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The Ridge,
Haverhill Business Park

Plots SE2, NE1 and NE2
SW DRAINAGE STRATEGY

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CONTENTS

APPENDICES

1.0 Introduction

The Drainage Strategy has been prepared in support of a Reserved Matters planning application at Haverhill Business Park.

The site currently has outline consent DC/15/2424/OUT for an industrial development. The Drainage Assessment for the Outline Application was described in Baynham Meikle Partnership report NSB/12070/FRA Dated 26th November 2015, which identified discharge rates and outfall locations to the local Anglian Water Adopted SW sewer network.

This Drainage Strategy covers the proposed drainage for Plots SE2, NE1 and NE2. Revision 4 of this document has been updated to suit revised unit layout on the NE2 plot based upon the parking required for B2 use.

In the preparation of this document, reference has been made to Suffolk Flood Risk Management Partnership document Sustainable Drainage Systems (SuDS) a Local Design Guide to determine allowable discharge rates.

2.0 Site Context

2.1 Site Location.

The site comprised 2 development plots north and south of Iceni Way, Haverhill at Grid Reference TL67844424. The sites are shown in Figure 1.

Figure 1 - SIte Boundary

Reference should be made to the Ground Investigation Report for historical and current land use.

In summary, the site forms part of a wider business park development. Development Plots SE2 and NE1/NE2 have been subject to previous earthworks and remediation. The site is now characterized by generally level plateaued ground with freshly exposed clayey soils at surface. Steep slopes bound the NE1/2 site to the north and west.

The NE1/NE2 site is bounded to the north by an ecological area, and the east by dense vegetation and footpath. To the west is Bumpstead Road with Iceni Way to the South.

SE2 plot is bounded to the north by Iceni Way, the west and east by previous phases of development and to the south by A1017 Haverhill Bypass.

2.2 Site Geology/ Hydrogeology

Reference should be made to the geo-environmental reports for details of the site geology.

In summary, the site comprises reworked natural fill comprising firm to stiff brown clays with varying degrees of sands and gravels. This is underlain by a natural strata of the Lowestoft Formation, a firm to stiff brown clay with varying degrees of sands and gravels, below which is the Lewes Nodular Chalk formation of the Seaford Nodular Chalk formation.

In terms of Groundwater Vulnerability, the underlying bedrock geology strata is classed as a ‘Principal Aquifer’.

The overlying Superficial Deposits is classed as Secondary A/ Secondary (undifferentiated).

The NE1/2 site is not within a Source Protection Zone. The SE2 site is in Groundwater Source Protection Zone 3.

3.0 Impermeable Area

Figure 2 shows the development proposals with a B2 parking and a total site area of 5.6Ha. The site current has no impermeable area.

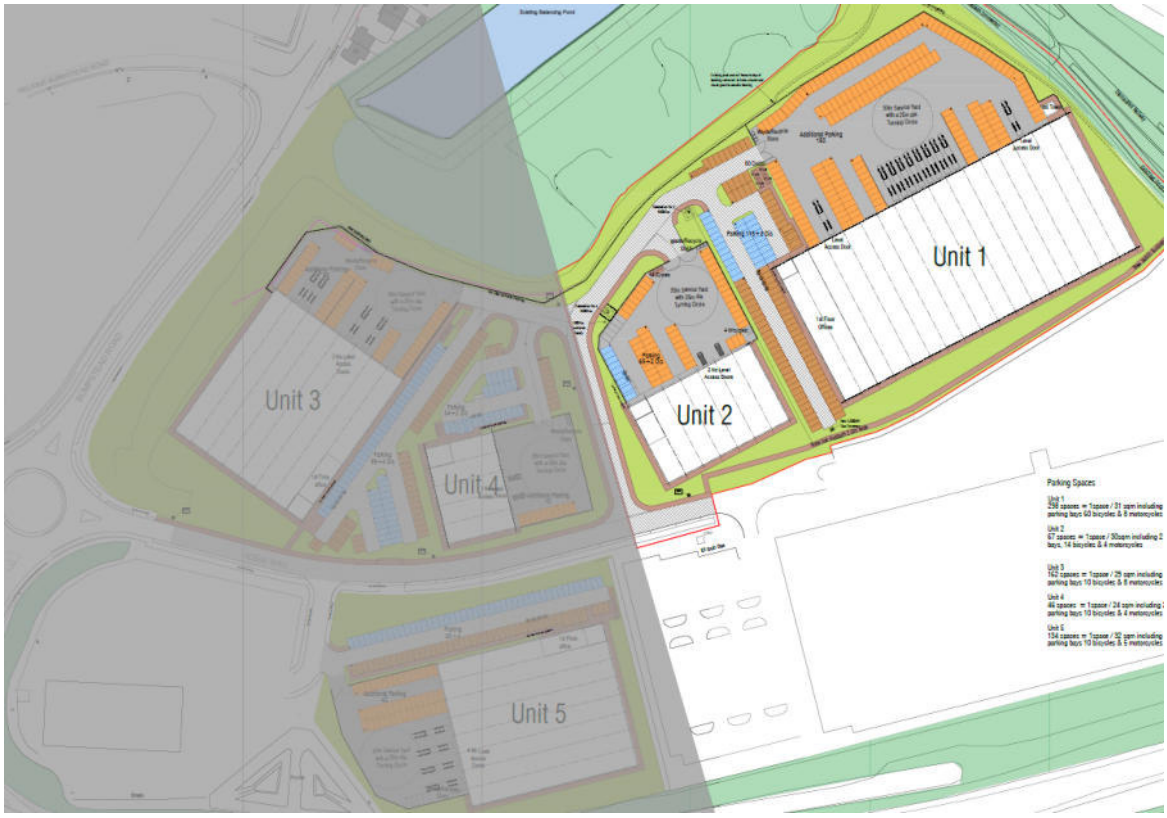


Figure 2 - Site Plan

4.0 Drainage Strategy

4.1 Hierarchy of Disposal

Generally the aim should be to discharge surface water run-off as high up the following hierarchy of drainage options as reasonably practicable.

- Into the ground (infiltration).
- To a surface water body.
- To a surface water sewer, highway drain, or other drainage system.
- To a combined sewer.

Infiltration

As assessment of the potential suitability of the prevailing ground conditions for constructing soakaways to deal with surface water drainage has not been carried out to date. However, the described CLAY soils are likely to be encountered to significant depth.

The ground conditions would therefore suggest that soakaways are not a suitable option for dealing with surface water drainage.

Water Body

There are no accessible water bodies running through or adjacent to the site. However the network of Anglian Water surface water sewers running in Iceni Way and Bumpstead road discharges to a balancing pond in the ecological are to the north of the NE1/NE2 site.

Surface Water Sewer/Combined Sewer

Surface water sewers run along Iceni Way and Bumpstead Road.

Anglian Water have previously consented to the discharge of surface water from these development plots into the sewer network as part of the outline consent for the development of the business park. A developer enquiry will be made to confirm the proposed discharge rates presented in this report, which are lower than previously agreed.

Current proposals are therefore to connect to public sewers in Iceni Way and Bumpstead Road subject to a Section 106 application for connection.

4.2 Climate Change

The site will need to consider the potential future impacts of climate change on peak rainfall intensity to understand the effects of discharge from the site. The site drainage will therefore be designed in accordance with accommodate the 1 in 100 year event + climate change. The network has been modelled for the 100yr return period with a climate change allowance of 20%. The sensitivity of a 40% climate change allowance has also been assessed.

4.3 Discharge Rates

In accordance with Section 5 of the Suffolk Surface Water Drainage (SuDS) Guidance discharge rates from the site will be limited to Qbar or 2 l/s / Ha whichever is higher for all return periods up to the critical 100yr +CC.

Qbar calculations using ICP SuDS are included at Appendix A and summarized in Table 1.

Site SE2 Qbar (l/s)	3.0
Site NE1/2 Qbar (l/s)	13.1

Table 1 - Qbar Rates

Ordinarily, discharge rates less the 5l/s would be set at 5 l/s to minimize the risk of blockages. However, as part of the Reserved Matters application and consent for the Builders Merchant on the adjacent Plot SE1, Anglian Water have previously accepted a combined discharge rate of 7 l/s for SE1 and SE2. SE1 discharges 3.5 l/s with 3.5l /s reserved for plot SE2. It is therefore proposed to discharge surface water from SE at 3.5 l/s.

Plots NE1 and NE2 generally sit at 2 separate plateau levels. Each site therefore will have a separate flow control device with each unit having their own attenuation storage.

Attenuation will be provided by cellular storage tanks within each plot. Additional Storage is also available with permeable paving subbase, although this is primarily provided for water quality purposes (see section 6.0). All attenuation feature will be lined with an impermeable membrane.

The final outfall will be control by a Hydrobrake at 13.1l/s

4.4 Drainage Network

A preliminary drainage layout is shown on drawing 2018-294-122 P2 (Appendix B).

The 2 SW drainage networks have been designed in accordance with the design principles in Section 5 of the Suffolk Surface Water Drainage (SuDS) Guidance, i.e.

- Not increase flood risk off site (in all events up to 100 year return period);
- No flooding inside buildings in events up to a 100 year return period and no flooding in other areas (apart from designated flood paths /storage areas) in events up to 30 year return period

The principles of the design are to ensure that below ground attenuation tanks will store all surface water up to the 30 year return period. The loading docks will be utilised to temporarily contain water in excess of the 30 year return period with minimal flooding, other than in the loading docks, up to the 1 in 100 year return period.

Microdrainage Network Details and Simulation results are included at Appendix C1 and C2

For the SE2 plot, the results demonstrate

- No flooding for the 30 year return period.
- Negligible flooding for the 100 year return period within the porous paving

- For the 100 year return period plus 20% climate change there is 7m3 flooding at MH 14. Overland flow routing directs this away from the building and into the low point of Iceni Way. There will be sufficient capacity to contain this volume of water without risk to buildings. Additional Flooding at MH 10/11 (porous paving) will be contained within the car park

- For the 100 year plus 20% and 40% climate change events the principle flooding occurs near the outfall. Again, this is directed away from buildings to Iceni Way.

For NE1/2 Plots, the loading docks have been modelled as surface ponds and the simulation results demonstrate:

- No flooding for the 30 year return period.

- Negligible flooding for the 100 year return period with surface water backing up into the loading docks.

- For the 100 return period with 20% and 40% climate change allowances flooding occurs generally across the site. Overland flow routes ensure that this flooding is directed to the car park areas and the additional capacity in loading docks and low points of service yards where it can be temporarily contained before draining back into the system.

