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Sanderson House Jubilee Way Huddersfield, WF4 4TD	11444 Stud Farm S104- Surface Water Calcs REV D	
Date 27/01/2022	Designed by WW	
File SWS1 with 40 cc REV D.mdx	Checked by PJM	
Micro Drainage		Network 2019.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SWS1B.SWS

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.364	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	75	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for SWS1B.SWS

- Indicates pipe length does not match coordinates

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	11.262	0.045	250.3	0.000	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	16.404	0.060	273.4	0.171	0.00	0.0	0.600	o	900	Pipe/Conduit	
S2.000	12.424	0.025	497.0	0.020	5.00	0.0	0.600	o	900	Pipe/Conduit	
S1.002	8.934	0.018	496.3	0.007	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.003	29.921#	0.067	446.6	0.022	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.004	9.415#	0.093	101.2	0.040	0.00	0.0	0.600	o	150	Pipe/Conduit	

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)
S1.000	62.61	5.19	99.611	0.000	0.0	0.0	0.0	0.99	69.9	0.0
S1.001	61.90	5.33	98.948	0.171	0.0	0.0	0.0	1.89	1202.4	28.7
S2.000	62.82	5.15	98.913	0.020	0.0	0.0	0.0	1.40	889.8	3.4
S1.002	61.38	5.44	98.888	0.198	0.0	0.0	0.0	1.40	890.4	32.9
S1.003	59.81	5.78	98.308	0.220	0.0	0.0	0.0	1.48	939.1	35.6
S1.004	62.77	5.16	98.803	0.000	2.6	0.0	0.0	1.00	17.6	2.6

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Manhole Schedules for SWS1B.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)
SStorage Crate 1	101.100	1.489	Open Manhole	1200	S1.000	99.611	300			
SWMH01	101.143	2.195	Open Manhole	1800	S1.001	98.948	900	S1.000	99.566	300
SWMH05	101.545	2.632	Open Manhole	1800	S2.000	98.913	900			
SWMH02	101.380	2.492	Open Manhole	1800	S1.002	98.888	900	S1.001	98.888	900
								S2.000	98.888	900
SWMH03	101.390	3.082	Open Manhole	1800	S1.003	98.308	900	S1.002	98.870	900
SWMH04	101.160	2.919	Open Manhole	2250	S1.004	98.803	150	S1.003	98.241	900
S6	101.108	2.398	Open Manhole	0		OUTFALL		S1.004	98.710	150

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWMH01	434762.238	408777.196	434762.238	408777.196	Required	
SWMH05	434781.789	408765.071	434781.789	408765.071	Required	
SWMH02	434769.624	408762.548	434769.624	408762.548	Required	
SWMH03	434766.693	408754.149	434766.693	408754.149	Required	
SWMH04	434782.379	408724.760	434782.379	408724.760	Required	
S6	434789.716	408723.490			No Entry	

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PIPELINE SCHEDULES for SWS1B.SWS

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	300	SStorage	101.100	99.611	1.189	Open Manhole	1200
S1.001	o	900	SWMH01	101.143	98.948	1.295	Open Manhole	1800
S2.000	o	900	SWMH05	101.545	98.913	1.732	Open Manhole	1800
S1.002	o	900	SWMH02	101.380	98.888	1.592	Open Manhole	1800
S1.003	o	900	SWMH03	101.390	98.308	2.182	Open Manhole	1800
S1.004	o	150	SWMH04	101.160	98.803	2.207	Open Manhole	2250

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	11.262	250.3	SWMH01	101.143	99.566	1.277	Open Manhole	1800
S1.001	16.404	273.4	SWMH02	101.380	98.888	1.592	Open Manhole	1800
S2.000	12.424	497.0	SWMH02	101.380	98.888	1.592	Open Manhole	1800
S1.002	8.934	496.3	SWMH03	101.390	98.870	1.620	Open Manhole	1800
S1.003	29.921#	446.6	SWMH04	101.160	98.241	2.019	Open Manhole	2250
S1.004	9.415#	101.2	S6	101.108	98.710	2.248	Open Manhole	0

