

OEC Consulting Engineers Ltd		Page 1
Clarke Hall Farm Aberford Road, Wakefield WF1 4AL	124.008 Westfield Lane, Wyke	
Date 06/04/2023 File 124.008 - V3.MDX	Designed by A.Bottomley Checked by A.Bottomley	
Innovyze		Network 2019.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SWS.SWS

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.321	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	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)	0.75
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for SWS.SWS

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.172	4-8	0.129

Total Area Contributing (ha) = 0.301

Total Pipe Volume (m³) = 210.028

Network Design Table for SWS.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
1.000	10.417	0.494	21.1	0.032	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	13.376	0.892	15.0	0.017	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	18.582	0.449	41.4	0.017	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)
1.000	46.28	5.08	171.569	0.032	0.0	0.0	0.0	2.20	38.9	5.3
1.001	45.97	5.16	171.075	0.049	0.0	0.0	0.0	2.61	46.2	8.1
1.002	45.26	5.36	170.183	0.066	0.0	0.0	0.0	1.57	27.7	10.8

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OEC Consulting Engineers Ltd		Page 3
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Date 06/04/2023 File 124.008 - V3.MDX	Designed by A.Bottomley Checked by A.Bottomley	
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Manhole Schedules for SWS.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	173.119	1.550	Open Manhole	1200	1.000	171.569	150				
2	172.629	1.554	Open Manhole	1200	1.001	171.075	150	1.000	171.075	150	
3	171.987	1.804	Open Manhole	1200	1.002	170.183	150	1.001	170.183	150	
4	170.271	1.425	Open Manhole	1200	2.000	168.846	225				
5	171.106	2.497	Open Manhole	1200	1.003	168.609	225	1.002	169.734	150	1050
								2.000	168.609	225	
6	169.600	2.655	Open Manhole	1	3.000	166.945	-1				
7	170.345	3.510	Open Manhole	1	3.001	166.835	375	3.000	166.835	-1	
8	170.500	3.750	Open Manhole	2100	1.004	166.750	150	1.003	168.275	225	1600
								3.001	166.800	375	275
9	170.368	3.654	Open Manhole	1200	1.005	166.714	150	1.004	166.714	150	
10	167.800	1.485	Open Manhole	1200	1.006	166.315	150	1.005	166.315	150	
C1	165.750	1.416	Open Manhole	1200	1.007	164.334	150	1.006	164.334	150	
C2	165.750	1.473	Open Manhole	0		OUTFALL		1.007	164.277	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1	106177.217	74525.738	106177.217	74525.738	Required	
2	106177.224	74515.321	106177.224	74515.321	Required	
3	106168.432	74505.240	106168.432	74505.240	Required	
4	106133.279	74502.217	106133.279	74502.217	Required	
5	106149.919	74503.648	106149.919	74503.648	Required	
6	106155.215	74454.430	106155.215	74454.430	Required	
7	106153.412	74472.454	106153.412	74472.454	Required	
8	106152.857	74476.344	106152.857	74476.344	Required	

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124.008
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Manhole Schedules for SWS.SWS

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
9	106149.363	74475.987	106149.363	74475.987	Required	
10	106150.803	74443.552	106150.803	74443.552	Required	
C1	106128.698	74441.651	106128.698	74441.651	Required	
C2	106123.874	74442.833			No Entry	

OEC Consulting Engineers Ltd		Page 5
Clarke Hall Farm Aberford Road, Wakefield WF1 4AL	124.008 Westfield Lane, Wyke	
Date 06/04/2023 File 124.008 - V3.MDX	Designed by A.Bottomley Checked by A.Bottomley	
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PIPELINE SCHEDULES for SWS.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)
1.000	o	150	1	173.119	171.569	1.400	Open Manhole	1200
1.001	o	150	2	172.629	171.075	1.404	Open Manhole	1200
1.002	o	150	3	171.987	170.183	1.654	Open Manhole	1200
2.000	o	225	4	170.271	168.846	1.200	Open Manhole	1200
1.003	o	225	5	171.106	168.609	2.272	Open Manhole	1200
3.000	[]	-1	6	169.600	166.945	1.455	Open Manhole	1
3.001	o	375	7	170.345	166.835	3.135	Open Manhole	1
1.004	o	150	8	170.500	166.750	3.600	Open Manhole	2100
1.005	o	150	9	170.368	166.714	3.504	Open Manhole	1200
1.006	o	150	10	167.800	166.315	1.335	Open Manhole	1200
1.007	o	150	C1	165.750	164.334	1.266	Open Manhole	1200