Drawing 2018-294 122 P2 indicates the flood volumes and depths by return period.

5.0 Maintenance of SuDS Features

The maintenance regime of the drainage system, attenuation tank and oil separator will be provided to the end user in the form of Operation and Maintenance Manuals to ensure that the SuDS features continue to operate in the manner intended.

The attenuation tank will be subject to the maintenance schedule detailed in Table 2.

Monthly	Inspect upsteam catchpit for silt. Clean out if necessary using vacuum tanker.
Six monthly	Remove sediment from the inlet catchpit with a vacuum tanker twice a year as necessary, ideally at the start of Spring when general landscaping tidying up is carried out after winter damage and autumn leaf fall.
Annually	Annually inspect/check all sumps, inlets, outlets, vents to tanks to ensure that they are in good condition and operating as designed. Inspect distribution pipe by CCTV and if necessary clean out.
Remediation Inspection & tasks following significant storm events	Inspect upsteam and downstream manholes for silt and debris. Clean out as necessary using vacuum tanker.
Contingency plan details	Exceedance flows as defined in the Drainage Strategy Drawing.

Table 2 - Attenuation Tank Typical Maintenance Schedule

Permeable block paving will be subject to the maintenance schedule detailed in Table 3.

Six monthly	Brushing and vacuuming to manufacturer requirements. Re-grit where necessary after brushing.
Annually	Inspect infiltration surface for excessive siltation.
As Required	After significant storm events inspect / check surface and overflows (where specified) to ensure they are in good condition, free from blockages and operating as designed. Removal of weeds where required. Regularly Remove Leaf Fall in Autumn
Contingency plan details	Exceedance flows as defined in the Drainage Strategy Drawing.

Table 3 – Permeable Paving Typical Maintenance Schedule

Maintenance of the oil separator will be in accordance with the manufacturers' details to be incorporated in the Operation and Maintenance Manuals.

At the time of writing, no end user has been identified. Contact details for the person responsible for maintenance will be provided, when known.

6.0 Water Quality

Permeable paving has been used in parking areas to provide initial treatment. Water quality provision in service yards will be proved by class 1 full retention separators.

Both site discharge to the Anglian water surface water sewer network which in turn discharges to an existing balancing pond off site to the north. The final outfall from this pond is unknown.

In accordance with the simple index approach used in the SuDS Manual, the provision of permeable paving and oil separators on site as the initial treatment, together with the existing balancing pond off site ensures that the hazard mitigation index exceeds the hazard risk rating.

A summary of the Risk and Hazard ratings are shown below.

Hazard	Commercial Yard Hazard Index	Full Retention Separator Mitigation	Car Pak Hazard Index	Porous Subbase SuDS Mitigation Index	Balancing Pond
Total suspended solids (TSS)	0.7	-	0.5	0.7	0.7
Metals	0.6	-	0.4	0.6	0.7
Hydrocarbons	0.7		0.4	0.7	0.5

APPENDICES

Appendix A – Greenfield Rates
Appendix B – Drainage Strategy Plan
Appendix C – Microdrainage Calculations
1. Plot SE2
2. Plot NE1/2

Appendix A – Greenfield Rates

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.400
Area (ha)	1.060	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results l/s

QBAR Rural	3.0
QBAR Urban	3.0
Q1 year	2.6
Q1 year	2.6
Q30 years	6.8
Q100 years	9.6

ICP SUDS Mean Annual Flood

Input

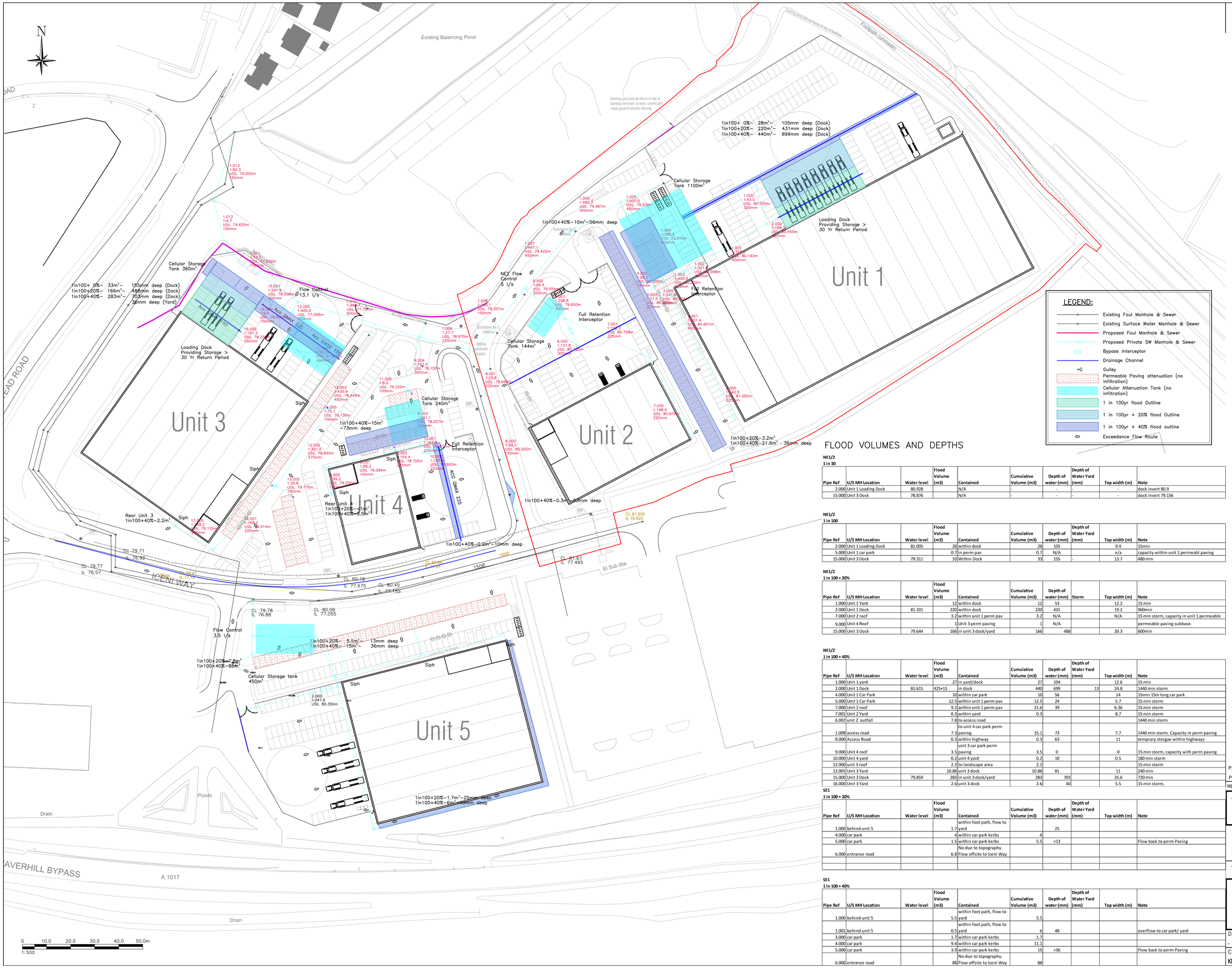
Return Period (years)	1	Soil	0.400
Area (ha)	4.600	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results l/s

QBAR Rural	13.1
QBAR Urban	13.1
Q1 year	11.1
Q1 year	11.1
Q30 years	29.6
Q100 years	41.7

Appendix B – Drawings

- 2018-294-122 P1 100k Unit B2 Drainage Strategy



LEGEND:

- Existing Foul Manhole & Sewer
- Existing Surface Water Manhole & Sewer
- Proposed Foul Manhole & Sewer
- Proposed Private SW Manhole & Sewer
- Bypass Interceptor
- Drainage Channel
- Gulley
- Permeable Paving attenuation (no infiltration)
- Cellular Attenuation Tank (no infiltration)
- 1 in 100yr flood Outline
- 1 in 100yr + 20% flood Outline
- 1 in 100yr + 40% flood outline
- Exceedance Flow Route

FLOOD VOLUMES AND DEPTHS

NE1/2
1 in 30

Pipe Ref	U/S MH Location	Water level	Flood Volume (m3)	Contained	Cumulative Volume (m3)	Depth of water (mm)	Depth of Water Yard (mm)	Top width (m)	Note
2.000	Unit 1 Loading Dock	80.928		N/A	-	-	-	-	dock invert 80.9
15.000	Unit 3 Dock	78.876		N/A	-	-	-	-	dock invert 79.156

NE1/2
1 in 100

Pipe Ref	U/S MH Location	Water level	Flood Volume (m3)	Contained	Cumulative Volume (m3)	Depth of water (mm)	Depth of Water Yard (mm)	Top width (m)	Note
2.000	Unit 1 Loading Dock	81.005	28	within dock	28	105		9.4	15min
5.000	Unit 1 car park		0.7	in perm pav	0.7	N/A		n/a	capacity within unit 1 permeabl paving
15.000	Unit 3 Dock	79.311	33	Within Dock	33	155	-	13.7	480 min

NE1/2
1 in 100 + 20%

Pipe Ref	U/S MH Location	Water level	Flood Volume (m3)	Contained	Cumulative Volume (m3)	Depth of water (mm)	Storm	Top width (m)	Note
1.000	Unit 1 Yard		12	within dock	12	53		12.2	15 min
2.000	Unit 1 Dock	81.331	220	within dock	220	431		19.2	960min
7.000	Unit 2 roof		3.2	within unit 1 perm pav	3.2	N/A		N/A	15 min storm, capacity in unit 1 permeable
9.000	Unit 4 Roof		1	Unit 3 perm paving	1	N/A			permeable paving subbase.
15.000	Unit 3 Dock	79.644	166	In unit 3 dock/yard	166	488		20.3	600min

