

Surface Water Drainage Calculations

For a site referred to as

Our Lady's RC High School

Undertaken on behalf of

Pozzoni

Job No: 9670

Document No: 9670-WML-ZZ-XX-CA-C-1001

Date: May 2021

Project No. & Name:	9670 – Our Lady’s RC High School, Manchester	Prepared by:	Rev:	Date:
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No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL											
Date 14/05/2021 08:27 File 9670 - SURFACE WATER - ...						Designed by DBaker Checked by					
Innovyze						Network 2014.1.1					
Network Design Table for Storm											
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	
S4.000	18.042	0.000	0.0	0.012	5.00	0.0	0.600	o	150		
S4.001	9.000	0.000	0.0	0.000	0.00	0.0	0.600	o	150		
S4.002	6.137	0.150	40.9	0.009	0.00	0.0	0.600	o	150		
S1.002	2.500	0.025	100.0	0.036	0.00	0.0	0.600	o	225		
S5.000	22.305	0.000	0.0	0.018	10.00	0.0	0.600	o	100		
S5.001	27.150	0.000	0.0	0.018	0.00	0.0	0.600	o	100		
S5.002	3.071	0.070	43.9	0.000	0.00	0.0	0.600	o	100		
S1.003	7.690	0.020	384.5	0.000	0.00	0.0	0.600	o	300		
S1.004	7.690	0.020	384.5	0.000	0.00	0.0	0.600	o	300		
S1.005	24.000	1.210	19.8	0.000	0.00	0.0	0.600	o	300		
S1.006	2.568	0.026	98.8	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)	
S4.000	37.06	8.24	101.810	0.012	0.0	0.0	0.0	0.09	1.6	1.2	
S4.001	33.76	9.86	101.810	0.012	0.0	0.0	0.0	0.09	1.6	1.2	
S4.002	33.64	9.93	101.810	0.022	0.0	0.0	0.0	1.58	27.9	2.0	
S1.002	33.58	9.96	100.765	0.164	0.0	0.0	0.0	1.31	52.0	14.9	
S5.000	26.46	15.35	101.680	0.018	0.0	0.0	0.0	0.07	0.5«	1.3	
S5.001	21.51	21.86	101.680	0.037	0.0	0.0	0.0	0.07	0.5«	2.1	
S5.002	21.48	21.91	101.680	0.037	0.0	0.0	0.0	1.17	9.2	2.1	
S1.003	21.39	22.07	100.665	0.201	0.0	0.0	0.0	0.80	56.3	14.9	
S1.004	21.30	22.23	100.220	0.201	0.0	0.0	0.0	0.80	56.3	14.9	
S1.005	21.23	22.34	100.200	0.201	0.0	0.0	0.0	3.55	250.7	14.9	
S1.006	21.21	22.37	98.990	0.201	0.0	0.0	0.0	1.58	111.8	14.9	
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Innovyze		Network 2014.1.1						
Manhole Schedules for Storm								
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN
S1	102.280	0.910	Open Manhole	450	S1.000	101.370	150	
S2	102.280	1.150	Open Manhole	450	S1.001	101.130	150	S1.000
S-RE	102.440	1.070	Open Manhole	450	S2.000	101.370	150	
S3	102.170	0.450	Open Manhole	450	S3.000	101.720	150	
S4	102.140	0.450	Open Manhole	450	S3.001	101.690	150	S3.000
S5	101.950	0.450	Open Manhole	450	S3.002	101.500	150	S3.001
S6	101.800	0.450	Open Manhole	450	S3.003	101.350	150	S3.002
S7	102.300	1.190	Open Manhole	450	S2.001	101.110	150	S2.000
								S3.003
S-RE	102.260	0.450	Open Manhole	450	S4.000	101.810	150	
S8	102.260	0.450	Open Manhole	450	S4.001	101.810	150	S4.000
S9	102.260	0.450	Open Manhole	450	S4.002	101.810	150	S4.001
S10	102.340	1.575	Open Manhole	600	S1.002	100.765	225	S1.001
								S2.001
								S4.002
S-FILTER DRAIN 1	102.280	0.600	Junction		S5.000	101.680	100	
S-FILTER DRAIN 2	102.280	0.600	Junction		S5.001	101.680	100	S5.000
SX	102.280	0.600	Junction	0	S5.002	101.680	100	S5.001
S11	102.400	1.735	Open Manhole		S1.003	100.665	300	S1.002
								S5.002
S-TANK	102.500	2.280	Junction	0	S1.004	100.220	300	S1.003
