor = 0.995

Notes:-

Note 1 - Percentage runoff for combined areas is calculated from:-
PR=(0.829*PIMP)+(25*SOIL)+(0.078*UCWI)-20.7
Note 2 - Rainfall calculated using FSR data.

Pipe sizes

The pipe definition file used for these calculations allows the following diameters:-

100	-------	375	-------	600	allowed	900	allowed	1200	allowed	1800	allowed
150	allowed	400	allowed	700	allowed	1000	allowed	1350	-------	1950	-------
225	allowed	450	-------	750	-------	1050	-------	1500	allowed	2100	allowed
300	allowed	500	allowed	800	allowed	1125	allowed	1650	-------	2400	-------

Surcharge 15mins/30 years (with graphics)

MasterDrain
SW 10.85

Company: Demonstration Version						Project: Bona Homes		
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW						Job Ref: 08/0045	Sheet no.: 1	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene				Hydrograph ret.per.: 30 yrs	Hydrograph duration: 15 mins	Time to peak: 7.5 mins
Calc. by:	Date: 21/02/08	Checked by:	Date:			Approved by:		Date:
Location: BOURNEMOUTH	Nat. Grid ref: SZ0991	M5-60: 19.00	r: 0.34	SAAR: 800		WRAP: 1	Soil index: 0.15	Flood warning level: 300mm

Free flowing outlet

Peak hydrograph values printed

Entry No.		SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE DIAM mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	SURCHARGE Depth	OVERFLOW l/s	FLOODED VOL m³	STATUS
1	I	1.01	SW1.01	16.1	3.2	150	1200	10.65	10.69	12.00	0.20	-0.111	0.00	0.00	OK
2	I	1.02	SW1.02	16.1	9.7	150	1200	10.48	10.57	12.00	0.60	-0.063	0.00	0.00	OK
3	B	2.01	SW2.01	35.7	6.5	150	1200	10.65	10.69	12.00	0.18	-0.114	0.00	0.00	OK
4	I	1.03	SW1.03	16.1	21.1	150	1200	9.98	10.17	12.00	1.31	0.033	4.94	0.00	Surcharged
5	B	3.01	SW3.01	16.1	3.2	150	1200	10.65	10.69	12.00	0.20	-0.111	0.00	0.00	OK
6	B	3.02	SW3.02	20.9	11.3	150	1200	10.48	10.56	12.00	0.54	-0.070	0.00	0.00	OK
7	B	4.01	SW4.01	16.1	13.0	150	1200	10.65	10.76	12.00	0.80	-0.038	0.00	0.00	OK
8	S1	5.01	SW5.01	18.3	10.1	150	1200	10.65	10.73	12.00	0.55	-0.068	0.00	0.00	OK
9	B	4.02	SW4.02	16.1	23.1	150	1200	10.38	10.58	12.00	1.43	0.046	6.97	0.00	Surcharged
10	B	4.03	SW4.03	30.5	36.1	150	1200	10.01	10.19	12.00	1.18	0.037	5.51	0.00	Surcharged
11	I	1.04	SW1.04	38.5	57.1	225	1200	9.65	10.00	12.00	1.48	0.124	18.64	0.00	Surcharged
12	B	6.01	SW6.01	61.2	38.9	225	1200	10.57	10.71	12.00	0.64	-0.088	0.00	0.00	OK
13	I	1.05	SW1.05	71.2	96.0	300	1200	9.54	10.00	12.00	1.35	0.165	24.84	0.00	Surcharged
14	B	7.01	SW7.01	23.5	32.4	150	1200	10.57	10.78	12.00	1.38	0.059	8.89	0.00	Surcharged
15	B	8.01	SW8.01	68.9	37.3	225	1200	10.57	10.70	12.00	0.54	-0.105	0.00	0.00	OK
16	I	1.06	SW1.06	71.2	133.3	300	1200	9.27	9.98	12.00	1.87	0.412	62.11	0.00	Surcharged
17	B	9.01	SW9.01	38.5	48.6	225	1200	10.57	10.87	12.00	1.26	0.067	10.14	0.00	Surcharged
18	B	9.02	SW9.02	38.5	58.7	225	1200	10.49	10.85	12.00	1.53	0.134	20.27	0.00	Surcharged
19	B	9.03	SW9.03	38.5	58.7	225	1200	10.32	10.68	12.00	1.53	0.134	20.27	0.00	Surcharged
20	S1	10.01	SW10.01	23.5	10.1	150	1200	10.65	10.72	12.00	0.43	-0.083	0.00	0.00	OK
21	B	9.04	SW9.04	111.2	68.9	225	1200	10.21	10.35	12.00	0.62	-0.091	0.00	0.00	OK
22	I	1.07	SW1.07	131.4	202.1	400	1350	9.10	9.87	12.00	1.54	0.371	70.71	0.00	Surcharged

MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes		
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 2	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs	Hydrograph duration: 15 mins	Time to peak: 7.5 mins
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date	

Notes

Printout headings

1) Entry no - position in file
2) Section no - pipe identifier
3) Manhole ref - Manhole identifier
4) Pipe cap - full bore capacity of that pipe
5) Rate of flow - calculated flow rate (l/s)
6) Pipe diam - outlet pipe diameter (mm)
7) Chamber diam - chamber diam. at base of MH
8) Invert level - invert level of manhole
9) Water level - calculated peak water level.
10) Grnd level - ground / cover level
11) Surch. fract - calc.flow/pipe capacity
12) Surch. depth - surcharge level above soffit
13) Overflow - surcharged flow rate (l/s)
14) Flooded vol - volume of water above cover
15) Status - OK - outlet not surcharged
16) Status - Surcharged - outlet surcharged
17) Status - Warning - water level at/above warning
18) Status - Flooded - cover over-topped

Title box

Hydrograph data

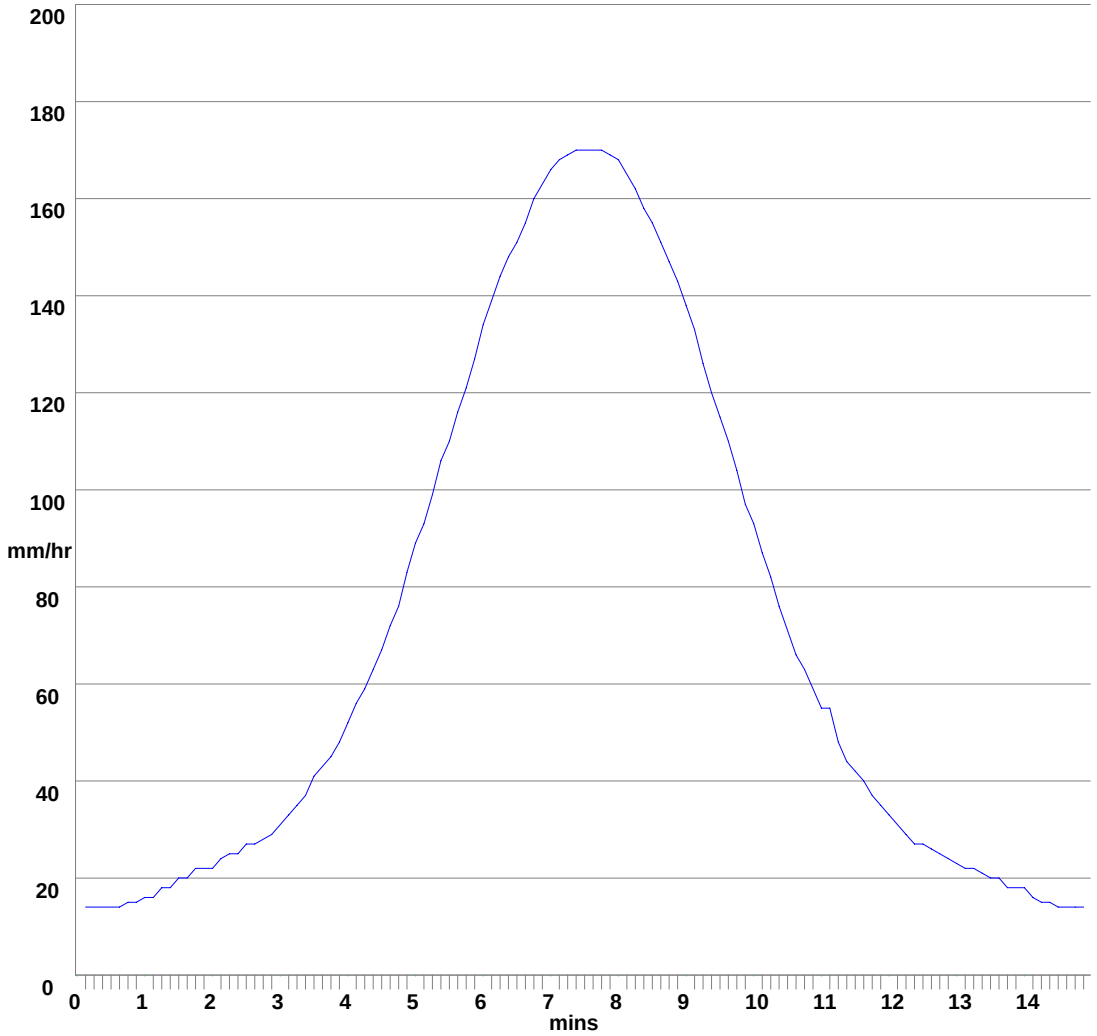
1) Ret. period - that used to calculate profile
2) Duration - length of storm (mins)
3) Profile - either Winter (75%) or Summer (50%)

MasterDrain
SW 10.85

Company: Demonstration Version			Project: Bona Homes
Item: Rainfall Hyetograph		Job Ref: 08/0045	Sheet no.: 3 / Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon	Drainage Engineer: J Greene	Hydrograph ret.per.: 30 yrs	Hydrograph duration: 15 mins / Time to peak: 7.5 mins
Calc. by	Date: 21/02/08	Checked by	Date
		Approved by	Date

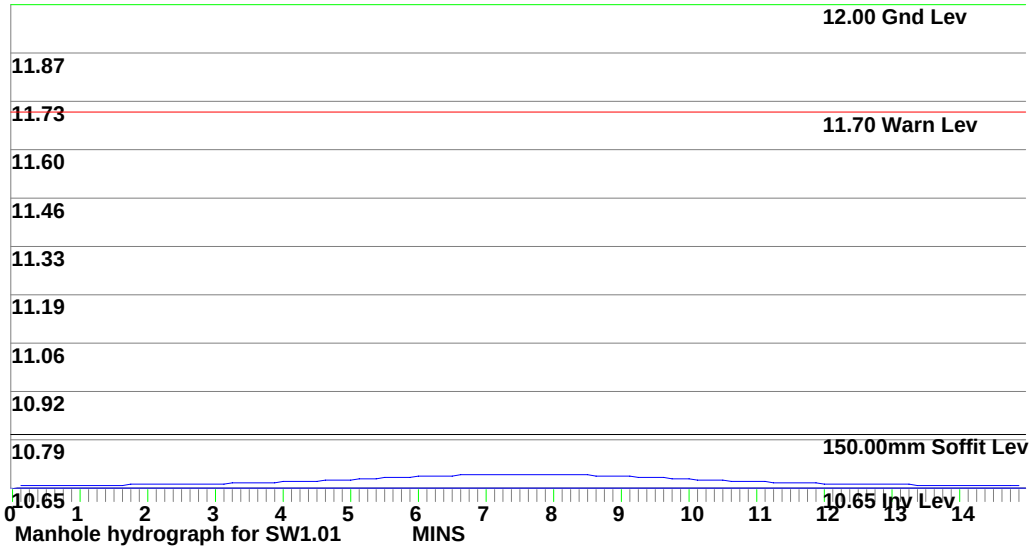
Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	14.00	5:08	93.00	10:08	87.00
0:15	14.00	5:15	99.00	10:15	82.00
0:22	14.00	5:22	106.00	10:22	76.00
0:30	14.00	5:30	110.00	10:30	71.00
0:38	14.00	5:38	116.00	10:38	66.00
0:45	15.00	5:45	121.00	10:45	63.00
0:52	15.00	5:52	127.00	10:52	59.00
1:00	16.00	6:00	134.00	11:00	55.00
1:08	16.00	6:08	139.00	11:08	55.00
1:15	18.00	6:15	144.00	11:15	48.00
1:22	18.00	6:22	148.00	11:22	44.00
1:30	20.00	6:30	151.00	11:30	42.00
1:38	20.00	6:38	155.00	11:38	40.00
1:45	22.00	6:45	160.00	11:45	37.00
1:52	22.00	6:52	163.00	11:52	35.00
2:00	22.00	7:00	166.00	12:00	33.00
2:08	24.00	7:08	168.00	12:08	31.00
2:15	25.00	7:15	169.00	12:15	29.00
2:22	25.00	7:22	170.00	12:22	27.00
2:30	27.00	7:30	170.00	12:30	27.00
2:38	27.00	7:38	170.00	12:38	26.00
2:45	28.00	7:45	170.00	12:45	25.00
2:52	29.00	7:52	169.00	12:52	24.00
3:00	31.00	8:00	168.00	13:00	23.00
3:08	33.00	8:08	165.00	13:08	22.00
3:15	35.00	8:15	162.00	13:15	22.00
3:22	37.00	8:22	158.00	13:22	21.00
3:30	41.00	8:30	155.00	13:30	20.00
3:38	43.00	8:38	151.00	13:38	20.00
3:45	45.00	8:45	147.00	13:45	18.00
3:52	48.00	8:52	143.00	13:52	18.00
4:00	52.00	9:00	138.00	14:00	18.00
4:08	56.00	9:08	133.00	14:08	16.00
4:15	59.00	9:15	126.00	14:15	15.00
4:22	63.00	9:22	120.00	14:22	15.00
4:30	67.00	9:30	115.00	14:30	14.00
4:38	72.00	9:38	110.00	14:38	14.00
4:45	76.00	9:45	104.00	14:45	14.00
4:52	83.00	9:52	97.00	14:52	14.00
5:00	89.00	10:00	93.00	15:00	12.00

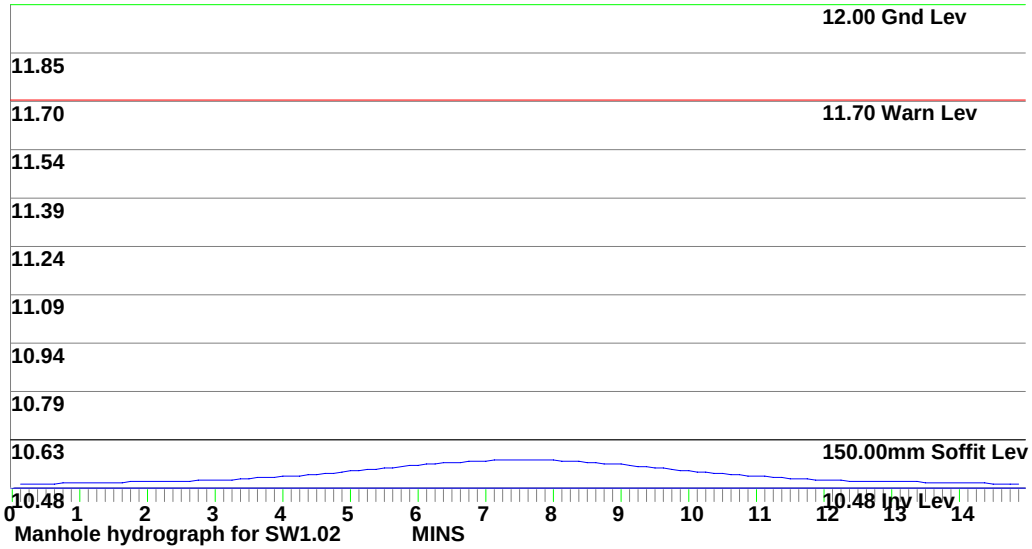
Hydrograph profile derived from data in the Flood Studies Report

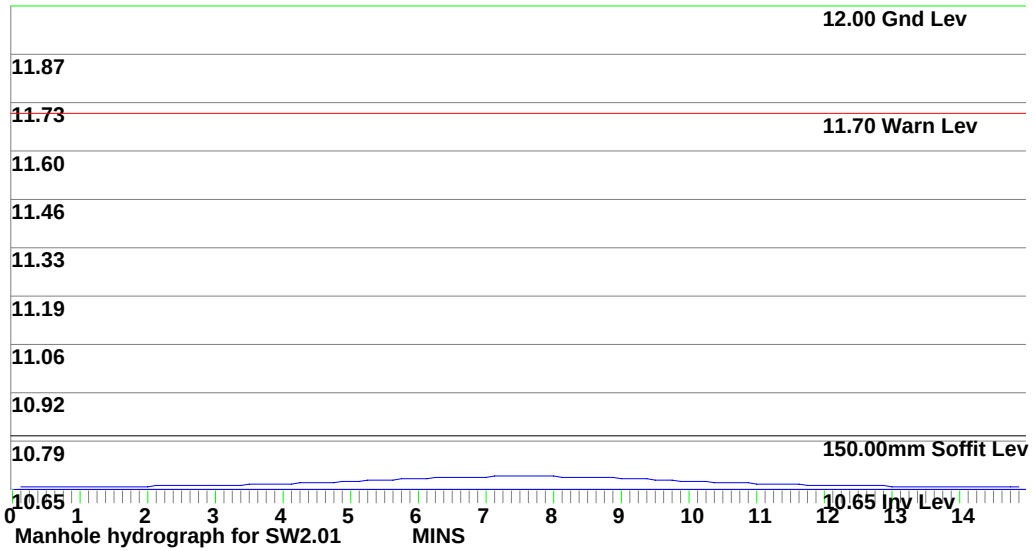


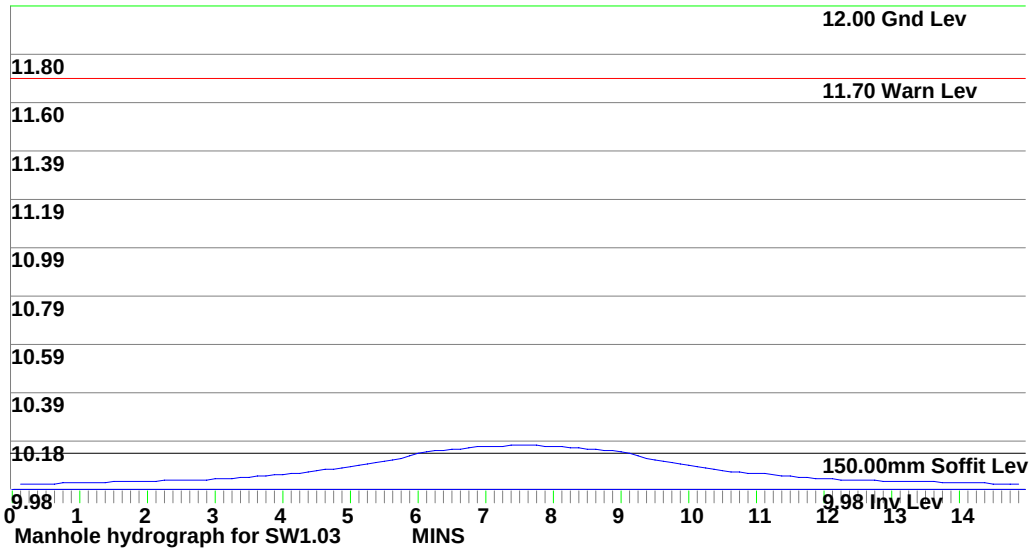
MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes		
Item: Manhole hydrographs				Job Ref: 08/0045	Sheet no.: 4	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs	Hydrograph duration: 15 mins	Time to peak: 7.5 mins
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date	



