Consulting Civil & Structural Engineers, Building Surveyors
Project Managers & Geotechnical Engineers

Alan Wood & Partners

DESIGN CALCULATIONS

PROJECT NO:	41207
JOB TITLE:	New Barnsley Fire Station for SYFR
CLIENT:	Turner & Townsend Project Management Limited
DATE:	21.05.2020
DOCUMENT NO:	BFS-AWP-XX-S104-CA-C-0001 Surface Water Drainage Calculations

VERSION HISTORY

REV:	PAGE:	DESCRIPTION:	CHK'D:	DATE:	APP'D:	DATE:
-	24	SW Calcuations	JMcA	22.05.20	JMcA	22.05.20

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

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	0.352	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	200	Maximum Backdrop Height (m)	1.500
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

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Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.306	4-8	0.170

Total Area Contributing (ha) = 0.476

Total Pipe Volume (m³) = 20.372

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STORM SEWER DESIGN by the Modified Rational Method

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)	Section Type	Auto Design
1.000	49.849	1.548	32.2	0.078	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	35.204	0.352	100.0	0.039	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	6.558	0.033	200.0	0.015	5.00	0.0	0.600	o	450	Pipe/Conduit	
1.002	20.706	0.052	400.0	0.113	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.003	15.622	0.039	400.0	0.033	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.000	15.904	0.636	25.0	0.034	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.000	20.280	1.014	20.0	0.015	5.00	0.0	0.600	o	150	Pipe/Conduit	
3.001	8.556	0.462	18.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	8.587	0.595	14.4	0.003	0.00	0.0	0.600	o	450	Pipe/Conduit	
5.000	13.971	0.140	100.0	0.015	5.00	0.0	0.600	o	150	Pipe/Conduit	
5.001	10.846	0.064	169.5	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.002	7.669	0.234	32.8	0.019	0.00	0.0	0.600	o	225	Pipe/Conduit	
6.000	33.274	0.586	56.8	0.036	5.00	0.0	0.600	o	225	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	46.98	5.47	147.350	0.078	0.0	0.0	0.0	1.78	31.5	9.9
1.001	45.37	5.92	145.802	0.117	0.0	0.0	0.0	1.31	52.0	14.4
2.000	48.48	5.08	145.258	0.015	0.0	0.0	0.0	1.43	228.1	2.0
1.002	44.24	6.26	145.225	0.245	0.0	0.0	0.0	1.01	160.7	29.4
1.003	43.42	6.51	145.173	0.278	0.0	0.0	0.0	1.01	160.7	32.7
3.000	48.27	5.13	146.532	0.034	0.0	0.0	0.0	2.02	35.7	4.4
4.000	48.19	5.15	146.910	0.015	0.0	0.0	0.0	2.26	40.0	2.0
3.001	47.95	5.21	145.896	0.049	0.0	0.0	0.0	2.35	41.6	6.4
1.004	43.34	6.54	145.134	0.330	0.0	0.0	0.0	5.37	854.5	38.8
5.000	47.87	5.23	145.466	0.015	0.0	0.0	0.0	1.00	17.8	1.9
5.001	47.18	5.41	145.251	0.029	0.0	0.0	0.0	1.00	39.8	3.7
5.002	46.97	5.47	145.187	0.048	0.0	0.0	0.0	2.29	91.2	6.0
6.000	47.53	5.32	145.539	0.036	0.0	0.0	0.0	1.74	69.2	4.6

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STORM SEWER DESIGN by the Modified Rational Method