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)
1.000	10.417	21.1	2	172.629	171.075	1.404	Open Manhole	1200
1.001	13.376	15.0	3	171.987	170.183	1.654	Open Manhole	1200
1.002	18.582	41.4	5	171.106	169.734	1.222	Open Manhole	1200
2.000	16.702	70.5	5	171.106	168.609	2.272	Open Manhole	1200
1.003	27.462	82.2	8	170.500	168.275	2.000	Open Manhole	2100
3.000	22.000#	200.0	7	170.345	166.835	2.310	Open Manhole	1
3.001	2.874#	82.1	8	170.500	166.800	3.325	Open Manhole	2100
1.004	3.512	97.6	9	170.368	166.714	3.504	Open Manhole	1200
1.005	39.840#	99.8	10	167.800	166.315	1.335	Open Manhole	1200
1.006	23.776#	12.0	C1	165.750	164.334	1.266	Open Manhole	1200
1.007	5.630#	98.8	C2	165.750	164.277	1.323	Open Manhole	0

Free Flowing Outfall Details for SWS.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
1.007	C2	165.750	164.277	0.000	0	0

OEC Consulting Engineers Ltd		Page 6
Clarke Hall Farm Aberford Road, Wakefield WF1 4AL	124.008 Westfield Lane, Wyke	
Date 06/04/2023 File 124.008 - V3.MDX	Designed by A.Bottomley Checked by A.Bottomley	
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<u>Simulation Criteria for SWS.SWS</u> Volumetric Runoff Coeff 1.000 Additional Flow - % of Total Flow 0.000 Areal Reduction Factor 1.000 MADD Factor * 10m³/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 0 Number of Online Controls 1 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> Rainfall Model FSR Profile Type Summer Return Period (years) 1 Cv (Summer) 1.000 Region England and Wales Cv (Winter) 0.840 M5-60 (mm) 19.000 Storm Duration (mins) 30 Ratio R 0.321		
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OEC Consulting Engineers Ltd				Page 7																																																																																																													
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<u>Online Controls for SWS.SWS</u> <u>Depth/Flow Relationship Manhole: 8, DS/PN: 1.004, Volume (m³): 14.2</u> Invert Level (m) 166.750 <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.090</td><td>1.8800</td><td>0.800</td><td>2.2900</td><td>1.510</td><td>3.0300</td><td>2.220</td><td>3.5400</td></tr><tr><td>0.180</td><td>2.6200</td><td>0.890</td><td>2.4000</td><td>1.600</td><td>3.1000</td><td>2.310</td><td>3.6000</td></tr><tr><td>0.270</td><td>2.8600</td><td>0.980</td><td>2.5100</td><td>1.690</td><td>3.1700</td><td>2.400</td><td>3.6500</td></tr><tr><td>0.360</td><td>2.8600</td><td>1.070</td><td>2.6000</td><td>1.780</td><td>3.2400</td><td>2.490</td><td>3.7000</td></tr><tr><td>0.440</td><td>2.8000</td><td>1.160</td><td>2.7000</td><td>1.870</td><td>3.3100</td><td>2.580</td><td>3.7500</td></tr><tr><td>0.530</td><td>2.6600</td><td>1.240</td><td>2.7900</td><td>1.950</td><td>3.3700</td><td></td><td></td></tr><tr><td>0.620</td><td>2.3600</td><td>1.330</td><td>2.8700</td><td>2.040</td><td>3.4300</td><td></td><td></td></tr><tr><td>0.710</td><td>2.1700</td><td>1.420</td><td>2.9500</td><td>2.130</td><td>3.4900</td><td></td><td></td></tr></table> <u>Manhole Headloss for SWS.SWS</u> <table><tr><th>PN</th><th>US/MH Name</th><th>US/MH Headloss</th></tr><tr><td>1.000</td><td>1</td><td>0.500</td></tr><tr><td>1.001</td><td>2</td><td>0.500</td></tr><tr><td>1.002</td><td>3</td><td>0.500</td></tr><tr><td>2.000</td><td>4</td><td>0.500</td></tr><tr><td>1.003</td><td>5</td><td>0.500</td></tr><tr><td>3.000</td><td>6</td><td>0.500</td></tr><tr><td>3.001</td><td>7</td><td>0.500</td></tr><tr><td>1.004</td><td>8</td><td>0.500</td></tr><tr><td>1.005</td><td>9</td><td>0.500</td></tr><tr><td>1.006</td><td>10</td><td>0.500</td></tr><tr><td>1.007</td><td>C1</td><td>0.500</td></tr></table>						Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.090	1.8800	0.800	2.2900	1.510	3.0300	2.220	3.5400	0.180	2.6200	0.890	2.4000	1.600	3.1000	2.310	3.6000	0.270	2.8600	0.980	2.5100	1.690	3.1700	2.400	3.6500	0.360	2.8600	1.070	2.6000	1.780	3.2400	2.490	3.7000	0.440	2.8000	1.160	2.7000	1.870	3.3100	2.580	3.7500	0.530	2.6600	1.240	2.7900	1.950	3.3700			0.620	2.3600	1.330	2.8700	2.040	3.4300			0.710	2.1700	1.420	2.9500	2.130	3.4900			PN	US/MH Name	US/MH Headloss	1.000	1	0.500	1.001	2	0.500	1.002	3	0.500	2.000	4	0.500	1.003	5	0.500	3.000	6	0.500	3.001	7	0.500	1.004	8	0.500	1.005	9	0.500	1.006	10	0.500	1.007	C1	0.500
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OEC Consulting Engineers Ltd		Page 11
Clarke Hall Farm Aberford Road, Wakefield WF1 4AL	124.008 Westfield Lane, Wyke	
Date 06/04/2023 File 124.008 - V3.MDX	Designed by A.Bottomley Checked by A.Bottomley	
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Summary of Critical Results by Maximum Level (Rank 1) for SWS.SWS

