


David R Murray and Associates LLP		Page 1
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SW1.SWS










Pipe Sizes ScottishWater Manhole Sizes Scottish Water

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	30	Add Flow / Climate Change (%)	20
M5-60 (mm)	14.000	Minimum Backdrop Height (m)	0.000
Ratio R	0.300	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.400
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	300
Volumetric Runoff Coeff.	0.750		


Designed with Level Soffits

Network Design Table for SW1.SWS


















PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.000	64.670	1.197	54.0	0.113	5.00	0.0	0.600	o	150	
1.001	43.130	1.027	42.0	0.069	0.00	0.0	0.600	o	225	
1.002	19.147	0.430	44.5	0.014	0.00	0.0	0.600	o	225	
2.000	19.518	0.193	101.1	0.077	5.00	0.0	0.600	o	225	
1.003	4.617	0.082	56.3	0.004	0.00	0.0	0.600	o	300	
3.000	25.060	0.545	46.0	0.029	5.00	0.0	0.600	o	150	
3.001	16.007	0.642	24.9	0.017	0.00	0.0	0.600	o	150	
3.002	27.302	1.288	21.2	0.054	0.00	0.0	0.600	o	150	
1.004	32.868	0.754	43.6	0.036	0.00	0.0	0.600	o	300	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.79	134.626	0.113	0.0	0.0	3.1	1.37	24.2	18.4
1.001	50.00	6.14	133.354	0.182	0.0	0.0	4.9	2.02	80.5	29.6
1.002	50.00	6.30	132.327	0.196	0.0	0.0	5.3	1.97	78.2	31.8
2.000	50.00	5.25	132.150	0.077	0.0	0.0	2.1	1.30	51.7	12.5
1.003	50.00	6.34	131.882	0.277	0.0	0.0	7.5	2.10	148.4	45.0
3.000	50.00	5.28	134.350	0.029	0.0	0.0	0.8	1.49	26.3	4.7
3.001	50.00	5.41	133.805	0.046	0.0	0.0	1.2	2.02	35.8	7.5
3.002	50.00	5.62	133.163	0.100	0.0	0.0	2.7	2.20	38.8	16.2
1.004	50.00	6.57	131.725	0.413	0.0	0.0	11.2	2.39	168.8	67.1


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Network Design Table for SW1.SWS


















PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.005	23.662	0.583	40.6	0.072	0.00	0.0	0.600	o	300	
4.000	38.587	1.730	22.3	0.056	5.00	0.0	0.600	o	150	
4.001	60.003	1.144	52.5	0.142	0.00	0.0	0.600	o	225	
4.002	28.864	0.195	148.0	0.062	0.00	0.0	0.600	o	300	
4.003	18.885	0.078	242.1	0.057	0.00	0.0	0.600	o	300	
4.004	51.563	0.639	80.7	0.119	0.00	0.0	0.600	o	300	
1.006	7.500	0.181	41.4	0.005	0.00	0.0	0.600	o	450	
1.007	20.720	0.069	300.3	0.028	0.00	0.0	0.600	o	450	
1.008	24.797	0.083	298.8	0.046	0.00	0.0	0.600	o	450	
1.009	19.726	0.066	298.9	0.044	0.00	0.0	0.600	o	450	
5.000	17.893	0.179	100.0	0.088	5.00	0.0	0.600	o	150	
5.001	46.383	0.576	80.5	0.059	0.00	0.0	0.600	o	225	
1.010	47.972	0.250	192.3	0.101	0.00	0.0	0.600	o	450	
1.011	27.968	0.093	300.0	0.035	0.00	0.0	0.600	o	525	
1.012	20.707	0.069	300.0	0.055	0.00	0.0	0.600	o	525	
1.013	37.078	0.302	122.9	0.049	0.00	0.0	0.600	o	525	
6.000	22.497	0.223	100.9	0.058	5.00	0.0	0.600	o	150	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.005	50.00	6.73	130.971	0.485	0.0	0.0	13.1	2.48	175.0	78.8
4.000	50.00	5.30	134.324	0.056	0.0	0.0	1.5	2.14	37.8	9.1
4.001	50.00	5.85	132.519	0.198	0.0	0.0	5.4	1.81	72.0	32.2
4.002	50.00	6.23	131.375	0.260	0.0	0.0	7.0	1.29	91.2	42.2
4.003	50.00	6.54	131.105	0.317	0.0	0.0	8.6	1.01	71.1	51.5
4.004	50.00	7.03	131.027	0.436	0.0	0.0	11.8	1.75	123.8	70.8
1.006	50.00	7.07	130.388	0.926	0.0	0.0	25.1	3.17	503.5	150.5
1.007	50.00	7.36	130.057	0.954	0.0	0.0	25.8	1.17	185.8	155.0
1.008	50.00	7.72	129.988	1.000	0.0	0.0	27.1	1.17	186.2	162.5
1.009	50.00	8.00	129.905	1.044	0.0	0.0	28.3	1.17	186.2	169.6
5.000	50.00	5.30	131.250	0.088	0.0	0.0	2.4	1.00	17.8	14.3
5.001	50.00	5.83	130.996	0.147	0.0	0.0	4.0	1.46	58.0	23.9
1.010	50.00	8.54	129.839	1.292	0.0	0.0	35.0	1.46	232.6	209.9
1.011	50.00	8.91	129.515	1.327	0.0	0.0	35.9	1.29	278.8	215.6
1.012	50.00	9.17	129.422	1.382	0.0	0.0	37.4	1.29	278.8	224.6
1.013	50.00	9.48	129.353	1.431	0.0	0.0	38.8	2.02	437.2	232.5
6.000	50.00	5.37	133.295	0.058	0.0	0.0	1.6	1.00	17.7	9.4


