Project Name	: Horton Heath, Eastleigh
Job No	: 19-367
Note Title	: Flood Risk Assessment and Drainage Strategy - Addendum 1
Author	: JW
Checked	: JH
Approved	: GG
Date	: May 2021

1.0 INTRODUCTION

1.1 Background

1.1.1 Odyssey was commissioned by Eastleigh Borough Council (EBC) to undertake a Flood Risk Assessment (FRA) and Water Management Strategy to be submitted in association with a planning application in support of a proposed development for a site at Horton Heath, Eastleigh.

1.1.2 The wider One Horton Heath development has obtained planning permission via two separate applications. The new composite outline planning permission for the wider site would increase the number of proposed dwellings from circa 1,500 to 2,500. The FRA and Water Management Strategy relates to the First Residential Parcel (FRP) of the development for 393 of the 2,500 dwellings.

1.1.3 The FRA and Water Management Strategy were submitted to EBC as part of the full planning application (reference F/20/89500) for the proposed FRP development.

1.1.4 Following the submission of the application, comments were received from Hampshire County Council (HCC) in their capacity as the Lead Local Flood Authority (LLFA), in February 2021 (HCC reference: SWM/2021/0019). A copy of the LLFA consultation comments is provided in **Appendix A**.

1.1.5 This FRA Addendum, which should be read in conjunction with the submitted FRA and Water Management Strategy (reference 19-367-01B), provides additional information as requested by the LLFA.

2.0 RESPONSE TO HAMPSHIRE COUNTY COUNCIL COMMENTS

2.1.1 HCC provided the following comments (***in bold italics)*** in February 2021. Odyssey's response directly follows each comment.

"*The drainage plan shows a series of outfalls into the existing ditch. However, the fall of the ditch is erratic with some sections backfalling and there being a relatively shallow depth throughout. No levels have been provided at the headwalls so it is not clear what the final outfall levels will be nor is there any information about the typical water level within the ditch. This should be provided to ensure that the outfalls will be functional and water will flow appropriately within the ditch*."

2.1.2 It is proposed to discharge Basin I, Basin K and Basin L directly into the existing ditch.

2.1.3 The pipework from Basin I has been designed to outfall at an approximate invert level of 19.88 metres above ordinance datum (m AOD). The bed level of the ditch in the location of the proposed outfall is 19.58. The proposed pipe would outfall at 300mm above the invert level of the ditch.

2.1.4 The pipework from Basin K has been designed to outfall at an approximate invert level of 18.05m AOD. The bed level of the ditch in the location of the proposed outfall is 17.90m AOD. The proposed pipe would outfall 150mm above the invert of the ditch.

2.1.5 The pipework from Basin L has been designed to outfall at an approximate invert level of 17.00m AOD. The bed level of the ditch in the location of the proposed outfall is 16.60m AOD. The proposed pipe would outfall at 400mm above the invert of the ditch.

2.1.6 The typical water level within the ditch is currently unknown.

"*If water levels in the ditch rise, it is not clear what the impact will be on the drainage system so if modelling is not available, the drainage should be modelled using a surcharged outfall to understand the potential flood risk.*"

2.1.7 The drainage networks have been modelled using a submerged outfall for the 1 in 100 year storm with 40% allowance for climate change. The results are presented in **Appendix B**. The results show that even with a submerged outfall, none of the proposed drainage networks would flood.

"*Permeable paving is proposed within the parking areas. Please confirm whether these are lined given that parts of the site could suffer with high groundwater.*"

2.1.8 All proposed permeable paving would be lined.

"*A series of what we believe to be swales are identified adjacent to the watercourse and in various locations around the development. These do not appear to be connected and there is a section that appears to go through basin I. There are also sections that appear to clash with the proposed access roads between the dwellings and the ponds. Please clarify these elements particularly as there appears to be an existing ditch in this location which would require ordinary watercourse consent if any alterations are proposed*."