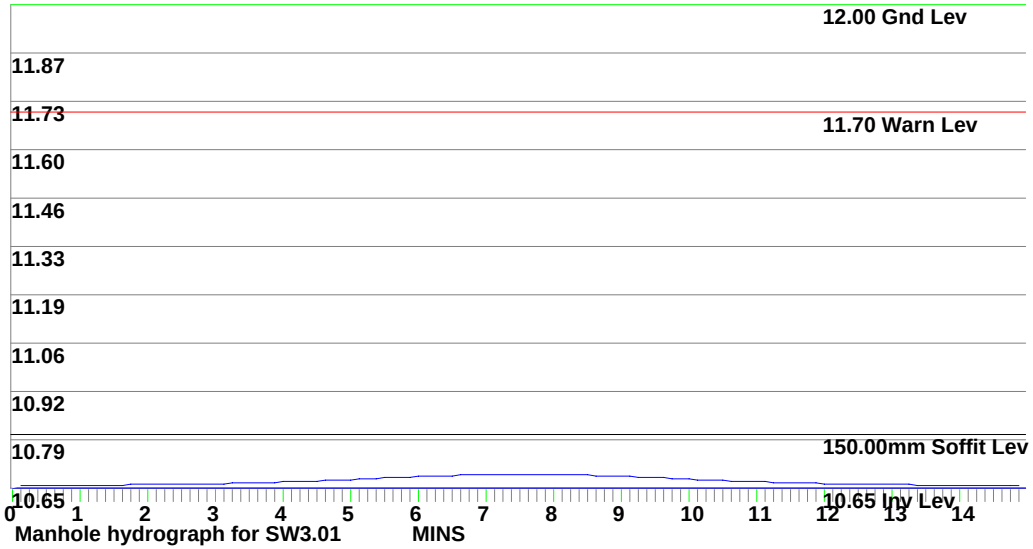


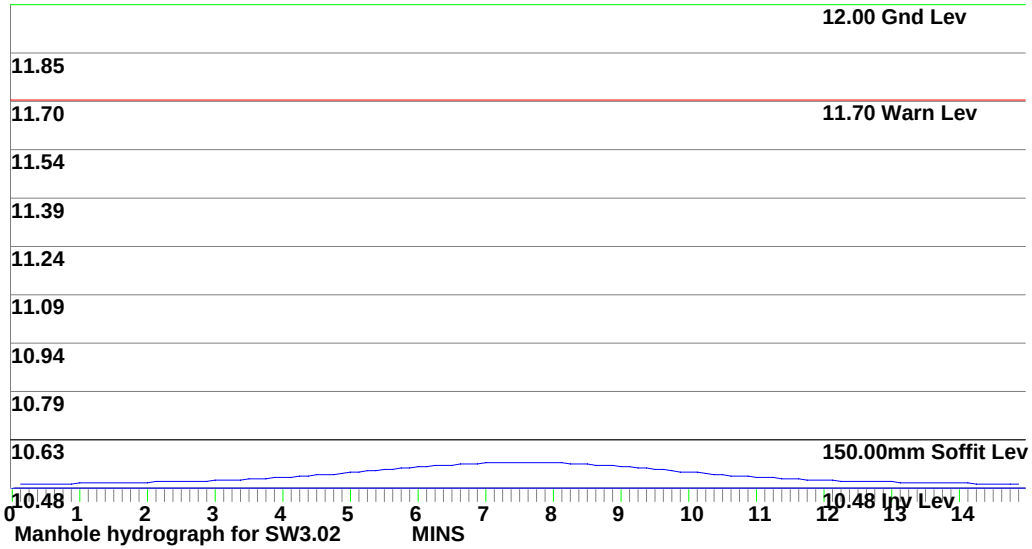


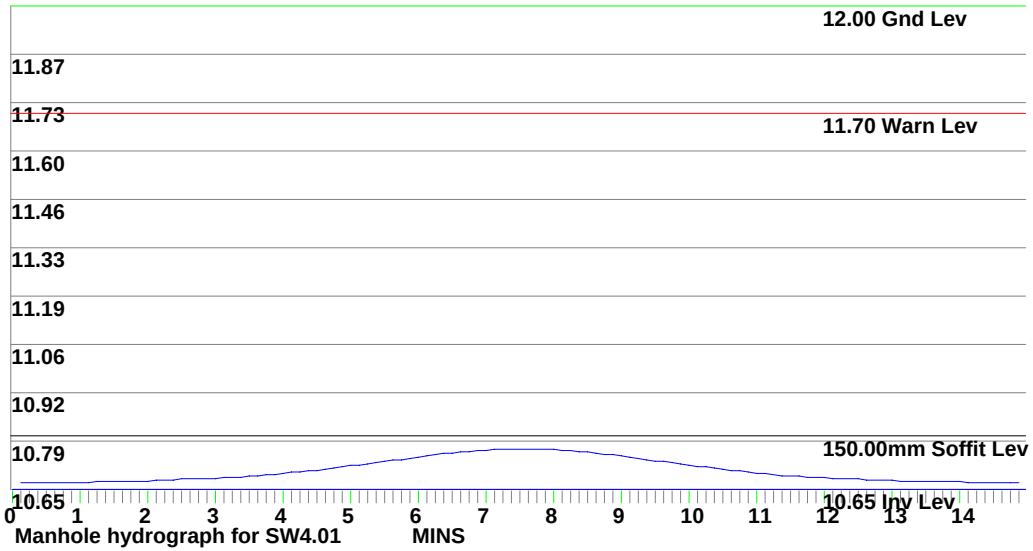


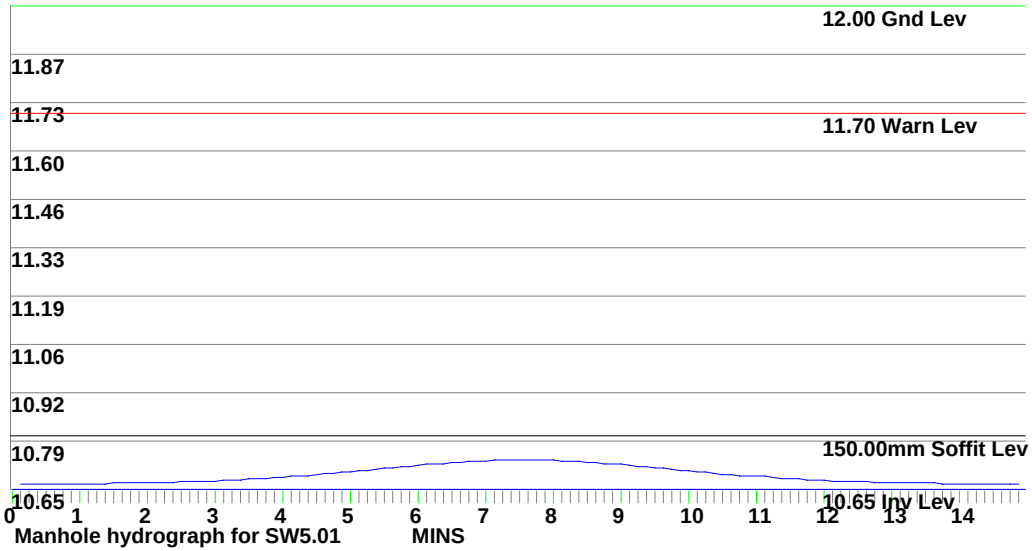
MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes	
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 5
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs	Hydrograph duration: 15 mins
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date



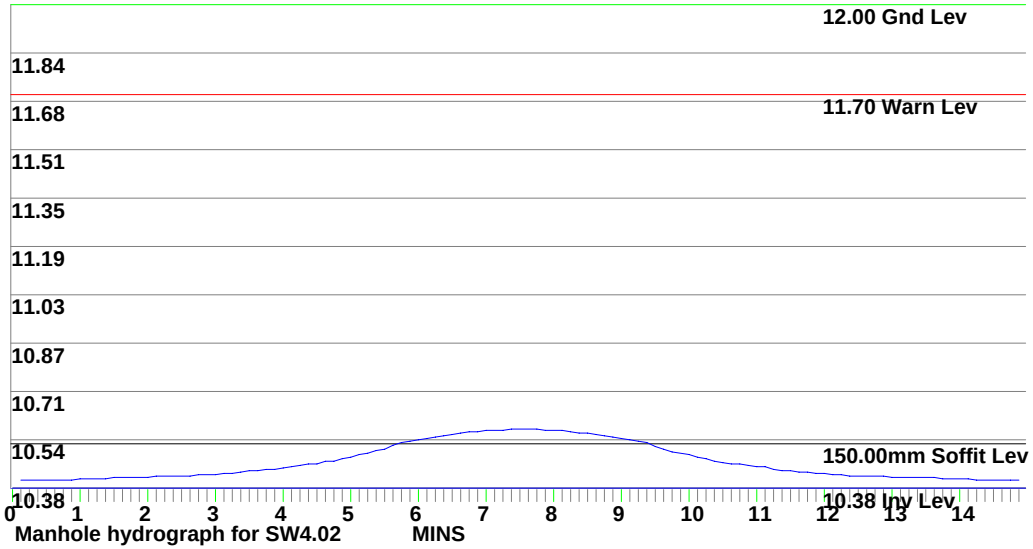


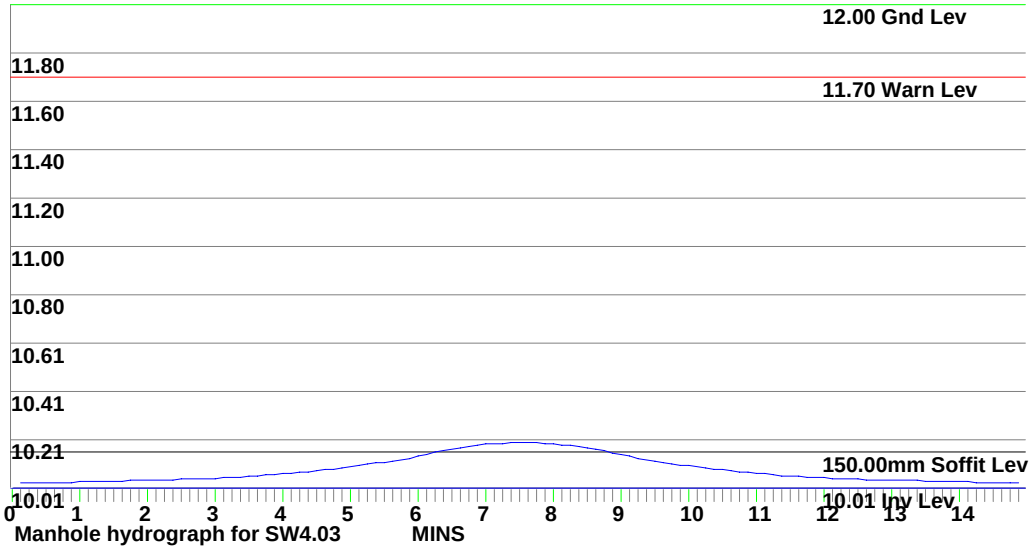


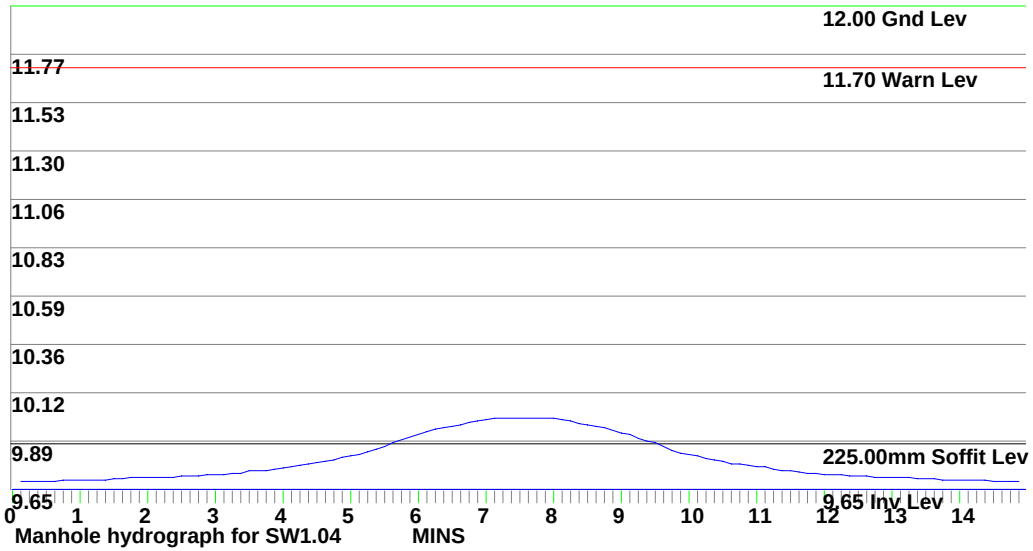


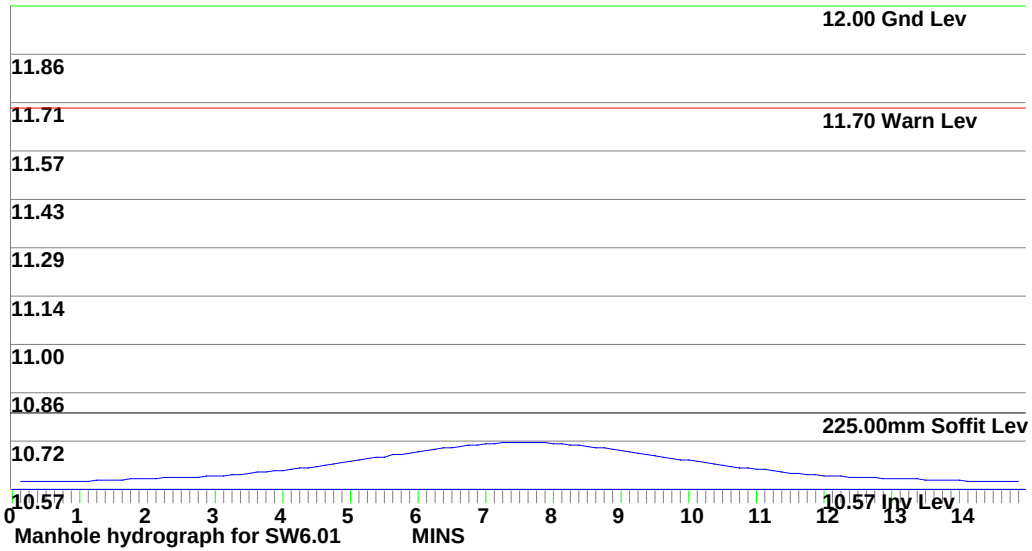
MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes	
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 6 / Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs / Hydrograph duration: 15 mins / Time to peak: 7.5 mins	
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date