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)	Section Type	Auto Design
5.003	19.353	0.097	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
7.000	14.446	0.090	160.5	0.062	5.00	0.0	0.600	o	150	Pipe/Conduit	
5.004	7.572	0.038	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.005	3.247	0.016	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.006	2.922	0.015	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.007	4.771	0.024	200.0	0.000	0.00	0.0	0.600	o	350	Pipe/Conduit	
1.005	7.843	0.039	200.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.006	7.844	0.016	500.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.007	11.755	0.198	59.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.008	6.064	0.411	14.8	0.000	0.00	0.0	0.600	o	300	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)
5.003	45.92	5.76	144.878	0.084	0.0	0.0	0.0	1.11	78.3	10.4
7.000	47.59	5.30	146.093	0.062	0.0	0.0	0.0	0.79	14.0	8.0
5.004	45.52	5.87	144.781	0.146	0.0	0.0	0.0	1.11	78.3	17.9
5.005	45.35	5.92	144.743	0.146	0.0	0.0	0.0	1.11	78.3	17.9
5.006	45.20	5.97	144.677	0.146	0.0	0.0	0.0	1.11	78.3	17.9
5.007	44.98	6.03	144.663	0.146	0.0	0.0	0.0	1.22	117.6	17.9
1.005	43.06	6.63	144.539	0.476	0.0	0.0	0.0	1.43	228.1	55.5
1.006	42.63	6.78	144.499	0.476	0.0	0.0	0.0	0.90	143.5	55.5
1.007	42.34	6.87	144.434	0.476	0.0	0.0	0.0	2.04	144.5	55.5
1.008	42.27	6.90	144.236	0.476	0.0	0.0	0.0	4.11	290.8	55.5

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Omega 2
Monks Cross Drive
York YO32 9GZ

41207 Barnsley Fire Station
(SYFR)
Surface Water Design

Date 22-May-20 9:03 AM
File SURFACE WATER.MDX

Designed by JMcA
Checked by JJS

Micro Drainage

Network 2019.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
EXS1	148.920	1.570	Open Manhole	1200	1.000	147.350	150				
S1	146.978	1.176	Open Manhole	1200	1.001	145.802	225	1.000	145.802	150	
S2	146.900	1.642	Open Manhole	1350	2.000	145.258	450				
S3	147.040	1.815	Open Manhole	1350	1.002	145.225	450	1.001	145.450	225	
								2.000	145.225	450	
S4	147.380	2.207	Open Manhole	1350	1.003	145.173	450	1.002	145.173	450	
S5	147.405	0.873	Open Manhole	475	3.000	146.532	150				
S6	148.110	1.200	Open Manhole	475	4.000	146.910	150				
S7	147.734	1.838	Open Manhole	475	3.001	145.896	150	3.000	145.896	150	
								4.000	145.896	150	
S8	147.442	2.308	Open Manhole	1350	1.004	145.134	450	1.003	145.134	450	
								3.001	145.434	150	
RE1	146.290	0.824	Open Manhole	150	5.000	145.466	150				
S9	146.335	1.084	Open Manhole	1200	5.001	145.251	225	5.000	145.326	150	
S10	146.627	1.440	Open Manhole	1200	5.002	145.187	225	5.001	145.187	225	
RE2	146.658	1.119	Open Manhole	225	6.000	145.539	225				
S11	146.959	2.081	Open Manhole	1200	5.003	144.878	300	5.002	144.953	225	
								6.000	144.953	225	
S12	147.293	1.200	Open Manhole	1200	7.000	146.093	150				
S13	147.267	2.486	Open Manhole	1200	5.004	144.781	300	5.003	144.781	300	

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
								7.000	146.003	150	1072
S14	147.385	2.642	Open Manhole	1200	5.005	144.743	300	5.004	144.743	300	
INTER	147.226	2.549	Open Manhole	2100 x 1200	5.006	144.677	300	5.005	144.727	300	
S15	147.183	2.520	Open Manhole	1200	5.007	144.663	350	5.006	144.663	300	
S16	147.176	2.637	Open Manhole	1350	1.005	144.539	450	1.004	144.539	450	
								5.007	144.639	350	
ATT	146.975	2.476	Open Manhole	1350	1.006	144.499	450	1.005	144.499	450	
S17 (HB)	146.886	2.452	Open Manhole	1800	1.007	144.434	300	1.006	144.484	450	
S18	147.210	2.974	Open Manhole	1200	1.008	144.236	300	1.007	144.236	300	
SW-OF	145.280	1.455	Open Manhole	1200		OUTFALL		1.008	143.825	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
EXS1	433158.660	405636.256	433158.660	405636.256	Required	
S1	433193.765	405671.647	433193.765	405671.647	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2	433222.342	405652.527	433222.342	405652.527	Required	
S3	433218.867	405646.965	433218.867	405646.965	Required	
S4	433204.368	405632.183	433204.368	405632.183	Required	
S5	433232.898	405604.668	433232.898	405604.668	Required	
S6	433207.235	405601.461	433207.235	405601.461	Required	
S7	433221.558	405615.818	433221.558	405615.818	Required	
S8	433217.089	405623.114	433217.089	405623.114	Required	
RE1	433216.832	405673.627	433216.832	405673.627	Required	