Free Flowing Outfall Details for SWS1B.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
S1.004	S6	101.108	98.710	0.000	0	0

Simulation Criteria for SWS1B.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	0.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

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Simulation Criteria for SWS1B.SWS

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.364		

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Online Controls for SWS1B.SWS

Hydro-Brake® Optimum Manhole: SWMH04, DS/PN: S1.004, Volume (m³): 27.1

Unit Reference	MD-SHE-0075-2700-1200-2700
Design Head (m)	1.200
Design Flow (l/s)	2.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	98.803
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	2.7
Flush-Flo™	0.330	2.6
Kick-Flo®	0.670	2.1
Mean Flow over Head Range	-	2.3

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	2.1	1.200	2.7	3.000	4.1	7.000	6.1
0.200	2.5	1.400	2.9	3.500	4.4	7.500	6.3
0.300	2.6	1.600	3.1	4.000	4.7	8.000	6.5
0.400	2.5	1.800	3.2	4.500	5.0	8.500	6.7
0.500	2.5	2.000	3.4	5.000	5.2	9.000	6.9
0.600	2.3	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.2	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.9	6.500	5.9		

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Storage Structures for SWS1B.SWS

Cellular Storage Manhole: SStorage Crate 1, DS/PN: S1.000

Invert Level (m) 99.048 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	65.0	0.0	1.201	0.0	0.0
1.200	65.0	0.0			

Manhole Headloss for SWS1B.SWS

PN	US/MH Name	US/MH Headloss
S1.000	SStorage Crate 1	0.500
S1.001	SWMH01	0.500
S2.000	SWMH05	0.500
S1.002	SWMH02	0.500
S1.003	SWMH03	0.500
S1.004	SWMH04	0.500

Volume Summary (Static)

Length Calculations based on Centre-Centre

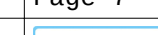
Pipe Number	USMH Name	Manhole Volume (m ³)	Pipe Volume (m ³)	Storage Structure Volume (m ³)	Total Volume (m ³)
S1.000	SStorage Crate 1	1.684	0.796	74.121	76.601
S1.001	SWMH01	5.586	10.436	0.000	16.021
S2.000	SWMH05	6.698	7.904	0.000	14.601
S1.002	SWMH02	6.341	5.684	0.000	12.025
S1.003	SWMH03	7.843	19.035	0.000	26.878
S1.004	SWMH04	9.372	0.166	0.000	9.538
Total		37.523	44.021	74.121	155.664

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Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
S1.000	SStorage Crate 1	1.684	0.690	74.121	76.495
S1.001	SWMH01	5.586	9.291	0.000	14.876
S2.000	SWMH05	6.698	6.759	0.000	13.456
S1.002	SWMH02	6.341	4.538	0.000	10.880
S1.003	SWMH03	7.843	17.747	0.000	25.589
S1.004	SWMH04	9.372	0.146	0.000	9.518
Total		37.523	39.171	74.121	150.815

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Summary of Critical Results by Maximum Level (Rank 1) for SWS1B.SWS

Simulation Criteria

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.364
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	SStorage	Crate 1	360	Winter	100	+40%	100/120 Summer
S1.001		SWMH01	360	Winter	100	+40%	100/15 Summer
S2.000		SWMH05	360	Winter	100	+40%	30/120 Winter
S1.002		SWMH02	360	Winter	100	+40%	30/120 Winter
S1.003		SWMH03	360	Winter	100	+40%	30/15 Summer
S1.004		SWMH04	360	Winter	100	+40%	1/30 Winter

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S1.000	SStorage Crate 1		100.611	0.700	0.000	0.44		24.5
S1.001	SWMH01		100.611	0.763	0.000	0.03		21.2
S2.000	SWMH05		100.611	0.798	0.000	0.01		3.9
S1.002	SWMH02		100.612	0.824	0.000	0.05		18.9
S1.003	SWMH03		100.612	1.404	0.000	0.02		11.1
S1.004	SWMH04		100.612	1.659	0.000	0.21		3.3

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Summary of Critical Results by Maximum Level (Rank 1) for SWS1B.SWS