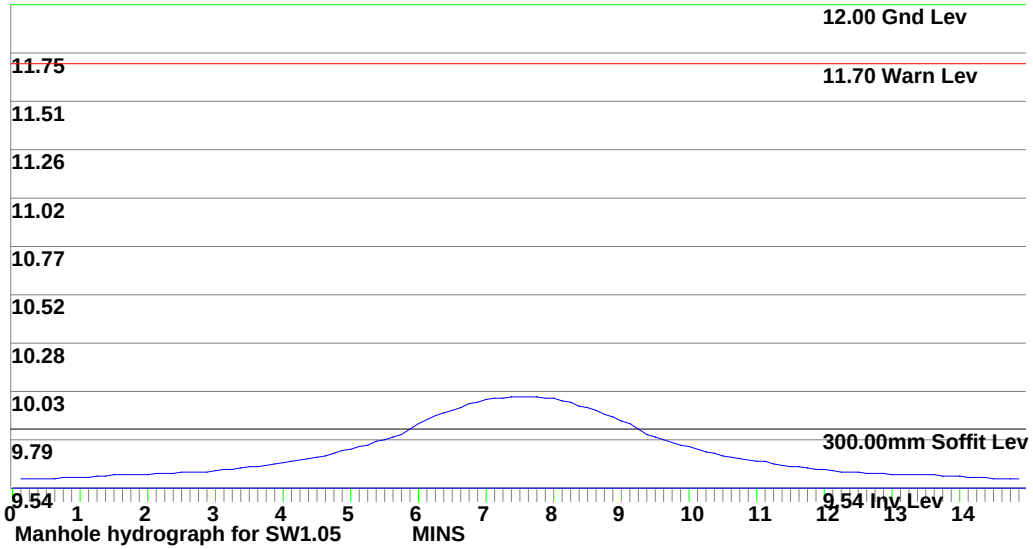


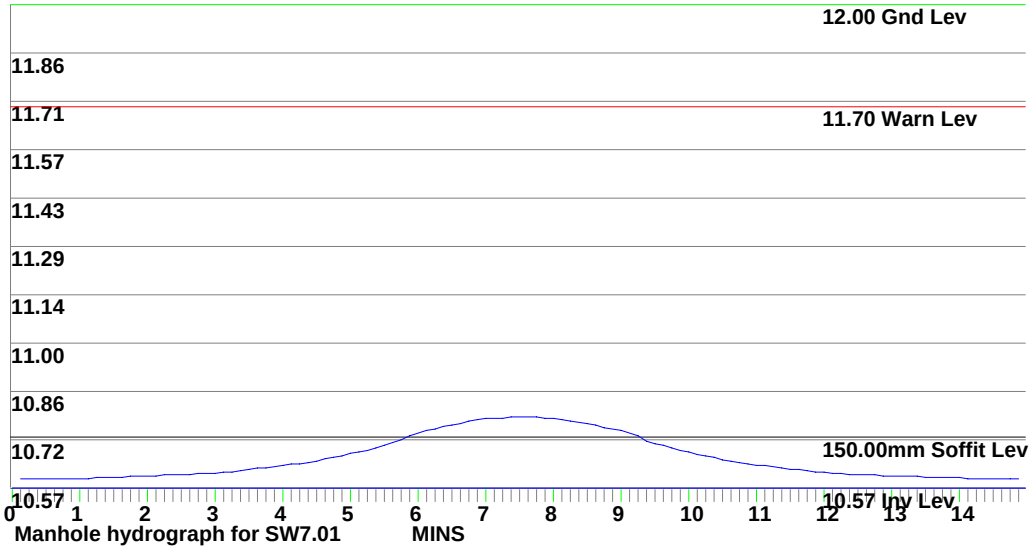


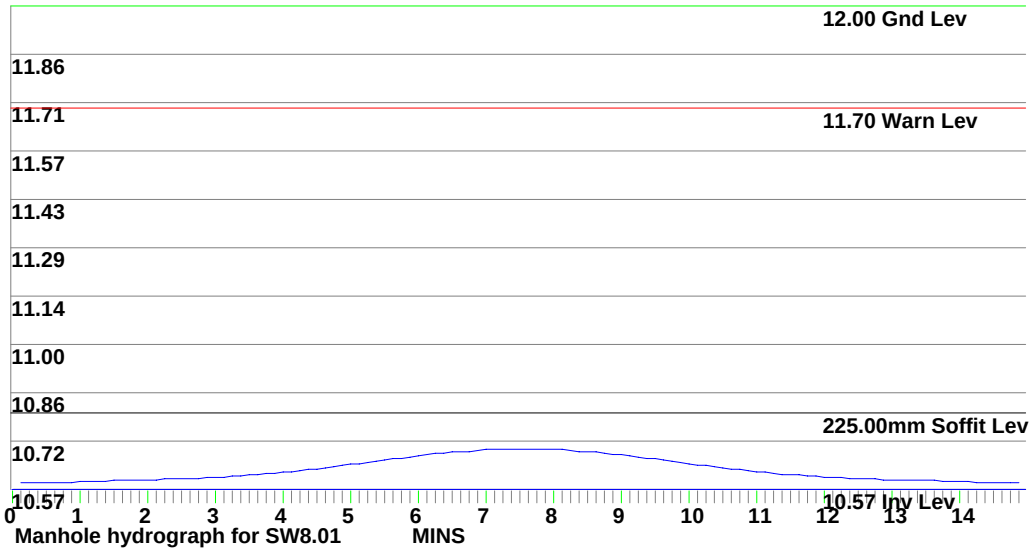


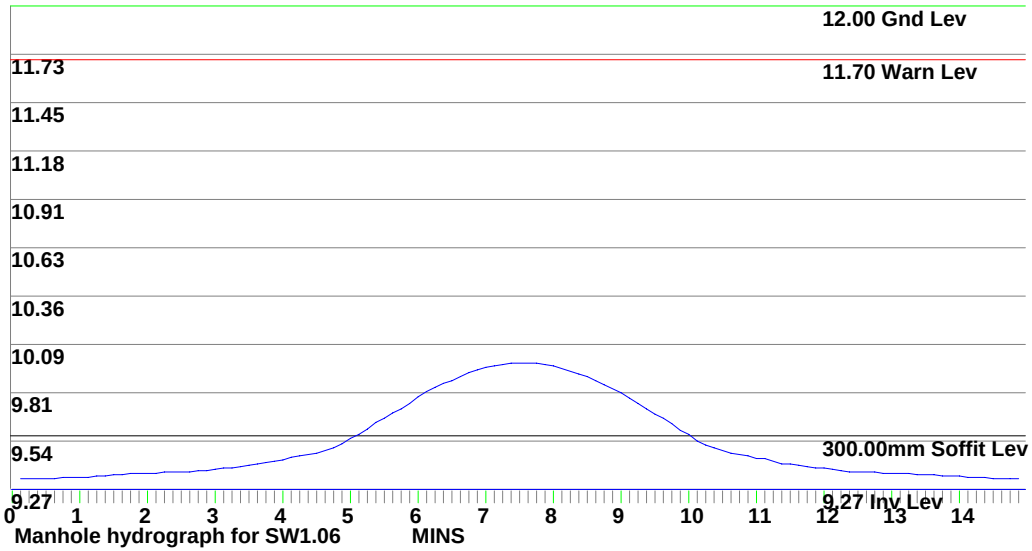
MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes		
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 7	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs	Hydrograph duration: 15 mins	Time to peak: 7.5 mins
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date	



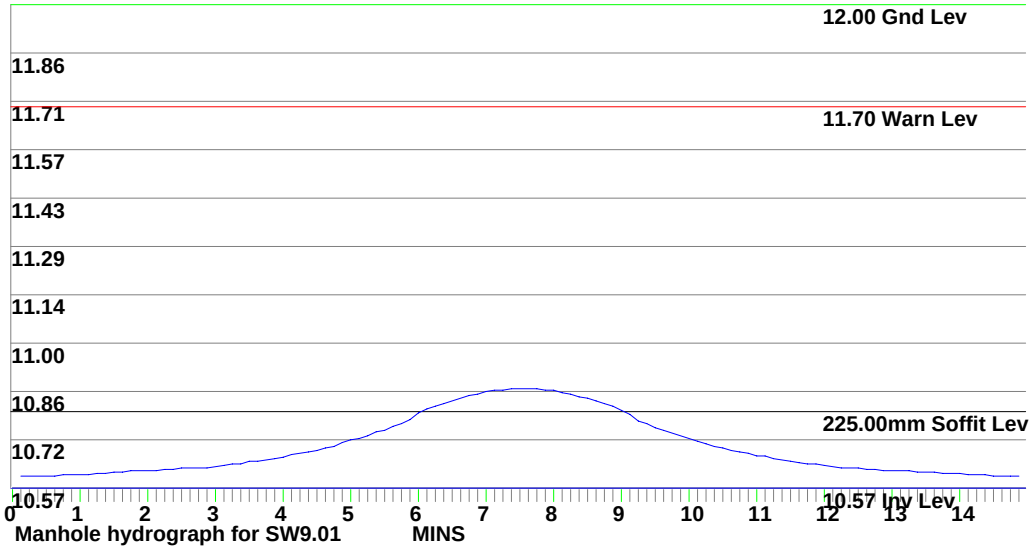


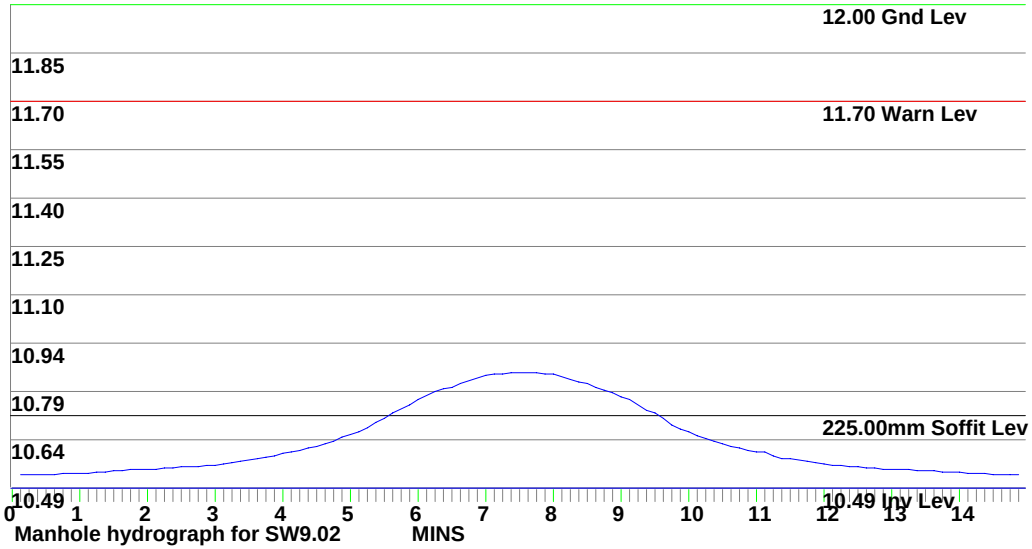


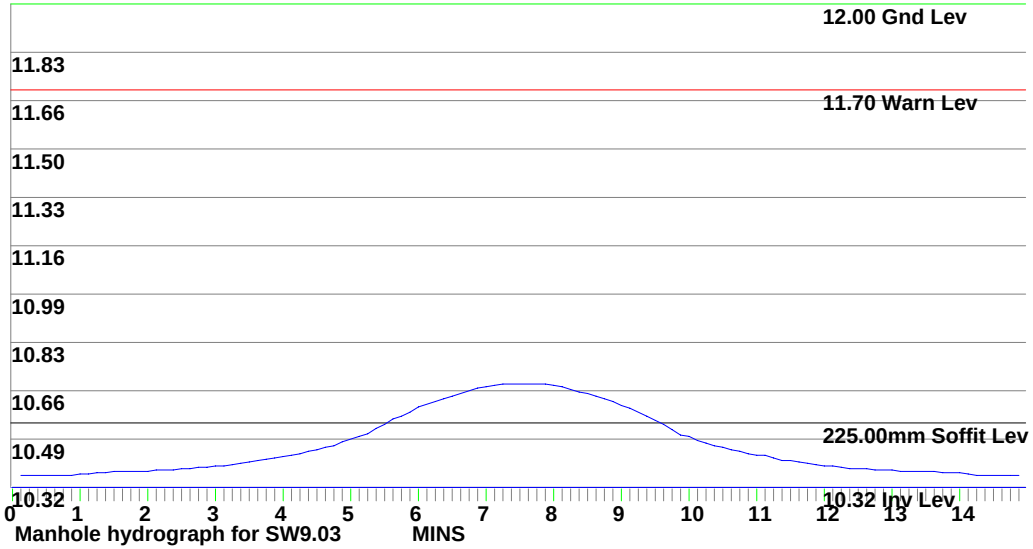


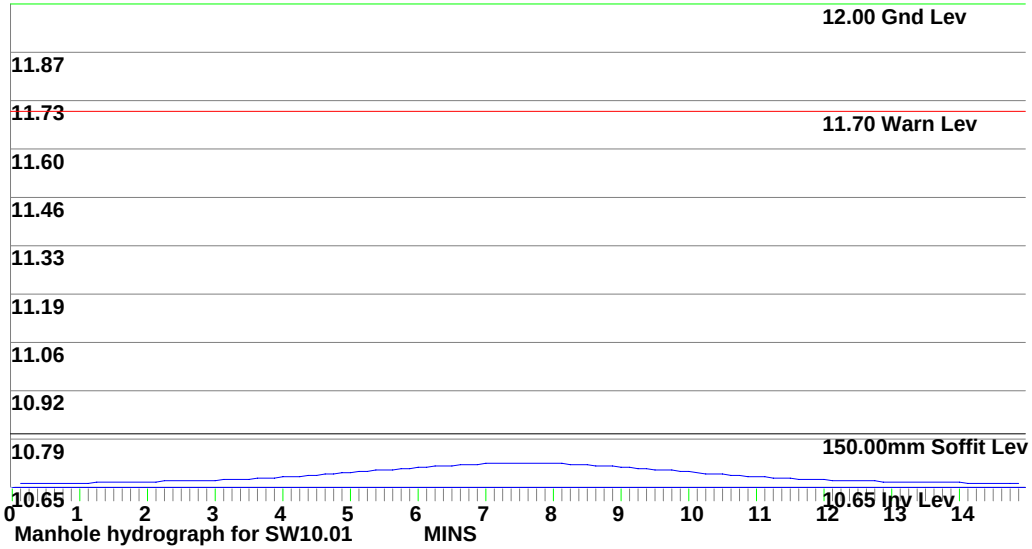
MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes	
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 8 / Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs / Hydrograph duration: 15 mins / Time to peak: 7.5 mins	
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date



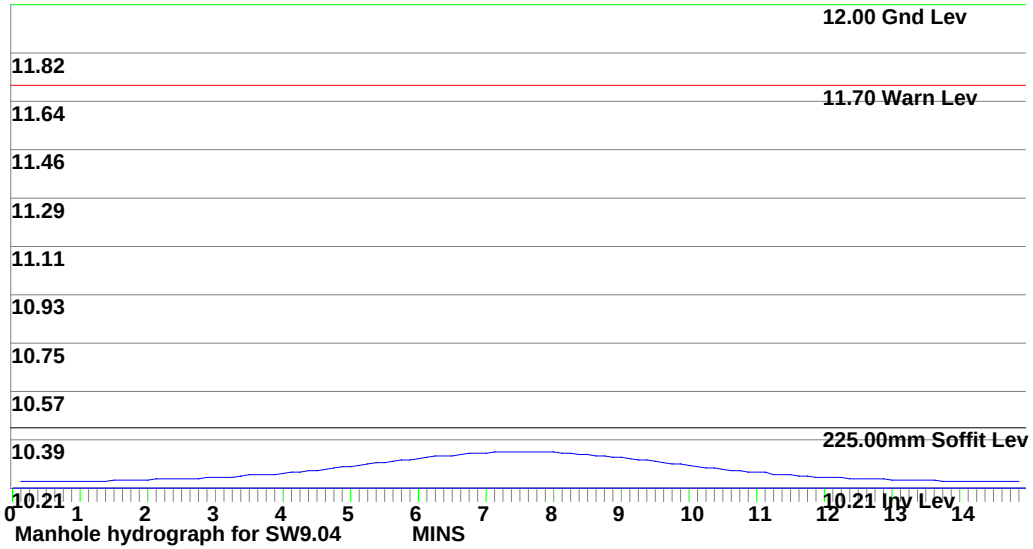


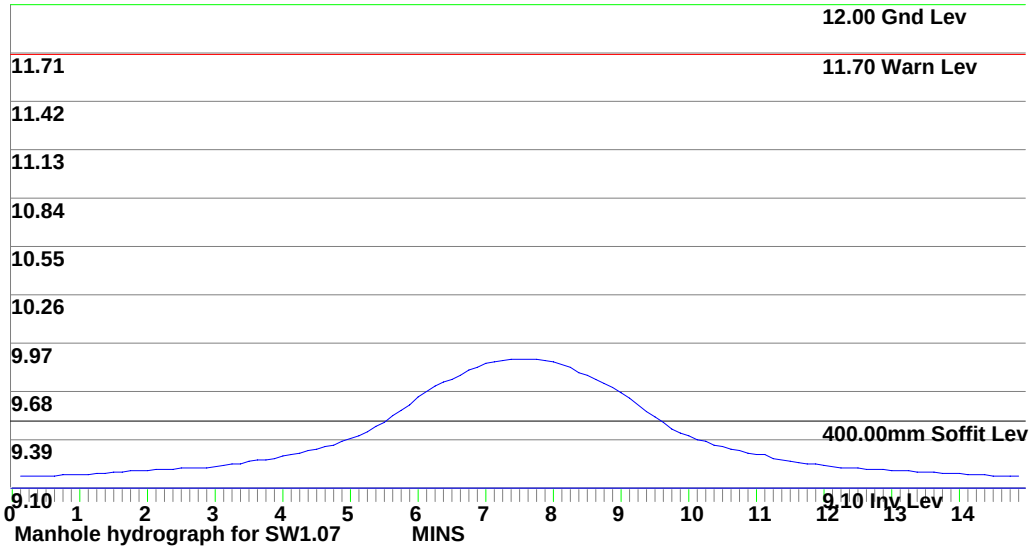




MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes	
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 9 / Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs / Hydrograph duration: 15 mins / Time to peak: 7.5 mins	
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date





Surcharge 30mins/30 years

MasterDrain
SW 10.85

Company: Demonstration Version						Project: Bona Homes		
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW						Job Ref: 08/0045	Sheet no.: 1	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene				Hydrograph ret.per.: 30 yrs	Hydrograph duration: 30 mins	Time to peak: 15.0 mins
Calc. by: IJ	Date: 21/02/08	Checked by:	Date:			Approved by:		Date:
Location: BOURNEMOUTH	Nat. Grid ref: SZ0991	M5-60: 19.00	r: 0.34	SAAR: 800		WRAP: 1	Soil index: 0.15	Flood warning level: 300mm

Free flowing outlet

Peak hydrograph values printed

Entry No.		SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE DIAM mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	SURCHARGE Depth	OVERFLOW l/s	FLOODED VOL m³	STATUS
1	I	1.01	SW1.01	16.1	2.2	150	1200	10.65	10.68	12.00	0.13	-0.121	0.00	0.00	OK
2	I	1.02	SW1.02	16.1	6.5	150	1200	10.48	10.55	12.00	0.40	-0.086	0.00	0.00	OK
3	B	2.01	SW2.01	35.7	4.3	150	1200	10.65	10.68	12.00	0.12	-0.123	0.00	0.00	OK
4	I	1.03	SW1.03	16.1	14.1	150	1200	9.98	10.11	12.00	0.88	-0.027	0.00	0.00	OK
5	B	3.01	SW3.01	16.1	2.2	150	1200	10.65	10.68	12.00	0.13	-0.121	0.00	0.00	OK
6	B	3.02	SW3.02	20.9	7.6	150	1200	10.48	10.54	12.00	0.36	-0.091	0.00	0.00	OK
7	B	4.01	SW4.01	16.1	8.7	150	1200	10.65	10.73	12.00	0.54	-0.070	0.00	0.00	OK
8	S1	5.01	SW5.01	18.3	6.8	150	1200	10.65	10.71	12.00	0.37	-0.090	0.00	0.00	OK
9	B	4.02	SW4.02	16.1	15.5	150	1200	10.38	10.52	12.00	0.96	-0.012	0.00	0.00	OK
10	B	4.03	SW4.03	30.5	24.2	150	1200	10.01	10.12	12.00	0.79	-0.039	0.00	0.00	OK
11	I	1.04	SW1.04	38.5	38.3	225	1200	9.65	9.87	12.00	1.00	-0.004	0.00	0.00	OK
12	B	6.01	SW6.01	61.2	26.1	225	1200	10.57	10.67	12.00	0.43	-0.125	0.00	0.00	OK
13	I	1.05	SW1.05	71.2	64.4	300	1200	9.54	9.79	12.00	0.90	-0.045	0.00	0.00	OK
14	B	7.01	SW7.01	23.5	21.7	150	1200	10.57	10.71	12.00	0.92	-0.019	0.00	0.00	OK
15	B	8.01	SW8.01	68.9	25.0	225	1200	10.57	10.66	12.00	0.36	-0.137	0.00	0.00	OK
16	I	1.06	SW1.06	71.2	89.4	300	1200	9.27	9.81	12.00	1.26	0.242	18.21	0.00	Surcharged
17	B	9.01	SW9.01	38.5	32.6	225	1200	10.57	10.75	12.00	0.85	-0.047	0.00	0.00	OK
18	B	9.02	SW9.02	38.5	39.4	225	1200	10.49	10.73	12.00	1.02	0.012	0.92	0.00	Surcharged
19	B	9.03	SW9.03	38.5	39.4	225	1200	10.32	10.56	12.00	1.02	0.012	0.92	0.00	Surcharged
20	S1	10.01	SW10.01	23.5	6.8	150	1200	10.65	10.70	12.00	0.29	-0.100	0.00	0.00	OK
21	B	9.04	SW9.04	111.2	46.2	225	1200	10.21	10.31	12.00	0.42	-0.127	0.00	0.00	OK
22	I	1.07	SW1.07	131.4	135.6	400	1350	9.10	9.54	12.00	1.03	0.043	4.12	0.00	Surcharged

MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes		
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 2	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs	Hydrograph duration: 30 mins	Time to peak: 15.0 mins
Calc. by: IJ	Date: 21/02/08	Checked by	Date	Approved by	Date	

Notes

Printout headings

1) Entry no - position in file
2) Section no - pipe identifier
3) Manhole ref - Manhole identifier
4) Pipe cap - full bore capacity of that pipe
5) Rate of flow - calculated flow rate (l/s)
6) Pipe diam - outlet pipe diameter (mm)
7) Chamber diam - chamber diam. at base of MH
8) Invert level - invert level of manhole
9) Water level - calculated peak water level.
10) Grnd level - ground / cover level
11) Surch. fract - calc.flow/pipe capacity
12) Surch. depth - surcharge level above soffit
13) Overflow - surcharged flow rate (l/s)
14) Flooded vol - volume of water above cover
15) Status - OK - outlet not surcharged
16) Status - Surcharged - outlet surcharged
17) Status - Warning - water level at/above warning
18) Status - Flooded - cover over-topped

