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MAPLE AND POPLAR
HAYES, UB4 9NQ

BELOW GROUND DRAINAGE CALCULATIONS

Document Prepared For:

Building control submission

December 2022
Job Number – 34111
Revision 01

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Document Record

Document Title	Document Revision	Issued Date	Engineer	Checked
34111-####-CA-S-001	01	December 2022	LJ	TP

1 INTRODUCTION

The purpose of this document is to provide sufficient detail to support the full planning application for Maple and Poplar, Hayes, UB4 9NQ.

2 SURFACE WATER DRAINAGE DESIGN METHODOLOGY & OVERVIEW

The hydraulic modelling has been completed using the MicroDrainage Network 2020.1.3 software.

For surface water drainage, peak design flows are based on the drainage catchment areas and FSR rainfall data. The total rainwater catchment area for the site = 0.258ha.

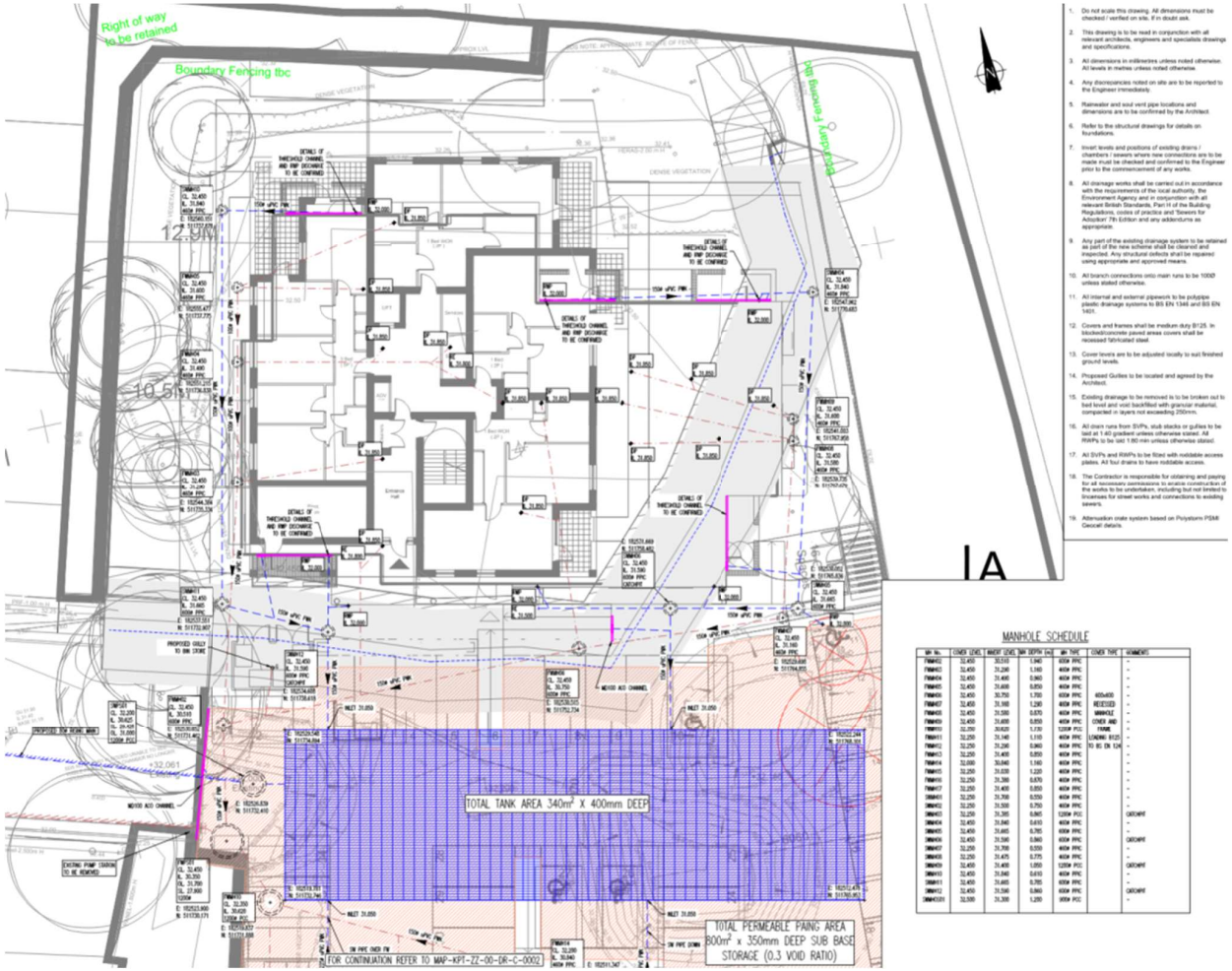
The piped networks have been modelled to include all runs between inspection chambers and manholes. The surface water main runs are 150mm and 225mm diameter and the manholes vary from 450mm diameter inspection chambers to 1200mm diameter PCC manholes. The surface water system is designed to achieve where feasible a minimum self-cleansing velocities of 1m/s.

