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4 Brindley Road City Park Manchester M16 9HQ	Chipping Lane Longridge	
Date 10.08.16 File SW Network 1, Rev C.mdx	Designed by CD Checked by SG	
Micro Drainage	Network 2014.1.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SW1.SWS

Pipe Sizes Surface Water Network 1 Manhole Sizes Surface Water Network 1








FSR Rainfall Model - England and Wales

Return Period (years)	2	Add Flow / Climate Change (%)	0
M5-60 (mm)	18.800	Minimum Backdrop Height (m)	0.200
Ratio R	0.280	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
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)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits


Network Design Table for SW1.SWS

« - Indicates pipe capacity < flow
















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	34.856	0.087	400.6	0.168	5.00	0.0	0.600	o	1200	
1.001	14.100	0.028	500.0	0.034	0.00	0.0	0.600	o	1500	
2.000	26.078	0.153	170.0	0.051	5.00	0.0	0.600	o	225	
2.001	26.997	0.429	62.9	0.016	0.00	0.0	0.600	o	225	
2.002	9.582	0.056	170.0	0.050	0.00	0.0	0.600	o	225	
2.003	30.639	0.361	84.8	0.115	0.00	0.0	0.600	o	225	
1.002	12.887	0.026	495.7	0.039	0.00	0.0	0.600	o	1500	

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	5.31	103.006	0.168	0.0	0.0	0.0	1.86	2106.9	22.7
1.001	50.00	5.43	102.619	0.202	0.0	0.0	0.0	1.91	3377.8	27.4
2.000	50.00	5.43	104.865	0.051	0.0	0.0	0.0	1.00	39.8	6.9
2.001	50.00	5.71	104.712	0.067	0.0	0.0	0.0	1.65	65.7	9.1
2.002	50.00	5.87	104.283	0.117	0.0	0.0	0.0	1.00	39.8	15.8
2.003	50.00	6.23	104.226	0.232	0.0	0.0	0.0	1.42	56.5	31.4
1.002	50.00	6.34	102.591	0.473	0.0	0.0	0.0	1.92	3392.6	64.1


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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
3.000	37.925	0.181	210.0	0.075	5.00	0.0	0.600	o	300	
3.001	12.547	0.031	400.0	0.009	0.00	0.0	0.600	o	450	
1.003	20.839	0.042	496.2	0.030	0.00	0.0	0.600	o	1500	
1.004	19.697	0.039	500.0	0.049	0.00	0.0	0.600	o	1500	
1.005	11.281	0.023	490.5	0.000	0.00	0.0	0.600	o	1500	
1.006	21.474	0.043	499.4	0.000	0.00	0.0	0.600	o	1500	
1.007	11.233	0.022	510.6	0.057	0.00	0.0	0.600	o	1500	
1.008	47.046	0.094	500.5	0.094	0.00	0.0	0.600	o	1500	
4.000	32.098	0.597	53.8	0.044	5.00	0.0	0.600	o	225	
4.001	27.069	0.068	398.1	0.084	0.00	0.0	0.600	o	525	
1.009	39.272	0.080	490.9	0.022	0.00	0.0	0.600	o	1500	
1.010	20.549	0.041	501.2	0.068	0.00	0.0	0.600	o	1500	
5.000	31.163	0.663	47.0	0.033	5.00	0.0	0.600	o	225	
5.001	24.755	0.688	36.0	0.068	0.00	0.0	0.600	o	225	
5.002	7.704	0.198	39.0	0.000	0.00	0.0	0.600	o	225	