PN	US/MH Name	Status	Level Exceeded
S1.000	SStorage Crate 1	SURCHARGED	
S1.001	SWMH01	SURCHARGED	
S2.000	SWMH05	SURCHARGED	
S1.002	SWMH02	SURCHARGED	
S1.003	SWMH03	SURCHARGED	
S1.004	SWMH04	SURCHARGED	

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Micro Drainage		Network 2019.1							
Rainfall Hyetograph for 360 minute 100 year Winter I+40% for Pipe S1.000 (SWS1B.SWS)									
Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1	0.476	50	6.446	99	10.907	148	27.761	197	33.586
2	0.476	51	6.440	100	10.907	149	28.602	198	33.586
3	0.476	52	6.436	101	11.084	150	28.602	199	32.470
4	1.030	53	6.436	102	11.794	151	28.602	200	32.470
5	1.859	54	6.436	103	11.794	152	29.688	201	32.470
6	1.859	55	6.442	104	11.794	153	29.959	202	31.984
7	1.859	56	6.442	105	12.375	154	29.959	203	31.254
8	2.774	57	6.442	106	12.763	155	30.218	204	31.254
9	3.003	58	6.455	107	12.763	156	31.254	205	31.254
10	3.003	59	6.474	108	12.763	157	31.254	206	30.218
11	3.189	60	6.474	109	13.813	158	31.254	207	29.959
12	3.932	61	6.474	110	13.813	159	31.984	208	29.959
13	3.932	62	6.530	111	13.813	160	32.470	209	29.688
14	3.932	63	6.543	112	14.263	161	32.470	210	28.602
15	4.377	64	6.543	113	14.938	162	32.470	211	28.602
16	4.674	65	6.567	114	14.938	163	33.586	212	28.602
17	4.674	66	6.660	115	14.938	164	33.586	213	27.761
18	4.674	67	6.660	116	15.894	165	33.586	214	27.201
19	5.250	68	6.660	117	16.133	166	33.984	215	27.201
20	5.250	69	6.764	118	16.133	167	34.582	216	27.201
21	5.250	70	6.832	119	16.384	168	34.582	217	25.772
22	5.424	71	6.832	120	17.391	169	34.582	218	25.772
23	5.685	72	6.832	121	17.391	170	35.265	219	25.772
24	5.685	73	7.068	122	17.391	171	35.436	220	25.196
25	5.685	74	7.068	123	18.180	172	35.436	221	24.331
26	5.937	75	7.068	124	18.705	173	35.574	222	24.331
27	6.000	76	7.191	125	18.705	174	36.126	223	24.331
28	6.000	77	7.374	126	18.705	175	36.126	224	23.179
29	6.043	78	7.374	127	20.067	176	36.126	225	22.891
30	6.215	79	7.374	128	20.067	177	36.426	226	22.891
31	6.215	80	7.679	129	20.067	178	36.627	227	22.606
32	6.215	81	7.755	130	20.626	179	36.627	228	21.466
33	6.296	82	7.755	131	21.466	180	36.627	229	21.466
34	6.350	83	7.848	132	21.466	181	36.627	230	21.466
35	6.350	84	8.216	133	21.466	182	36.627	231	20.626
36	6.350	85	8.216	134	22.606	183	36.627	232	20.067
37	6.424	86	8.216	135	22.891	184	36.426	233	20.067
38	6.424	87	8.543	136	22.891	185	36.126	234	20.067
39	6.424	88	8.760	137	23.179	186	36.126	235	18.705
40	6.436	89	8.760	138	24.331	187	36.126	236	18.705
41	6.454	90	8.760	139	24.331	188	35.574	237	18.705
42	6.454	91	9.390	140	24.331	189	35.436	238	18.180
43	6.454	92	9.390	141	25.196	190	35.436	239	17.391
44	6.456	93	9.390	142	25.772	191	35.265	240	17.391
45	6.456	94	9.676	143	25.772	192	34.582	241	17.391
46	6.456	95	10.105	144	25.772	193	34.582	242	16.384
47	6.454	96	10.105	145	27.201	194	34.582	243	16.133
48	6.446	97	10.105	146	27.201	195	33.984	244	16.133
49	6.446	98	10.746	147	27.201	196	33.586	245	15.894
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Rainfall Hyetograph for 360 minute 100 year Winter I+40%
for Pipe S1.000 (SWS1B.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
246	14.938	269	9.390	292	6.763	315	6.456	338	5.685
247	14.938	270	9.390	293	6.660	316	6.456	339	5.424
248	14.938	271	8.760	294	6.660	317	6.456	340	5.250
249	14.263	272	8.760	295	6.660	318	6.454	341	5.250
250	13.813	273	8.760	296	6.567	319	6.454	342	5.250
251	13.813	274	8.543	297	6.543	320	6.454	343	4.674
252	13.813	275	8.216	298	6.543	321	6.436	344	4.674
253	12.763	276	8.216	299	6.530	322	6.424	345	4.674
254	12.763	277	8.216	300	6.474	323	6.424	346	4.377
255	12.763	278	7.848	301	6.474	324	6.424	347	3.932
256	12.375	279	7.756	302	6.474	325	6.350	348	3.932
257	11.794	280	7.756	303	6.455	326	6.350	349	3.932
258	11.794	281	7.679	304	6.442	327	6.350	350	3.189
259	11.794	282	7.374	305	6.442	328	6.296	351	3.003
260	11.084	283	7.374	306	6.442	329	6.215	352	3.003
261	10.907	284	7.374	307	6.436	330	6.215	353	2.774
262	10.907	285	7.191	308	6.436	331	6.215	354	1.859
263	10.746	286	7.068	309	6.436	332	6.043	355	1.859
264	10.105	287	7.068	310	6.440	333	6.000	356	1.859
265	10.105	288	7.068	311	6.446	334	6.000	357	1.029
266	10.105	289	6.832	312	6.446	335	5.937	358	0.476
267	9.676	290	6.832	313	6.446	336	5.685	359	0.476
268	9.390	291	6.832	314	6.454	337	5.685	360	0.476