Title box

Hydrograph data

1) Ret. period - that used to calculate profile
2) Duration - length of storm (mins)
3) Profile - either Winter (75%) or Summer (50%)

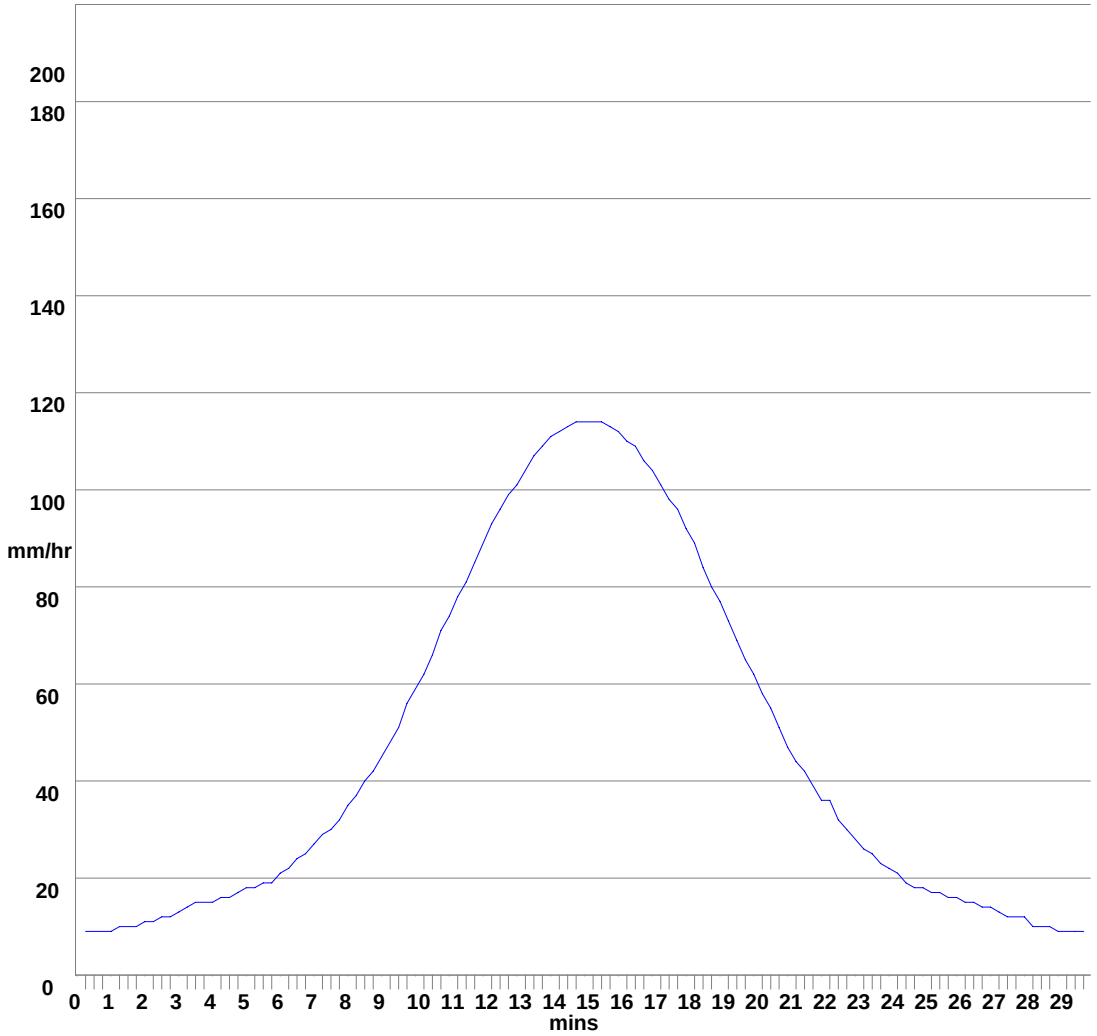
MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes	
Item: Rainfall Hyetograph				Job Ref: 08/0045	Sheet no.: 3
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs	Hydrograph duration: 30 mins
Calc. by: IJ	Date: 21/02/08	Checked by	Date	Approved by	Date

Hydrograph profile: Winter 75%	Time to peak: 15.0 mins

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:15	9.00	10:15	62.00	20:15	58.00
0:30	9.00	10:30	66.00	20:30	55.00
0:45	9.00	10:45	71.00	20:45	51.00
1:00	9.00	11:00	74.00	21:00	47.00
1:15	10.00	11:15	78.00	21:15	44.00
1:30	10.00	11:30	81.00	21:30	42.00
1:45	10.00	11:45	85.00	21:45	39.00
2:00	11.00	12:00	89.00	22:00	36.00
2:15	11.00	12:15	93.00	22:15	36.00
2:30	12.00	12:30	96.00	22:30	32.00
2:45	12.00	12:45	99.00	22:45	30.00
3:00	13.00	13:00	101.00	23:00	28.00
3:15	14.00	13:15	104.00	23:15	26.00
3:30	15.00	13:30	107.00	23:30	25.00
3:45	15.00	13:45	109.00	23:45	23.00
4:00	15.00	14:00	111.00	24:00	22.00
4:15	16.00	14:15	112.00	24:15	21.00
4:30	16.00	14:30	113.00	24:30	19.00
4:45	17.00	14:45	114.00	24:45	18.00
5:00	18.00	15:00	114.00	25:00	18.00
5:15	18.00	15:15	114.00	25:15	17.00
5:30	19.00	15:30	114.00	25:30	17.00
5:45	19.00	15:45	113.00	25:45	16.00
6:00	21.00	16:00	112.00	26:00	16.00
6:15	22.00	16:15	110.00	26:15	15.00
6:30	24.00	16:30	109.00	26:30	15.00
6:45	25.00	16:45	106.00	26:45	14.00
7:00	27.00	17:00	104.00	27:00	14.00
7:15	29.00	17:15	101.00	27:15	13.00
7:30	30.00	17:30	98.00	27:30	12.00
7:45	32.00	17:45	96.00	27:45	12.00
8:00	35.00	18:00	92.00	28:00	12.00
8:15	37.00	18:15	89.00	28:15	10.00
8:30	40.00	18:30	84.00	28:30	10.00
8:45	42.00	18:45	80.00	28:45	10.00
9:00	45.00	19:00	77.00	29:00	9.00
9:15	48.00	19:15	73.00	29:15	9.00
9:30	51.00	19:30	69.00	29:30	9.00
9:45	56.00	19:45	65.00	29:45	9.00
10:00	59.00	20:00	62.00	30:00	8.00

Hydrograph profile derived from data in the Flood Studies Report



Surcharge 45mins/30 years

MasterDrain
SW 10.85

Company: Demonstration Version							Project: Bona Homes		
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW							Job Ref: 08/0045	Sheet no.: 1	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene					Hydrograph ret.per.: 30 yrs	Hydrograph duration: 45 mins	Time to peak: 22.5 mins
Calc. by: IJ	Date: 21/02/08	Checked by:	Date:				Approved by:	Date:	
Location: BOURNEMOUTH	Nat. Grid ref: SZ0991	M5-60: 19.00	r: 0.34	SAAR: 800			WRAP: 1	Soil index: 0.15	Flood warning level: 300mm

Free flowing outlet

Peak hydrograph values printed

Entry No.		SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE DIAM mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	SURCHARGE Depth	OVERFLOW l/s	FLOODED VOL m³	STATUS
1	I	1.01	SW1.01	16.1	1.7	150	1200	10.65	10.67	12.00	0.10	-0.126	0.00	0.00	OK
2	I	1.02	SW1.02	16.1	5.0	150	1200	10.48	10.54	12.00	0.31	-0.097	0.00	0.00	OK
3	B	2.01	SW2.01	35.7	3.4	150	1200	10.65	10.67	12.00	0.09	-0.127	0.00	0.00	OK
4	I	1.03	SW1.03	16.1	10.9	150	1200	9.98	10.08	12.00	0.68	-0.054	0.00	0.00	OK
5	B	3.01	SW3.01	16.1	1.7	150	1200	10.65	10.67	12.00	0.10	-0.126	0.00	0.00	OK
6	B	3.02	SW3.02	20.9	5.9	150	1200	10.48	10.53	12.00	0.28	-0.101	0.00	0.00	OK
7	B	4.01	SW4.01	16.1	6.7	150	1200	10.65	10.72	12.00	0.42	-0.085	0.00	0.00	OK
8	S1	5.01	SW5.01	18.3	5.2	150	1200	10.65	10.70	12.00	0.29	-0.100	0.00	0.00	OK
9	B	4.02	SW4.02	16.1	12.0	150	1200	10.38	10.49	12.00	0.74	-0.046	0.00	0.00	OK
10	B	4.03	SW4.03	30.5	18.7	150	1200	10.01	10.10	12.00	0.61	-0.061	0.00	0.00	OK
11	I	1.04	SW1.04	38.5	29.6	225	1200	9.65	9.81	12.00	0.77	-0.063	0.00	0.00	OK
12	B	6.01	SW6.01	61.2	20.1	225	1200	10.57	10.66	12.00	0.33	-0.143	0.00	0.00	OK
13	I	1.05	SW1.05	71.2	49.7	300	1200	9.54	9.74	12.00	0.70	-0.102	0.00	0.00	OK
14	B	7.01	SW7.01	23.5	16.8	150	1200	10.57	10.68	12.00	0.71	-0.049	0.00	0.00	OK
15	B	8.01	SW8.01	68.9	19.3	225	1200	10.57	10.65	12.00	0.28	-0.152	0.00	0.00	OK
16	I	1.06	SW1.06	71.2	69.0	300	1200	9.27	9.55	12.00	0.97	-0.021	0.00	0.00	OK
17	B	9.01	SW9.01	38.5	25.2	225	1200	10.57	10.72	12.00	0.65	-0.084	0.00	0.00	OK
18	B	9.02	SW9.02	38.5	30.4	225	1200	10.49	10.66	12.00	0.79	-0.059	0.00	0.00	OK
19	B	9.03	SW9.03	38.5	30.4	225	1200	10.32	10.49	12.00	0.79	-0.059	0.00	0.00	OK
20	S1	10.01	SW10.01	23.5	5.2	150	1200	10.65	10.69	12.00	0.22	-0.108	0.00	0.00	OK
21	B	9.04	SW9.04	111.2	35.6	225	1200	10.21	10.29	12.00	0.32	-0.144	0.00	0.00	OK
22	I	1.07	SW1.07	131.4	104.6	400	1350	9.10	9.40	12.00	0.80	-0.102	0.00	0.00	OK

MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes		
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 2	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs	Hydrograph duration: 45 mins	Time to peak: 22.5 mins
Calc. by: IJ	Date: 21/02/08	Checked by	Date	Approved by	Date	

Notes

Printout headings

1) Entry no - position in file
2) Section no - pipe identifier
3) Manhole ref - Manhole identifier
4) Pipe cap - full bore capacity of that pipe
5) Rate of flow - calculated flow rate (l/s)
6) Pipe diam - outlet pipe diameter (mm)
7) Chamber diam - chamber diam. at base of MH
8) Invert level - invert level of manhole
9) Water level - calculated peak water level.
10) Grnd level - ground / cover level
11) Surch. fract - calc.flow/pipe capacity
12) Surch. depth - surcharge level above soffit
13) Overflow - surcharged flow rate (l/s)
14) Flooded vol - volume of water above cover
15) Status - OK - outlet not surcharged
16) Status - Surcharged - outlet surcharged
17) Status - Warning - water level at/above warning
18) Status - Flooded - cover over-topped

Title box

Hydrograph data

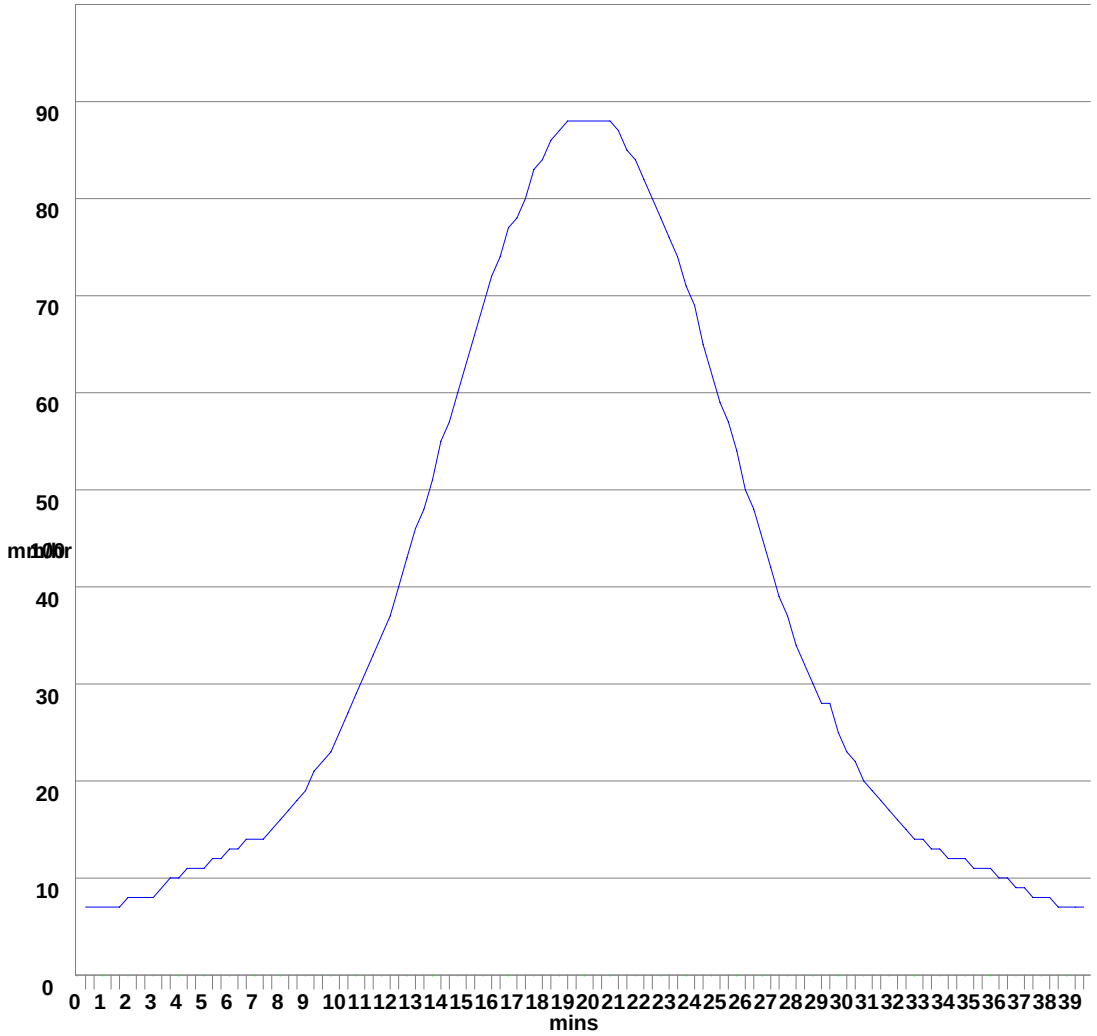
1) Ret. period - that used to calculate profile
2) Duration - length of storm (mins)
3) Profile - either Winter (75%) or Summer (50%)

MasterDrain
SW 10.85

Company: Demonstration Version			Project: Bona Homes
Item: Rainfall Hyetograph		Job Ref: 08/0045	Sheet no.: 3 / Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon	Drainage Engineer: J Greene	Hydrograph ret.per.: 30 yrs / Hydrograph duration: 45 mins	Time to peak: 22.5 mins
Calc. by: IJ / Date: 21/02/08	Checked by / Date	Approved by / Date	

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:22	7.00	15:22	48.00	30:22	45.00
0:45	7.00	15:45	51.00	30:45	42.00
1:08	7.00	16:08	55.00	31:08	39.00
1:30	7.00	16:30	57.00	31:30	37.00
1:52	7.00	16:52	60.00	31:52	34.00
2:15	8.00	17:15	63.00	32:15	32.00
2:38	8.00	17:38	66.00	32:38	30.00
3:00	8.00	18:00	69.00	33:00	28.00
3:22	8.00	18:22	72.00	33:22	28.00
3:45	9.00	18:45	74.00	33:45	25.00
4:08	10.00	19:08	77.00	34:08	23.00
4:30	10.00	19:30	78.00	34:30	22.00
4:52	11.00	19:52	80.00	34:52	20.00
5:15	11.00	20:15	83.00	35:15	19.00
5:38	11.00	20:38	84.00	35:38	18.00
6:00	12.00	21:00	86.00	36:00	17.00
6:22	12.00	21:22	87.00	36:22	16.00
6:45	13.00	21:45	88.00	36:45	15.00
7:08	13.00	22:08	88.00	37:08	14.00
7:30	14.00	22:30	88.00	37:30	14.00
7:52	14.00	22:52	88.00	37:52	13.00
8:15	14.00	23:15	88.00	38:15	13.00
8:38	15.00	23:38	88.00	38:38	12.00
9:00	16.00	24:00	87.00	39:00	12.00
9:22	17.00	24:22	85.00	39:22	12.00
9:45	18.00	24:45	84.00	39:45	11.00
10:08	19.00	25:08	82.00	40:08	11.00
10:30	21.00	25:30	80.00	40:30	11.00
10:52	22.00	25:52	78.00	40:52	10.00
11:15	23.00	26:15	76.00	41:15	10.00
11:38	25.00	26:38	74.00	41:38	9.00
12:00	27.00	27:00	71.00	42:00	9.00
12:22	29.00	27:22	69.00	42:22	8.00
12:45	31.00	27:45	65.00	42:45	8.00
13:08	33.00	28:08	62.00	43:08	8.00
13:30	35.00	28:30	59.00	43:30	7.00
13:52	37.00	28:52	57.00	43:52	7.00
14:15	40.00	29:15	54.00	44:15	7.00
14:38	43.00	29:38	50.00	44:38	7.00
15:00	46.00	30:00	48.00	45:00	6.00

Hydrograph profile derived from data in the Flood Studies Report



Surcharge 60mins/30 years

MasterDrain
SW 10.85

Company: Demonstration Version						Project: Bona Homes		
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW						Job Ref: 08/0045	Sheet no.: 1	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene				Hydrograph ret.per.: 30 yrs	Hydrograph duration: 60 mins	Time to peak: 30.0 mins
Calc. by: IJ	Date: 21/02/08	Checked by:	Date:			Approved by:		Date:
Location: BOURNEMOUTH	Nat. Grid ref: SZ0991	M5-60: 19.00	r: 0.34	SAAR: 800		WRAP: 1	Soil index: 0.15	Flood warning level: 300mm