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)
3.000	50.00	5.58	103.977	0.075	0.0	0.0	0.0	1.08	76.4	10.2
3.001	50.00	5.79	103.646	0.084	0.0	0.0	0.0	1.01	160.7	11.4
1.003	49.53	6.52	102.565	0.587	0.0	0.0	0.0	1.92	3390.9	78.7
1.004	49.00	6.69	102.523	0.636	0.0	0.0	0.0	1.91	3377.8	84.4
1.005	48.70	6.79	102.484	0.636	0.0	0.0	0.0	1.93	3410.6	84.4
1.006	48.14	6.98	102.461	0.636	0.0	0.0	0.0	1.91	3379.8	84.4
1.007	47.86	7.07	102.418	0.693	0.0	0.0	0.0	1.89	3342.3	89.8
1.008	46.71	7.48	102.396	0.787	0.0	0.0	0.0	1.91	3376.1	99.6
4.000	50.00	5.30	104.242	0.044	0.0	0.0	0.0	1.79	71.1	6.0
4.001	50.00	5.70	103.345	0.128	0.0	0.0	0.0	1.12	241.7	17.3
1.009	45.81	7.82	102.302	0.937	0.0	0.0	0.0	1.93	3409.1	116.3
1.010	45.35	8.00	102.222	1.005	0.0	0.0	0.0	1.91	3373.7	123.4
5.000	50.00	5.27	108.172	0.033	0.0	0.0	0.0	1.91	76.1	4.5
5.001	50.00	5.46	107.509	0.101	0.0	0.0	0.0	2.19	87.0	13.7
5.002	50.00	5.52	106.821	0.101	0.0	0.0	0.0	2.10	83.5	13.7


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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
5.003	6.655	0.126	53.0	0.000	0.00	0.0	0.600	o	225	
5.004	6.888	0.066	104.4	0.597	0.00	0.0	0.600	o	450	
5.005	30.420	0.317	96.0	0.022	0.00	0.0	0.600	o	450	
5.006	7.929	0.091	87.1	0.021	0.00	0.0	0.600	o	450	
5.007	19.595	0.338	58.0	0.033	0.00	0.0	0.600	o	450	
5.008	12.502	0.272	46.0	0.000	0.00	0.0	0.600	o	450	
5.009	9.280	0.023	400.0	0.087	0.00	0.0	0.600	o	450	
5.010	11.131	0.028	400.0	0.000	0.00	0.0	0.600	o	450	
5.011	19.961	0.139	143.6	0.016	0.00	0.0	0.600	o	450	
5.012	13.450	0.157	85.7	0.050	0.00	0.0	0.600	o	450	
6.000	41.858	1.231	34.0	0.052	5.00	0.0	0.600	o	225	
6.001	39.560	1.364	29.0	0.090	0.00	0.0	0.600	o	225	
6.002	13.898	0.409	34.0	0.036	0.00	0.0	0.600	o	225	
6.003	48.787	1.203	40.6	0.282	0.00	0.0	0.600	o	375	
5.013	18.119	0.045	402.6	0.011	0.00	0.0	0.600	o	525	
5.014	27.409	0.069	400.0	0.043	0.00	0.0	0.600	o	525	
5.015	14.736	0.037	398.3	0.090	0.00	0.0	0.600	o	525	
5.016	6.640	0.017	390.6	0.011	0.00	0.0	0.600	o	525	

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)
5.003	50.00	5.58	106.623	0.101	0.0	0.0	0.0	1.80	71.6	13.7
5.004	50.00	5.64	106.273	0.698	0.0	0.0	0.0	1.99	316.5	94.5
5.005	50.00	5.88	106.207	0.720	0.0	0.0	0.0	2.08	330.1	97.5
5.006	50.00	5.95	105.890	0.741	0.0	0.0	0.0	2.18	346.6	100.3
5.007	50.00	6.07	105.799	0.774	0.0	0.0	0.0	2.67	425.3	104.8
5.008	50.00	6.14	105.461	0.774	0.0	0.0	0.0	3.01	477.9	104.8
5.009	50.00	6.29	105.189	0.861	0.0	0.0	0.0	1.01	160.7	116.6
5.010	49.67	6.47	105.166	0.861	0.0	0.0	0.0	1.01	160.7	116.6
5.011	49.06	6.67	105.138	0.877	0.0	0.0	0.0	1.69	269.5	116.6
5.012	48.75	6.77	104.999	0.927	0.0	0.0	0.0	2.20	349.5	122.4
6.000	50.00	5.31	108.448	0.052	0.0	0.0	0.0	2.25	89.5	7.0
6.001	50.00	5.58	107.217	0.142	0.0	0.0	0.0	2.44	97.0	19.2
6.002	50.00	5.68	105.853	0.178	0.0	0.0	0.0	2.25	89.5	24.1
6.003	50.00	5.97	105.294	0.460	0.0	0.0	0.0	2.85	315.1	62.3
5.013	47.94	7.04	103.941	1.398	0.0	0.0	0.0	1.11	240.3	181.5
5.014	46.79	7.45	103.896	1.441	0.0	0.0	0.0	1.11	241.1	182.6
5.015	46.20	7.67	103.827	1.531	0.0	0.0	0.0	1.12	241.6	191.6
5.016	45.95	7.77	103.790	1.542	0.0	0.0	0.0	1.13	244.0	191.9