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
1.000	1	-0.088	0.000	0.35		12.3	OK	
1.001	2	-0.078	0.000	0.46		19.5	OK	
1.002	3	0.018	0.000	1.00		26.0	SURCHARGED	
2.000	4	-0.085	0.000	0.44		24.3	OK	
1.003	5	0.103	0.000	1.15		61.4	SURCHARGED	
3.000	6	-0.616	0.000	0.00		11.1	OK	
3.001	7	0.319	0.000	0.03		2.7	SURCHARGED	
1.004	8	0.630	0.000	0.24		2.9	SURCHARGED	
1.005	9	-0.109	0.000	0.17		2.9	OK	
1.006	10	-0.127	0.000	0.06		2.9	OK	
1.007	C1	-0.106	0.000	0.19		2.9	OK	

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Page 12

Clarke Hall Farm
Aberford Road, Wakefield
WF1 4AL

124.008
Westfield Lane,
Wyke

Date 06/04/2023
File 124.008 - V3.MDX

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Micro Drainage

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

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 0.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 0

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 0.325

Region England and Wales Cv (Summer) 1.000

M5-60 (mm) 19.000 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status OFF

DVD Status ON

Inertia Status ON

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Period(s) (years) 100

Climate Change (%) 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Summer	100	+40%	100/15 Summer				171.727
1.001	2	15 Summer	100	+40%	100/15 Summer				171.546
1.002	3	15 Summer	100	+40%	100/15 Summer				171.055
2.000	4	15 Summer	100	+40%	100/15 Summer				169.883
1.003	5	15 Summer	100	+40%	100/15 Summer				169.741
3.000	6	480 Winter	100	+40%	100/240 Summer				168.962
3.001	7	480 Winter	100	+40%	100/15 Summer				168.962
1.004	8	480 Winter	100	+40%	100/15 Summer				168.962
1.005	9	480 Winter	100	+40%					166.760
1.006	10	480 Winter	100	+40%					166.341
1.007	C1	480 Winter	100	+40%					164.383

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OEC Consulting Engineers Ltd		Page 13
Clarke Hall Farm Aberford Road, Wakefield WF1 4AL	124.008 Westfield Lane, Wyke	
Date 06/04/2023 File 124.008 - V3.MDX	Designed by A.Bottomley Checked by A.Bottomley	
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PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
1.000	1	0.008	0.000	0.63		21.8	SURCHARGED	
1.001	2	0.321	0.000	0.74		31.2	SURCHARGED	
1.002	3	0.722	0.000	1.61		41.7	SURCHARGED	
2.000	4	0.812	0.000	0.77		42.6	SURCHARGED	
1.003	5	0.907	0.000	1.91		101.7	SURCHARGED	
3.000	6	0.817	0.000	0.00		12.1	SURCHARGED	
3.001	7	1.752	0.000	0.03		3.0	SURCHARGED	
1.004	8	2.062	0.000	0.30		3.5	SURCHARGED	
1.005	9	-0.104	0.000	0.20		3.5	OK	
1.006	10	-0.124	0.000	0.07		3.5	OK	
1.007	C1	-0.101	0.000	0.24		3.5	OK	