Sanderson Associates		Page 12
Sanderson House Jubilee Way Huddersfield, WF4 4TD	11444 Stud Farm S104- Surface Water Calcs REV D	
Date 27/01/2022	Designed by WW	
File SWS1 with 40 cc REV D.mdx	Checked by PJM	
Micro Drainage		Network 2019.1

Rainfall Hyetograph for 360 minute 100 year Winter I+40%
for Pipe S1.001 (SWS1B.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
246	14.938	269	9.390	292	6.763	315	6.456	338	5.685
247	14.938	270	9.390	293	6.660	316	6.456	339	5.424
248	14.938	271	8.760	294	6.660	317	6.456	340	5.250
249	14.263	272	8.760	295	6.660	318	6.454	341	5.250
250	13.813	273	8.760	296	6.567	319	6.454	342	5.250
251	13.813	274	8.543	297	6.543	320	6.454	343	4.674
252	13.813	275	8.216	298	6.543	321	6.436	344	4.674
253	12.763	276	8.216	299	6.530	322	6.424	345	4.674
254	12.763	277	8.216	300	6.474	323	6.424	346	4.377
255	12.763	278	7.848	301	6.474	324	6.424	347	3.932
256	12.375	279	7.756	302	6.474	325	6.350	348	3.932
257	11.794	280	7.756	303	6.455	326	6.350	349	3.932
258	11.794	281	7.679	304	6.442	327	6.350	350	3.189
259	11.794	282	7.374	305	6.442	328	6.296	351	3.003
260	11.084	283	7.374	306	6.442	329	6.215	352	3.003
261	10.907	284	7.374	307	6.436	330	6.215	353	2.774
262	10.907	285	7.191	308	6.436	331	6.215	354	1.859
263	10.746	286	7.068	309	6.436	332	6.043	355	1.859
264	10.105	287	7.068	310	6.440	333	6.000	356	1.859
265	10.105	288	7.068	311	6.446	334	6.000	357	1.029
266	10.105	289	6.832	312	6.446	335	5.937	358	0.476
267	9.676	290	6.832	313	6.446	336	5.685	359	0.476
268	9.390	291	6.832	314	6.454	337	5.685	360	0.476