Free flowing outlet

Peak hydrograph values printed

Entry No.		SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE DIAM mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	SURCHARGE Depth	OVERFLOW l/s	FLOODED VOL m³	STATUS
1	I	1.01	SW1.01	16.1	1.4	150	1200	10.65	10.67	12.00	0.09	-0.128	0.00	0.00	OK
2	I	1.02	SW1.02	16.1	4.2	150	1200	10.48	10.53	12.00	0.26	-0.104	0.00	0.00	OK
3	B	2.01	SW2.01	35.7	2.8	150	1200	10.65	10.67	12.00	0.08	-0.130	0.00	0.00	OK
4	I	1.03	SW1.03	16.1	9.0	150	1200	9.98	10.07	12.00	0.56	-0.067	0.00	0.00	OK
5	B	3.01	SW3.01	16.1	1.4	150	1200	10.65	10.67	12.00	0.09	-0.128	0.00	0.00	OK
6	B	3.02	SW3.02	20.9	4.9	150	1200	10.48	10.53	12.00	0.23	-0.107	0.00	0.00	OK
7	B	4.01	SW4.01	16.1	5.6	150	1200	10.65	10.71	12.00	0.35	-0.093	0.00	0.00	OK
8	S1	5.01	SW5.01	18.3	4.3	150	1200	10.65	10.69	12.00	0.24	-0.107	0.00	0.00	OK
9	B	4.02	SW4.02	16.1	9.9	150	1200	10.38	10.47	12.00	0.61	-0.061	0.00	0.00	OK
10	B	4.03	SW4.03	30.5	15.5	150	1200	10.01	10.08	12.00	0.51	-0.075	0.00	0.00	OK
11	I	1.04	SW1.04	38.5	24.5	225	1200	9.65	9.79	12.00	0.64	-0.087	0.00	0.00	OK
12	B	6.01	SW6.01	61.2	16.7	225	1200	10.57	10.65	12.00	0.27	-0.153	0.00	0.00	OK
13	I	1.05	SW1.05	71.2	41.2	300	1200	9.54	9.71	12.00	0.58	-0.130	0.00	0.00	OK
14	B	7.01	SW7.01	23.5	13.9	150	1200	10.57	10.66	12.00	0.59	-0.064	0.00	0.00	OK
15	B	8.01	SW8.01	68.9	16.0	225	1200	10.57	10.64	12.00	0.23	-0.161	0.00	0.00	OK
16	I	1.06	SW1.06	71.2	57.2	300	1200	9.27	9.49	12.00	0.80	-0.075	0.00	0.00	OK
17	B	9.01	SW9.01	38.5	20.9	225	1200	10.57	10.70	12.00	0.54	-0.105	0.00	0.00	OK
18	B	9.02	SW9.02	38.5	25.2	225	1200	10.49	10.63	12.00	0.66	-0.084	0.00	0.00	OK
19	B	9.03	SW9.03	38.5	25.2	225	1200	10.32	10.47	12.00	0.66	-0.084	0.00	0.00	OK
20	S1	10.01	SW10.01	23.5	4.3	150	1200	10.65	10.69	12.00	0.18	-0.114	0.00	0.00	OK
21	B	9.04	SW9.04	111.2	29.6	225	1200	10.21	10.28	12.00	0.27	-0.155	0.00	0.00	OK
22	I	1.07	SW1.07	131.4	86.8	400	1350	9.10	9.35	12.00	0.66	-0.148	0.00	0.00	OK

MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes		
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 2	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs	Hydrograph duration: 60 mins	Time to peak: 30.0 mins
Calc. by: IJ	Date: 21/02/08	Checked by	Date	Approved by	Date	

Notes

Printout headings

1) Entry no - position in file
2) Section no - pipe identifier
3) Manhole ref - Manhole identifier
4) Pipe cap - full bore capacity of that pipe
5) Rate of flow - calculated flow rate (l/s)
6) Pipe diam - outlet pipe diameter (mm)
7) Chamber diam - chamber diam. at base of MH
8) Invert level - invert level of manhole
9) Water level - calculated peak water level.
10) Grnd level - ground / cover level
11) Surch. fract - calc.flow/pipe capacity
12) Surch. depth - surcharge level above soffit
13) Overflow - surcharged flow rate (l/s)
14) Flooded vol - volume of water above cover
15) Status - OK - outlet not surcharged
16) Status - Surcharged - outlet surcharged
17) Status - Warning - water level at/above warning
18) Status - Flooded - cover over-topped

Title box

Hydrograph data

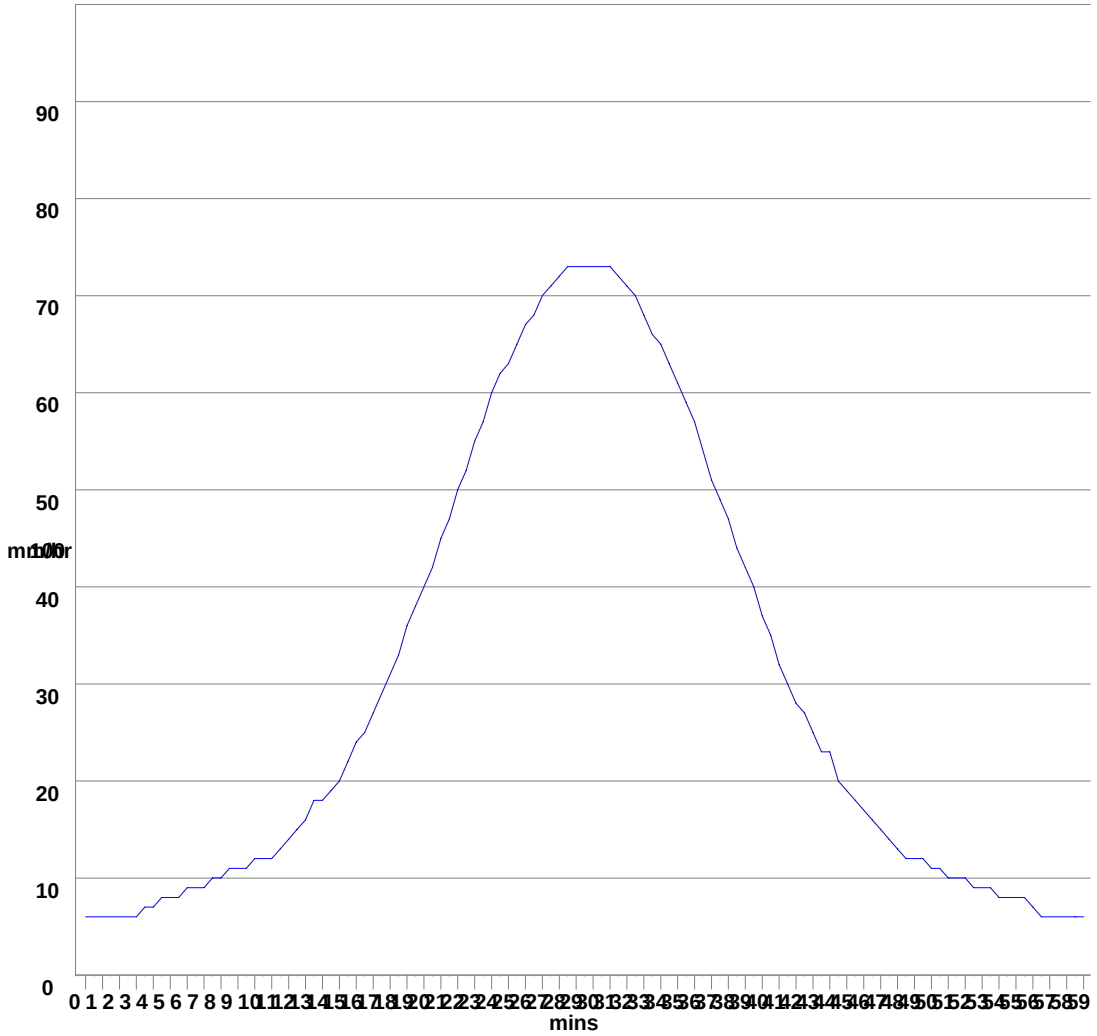
1) Ret. period - that used to calculate profile
2) Duration - length of storm (mins)
3) Profile - either Winter (75%) or Summer (50%)

MasterDrain
SW 10.85

Company: Demonstration Version			Project: Bona Homes
Item: Rainfall Hyetograph		Job Ref: 08/0045	Sheet no.: 3 / Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon	Drainage Engineer: J Greene	Hydrograph ret.per.: 30 yrs	Hydrograph duration: 60 mins / Time to peak: 30.0 mins
Calc. by: IJ / Date: 21/02/08	Checked by / Date	Approved by / Date	

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:30	6.00	20:30	40.00	40:30	37.00
1:00	6.00	21:00	42.00	41:00	35.00
1:30	6.00	21:30	45.00	41:30	32.00
2:00	6.00	22:00	47.00	42:00	30.00
2:30	6.00	22:30	50.00	42:30	28.00
3:00	6.00	23:00	52.00	43:00	27.00
3:30	6.00	23:30	55.00	43:30	25.00
4:00	7.00	24:00	57.00	44:00	23.00
4:30	7.00	24:30	60.00	44:30	23.00
5:00	8.00	25:00	62.00	45:00	20.00
5:30	8.00	25:30	63.00	45:30	19.00
6:00	8.00	26:00	65.00	46:00	18.00
6:30	9.00	26:30	67.00	46:30	17.00
7:00	9.00	27:00	68.00	47:00	16.00
7:30	9.00	27:30	70.00	47:30	15.00
8:00	10.00	28:00	71.00	48:00	14.00
8:30	10.00	28:30	72.00	48:30	13.00
9:00	11.00	29:00	73.00	49:00	12.00
9:30	11.00	29:30	73.00	49:30	12.00
10:00	11.00	30:00	73.00	50:00	12.00
10:30	12.00	30:30	73.00	50:30	11.00
11:00	12.00	31:00	73.00	51:00	11.00
11:30	12.00	31:30	73.00	51:30	10.00
12:00	13.00	32:00	72.00	52:00	10.00
12:30	14.00	32:30	71.00	52:30	10.00
13:00	15.00	33:00	70.00	53:00	9.00
13:30	16.00	33:30	68.00	53:30	9.00
14:00	18.00	34:00	66.00	54:00	9.00
14:30	18.00	34:30	65.00	54:30	8.00
15:00	19.00	35:00	63.00	55:00	8.00
15:30	20.00	35:30	61.00	55:30	8.00
16:00	22.00	36:00	59.00	56:00	8.00
16:30	24.00	36:30	57.00	56:30	7.00
17:00	25.00	37:00	54.00	57:00	6.00
17:30	27.00	37:30	51.00	57:30	6.00
18:00	29.00	38:00	49.00	58:00	6.00
18:30	31.00	38:30	47.00	58:30	6.00
19:00	33.00	39:00	44.00	59:00	6.00
19:30	36.00	39:30	42.00	59:30	6.00
20:00	38.00	40:00	40.00	60:00	5.00

Hydrograph profile derived from data in the Flood Studies Report



Surcharge 15mins/30 years surcharged at 1 metre

MasterDrain
SW 10.85

Company: Demonstration Version						Project: Bona Homes		
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW						Job Ref: 08/0045	Sheet no.: 1	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene				Hydrograph ret.per.: 30 yrs	Hydrograph duration: 15 mins	Time to peak: 7.5 mins
Calc. by:	Date: 21/02/08	Checked by:	Date:			Approved by:		Date:
Location: BOURNEMOUTH	Nat. Grid ref: SZ0991	M5-60: 19.00	r: 0.34	SAAR: 800		WRAP: 1	Soil index: 0.15	Flood warning level: 300mm

1 metre surcharged outlet

Peak hydrograph values printed

Entry No.		SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE DIAM mm	CHAMBER DIAM/LxW mm	STATIC LEVEL m	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	SURCHARGE Depth	OVERFLOW l/s	FLOODED VOL m³	STATUS
1	I	1.01	SW1.01	16.1	3.2	150	1200	0.00	10.65	10.69	12.00	0.20	-0.111	0.00	0.00	OK
2	I	1.02	SW1.02	16.1	9.7	150	1200	0.00	10.48	10.57	12.00	0.60	-0.063	0.00	0.00	OK
3	B	2.01	SW2.01	35.7	6.5	150	1200	0.00	10.65	10.69	12.00	0.18	-0.114	0.00	0.00	OK
4	I	1.03	SW1.03	16.1	21.1	150	1200	0.12	9.98	10.28	12.00	1.31	0.151	4.94	0.00	Surcharged
5	B	3.01	SW3.01	16.1	3.2	150	1200	0.00	10.65	10.69	12.00	0.20	-0.111	0.00	0.00	OK
6	B	3.02	SW3.02	20.9	11.3	150	1200	0.00	10.48	10.56	12.00	0.54	-0.070	0.00	0.00	OK
7	B	4.01	SW4.01	16.1	13.0	150	1200	0.00	10.65	10.76	12.00	0.80	-0.038	0.00	0.00	OK
8	S1	5.01	SW5.01	18.3	10.1	150	1200	0.00	10.65	10.73	12.00	0.55	-0.068	0.00	0.00	OK
9	B	4.02	SW4.02	16.1	23.1	150	1200	0.00	10.38	10.58	12.00	1.43	0.046	6.97	0.00	Surcharged
10	B	4.03	SW4.03	30.5	36.1	150	1200	0.09	10.01	10.29	12.00	1.18	0.130	5.51	0.00	Surcharged
11	I	1.04	SW1.04	38.5	57.1	225	1200	0.45	9.65	10.45	12.00	1.48	0.575	18.64	0.00	Surcharged
12	B	6.01	SW6.01	61.2	38.9	225	1200	0.00	10.57	10.71	12.00	0.64	-0.088	0.00	0.00	OK
13	I	1.05	SW1.05	71.2	96.0	300	1200	0.56	9.54	10.57	12.00	1.35	0.727	24.84	0.00	Surcharged
14	B	7.01	SW7.01	23.5	32.4	150	1200	0.00	10.57	10.78	12.00	1.38	0.059	8.89	0.00	Surcharged
15	B	8.01	SW8.01	68.9	37.3	225	1200	0.00	10.57	10.70	12.00	0.54	-0.105	0.00	0.00	OK
16	I	1.06	SW1.06	71.2	133.3	300	1200	0.83	9.27	10.81	12.00	1.87	1.245	62.11	0.00	Surcharged
17	B	9.01	SW9.01	38.5	48.6	225	1200	0.00	10.57	10.87	12.00	1.26	0.067	10.14	0.00	Surcharged
18	B	9.02	SW9.02	38.5	58.7	225	1200	0.00	10.49	10.85	12.00	1.53	0.134	20.27	0.00	Surcharged
19	B	9.03	SW9.03	38.5	58.7	225	1200	0.00	10.32	10.68	12.00	1.53	0.134	20.27	0.00	Surcharged
20	S1	10.01	SW10.01	23.5	10.1	150	1200	0.00	10.65	10.72	12.00	0.43	-0.083	0.00	0.00	OK
21	B	9.04	SW9.04	111.2	68.9	225	1200	0.00	10.21	10.35	12.00	0.62	-0.091	0.00	0.00	OK
22	I	1.07	SW1.07	131.4	202.1	400	1350	1.00	9.10	10.87	12.00	1.54	1.371	70.71	0.00	Surcharged

MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes		
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 2	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs	Hydrograph duration: 15 mins	Time to peak: 7.5 mins
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date	

Notes

Printout headings

1) Entry no - position in file
2) Section no - pipe identifier
3) Manhole ref - Manhole identifier
4) Pipe cap - full bore capacity of that pipe
5) Rate of flow - calculated flow rate (l/s)
6) Pipe diam - outlet pipe diameter (mm)
7) Chamber diam - chamber diam. at base of MH, or Manhole length x width
8) Static level - 1m surcharge level
9) Invert level - invert level of manhole
10) Water level - calculated peak water level.
11) Grnd level - ground / cover level
12) Surch. fract - calc.flow/pipe capacity
13) Surch. depth - surcharge level above soffit
14) Overflow - surcharged flow rate (l/s)
15) Flooded vol - volume of water above cover
16) Status - OK - outlet not surcharged
17) Status - Surcharged - outlet surcharged
18) Status - Warning - water level at/above warning
19) Status - Flooded - cover over-topped

Title box

Hydrograph data

1) Ret. period - that used to calculate profile
2) Duration - length of storm (mins)
3) Profile - either Winter (75%) or Summer (50%)

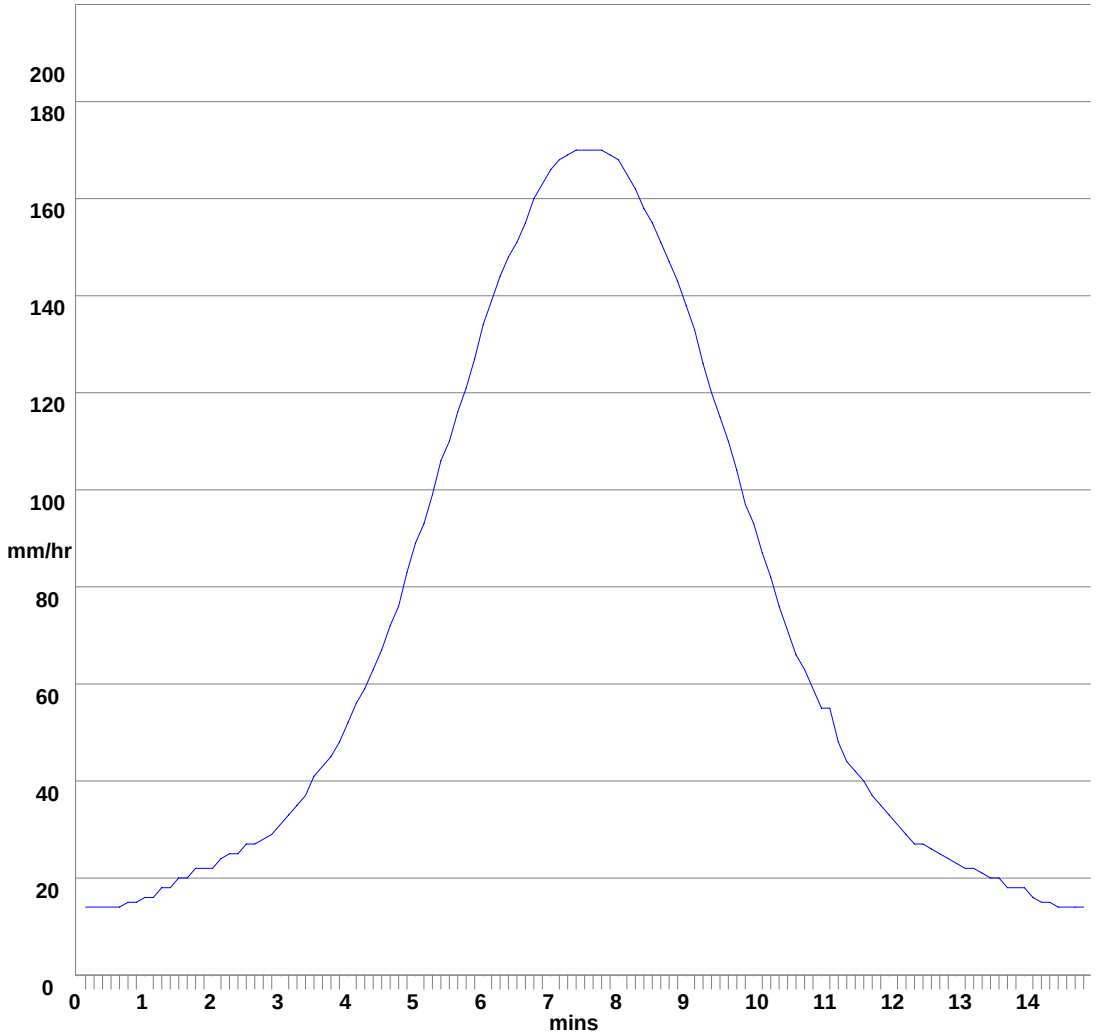
MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes	
Item: Rainfall Hyetograph				Job Ref: 08/0045	Sheet no.: 3
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs	Hydrograph duration: 15 mins
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date