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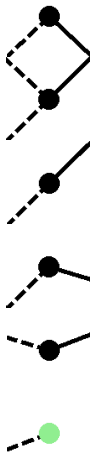
Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S9	433226.959	405664.002	433226.959	405664.002	Required	
S10	433228.422	405653.255	433228.422	405653.255	Required	
RE2	433247.428	405624.887	433247.428	405624.887	Required	
S11	433223.172	405647.664	433223.172	405647.664	Required	
S12	433199.960	405623.096	433199.960	405623.096	Required	
S13	433209.924	405633.556	433209.924	405633.556	Required	
S14	433215.251	405628.175	433215.251	405628.175	Required	
INTER	433217.605	405630.412	433217.605	405630.412	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S15	433219.718	405632.430	433219.718	405632.430	Required	
S16	433223.190	405629.157	433223.190	405629.157	Required	
ATT	433228.759	405634.679	433228.759	405634.679	Required	
S17 (HB)	433234.329	405640.202	433234.329	405640.202	Required	
S18	433245.587	405636.820	433245.587	405636.820	Required	
SW-OF	433251.247	405638.995			No Entry	



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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)
1.000	o	150	EXS1	148.920	147.350	1.420	Open Manhole	1200
1.001	o	225	S1	146.978	145.802	0.951	Open Manhole	1200
2.000	o	450	S2	146.900	145.258	1.192	Open Manhole	1350
1.002	o	450	S3	147.040	145.225	1.365	Open Manhole	1350
1.003	o	450	S4	147.380	145.173	1.757	Open Manhole	1350
3.000	o	150	S5	147.405	146.532	0.723	Open Manhole	475
4.000	o	150	S6	148.110	146.910	1.050	Open Manhole	475
3.001	o	150	S7	147.734	145.896	1.688	Open Manhole	475
1.004	o	450	S8	147.442	145.134	1.858	Open Manhole	1350
5.000	o	150	RE1	146.290	145.466	0.674	Open Manhole	150
5.001	o	225	S9	146.335	145.251	0.859	Open Manhole	1200
5.002	o	225	S10	146.627	145.187	1.215	Open Manhole	1200
6.000	o	225	RE2	146.658	145.539	0.894	Open Manhole	225

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	49.849	32.2	S1	146.978	145.802	1.026	Open Manhole	1200
1.001	35.204	100.0	S3	147.040	145.450	1.365	Open Manhole	1350
2.000	6.558	200.0	S3	147.040	145.225	1.365	Open Manhole	1350
1.002	20.706	400.0	S4	147.380	145.173	1.757	Open Manhole	1350
1.003	15.622	400.0	S8	147.442	145.134	1.858	Open Manhole	1350
3.000	15.904	25.0	S7	147.734	145.896	1.688	Open Manhole	475
4.000	20.280	20.0	S7	147.734	145.896	1.688	Open Manhole	475
3.001	8.556	18.5	S8	147.442	145.434	1.858	Open Manhole	1350
1.004	8.587	14.4	S16	147.176	144.539	2.187	Open Manhole	1350
5.000	13.971	100.0	S9	146.335	145.326	0.859	Open Manhole	1200
5.001	10.846	169.5	S10	146.627	145.187	1.215	Open Manhole	1200
5.002	7.669	32.8	S11	146.959	144.953	1.781	Open Manhole	1200
6.000	33.274	56.8	S11	146.959	144.953	1.781	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)
5.003	o	300	S11	146.959	144.878	1.781	Open Manhole	1200
7.000	o	150	S12	147.293	146.093	1.050	Open Manhole	1200
5.004	o	300	S13	147.267	144.781	2.186	Open Manhole	1200
5.005	o	300	S14	147.385	144.743	2.342	Open Manhole	1200
5.006	o	300	INTER	147.226	144.677	2.199	Open Manhole	2100 x 1200
5.007	o	350	S15	147.183	144.663	2.170	Open Manhole	1200
1.005	o	450	S16	147.176	144.539	2.187	Open Manhole	1350
1.006	o	450	ATT	146.975	144.499	2.026	Open Manhole	1350
1.007	o	300	S17 (HB)	146.886	144.434	1.952	Open Manhole	1800
1.008	o	300	S18	147.210	144.236	2.674	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)
5.003	19.353	200.0	S13	147.267	144.781	2.186	Open Manhole	1200
7.000	14.446	160.5	S13	147.267	146.003	1.114	Open Manhole	1200
5.004	7.572	200.0	S14	147.385	144.743	2.342	Open Manhole	1200
5.005	3.247	200.0	INTER	147.226	144.727	2.199	Open Manhole	2100 x 1200
5.006	2.922	200.0	S15	147.183	144.663	2.170	Open Manhole	1200
5.007	4.771	200.0	S16	147.176	144.639	2.187	Open Manhole	1350
1.005	7.843	200.0	ATT	146.975	144.499	2.026	Open Manhole	1350
1.006	7.844	500.0	S17 (HB)	146.886	144.484	1.952	Open Manhole	1800
1.007	11.755	59.4	S18	147.210	144.236	2.474	Open Manhole	1200
1.008	6.064	14.8	SW-OF	145.280	143.825	1.155	Open Manhole	1200