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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
7.000	24.649	0.325	75.8	0.034	5.00	0.0	0.600	o	225	
5.017	17.660	0.044	401.4	0.015	0.00	0.0	0.600	o	525	
5.018	66.145	0.165	400.0	0.090	0.00	0.0	0.600	o	525	
5.019	62.798	0.157	400.0	0.119	0.00	0.0	0.600	o	525	
5.020	26.670	0.067	400.0	0.035	0.00	0.0	0.600	o	1500	
5.021	39.206	0.098	400.0	0.000	0.00	0.0	0.600	o	1500	
5.022	34.028	0.085	400.3	0.076	0.00	0.0	0.600	o	1500	
1.011	44.746	0.089	500.0	0.000	0.00	0.0	0.600	o	1500	
1.012	8.914	0.053	168.0	0.000	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)
7.000	50.00	5.27	104.399	0.034	0.0	0.0	0.0	1.50	59.8	4.6
5.017	45.27	8.04	103.773	1.591	0.0	0.0	0.0	1.11	240.7	195.1
5.018	42.94	9.03	103.729	1.681	0.0	0.0	0.0	1.11	241.1	195.5
5.019	41.00	9.97	103.564	1.800	0.0	0.0	0.0	1.11	241.1	199.8
5.020	40.59	10.17	102.432	1.835	0.0	0.0	0.0	2.14	3779.1	201.7
5.021	40.02	10.48	102.365	1.835	0.0	0.0	0.0	2.14	3779.1	201.7
5.022	39.54	10.75	102.267	1.911	0.0	0.0	0.0	2.14	3777.5	204.6
1.011	38.86	11.14	102.182	2.916	0.0	0.0	0.0	1.91	3377.8	306.8
1.012	38.65	11.26	102.093	2.916	0.0	0.0	0.0	1.21	85.5<<	306.8