S12	102.500	2.300	Open Manhole	1200	S1.005	100.200	300	S1.004
S13	100.190	1.200	Open Manhole	1200	S1.006	98.990	300	S1.005
S	100.190	1.226	Open Manhole	0		OUTFALL		S1.006
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PIPELINE SCHEDULES for Storm										
Upstream Manhole										
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., (mm)	L*W	
S1.000	o	150		S1 102.280	101.370	0.760	Open Manhole		450	
S1.001	o	150		S2 102.280	101.130	1.000	Open Manhole		450	
S2.000	o	150	S-RE	102.440	101.370	0.920	Open Manhole		450	
S3.000	o	150		S3 102.170	101.720	0.300	Open Manhole		450	
S3.001	o	150		S4 102.140	101.690	0.300	Open Manhole		450	
S3.002	o	150		S5 101.950	101.500	0.300	Open Manhole		450	
S3.003	o	150		S6 101.800	101.350	0.300	Open Manhole		450	
S2.001	o	150		S7 102.300	101.110	1.040	Open Manhole		450	
S4.000	o	150	S-RE	102.260	101.810	0.300	Open Manhole		450	
S4.001	o	150		S8 102.260	101.810	0.300	Open Manhole		450	
S4.002	o	150		S9 102.260	101.810	0.300	Open Manhole		450	
S1.002	o	225		S10 102.340	100.765	1.350	Open Manhole		600	
S5.000	o	100	S-FILTER DRAIN 1	102.280	101.680	0.500	Junction			
S5.001	o	100	S-FILTER DRAIN 2	102.280	101.680	0.500	Junction			
S5.002	o	100	SX	102.280	101.680	0.500	Junction			
Downstream Manhole										
PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., (mm)	L*W	
S1.000	24.000	100.0		S2 102.280	101.130	1.000	Open Manhole		450	
S1.001	29.000	100.0		S10 102.340	100.840	1.350	Open Manhole		600	
S2.000	18.000	85.7		S7 102.300	101.160	0.990	Open Manhole		450	
S3.000	29.000	966.7		S4 102.140	101.690	0.300	Open Manhole		450	
S3.001	13.288	69.9		S5 101.950	101.500	0.300	Open Manhole		450	
S3.002	3.432	22.9		S6 101.800	101.350	0.300	Open Manhole		450	
S3.003	15.476	64.5		S7 102.300	101.110	1.040	Open Manhole		450	
S2.001	27.000	103.8		S10 102.340	100.850	1.340	Open Manhole		600	
S4.000	18.042	0.0		S8 102.260	101.810	0.300	Open Manhole		450	
S4.001	9.000	0.0		S9 102.260	101.810	0.300	Open Manhole		450	
S4.002	6.137	40.9		S10 102.340	101.660	0.530	Open Manhole		600	
S1.002	2.500	100.0		S11 102.400	100.740	1.435	Open Manhole		1200	
S5.000	22.305	0.0	S-FILTER DRAIN 2	102.280	101.680	0.500	Junction			
S5.001	27.150	0.0	SX	102.280	101.680	0.500	Junction			
S5.002	3.071	43.9		S11 102.400	101.610	0.690	Open Manhole		1200	
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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.003	o	300	S11	102.400	100.665	1.435	Open Manhole	1200
S1.004	o	300	S-TANK	102.500	100.220	1.980	Junction	
S1.005	o	300	S12	102.500	100.200	2.000	Open Manhole	1200
S1.006	o	300	S13	100.190	98.990	0.900	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)
S1.003	7.690	384.5	S-TANK	102.500	100.645	1.555	Junction	
S1.004	7.690	384.5	S12	102.500	100.200	2.000	Open Manhole	1200
S1.005	24.000	19.8	S13	100.190	98.990	0.900	Open Manhole	1200
S1.006	2.568	98.8	S	100.190	98.964	0.926	Open Manhole	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
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 6
 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	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.359		