Sanderson Associates				Page 13					
Sanderson House Jubilee Way Huddersfield, WF4 4TD		11444 Stud Farm S104- Surface Water Calcs REV D							
Date 27/01/2022 File SWS1 with 40 cc REV D.mdx		Designed by WW Checked by PJM							
Micro Drainage		Network 2019.1							
Rainfall Hyetograph for 360 minute 100 year Winter I+40% for Pipe S2.000 (SWS1B.SWS)									
Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1	0.476	50	6.446	99	10.907	148	27.761	197	33.586
2	0.476	51	6.440	100	10.907	149	28.602	198	33.586
3	0.476	52	6.436	101	11.084	150	28.602	199	32.470
4	1.030	53	6.436	102	11.794	151	28.602	200	32.470
5	1.859	54	6.436	103	11.794	152	29.688	201	32.470
6	1.859	55	6.442	104	11.794	153	29.959	202	31.984
7	1.859	56	6.442	105	12.375	154	29.959	203	31.254
8	2.774	57	6.442	106	12.763	155	30.218	204	31.254
9	3.003	58	6.455	107	12.763	156	31.254	205	31.254
10	3.003	59	6.474	108	12.763	157	31.254	206	30.218
11	3.189	60	6.474	109	13.813	158	31.254	207	29.959
12	3.932	61	6.474	110	13.813	159	31.984	208	29.959
13	3.932	62	6.530	111	13.813	160	32.470	209	29.688
14	3.932	63	6.543	112	14.263	161	32.470	210	28.602
15	4.377	64	6.543	113	14.938	162	32.470	211	28.602
16	4.674	65	6.567	114	14.938	163	33.586	212	28.602
17	4.674	66	6.660	115	14.938	164	33.586	213	27.761
18	4.674	67	6.660	116	15.894	165	33.586	214	27.201
19	5.250	68	6.660	117	16.133	166	33.984	215	27.201
20	5.250	69	6.764	118	16.133	167	34.582	216	27.201
21	5.250	70	6.832	119	16.384	168	34.582	217	25.772
22	5.424	71	6.832	120	17.391	169	34.582	218	25.772
23	5.685	72	6.832	121	17.391	170	35.265	219	25.772
24	5.685	73	7.068	122	17.391	171	35.436	220	25.196
25	5.685	74	7.068	123	18.180	172	35.436	221	24.331
26	5.937	75	7.068	124	18.705	173	35.574	222	24.331
27	6.000	76	7.191	125	18.705	174	36.126	223	24.331
28	6.000	77	7.374	126	18.705	175	36.126	224	23.179
29	6.043	78	7.374	127	20.067	176	36.126	225	22.891
30	6.215	79	7.374	128	20.067	177	36.426	226	22.891
31	6.215	80	7.679	129	20.067	178	36.627	227	22.606
32	6.215	81	7.755	130	20.626	179	36.627	228	21.466
33	6.296	82	7.755	131	21.466	180	36.627	229	21.466
34	6.350	83	7.848	132	21.466	181	36.627	230	21.466
35	6.350	84	8.216	133	21.466	182	36.627	231	20.626
36	6.350	85	8.216	134	22.606	183	36.627	232	20.067
37	6.424	86	8.216	135	22.891	184	36.426	233	20.067
38	6.424	87	8.543	136	22.891	185	36.126	234	20.067
39	6.424	88	8.760	137	23.179	186	36.126	235	18.705
40	6.436	89	8.760	138	24.331	187	36.126	236	18.705
41	6.454	90	8.760	139	24.331	188	35.574	237	18.705
42	6.454	91	9.390	140	24.331	189	35.436	238	18.180
43	6.454	92	9.390	141	25.196	190	35.436	239	17.391
44	6.456	93	9.390	142	25.772	191	35.265	240	17.391
45	6.456	94	9.676	143	25.772	192	34.582	241	17.391
46	6.456	95	10.105	144	25.772	193	34.582	242	16.384
47	6.454	96	10.105	145	27.201	194	34.582	243	16.133
48	6.446	97	10.105	146	27.201	195	33.984	244	16.133
49	6.446	98	10.746	147	27.201	196	33.586	245	15.894
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Sanderson Associates		Page 14
Sanderson House Jubilee Way Huddersfield, WF4 4TD	11444 Stud Farm S104- Surface Water Calcs REV D	
Date 27/01/2022	Designed by WW	
File SWS1 with 40 cc REV D.mdx	Checked by PJM	
Micro Drainage		Network 2019.1