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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)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	105.233	2.227	Open Manhole	2400	1.000	103.006	1200				
2	105.924	3.305	Open Manhole	2400	1.001	102.619	1500	1.000	102.919	1200	
15	106.290	1.425	Open Manhole	1350	2.000	104.865	225				
16	106.358	1.646	Open Manhole	1350	2.001	104.712	225	2.000	104.712	225	
17	105.854	1.571	Open Manhole	1350	2.002	104.283	225	2.001	104.283	225	
18	105.655	1.429	Open Manhole	1500	2.003	104.226	225	2.002	104.226	225	
3	105.961	3.370	Open Manhole	2400	1.002	102.591	1500	1.001	102.591	1500	
								2.003	103.865	225	
19	105.531	1.554	Open Manhole	1800	3.000	103.977	300				
20	105.820	2.174	Open Manhole	1500	3.001	103.646	450	3.000	103.796	300	
4	105.808	3.243	Open Manhole	2700	1.003	102.565	1500	1.002	102.565	1500	
								3.001	103.615	450	
5	105.622	3.099	Open Manhole	2400	1.004	102.523	1500	1.003	102.523	1500	
6	105.847	3.363	Open Manhole	2400	1.005	102.484	1500	1.004	102.484	1500	
7	105.909	3.448	Open Manhole	2400	1.006	102.461	1500	1.005	102.461	1500	
8	105.721	3.303	Open Manhole	2400	1.007	102.418	1500	1.006	102.418	1500	
9	105.581	3.185	Open Manhole	2400	1.008	102.396	1500	1.007	102.396	1500	
21	105.667	1.425	Open Manhole	1350	4.000	104.242	225				
22	105.259	1.914	Open Manhole	1800	4.001	103.345	525	4.000	103.645	225	
10	105.002	2.700	Open Manhole	3000	1.009	102.302	1500	1.008	102.302	1500	
								4.001	103.277	525	
11	104.922	2.700	Open Manhole	3000	1.010	102.222	1500	1.009	102.222	1500	
23	109.597	1.425	Open Manhole	1350	5.000	108.172	225				
24	108.947	1.438	Open Manhole	1500	5.001	107.509	225	5.000	107.509	225	
25	108.247	1.426	Open Manhole	1350	5.002	106.821	225	5.001	106.821	225	
26	108.049	1.426	Open Manhole	1350	5.003	106.623	225	5.002	106.623	225	
27	107.924	1.651	Open Manhole	1500	5.004	106.273	450	5.003	106.498	225	
28	107.857	1.650	Open Manhole	1500	5.005	106.207	450	5.004	106.207	450	
29	107.540	1.650	Open Manhole	1500	5.006	105.890	450	5.005	105.890	450	
30	107.449	1.650	Open Manhole	1500	5.007	105.799	450	5.006	105.799	450	
31	107.646	2.185	Open Manhole	1500	5.008	105.461	450	5.007	105.461	450	
32	107.569	2.380	Open Manhole	1500	5.009	105.189	450	5.008	105.189	450	
33	107.430	2.264	Open Manhole	1500	5.010	105.166	450	5.009	105.166	450	
34	107.241	2.103	Open Manhole	1500	5.011	105.138	450	5.010	105.138	450	

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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)
35	106.909	1.910	Open Manhole	1500	5.012	104.999	450	5.011	104.999	450	
46	109.881	1.433	Open Manhole	1350	6.000	108.448	225				
47	108.671	1.454	Open Manhole	1350	6.001	107.217	225	6.000	107.217	225	
48	107.297	1.444	Open Manhole	1350	6.002	105.853	225	6.001	105.853	225	
49	106.894	1.600	Open Manhole	1350	6.003	105.294	375	6.002	105.444	225	
36	106.895	2.954	Open Manhole	1800	5.013	103.941	525	5.012	104.842	450	826
								6.003	104.091	375	
37	106.951	3.055	Open Manhole	1800	5.014	103.896	525	5.013	103.896	525	
38	106.608	2.781	Open Manhole	1800	5.015	103.827	525	5.014	103.827	525	
39	106.386	2.596	Open Manhole	1800	5.016	103.790	525	5.015	103.790	525	
50	105.824	1.425	Open Manhole	1350	7.000	104.399	225				
40	106.262	2.489	Open Manhole	1800	5.017	103.773	525	5.016	103.773	525	
								7.000	104.074	225	1
41	105.972	2.243	Open Manhole	1800	5.018	103.729	525	5.017	103.729	525	
42	105.729	2.165	Open Manhole	1800	5.019	103.564	525	5.018	103.564	525	
43	105.566	3.134	Open Manhole	2700	5.020	102.432	1500	5.019	103.407	525	
44	105.250	2.885	Open Manhole	2700	5.021	102.365	1500	5.020	102.365	1500	
45	104.968	2.701	Open Manhole	3000	5.022	102.267	1500	5.021	102.267	1500	
12	104.882	2.701	Open Manhole	3000	1.011	102.182	1500	1.010	102.181	1500	
								5.022	102.182	1500	
13	104.793	2.700	Open Manhole	3000	1.012	102.093	300	1.011	102.093	1500	
14	102.473	0.433	Open Manhole	600		OUTFALL		1.012	102.040	300	