

The alternative drainage design software

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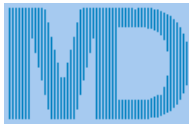
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Job No. 1234/2010		
Sheet no. 1		
Date 24/09/10		
By IJ	Checked	Approved

Project **Crown Estates**

Title **Calculations (2 yrs storm) for COLLEGE.SW**

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:s	Rain mm/hr	Pipe vol	System vol
1	1.01	150	166	120	20.0	2.4	16.2	21.0	0.50	15.05	0.91	0.58	0:22	5:52	66.1	0.35	0.35
2	1.02	150	500	120	60.0	6.7	16.2	43.5	0.91	41.64	0.91	0.86	1:06	6:57	60.9	1.06	1.41
3	2.01	150	680	25	17.0	4.9	35.7	19.9	0.48	13.87	2.02	1.24	0:08	5:38	67.2	0.30	1.71
4	1.03	225	222	180	40.0	17.1	38.5	45.6	0.94	44.41	0.97	0.93	0:41	7:39	58.1	1.59	3.30
5	3.01	150	166	120	20.0	2.4	16.2	21.0	0.50	15.05	0.91	0.58	0:22	5:52	66.1	0.35	3.66
6	3.02	150	722	83	60.0	8.0	19.5	43.0	0.90	40.83	1.10	1.03	0:54	6:46	61.7	1.06	4.72
7	4.01	150	266	120	32.0	9.6	16.2	57.4	1.09	59.19	0.91	0.97	0:35	6:05	65.0	0.57	5.28
8	5.01	150	265	94	25.0	7.6	18.3	43.5	0.91	41.43	1.04	0.97	0:24	5:54	65.9	0.44	5.72
9	4.02	150	375	120	45.0	16.0	16.2	100.0	1.00	100.00	0.91	0.91	0:49	6:54	61.2	0.80	6.52
10	4.03	150	244	49	12.0	24.8	25.4	94.1	1.16	97.55	1.44	1.59	0:08	7:03	60.6	0.21	6.73
11	1.04	300	111	180	20.0	47.5	82.5	56.1	1.07	57.62	1.17	1.22	0:17	7:56	57.1	1.41	8.15
12	6.01	225	925	81	75.0	56.2	57.7	93.7	1.16	97.33	1.45	1.60	0:52	6:22	63.6	2.98	11.13
13	1.05	375	216	300	65.0	93.0	114.7	75.8	1.21	81.03	1.04	1.18	1:03	8:58	54.2	7.18	18.30
14	7.01	225	1136	66	75.0	47.1	64.0	69.1	1.18	73.60	1.61	1.80	0:47	6:17	64.0	2.98	21.29
15	8.01	225	1136	66	75.0	54.2	64.0	79.0	1.22	84.64	1.61	1.83	0:47	6:17	64.0	2.98	24.27
16	1.06	600	111	360	40.0	173.4	360.7	48.7	0.98	48.07	1.28	1.26	0:31	9:30	52.6	11.31	35.57
17	9.01	450	62	240	15.0	184.9	207.7	83.5	1.22	89.00	1.31	1.49	0:11	5:41	67.0	2.39	37.96
18	9.02	450	125	240	30.0	186.9	207.7	84.4	1.21	89.99	1.31	1.49	0:23	6:04	65.0	4.77	42.73
19	9.03	450	83	240	20.0	183.3	207.7	82.8	1.22	88.27	1.31	1.49	0:15	6:20	63.8	3.18	45.91
20	10.01	150	416	60	25.0	7.6	23.0	37.1	0.81	33.22	1.30	1.13	0:19	5:49	66.3	0.44	46.35
21	9.04	150	892	28	25.0	0.0	33.7	0.0	0.00	0.00	1.91	0.01	0:13	5:43	66.8	0.44	46.79
22	1.07	600	27	360	10.0	328.1	360.7	85.7	1.21	90.97	1.28	1.45	0:08	9:38	52.2	2.83	49.62



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SW 12.23



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Job No. 1234/2010		
Sheet no. 2		
Date 24/09/10		
By IJ	Checked	Approved

Project **Crown Estates**

Title **Calculations (2 yrs storm) for COLLEGE.SW**

Column heading definitions.

Input data - light blue areas on printout

Entry number - The file position (number) of this section's data. This is automatically calculated.

Section number - The reference number of this section, in the format XX.YY where XX is the run number and YY is the section number down that run.

Fall - The fall of this section along its length. This will be automatically calculated if not entered.*

Gradient - The gradient of this section as 1:XX. This is automatically calculated if not entered.*

Length - The length of this section between manhole centres.

* Refer to the workbook for methods of inputting gradient, fall or invert levels.

Output (calculated) data

Diameter - The calculated diameter (mm) for this section (yellow area on printout).

Flow l/s - The flow in litre/second along this section.

Pipe capacity full l/s - The capacity of the pipe running full (calculated using Colebrook-White) in litres/second.

Depth of flow% - The percentage depth of flow in this section for the given design parameters.

Hydraulic Mean Depth - The HMD in this section for the given design parameters.

Proportional area% - The proportional area of the pipe occupied by the flow.

Velocity m/s - The velocity of this section running full bore (calculated using Colebrook-White).

Proportional Velocity m/s - The calculated velocity of the actual flow (pipe full velocity x HMD).

Time of flow (s) - The time in seconds that is taken by the flow to traverse this section.

Time of Concentration (minutes) - A function of the time of flow plus the time of entry to give the actual rainfall intensity.

Rainfall intensity (mm/hr) - The calculated actual rainfall intensity used to derive the flow in this section

Pipe volume (m³) - The volume of this section.

System volume (m³) - The cumulative volume of the system, up to and including this section.



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Job No. 1234/2010		
Sheet no. 3		
Date 24/09/10		
By IJ	Checked	Approved

Project Crown Estates					
Title Calculations (2 yrs storm) for COLLEGE.SW					
Location BECKENHAM	Nat. Grid ref: TQ3769	M5-60 20	r 0.41	WRAP 1	SAAR 660

Data summary for printout

Design data

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

System data

System volume (m ³)	= 50	Total flow rate (l/s)	= 328.11
Final Rainfall rate (mm/hr)	= 52.17	Total length of index run (m)	= 255.0
Total fall of index run (m)	= 1.36	Total impermeable area (Ha)	= 1.5175
Total permeable area (Ha)	= 0.0	Time of entry (mins)	= 5.5
Time of concentration (mins)	= 9.63	Percentage impermeable area	= 100.00
Outfall diameter (mm)	= 600		

Calculated variables

Routing coefficient (Cr)	= 1.3	Volumetric coefficient (Cv)	= 0.714
UCWI	= 69.34	Areal reduction factor	= 0.995
Percentage runoff (combined)	= 71.36 (see note 1 below).		

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.
- Note 4 - ‡ against diameter indicates preferred diameter used.
- Note 5 - ¨ against diameter indicates preferred diameter too small and therefore not used.
- Note 6 - § against diameter indicates throttle pipe used.

Pipe sizes

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

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

Legend - manual input, automatically generated values, default variables, default variables that are overwritten, default variables that are overwritten outside a predetermined range indicating they may not be suitable