Rainfall Hyetograph for 360 minute 100 year Winter I+40%
for Pipe S2.000 (SWS1B.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
246	14.938	269	9.390	292	6.763	315	6.456	338	5.685
247	14.938	270	9.390	293	6.660	316	6.456	339	5.424
248	14.938	271	8.760	294	6.660	317	6.456	340	5.250
249	14.263	272	8.760	295	6.660	318	6.454	341	5.250
250	13.813	273	8.760	296	6.567	319	6.454	342	5.250
251	13.813	274	8.543	297	6.543	320	6.454	343	4.674
252	13.813	275	8.216	298	6.543	321	6.436	344	4.674
253	12.763	276	8.216	299	6.530	322	6.424	345	4.674
254	12.763	277	8.216	300	6.474	323	6.424	346	4.377
255	12.763	278	7.848	301	6.474	324	6.424	347	3.932
256	12.375	279	7.756	302	6.474	325	6.350	348	3.932
257	11.794	280	7.756	303	6.455	326	6.350	349	3.932
258	11.794	281	7.679	304	6.442	327	6.350	350	3.189
259	11.794	282	7.374	305	6.442	328	6.296	351	3.003
260	11.084	283	7.374	306	6.442	329	6.215	352	3.003
261	10.907	284	7.374	307	6.436	330	6.215	353	2.774
262	10.907	285	7.191	308	6.436	331	6.215	354	1.859
263	10.746	286	7.068	309	6.436	332	6.043	355	1.859
264	10.105	287	7.068	310	6.440	333	6.000	356	1.859
265	10.105	288	7.068	311	6.446	334	6.000	357	1.029
266	10.105	289	6.832	312	6.446	335	5.937	358	0.476
267	9.676	290	6.832	313	6.446	336	5.685	359	0.476
268	9.390	291	6.832	314	6.454	337	5.685	360	0.476

Sanderson Associates		Page 16
Sanderson House Jubilee Way Huddersfield, WF4 4TD	11444 Stud Farm S104- Surface Water Calcs REV D	
Date 27/01/2022	Designed by WW	
File SWS1 with 40 cc REV D.mdx	Checked by PJM	
Micro Drainage		Network 2019.1

Rainfall Hyetograph for 360 minute 100 year Winter I+40%
for Pipe S1.002 (SWS1B.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
246	14.938	269	9.390	292	6.763	315	6.456	338	5.685
247	14.938	270	9.390	293	6.660	316	6.456	339	5.424
248	14.938	271	8.760	294	6.660	317	6.456	340	5.250
249	14.263	272	8.760	295	6.660	318	6.454	341	5.250
250	13.813	273	8.760	296	6.567	319	6.454	342	5.250
251	13.813	274	8.543	297	6.543	320	6.454	343	4.674
252	13.813	275	8.216	298	6.543	321	6.436	344	4.674
253	12.763	276	8.216	299	6.530	322	6.424	345	4.674
254	12.763	277	8.216	300	6.474	323	6.424	346	4.377
255	12.763	278	7.848	301	6.474	324	6.424	347	3.932
256	12.375	279	7.756	302	6.474	325	6.350	348	3.932
257	11.794	280	7.756	303	6.455	326	6.350	349	3.932
258	11.794	281	7.679	304	6.442	327	6.350	350	3.189
259	11.794	282	7.374	305	6.442	328	6.296	351	3.003
260	11.084	283	7.374	306	6.442	329	6.215	352	3.003
261	10.907	284	7.374	307	6.436	330	6.215	353	2.774
262	10.907	285	7.191	308	6.436	331	6.215	354	1.859
263	10.746	286	7.068	309	6.436	332	6.043	355	1.859
264	10.105	287	7.068	310	6.440	333	6.000	356	1.859
265	10.105	288	7.068	311	6.446	334	6.000	357	1.029
266	10.105	289	6.832	312	6.446	335	5.937	358	0.476
267	9.676	290	6.832	313	6.446	336	5.685	359	0.476
268	9.390	291	6.832	314	6.454	337	5.685	360	0.476