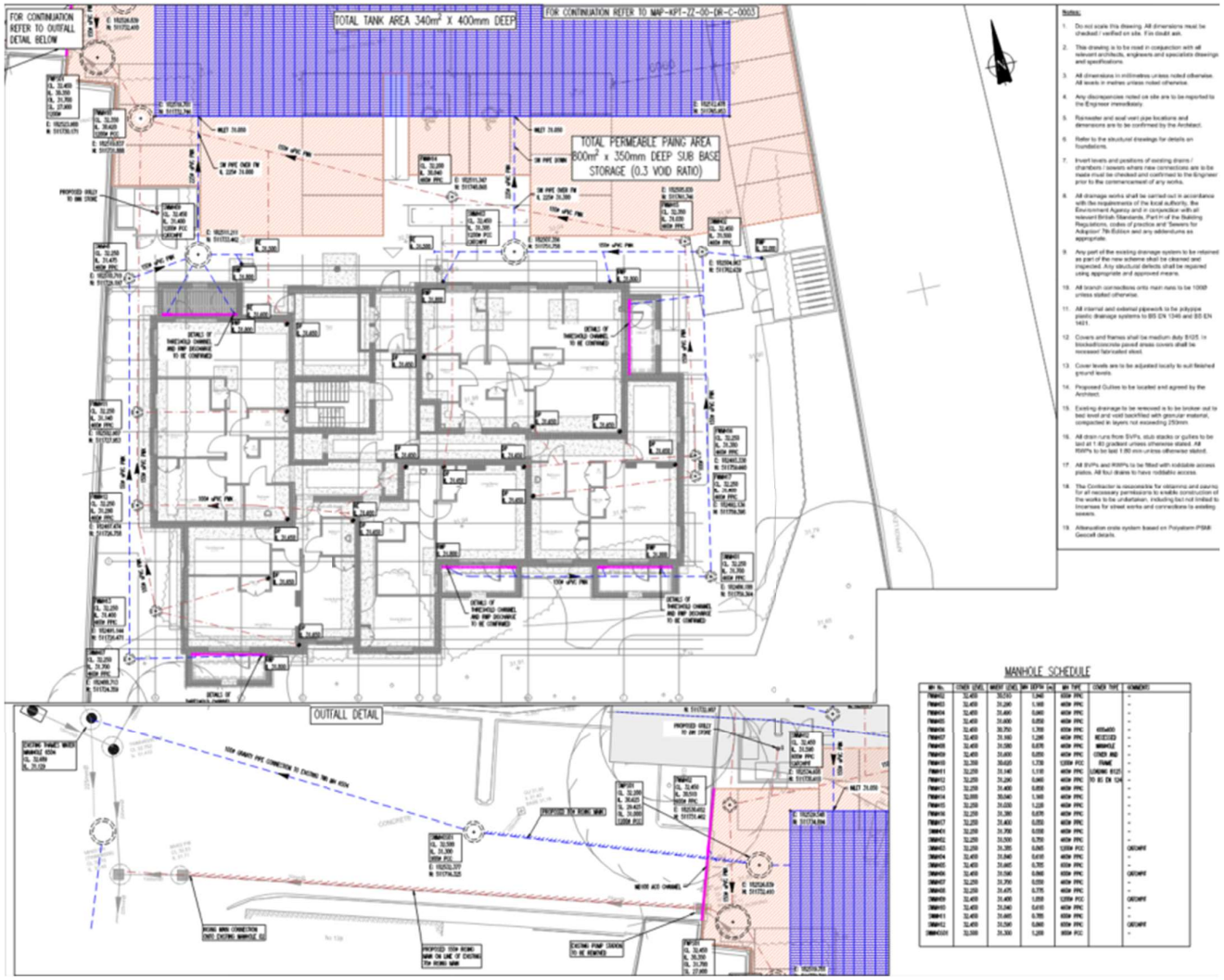
The surface water system has been designed to attenuate storm water flows for the 100 year return period storm plus 40% additional allowance for climate change. Surface water is attenuated using a combination of the pipe network, inspection chambers/manholes, permeable paving and the cellular storage crates. The discharge of the developments surface water runoff into the existing surface water sewer is to be pumped at a maximum rate of 3.0 litres per second to ensure the existing surface water sewer does not exceed its capacity during critical rainfall events.