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Network Design Table for SW1.SWS

















PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
10.001	7.784	0.102	76.3	0.000	0.00	0.0	0.600	o	150	
1.019	6.687	0.022	300.0	0.004	0.00	0.0	0.600	o	600	
1.020	26.646	0.089	300.0	0.050	0.00	0.0	0.600	o	600	
1.021	27.881	0.093	300.0	0.016	0.00	0.0	0.600	o	600	
11.000	40.167	0.536	74.9	0.100	5.00	0.0	0.600	o	225	
11.001	15.186	0.284	53.5	0.023	0.00	0.0	0.600	o	225	
11.002	19.947	0.119	168.2	0.020	0.00	0.0	0.600	o	225	
11.003	30.438	0.399	76.2	0.060	0.00	0.0	0.600	o	225	
11.004	17.439	0.249	70.0	0.044	0.00	0.0	0.600	o	225	
11.005	34.882	0.469	74.4	0.082	0.00	0.0	0.600	o	225	
1.022	32.376	0.108	300.0	0.045	0.00	0.0	0.600	o	675	
1.023	63.927	0.213	300.0	0.080	0.00	0.0	0.600	o	675	
12.000	24.194	0.774	31.3	0.088	5.00	0.0	0.600	o	150	
12.001	70.515	2.337	30.2	0.110	0.00	0.0	0.600	o	225	
12.002	10.724	0.064	167.7	0.007	0.00	0.0	0.600	o	225	
1.024	58.281	0.194	300.0	0.067	0.00	0.0	0.600	o	675	
1.025	32.263	0.108	300.0	0.052	0.00	0.0	0.600	o	675	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
10.001	50.00	5.39	131.550	0.039	0.0	0.0	1.1	1.15	20.4	6.3
1.019	50.00	11.24	128.506	2.174	0.0	0.0	58.9	1.40	396.0	353.3
1.020	50.00	11.56	128.483	2.224	0.0	0.0	60.2	1.40	396.0	361.4
1.021	50.00	11.89	128.394	2.240	0.0	0.0	60.7	1.40	396.0	364.0
11.000	50.00	5.44	134.153	0.100	0.0	0.0	2.7	1.51	60.1	16.2
11.001	50.00	5.58	133.617	0.123	0.0	0.0	3.3	1.79	71.3	20.0
11.002	50.00	5.91	133.333	0.143	0.0	0.0	3.9	1.01	40.0	23.2
11.003	50.00	6.25	133.214	0.203	0.0	0.0	5.5	1.50	59.6	33.0
11.004	50.00	6.44	132.815	0.247	0.0	0.0	6.7	1.56	62.2	40.1
11.005	50.00	6.82	132.566	0.329	0.0	0.0	8.9	1.52	60.4	53.5
1.022	50.00	12.25	128.227	2.614	0.0	0.0	70.8	1.51	539.6	424.8
1.023	50.00	12.95	128.119	2.694	0.0	0.0	73.0	1.51	539.6	437.8
12.000	50.00	5.22	134.158	0.088	0.0	0.0	2.4	1.81	31.9	14.3
12.001	50.00	5.71	133.384	0.198	0.0	0.0	5.4	2.39	95.1	32.2
12.002	50.00	5.89	130.972	0.205	0.0	0.0	5.6	1.01	40.0	33.3
1.024	50.00	13.60	127.906	2.966	0.0	0.0	80.3	1.51	539.6	482.0
1.025	49.97	13.95	127.711	3.018	0.0	0.0	81.7	1.51	539.6	490.1