Hydrograph profile: Winter 75%	Time to peak: 7.5 mins

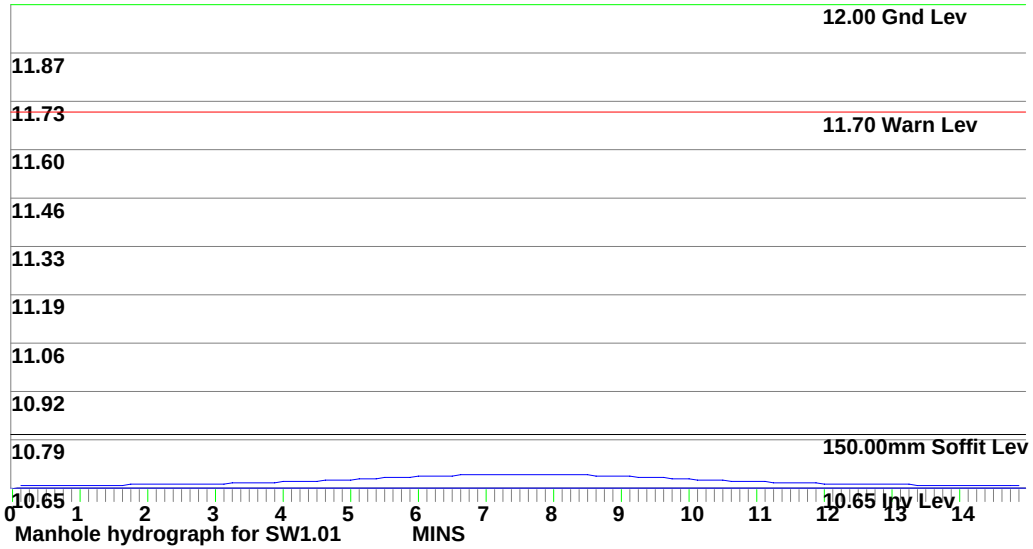
Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	14.00	5:08	93.00	10:08	87.00
0:15	14.00	5:15	99.00	10:15	82.00
0:22	14.00	5:22	106.00	10:22	76.00
0:30	14.00	5:30	110.00	10:30	71.00
0:38	14.00	5:38	116.00	10:38	66.00
0:45	15.00	5:45	121.00	10:45	63.00
0:52	15.00	5:52	127.00	10:52	59.00
1:00	16.00	6:00	134.00	11:00	55.00
1:08	16.00	6:08	139.00	11:08	55.00
1:15	18.00	6:15	144.00	11:15	48.00
1:22	18.00	6:22	148.00	11:22	44.00
1:30	20.00	6:30	151.00	11:30	42.00
1:38	20.00	6:38	155.00	11:38	40.00
1:45	22.00	6:45	160.00	11:45	37.00
1:52	22.00	6:52	163.00	11:52	35.00
2:00	22.00	7:00	166.00	12:00	33.00
2:08	24.00	7:08	168.00	12:08	31.00
2:15	25.00	7:15	169.00	12:15	29.00
2:22	25.00	7:22	170.00	12:22	27.00
2:30	27.00	7:30	170.00	12:30	27.00
2:38	27.00	7:38	170.00	12:38	26.00
2:45	28.00	7:45	170.00	12:45	25.00
2:52	29.00	7:52	169.00	12:52	24.00
3:00	31.00	8:00	168.00	13:00	23.00
3:08	33.00	8:08	165.00	13:08	22.00
3:15	35.00	8:15	162.00	13:15	22.00
3:22	37.00	8:22	158.00	13:22	21.00
3:30	41.00	8:30	155.00	13:30	20.00
3:38	43.00	8:38	151.00	13:38	20.00
3:45	45.00	8:45	147.00	13:45	18.00
3:52	48.00	8:52	143.00	13:52	18.00
4:00	52.00	9:00	138.00	14:00	18.00
4:08	56.00	9:08	133.00	14:08	16.00
4:15	59.00	9:15	126.00	14:15	15.00
4:22	63.00	9:22	120.00	14:22	15.00
4:30	67.00	9:30	115.00	14:30	14.00
4:38	72.00	9:38	110.00	14:38	14.00
4:45	76.00	9:45	104.00	14:45	14.00
4:52	83.00	9:52	97.00	14:52	14.00
5:00	89.00	10:00	93.00	15:00	12.00

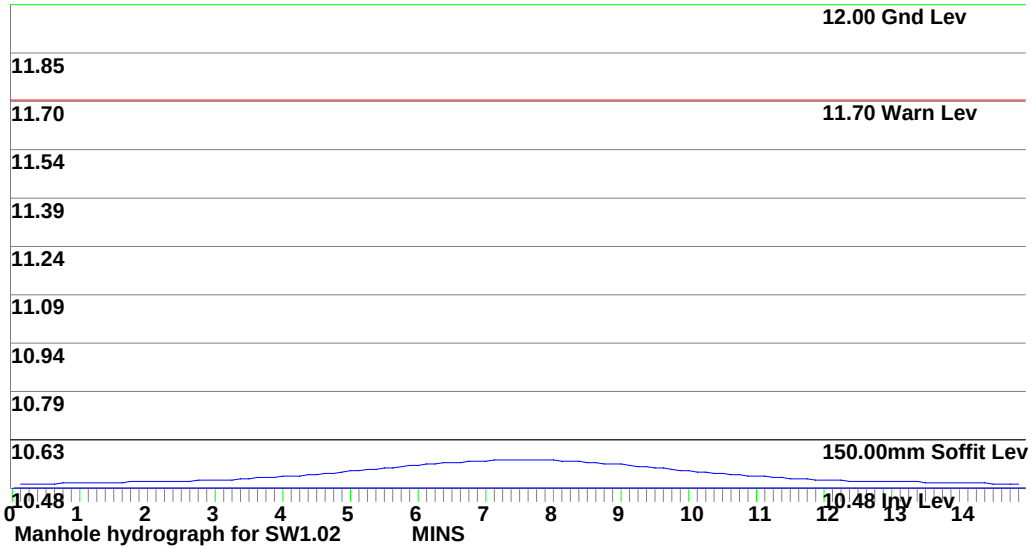
Hydrograph profile derived from data in the Flood Studies Report

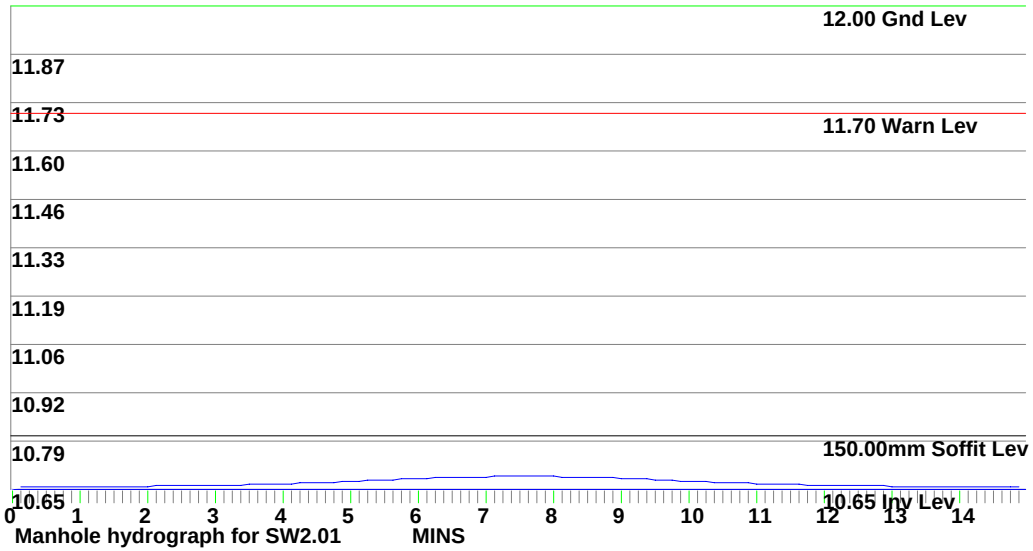


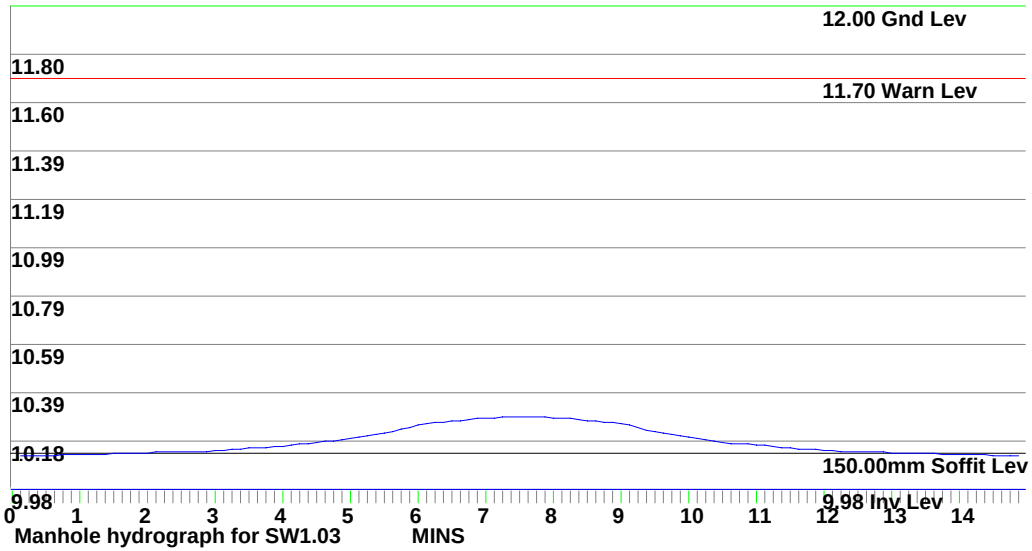
MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes		
Item: Manhole hydrographs				Job Ref: 08/0045	Sheet no.: 4	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs	Hydrograph duration: 15 mins	Time to peak: 7.5 mins
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date	



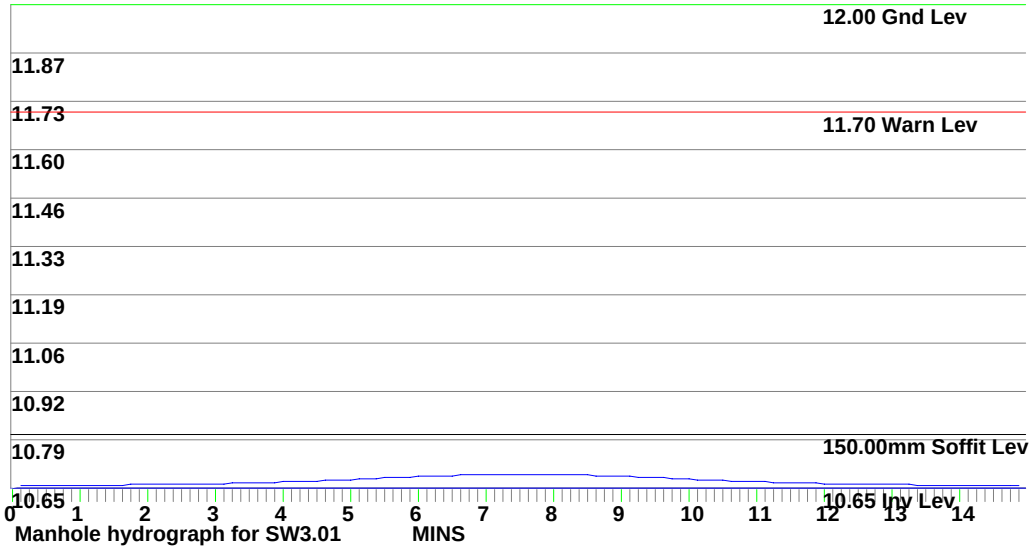


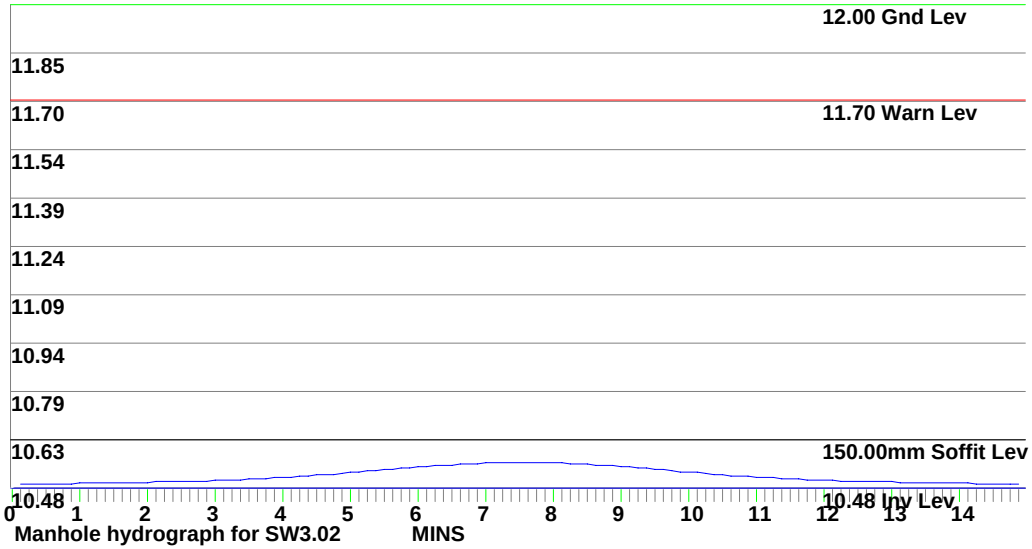


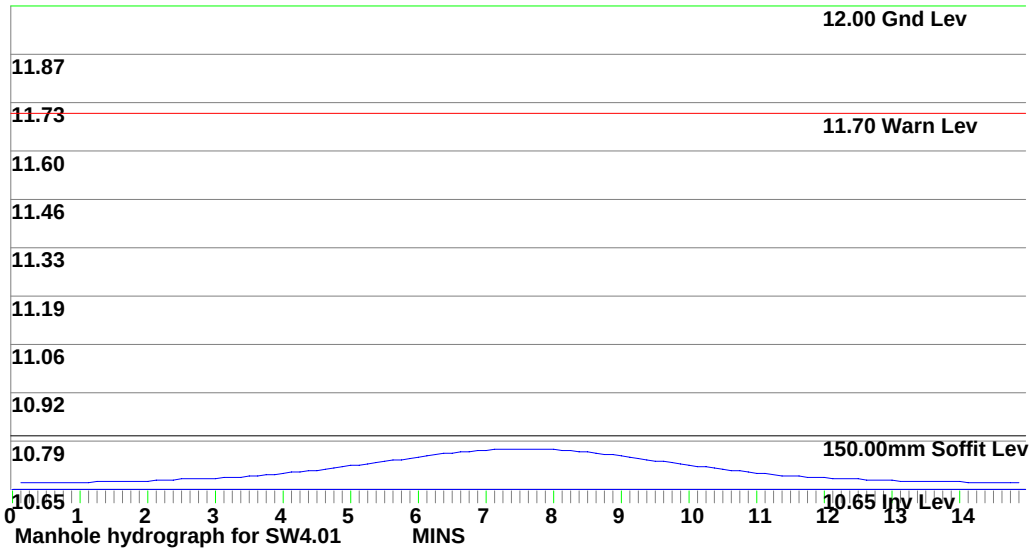


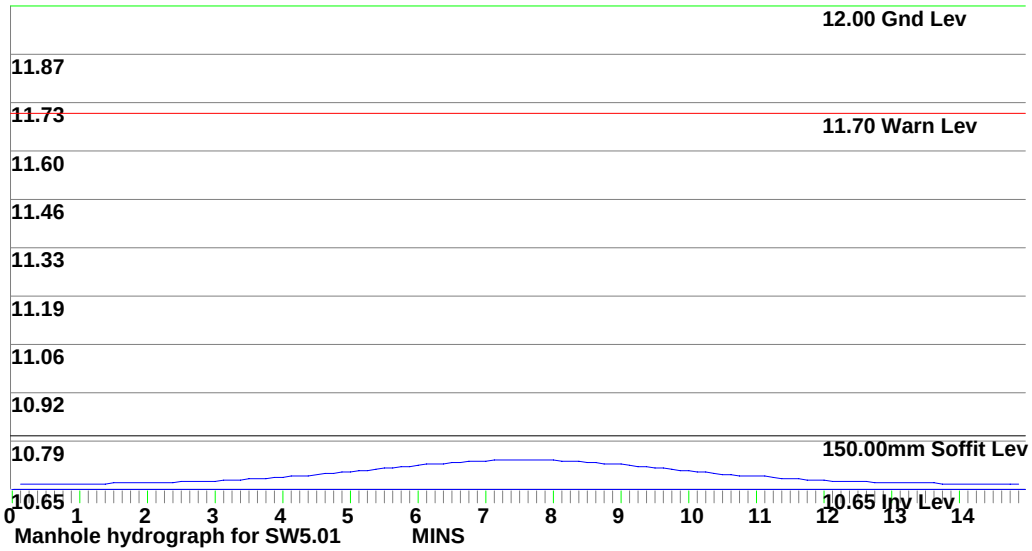
MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes	
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 5
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs	Hydrograph duration: 15 mins
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date