A network overview for the surface water drainage is shown on the next page.

Refer to appendix A for drawings MAP-KPT-ZZ-00-DR-C-0002 Rev P4 North Block Proposed Drainage Layout and MAP-KPT-ZZ-00-DR-C-0003 P4 South Block Proposed Drainage Layout

Surface water network overview




TOTAL TANK AREA 340m² X 400mm DEEP
TOTAL PERMEABLE PAING AREA
800m² x 350mm DEEP SUB BASE
STORAGE (0.3 VOID RATIO)
OUTFALL DETAIL
MANHOLE SCHEDULE

Surface Water calculations

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)	2	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	20.200	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.419	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.000	4-8	0.143	8-12	0.115

Total Area Contributing (ha) = 0.258

Total Pipe Volume (m³) = 3.977

Network Design Table for Storm

« - Indicates pipe capacity < flow

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	19.125	0.200	95.6	0.015	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	11.100	0.115	96.5	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	13.722	0.335	41.0	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	18.570	0.175	106.1	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
2.001	7.560	0.075	100.8	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.002	13.360	0.540	24.7	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	22.521	0.225	100.1	0.015	5.00	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	50.00	5.31	31.700	0.015	0.0	0.0	0.0	1.03	18.2	2.0
1.001	50.00	5.49	31.500	0.030	0.0	0.0	0.0	1.02	18.1	4.1
1.002	50.00	5.64	31.385	0.045	0.0	0.0	0.0	1.58	27.9	6.1
2.000	50.00	5.32	31.840	0.013	0.0	0.0	0.0	0.98	17.2	1.8
2.001	50.00	5.44	31.665	0.026	0.0	0.0	0.0	1.00	17.7	3.5
2.002	50.00	5.55	31.590	0.039	0.0	0.0	0.0	2.03	35.9	5.3
3.000	50.00	5.37	31.700	0.015	0.0	0.0	0.0	1.00	17.7	2.0

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
3.001	4.433	0.075	59.1	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.002	19.591	0.350	56.0	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.000	23.200	0.175	132.6	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.001	6.500	0.075	86.7	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.002	18.006	0.540	33.3	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	18.933	0.175	108.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	17.000	-0.675	-25.2	0.090	0.00	0.0	0.600	o	80	Pipe/Conduit	
1.005	23.600	0.171	138.0	0.000	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)
3.001	50.00	5.43	31.475	0.030	0.0	0.0	0.0	1.31	23.2	4.1
3.002	50.00	5.67	31.400	0.045	0.0	0.0	0.0	1.35	23.8	6.1
4.000	50.00	5.44	31.840	0.013	0.0	0.0	0.0	0.87	15.4	1.8
4.001	50.00	5.54	31.665	0.026	0.0	0.0	0.0	1.08	19.1	3.5
4.002	50.00	5.72	31.590	0.039	0.0	0.0	0.0	1.75	30.9	5.3
1.003	50.00	6.04	30.800	0.168	0.0	0.0	0.0	0.97	17.1«	22.7
1.004	49.54	10.84	30.625	0.258	0.0	0.0	0.0	0.06	0.3«	34.6
1.005	48.41	11.30	31.300	0.258	0.0	0.0	0.0	0.85	15.1«	34.6