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Network Design Table for SW1.SWS














PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
14.008	6.539	0.216	30.3	0.000	0.00	0.0	0.600	o	450	
14.009	51.623	1.362	37.9	0.082	0.00	0.0	0.600	o	450	
1.032	28.357	0.679	41.8	0.037	0.00	0.0	0.600	o	675	
1.033	43.796	0.823	53.2	0.047	0.00	0.0	0.600	o	675	
20.000	35.253	1.763	20.0	0.133	5.00	0.0	0.600	o	150	
20.001	24.735	0.784	31.5	0.036	0.00	0.0	0.600	o	150	
1.034	72.941	0.243	300.0	0.103	0.00	0.0	0.600	o	825	
1.035	8.075	0.027	300.0	0.000	0.00	0.0	0.600	o	825	
21.000	40.256	1.264	31.8	0.076	5.00	0.0	0.600	o	150	
21.001	58.722	2.520	23.3	0.154	0.00	0.0	0.600	o	225	
21.002	78.811	2.814	28.0	0.165	0.00	0.0	0.600	o	300	
21.003	42.335	0.141	300.0	0.106	0.00	0.0	0.600	o	375	
22.000	65.122	1.206	54.0	0.063	5.00	0.0	0.600	o	150	
22.001	84.453	2.716	31.1	0.171	0.00	0.0	0.600	o	225	
23.000	50.356	0.979	51.4	0.035	5.00	0.0	0.600	o	150	
23.001	37.962	1.690	22.5	0.096	0.00	0.0	0.600	o	150	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
14.008	50.00	9.55	128.117	1.818	0.0	0.0	49.2	3.71	589.4	295.4
14.009	50.00	9.81	127.901	1.900	0.0	0.0	51.5	3.31	526.5	308.7
1.032	44.74	17.25	126.314	5.359	0.0	0.0	129.9	4.06	1453.9	779.2
1.033	44.46	17.45	125.635	5.406	0.0	0.0	130.2	3.60	1287.5	781.2
20.000	50.00	5.26	127.884	0.133	0.0	0.0	3.6	2.26	40.0	21.6
20.001	50.00	5.49	126.121	0.169	0.0	0.0	4.6	1.80	31.8	27.5
1.034	43.52	18.16	124.662	5.678	0.0	0.0	133.8	1.71	913.5	803.1
1.035	43.42	18.24	124.419	5.678	0.0	0.0	133.8	1.71	913.5	803.1
21.000	50.00	5.37	133.255	0.076	0.0	0.0	2.1	1.79	31.6	12.3
21.001	50.00	5.73	131.916	0.230	0.0	0.0	6.2	2.72	108.2	37.4
21.002	50.00	6.17	129.396	0.395	0.0	0.0	10.7	2.98	210.8	64.2
21.003	50.00	6.85	126.432	0.501	0.0	0.0	13.6	1.04	115.0	81.4
22.000	50.00	5.79	134.950	0.063	0.0	0.0	1.7	1.37	24.2	10.2
22.001	50.00	6.39	133.669	0.234	0.0	0.0	6.3	2.35	93.6	38.0
23.000	50.00	5.60	135.550	0.035	0.0	0.0	0.9	1.41	24.8	5.7
23.001	50.00	5.89	134.571	0.131	0.0	0.0	3.5	2.13	37.7	21.3


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Network Design Table for SW1.SWS















PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
24.000	53.973	1.924	28.1	0.100	5.00	0.0	0.600	o	150	
23.002	42.371	1.853	22.9	0.085	0.00	0.0	0.600	o	225	
22.002	32.626	1.292	25.3	0.064	0.00	0.0	0.600	o	300	
22.003	15.492	0.611	25.4	0.039	0.00	0.0	0.600	o	300	
22.004	28.385	0.928	30.6	0.018	0.00	0.0	0.600	o	300	
21.004	25.310	0.084	300.0	0.060	0.00	0.0	0.600	o	525	
25.000	51.706	0.512	101.0	0.077	5.00	0.0	0.600	o	150	
25.001	54.013	3.444	15.7	0.115	0.00	0.0	0.600	o	150	
26.000	42.275	0.419	100.9	0.086	5.00	0.0	0.600	o	150	
25.002	14.728	0.409	36.0	0.027	0.00	0.0	0.600	o	225	
25.003	58.062	2.934	19.8	0.113	0.00	0.0	0.600	o	225	
21.005	5.989	0.020	300.0	0.007	0.00	0.0	0.600	o	525	
27.000	61.512	0.366	168.1	0.137	5.00	0.0	0.600	o	225	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
24.000	50.00	5.47	134.805	0.100	0.0	0.0	2.7	1.91	33.7	16.2
23.002	50.00	6.15	132.806	0.316	0.0	0.0	8.6	2.75	109.3	51.3
22.002	50.00	6.56	130.953	0.614	0.0	0.0	16.6	3.14	222.1	99.8
22.003	50.00	6.64	129.586	0.653	0.0	0.0	17.7	3.14	221.6	106.1
22.004	50.00	6.81	128.975	0.671	0.0	0.0	18.2	2.85	201.7	109.0
21.004	50.00	7.18	126.141	1.232	0.0	0.0	33.4	1.29	278.8	200.2
25.000	50.00	5.86	136.525	0.077	0.0	0.0	2.1	1.00	17.7	12.5
25.001	50.00	6.21	136.013	0.192	0.0	0.0	5.2	2.56	45.2	31.2
26.000	50.00	5.70	132.671	0.086	0.0	0.0	2.3	1.00	17.7	14.0
25.002	50.00	6.33	132.177	0.305	0.0	0.0	8.3	2.19	87.0	49.6
25.003	50.00	6.65	131.768	0.418	0.0	0.0	11.3	2.95	117.5	67.9
21.005	50.00	7.26	126.057	1.657	0.0	0.0	44.9	1.29	278.8	269.3
27.000	50.00	6.02	129.292	0.137	0.0	0.0	3.7	1.01	40.0	22.3


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Network Design Table for SW1.SWS










PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
21.006	62.275	0.986	63.2	0.087	0.00	0.0	0.600	o	525	
28.000	38.524	0.101	381.4	0.222	5.00	0.0	0.600	o	675	
28.001	20.790	0.086	241.7	0.020	0.00	0.0	0.600	o	675	
21.007	41.667	0.119	350.1	0.065	0.00	0.0	0.600	o	675	
21.008	50.201	0.154	326.0	0.130	0.00	0.0	0.600	o	675	
21.009	60.954	0.197	309.4	0.074	0.00	0.0	0.600	o	675	
29.000	58.340	0.942	61.9	0.158	5.00	0.0	0.600	o	225	
29.001	55.401	3.260	17.0	0.084	0.00	0.0	0.600	o	225	
29.002	6.128	0.163	37.6	0.020	0.00	0.0	0.600	o	225	
30.000	87.040	1.384	62.9	0.240	5.00	0.0	0.600	o	225	
30.001	52.982	0.854	62.0	0.125	0.00	0.0	0.600	o	300	
29.003	59.206	3.792	15.6	0.074	0.00	0.0	0.600	o	300	
31.000	55.650	0.604	92.1	0.119	5.00	0.0	0.600	o	225	
31.001	59.883	2.486	24.1	0.117	0.00	0.0	0.600	o	225	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
21.006	50.00	7.63	126.037	1.881	0.0	0.0	50.9	2.82	610.7	305.7
28.000	50.00	5.48	124.000	0.222	0.0	0.0	6.0	1.34	478.1	36.1
28.001	50.00	5.69	123.899	0.242	0.0	0.0	6.6	1.68	601.6	39.3
21.007	50.00	8.12	123.511	2.188	0.0	0.0	59.3	1.39	499.1	355.5
21.008	50.00	8.70	123.392	2.318	0.0	0.0	62.8	1.45	517.5	376.7
21.009	50.00	9.39	123.237	2.392	0.0	0.0	64.8	1.48	531.3	388.7
29.000	50.00	5.58	133.238	0.158	0.0	0.0	4.3	1.66	66.2	25.7
29.001	50.00	5.87	132.296	0.242	0.0	0.0	6.6	3.19	126.8	39.3
29.002	50.00	5.92	129.036	0.262	0.0	0.0	7.1	2.14	85.1	42.6
30.000	50.00	5.88	131.111	0.240	0.0	0.0	6.5	1.65	65.7	39.0
30.001	50.00	6.32	129.727	0.365	0.0	0.0	9.9	2.00	141.3	59.3
29.003	50.00	6.57	128.873	0.701	0.0	0.0	19.0	4.00	282.7	113.9
31.000	50.00	5.68	128.171	0.119	0.0	0.0	3.2	1.36	54.2	19.3
31.001	50.00	6.05	127.567	0.236	0.0	0.0	6.4	2.68	106.4	38.3