2.1.9 The proposed swales are shown in blue on the drainage strategy. The basin and access roads are shown over existing hedges, which would be removed. The updated drawing is presented in **Appendix C**.

2.1.10 The proposed swales to the south-west of the site would drain into the main drainage system. The two enhanced swales on the north side of the site would be incorporated into the pipework; directing water through the enhanced swales would provide additional treatment. The outfall into Basin K has also been moved to better accommodate the swales. The storage volume that would be provided by the proposed swales has not been included in the hydraulic model as a conservative approach.

"*Detailed hydraulic calculations have been provided but these do not appear to include the results summary pages. Please can this be provided*."

2.1.11 Updated hydraulic calculations including the results summary pages are presented in **Appendix B**.

"*It is stated that a maintenance company will be responsible for the drainage assets. Please note that our response is separate from Highways and if the roads are to be adopted, maintenance responsibilities will need to be discussed with the Highways team*."

2.1.12 All proposed adoptable highway drains and adoptable surface water sewers would be maintained by HCC Highways and Southern Water respectively. The remaining private drainage would be maintained by the appointed maintenance company.

"Not with standing the above comments, we would request a condition to ensure clarity on who will be responsible for the drainage maintenance responsibility with a clear plan detailing this as well as confirmation that the relevant bodies will adopt the relevant features"

2.1.13 A condition of this nature would be accepted.

APPENDIX A

LLFA Comments

Hampshire County Council

Economy, Transport and Environment Department
Elizabeth II Court West, The Castle
Winchester, Hampshire SO23 8UD

Tel: 0300 555 1375 (General Enquiries)
0300 555 1388 (Roads and Transport)
0300 555 1389 (Recycling Waste & Planning)
Textphone 0300 555 1390
Fax 01962 847055
www.hants.gov.uk

Enquiries to	Sarah Reghif	*My reference*	SWM/2021/0019
Direct Line	0370 779 7497	*Your reference*	F/20/89500
Date	5 February 2021	*Email*	SWM.consultee@hants.gov.uk

Dear Sir/Madam,

Erection of 393 residential units with public open space, hard and soft landscape works, internal roads, footway/cycleways, associated parking spaces, substation, SuDS and associated infrastructure (This application is subject to Environmental Impact Assessment). at Land west of Burnetts Lane, Eastleigh, SO30 2HH

Hampshire County Council as Lead Local Flood Authority has provided comments in relation to the above application in our role as statutory consultee on surface water drainage for major developments.

In order to assist applicants in providing the correct information to their Local Planning Authority for planning permission, Hampshire County Council has set out the information it requires to provide a substantive response at https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/planning

The County Council has reviewed the following documents relating to the above application:

- Flood Risk Assessment and Water Management Strategy rev B
- PFA Flood Risk Assessment Issue 1 dated December 2020
- Phase 1 – Ground Investigation Desk Study Assessment ref S2 P01
- Phase 2 – Ground Investigation Report ref: S2 P1

In order for us to provide a substantive response, the following information is required:

The drainage plan shows a series of outfalls into the existing ditch. However, the fall of the ditch is erratic with some sections backfalling and there being a relatively shallow depth throughout. No levels have been provided at the

headwalls so it is not clear what the final outfall levels will be nor is there any information about the typical water level within the ditch. This should be provided to ensure that the outfalls will be functional and water will flow appropriately within the ditch.

If water levels in the ditch rise, it is not clear what the impact will be on the drainage system so if modelling is not available, the drainage should be modelled using a surcharged outfall to understand the potential flood risk.

Permeable paving is proposed within the parking areas. Please confirm whether these are lined given that parts of the site could suffer with high groundwater.

A series of what we believe to be swales are identified adjacent to the watercourse and in various locations around the development. These do not appear to be connected and there is a section that appears to go through basin I. There are also sections that appear to clash with the proposed access roads between the dwellings and the ponds. Please clarify these elements particularly as there appears to be an existing ditch in this location which would require ordinary watercourse consent if any alterations are proposed.