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Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.008	SW-OF	145.280	143.825	144.140	1200	0

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	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

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)	19.000	Storm Duration (mins)	30
Ratio R	0.352		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S17 (HB), DS/PN: 1.007, Volume (m³): 7.2

Unit Reference	MD-SHE-0254-3700-1400-3700
Design Head (m)	1.400
Design Flow (l/s)	37.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	254
Invert Level (m)	144.434
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	37.0	Kick-Flo®	0.983	31.2
Flush-Flo™	0.456	37.0	Mean Flow over Head Range	-	31.4

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	8.2	1.200	34.4	3.000	53.4	7.000	80.6
0.200	26.1	1.400	37.0	3.500	57.5	7.500	83.3
0.300	35.9	1.600	39.4	4.000	61.4	8.000	86.0
0.400	36.9	1.800	41.7	4.500	65.0	8.500	88.6
0.500	36.9	2.000	43.9	5.000	68.4	9.000	91.1
0.600	36.5	2.200	46.0	5.500	71.7	9.500	93.5
0.800	35.1	2.400	48.0	6.000	74.8		
1.000	31.5	2.600	49.8	6.500	77.7		

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Storage Structures for Storm

Cellular Storage Manhole: ATT, DS/PN: 1.006

Invert Level (m) 144.694 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	42.0	0.0	1.401	0.0	0.0
1.400	42.0	0.0			

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1 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 Coeffiecient	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	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	0.352
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	OFF
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, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	EXS1	15 Winter	1	+0%	100/15 Summer				147.409
1.001	S1	15 Winter	1	+0%	100/15 Summer				145.884
2.000	S2	15 Winter	1	+0%	100/15 Summer				145.380
1.002	S3	15 Winter	1	+0%	100/15 Summer				145.379
1.003	S4	15 Winter	1	+0%	100/15 Summer				145.334
3.000	S5	15 Winter	1	+0%					146.568
4.000	S6	15 Winter	1	+0%					146.932
3.001	S7	15 Winter	1	+0%	100/30 Winter				145.938
1.004	S8	15 Winter	1	+0%	100/15 Summer				145.221
5.000	RE1	15 Winter	1	+0%	100/15 Summer				145.500
5.001	S9	15 Winter	1	+0%	100/15 Summer				145.299
5.002	S10	15 Winter	1	+0%	100/15 Summer				145.229
6.000	RE2	15 Winter	1	+0%	100/15 Winter				145.578
5.003	S11	15 Winter	1	+0%	30/15 Summer				144.955
7.000	S12	15 Winter	1	+0%	30/15 Summer				146.178
5.004	S13	15 Winter	1	+0%	30/15 Summer				144.894
5.005	S14	15 Winter	1	+0%	30/15 Summer				144.866
5.006	INTER	15 Winter	1	+0%	30/15 Summer				144.832
5.007	S15	15 Winter	1	+0%	30/15 Summer				144.784