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Network Design Table for SW1.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
29.004	36.440	0.121	301.2	0.056	0.00	0.0	0.600	o	450	
21.010	7.626	0.018	425.0	0.000	0.00	0.0	0.600	o	750	
21.011	22.810	0.054	425.0	0.005	0.00	0.0	0.600	o	750	
21.012	58.725	0.138	425.0	0.035	0.00	0.0	0.600	o	750	
1.036	16.792	0.036	462.0	0.000	0.00	0.0	0.600	o	1050	
1.037	80.001	0.173	462.0	0.000	0.00	0.0	0.600	o	1050	
1.038	76.325	0.165	462.6	0.000	0.00	0.0	0.600	o	1050	
1.039	22.157	0.049	452.2	0.000	0.00	0.0	0.600	o	1050	
1.040	35.608	0.089	400.0	0.000	0.00	0.0	0.600	o	1050	


Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
29.004	50.00	7.09	124.856	0.993	0.0	0.0	26.9	1.17	185.5	161.4
21.010	50.00	9.48	122.891	3.385	0.0	0.0	91.7	1.35	596.9	550.0
21.011	50.00	9.76	122.873	3.390	0.0	0.0	91.8	1.35	596.9	550.9
21.012	50.00	10.49	122.819	3.425	0.0	0.0	92.8	1.35	596.9	556.5
1.036	43.19	18.42	122.381	9.103	0.0	0.0	213.0	1.60	1382.5	1277.8
1.037	42.16	19.25	122.345	9.103	0.0	0.0	213.0	1.60	1382.5	1277.8
1.038	41.24	20.05	122.171	9.103	0.0	0.0	213.0	1.60	1381.7	1277.8
1.039	40.98	20.28	122.006	9.103	0.0	0.0	213.0	1.61	1397.6	1277.8
1.040	40.60	20.62	121.957	9.103	0.0	0.0	213.0	1.72	1486.6	1277.8

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Manhole Schedules for SW1.SWS


MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	136.076	1.450	Open Manhole	1200	1.000	134.626	150				
2	134.879	1.525	Open Manhole	1200	1.001	133.354	225	1.000	133.429	150	
3	133.952	1.625	Open Manhole	1200	1.002	132.327	225	1.001	132.327	225	
44	133.600	1.450	Open Manhole	1200	2.000	132.150	225				
4	133.522	1.640	Open Manhole	1200	1.003	131.882	300	1.002	131.897	225	
								2.000	131.957	225	
46	136.003	1.653	Open Manhole	1200	3.000	134.350	150				
47	135.458	1.653	Open Manhole	1200	3.001	133.805	150	3.000	133.805	150	
48	134.713	1.550	Open Manhole	1200	3.002	133.163	150	3.001	133.163	150	
5	133.425	1.700	Open Manhole	1200	1.004	131.725	300	1.003	131.800	300	75
								3.002	131.875	150	
6	132.671	1.700	Open Manhole	1200	1.005	130.971	300	1.004	130.971	300	
50	135.774	1.450	Open Manhole	1200	4.000	134.324	150				
51	134.044	1.525	Open Manhole	1200	4.001	132.519	225	4.000	132.594	150	
52	133.000	1.625	Open Manhole	1200	4.002	131.375	300	4.001	131.375	225	
53	133.273	2.168	Open Manhole	1200	4.003	131.105	300	4.002	131.180	300	75
54	133.229	2.202	Open Manhole	1200	4.004	131.027	300	4.003	131.027	300	
7	132.088	1.700	Open Manhole	1200	1.006	130.388	450	1.005	130.388	300	
								4.004	130.388	300	
8	131.907	1.850	Open Manhole	1350	1.007	130.057	450	1.006	130.207	450	150
9	132.072	2.084	Open Manhole	1350	1.008	129.988	450	1.007	129.988	450	
10	132.237	2.332	Open Manhole	1350	1.009	129.905	450	1.008	129.905	450	
56	132.898	1.648	Open Manhole	1200	5.000	131.250	150				
57	132.614	1.618	Open Manhole	1200	5.001	130.996	225	5.000	131.071	150	
11	132.045	2.206	Open Manhole	1350	1.010	129.839	450	1.009	129.839	450	
								5.001	130.420	225	356
12	131.440	1.925	Open Manhole	1500	1.011	129.515	525	1.010	129.589	450	
13	131.625	2.203	Open Manhole	1500	1.012	129.422	525	1.011	129.422	525	
14	131.355	2.002	Open Manhole	1500	1.013	129.353	525	1.012	129.353	525	
59	134.745	1.450	Open Manhole	1200	6.000	133.295	150				
60	134.592	1.595	Open Manhole	1200	6.001	132.997	225	6.000	133.072	150	
66	134.500	1.450	Open Manhole	1200	7.000	133.050	150				
61	134.318	1.625	Open Manhole	1200	6.002	132.693	225	6.001	132.693	225	
								7.000	132.868	150	100
62	133.968	1.625	Open Manhole	1200	6.003	132.343	225	6.002	132.343	225	
68	135.278	1.450	Open Manhole	1200	8.000	133.828	150				
63	133.215	1.625	Open Manhole	1200	6.004	131.590	225	6.003	131.590	225	
								8.000	131.765	150	100