Detailed hydraulic calculations have been provided but these do not appear to include the results summary pages. Please can this be provided.

It is stated that a maintenance company will be responsible for the drainage assets. Please note that our response is separate from Highways and if the roads are to be adopted, maintenance responsibilities will need to be discussed with the Highways team.

Notwithstanding the above points, we would request a condition to ensure clarity on who will be responsible for the drainage maintenance responsibilities with a clear plan detailing this as well as confirmation that the relevant bodies will adopt the relevant features.

As a statutory consultee, the County Council has a duty to respond to consultations within **21 days**. The 21 day period will not begin until we have received sufficient information to enable us to provide a meaningful response.

Please ensure all data is sent to us via the relevant Local Planning Authority.

For guidance on providing the correct information, we recommend you use our **Surface Water Management Pre-application service** which provides clear guidance on what is required for us to recommend that planning permission is granted and consider the works as best practise. For full details, please visit: https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/planning and click on pre-application advice request form.

This response has been provided using the best knowledge and information submitted as part of the planning application at the time of responding and is reliant on the accuracy of that information.

Yours faithfully,

Flood and Water Management Team
Economy, Transport & Environment Department,
Hampshire County Council, 1st Floor, EII Court West,
The Castle, Winchester, Hampshire SO23 8UD
Web:
https://www.hants.gov.uk/landplanningandenvironment/environment/flooding

General guidance for the application

It is important to ensure that the long-term maintenance and responsibility for Sustainable Drainage Systems is agreed between the Local Planning Authority and the applicant before planning permission is granted. This should involve discussions with those adopting and/or maintaining the proposed systems, which could include the Highway Authority, Planning Authority, Parish Councils, Water Companies and private management companies.

For SuDS systems to be adopted by Hampshire Highways it is recommended that you visit the website at:
https://www.hants.gov.uk/transport/developers/constructionstandards for guidance on which drainage features would be suitable for adoption.

Where the proposals are connecting to an existing drainage system it is likely that the authorities responsible for maintaining those systems will have their own design requirements. These requirements will need to be reviewed and agreed as part of any surface water drainage scheme.

Works in relation to ordinary watercourses

PLEASE NOTE: If the proposals include works to an ordinary watercourse, under the Land Drainage Act 1991, as amended by the Flood and Water Management Act 2010, prior consent from the Lead Local Flood Authority is required. ***This consent is required as a separate permission to planning.***

Information on ordinary watercourse consenting can be found at the following link

https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/changewatercourse

It is strongly recommended that this information is reviewed before Land Drainage consent application is made.

For guidance on providing the correct information, we recommend you use our ***Ordinary Watercourse Consents Pre-application service*** *and help avoid delays occurring at the formal application stage. A Pre-application service for Ordinary Watercourse Consents is available, allowing consents to go through in a smoother, often more timely manner. For full information please visit:*
https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/changewatercourse

APPENDIX B

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)	19.900	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.386	4-8	0.602

Total Area Contributing (ha) = 0.988

Total Pipe Volume (m³) = 41.916

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
S1.000	4.862	0.161	30.2	0.023	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	33.610	0.862	39.0	0.071	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	23.881	0.353	67.7	0.036	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	9.044	0.270	33.5	0.050	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	33.270	0.746	44.6	0.005	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)
S1.000	50.00	4.04	26.241	0.023	0.0	0.0	0.0	1.84	32.5	3.1
S1.001	50.00	4.31	26.005	0.094	0.0	0.0	0.0	2.10	83.6	12.7
S1.002	50.00	4.56	25.143	0.130	0.0	0.0	0.0	1.59	63.3	17.6
S1.003	50.00	4.63	24.790	0.180	0.0	0.0	0.0	2.27	90.2	24.4
S1.004	50.00	4.91	24.520	0.185	0.0	0.0	0.0	1.96	78.1	25.1