NE1/2
1 in 100 + 40%

Pipe Ref	U/S MH Location	Water level	Flood Volume (m3)	Contained	Cumulative Volume (m3)	Depth of water (mm)	Depth of Water Yard (mm)	Top width (m)	Note
1.000	Unit 1 yard		27	in yard/dock	104			12.6	15 min
2.000	Unit 1 Dock	81.615	425+15	in dock	440	699	13	24.8	1440 min storm
4.000	Unit 1 Car Park		10	within car park	10	56		14	15min 15m long car park
5.000	Unit 1 Car Park		12.5	within unit 1 perm pav	12.5	24		5.7	15 min storm
7.000	Unit 2 roof		9.1	within unit 1 perm pav	21.6	39		6.36	15 min storm
7.001	Unit 2 Yard		0.3	within yard	0.3			8.7	15 min storm
6.002	unit 2 outfall		7.8	to access road					1440 min storm
1.008	access road		7.3	to unit 4 car park perm paving.	15.1	73		7.7	1440 min storm. Capacity in perm paving
8.000	Access Road		0.3	within highway	0.3	63		11	temprary storgae within highways
9.000	Unit 4 roof		3.5	unit 3 car park perm paving	3.5	0		0	15 min storm, capacity with perm paving
10.000	Unit 4 yard		0.2	unit 4 yard	0.2	10		0.5	180 min storm
12.000	unit 3 roof		2.2	to landscape area	2.2				15 min storm
12.005	Unit 3 Yard		10.88	unit 3 dock	10.88	81		11	240 min
15.000	Unit 3 Dock	79.859	283	in unit 3 dock/yard	283	703		25.6	720 min
16.000	Unit 3 Yard		2.6	unit 3 dock	2.6	40		5.5	15 min storm,

SE1
1 in 100 + 20%

Pipe Ref	U/S MH Location	Water level	Flood Volume (m3)	Contained	Cumulative Volume (m3)	Depth of water (mm)	Depth of Water Yard (mm)	Top width (m)	Note
1.000	behind unit 5		1.7	within foot path, flow to yard		25			
4.000	car park		4	within car park kerbs	4				
5.000	car park		1.5	within car park kerbs	5.5	<13			Flow back to perm Paving
6.000	entrance road		6.8	No due to topography. Flow offsite to Iceni Way					

SE1
1 in 100 + 40%

Pipe Ref	U/S MH Location	Water level	Flood Volume (m3)	Contained	Cumulative Volume (m3)	Depth of water (mm)	Depth of Water Yard (mm)	Top width (m)	Note
1.000	behind unit 5		5.5	within foot path, flow to yard	5.5				
1.001	behind unit 5		0.5	within foot path, flow to yard	6	48			overflow to car park/ yard
3.000	car park		1.7	within car park kerbs	1.7				
4.000	car park		9.4	within car park kerbs	11.1				
5.000	car park		3.9	within car park kerbs	15	<36			Flow back to perm Paving
6.000	entrance road		88	No due to topography. Flow offsite to Iceni Way	88				

NOLAN ASSOCIATES

PRELIMINARY DRAWING

NOT TO BE USED FOR CONSTRUCTION

REV	DESCRIPTION	BY	CHKD	DATE
P2	Site Plan Update to latest layout	...	KP	15.04.20
P1	PRELIMINARY	...	KP	02.03.20

The Ridge
Haverhill

Drainage Strategy 100k Scheme
General Arrangement B2

Trebor Developments

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Drawn by	Date	Plot Date	Scale
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Checked by	Project No		Dwg No
KP	2018–294		121 P2

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Appendix C1 – Plot SE1 Microdrainage 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)	100	PIMP (%)	100
M5-60 (mm)	20.500	Add Flow / Climate Change (%)	0
Ratio R	0.418	Minimum Backdrop Height (m)	2.000
Maximum Rainfall (mm/hr)	100	Maximum Backdrop Height (m)	2.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.900
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 Storm

« - Indicates pipe capacity < flow

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	35.930	0.363	99.0	0.054	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	36.548	0.262	139.6	0.108	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	61.012	0.253	241.6	0.054	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	1.715	0.007	241.6	0.212	5.00	0.0	0.600	o	300	Pipe/Conduit	
2.001	10.784	0.720	15.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	3.819	0.013	289.7	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
3.000	36.198	0.366	99.0	0.054	5.00	0.0	0.600	o	150	Pipe/Conduit	
3.001	36.757	0.525	70.0	0.108	0.00	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	100.00	5.59	80.650	0.054	0.0	0.0	0.0	1.01	17.8	14.6
1.001	100.00	6.14	80.212	0.162	0.0	0.0	0.0	1.10	43.9	43.9
1.002	100.00	7.15	79.875	0.216	0.0	0.0	0.0	1.01	71.2	58.5
2.000	100.00	5.03	80.350	0.212	0.0	0.0	0.0	1.01	71.2	57.4
2.001	100.00	5.07	80.343	0.212	0.0	0.0	0.0	4.08	288.6	57.4
1.003	100.00	7.21	79.548	0.428	0.0	0.0	0.0	1.06	117.0	115.9
3.000	100.00	5.60	80.650	0.054	0.0	0.0	0.0	1.01	17.8	14.6
3.001	100.00	5.99	80.209	0.162	0.0	0.0	0.0	1.56	62.2	43.9

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
1.004	9.740	0.029	333.7	0.054	0.00	0.0	0.600	o	450	Pipe/Conduit	
4.000	1.181	0.023	50.5	0.149	5.00	0.0	0.600	o	225	Pipe/Conduit	
5.000	2.323	0.023	99.3	0.040	5.00	0.0	0.600	o	150	Pipe/Conduit	
4.001	5.750	0.024	241.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	30.870	0.068	454.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
6.000	6.472	0.111	58.5	0.023	5.00	0.0	0.600	o	100	Pipe/Conduit	
1.006	16.849	0.862	19.5	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)
1.004	100.00	7.36	79.460	0.644	0.0	0.0	0.0	1.11	176.1	174.4
4.000	100.00	5.01	80.150	0.149	0.0	0.0	0.0	1.85	73.4	40.4
5.000	100.00	5.04	80.225	0.040	0.0	0.0	0.0	1.01	17.8	10.8
4.001	100.00	5.13	80.052	0.189	0.0	0.0	0.0	1.01	71.1	51.2
1.005	100.00	7.90	78.600	0.833	0.0	0.0	0.0	0.95	150.7«	225.6
6.000	100.00	5.11	79.300	0.023	0.0	0.0	0.0	1.01	7.9	6.2
1.006	100.00	8.03	78.532	0.856	0.0	0.0	0.0	2.29	40.4«	231.8

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)
1.006	16	79.780	77.670	76.880	1200	0

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	3
Number of Online Controls	2	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)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.500	Storm Duration (mins)	30
Ratio R	0.418		

Online Controls for Storm

Complex Manhole: 12, DS/PN: 4.001, Volume (m³): 1.5

Orifice

Diameter (m) 0.042 Discharge Coefficient 0.600 Invert Level (m) 80.052

Weir

Discharge Coef 0.544 Width (m) 1.200 Invert Level (m) 81.232

Hydro-Brake® Optimum Manhole: 15, DS/PN: 1.006, Volume (m³): 9.3

Unit Reference	MD-SHE-0084-3500-1300-3500
Design Head (m)	1.300
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	84
Invert Level (m)	78.532
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	3.5
Flush-Flo™	0.368	3.4
Kick-Flo®	0.751	2.7
Mean Flow over Head Range	-	3.0

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	2.5	1.200	3.4	3.000	5.1	7.000	7.7
0.200	3.2	1.400	3.6	3.500	5.5	7.500	7.9
0.300	3.4	1.600	3.8	4.000	5.9	8.000	8.2
0.400	3.4	1.800	4.1	4.500	6.2	8.500	8.4
0.500	3.3	2.000	4.3	5.000	6.5	9.000	8.7
0.600	3.2	2.200	4.5	5.500	6.8	9.500	8.9
0.800	2.8	2.400	4.6	6.000	7.1		
1.000	3.1	2.600	4.8	6.500	7.4		

Storage Structures for Storm

Porous Car Park Manhole: 10, DS/PN: 4.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	69.6
Max Percolation (l/s)	92.8	Slope (1:X)	2000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	80.815	Membrane Depth (mm)	160

Porous Car Park Manhole: 11, DS/PN: 5.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	16.8
Max Percolation (l/s)	22.4	Slope (1:X)	2000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	80.815	Membrane Depth (mm)	160

Cellular Storage Manhole: 15, DS/PN: 1.006

Invert Level (m)	78.700	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	280.0	280.0	1.601	0.0	387.1
1.600	280.0	387.1			

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 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	3
Number of Online Controls	2	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	0.418
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.500	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	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)	30, 100
Climate Change (%)	0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
1.001	2	15 Winter	30	+0%	30/15 Summer			
1.002	3	15 Winter	30	+0%	30/15 Summer			
2.000	4	15 Winter	30	+0%	30/15 Summer			
2.001	5	15 Winter	30	+0%				
1.003	6	15 Winter	30	+0%	30/15 Summer			
3.000	7	15 Winter	30	+0%	30/15 Summer			
3.001	8	15 Winter	30	+0%	30/15 Summer			
1.004	9	15 Winter	30	+0%	30/15 Summer			
4.000	10	120 Winter	30	+0%	30/15 Summer	100/30 Winter		
5.000	11	120 Winter	30	+0%	30/15 Summer	100/30 Winter		
4.001	12	120 Winter	30	+0%	30/15 Summer			
1.005	13	600 Winter	30	+0%	30/15 Summer			
6.000	14	600 Winter	30	+0%	30/15 Summer	100/720 Winter		
1.006	15	600 Winter	30	+0%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	81.000	0.200	0.000	0.97		16.7	SURCHARGED	3
1.001	2	80.686	0.249	0.000	1.18		48.8	SURCHARGED	
1.002	3	80.337	0.161	0.000	0.92		62.1	SURCHARGED	
2.000	4	80.722	0.072	0.000	1.37		75.2	SURCHARGED	
2.001	5	80.467	-0.176	0.000	0.35		74.7	OK	
1.003	6	80.104	0.181	0.000	1.64		132.1	SURCHARGED	
3.000	7	80.844	0.044	0.000	1.04		18.0	SURCHARGED	
3.001	8	80.448	0.014	0.000	0.93		54.7	SURCHARGED	
1.004	9	79.990	0.080	0.000	1.73		200.1	SURCHARGED	
4.000	10	81.082	0.707	0.000	0.12		3.7	FLOOD RISK	7
5.000	11	81.081	0.706	0.000	0.09		1.0	FLOOD RISK	7
4.001	12	81.117	0.765	0.000	0.08		3.7	FLOOD RISK	
1.005	13	79.704	0.654	0.000	0.18		23.7	SURCHARGED	
6.000	14	79.702	0.302	0.000	0.10		0.7	SURCHARGED	2
1.006	15	79.702	1.020	0.000	0.09		3.4	SURCHARGED	