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: S12, DS/PN: S1.005, Volume (m³): 3.1

Unit Reference	MD-SCU-0035-8000-0300-8000
Design Head (m)	0.300
Design Flow (l/s)	0.8
Flush-Flo™	Calculated
Objective	Linear discharge profile
Diameter (mm)	35
Invert Level (m)	100.200
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.300	0.8
Flush-Flo™	0.053	0.4
Kick-Flo®	0.053	0.4
Mean Flow over Head Range	-	0.5

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	0.5	1.200	1.5	3.000	2.3	7.000	3.5
0.200	0.7	1.400	1.6	3.500	2.4	7.500	3.6
0.300	0.8	1.600	1.7	4.000	2.6	8.000	3.7
0.400	0.9	1.800	1.8	4.500	2.8	8.500	3.8
0.500	1.0	2.000	1.9	5.000	2.9	9.000	3.9
0.600	1.1	2.200	2.0	5.500	3.1	9.500	4.0
0.800	1.2	2.400	2.0	6.000	3.2		
1.000	1.4	2.600	2.1	6.500	3.3		

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Innovyze	Network 2014.1.1	
<u>Storage Structures for Storm</u>		
<u>Porous Car Park Manhole: S3, DS/PN: S3.000</u>		
Infiltration Coefficient Base (m/hr)	0.00000	Width (m) 29.0
Membrane Percolation (mm/hr)	1000	Length (m) 9.4
Max Percolation (l/s)	75.7	Slope (1:X) 40.0
Safety Factor	2.0	Depression Storage (mm) 5
Porosity	0.30	Evaporation (mm/day) 3
Invert Level (m)	101.720	Cap Volume Depth (m) 0.350
<u>Porous Car Park Manhole: S4, DS/PN: S3.001</u>		
Infiltration Coefficient Base (m/hr)	0.00000	Width (m) 13.3
Membrane Percolation (mm/hr)	1000	Length (m) 12.8
Max Percolation (l/s)	47.3	Slope (1:X) 40.0
Safety Factor	2.0	Depression Storage (mm) 5
Porosity	0.30	Evaporation (mm/day) 3
Invert Level (m)	101.690	Cap Volume Depth (m) 0.350
<u>Porous Car Park Manhole: S5, DS/PN: S3.002</u>		
Infiltration Coefficient Base (m/hr)	0.00000	Width (m) 3.5
Membrane Percolation (mm/hr)	1000	Length (m) 23.7
Max Percolation (l/s)	23.0	Slope (1:X) 30.0
Safety Factor	2.0	Depression Storage (mm) 5
Porosity	0.30	Evaporation (mm/day) 3
Invert Level (m)	101.500	Cap Volume Depth (m) 0.350
<u>Infiltration Trench Manhole: S-FILTER DRAIN 1, DS/PN: S5.000</u>		
Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m) 0.3
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m) 22.3
Safety Factor	2.0	Slope (1:X) 0.0
Porosity	0.30	Cap Volume Depth (m) 0.000
Invert Level (m)	101.680	Cap Infiltration Depth (m) 0.500
<u>Infiltration Trench Manhole: S-FILTER DRAIN 2, DS/PN: S5.001</u>		
Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m) 0.3
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m) 27.2
Safety Factor	2.0	Slope (1:X) 0.0
Porosity	0.30	Cap Volume Depth (m) 0.000
Invert Level (m)	101.680	Cap Infiltration Depth (m) 0.500
<u>Cellular Storage Manhole: S-TANK, DS/PN: S1.004</u>		