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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
S2.000	8.269	0.055	150.0	0.046	4.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	26.172	0.157	167.0	0.066	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	4.867	0.029	167.0	0.053	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.003	21.279	0.127	167.0	0.003	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	14.376	0.398	36.1	0.052	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.006	13.212	0.363	36.4	0.022	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	12.906	0.344	37.5	0.018	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.008	15.865	0.473	33.5	0.018	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	25.344	0.300	84.5	0.102	4.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	22.383	0.137	162.9	0.054	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.009	19.700	0.496	39.7	0.036	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.010	11.941	0.187	63.9	0.029	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.011	17.760	0.371	47.9	0.020	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.000	26.867	1.033	26.0	0.071	4.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	17.677	0.654	27.0	0.040	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	6.576	0.395	16.6	0.030	4.00	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)
S2.000	50.00	4.17	24.217	0.046	0.0	0.0	0.0	0.82	14.5	6.2
S2.001	50.00	4.60	24.087	0.112	0.0	0.0	0.0	1.01	40.1	15.2
S2.002	50.00	4.68	23.930	0.165	0.0	0.0	0.0	1.01	40.1	22.3
S2.003	50.00	5.03	23.901	0.168	0.0	0.0	0.0	1.01	40.1	22.7
S1.005	50.00	5.12	23.699	0.405	0.0	0.0	0.0	2.62	185.5	54.8
S1.006	50.00	5.21	23.301	0.427	0.0	0.0	0.0	2.61	184.8	57.8
S1.007	50.00	5.29	22.938	0.445	0.0	0.0	0.0	2.57	182.0	60.3
S1.008	50.00	5.39	22.594	0.463	0.0	0.0	0.0	2.72	192.6	62.7
S3.000	50.00	4.30	22.633	0.102	0.0	0.0	0.0	1.42	56.6	13.8
S3.001	50.00	4.66	22.333	0.156	0.0	0.0	0.0	1.02	40.6	21.1
S1.009	50.00	5.52	22.121	0.655	0.0	0.0	0.0	2.50	176.9	88.7
S1.010	50.00	5.62	21.625	0.684	0.0	0.0	0.0	1.97	139.3	92.6
S1.011	50.00	5.75	21.438	0.704	0.0	0.0	0.0	2.28	161.0	95.3
S4.000	50.00	4.17	23.112	0.071	0.0	0.0	0.0	2.58	102.4	9.6
S4.001	50.00	4.29	22.079	0.111	0.0	0.0	0.0	2.53	100.5	15.0
S5.000	50.00	4.04	21.895	0.030	0.0	0.0	0.0	2.48	43.8	4.1

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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
S4.002	15.165	0.283	53.6	0.011	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.012	7.910	0.025	313.0	0.030	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.013	6.861	0.020	350.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.014	6.475	0.097	66.8	0.007	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.015	17.327	0.050	350.0	0.004	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.016	36.838	0.126	292.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S6.000	20.356	0.136	150.0	0.011	4.00	0.0	0.600	o	150	Pipe/Conduit	
S6.001	28.557	0.190	150.0	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.002	56.866	1.400	40.6	0.019	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.003	27.554	0.580	47.5	0.050	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.004	27.972	0.186	150.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.005	35.180	0.514	68.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.017	48.497	0.550	88.2	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.018	13.823	0.168	82.3	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)
S4.002	50.00	4.43	21.425	0.152	0.0	0.0	0.0	1.79	71.2	20.6
S1.012	50.00	5.88	20.992	0.886	0.0	0.0	0.0	1.02	112.5«	120.0
S1.013	50.00	5.99	20.892	0.886	0.0	0.0	0.0	1.08	171.9	120.0
S1.014	50.00	6.03	20.872	0.893	0.0	0.0	0.0	2.49	396.2	120.9
S1.015	50.00	6.30	20.775	0.897	0.0	0.0	0.0	1.08	171.9	121.5
S1.016	50.00	6.82	20.726	0.897	0.0	0.0	0.0	1.18	188.3	121.5
S6.000	50.00	4.41	23.906	0.011	0.0	0.0	0.0	0.82	14.5	1.5
S6.001	50.00	5.00	23.770	0.022	0.0	0.0	0.0	0.82	14.5	3.0
S6.002	50.00	5.59	23.580	0.041	0.0	0.0	0.0	1.58	28.0	5.6
S6.003	50.00	5.91	22.180	0.091	0.0	0.0	0.0	1.46	25.9	12.3
S6.004	50.00	6.48	21.600	0.091	0.0	0.0	0.0	0.82	14.4	12.3
S6.005	50.00	6.96	21.414	0.091	0.0	0.0	0.0	1.22	21.5	12.3
S1.017	50.00	7.33	20.600	0.988	0.0	0.0	0.0	2.17	344.5	133.8
S1.018	50.00	7.47	20.050	0.988	0.0	0.0	0.0	1.73	122.6«	133.8

