Modelling a Stormcell® Storage System Within The Micro Drainage Program Win *Des* - Source Control

There are probably several different ways of modelling Stormcell® within Win *Des* - Source Control Module. The following method is just one of them. This method illustrates principles which can be carried forward to model more complicated Stormcell® storage systems. This example does not utilise the CASDeF feature of Win *Des* .

Design Criteria

For this Example we have used the following variables:

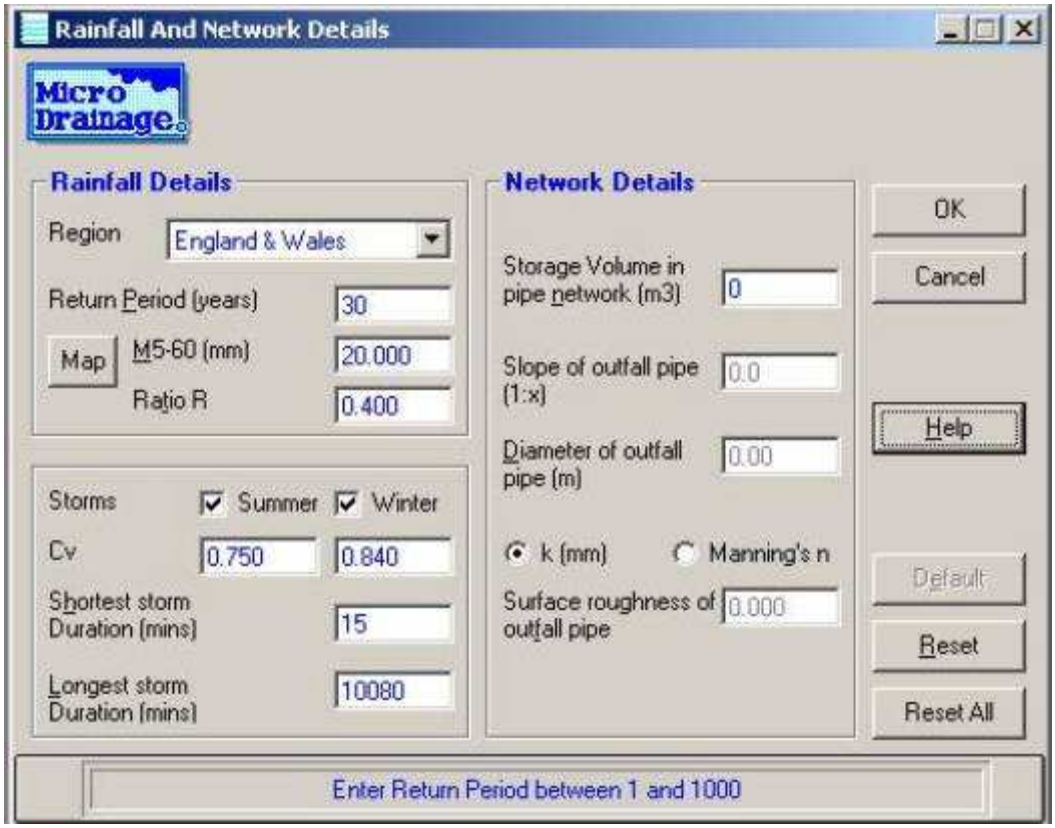
Return Period	30 years
Impermeable Area	1 Ha
M5-60	20
Maximum pass forward flow	10 l/s
Ratio R	0.4

1. **Global Variables**

   Model the units as cellular storage controlled by a Hydro-Brake® Flow Control:

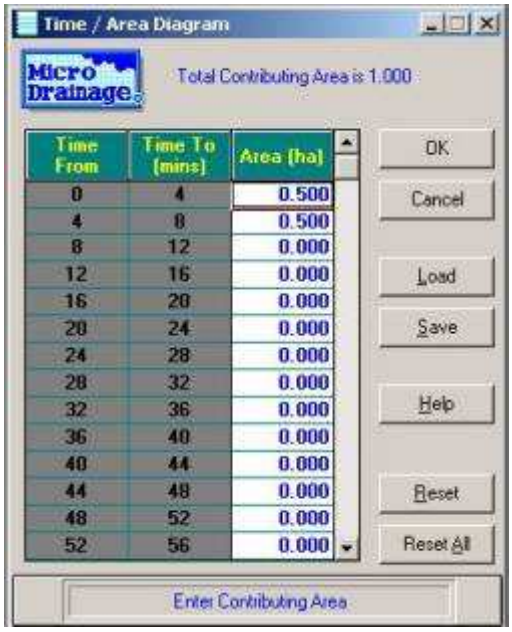
2. Rainfall and Network Details

Enter the return period and other rainfall details as normal



3. Time/Area Diagram

Enter the time Area details as normal. In this instance the catchment area is relatively small with evenly shaped characteristics. We have therefore assumed that the time/area diagram is linear in form.