Invert Level (m)	100.220	Safety Factor 2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity 0.95
Infiltration Coefficient Side (m/hr)	0.00000	
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<u>Cellular Storage Manhole: S-TANK, DS/PN: S1.004</u>					
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	90.0	90.0	2.600	0.0	139.3
0.200	90.0	97.6	2.800	0.0	139.3
0.400	90.0	105.2	3.000	0.0	139.3
0.600	90.0	112.8	3.200	0.0	139.3
0.800	90.0	120.4	3.400	0.0	139.3
1.000	90.0	127.9	3.600	0.0	139.3
1.200	90.0	135.5	3.800	0.0	139.3
1.400	0.0	139.3	4.000	0.0	139.3
1.600	0.0	139.3	4.200	0.0	139.3
1.800	0.0	139.3	4.400	0.0	139.3
2.000	0.0	139.3	4.600	0.0	139.3
2.200	0.0	139.3	4.800	0.0	139.3
2.400	0.0	139.3	5.000	0.0	139.3
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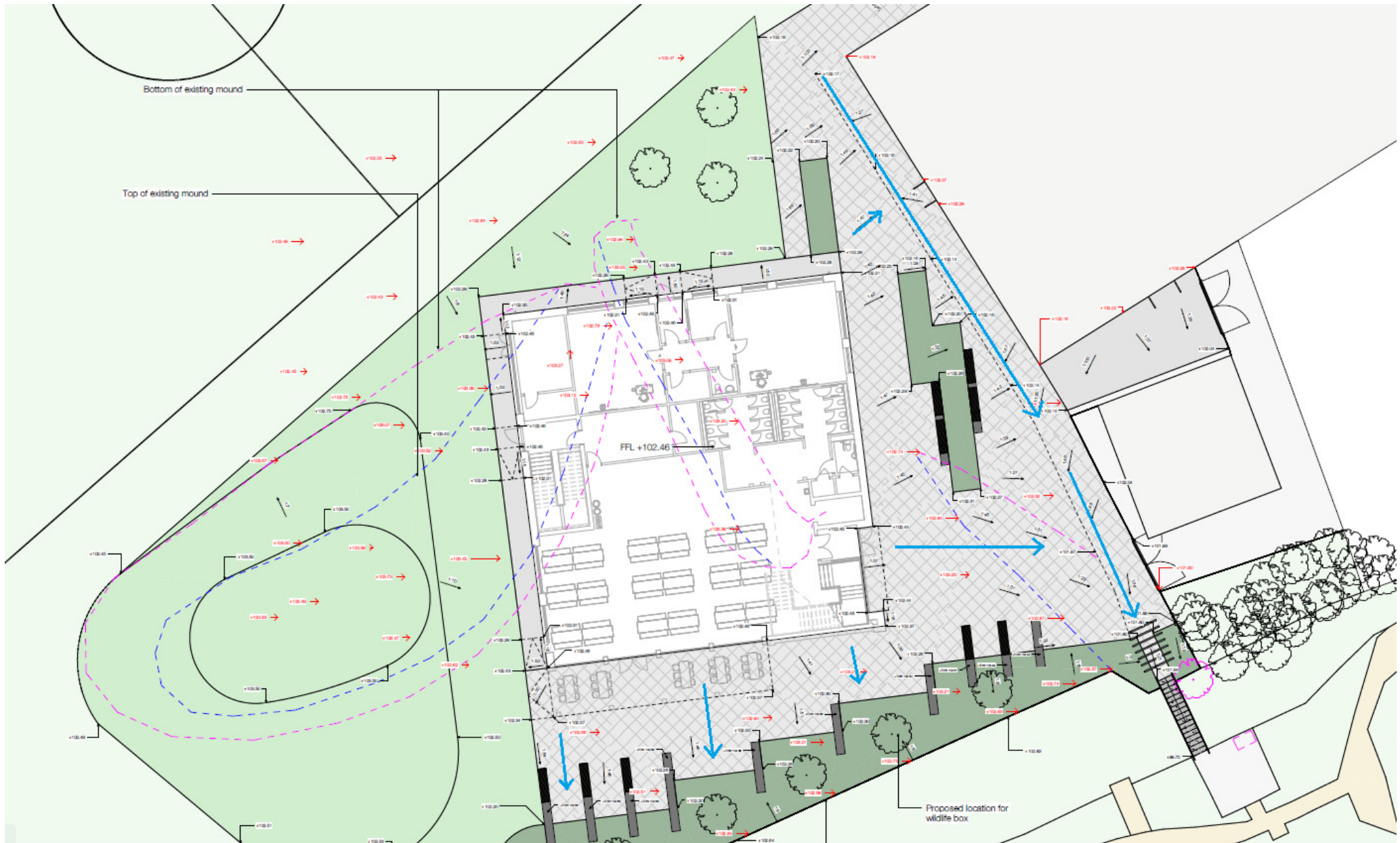
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Innovyze		Network 2014.1.1			
<u>1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)</u> <u>for Storm</u>					
Simulation Criteria					
Areal Reduction Factor 1.000		Additional Flow - % of Total Flow 0.000			
Hot Start (mins) 0		MADD Factor * 10m³/ha Storage 2.000			
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 6			
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 0.359	
Region England and Wales Cv (Summer) 0.750					
M5-60 (mm)		18.000 Cv (Winter) 0.840			
Margin for Flood Risk Warning (mm)		300.0			
Analysis Timestep 2.5 Second Increment (Extended)					
DTS Status		ON			
DVD Status		ON			
Inertia Status		OFF			
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)		1, 30, 100			
Climate Change (%)		0, 0, 40			
PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood First Z Overflow Act. O/F Lvl Exc.
S1.000	15 Winter	1	0%	100/360 Winter	
S1.001	15 Winter	1	0%	100/15 Summer	
S2.000	15 Winter	1	0%	100/15 Summer	
S3.000	60 Winter	1	0%		
S3.001	60 Winter	1	0%		
S3.002	60 Winter	1	0%	100/15 Summer	
S3.003	60 Winter	1	0%	100/15 Summer	
S2.001	60 Winter	1	0%	100/15 Summer	
S4.000	15 Winter	1	0%	100/15 Summer	
S4.001	15 Winter	1	0%		
S4.002	15 Winter	1	0%		
S1.002	15 Winter	1	0%	30/15 Summer	
S5.000	30 Winter	1	0%	1/15 Winter	3
S5.001	30 Winter	1	0%	1/30 Winter	
S5.002	60 Winter	1	0%		
S1.003	15 Winter	1	0%	100/15 Summer	
S1.004	720 Winter	1	0%	30/30 Summer	
S1.005	720 Winter	1	0%	30/30 Summer	
S1.006	720 Winter	1	0%		
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Innovyze	Network 2014.1.1						
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm							
Simulation Criteria							
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000							
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000							