Sanderson Associates		Page 18
Sanderson House Jubilee Way Huddersfield, WF4 4TD	11444 Stud Farm S104- Surface Water Calcs REV D	
Date 27/01/2022	Designed by WW	
File SWS1 with 40 cc REV D.mdx	Checked by PJM	
Micro Drainage		Network 2019.1

Rainfall Hyetograph for 360 minute 100 year Winter I+40%
for Pipe S1.003 (SWS1B.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
246	14.938	269	9.390	292	6.763	315	6.456	338	5.685
247	14.938	270	9.390	293	6.660	316	6.456	339	5.424
248	14.938	271	8.760	294	6.660	317	6.456	340	5.250
249	14.263	272	8.760	295	6.660	318	6.454	341	5.250
250	13.813	273	8.760	296	6.567	319	6.454	342	5.250
251	13.813	274	8.543	297	6.543	320	6.454	343	4.674
252	13.813	275	8.216	298	6.543	321	6.436	344	4.674
253	12.763	276	8.216	299	6.530	322	6.424	345	4.674
254	12.763	277	8.216	300	6.474	323	6.424	346	4.377
255	12.763	278	7.848	301	6.474	324	6.424	347	3.932
256	12.375	279	7.756	302	6.474	325	6.350	348	3.932
257	11.794	280	7.756	303	6.455	326	6.350	349	3.932
258	11.794	281	7.679	304	6.442	327	6.350	350	3.189
259	11.794	282	7.374	305	6.442	328	6.296	351	3.003
260	11.084	283	7.374	306	6.442	329	6.215	352	3.003
261	10.907	284	7.374	307	6.436	330	6.215	353	2.774
262	10.907	285	7.191	308	6.436	331	6.215	354	1.859
263	10.746	286	7.068	309	6.436	332	6.043	355	1.859
264	10.105	287	7.068	310	6.440	333	6.000	356	1.859
265	10.105	288	7.068	311	6.446	334	6.000	357	1.029
266	10.105	289	6.832	312	6.446	335	5.937	358	0.476
267	9.676	290	6.832	313	6.446	336	5.685	359	0.476
268	9.390	291	6.832	314	6.454	337	5.685	360	0.476