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	EXS1	-0.091	0.000	0.32		9.7	OK	
1.001	S1	-0.143	0.000	0.29		14.0	OK	
2.000	S2	-0.328	0.000	0.01		1.7	OK	
1.002	S3	-0.296	0.000	0.21		27.0	OK	
1.003	S4	-0.289	0.000	0.28		30.2	OK	
3.000	S5	-0.114	0.000	0.13		4.3	OK	
4.000	S6	-0.128	0.000	0.05		1.9	OK	
3.001	S7	-0.108	0.000	0.17		6.2	OK	
1.004	S8	-0.363	0.000	0.08		36.0	OK	
5.000	RE1	-0.116	0.000	0.11		1.8	OK	
5.001	S9	-0.177	0.000	0.10		3.3	OK	
5.002	S10	-0.183	0.000	0.08		5.4	OK	
6.000	RE2	-0.186	0.000	0.07		4.5	OK	
5.003	S11	-0.223	0.000	0.15		9.9	OK	
7.000	S12	-0.065	0.000	0.60		7.7	OK	
5.004	S13	-0.187	0.000	0.30		17.6	OK	
5.005	S14	-0.177	0.000	0.35		17.5	OK	
5.006	INTER	-0.145	0.000	0.52		17.6	OK	
5.007	S15	-0.229	0.000	0.24		17.6	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.005	S16	15 Winter	1	+0%	30/15 Summer				144.778
1.006	ATT	15 Winter	1	+0%	30/15 Summer				144.771
1.007	S17 (HB)	15 Winter	1	+0%	1/15 Summer				144.762
1.008	S18	15 Winter	1	+0%					144.332

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	S16	-0.211	0.000	0.35		52.7	OK	
1.006	ATT	-0.178	0.000	0.41		37.7	OK	
1.007	S17 (HB)	0.029	0.000	0.33		36.3	SURCHARGED	
1.008	S18	-0.204	0.000	0.23		36.3	OK	

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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 Coeffiecient	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	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	0.352
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	OFF
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, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	EXS1	15 Winter	30	+0%	100/15 Summer				147.452
1.001	S1	15 Winter	30	+0%	100/15 Summer				145.949
2.000	S2	15 Winter	30	+0%	100/15 Summer				145.513
1.002	S3	15 Winter	30	+0%	100/15 Summer				145.512
1.003	S4	15 Winter	30	+0%	100/15 Summer				145.468
3.000	S5	15 Winter	30	+0%					146.590
4.000	S6	15 Winter	30	+0%					146.945
3.001	S7	15 Winter	30	+0%	100/30 Winter				145.964
1.004	S8	30 Winter	30	+0%	100/15 Summer				145.347
5.000	RE1	15 Winter	30	+0%	100/15 Summer				145.520
5.001	S9	30 Winter	30	+0%	100/15 Summer				145.364
5.002	S10	30 Winter	30	+0%	100/15 Summer				145.362
6.000	RE2	15 Winter	30	+0%	100/15 Winter				145.602
5.003	S11	30 Winter	30	+0%	30/15 Summer				145.360
7.000	S12	15 Winter	30	+0%	30/15 Summer				146.339
5.004	S13	30 Winter	30	+0%	30/15 Summer				145.356
5.005	S14	30 Winter	30	+0%	30/15 Summer				145.351
5.006	INTER	30 Winter	30	+0%	30/15 Summer				145.348
5.007	S15	30 Winter	30	+0%	30/15 Summer				145.344

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	EXS1	-0.048	0.000	0.77		23.7	OK	
1.001	S1	-0.078	0.000	0.73		35.8	OK	
2.000	S2	-0.195	0.000	0.03		4.5	OK	
1.002	S3	-0.163	0.000	0.57		73.9	OK	
1.003	S4	-0.155	0.000	0.76		83.0	OK	
3.000	S5	-0.092	0.000	0.32		10.5	OK	
4.000	S6	-0.115	0.000	0.13		4.7	OK	
3.001	S7	-0.082	0.000	0.42		15.1	OK	
1.004	S8	-0.237	0.000	0.18		79.8	OK	
5.000	RE1	-0.096	0.000	0.28		4.5	OK	
5.001	S9	-0.112	0.000	0.21		7.1	OK	
5.002	S10	-0.050	0.000	0.17		11.8	OK	
6.000	RE2	-0.162	0.000	0.17		11.0	OK	
5.003	S11	0.182	0.000	0.29		19.8	SURCHARGED	
7.000	S12	0.096	0.000	1.45		18.7	SURCHARGED	
5.004	S13	0.275	0.000	0.55		31.6	SURCHARGED	
5.005	S14	0.307	0.000	0.60		30.2	SURCHARGED	
5.006	INTER	0.371	0.000	0.85		28.5	SURCHARGED	
5.007	S15	0.331	0.000	0.37		27.1	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.005	S16	30 Winter	30	+0%	30/15 Summer				145.341
1.006	ATT	30 Winter	30	+0%	30/15 Summer				145.335
1.007	S17 (HB)	30 Winter	30	+0%	1/15 Summer				145.354
1.008	S18	15 Winter	30	+0%					144.333