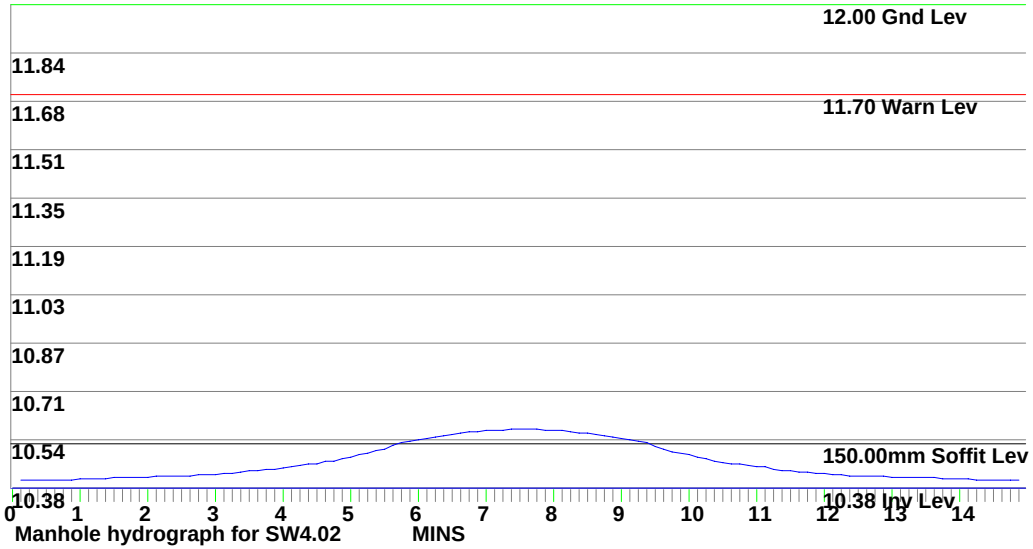


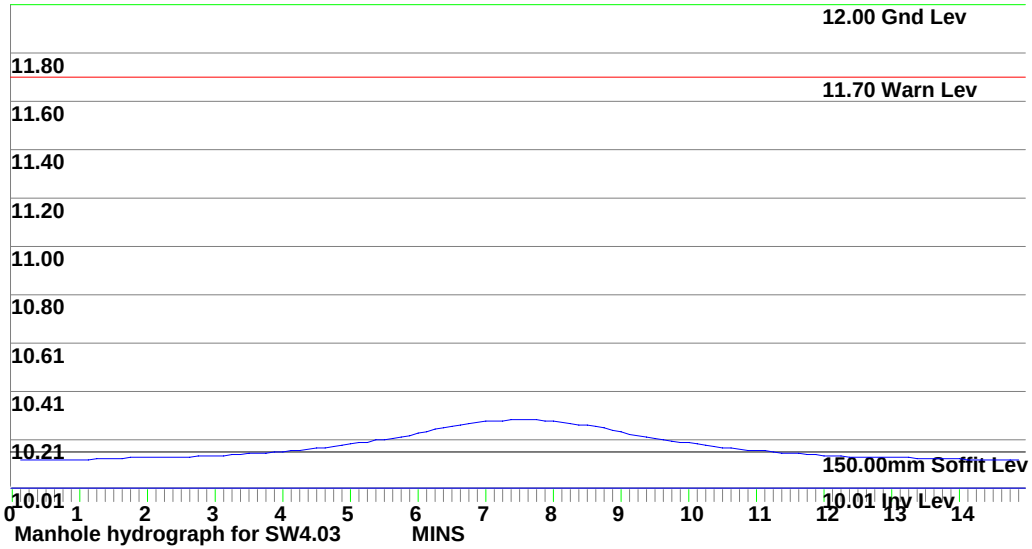


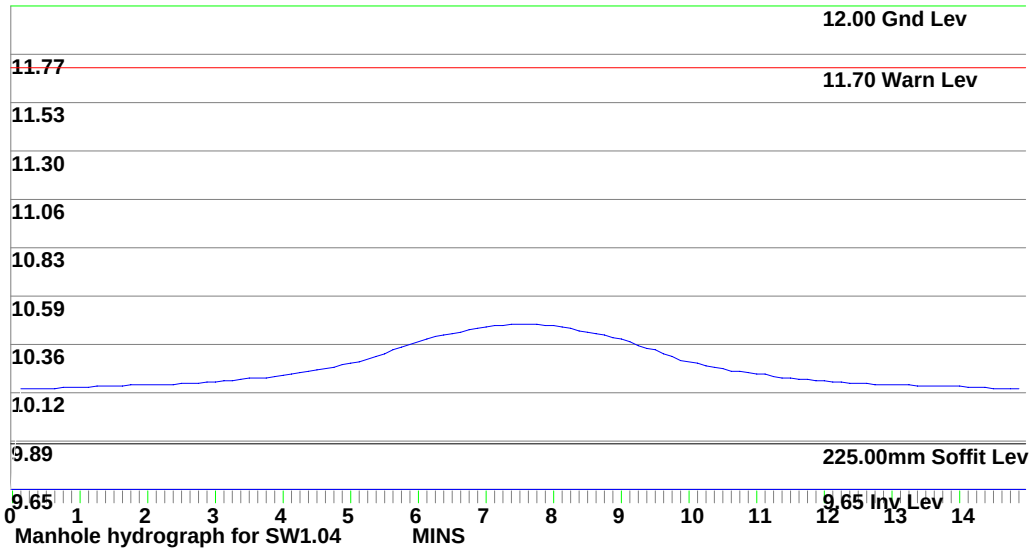


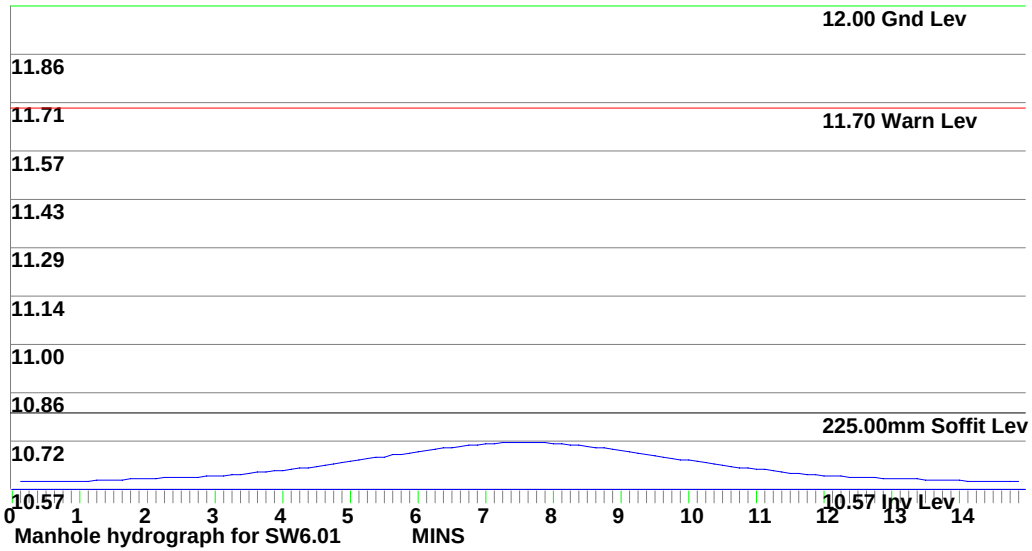
MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes	
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 6 / Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs / Hydrograph duration: 15 mins / Time to peak: 7.5 mins	
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date



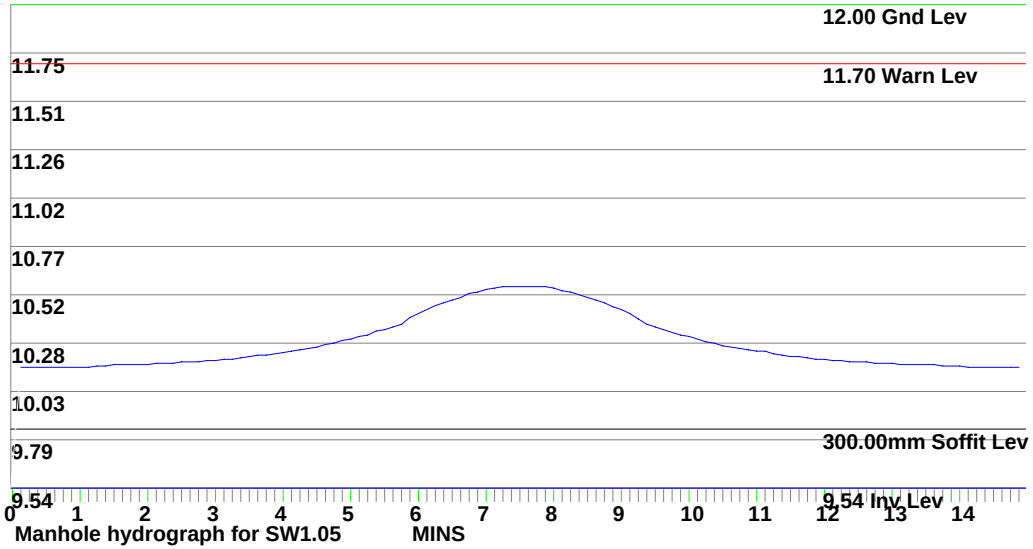




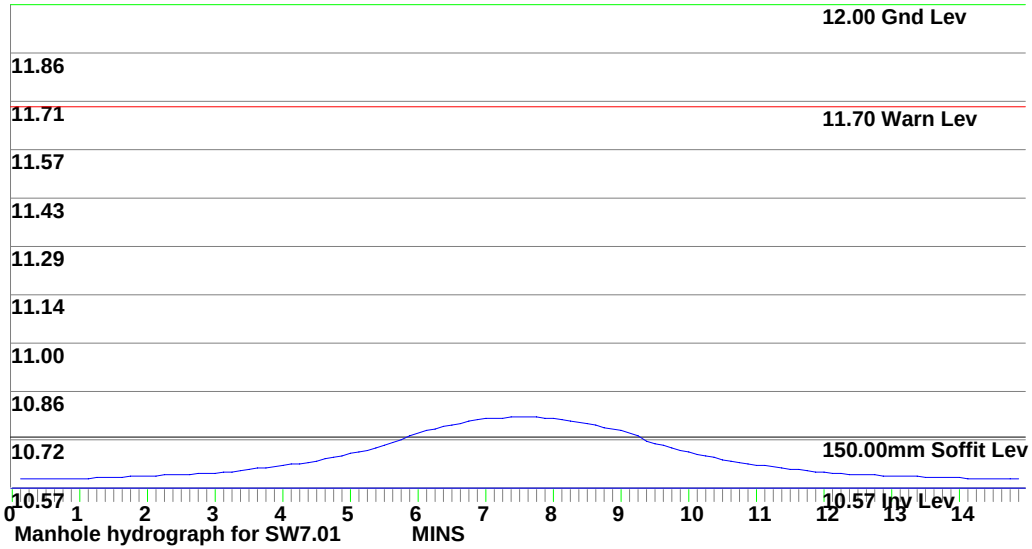


MasterDrain
SW 10.85

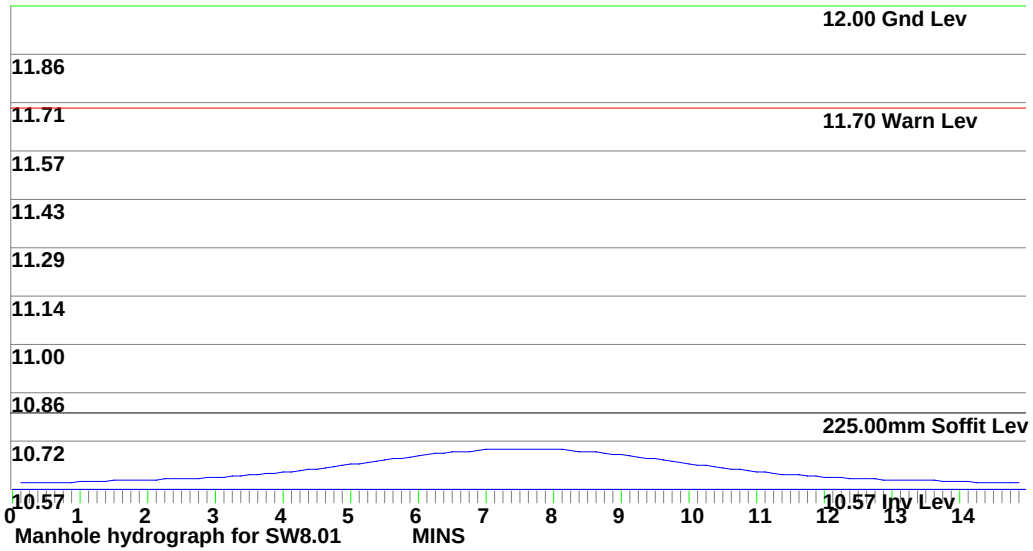
Company: Demonstration Version				Project: Bona Homes		
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 7	Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs	Hydrograph duration: 15 mins	Time to peak: 7.5 mins
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date	



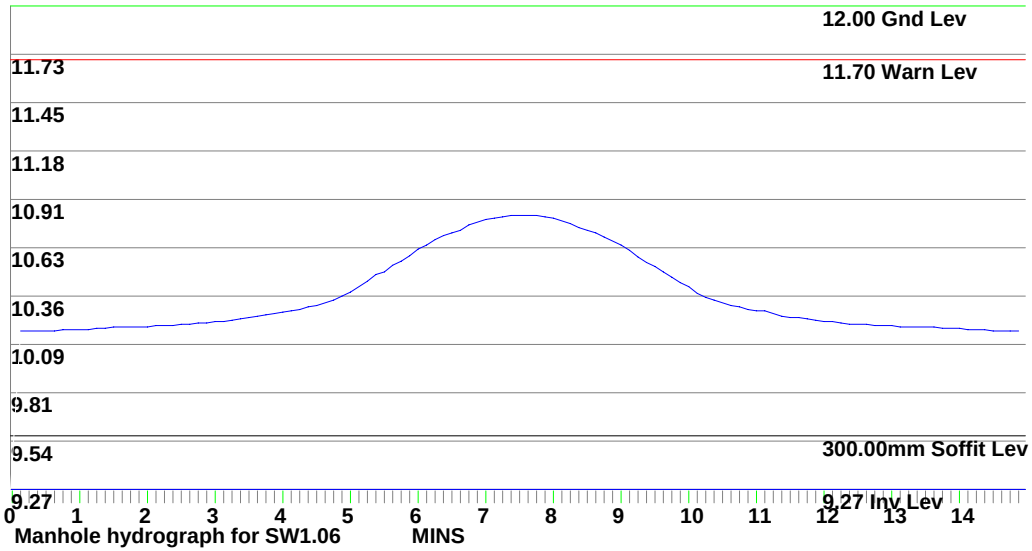
Manhole hydrograph for SW1.05



Manhole hydrograph for SW7.01



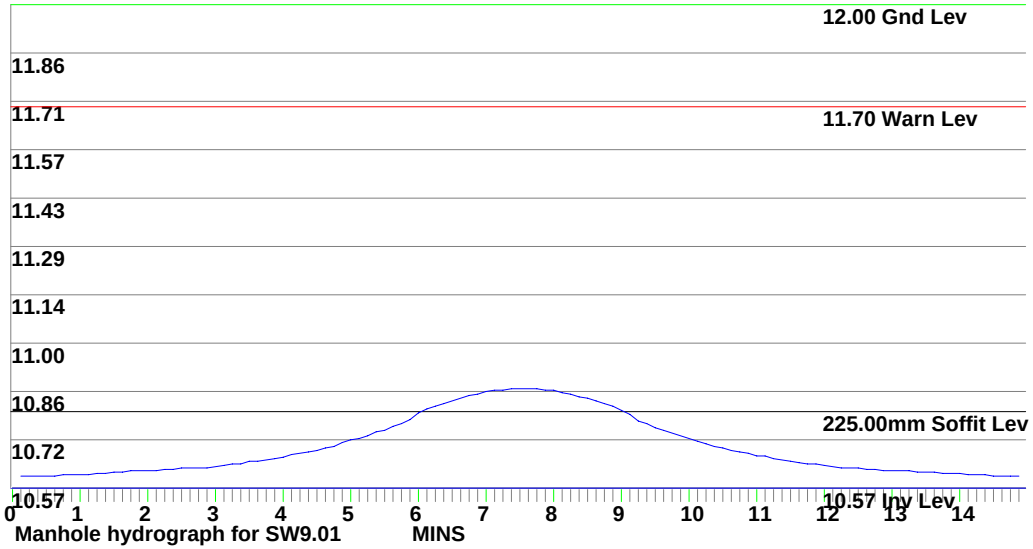
Manhole hydrograph for SW8.01

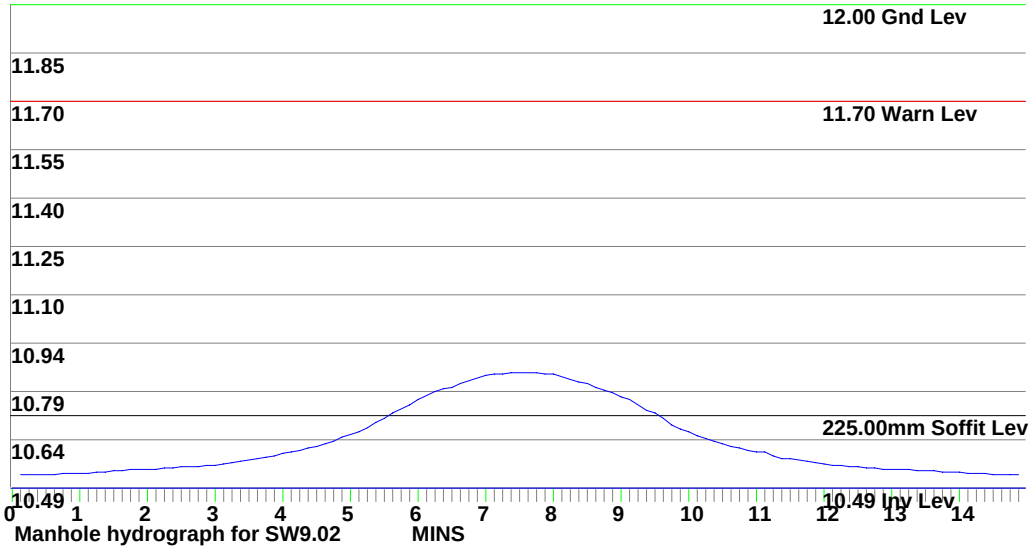


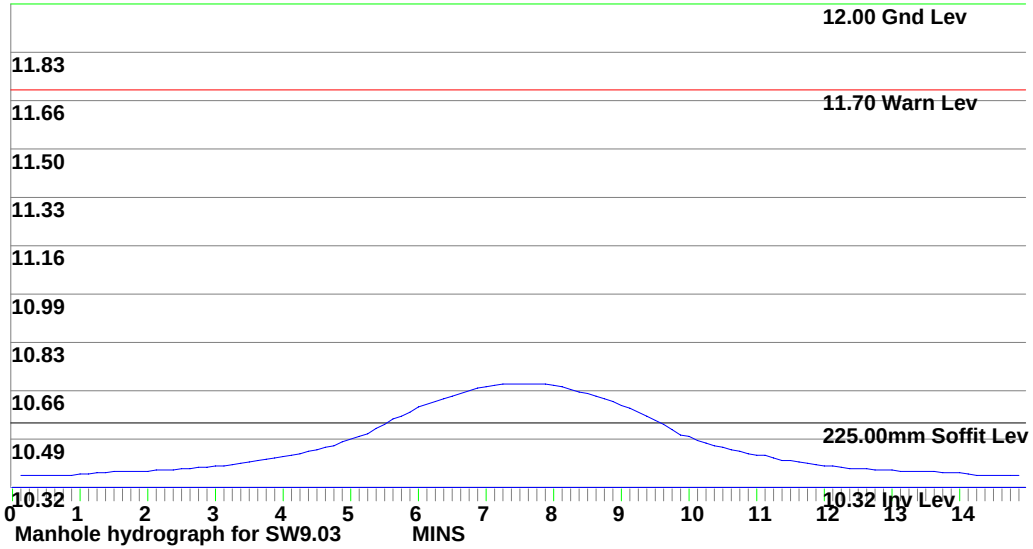
Manhole hydrograph for SW1.06

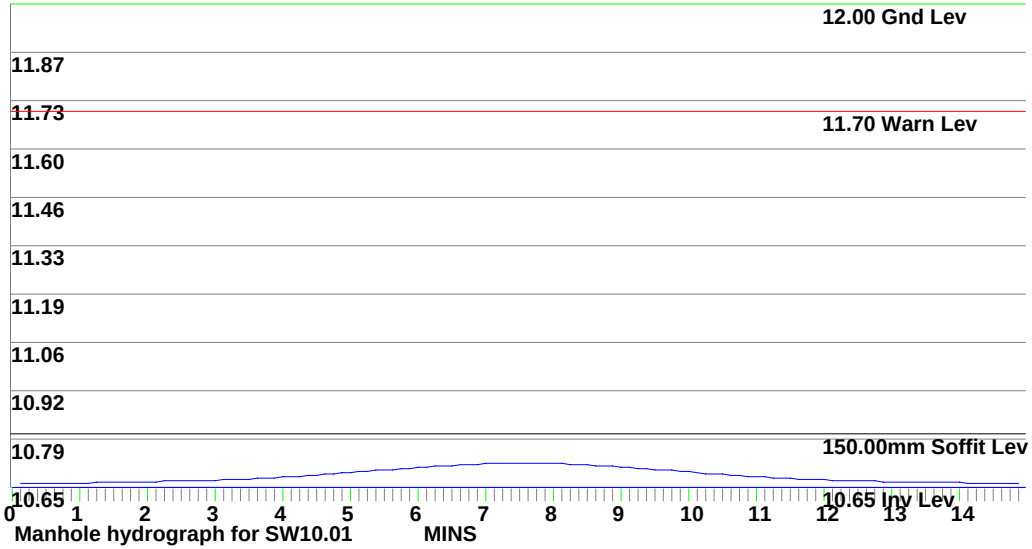
MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes	
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 8 / Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs / Hydrograph duration: 15 mins / Time to peak: 7.5 mins	
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date