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)
SWMH01	32.250	0.550	Open Manhole	460	1.000	31.700	150				
SWMH02	32.250	0.750	Open Manhole	460	1.001	31.500	150	1.000	31.500	150	
SWMH03	32.250	0.865	Open Manhole	460	1.002	31.385	150	1.001	31.385	150	
SWMH04	32.450	0.610	Open Manhole	460	2.000	31.840	150				
SWMH05	32.450	0.785	Open Manhole	460	2.001	31.665	150	2.000	31.665	150	
SWMH06	32.450	0.860	Open Manhole	460	2.002	31.590	150	2.001	31.590	150	
SWMH07	32.250	0.550	Open Manhole	460	3.000	31.700	150				
SWMH08	32.250	0.775	Open Manhole	460	3.001	31.475	150	3.000	31.475	150	
SWMH09	32.250	0.850	Open Manhole	460	3.002	31.400	150	3.001	31.400	150	
SWMH10	32.450	0.610	Open Manhole	460	4.000	31.840	150				
SWMH11	32.450	0.785	Open Manhole	460	4.001	31.665	150	4.000	31.665	150	
SWMH12	32.450	0.860	Open Manhole	460	4.002	31.590	150	4.001	31.590	150	
TANK	32.200	1.400	Junction		1.003	30.800	150	1.002	31.050	150	250
								2.002	31.050	150	250
								3.002	31.050	150	250
								4.002	31.050	150	250
SWSP01	32.200	1.575	Open Manhole	1200	1.004	30.625	80	1.003	30.625	150	
SWMHOS01	32.200	0.900	Open Manhole	900	1.005	31.300	150	1.004	31.300	80	
	32.200	1.071	Open Manhole	0		OUTFALL		1.005	31.129	150	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWMH01	182486.188	511759.364	182486.188	511759.364	Required	
SWMH02	182504.963	511762.639	0.000	5117.000	Required	
SWMH03	182507.356	511751.758	182507.356	511751.758	Required	
SWMH04	182547.962	511770.683	182547.962	511770.683	Required	
SWMH05	182530.052	511765.836	182530.052	511765.836	Required	
SWMH06	182531.669	511758.482	182531.669	511758.482	Required	
SWMH07	182488.713	511724.359	182488.713	511724.359	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SWMH08	182510.710	511729.197	182510.710	0.000	Required	
SWMH09	182511.211	511733.462	182511.211	511733.462	Required	
SWMH10	182560.151	511737.878	182560.151	511737.878	Required	
SWMH11	182537.551	511732.907	182537.551	0.000	Required	
SWMH12	182534.608	511738.618	182534.608	511738.618	Required	
TANK	182521.013	511750.424			No Entry	
SWSP01	182526.839	511732.410	182526.839	511732.410	Required	
SWMHOS01	182532.377	511716.325	182532.377	511716.325	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
	182555.977	511716.325			No Entry	

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	SWMH01	32.250	31.700	0.400	Open Manhole	460
1.001	o	150	SWMH02	32.250	31.500	0.600	Open Manhole	460
1.002	o	150	SWMH03	32.250	31.385	0.715	Open Manhole	460
2.000	o	150	SWMH04	32.450	31.840	0.460	Open Manhole	460
2.001	o	150	SWMH05	32.450	31.665	0.635	Open Manhole	460
2.002	o	150	SWMH06	32.450	31.590	0.710	Open Manhole	460
3.000	o	150	SWMH07	32.250	31.700	0.400	Open Manhole	460