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	3
Number of Online Controls	2	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	0.418
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.500	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	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 (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Winter	100	+0%	100/15 Summer			
1.001	2	15 Winter	100	+0%	100/15 Summer			
1.002	3	15 Winter	100	+0%	100/15 Summer			
2.000	4	15 Winter	100	+0%	100/15 Summer			
2.001	5	15 Winter	100	+0%				
1.003	6	15 Winter	100	+0%	100/15 Summer			
3.000	7	15 Winter	100	+0%	100/15 Summer			
3.001	8	15 Winter	100	+0%	100/15 Summer			
1.004	9	15 Winter	100	+0%	100/15 Summer			
4.000	10	60 Winter	100	+0%	100/15 Summer	100/60 Winter		
5.000	11	60 Winter	100	+0%	100/15 Summer	100/60 Winter		
4.001	12	60 Winter	100	+0%	100/15 Summer			
1.005	13	720 Winter	100	+0%	100/15 Summer			
6.000	14	720 Winter	100	+0%	100/15 Summer			
1.006	15	720 Winter	100	+0%	100/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	81.537	0.737	0.000	1.24		21.3	FLOOD RISK	
1.001	2	81.139	0.702	0.000	1.40		58.1	SURCHARGED	
1.002	3	80.607	0.432	0.000	1.12		75.9	SURCHARGED	
2.000	4	80.787	0.137	0.000	1.77		97.2	SURCHARGED	
2.001	5	80.487	-0.156	0.000	0.46		97.2	OK	
1.003	6	80.251	0.329	0.000	2.08		166.9	SURCHARGED	
3.000	7	81.239	0.439	0.000	1.27		21.8	SURCHARGED	
3.001	8	80.701	0.267	0.000	1.09		64.2	SURCHARGED	
1.004	9	80.066	0.156	0.000	2.18		252.1	SURCHARGED	
4.000	10	81.275	0.900	0.054	0.51		15.2	FLOOD	1
5.000	11	81.275	0.900	0.034	0.39		4.2	FLOOD	1
4.001	12	81.270	0.919	0.000	0.40		19.4	FLOOD RISK	
1.005	13	80.039	0.989	0.000	0.20		26.1	SURCHARGED	
6.000	14	80.038	0.638	0.000	0.11		0.8	FLOOD RISK	
1.006	15	80.038	1.356	0.000	0.10		3.7	SURCHARGED	

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	3
Number of Online Controls	2	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 0.418
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.500	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	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)	30, 100
Climate Change (%)	0, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Winter	100	+20%	30/15 Summer	100/15 Summer		
1.001	2	15 Winter	100	+20%	30/15 Summer			
1.002	3	15 Winter	100	+20%	30/15 Summer			
2.000	4	15 Winter	100	+20%	30/15 Summer			
2.001	5	15 Winter	100	+20%				
1.003	6	15 Winter	100	+20%	30/15 Summer			
3.000	7	15 Winter	100	+20%	30/15 Summer			
3.001	8	15 Winter	100	+20%	30/15 Summer			
1.004	9	960 Winter	100	+20%	30/15 Summer			
4.000	10	60 Winter	100	+20%	30/15 Summer	100/30 Winter		
5.000	11	60 Winter	100	+20%	30/15 Summer	100/30 Winter		
4.001	12	60 Winter	100	+20%	30/15 Summer			
1.005	13	960 Winter	100	+20%	30/15 Summer			
6.000	14	960 Winter	100	+20%	30/15 Summer	100/720 Winter		
1.006	15	960 Winter	100	+20%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	81.702	0.902	1.707	1.56		26.8	FLOOD	3
1.001	2	81.531	1.093	0.000	1.56		64.7	FLOOD RISK	
1.002	3	80.874	0.699	0.000	1.29		87.2	SURCHARGED	
2.000	4	80.856	0.206	0.000	2.11		116.1	SURCHARGED	
2.001	5	80.606	-0.037	0.000	0.55		116.2	OK	
1.003	6	80.408	0.485	0.000	2.47		198.7	SURCHARGED	
3.000	7	81.656	0.856	0.000	1.47		25.3	FLOOD RISK	
3.001	8	81.001	0.566	0.000	1.27		74.5	SURCHARGED	
1.004	9	80.342	0.432	0.000	0.19		21.7	SURCHARGED	
4.000	10	81.279	0.904	3.991	0.59		17.5	FLOOD	7
5.000	11	81.276	0.901	1.461	0.76		8.2	FLOOD	7
4.001	12	81.273	0.921	0.000	0.43		21.0	FLOOD RISK	
1.005	13	80.341	1.291	0.000	0.19		25.0	SURCHARGED	
6.000	14	80.308	0.908	7.809	0.39		2.8	FLOOD	2
1.006	15	80.338	1.656	0.000	0.11		4.1	SURCHARGED	

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	3
Number of Online Controls	2	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	0.418
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.500	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	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) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Winter	100	+40%	100/15 Summer	100/15 Summer		
1.001	2	15 Winter	100	+40%	100/15 Summer	100/15 Summer		
1.002	3	15 Winter	100	+40%	100/15 Summer			
2.000	4	15 Winter	100	+40%	100/15 Summer			
2.001	5	15 Winter	100	+40%	100/15 Summer			
1.003	6	600 Winter	100	+40%	100/15 Summer			
3.000	7	15 Winter	100	+40%	100/15 Summer	100/15 Summer		
3.001	8	15 Winter	100	+40%	100/15 Summer			
1.004	9	600 Winter	100	+40%	100/15 Summer			
4.000	10	60 Winter	100	+40%	100/15 Summer	100/15 Winter		
5.000	11	60 Winter	100	+40%	100/15 Summer	100/15 Winter		
4.001	12	360 Winter	100	+40%	100/15 Summer			
1.005	13	600 Winter	100	+40%	100/15 Summer			
6.000	14	960 Winter	100	+40%	100/15 Summer	100/180 Winter		
1.006	15	600 Winter	100	+40%	100/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	81.705	0.905	5.491	1.83		31.5	FLOOD	4
1.001	2	81.701	1.263	0.526	1.59		66.1	FLOOD	2
1.002	3	81.057	0.881	0.000	1.39		94.1	SURCHARGED	
2.000	4	81.060	0.410	0.000	2.33		128.1	SURCHARGED	
2.001	5	80.798	0.155	0.000	0.60		127.3	SURCHARGED	
1.003	6	80.592	0.669	0.000	0.31		24.6	SURCHARGED	
3.000	7	81.702	0.902	1.723	1.73		29.8	FLOOD	3
3.001	8	81.305	0.871	0.000	1.43		83.9	SURCHARGED	
1.004	9	80.592	0.682	0.000	0.32		36.7	SURCHARGED	
4.000	10	81.284	0.909	9.395	0.68		20.5	FLOOD	17
5.000	11	81.279	0.904	3.898	0.99		10.8	FLOOD	17
4.001	12	81.323	0.972	0.000	0.33		15.9	FLOOD RISK	
1.005	13	80.592	1.542	0.000	0.31		40.4	SURCHARGED	
6.000	14	80.389	0.989	88.739	0.55		3.9	FLOOD	13
1.006	15	80.589	1.907	0.000	0.11		4.3	SURCHARGED	

Nolan Associates
consulting civil and structural engineers

Appendix C2 – Plot NE1/2 Microdrainage 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)	30	PIMP (%)	100
M5-60 (mm)	20.500	Add Flow / Climate Change (%)	0
Ratio R	0.418	Minimum Backdrop Height (m)	2.000
Maximum Rainfall (mm/hr)	75	Maximum Backdrop Height (m)	2.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.900
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 Storm

« - Indicates pipe capacity < flow

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	15.359	0.357	43.0	0.562	5.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	6.227	0.037	168.3	0.095	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	30.485	0.095	321.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.002	6.900	0.021	321.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.003	11.902	0.030	400.9	0.215	0.00	0.0	0.600	o	525	Pipe/Conduit	
3.000	8.458	0.226	37.5	0.180	5.00	0.0	0.600	o	225	Pipe/Conduit	
4.000	7.506	0.076	99.2	0.058	5.00	0.0	0.600	o	150	Pipe/Conduit	
3.001	4.004	0.017	241.9	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)
1.000	75.00	5.11	80.700	0.562	0.0	0.0	0.0	2.40	169.9	114.1
2.000	75.00	5.10	80.455	0.095	0.0	0.0	0.0	1.00	40.0	19.4
1.001	75.00	5.56	80.193	0.657	0.0	0.0	0.0	1.13	179.6	133.5
1.002	75.00	5.66	80.098	0.657	0.0	0.0	0.0	1.13	179.6	133.5
1.003	75.00	5.84	80.002	0.872	0.0	0.0	0.0	1.11	240.8	177.2
3.000	75.00	5.07	80.625	0.180	0.0	0.0	0.0	2.14	85.2	36.5
4.000	75.00	5.12	80.550	0.058	0.0	0.0	0.0	1.01	17.8	11.8
3.001	75.00	5.19	80.324	0.238	0.0	0.0	0.0	1.01	71.1	48.3