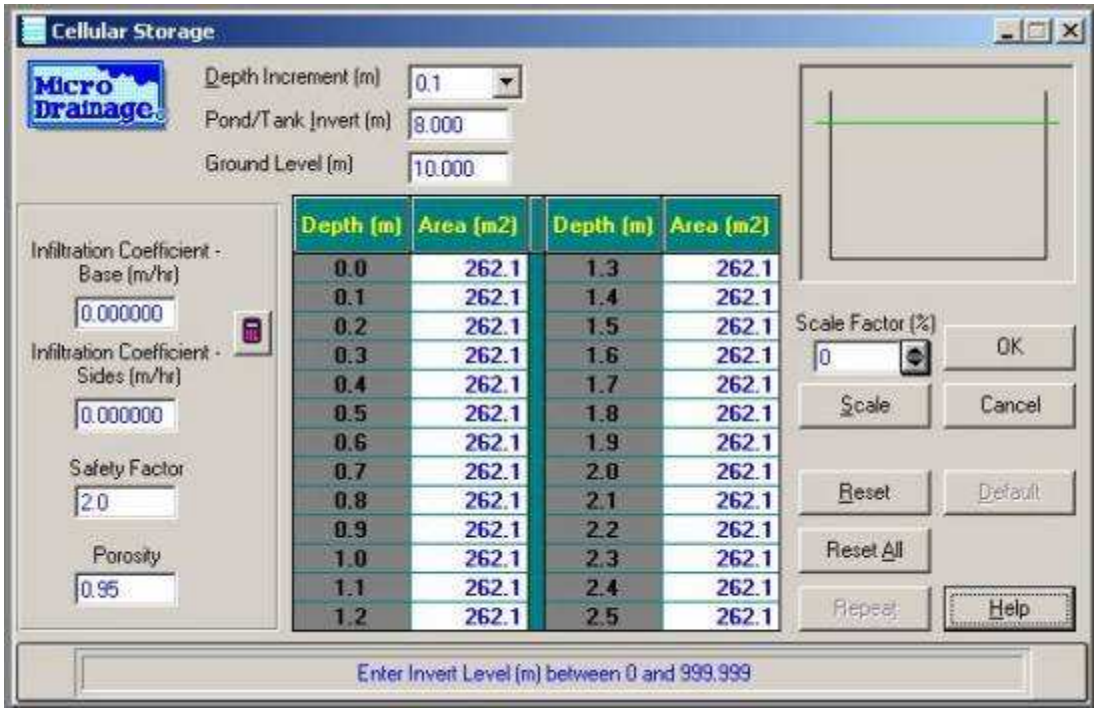
4. Cellular Storage Details

Enter the dimensions of the Stormcell® here. For this instance the Stormcell® Storage System we are looking at is 31.2 m (13 blocks) long, 8.4 m (7 blocks) wide and 1.04 (2 blocks) deep. We therefore input the data as a surface area, in this case 31.2 m x 8.4 m gives a surface area of 262.08 m². The downstream invert should be input as the invert level of the bottom of the blocks. The cover level is the cover level above the storage system. For this example we have used relative levels of 8 for the invert level of the blocks and 10, as the cover level as shown on the sketch at the end of these notes.

Within the table you can make allowances for the infiltration coefficient of the ground if the Stormcell® is to be used as an Infiltration structure as well as storage. If it is used as a Infiltration structure a factor of safety will have to be incorporated into the design. The porosity of the Stormcell® , 95%, can also be inputted into the table.

For this example we have assumed that there is no infiltration, so the factor of safety will be ignored.

If the sides of the tank are to be battered (ie. for an installation deeper than 3 m to the base of the blocks) then the area of the tank should be varied accordingly. The diagram at the top right of this window shows the profile of the tank.