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
SPP1	27.241	1.000	Open Manhole	1200	S1.000	26.241	150			
SHBRAKE PP1	27.430	1.425	Open Manhole	1200	S1.001	26.005	225	S1.000	26.080	150
S3	26.568	1.425	Open Manhole	1200	S1.002	25.143	225	S1.001	25.143	225
S4	26.215	1.425	Open Manhole	1200	S1.003	24.790	225	S1.002	24.790	225
S5	25.945	1.425	Open Manhole	1200	S1.004	24.520	225	S1.003	24.520	225
SPP2	25.217	1.000	Open Manhole	1200	S2.000	24.217	150			
SHBRAKE PP2	25.800	1.713	Open Manhole	1200	S2.001	24.087	225	S2.000	24.162	150
S8	25.458	1.528	Open Manhole	1200	S2.002	23.930	225	S2.001	23.930	225
S9	25.390	1.489	Open Manhole	1200	S2.003	23.901	225	S2.002	23.901	225
S10	25.202	1.503	Open Manhole	1200	S1.005	23.699	300	S1.004	23.774	225
								S2.003	23.774	225
S11	24.804	1.503	Open Manhole	1200	S1.006	23.301	300	S1.005	23.301	300
S12	24.441	1.504	Open Manhole	1200	S1.007	22.938	300	S1.006	22.938	300
S13	24.097	1.503	Open Manhole	1200	S1.008	22.594	300	S1.007	22.594	300
S14	24.058	1.425	Open Manhole	1200	S3.000	22.633	225			
S15	23.758	1.425	Open Manhole	1200	S3.001	22.333	225	S3.000	22.333	225
S16	23.662	1.541	Open Manhole	1200	S1.009	22.121	300	S1.008	22.121	300
								S3.001	22.196	225
S17	23.127	1.503	Open Manhole	1200	S1.010	21.625	300	S1.009	21.625	300
S18	22.841	1.403	Open Manhole	1200	S1.011	21.438	300	S1.010	21.438	300
S19	24.537	1.425	Open Manhole	1200	S4.000	23.112	225			
S20	23.504	1.425	Open Manhole	1200	S4.001	22.079	225	S4.000	22.079	225
SPP3	22.895	1.000	Open Manhole	1200	S5.000	21.895	150			
SHBRAKE PP3	22.850	1.425	Open Manhole	1200	S4.002	21.425	225	S4.001	21.425	225
								S5.000	21.500	150
S23	22.467	1.475	Open Manhole	1350	S1.012	20.992	375	S1.011	21.067	300
								S4.002	21.142	225
S24	22.335	1.444	Open Manhole	1350	S1.013	20.892	450	S1.012	20.967	375
S25	22.229	1.357	Open Manhole	1350	S1.014	20.872	450	S1.013	20.872	450
S26	22.132	1.357	Open Manhole	1350	S1.015	20.775	450	S1.014	20.775	450
S27	22.602	1.876	Open Manhole	1350	S1.016	20.726	450	S1.015	20.726	450
S28	25.256	1.350	Open Manhole	1200	S6.000	23.906	150			
S29	25.560	1.789	Open Manhole	1200	S6.001	23.770	150	S6.000	23.770	150
S30	25.234	1.654	Open Manhole	1200	S6.002	23.580	150	S6.001	23.580	150
S31	23.530	1.350	Open Manhole	1200	S6.003	22.180	150	S6.002	22.180	150
SBASIN J	22.500	0.900	Open Manhole	1200	S6.004	21.600	150	S6.003	21.600	150
SHBRAKE BASIN J	22.500	1.086	Open Manhole	1200	S6.005	21.414	150	S6.004	21.414	150
SBASIN I	21.600	1.000	Open Manhole	1350	S1.017	20.600	450	S1.016	20.600	450