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	19.125	95.6	SWMH02	32.250	31.500	0.600	Open Manhole	460
1.001	11.100	96.5	SWMH03	32.250	31.385	0.715	Open Manhole	460
1.002	13.722	41.0	TANK	32.200	31.050	1.000	Junction	
2.000	18.570	106.1	SWMH05	32.450	31.665	0.635	Open Manhole	460
2.001	7.560	100.8	SWMH06	32.450	31.590	0.710	Open Manhole	460
2.002	13.360	24.7	TANK	32.200	31.050	1.000	Junction	
3.000	22.521	100.1	SWMH08	32.250	31.475	0.625	Open Manhole	460

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)
3.001	o	150	SWMH08	32.250	31.475	0.625	Open Manhole	460
3.002	o	150	SWMH09	32.250	31.400	0.700	Open Manhole	460
4.000	o	150	SWMH10	32.450	31.840	0.460	Open Manhole	460
4.001	o	150	SWMH11	32.450	31.665	0.635	Open Manhole	460
4.002	o	150	SWMH12	32.450	31.590	0.710	Open Manhole	460
1.003	o	150	TANK	32.200	30.800	1.250	Junction	
1.004	o	80	SWSP01	32.200	30.625	1.495	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)
3.001	4.433	59.1	SWMH09	32.250	31.400	0.700	Open Manhole	460
3.002	19.591	56.0	TANK	32.200	31.050	1.000	Junction	
4.000	23.200	132.6	SWMH11	32.450	31.665	0.635	Open Manhole	460
4.001	6.500	86.7	SWMH12	32.450	31.590	0.710	Open Manhole	460
4.002	18.006	33.3	TANK	32.200	31.050	1.000	Junction	
1.003	18.933	108.2	SWSP01	32.200	30.625	1.425	Open Manhole	1200
1.004	17.000	-25.2	SWMHOS01	32.200	31.300	0.820	Open Manhole	900

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)
1.005	o	150	SWMHOS01	32.200	31.300	0.750	Open Manhole	900

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)
1.005	23.600	138.0		32.200	31.129	0.921	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.015	0.015	0.015
1.001	-	-	100	0.015	0.015	0.015
1.002	-	-	100	0.015	0.015	0.015
2.000	-	-	100	0.013	0.013	0.013
2.001	-	-	100	0.013	0.013	0.013
2.002	-	-	100	0.013	0.013	0.013
3.000	-	-	100	0.015	0.015	0.015
3.001	-	-	100	0.015	0.015	0.015
3.002	-	-	100	0.015	0.015	0.015
4.000	-	-	100	0.013	0.013	0.013
4.001	-	-	100	0.013	0.013	0.013
4.002	-	-	100	0.013	0.013	0.013
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.090	0.090	0.090
1.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.258	0.258	0.258

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)
1.005		32.200	31.129	0.000	0	0

Online Controls for Storm

Pump Manhole: SWSP01, DS/PN: 1.004, Volume (m³): 2.1

Invert Level (m) 30.625

Depth (m)	Flow (l/s)
0.675	3.0000

Storage Structures for Storm

Cellular Storage Manhole: TANK, DS/PN: 1.003

Invert Level (m) 30.800 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	340.0	340.0	2.800	0.0	369.5	5.600	0.0	369.5	8.400	0.0	369.5
0.400	340.0	369.5	3.200	0.0	369.5	6.000	0.0	369.5	8.800	0.0	369.5
0.401	0.0	369.5	3.600	0.0	369.5	6.400	0.0	369.5	9.200	0.0	369.5
1.200	0.0	369.5	4.000	0.0	369.5	6.800	0.0	369.5	9.600	0.0	369.5
1.600	0.0	369.5	4.400	0.0	369.5	7.200	0.0	369.5	10.000	0.0	369.5
2.000	0.0	369.5	4.800	0.0	369.5	7.600	0.0	369.5			
2.400	0.0	369.5	5.200	0.0	369.5	8.000	0.0	369.5			

Porous Car Park Manhole: SWSP01, DS/PN: 1.004

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	400.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	31.700	Depression Storage (mm)	5
Max Percolation (l/s)	222.2	Width (m)	25.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	32.0	Cap Volume Depth (m)	0.350