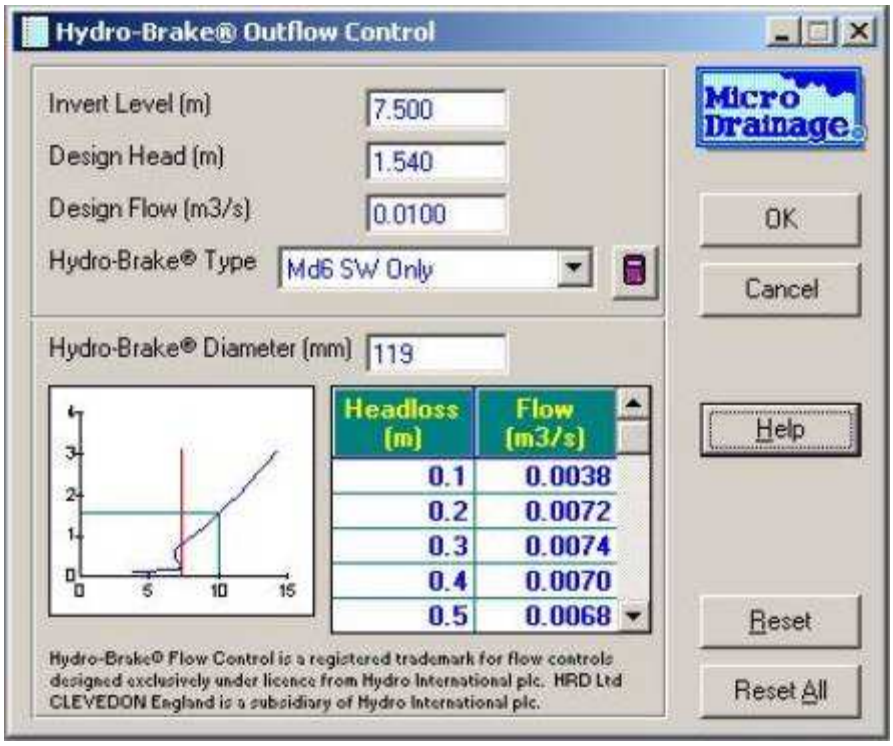
5. Hydro-Brake® Outflow Control

The invert of the control chamber needs to be input here. This will usually be the same as the invert level of the distribution pipe(s) at the downstream end of the Stormcell® Storage System. From the sketch at the end of these notes it can be seen that the invert level for this example will be 7.5.

The design head then needs to be given. This is usually the top water level (top of the Stormcell®) minus the invert level of the outlet pipe:

9.04 - 7.5 = 1.54 m

The desired flow restriction is also given. By clicking on the calculator icon a range of Hydro-Brake® Flow Controls are given. In this particular instance the 119 mm Type 'MD 6' gives the best head/discharge curve, which will result in a lower storage requirement. The simulation can now commence by clicking the icon.



6. Summary of Results

Small amendments may need to be applied to the model to tweak the Hydro-Brake® Flow Control size if you find you are not discharging the maximum allowable pass forward flow. This will usually involve reducing the design head by small increments.

The amount of storage provided by the Stormcell® in the attached sketch is as follows:

31.2m x 8.4m x 1.04m x 0.95 (void ratio) = 258.93m³

Results

Summary of Results For 30 Year Return Period

Half Drain Time : 239 minutes

Storm Duration (mins)	Rain (mm/hr)	Time To Vol Peak (mins)	Max Water Level (m)	Max Depth (m)	Max Control (m3/s)	Max Filtration (m3/s)	E. Max Outflow (m3/s)	Maximum Volume (m3)	Status
2160 Summer	1.98	1260	8.404	0.404	0.007818	0.000000	0.007818	100.7	O K
2880 Summer	1.58	1644	8.284	0.284	0.007387	0.000000	0.007387	70.7	O K
4320 Summer	1.14	2336	8.111	0.112	0.006911	0.000000	0.006911	27.9	O K
5760 Summer	0.91	2952	8.017	0.017	0.006833	0.000000	0.006833	4.1	O K
7200 Summer	0.76	0	8.000	0.000	0.006222	0.000000	0.006222	0.0	O K
8640 Summer	0.66	0	8.000	0.000	0.005380	0.000000	0.005380	0.0	O K
10080 Summer	0.58	0	8.000	0.000	0.004758	0.000000	0.004758	0.0	O K
15 Winter	76.03	22	8.601	0.601	0.008548	0.000000	0.008548	149.8	O K
30 Winter	49.50	36	8.767	0.767	0.009151	0.000000	0.009151	191.2	O K
60 Winter	30.81	64	8.915	0.915	0.009669	0.000000	0.009669	227.9	O K
120 Winter	18.61	120	9.017	1.017	0.010007	0.000000	0.010007	253.3	O K
180 Winter	13.72	176	9.035	1.035	0.010066	0.000000	0.010066	257.8	O K
240 Winter	10.99	228	9.019	1.019	0.010013	0.000000	0.010013	253.9	O K
360 Winter	8.03	284	8.968	0.968	0.009845	0.000000	0.009845	241.3	O K
480 Winter	6.43	362	8.915	0.915	0.009669	0.000000	0.009669	227.9	O K
600 Winter	5.40	438	8.869	0.869	0.009511	0.000000	0.009511	216.4	O K
720 Winter	4.69	514	8.822	0.822	0.009345	0.000000	0.009345	204.9	O K
960 Winter	3.74	662	8.731	0.731	0.009025	0.000000	0.009025	182.0	O K

The summary below indicates a storage volume of 257.8 m 3 for the critical, winter storm of 180 minute. The overall amount of storage provided by the system illustrated (storage in Stormcell® , pipes below Stormcell® and single sized stone above perforated pipes) will in fact give a volume in excess of the required 257.8m³.

The proposed Stormcell® Storage System will therefore be sufficient for this site.