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
5.000	31.876	0.224	142.5	0.213	5.00	0.0	0.600	o	225	Pipe/Conduit	
5.001	35.703	0.089	401.4	0.429	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.004	30.852	0.100	308.5	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.005	6.736	0.013	500.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.006	24.269	0.049	495.3	0.015	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.007	32.310	0.065	497.1	0.011	0.00	0.0	0.600	o	450	Pipe/Conduit	
6.000	8.856	0.073	121.8	0.243	5.00	0.0	0.600	o	300	Pipe/Conduit	
7.000	36.477	0.217	168.4	0.103	5.00	0.0	0.600	o	225	Pipe/Conduit	
7.001	38.344	0.252	152.2	0.103	0.00	0.0	0.600	o	225	Pipe/Conduit	
6.001	20.042	0.096	208.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
6.002	5.497	0.057	96.4	0.030	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.008	31.242	0.312	100.1	0.034	0.00	0.0	0.600	o	150	Pipe/Conduit	
8.000	42.566	0.429	99.2	0.060	5.00	0.0	0.600	o	150	Pipe/Conduit	
8.001	18.710	0.726	25.8	0.047	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.009	23.378	0.844	27.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
9.000	11.519	0.116	99.2	0.061	5.00	0.0	0.600	o	150	Pipe/Conduit	
9.001	30.137	0.304	99.2	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)
5.000	75.00	5.49	81.050	0.213	0.0	0.0	0.0	1.09	43.5	43.2
5.001	75.00	6.08	80.601	0.642	0.0	0.0	0.0	1.01	160.4	130.3
1.004	75.00	6.45	79.600	1.752	0.0	0.0	0.0	1.38	390.5	355.9
1.005	75.00	6.57	79.500	1.752	0.0	0.0	0.0	0.90	143.5«	355.9
1.006	75.00	7.02	79.487	1.767	0.0	0.0	0.0	0.91	144.2«	358.8
1.007	75.00	7.61	79.422	1.777	0.0	0.0	0.0	0.91	143.9«	361.0
6.000	75.00	5.10	80.725	0.243	0.0	0.0	0.0	1.42	100.6	49.4
7.000	75.00	5.61	80.975	0.103	0.0	0.0	0.0	1.00	39.9	20.9
7.001	75.00	6.21	80.758	0.206	0.0	0.0	0.0	1.06	42.0	41.8
6.001	75.00	6.52	79.650	0.449	0.0	0.0	0.0	1.08	76.6«	91.3
6.002	75.00	6.57	79.554	0.479	0.0	0.0	0.0	1.60	113.2	97.3
1.008	75.00	8.13	79.357	2.290	0.0	0.0	0.0	1.00	17.7«	465.2
8.000	75.00	5.70	80.200	0.060	0.0	0.0	0.0	1.01	17.8	12.2
8.001	75.00	5.82	79.696	0.107	0.0	0.0	0.0	2.59	102.9	21.8
1.009	75.00	8.29	78.970	2.398	0.0	0.0	0.0	2.50	99.2«	487.0
9.000	75.00	5.19	79.200	0.061	0.0	0.0	0.0	1.01	17.8	12.4
9.001	75.00	5.69	79.084	0.061	0.0	0.0	0.0	1.01	17.8	12.4

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
9.002	12.936	0.084	154.4	0.143	0.00	0.0	0.600	o	225	Pipe/Conduit	
10.000	4.926	0.029	167.9	0.132	5.00	0.0	0.600	o	225	Pipe/Conduit	
10.001	3.517	0.021	167.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
9.003	25.795	0.107	241.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
11.000	5.823	0.970	6.0	0.043	5.00	0.0	0.600	o	100	Pipe/Conduit	
9.004	19.502	0.099	197.0	0.007	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.010	65.328	0.131	498.7	0.063	0.00	0.0	0.600	o	600	Pipe/Conduit	
12.000	18.644	0.111	168.2	0.117	5.00	0.0	0.600	o	225	Pipe/Conduit	
12.001	36.856	0.219	168.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
13.000	9.128	0.255	35.8	0.077	5.00	0.0	0.600	o	100	Pipe/Conduit	
12.002	38.798	0.121	321.0	0.233	0.00	0.0	0.600	o	375	Pipe/Conduit	
14.000	5.000	0.331	15.1	0.165	5.00	0.0	0.600	o	100	Pipe/Conduit	
12.003	19.587	0.049	400.9	0.115	0.00	0.0	0.600	o	450	Pipe/Conduit	
12.004	23.476	0.059	397.9	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
12.005	20.969	0.052	400.0	0.000	0.00	0.0	0.600	o	450	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)
9.002	75.00	5.89	78.705	0.204	0.0	0.0	0.0	1.05	41.7	41.5
10.000	75.00	5.08	78.900	0.132	0.0	0.0	0.0	1.01	40.0	26.9
10.001	75.00	5.14	78.871	0.132	0.0	0.0	0.0	1.01	40.0	26.9
9.003	75.00	6.32	78.257	0.337	0.0	0.0	0.0	1.01	71.3	68.4
11.000	75.00	5.03	79.320	0.043	0.0	0.0	0.0	3.18	25.0	8.7
9.004	75.00	6.61	78.150	0.387	0.0	0.0	0.0	1.12	78.9	78.6
1.010	75.00	9.29	77.751	2.847	0.0	0.0	0.0	1.08	306.4«	578.3
12.000	75.00	5.31	79.125	0.117	0.0	0.0	0.0	1.01	40.0	23.8
12.001	75.00	5.92	79.014	0.117	0.0	0.0	0.0	1.01	40.0	23.8
13.000	75.00	5.12	79.175	0.077	0.0	0.0	0.0	1.29	10.2«	15.7
12.002	75.00	6.56	78.645	0.427	0.0	0.0	0.0	1.01	111.1	86.8
14.000	75.00	5.04	79.130	0.165	0.0	0.0	0.0	2.00	15.7«	33.5
12.003	75.00	6.89	78.449	0.708	0.0	0.0	0.0	1.01	160.5	143.8
12.004	75.00	7.27	77.658	0.708	0.0	0.0	0.0	1.01	161.1	143.8
12.005	75.00	7.62	77.599	0.708	0.0	0.0	0.0	1.01	160.7	143.8

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
15.000	17.401	0.172	101.2	0.085	5.00	0.0	0.600	o	150	Pipe/Conduit	
16.000	4.400	0.692	6.4	0.156	5.00	0.0	0.600	o	150	Pipe/Conduit	
15.001	5.840	0.024	241.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.011	23.318	2.096	11.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.012	21.768	4.655	4.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.013	29.732	0.322	92.3	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)
15.000	75.00	5.29	78.330	0.085	0.0	0.0	0.0	1.00	17.7	17.3
16.000	75.00	5.02	78.850	0.156	0.0	0.0	0.0	4.02	71.1	31.7
15.001	75.00	5.39	78.008	0.241	0.0	0.0	0.0	1.01	71.1	49.0
1.011	75.00	9.42	77.620	3.796	0.0	0.0	0.0	3.04	53.7«	771.1
1.012	75.00	9.50	74.655	3.796	0.0	0.0	0.0	4.69	82.9«	771.1
1.013	75.00	9.97	70.000	3.796	0.0	0.0	0.0	1.05	18.5«	771.1

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.562	0.562	0.562
2.000	User	-	100	0.095	0.095	0.095
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
1.003	User	-	100	0.215	0.215	0.215
3.000	User	-	100	0.180	0.180	0.180
4.000	User	-	100	0.058	0.058	0.058
3.001	-	-	100	0.000	0.000	0.000
5.000	User	-	100	0.213	0.213	0.213
5.001	User	-	100	0.429	0.429	0.429
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	User	-	100	0.015	0.015	0.015
1.007	User	-	100	0.011	0.011	0.011
6.000	User	-	100	0.243	0.243	0.243
7.000	User	-	100	0.103	0.103	0.103
7.001	User	-	100	0.103	0.103	0.103
6.001	-	-	100	0.000	0.000	0.000
6.002	User	-	100	0.030	0.030	0.030
1.008	User	-	100	0.034	0.034	0.034
8.000	User	-	100	0.060	0.060	0.060
8.001	User	-	100	0.047	0.047	0.047
1.009	-	-	100	0.000	0.000	0.000
9.000	User	-	100	0.061	0.061	0.061
9.001	-	-	100	0.000	0.000	0.000
9.002	User	-	100	0.143	0.143	0.143
10.000	User	-	100	0.132	0.132	0.132
10.001	-	-	100	0.000	0.000	0.000
9.003	-	-	100	0.000	0.000	0.000
11.000	User	-	100	0.043	0.043	0.043
9.004	User	-	100	0.007	0.007	0.007
1.010	User	-	100	0.063	0.063	0.063
12.000	User	-	100	0.117	0.117	0.117
12.001	-	-	100	0.000	0.000	0.000
13.000	User	-	100	0.077	0.077	0.077
12.002	User	-	100	0.233	0.233	0.233
14.000	User	-	100	0.165	0.165	0.165
12.003	User	-	100	0.115	0.115	0.115
12.004	-	-	100	0.000	0.000	0.000
12.005	-	-	100	0.000	0.000	0.000
15.000	User	-	100	0.085	0.085	0.085
16.000	User	-	100	0.156	0.156	0.156
15.001	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.000	0.000	0.000
1.012	-	-	100	0.000	0.000	0.000
1.013	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				3.796	3.796	3.796

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)
1.013	48	71.100	69.678	69.050	1500	0

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 Offline Controls 0	Number of Time/Area Diagrams 0
Number of Online Controls 2	Number of Storage Structures 11	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.500	Storm Duration (mins)	30
Ratio R	0.418		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 20, DS/PN: 1.008, Volume (m³): 8.4

Unit Reference	MD-SHE-0103-5000-1200-5000
Design Head (m)	1.200
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	103
Invert Level (m)	79.357
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.0	Kick-Flo®	0.745	4.0
Flush-Flo™	0.354	5.0	Mean Flow over Head Range	-	4.4

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	3.4	1.200	5.0	3.000	7.7	7.000	11.5
0.200	4.7	1.400	5.4	3.500	8.3	7.500	11.8
0.300	5.0	1.600	5.7	4.000	8.8	8.000	12.2
0.400	5.0	1.800	6.0	4.500	9.3	8.500	12.6
0.500	4.9	2.000	6.3	5.000	9.8	9.000	12.9
0.600	4.7	2.200	6.6	5.500	10.2	9.500	13.3
0.800	4.1	2.400	6.9	6.000	10.7		
1.000	4.6	2.600	7.2	6.500	11.1		

Hydro-Brake® Optimum Manhole: 45, DS/PN: 1.011, Volume (m³): 25.8

Unit Reference	MD-SHE-0145-1310-2300-1310
Design Head (m)	2.300
Design Flow (l/s)	13.1
Flush-Flo™	User Defined
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	145
Invert Level (m)	77.620
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.300	13.1	Kick-Flo®	1.301	10.0
Flush-Flo™	0.633	12.7	Mean Flow over Head Range	-	11.3

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

Hydro-Brake® Optimum Manhole: 45, DS/PN: 1.011, Volume (m³): 25.8

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.2	1.200	11.0	3.000	14.9	7.000	22.3
0.200	10.4	1.400	10.4	3.500	16.0	7.500	23.0
0.300	11.6	1.600	11.0	4.000	17.0	8.000	23.8
0.400	12.3	1.800	11.7	4.500	18.0	8.500	24.5
0.500	12.6	2.000	12.3	5.000	19.0	9.000	25.1
0.600	12.7	2.200	12.8	5.500	19.8	9.500	25.8
0.800	12.6	2.400	13.4	6.000	20.7		
1.000	12.1	2.600	13.9	6.500	21.5		

Storage Structures for Storm

Complex Manhole: 2, DS/PN: 2.000

Pipe

Diameter (m)	Conduit Section	Length (m)	37.000
Slope (1:X)	9999.000	Invert Level (m)	80.900