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
								S6.005	20.900	150
SHBRAKE BASIN I	21.100	1.050	Open Manhole	1350	S1.018	20.050	300	S1.017	20.050	450
S	20.300	0.418	Open Manhole	0		OUTFALL		S1.018	19.882	300

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SPP1	449017.276	116204.217	449017.276	116204.217	Required	
SHBRAKE PP1	449017.901	116209.038	449017.901	116209.038	Required	
S3	448988.776	116225.812	448988.776	116225.812	Required	
S4	449000.622	116246.547	449000.622	116246.547	Required	
S5	448992.771	116251.037	448992.771	116251.037	Required	
SPP2	449059.454	116257.872	449059.454	116257.872	Required	
SHBRAKE PP2	449054.217	116251.472	449054.217	116251.472	Required	
S8	449031.533	116264.525	449031.533	116264.525	Required	
S9	449029.275	116268.836	449029.275	116268.836	Required	
S10	449010.637	116279.103	449010.637	116279.103	Required	
S11	449017.601	116291.679	449017.601	116291.679	Required	
S12	449021.778	116304.213	449021.778	116304.213	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S13	449028.405	116315.288	449028.405	116315.288	Required	
S14	449077.743	116305.142	449077.743	116305.142	Required	
S15	449056.035	116318.221	449056.035	116318.221	Required	
S16	449036.410	116328.985	449036.410	116328.985	Required	
S17	449045.466	116346.481	449045.466	116346.481	Required	
S18	449052.354	116356.235	449052.354	116356.235	Required	
S19	449110.976	116349.600	449110.976	116349.600	Required	
S20	449086.876	116361.476	449086.876	116361.476	Required	
SPP3	449075.530	116372.816	449075.530	116372.816	Required	
SHBRAKE PP3	449070.626	116368.435	449070.626	116368.435	Required	
S23	449056.346	116373.540	449056.346	116373.540	Required	
S24	449059.135	116380.942	449059.135	116380.942	Required	
S25	449061.639	116387.330	449061.639	116387.330	Required	
S26	449060.142	116393.629	449060.142	116393.629	Required	
S27	449066.588	116409.712	449066.588	116409.712	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S28	449131.816	116327.692	449131.816	116327.692	Required	
S29	449141.616	116345.534	449141.616	116345.534	Required	
S30	449151.873	116372.185	449151.873	116372.185	Required	
S31	449099.208	116393.637	449099.208	116393.637	Required	
SBASIN J	449110.340	116418.843	449110.340	116418.843	Required	
SHBRAKE BASIN J	449085.669	116432.026	449085.669	116432.026	Required	
SBASIN I	449052.501	116443.750	449052.501	116443.750	Required	
SHBRAKE BASIN I	449007.623	116462.133	449007.623	116462.133	Required	
S	448995.517	116468.805			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	SPP1	27.241	26.241	0.850	Open Manhole	1200
S1.001	o	225	SHBRAKE PP1	27.430	26.005	1.200	Open Manhole	1200
S1.002	o	225	S3	26.568	25.143	1.200	Open Manhole	1200
S1.003	o	225	S4	26.215	24.790	1.200	Open Manhole	1200
S1.004	o	225	S5	25.945	24.520	1.200	Open Manhole	1200
S2.000	o	150	SPP2	25.217	24.217	0.850	Open Manhole	1200
S2.001	o	225	SHBRAKE PP2	25.800	24.087	1.488	Open Manhole	1200
S2.002	o	225	S8	25.458	23.930	1.303	Open Manhole	1200
S2.003	o	225	S9	25.390	23.901	1.264	Open Manhole	1200
S1.005	o	300	S10	25.202	23.699	1.203	Open Manhole	1200
S1.006	o	300	S11	24.804	23.301	1.203	Open Manhole	1200
S1.007	o	300	S12	24.441	22.938	1.204	Open Manhole	1200
S1.008	o	300	S13	24.097	22.594	1.203	Open Manhole	1200