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Manhole Schedules for SW1.SWS


MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
70	133.143	1.450	Open Manhole	1200	9.000	131.693	225				
64	132.890	1.625	Open Manhole	1200	6.005	131.265	300	6.004	131.265	225	
								9.000	131.360	225	20
15	130.976	2.000	Open Manhole	1800	1.014	128.976	600	1.013	129.051	525	
								6.005	129.351	300	75
16	131.092	2.193	Open Manhole	1800	1.015	128.899	600	1.014	128.899	600	
17	131.790	3.135	Open Manhole	1800	1.016	128.655	600	1.015	128.655	600	
18	132.150	3.550	Open Manhole	1800	1.017	128.600	600	1.016	128.600	600	
19	132.781	4.246	Open Manhole	1800	1.018	128.535	600	1.017	128.535	600	
72	133.220	1.450	Open Manhole	1200	10.000	131.770	150				
73	133.000	1.450	Open Manhole	1200	10.001	131.550	150	10.000	131.550	150	
20	132.998	4.492	Open Manhole	1350	1.019	128.506	600	1.018	128.506	600	
								10.001	131.448	150	2492
21	133.113	4.630	Open Manhole	1800	1.020	128.483	600	1.019	128.483	600	
22	133.394	5.000	Open Manhole	1800	1.021	128.394	600	1.020	128.394	600	
75	135.678	1.525	Open Manhole	1200	11.000	134.153	225				
76	135.142	1.525	Open Manhole	1200	11.001	133.617	225	11.000	133.617	225	
77	134.958	1.625	Open Manhole	1200	11.002	133.333	225	11.001	133.333	225	
78	134.856	1.642	Open Manhole	1200	11.003	133.214	225	11.002	133.214	225	
79	134.440	1.625	Open Manhole	1200	11.004	132.815	225	11.003	132.815	225	
80	134.191	1.625	Open Manhole	1200	11.005	132.566	225	11.004	132.566	225	
23	133.722	5.495	Open Manhole	1800	1.022	128.227	675	1.021	128.302	600	
								11.005	132.097	225	3420
24	133.404	5.285	Open Manhole	1800	1.023	128.119	675	1.022	128.119	675	
82	135.608	1.450	Open Manhole	1200	12.000	134.158	150				
83	134.834	1.450	Open Manhole	1800	12.001	133.384	225	12.000	133.384	150	
84	132.597	1.625	Open Manhole	1200	12.002	130.972	225	12.001	131.047	225	75
25	132.549	4.643	Open Manhole	1800	1.024	127.906	675	1.023	127.906	675	
								12.002	130.908	225	2552
26	131.988	4.277	Open Manhole	1800	1.025	127.711	675	1.024	127.711	675	
27	132.113	4.509	Open Manhole	1800	1.026	127.604	675	1.025	127.604	675	
28	131.674	4.185	Open Manhole	1800	1.027	127.489	675	1.026	127.489	675	
29	130.592	3.385	Open Manhole	1800	1.028	127.207	675	1.027	127.207	675	
86	130.945	1.450	Open Manhole	1200	13.000	129.495	150				
87	130.494	1.450	Open Manhole	1200	13.001	129.044	150	13.000	129.044	150	
30	130.301	3.152	Open Manhole	1800	1.029	127.149	675	1.028	127.149	675	
								13.001	128.751	150	1077
31	130.000	2.971	Open Manhole	1800	1.030	127.029	675	1.029	127.029	675	