Section Number	-2	Minor Dimn (mm)	686 4 *	Hyd Radius (mm)	0.934
Conduit Type	-2	Side Slope (Deg)		XSect Area (m²)	11.477
Major Dimn (mm)	24275	Corner Splay (mm)			

Porous Car Park Manhole: 6, DS/PN: 3.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	91.2
Max Percolation (l/s)	121.6	Slope (1:X)	10000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	81.320	Membrane Depth (mm)	130

Porous Car Park Manhole: 7, DS/PN: 4.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.6
Membrane Percolation (mm/hr)	1000	Length (m)	12.2
Max Percolation (l/s)	32.5	Slope (1:X)	1000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	81.170	Membrane Depth (mm)	0

Cellular Storage Manhole: 12, DS/PN: 1.005

Invert Level (m)	79.700	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	925.0	950.0	1.201	0.0	1098.0
1.200	925.0	1097.9			

Cellular Storage Manhole: 19, DS/PN: 6.002

Invert Level (m)	79.700	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	120.0	146.0	1.201	0.0	204.0
1.200	120.0	204.0			

Porous Car Park Manhole: 31, DS/PN: 11.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	33.5
Membrane Percolation (mm/hr)	1000	Length (m)	4.8
Max Percolation (l/s)	44.7	Slope (1:X)	10000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	79.370	Membrane Depth (mm)	130

Cellular Storage Manhole: 32, DS/PN: 9.004

Invert Level (m)	78.200	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	300.0	180.0	0.801	0.0	223.0
0.800	300.0	222.9			

Porous Car Park Manhole: 36, DS/PN: 13.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.6
Membrane Percolation (mm/hr)	1000	Length (m)	26.4
Max Percolation (l/s)	70.4	Slope (1:X)	10000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	79.745	Membrane Depth (mm)	130

Porous Car Park Manhole: 38, DS/PN: 14.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	86.4
Membrane Percolation (mm/hr)	1000	Length (m)	4.8
Max Percolation (l/s)	115.2	Slope (1:X)	10000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	79.695	Membrane Depth (mm)	130

Cellular Storage Manhole: 41, DS/PN: 12.005

Invert Level (m)	77.800	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	300.0	260.0	1.201	0.0	337.4
1.200	300.0	337.4			

Complex Manhole: 42, DS/PN: 15.000

Pipe

Diameter (m)	Conduit Section	Length (m)	23.500
Slope (1:X)	9999.000	Invert Level (m)	79.156

Section Number -2 Conduit Type -2 Major Dimn (mm) 24275

Pipe

Minor Dimn (mm) 686 Corner Splay (mm) XSect Area (m²) 11.477
Side Slope (Deg) 4 * Hyd Radius (mm) 0.934

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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm) 20.500 Cv (Summer)	0.750
Region England and Wales		Ratio R 0.418 Cv (Winter)	0.840

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
Return Period(s) (years)	30, 100
Climate Change (%)	0, 0

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	1	15 Winter	30	+0%	30/15 Summer	100/15 Winter			81.452
2.000	2	15 Winter	30	+0%	30/15 Summer				80.928
1.001	3	15 Winter	30	+0%	30/15 Summer				80.883
1.002	4	15 Winter	30	+0%	30/15 Summer				80.720
1.003	5	15 Winter	30	+0%	30/15 Summer				80.596
3.000	6	15 Winter	30	+0%	30/15 Summer				80.906
4.000	7	15 Winter	30	+0%	30/15 Summer				80.836
3.001	8	15 Winter	30	+0%	30/15 Summer				80.703
5.000	9	15 Winter	30	+0%	30/15 Summer	100/15 Summer			81.786
5.001	10	15 Winter	30	+0%	30/15 Summer				81.162
1.004	11	960 Winter	30	+0%	30/15 Summer				80.550
1.005	12	960 Winter	30	+0%	30/15 Summer				80.549
1.006	13	960 Winter	30	+0%	30/15 Summer				80.549
1.007	14	960 Winter	30	+0%	30/15 Summer				80.547
6.000	15	15 Winter	30	+0%	30/15 Summer				81.062
7.000	16	15 Winter	30	+0%	30/15 Summer				81.519
7.001	17	15 Winter	30	+0%	30/15 Summer				81.354
6.001	18	960 Winter	30	+0%	30/15 Summer				80.546
6.002	19	960 Winter	30	+0%	30/15 Summer				80.545
1.008	20	960 Winter	30	+0%	30/15 Summer				80.545
8.000	21	15 Winter	30	+0%	30/15 Summer				80.469
8.001	23	15 Winter	30	+0%					79.794
1.009	24	15 Winter	30	+0%	100/240 Winter				79.075
9.000	25	15 Winter	30	+0%	30/15 Summer				79.619
9.001	26	15 Winter	30	+0%	30/15 Summer				79.451
9.002	27	15 Winter	30	+0%	30/15 Summer				79.143
10.000	28	15 Winter	30	+0%	30/15 Summer				79.288

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	1	0.452	0.000	1.24		177.7	SURCHARGED	1
2.000	2	0.248	0.000	0.98		29.2	SURCHARGED	
1.001	3	0.240	0.000	1.30		202.0	SURCHARGED	
1.002	4	0.172	0.000	1.86		202.6	SURCHARGED	
1.003	5	0.069	0.000	1.80		260.4	SURCHARGED	
3.000	6	0.056	0.000	0.93		62.5	SURCHARGED	
4.000	7	0.136	0.000	1.31		20.1	SURCHARGED	
3.001	8	0.079	0.000	1.70		82.6	SURCHARGED	
5.000	9	0.511	0.000	1.70		69.1	SURCHARGED	2
5.001	10	0.111	0.000	1.55		218.9	SURCHARGED	
1.004	11	0.350	0.000	0.12		38.5	SURCHARGED	
1.005	12	0.599	0.000	0.05		5.5	SURCHARGED	
1.006	13	0.612	0.000	0.04		5.3	SURCHARGED	
1.007	14	0.675	0.000	0.04		4.5	SURCHARGED	
6.000	15	0.037	0.000	1.27		86.0	SURCHARGED	
7.000	16	0.319	0.000	0.87		32.7	SURCHARGED	
7.001	17	0.371	0.000	1.57		62.5	SURCHARGED	
6.001	18	0.596	0.000	0.15		9.8	SURCHARGED	
6.002	19	0.691	0.000	0.09		5.4	SURCHARGED	
1.008	20	1.038	0.000	0.29		5.0	SURCHARGED	
8.000	21	0.119	0.000	1.12		19.4	SURCHARGED	
8.001	23	-0.127	0.000	0.39		35.8	OK	
1.009	24	-0.120	0.000	0.44		40.0	OK	
9.000	25	0.269	0.000	1.17		18.8	SURCHARGED	
9.001	26	0.217	0.000	1.15		19.7	SURCHARGED	
9.002	27	0.213	0.000	1.86		67.2	SURCHARGED	
10.000	28	0.163	0.000	1.59		46.3	SURCHARGED	

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)
10.001	29	15 Winter	30	+0%	30/15 Summer				79.175	0.079
9.003	30	15 Winter	30	+0%	30/15 Summer				78.771	0.214
11.000	31	15 Winter	30	+0%					79.378	-0.042
9.004	32	360 Winter	30	+0%	30/30 Winter				78.737	0.287
1.010	33	360 Winter	30	+0%	30/15 Winter				78.756	0.405
12.000	34	15 Winter	30	+0%	30/15 Summer				79.471	0.121
12.001	35	15 Winter	30	+0%	30/15 Summer				79.343	0.104
13.000	36	15 Winter	30	+0%	30/15 Summer				79.772	0.497
12.002	37	15 Winter	30	+0%	30/15 Summer				79.140	0.120
14.000	38	15 Winter	30	+0%	30/15 Summer				79.767	0.537
12.003	39	15 Winter	30	+0%	30/15 Summer				78.937	0.038
12.004	40	360 Winter	30	+0%	30/15 Summer				78.738	0.630
12.005	41	360 Winter	30	+0%	30/15 Summer				78.736	0.687
15.000	42	15 Winter	30	+0%	30/15 Summer				78.876	0.396
16.000	43	15 Winter	30	+0%	30/15 Summer				79.074	0.074
15.001	44	360 Winter	30	+0%	30/15 Summer				78.753	0.445
1.011	45	360 Winter	30	+0%	30/15 Summer				78.751	0.981
1.012	46	960 Winter	30	+0%					74.695	-0.110
1.013	47	2880 Winter	30	+0%					70.094	-0.056

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
10.001	29	0.000	1.75		46.5	SURCHARGED	
9.003	30	0.000	1.75		112.0	SURCHARGED	
11.000	31	0.000	0.62		13.8	OK	
9.004	32	0.000	0.15		10.5	SURCHARGED	
1.010	33	0.000	0.07		20.1	SURCHARGED	
12.000	34	0.000	1.04		37.5	SURCHARGED	
12.001	35	0.000	1.02		38.7	SURCHARGED	
13.000	36	0.000	1.72		16.2	SURCHARGED	
12.002	37	0.000	1.25		125.5	SURCHARGED	
14.000	38	0.000	1.62		22.2	SURCHARGED	
12.003	39	0.000	1.44		184.0	SURCHARGED	
12.004	40	0.000	0.25		33.4	SURCHARGED	
12.005	41	0.000	0.08		11.0	SURCHARGED	
15.000	42	0.000	1.68		27.6	SURCHARGED	
16.000	43	0.000	1.00		52.2	SURCHARGED	
15.001	44	0.000	0.23		11.1	SURCHARGED	
1.011	45	0.000	0.25		12.7	SURCHARGED	
1.012	46	0.000	0.16		12.7	OK	
1.013	47	0.000	0.72		12.7	OK	

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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.500
Region	England and Wales	Ratio R	0.418
Cv (Summer)	0.750		
Cv (Winter)	0.840		

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
Return Period(s) (years)	30, 100
Climate Change (%)	0, 0