S3.000	o	225	S14	24.058	22.633	1.200	Open Manhole	1200
S3.001	o	225	S15	23.758	22.333	1.200	Open Manhole	1200
S1.009	o	300	S16	23.662	22.121	1.241	Open Manhole	1200
S1.010	o	300	S17	23.127	21.625	1.203	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	4.862	30.2	SHBRAKE PP1	27.430	26.080	1.200	Open Manhole	1200
S1.001	33.610	39.0	S3	26.568	25.143	1.200	Open Manhole	1200
S1.002	23.881	67.7	S4	26.215	24.790	1.200	Open Manhole	1200
S1.003	9.044	33.5	S5	25.945	24.520	1.200	Open Manhole	1200
S1.004	33.270	44.6	S10	25.202	23.774	1.203	Open Manhole	1200
S2.000	8.269	150.0	SHBRAKE PP2	25.800	24.162	1.488	Open Manhole	1200
S2.001	26.172	167.0	S8	25.458	23.930	1.303	Open Manhole	1200
S2.002	4.867	167.0	S9	25.390	23.901	1.264	Open Manhole	1200
S2.003	21.279	167.0	S10	25.202	23.774	1.203	Open Manhole	1200
S1.005	14.376	36.1	S11	24.804	23.301	1.203	Open Manhole	1200
S1.006	13.212	36.4	S12	24.441	22.938	1.204	Open Manhole	1200
S1.007	12.906	37.5	S13	24.097	22.594	1.203	Open Manhole	1200
S1.008	15.865	33.5	S16	23.662	22.121	1.241	Open Manhole	1200
S3.000	25.344	84.5	S15	23.758	22.333	1.200	Open Manhole	1200
S3.001	22.383	162.9	S16	23.662	22.196	1.241	Open Manhole	1200
S1.009	19.700	39.7	S17	23.127	21.625	1.203	Open Manhole	1200
S1.010	11.941	63.9	S18	22.841	21.438	1.103	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.011	o	300	S18	22.841	21.438	1.103	Open Manhole	1200
S4.000	o	225	S19	24.537	23.112	1.200	Open Manhole	1200
S4.001	o	225	S20	23.504	22.079	1.200	Open Manhole	1200
S5.000	o	150	SPP3	22.895	21.895	0.850	Open Manhole	1200
S4.002	o	225	SHBRAKE PP3	22.850	21.425	1.200	Open Manhole	1200
S1.012	o	375	S23	22.467	20.992	1.100	Open Manhole	1350
S1.013	o	450	S24	22.335	20.892	0.994	Open Manhole	1350
S1.014	o	450	S25	22.229	20.872	0.907	Open Manhole	1350
S1.015	o	450	S26	22.132	20.775	0.907	Open Manhole	1350
S1.016	o	450	S27	22.602	20.726	1.426	Open Manhole	1350
S6.000	o	150	S28	25.256	23.906	1.200	Open Manhole	1200
S6.001	o	150	S29	25.560	23.770	1.639	Open Manhole	1200
S6.002	o	150	S30	25.234	23.580	1.504	Open Manhole	1200
S6.003	o	150	S31	23.530	22.180	1.200	Open Manhole	1200
S6.004	o	150	SBASIN J	22.500	21.600	0.750	Open Manhole	1200
S6.005	o	150	SHBRAKE BASIN J	22.500	21.414	0.936	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.011	17.760	47.9	S23	22.467	21.067	1.100	Open Manhole	1350
S4.000	26.867	26.0	S20	23.504	22.079	1.200	Open Manhole	1200
S4.001	17.677	27.0	SHBRAKE PP3	22.850	21.425	1.200	Open Manhole	1200
S5.000	6.576	16.6	SHBRAKE PP3	22.850	21.500	1.200	Open Manhole	1200
S4.002	15.165	53.6	S23	22.467	21.142	1.100	Open Manhole	1350
S1.012	7.910	313.0	S24	22.335	20.967	0.994	Open Manhole	1350
S1.013	6.861	350.0	S25	22.229	20.872	0.907	Open Manhole	1350
S1.014	6.475	66.8	S26	22.132	20.775	0.907	Open Manhole	1350
S1.015	17.327	350.0	S27	22.602	20.726	1.426	Open Manhole	1350
S1.016	36.838	292.4	SBASIN I	21.600	20.600	0.550	Open Manhole	1350
S6.000	20.356	150.0	S29	25.560	23.770	1.639	Open Manhole	1200
S6.001	28.557	150.0	S30	25.234	23.580	1.504	Open Manhole	1200
S6.002	56.866	40.6	S31	23.530	22.180	1.200	Open Manhole	1200
S6.003	27.554	47.5	SBASIN J	22.500	21.600	0.750	Open Manhole	1200
S6.004	27.972	150.4	SHBRAKE BASIN J	22.500	21.414	0.936	Open Manhole	1200
S6.005	35.180	68.5	SBASIN I	21.600	20.900	0.550	Open Manhole	1350