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Manhole Schedules for SW1.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
32	130.200	3.339	Open Manhole	1800	1.031	126.861	675	1.030	126.861	675	
89	135.237	1.625	Open Manhole	1200	14.000	133.612	225				
90	135.723	2.566	Open Manhole	1200	14.001	133.157	225	14.000	133.157	225	
91	135.117	2.182	Open Manhole	1200	14.002	132.935	225	14.001	132.935	225	
100	137.926	1.450	Open Manhole	1200	15.000	136.476	150				
101	137.126	1.450	Open Manhole	1200	15.001	135.676	150	15.000	135.676	150	
105	134.689	1.525	Open Manhole	1200	16.000	133.164	225				
106	134.053	1.525	Open Manhole	1200	16.001	132.528	225	16.000	132.528	225	
102	136.205	4.097	Open Manhole	1200	15.002	132.108	300	15.001	134.655	150	2397
								16.001	132.183	225	
103	135.984	3.911	Open Manhole	1200	15.003	132.073	300	15.002	132.073	300	
92	134.984	3.207	Open Manhole	1350	14.003	131.777	375	14.002	132.878	225	951
								15.003	131.852	300	
93	134.522	2.929	Open Manhole	1350	14.004	131.593	450	14.003	131.668	375	
94	133.998	2.510	Open Manhole	1350	14.005	131.488	450	14.004	131.488	450	
95	133.600	2.201	Open Manhole	1350	14.006	131.399	450	14.005	131.399	450	
96	132.883	1.850	Open Manhole	1350	14.007	131.033	450	14.006	131.033	450	
108	133.681	1.450	Open Manhole	1200	17.000	132.231	225				
109	133.215	1.525	Open Manhole	1200	17.001	131.690	225	17.000	131.765	225	75
110	132.577	1.625	Open Manhole	1200	17.002	130.952	225	17.001	130.952	225	
111	131.485	1.700	Open Manhole	1200	17.003	129.785	300	17.002	129.860	225	
112	131.155	1.700	Open Manhole	1200	17.004	129.455	300	17.003	129.455	300	
113	131.303	1.892	Open Manhole	1200	17.005	129.411	300	17.004	129.411	300	
117	130.763	1.450	Open Manhole	1200	18.000	129.313	150				
119	132.787	1.450	Open Manhole	1200	19.000	131.337	150				
114	131.924	3.193	Open Manhole	1350	17.006	128.731	375	17.005	129.160	300	354
								18.000	128.956	150	
								19.000	130.474	150	1518
115	131.424	2.710	Open Manhole	1350	17.007	128.714	375	17.006	128.714	375	
97	129.967	1.850	Open Manhole	1350	14.008	128.117	450	14.007	128.117	450	
								17.007	128.192	375	
98	129.751	1.850	Open Manhole	1350	14.009	127.901	450	14.008	127.901	450	
33	128.389	2.075	Open Manhole	1800	1.032	126.314	675	1.031	126.314	675	
								14.009	126.539	450	
34	127.710	2.075	Open Manhole	1800	1.033	125.635	675	1.032	125.635	675	
121	129.334	1.450	Open Manhole	1200	20.000	127.884	150				
122	127.657	1.536	Open Manhole	1200	20.001	126.121	150	20.000	126.121	150	
35	126.887	2.225	Open Manhole	2100	1.034	124.662	825	1.033	124.812	675	

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Manhole Schedules for SW1.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
36	127.300	2.881	Open Manhole	2100	1.035	124.419	825	20.001	125.337	150	
124	134.705	1.450	Open Manhole	1200	21.000	133.255	150	1.034	124.419	825	
125	133.441	1.525	Open Manhole	1200	21.001	131.916	225	21.000	131.991	150	
126	131.021	1.625	Open Manhole	1200	21.002	129.396	300	21.001	129.396	225	
127	128.207	1.775	Open Manhole	1200	21.003	126.432	375	21.002	126.582	300	75
138	136.400	1.450	Open Manhole	1200	22.000	134.950	150				
139	135.194	1.525	Open Manhole	1200	22.001	133.669	225	22.000	133.744	150	
144	137.000	1.450	Open Manhole	1200	23.000	135.550	150				
145	136.021	1.450	Open Manhole	1200	23.001	134.571	150	23.000	134.571	150	
148	136.355	1.550	Open Manhole	1200	24.000	134.805	150				
146	134.431	1.625	Open Manhole	1200	23.002	132.806	225	23.001	132.881	150	
								24.000	132.881	150	
140	132.578	1.625	Open Manhole	1800	22.002	130.953	300	22.001	130.953	225	
								23.002	130.953	225	
141	131.286	1.700	Open Manhole	1200	22.003	129.586	300	22.002	129.661	300	75
142	130.675	1.700	Open Manhole	1200	22.004	128.975	300	22.003	128.975	300	
128	129.747	3.606	Open Manhole	1500	21.004	126.141	525	21.003	126.291	375	
								22.004	128.047	300	1681
150	137.975	1.450	Open Manhole	1200	25.000	136.525	150				
151	137.519	1.506	Open Manhole	1200	25.001	136.013	150	25.000	136.013	150	
155	134.121	1.450	Open Manhole	1200	26.000	132.671	150				
152	134.119	1.942	Open Manhole	1200	25.002	132.177	225	25.001	132.569	150	317
								26.000	132.252	150	
153	133.393	1.625	Open Manhole	1200	25.003	131.768	225	25.002	131.768	225	
129	130.459	4.402	Open Manhole	1500	21.005	126.057	525	21.004	126.057	525	
								25.003	128.834	225	2477
157	130.817	1.525	Open Manhole	1200	27.000	129.292	225				
130	130.543	4.506	Open Manhole	1500	21.006	126.037	525	21.005	126.037	525	
								27.000	128.926	225	2589
159	125.656	1.656	Open Manhole	1800	28.000	124.000	675				
160	126.417	2.518	Open Manhole	1800	28.001	123.899	675	28.000	123.899	675	
131	126.976	3.465	Open Manhole	1800	21.007	123.511	675	21.006	125.051	525	1390
								28.001	123.813	675	302
132	126.880	3.488	Open Manhole	1800	21.008	123.392	675	21.007	123.392	675	
133	126.363	3.126	Open Manhole	1800	21.009	123.237	675	21.008	123.238	675	1
162	134.763	1.525	Open Manhole	1200	29.000	133.238	225				
163	133.821	1.525	Open Manhole	1200	29.001	132.296	225	29.000	132.296	225	