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	1	15 Winter	100	+0%	30/15 Summer	100/15 Winter			81.901
2.000	2	15 Winter	100	+0%	30/15 Summer				81.005
1.001	3	15 Winter	100	+0%	30/15 Summer				81.018
1.002	4	960 Winter	100	+0%	30/15 Summer				80.839
1.003	5	960 Winter	100	+0%	30/15 Summer				80.838
3.000	6	15 Winter	100	+0%	30/15 Summer				81.102
4.000	7	15 Winter	100	+0%	30/15 Summer				80.985
3.001	8	960 Winter	100	+0%	30/15 Summer				80.838
5.000	9	15 Winter	100	+0%	30/15 Summer	100/15 Summer			82.176
5.001	10	15 Winter	100	+0%	30/15 Summer				81.303
1.004	11	960 Winter	100	+0%	30/15 Summer				80.838
1.005	12	960 Winter	100	+0%	30/15 Summer				80.837
1.006	13	960 Winter	100	+0%	30/15 Summer				80.837
1.007	14	960 Winter	100	+0%	30/15 Summer				80.835
6.000	15	15 Winter	100	+0%	30/15 Summer				81.147
7.000	16	15 Winter	100	+0%	30/15 Summer				81.970
7.001	17	15 Winter	100	+0%	30/15 Summer				81.717
6.001	18	960 Winter	100	+0%	30/15 Summer				80.834
6.002	19	960 Winter	100	+0%	30/15 Summer				80.833
1.008	20	960 Winter	100	+0%	30/15 Summer				80.833
8.000	21	15 Winter	100	+0%	30/15 Summer				80.757
8.001	23	15 Winter	100	+0%					79.807
1.009	24	480 Winter	100	+0%	100/240 Winter				79.352
9.000	25	15 Winter	100	+0%	30/15 Summer				80.023
9.001	26	15 Winter	100	+0%	30/15 Summer				79.793
9.002	27	15 Winter	100	+0%	30/15 Summer				79.384

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	1	0.901	0.918	1.58		226.4	FLOOD	1
2.000	2	0.325	0.000	1.67		50.0	SURCHARGED	
1.001	3	0.375	0.000	1.47		227.8	SURCHARGED	
1.002	4	0.291	0.000	0.16		17.8	SURCHARGED	
1.003	5	0.312	0.000	0.16		23.7	SURCHARGED	
3.000	6	0.252	0.000	1.20		80.1	SURCHARGED	
4.000	7	0.285	0.000	1.67		25.6	SURCHARGED	
3.001	8	0.214	0.000	0.14		6.7	SURCHARGED	
5.000	9	0.901	0.728	2.11		86.1	FLOOD	2
5.001	10	0.251	0.000	1.98		279.3	SURCHARGED	
1.004	11	0.638	0.000	0.15		47.7	SURCHARGED	
1.005	12	0.887	0.000	0.06		6.1	SURCHARGED	
1.006	13	0.900	0.000	0.05		5.7	SURCHARGED	
1.007	14	0.963	0.000	0.04		4.8	SURCHARGED	
6.000	15	0.122	0.000	1.65		111.3	SURCHARGED	
7.000	16	0.770	0.000	1.08		40.8	FLOOD RISK	
7.001	17	0.734	0.000	1.92		76.5	SURCHARGED	
6.001	18	0.884	0.000	0.19		12.6	SURCHARGED	
6.002	19	0.979	0.000	0.11		6.8	SURCHARGED	
1.008	20	1.326	0.000	0.32		5.5	SURCHARGED	
8.000	21	0.407	0.000	1.37		23.8	SURCHARGED	
8.001	23	-0.114	0.000	0.47		43.8	OK	
1.009	24	0.157	0.000	0.11		9.7	SURCHARGED	
9.000	25	0.673	0.000	1.40		22.5	FLOOD RISK	
9.001	26	0.559	0.000	1.43		24.4	SURCHARGED	
9.002	27	0.454	0.000	2.24		80.7	SURCHARGED	

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)
10.000	28	15 Winter	100	+0%	30/15 Summer				79.431	0.306
10.001	29	480 Winter	100	+0%	30/15 Summer				79.345	0.249
9.003	30	480 Winter	100	+0%	30/15 Summer				79.344	0.787
11.000	31	15 Winter	100	+0%					79.388	-0.032
9.004	32	480 Winter	100	+0%	30/30 Winter				79.342	0.892
1.010	33	480 Winter	100	+0%	30/15 Winter				79.339	0.988
12.000	34	15 Winter	100	+0%	30/15 Summer				79.828	0.478
12.001	35	15 Winter	100	+0%	30/15 Summer				79.625	0.385
13.000	36	15 Winter	100	+0%	30/15 Summer				79.811	0.536
12.002	37	480 Winter	100	+0%	30/15 Summer				79.344	0.324
14.000	38	15 Winter	100	+0%	30/15 Summer				79.820	0.590
12.003	39	480 Winter	100	+0%	30/15 Summer				79.342	0.443
12.004	40	480 Winter	100	+0%	30/15 Summer				79.340	1.232
12.005	41	480 Winter	100	+0%	30/15 Summer				79.338	1.289
15.000	42	480 Winter	100	+0%	30/15 Summer				79.311	0.831
16.000	43	15 Winter	100	+0%	30/15 Summer				79.470	0.470
15.001	44	480 Winter	100	+0%	30/15 Summer				79.333	1.025
1.011	45	480 Winter	100	+0%	30/15 Summer				79.336	1.566
1.012	46	4320 Summer	100	+0%					74.695	-0.110
1.013	47	4320 Winter	100	+0%					70.094	-0.056

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
10.000	28	0.000	2.05		59.7	SURCHARGED	
10.001	29	0.000	0.24		6.5	SURCHARGED	
9.003	30	0.000	0.26		16.4	SURCHARGED	
11.000	31	0.000	0.79		17.4	OK	
9.004	32	0.000	0.13		8.9	SURCHARGED	
1.010	33	0.000	0.06		17.9	SURCHARGED	
12.000	34	0.000	1.34		48.4	SURCHARGED	
12.001	35	0.000	1.29		48.9	SURCHARGED	
13.000	36	0.000	1.76		16.5	SURCHARGED	
12.002	37	0.000	0.21		21.0	SURCHARGED	
14.000	38	0.000	1.67		22.9	SURCHARGED	
12.003	39	0.000	0.27		34.7	SURCHARGED	
12.004	40	0.000	0.25		34.1	SURCHARGED	
12.005	41	0.000	0.08		10.4	SURCHARGED	
15.000	42	0.000	0.28		4.5	SURCHARGED	
16.000	43	0.000	1.21		63.3	SURCHARGED	
15.001	44	0.000	0.24		11.9	SURCHARGED	
1.011	45	0.000	0.25		12.7	SURCHARGED	
1.012	46	0.000	0.16		12.7	OK	
1.013	47	0.000	0.72		12.7	OK	

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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.500
Region	England and Wales	Ratio R	0.418
Cv (Summer)	0.750		
Cv (Winter)	0.840		

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
Return Period(s) (years)	100
Climate Change (%)	20

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	1	15 Winter	100	+20%	100/15 Summer	100/15 Summer			81.912
2.000	2	960 Winter	100	+20%	100/15 Summer				81.331
1.001	3	960 Winter	100	+20%	100/15 Summer				81.334
1.002	4	960 Winter	100	+20%	100/15 Summer				81.335
1.003	5	960 Winter	100	+20%	100/15 Summer				81.335
3.000	6	960 Winter	100	+20%	100/15 Summer				81.336
4.000	7	960 Winter	100	+20%	100/15 Summer				81.336
3.001	8	960 Winter	100	+20%	100/15 Summer				81.336
5.000	9	15 Winter	100	+20%	100/15 Summer	100/15 Summer			82.181
5.001	10	15 Winter	100	+20%	100/15 Summer				81.425
1.004	11	960 Winter	100	+20%	100/15 Summer				81.335
1.005	12	960 Winter	100	+20%	100/15 Summer				81.335
1.006	13	960 Winter	100	+20%	100/15 Summer				81.334
1.007	14	960 Winter	100	+20%	100/15 Summer				81.332
6.000	15	960 Winter	100	+20%	100/15 Summer				81.334
7.000	16	15 Winter	100	+20%	100/15 Summer	100/15 Summer			82.103
7.001	17	15 Winter	100	+20%	100/15 Summer				82.019
6.001	18	960 Winter	100	+20%	100/15 Summer				81.333
6.002	19	960 Winter	100	+20%	100/15 Summer				81.332
1.008	20	960 Winter	100	+20%	100/15 Summer				81.331
8.000	21	15 Winter	100	+20%	100/15 Summer				81.037
8.001	23	15 Winter	100	+20%					79.818
1.009	24	360 Winter	100	+20%	100/120 Winter				79.705
9.000	25	15 Winter	100	+20%	100/15 Summer	100/15 Summer			80.251
9.001	26	15 Winter	100	+20%	100/15 Summer				80.079
9.002	27	360 Winter	100	+20%	100/15 Summer				79.711

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	1	0.912	12.320	1.58		226.1	FLOOD	4
2.000	2	0.651	0.000	0.18		5.3	FLOOD RISK	
1.001	3	0.691	0.000	0.14		21.9	SURCHARGED	
1.002	4	0.787	0.000	0.20		21.8	SURCHARGED	
1.003	5	0.809	0.000	0.20		28.9	SURCHARGED	
3.000	6	0.486	0.000	0.09		6.1	SURCHARGED	
4.000	7	0.636	0.000	0.13		2.0	FLOOD RISK	
3.001	8	0.711	0.000	0.16		8.0	SURCHARGED	
5.000	9	0.906	5.872	2.23		90.7	FLOOD	4
5.001	10	0.373	0.000	2.25		317.7	SURCHARGED	
1.004	11	1.135	0.000	0.18		57.6	SURCHARGED	
1.005	12	1.385	0.000	0.08		8.6	SURCHARGED	
1.006	13	1.397	0.000	0.06		7.4	SURCHARGED	
1.007	14	1.460	0.000	0.05		5.8	SURCHARGED	
6.000	15	0.309	0.000	0.12		8.2	SURCHARGED	
7.000	16	0.903	3.203	1.40		52.9	FLOOD	3
7.001	17	1.036	0.000	2.05		81.5	FLOOD RISK	
6.001	18	1.383	0.000	0.23		15.1	SURCHARGED	
6.002	19	1.478	0.000	0.13		8.2	FLOOD RISK	
1.008	20	1.824	0.000	0.35		6.0	FLOOD RISK	
8.000	21	0.687	0.000	1.58		27.4	FLOOD RISK	
8.001	23	-0.103	0.000	0.55		50.9	OK	
1.009	24	0.510	0.000	0.14		12.6	SURCHARGED	
9.000	25	0.901	0.998	1.68		27.1	FLOOD	2
9.001	26	0.845	0.000	1.66		28.3	FLOOD RISK	
9.002	27	0.781	0.000	0.42		15.1	SURCHARGED	