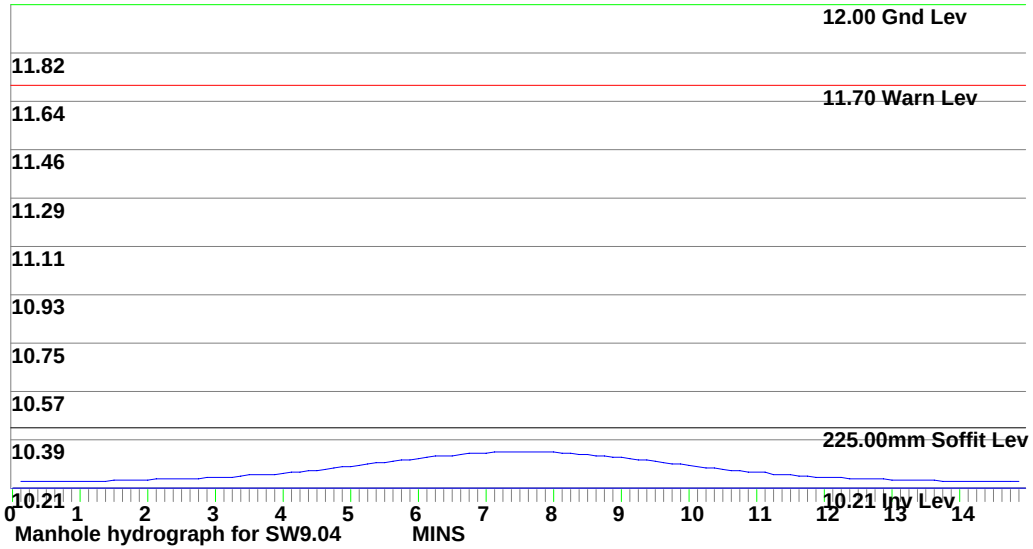


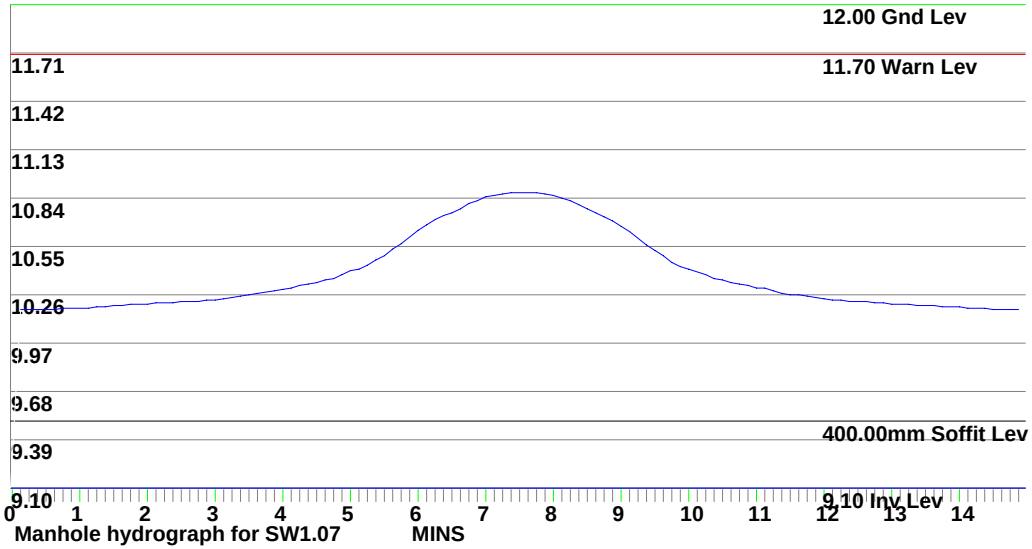




MasterDrain
SW 10.85

Company: Demonstration Version				Project: Bona Homes	
Item: Surcharge calcs (Sized at 2 yrs storm) for COLLEGE.SW				Job Ref: 08/0045	Sheet no.: 9 / Hydrograph profile: Winter 75%
Principal Engineer: A McCutcheon		Drainage Engineer: J Greene		Hydrograph ret.per.: 30 yrs / Hydrograph duration: 15 mins / Time to peak: 7.5 mins	
Calc. by	Date: 21/02/08	Checked by	Date	Approved by	Date





Manhole schedule

MasterDrain
SW 10.85

Company	Project	
Demonstration Version	Bona Homes	
Item	**Job Ref**	**Sheet no.**
Manhole printout for COLLEGE.SW	08/0045	1

Calc. by	Date	Checked by	Date	Approved by	Date
IJ			21/02/08		

Manhole ref.	X ref	Y ref	Form	Cham diam. or length	Rect. width	Chamb. height	Shaft height	MH Volume	Exit Diam	Exit Crown	Exit Invert	Cover Level	Dwnstr MH
SW1.01	N/A	N/A	circ	1200	N/A	1.35	N/A	1.53	150	10.825	10.650	12.000	SW1.02
SW1.02	N/A	N/A	circ	1200	N/A	1.52	N/A	1.72	150	10.658	10.483	12.000	SW1.03
SW2.01	N/A	N/A	circ	1200	N/A	1.35	N/A	1.53	150	10.825	10.650	12.000	SW1.03
SW1.03	N/A	N/A	circ	1200	N/A	2.02	N/A	2.28	150	10.158	9.983	12.000	SW1.04
SW3.01	N/A	N/A	circ	1200	N/A	1.35	N/A	1.53	150	10.825	10.650	12.000	SW3.02
SW3.02	N/A	N/A	circ	1200	N/A	1.52	N/A	1.72	150	10.658	10.483	12.000	SW1.04
SW4.01	N/A	N/A	circ	1200	N/A	1.35	N/A	1.53	150	10.825	10.650	12.000	SW4.02
SW5.01	N/A	N/A	circ	1200	N/A	1.35	N/A	1.53	150	10.825	10.650	12.000	SW4.02
SW4.02	N/A	N/A	circ	1200	N/A	1.62	N/A	1.83	150	10.558	10.383	12.000	SW4.03
SW4.03	N/A	N/A	circ	1200	N/A	1.99	N/A	2.25	150	10.183	10.008	12.000	SW1.04
SW1.04	N/A	N/A	circ	1200	N/A	2.35	N/A	2.66	225	9.900	9.650	12.000	SW1.05
SW6.01	N/A	N/A	circ	1200	N/A	1.43	N/A	1.61	225	10.825	10.575	12.000	SW1.05
SW1.05	N/A	N/A	circ	1200	N/A	2.46	N/A	2.78	300	9.864	9.539	12.000	SW1.06
SW7.01	N/A	N/A	circ	1200	N/A	1.43	N/A	1.61	150	10.750	10.575	12.000	SW1.06
SW8.01	N/A	N/A	circ	1200	N/A	1.43	N/A	1.61	225	10.825	10.575	12.000	SW1.06
SW1.06	N/A	N/A	circ	1200	N/A	2.00	0.73	2.73	300	9.593	9.268	12.000	SW1.07
SW9.01	N/A	N/A	circ	1200	N/A	1.43	N/A	1.61	225	10.825	10.575	12.000	SW9.02
SW9.02	N/A	N/A	circ	1200	N/A	1.51	N/A	1.71	225	10.742	10.492	12.000	SW9.03
SW9.03	N/A	N/A	circ	1200	N/A	1.68	N/A	1.89	225	10.575	10.325	12.000	SW9.04
SW10.01	N/A	N/A	circ	1200	N/A	1.35	N/A	1.53	150	10.825	10.650	12.000	SW9.04
SW9.04	N/A	N/A	circ	1200	N/A	1.79	N/A	2.02	225	10.464	10.214	12.000	SW1.07
SW1.07	N/A	N/A	circ	1350	N/A	2.00	0.90	3.43	400	9.526	9.101	12.000	Outfall

Levels calculated for level crowns

MasterDrain
SW 10.85

Company				Project	
Demonstration Version				Bona Homes	
Item				Job Ref	Sheet no.
Manhole printout notes				08/0045	2
Calc. by	Date	Checked by	Date	Approved by	Date
IJ			21/02/08		

These explanatory notes should be read in conjunction with the Manhole printout

1) Manhole ref - the reference for the manhole in question
2) Form - either circular or rectangular
3) Chamber diam or length - diameter of chamber if circular, or length if rectangular - in metres
4) Rectangular width - if form is rectangular, this gives the width of the chamber
5) Chamber height - height of chamber from invert
6) Shaft height - height of access shaft if applicable, from top of chamber to ground level
7) Manhole volume - cubic capacity of manhole chamber
8) Exit diameter - diameter of pipe leaving this manhole
9) Exit crown - crown level of pipe leaving this manhole
10) Exit invert - invert level of pipe leaving this manhole
11) Manhole diameters of 9999 have exceeded the sizes available in SfA
12) Manhole diameters may have to be modified due to the number of branches

Peak flow storage calculation

MasterDrain
SW 10.85

Company				Project	
Demonstration Version				Bona Homes	
Item				Job Ref	Sheet no.
Peak flow storage calcs for BOURNEMOUTH				08/0045	1
Calc. by	Date	Checked by	Date	Approved by	Date
IJ	21/02/08				

Data:-

FSR Hydrology:-

Location	= BOURNEMOUTH	Grid reference	= SZ0991
M5-60 (mm)	= 19	r	= 0.34
Soil index	= 0.15	SAAR (mm/yr)	= 800
Return period	= 30	UCWI	= 84.0

Soil classification for WRAP type 1

i) Well drained permeable sandy or loam soils and shallower analogues over highly permeable limestone, chalk, sandstone or related drifts;

ii) Earthy peat soils drained by dykes and pumps;

iii) Less permeable loamy over clayey soils on plateaux adjacent to very permeable soils in valleys.

The above data is taken from the Hydrological maps of HR Wallingford by permission.
Soil classification for WRAP type 1

Runoff factor (RF) = 72.5, calculated from:-

Runoff factor = (0.829*PIMP)+(25*SOIL)+(0.078*UCWI)-20.7
where
PIMP = Impervious Area*100/(Impervious Area+Pervious Area)
UCWI = Calculated value for Wetness Index

Design data:-

Imperv. area	= 15175 m²	Pervious area	= 0 m²
Total area (TA)	= 15175 m²	Equiv area	= 11002 m² (TA x RF).
Discharge to drain	= 7.60 l/s	Areal reduction factor	= 0.980

Calculated data:-

Time to max	= 290.0 mins	Storage volume	= 371.1 m³
Rainfall at max	= 9.49 mm/hr	Discharge rate per Ha	= 5.01 l/s/Ha

Adjustments to result for climate change:-

Volume as calculated above	-	Storage volume = 371.1 m³
Volume + 10% for normal discharge (W5-074)	-	Storage volume = 408.2 m³
Volume + 20% for discharge into river flows (DEFRA)	-	Storage volume = 445.3 m³

Rainfall intensities calculated using the Wallingford Procedure

Storage lengths for initial calculation (x 1.1 or 1.2 as above if required) :-

Diam	Len	Diam	Len	Box culvert	Len
100	47261.1	1125	373.4	500 x 500	1484.5
150	21004.9	1200	328.2	500 x 750	989.6
225	9335.5	1275	290.7	500 x 1000	742.2
300	5251.2	1350	259.3	750 x 1000	494.8
375	3360.8	1425	232.7	750 x 1200	412.4
450	2333.9	1500	210.0	750 x 1500	329.9
525	1714.7	1575	190.5	1000 x 1000	371.1
600	1312.8	1650	173.6	1000 x 1200	309.3
675	1037.3	1725	158.8	1000 x 1500	247.4
750	840.2	1800	145.9	1000 x 1800	206.2
825	694.4	1875	134.4	1000 x 2000	185.6
900	583.5	1950	124.3	1500 x 1500	164.9
975	497.2	2025	115.3	1500 x 1800	137.5
1050	428.7	2100	107.2	1500 x 2000	123.7

Company		Project	
Demonstration Version		Bona Homes	
Item		Job Ref	Sheet no.
Peak flow storage calcs for BOURNEMOUTH		08/0045	2
Calc. by	Date	Checked by	Date	Approved by	Date
IJ	21/02/08				

MasterDrain
SW 10.85

Data:-

Time (mins)	Rain mm/hr	Inflow (m3)	Outflow (m3)	Balance (m3)
10.0	83.0	152.210	4.560	147.650
20.0	58.0	211.349	9.120	202.229
30.0	45.0	248.917	13.680	235.237
40.0	38.0	277.020	18.240	258.780
50.0	33.0	299.674	22.800	276.874
60.0	29.0	318.752	27.360	291.392
70.0	26.0	335.286	31.920	303.366
80.0	24.0	349.908	36.480	313.428
90.0	22.0	363.033	41.040	321.993
100.0	20.0	374.951	45.600	329.351
110.0	19.0	385.872	50.160	335.712
120.0	18.0	395.954	54.720	341.234
130.0	17.0	405.320	59.280	346.040
140.0	16.0	414.064	63.840	350.224
150.0	15.0	422.265	68.400	353.865
160.0	15.0	429.986	72.960	357.026
170.0	14.0	437.279	77.520	359.759
180.0	13.0	444.187	82.080	362.107
190.0	13.0	450.749	86.640	364.109
200.0	12.0	456.995	91.200	365.795
210.0	12.0	462.954	95.760	367.194
220.0	12.0	468.649	100.320	368.329
230.0	11.0	474.102	104.880	369.222
240.0	11.0	479.330	109.440	369.890
250.0	11.0	484.351	114.000	370.351
260.0	10.0	489.177	118.560	370.617
270.0	10.0	494.008	123.120	370.888
280.0	10.0	498.750	127.680	371.070
290.0	9.0	503.357	132.240	371.117
300.0	9.0	507.838	136.800	371.038
310.0	9.0	512.202	141.360	370.842
320.0	9.0	516.453	145.920	370.533
330.0	9.0	520.599	150.480	370.120
340.0	8.0	524.646	155.040	369.606
350.0	8.0	528.598	159.600	368.998
360.0	8.0	532.461	164.160	368.301
370.0	8.0	536.239	168.720	367.519
380.0	8.0	539.935	173.280	366.655
390.0	8.0	543.555	177.840	365.715
400.0	7.0	547.100	182.400	364.700
410.0	7.0	550.575	186.960	363.615
420.0	7.0	553.983	191.520	362.463
430.0	7.0	557.327	196.080	361.247
440.0	7.0	560.609	200.640	359.969
450.0	7.0	563.831	205.200	358.631
460.0	7.0	566.996	209.760	357.236
470.0	7.0	570.107	214.320	355.787
480.0	7.0	573.165	218.880	354.285
490.0	6.0	576.172	223.440	352.732
500.0	6.0	579.131	228.000	351.131
510.0	6.0	582.042	232.560	349.482
520.0	6.0	584.908	237.120	347.788
530.0	6.0	587.730	241.680	346.050
540.0	6.0	590.509	246.240	344.269
550.0	6.0	593.248	250.800	342.448
560.0	6.0	595.947	255.360	340.587
570.0	6.0	598.607	259.920	338.687
580.0	6.0	601.230	264.480	336.750
590.0	6.0	603.817	269.040	334.777
600.0	6.0	606.369	273.600	332.769

Storage volume (m^3) = 371.1 m^3

IoH 124 greenfield runoff

MasterDrain Hydrology 5.75	Company: Demonstration version			Project:	
	Item: IoH 124 Runoff calcs for BOURNEMOUTH			Job Ref:	Sheet no.: 1
	Calc. by: IJ	Date: 21/02/08	Checked by:	Date:	Approved by: / Date:

Hydrological Data:-

FSR Hydrology:-

Location = BOURNEMOUTH
Grid reference = SZ0991
M5-60 (mm) = 19
r = 0.34
Soil runoff = 0.10
SAAR (mm/yr) = 800
WRAP = 1
Area = England & Wales
Hydrological area = 7
Hydrological zone = 7

Soil classification for WRAP type 1
i) Well drained permeable sandy or loam soils and shallower analogues over highly permeable limestone, chalk, sandstone or related drifts;
ii) Earthy peat soils drained by dykes and pumps;
iii) Less permeable loamy over clayey soils on plateaux adjacent to very permeable soils in valleys.

Design data:-

Area = 0.015 Km² - 1.5 Ha - 15000 m²

Calculation method:-

Runoff is calculated from:-

$$Q_{BAR(rural)} = 0.00108\ AREA^{0.89}\ .\ SAAR^{1.17}\ .\ SOIL^{2.17}$$

where

AREA = Site area in Km²
SAAR = Standard Average Annual Rainfall (mm/yr)
SOIL = Soil value derived from Winter Rainfall Acceptance Potential
$Q_{BAR(rural)}$ = Runoff (cumecs)

$Q_{BAR(rural)}$ is then multiplied by a growth factor - GC(T) - for different storm return periods derived from EA publication W5-074/A.

Calculated data:-

For areas less than 50Ha, a modified calculation which multiplies the 50Ha runoff value by the ratio of the site area to 50Ha is used
Reducing factor used for these calculations is 0.030

Mean Annual Peak Flow $Q_{BAR(rural)}$ = 0.29 l/s

Values for $Q_{BAR(rural)}$

1 year	2 year	5 year	30 year	100 year	Units
0.00	0.00	0.00	0.00	0.00	cumecs
0.25	0.29	0.38	0.66	0.93	l/s
0.17	0.19	0.25	0.44	0.62	l/s/Ha
0.850	0.970	1.280	2.230	3.150	GC(T)

The above is based on the Institute of Hydrology Report 124 to which you are referred for further details (see Sect 7).