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

Simulation Criteria

Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm)	20.300	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.424	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	2.5 Second Increment (Extended)	Inertia Status	ON
DTS 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)	2, 30, 100
Climate Change (%)	0, 0, 40

2 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)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	SWMH01	15 Winter	2	+0%					31.741	-0.109	0.000	0.16		
1.001	SWMH02	15 Winter	2	+0%	100/15 Summer				31.558	-0.092	0.000	0.31		
1.002	SWMH03	15 Winter	2	+0%	100/15 Summer				31.441	-0.094	0.000	0.29		
2.000	SWMH04	15 Winter	2	+0%					31.879	-0.111	0.000	0.15		
2.001	SWMH05	15 Winter	2	+0%	100/15 Summer				31.721	-0.094	0.000	0.29		
2.002	SWMH06	15 Winter	2	+0%	100/180 Winter				31.635	-0.105	0.000	0.20		
3.000	SWMH07	15 Winter	2	+0%	100/15 Winter				31.741	-0.109	0.000	0.16		
3.001	SWMH08	15 Winter	2	+0%	100/15 Summer				31.531	-0.094	0.000	0.30		
3.002	SWMH09	15 Winter	2	+0%	100/15 Summer				31.460	-0.090	0.000	0.33		
4.000	SWMH10	15 Winter	2	+0%					31.881	-0.109	0.000	0.16		
4.001	SWMH11	15 Winter	2	+0%					31.719	-0.096	0.000	0.27		
4.002	SWMH12	15 Winter	2	+0%	100/180 Winter				31.638	-0.102	0.000	0.22		
1.003	TANK	360 Winter	2	+0%	30/60 Summer				30.909	-0.041	0.000	0.07		324
1.004	SWSP01	30 Winter	2	+0%	2/15 Summer				31.033	0.328	0.000	1.64		
1.005	SWMHOS01	15 Winter	2	+0%					31.335	-0.115	0.000	0.12		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SWMH01	2.8	OK	
1.001	SWMH02	5.1	OK	
1.002	SWMH03	7.5	OK	
2.000	SWMH04	2.4	OK	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
2.001	SWMH05	4.4	OK	
2.002	SWMH06	6.5	OK	
3.000	SWMH07	2.7	OK	
3.001	SWMH08	5.1	OK	
3.002	SWMH09	7.5	OK	
4.000	SWMH10	2.4	OK	
4.001	SWMH11	4.4	OK	
4.002	SWMH12	6.5	OK	
1.003	TANK	1.2	OK*	
1.004	SWSP01	1.8	SURCHARGED	
1.005	SWMHOS01	1.7	OK	

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

Simulation Criteria

Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm)	20.300	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.424	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	2.5 Second Increment (Extended)	Inertia Status	ON
DTS 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)	2, 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	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
1.000	SWMH01	15 Winter	30	+0%					31.758	-0.092	0.000	0.31			5.2