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 6							
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 0.359							
Region England and Wales Cv (Summer) 0.750							
M5-60 (mm) 18.000 Cv (Winter) 0.840							
Margin for Flood Risk Warning (mm) 300.0							
Analysis Timestep 2.5 Second Increment (Extended)							
DTS Status ON							
DVD Status ON							
Inertia Status OFF							
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) 1, 30, 100							
Climate Change (%) 0, 0, 40							
PN	Storm	Return Climate Period Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	30 0%	100/360 Winter				
S1.001	15 Winter	30 0%	100/15 Summer				
S2.000	15 Winter	30 0%	100/15 Summer				
S3.000	30 Winter	30 0%					
S3.001	30 Winter	30 0%					
S3.002	30 Winter	30 0%	100/15 Summer				
S3.003	30 Winter	30 0%	100/15 Summer				
S2.001	15 Winter	30 0%	100/15 Summer				
S4.000	15 Winter	30 0%	100/15 Summer				
S4.001	15 Winter	30 0%					
S4.002	15 Winter	30 0%					
S1.002	15 Winter	30 0%	30/15 Summer				
S5.000	30 Winter	30 0%	1/15 Winter				3
S5.001	30 Winter	30 0%	1/30 Winter				
S5.002	30 Winter	30 0%					
S1.003	15 Summer	30 0%	100/15 Summer				
S1.004	720 Winter	30 0%	30/30 Summer				
S1.005	600 Winter	30 0%	30/30 Summer				
S1.006	720 Winter	30 0%					
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WML Consulting Ltd		Page 12
No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL		
Date 14/05/2021 08:27	Designed by DBaker	
File 9670 - SURFACE WATER - ...	Checked by	
Innovyze	Network 2014.1.1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / O'flow Cap. (l/s)	Pipe Flow (l/s)	Status
S1.000		S1 101.414	-0.106	0.000	0.19	0.0	3.1 OK
S1.001		S2 101.213	-0.067	0.000	0.57	0.0	9.7 OK
S2.000		S-RE 101.412	-0.108	0.000	0.17	0.0	3.1 OK
S3.000		S3 101.811	-0.059	0.000	0.68	0.0	3.4 OK
S3.001		S4 101.747	-0.093	0.000	0.31	0.0	6.0 OK
S3.002		S5 101.558	-0.092	0.000	0.31	0.0	7.6 OK
S3.003		S6 101.413	-0.087	0.000	0.37	0.0	7.6 OK
S2.001		S7 101.210	-0.050	0.000	0.75	0.0	12.4 OK
S4.000		S-RE 101.921	-0.039	0.000	0.81	0.0	3.5 OK
S4.001		S8 101.893	-0.067	0.000	0.59	0.0	3.5 OK
S4.002		S9 101.863	-0.097	0.000	0.26	0.0	6.1 OK
S1.002		S10 101.038	0.048	0.000	1.24	0.0	37.0 SURCHARGED
S5.000	S-FILTER DRAIN 1	102.011	0.231	0.000	1.64	0.0	3.0 FLOOD RISK*
S5.001	S-FILTER DRAIN 2	101.954	0.174	0.000	2.56	0.0	4.7 SURCHARGED*
S5.002	SX	101.738	-0.042	0.000	0.64	0.0	4.7 OK*
S1.003		S11 100.965	0.000	0.000	1.00	0.0	36.8 OK
S1.004	S-TANK	100.879	0.359	0.000	0.10	0.0	5.1 SURCHARGED*
S1.005		S12 100.920	0.420	0.000	0.01	0.0	1.1 SURCHARGED
S1.006		S13 99.017	-0.273	0.000	0.02	0.0	1.1 OK



9670 - WML EXCEEDANCE FLOW ROUTE SKETCH