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	S16	0.352	0.000	0.64		94.9	SURCHARGED	
1.006	ATT	0.386	0.000	0.46		42.5	SURCHARGED	
1.007	S17 (HB)	0.620	0.000	0.33		36.9	SURCHARGED	
1.008	S18	-0.203	0.000	0.23		36.9	OK	

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100 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 Coeffiecient	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	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	0.352
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	OFF
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, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	EXS1	15 Winter	100	+30%	100/15 Summer				148.036
1.001	S1	30 Winter	100	+30%	100/15 Summer				146.100
2.000	S2	30 Winter	100	+30%	100/15 Summer				146.072
1.002	S3	30 Winter	100	+30%	100/15 Summer				146.071
1.003	S4	30 Winter	100	+30%	100/15 Summer				146.063
3.000	S5	15 Winter	100	+30%					146.611
4.000	S6	15 Winter	100	+30%					146.957
3.001	S7	30 Winter	100	+30%	100/30 Winter				146.069
1.004	S8	30 Winter	100	+30%	100/15 Summer				146.054
5.000	RE1	30 Winter	100	+30%	100/15 Summer				146.088
5.001	S9	30 Winter	100	+30%	100/15 Summer				146.084
5.002	S10	30 Winter	100	+30%	100/15 Summer				146.080
6.000	RE2	30 Winter	100	+30%	100/15 Winter				146.084
5.003	S11	30 Winter	100	+30%	30/15 Summer				146.076
7.000	S12	15 Winter	100	+30%	30/15 Summer				146.655
5.004	S13	30 Winter	100	+30%	30/15 Summer				146.068
5.005	S14	30 Winter	100	+30%	30/15 Summer				146.061
5.006	INTER	30 Winter	100	+30%	30/15 Summer				146.058
5.007	S15	30 Winter	100	+30%	30/15 Summer				146.051

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	EXS1	0.536	0.000	1.12		34.4	SURCHARGED	
1.001	S1	0.073	0.000	0.96		47.0	SURCHARGED	
2.000	S2	0.364	0.000	0.04		5.9	SURCHARGED	
1.002	S3	0.396	0.000	0.75		98.6	SURCHARGED	
1.003	S4	0.439	0.000	1.00		109.2	SURCHARGED	
3.000	S5	-0.071	0.000	0.54		17.7	OK	
4.000	S6	-0.103	0.000	0.21		7.9	OK	
3.001	S7	0.023	0.000	0.57		20.6	SURCHARGED	
1.004	S8	0.470	0.000	0.28		122.4	SURCHARGED	
5.000	RE1	0.472	0.000	0.37		6.1	FLOOD RISK	
5.001	S9	0.607	0.000	0.34		11.5	FLOOD RISK	
5.002	S10	0.667	0.000	0.27		18.7	SURCHARGED	
6.000	RE2	0.320	0.000	0.23		15.0	SURCHARGED	
5.003	S11	0.898	0.000	0.38		25.9	SURCHARGED	
7.000	S12	0.412	0.000	2.36		30.3	SURCHARGED	
5.004	S13	0.987	0.000	0.74		42.5	SURCHARGED	
5.005	S14	1.018	0.000	0.78		39.2	SURCHARGED	
5.006	INTER	1.080	0.000	0.97		32.6	SURCHARGED	
5.007	S15	1.039	0.000	0.42		30.3	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.005	S16	30 Winter	100	+30%	30/15 Summer				146.048
1.006	ATT	30 Winter	100	+30%	30/15 Summer				146.041
1.007	S17 (HB)	30 Winter	100	+30%	1/15 Summer				146.062
1.008	S18	30 Winter	100	+30%					144.336

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	S16	1.060	0.000	0.95		141.8	SURCHARGED	
1.006	ATT	1.091	0.000	0.47		43.6	SURCHARGED	
1.007	S17 (HB)	1.328	0.000	0.35		39.5	SURCHARGED	
1.008	S18	-0.200	0.000	0.25		39.5	OK	

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