Sanderson Associates				Page 19			
Sanderson House Jubilee Way Huddersfield, WF4 4TD		11444 Stud Farm S104- Surface Water Calcs REV D					
Date 27/01/2022 File SWS1 with 40 cc REV D.mdx		Designed by WW Checked by PJM					
Micro Drainage		Network 2019.1					
<u>Rainfall Hyetograph for 360 minute 100 year Winter I+40%</u> <u>for Pipe S1.004 (SWS1B.SWS)</u>							
Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1	0.476	50	6.446	99	10.907	148	27.761
2	0.476	51	6.440	100	10.907	149	28.602
3	0.476	52	6.436	101	11.084	150	28.602
4	1.030	53	6.436	102	11.794	151	28.602
5	1.859	54	6.436	103	11.794	152	29.688
6	1.859	55	6.442	104	11.794	153	29.959
7	1.859	56	6.442	105	12.375	154	29.959
8	2.774	57	6.442	106	12.763	155	30.218
9	3.003	58	6.455	107	12.763	156	31.254
10	3.003	59	6.474	108	12.763	157	31.254
11	3.189	60	6.474	109	13.813	158	31.254
12	3.932	61	6.474	110	13.813	159	31.984
13	3.932	62	6.530	111	13.813	160	32.470
14	3.932	63	6.543	112	14.263	161	32.470
15	4.377	64	6.543	113	14.938	162	32.470
16	4.674	65	6.567	114	14.938	163	33.586
17	4.674	66	6.660	115	14.938	164	33.586
18	4.674	67	6.660	116	15.894	165	33.586
19	5.250	68	6.660	117	16.133	166	33.984
20	5.250	69	6.764	118	16.133	167	34.582
21	5.250	70	6.832	119	16.384	168	34.582
22	5.424	71	6.832	120	17.391	169	34.582
23	5.685	72	6.832	121	17.391	170	35.265
24	5.685	73	7.068	122	17.391	171	35.436
25	5.685	74	7.068	123	18.180	172	35.436
26	5.937	75	7.068	124	18.705	173	35.574
27	6.000	76	7.191	125	18.705	174	36.126
28	6.000	77	7.374	126	18.705	175	36.126
29	6.043	78	7.374	127	20.067	176	36.126
30	6.215	79	7.374	128	20.067	177	36.426
31	6.215	80	7.679	129	20.067	178	36.627
32	6.215	81	7.755	130	20.626	179	36.627
33	6.296	82	7.755	131	21.466	180	36.627
34	6.350	83	7.848	132	21.466	181	36.627
35	6.350	84	8.216	133	21.466	182	36.627
36	6.350	85	8.216	134	22.606	183	36.627
37	6.424	86	8.216	135	22.891	184	36.426
38	6.424	87	8.543	136	22.891	185	36.126
39	6.424	88	8.760	137	23.179	186	36.126
40	6.436	89	8.760	138	24.331	187	36.126
41	6.454	90	8.760	139	24.331	188	35.574
42	6.454	91	9.390	140	24.331	189	35.436
43	6.454	92	9.390	141	25.196	190	35.436
44	6.456	93	9.390	142	25.772	191	35.265
45	6.456	94	9.676	143	25.772	192	34.582
46	6.456	95	10.105	144	25.772	193	34.582
47	6.454	96	10.105	145	27.201	194	34.582

Sanderson Associates		Page 20
Sanderson House Jubilee Way Huddersfield, WF4 4TD	11444 Stud Farm S104- Surface Water Calcs REV D	
Date 27/01/2022	Designed by WW	
File SWS1 with 40 cc REV D.mdx	Checked by PJM	
Micro Drainage		Network 2019.1

Rainfall Hyetograph for 360 minute 100 year Winter I+40%
for Pipe S1.004 (SWS1B.SWS)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
246	14.938	269	9.390	292	6.763	315	6.456	338	5.685
247	14.938	270	9.390	293	6.660	316	6.456	339	5.424
248	14.938	271	8.760	294	6.660	317	6.456	340	5.250
249	14.263	272	8.760	295	6.660	318	6.454	341	5.250
250	13.813	273	8.760	296	6.567	319	6.454	342	5.250
251	13.813	274	8.543	297	6.543	320	6.454	343	4.674
252	13.813	275	8.216	298	6.543	321	6.436	344	4.674
253	12.763	276	8.216	299	6.530	322	6.424	345	4.674
254	12.763	277	8.216	300	6.474	323	6.424	346	4.377
255	12.763	278	7.848	301	6.474	324	6.424	347	3.932
256	12.375	279	7.756	302	6.474	325	6.350	348	3.932
257	11.794	280	7.756	303	6.455	326	6.350	349	3.932
258	11.794	281	7.679	304	6.442	327	6.350	350	3.189
259	11.794	282	7.374	305	6.442	328	6.296	351	3.003
260	11.084	283	7.374	306	6.442	329	6.215	352	3.003
261	10.907	284	7.374	307	6.436	330	6.215	353	2.774
262	10.907	285	7.191	308	6.436	331	6.215	354	1.859
263	10.746	286	7.068	309	6.436	332	6.043	355	1.859
264	10.105	287	7.068	310	6.440	333	6.000	356	1.859
265	10.105	288	7.068	311	6.446	334	6.000	357	1.029
266	10.105	289	6.832	312	6.446	335	5.937	358	0.476
267	9.676	290	6.832	313	6.446	336	5.685	359	0.476
268	9.390	291	6.832	314	6.454	337	5.685	360	0.476