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)
10.000	28	360 Winter	100	+20%	100/15 Summer				79.707	0.582
10.001	29	360 Winter	100	+20%	100/15 Summer				79.705	0.609
9.003	30	360 Winter	100	+20%	100/15 Summer				79.703	1.146
11.000	31	240 Winter	100	+20%	100/120 Winter				79.696	0.276
9.004	32	360 Winter	100	+20%	100/15 Summer				79.695	1.245
1.010	33	360 Winter	100	+20%	100/15 Summer				79.689	1.338
12.000	34	15 Winter	100	+20%	100/15 Summer				80.180	0.830
12.001	35	15 Winter	100	+20%	100/15 Summer				79.897	0.658
13.000	36	15 Winter	100	+20%	100/15 Summer				79.850	0.575
12.002	37	360 Winter	100	+20%	100/15 Summer				79.711	0.691
14.000	38	30 Winter	100	+20%	100/15 Summer				79.870	0.640
12.003	39	360 Winter	100	+20%	100/15 Summer				79.703	0.804
12.004	40	360 Winter	100	+20%	100/15 Summer				79.697	1.589
12.005	41	360 Winter	100	+20%	100/15 Summer				79.691	1.642
15.000	42	600 Winter	100	+20%	100/15 Summer				79.644	1.164
16.000	43	15 Winter	100	+20%	100/15 Summer				79.850	0.850
15.001	44	480 Winter	100	+20%	100/15 Summer				79.678	1.370
1.011	45	360 Winter	100	+20%	100/15 Summer				79.685	1.915
1.012	46	7200 Summer	100	+20%					74.695	-0.110
1.013	47	7200 Summer	100	+20%					70.094	-0.056

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
10.000	28	0.000	0.34		9.8	SURCHARGED	
10.001	29	0.000	0.37		9.8	SURCHARGED	
9.003	30	0.000	0.39		24.7	SURCHARGED	
11.000	31	0.000	0.21		4.6	SURCHARGED	
9.004	32	0.000	0.14		9.9	SURCHARGED	
1.010	33	0.000	0.07		19.6	SURCHARGED	
12.000	34	0.000	1.58		56.9	FLOOD RISK	
12.001	35	0.000	1.54		58.1	SURCHARGED	
13.000	36	0.000	1.80		16.9	SURCHARGED	
12.002	37	0.000	0.31		31.6	SURCHARGED	
14.000	38	0.000	1.72		23.5	FLOOD RISK	
12.003	39	0.000	0.39		50.5	SURCHARGED	
12.004	40	0.000	0.37		49.0	SURCHARGED	
12.005	41	0.000	0.24		31.8	FLOOD RISK	
15.000	42	0.000	0.32		5.2	FLOOD RISK	
16.000	43	0.000	1.39		72.6	FLOOD RISK	
15.001	44	0.000	0.29		14.2	FLOOD RISK	
1.011	45	0.000	0.25		12.7	SURCHARGED	
1.012	46	0.000	0.16		12.7	OK	
1.013	47	0.000	0.72		12.7	OK	

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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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.500
Region	England and Wales	Ratio R	0.418
Cv (Summer)	0.750		
Cv (Winter)	0.840		

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
Return Period(s) (years)	100
Climate Change (%)	40

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	1	15 Winter	100	+40%	100/15 Summer	100/15 Summer			81.927
2.000	2	1440 Winter	100	+40%	100/15 Summer	100/960 Winter			81.615
1.001	3	1440 Winter	100	+40%	100/15 Summer				81.615
1.002	4	1440 Winter	100	+40%	100/15 Summer				81.614
1.003	5	1440 Winter	100	+40%	100/15 Summer				81.614
3.000	6	1440 Winter	100	+40%	100/15 Summer				81.614
4.000	7	1440 Winter	100	+40%	100/15 Summer	100/720 Winter			81.611
3.001	8	1440 Winter	100	+40%	100/15 Summer				81.613
5.000	9	15 Winter	100	+40%	100/15 Summer	100/15 Summer			82.187
5.001	10	1440 Winter	100	+40%	100/15 Summer				81.615
1.004	11	1440 Winter	100	+40%	100/15 Summer				81.614
1.005	12	1440 Winter	100	+40%	100/15 Summer				81.612
1.006	13	1440 Winter	100	+40%	100/15 Summer				81.611
1.007	14	1440 Winter	100	+40%	100/15 Summer				81.609
6.000	15	1440 Winter	100	+40%	100/15 Summer				81.610
7.000	16	15 Winter	100	+40%	100/15 Summer	100/15 Summer			82.109
7.001	17	15 Winter	100	+40%	100/15 Summer	100/15 Summer			82.100
6.001	18	1440 Winter	100	+40%	100/15 Summer				81.609
6.002	19	1440 Winter	100	+40%	100/15 Summer	100/960 Winter			81.608
1.008	20	1440 Winter	100	+40%	100/15 Summer	100/960 Winter			81.607
8.000	21	15 Winter	100	+40%	100/15 Summer	100/15 Winter			81.250
8.001	23	180 Winter	100	+40%	100/120 Winter				79.990
1.009	24	360 Winter	100	+40%	100/60 Winter				79.977
9.000	25	15 Winter	100	+40%	100/15 Summer	100/15 Summer			80.254
9.001	26	15 Winter	100	+40%	100/15 Summer				80.189
9.002	27	180 Winter	100	+40%	100/15 Summer				80.049

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	1	0.927	27.034	1.58		225.8	FLOOD	4
2.000	2	0.935	15.369	0.31		9.3	FLOOD	2
1.001	3	0.972	0.000	0.12		18.6	SURCHARGED	
1.002	4	1.066	0.000	0.17		18.5	SURCHARGED	
1.003	5	1.088	0.000	0.17		24.3	SURCHARGED	
3.000	6	0.764	0.000	0.08		5.1	FLOOD RISK	
4.000	7	0.911	10.594	0.33		5.0	FLOOD	3
3.001	8	0.989	0.000	0.19		9.3	FLOOD RISK	
5.000	9	0.912	12.508	2.25		91.6	FLOOD	4
5.001	10	0.563	0.000	0.13		18.2	SURCHARGED	
1.004	11	1.414	0.000	0.15		48.4	SURCHARGED	
1.005	12	1.662	0.000	0.13		13.1	SURCHARGED	
1.006	13	1.674	0.000	0.09		11.1	SURCHARGED	
1.007	14	1.737	0.000	0.07		9.0	SURCHARGED	
6.000	15	0.585	0.000	0.10		6.9	FLOOD RISK	
7.000	16	0.909	9.116	1.62		61.1	FLOOD	4
7.001	17	1.117	0.328	2.07		82.5	FLOOD	2
6.001	18	1.659	0.000	0.19		12.5	FLOOD RISK	
6.002	19	1.754	7.830	0.17		10.2	FLOOD	2
1.008	20	2.100	7.290	0.37		6.4	FLOOD	2
8.000	21	0.900	0.269	1.76		30.5	FLOOD	1
8.001	23	0.069	0.000	0.17		16.0	SURCHARGED	
1.009	24	0.782	0.000	0.19		17.6	SURCHARGED	
9.000	25	0.904	3.558	1.81		29.2	FLOOD	4
9.001	26	0.955	0.000	1.73		29.6	FLOOD RISK	
9.002	27	1.119	0.000	0.85		30.6	SURCHARGED	

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)
10.000	28	180 Winter	100	+40%	100/15 Summer	100/180 Winter			80.025
10.001	29	180 Winter	100	+40%	100/15 Summer				80.016
9.003	30	180 Winter	100	+40%	100/15 Summer				80.014
11.000	31	480 Winter	100	+40%	100/60 Winter				79.935
9.004	32	360 Winter	100	+40%	100/15 Summer				79.986
1.010	33	360 Winter	100	+40%	100/15 Summer				79.969
12.000	34	15 Winter	100	+40%	100/15 Summer	100/15 Summer			80.252
12.001	35	15 Winter	100	+40%	100/15 Summer				80.051
13.000	36	180 Winter	100	+40%	100/15 Summer				79.966
12.002	37	180 Winter	100	+40%	100/15 Summer				79.955
14.000	38	180 Winter	100	+40%	100/15 Summer				79.965
12.003	39	240 Winter	100	+40%	100/15 Summer				79.947
12.004	40	240 Winter	100	+40%	100/15 Summer				79.941
12.005	41	240 Winter	100	+40%	100/15 Summer	100/180 Winter			79.936
15.000	42	720 Winter	100	+40%	100/15 Summer				79.859
16.000	43	15 Winter	100	+40%	100/15 Summer	100/15 Summer			79.903
15.001	44	360 Winter	100	+40%	100/15 Summer				79.933
1.011	45	360 Winter	100	+40%	100/15 Summer				79.961
1.012	46	360 Winter	100	+40%					74.696
1.013	47	240 Winter	100	+40%					70.096

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
10.000	28	0.900	0.200	0.68		19.8	FLOOD	1
10.001	29	0.921	0.000	0.74		19.8	FLOOD RISK	
9.003	30	1.457	0.000	0.77		49.4	SURCHARGED	
11.000	31	0.515	0.000	0.13		2.9	SURCHARGED	
9.004	32	1.536	0.000	0.16		10.8	FLOOD RISK	
1.010	33	1.618	0.000	0.08		22.3	SURCHARGED	
12.000	34	0.902	2.182	1.77		63.8	FLOOD	2
12.001	35	0.812	0.000	1.70		64.3	SURCHARGED	
13.000	36	0.691	0.000	1.21		11.4	FLOOD RISK	
12.002	37	0.935	0.000	0.62		62.9	FLOOD RISK	
14.000	38	0.735	0.000	1.57		21.5	FLOOD RISK	
12.003	39	1.048	0.000	0.63		80.8	FLOOD RISK	
12.004	40	1.833	0.000	0.59		79.0	FLOOD RISK	
12.005	41	1.887	10.888	0.44		57.8	FLOOD	4
15.000	42	1.379	0.000	0.32		5.3	FLOOD RISK	
16.000	43	0.903	2.626	1.44		74.9	FLOOD	8
15.001	44	1.625	0.000	0.43		20.9	FLOOD RISK	
1.011	45	2.191	0.000	0.26		13.1	FLOOD RISK	
1.012	46	-0.109	0.000	0.17		13.1	OK	
1.013	47	-0.054	0.000	0.74		13.1	OK	