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Manhole Schedules for SW1.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
164	130.661	1.625	Open Manhole	1500	29.002	129.036	225	29.001	129.036	225	
168	132.636	1.525	Open Manhole	1200	30.000	131.111	225				
169	131.252	1.525	Open Manhole	1500	30.001	129.727	300	30.000	129.727	225	
165	130.498	1.625	Open Manhole	1200	29.003	128.873	300	29.002	128.873	225	
								30.001	128.873	300	
171	129.696	1.525	Open Manhole	1200	31.000	128.171	225				
172	129.092	1.525	Open Manhole	1200	31.001	127.567	225	31.000	127.567	225	
166	126.706	1.850	Open Manhole	1200	29.004	124.856	450	29.003	125.081	300	75
								31.001	125.081	225	
134	127.458	4.567	Open Manhole	1800	21.010	122.891	750	21.009	123.040	675	74
								29.004	124.735	450	1544
135	127.500	4.627	Open Manhole	1800	21.011	122.873	750	21.010	122.873	750	
136	127.500	4.681	Open Manhole	1800	21.012	122.819	750	21.011	122.819	750	
37	127.457	5.076	Open Manhole	2400	1.036	122.381	1050	1.035	124.392	825	1786
								21.012	122.681	750	
38	126.500	4.155	Open Manhole	2400	1.037	122.345	1050	1.036	122.345	1050	
39	124.500	2.329	Open Manhole	2400	1.038	122.171	1050	1.037	122.171	1050	
40	124.500	2.494	Open Manhole	2400	1.039	122.006	1050	1.038	122.006	1050	
41	124.500	2.543	Open Manhole	2400	1.040	121.957	1050	1.039	121.957	1050	
42	124.500	2.632	Open Manhole	0		OUTFALL		1.040	121.868	1050	

Free Flowing Outfall Details for SW1.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
1.040	42	124.500	121.868	118.600	0	0

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Online Controls for SW1.SWS

Complex Manhole: 40, DS/PN: 1.039, Volume (m³): 75.3

Hydro-Brake Optimum®

Unit Reference MD-SHE-0272-4550-1694-4550
Design Head (m) 1.694
Design Flow (l/s) 45.5
Flush-Flo™ Calculated
Objective Minimise upstream storage
Diameter (mm) 272
Invert Level (m) 122.006
Minimum Outlet Pipe Diameter (mm) 300
Suggested Manhole Diameter (mm) 2100


Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.694	44.7
Flush-Flo™	0.532	44.5
Kick-Flo®	1.156	37.2
Mean Flow over Head Range	-	38.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.6	1.200	37.9	3.000	58.9	7.000	88.9
0.200	28.0	1.400	40.8	3.500	63.5	7.500	91.9
0.300	42.2	1.600	43.5	4.000	67.7	8.000	94.9
0.400	43.9	1.800	46.0	4.500	71.7	8.500	97.7
0.500	44.5	2.000	48.4	5.000	75.5	9.000	100.5
0.600	44.4	2.200	50.7	5.500	79.0	9.500	103.2
0.800	43.4	2.400	52.9	6.000	82.5		
1.000	41.3	2.600	55.0	6.500	85.7		

Weir

Discharge Coef 0.544 Width (m) 2.400 Invert Level (m) 123.700

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Storage Structures for SW1.SWS

Tank or Pond Manhole: 39, DS/PN: 1.038

Invert Level (m) 122.246

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	2493.0	1.454	5447.0	1.455	0.0