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

PN	US/MH Name	Status	Level Exceeded
1.000	SWMH01	OK	

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)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.001	SWMH02	15 Winter	30	+0%	100/15 Summer				31.591	-0.059	0.000	0.67		
1.002	SWMH03	15 Winter	30	+0%	100/15 Summer				31.474	-0.061	0.000	0.64		
2.000	SWMH04	15 Winter	30	+0%					31.895	-0.095	0.000	0.28		
2.001	SWMH05	15 Winter	30	+0%	100/15 Summer				31.751	-0.064	0.000	0.62		
2.002	SWMH06	15 Winter	30	+0%	100/180 Winter				31.660	-0.080	0.000	0.43		
3.000	SWMH07	15 Winter	30	+0%	100/15 Winter				31.758	-0.092	0.000	0.31		
3.001	SWMH08	15 Winter	30	+0%	100/15 Summer				31.563	-0.062	0.000	0.63		
3.002	SWMH09	15 Winter	30	+0%	100/15 Summer				31.497	-0.053	0.000	0.73		
4.000	SWMH10	15 Winter	30	+0%					31.898	-0.092	0.000	0.31		
4.001	SWMH11	15 Winter	30	+0%					31.748	-0.067	0.000	0.58		
4.002	SWMH12	15 Winter	30	+0%	100/180 Winter				31.665	-0.075	0.000	0.49		
1.003	TANK	360 Winter	30	+0%	30/60 Summer				31.026	0.076	0.000	0.10		
1.004	SWSP01	15 Winter	30	+0%	2/15 Summer				31.461	0.756	0.000	2.80		10
1.005	SWMHOS01	15 Winter	30	+0%					31.346	-0.104	0.000	0.21		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.001	SWMH02	10.8	OK	
1.002	SWMH03	16.5	OK	
2.000	SWMH04	4.5	OK	
2.001	SWMH05	9.4	OK	
2.002	SWMH06	14.3	OK	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
3.000	SWMH07	5.2	OK	
3.001	SWMH08	10.8	OK	
3.002	SWMH09	16.4	OK	
4.000	SWMH10	4.5	OK	
4.001	SWMH11	9.3	OK	
4.002	SWMH12	14.2	OK	
1.003	TANK	1.7	SURCHARGED*	
1.004	SWSP01	3.0	SURCHARGED	
1.005	SWMHOS01	3.0	OK	

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

Simulation Criteria

Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm)	20.300	Cv (Summer)	0.750
Region	England and Wales	Ratio R	0.424	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	2.5 Second Increment (Extended)	Inertia Status	ON
DTS 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)	2, 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	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
1.000	SWMH01	15 Winter	100	+40%					31.798	-0.052	0.000	0.56			9.5

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

PN	US/MH Name	Status	Level Exceeded
1.000	SWMH01	OK	

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)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.001	SWMH02	360 Winter	100	+40%	100/15 Summer				31.783	0.133	0.000	0.16		
1.002	SWMH03	360 Winter	100	+40%	100/15 Summer				31.781	0.246	0.000	0.15		
2.000	SWMH04	15 Winter	100	+40%					31.917	-0.073	0.000	0.51		
2.001	SWMH05	15 Winter	100	+40%	100/15 Summer				31.832	0.017	0.000	1.09		
2.002	SWMH06	360 Winter	100	+40%	100/180 Winter				31.781	0.041	0.000	0.10		
3.000	SWMH07	15 Winter	100	+40%	100/15 Winter				31.857	0.007	0.000	0.54		
3.001	SWMH08	15 Winter	100	+40%	100/15 Summer				31.799	0.174	0.000	1.09		
3.002	SWMH09	360 Winter	100	+40%	100/15 Summer				31.782	0.232	0.000	0.17		
4.000	SWMH10	15 Winter	100	+40%					31.922	-0.068	0.000	0.56		
4.001	SWMH11	15 Winter	100	+40%					31.814	-0.001	0.000	1.00		
4.002	SWMH12	360 Winter	100	+40%	100/180 Winter				31.781	0.041	0.000	0.12		
1.003	TANK	360 Winter	100	+40%	30/60 Summer				31.779	0.829	0.000	0.24		
1.004	SWSP01	360 Winter	100	+40%	2/15 Summer				31.770	1.065	0.000	2.80		38
1.005	SWMHOS01	720 Winter	100	+40%					31.346	-0.104	0.000	0.21		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.001	SWMH02	2.6	SURCHARGED	
1.002	SWMH03	3.8	SURCHARGED	
2.000	SWMH04	8.3	OK	
2.001	SWMH05	16.7	SURCHARGED	
2.002	SWMH06	3.3	SURCHARGED	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
3.000	SWMH07	9.1	SURCHARGED	
3.001	SWMH08	18.6	SURCHARGED	
3.002	SWMH09	3.8	SURCHARGED	
4.000	SWMH10	8.2	OK	
4.001	SWMH11	16.1	OK	
4.002	SWMH12	3.3	SURCHARGED	
1.003	TANK	4.0	SURCHARGED*	
1.004	SWSP01	3.0	SURCHARGED	
1.005	SWMHOS01	3.0	OK	

Note: surcharge and flood risk are normal and is a result of water filling up the porous areas, attenuation and pipework.