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.017	o	450	SBASIN I	21.600	20.600	0.550	Open Manhole	1350
S1.018	o	300	SHBRAKE BASIN I	21.100	20.050	0.750	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.017	48.497	88.2	SHBRAKE BASIN I	21.100	20.050	0.600	Open Manhole	1350
S1.018	13.823	82.3	S	20.300	19.882	0.118	Open Manhole	0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.023	0.023	0.023
1.001	-	-	100	0.071	0.071	0.071
1.002	-	-	100	0.036	0.036	0.036
1.003	-	-	100	0.050	0.050	0.050
1.004	-	-	100	0.005	0.005	0.005
2.000	-	-	100	0.046	0.046	0.046
2.001	-	-	100	0.066	0.066	0.066
2.002	-	-	100	0.053	0.053	0.053
2.003	-	-	100	0.003	0.003	0.003
1.005	-	-	100	0.052	0.052	0.052
1.006	-	-	100	0.022	0.022	0.022
1.007	-	-	100	0.018	0.018	0.018
1.008	-	-	100	0.018	0.018	0.018
3.000	-	-	100	0.102	0.102	0.102
3.001	-	-	100	0.054	0.054	0.054
1.009	-	-	100	0.036	0.036	0.036
1.010	-	-	100	0.029	0.029	0.029
1.011	-	-	100	0.020	0.020	0.020
4.000	-	-	100	0.071	0.071	0.071
4.001	-	-	100	0.040	0.040	0.040
5.000	-	-	100	0.030	0.030	0.030
4.002	-	-	100	0.011	0.011	0.011
1.012	-	-	100	0.030	0.030	0.030
1.013	-	-	100	0.000	0.000	0.000
1.014	-	-	100	0.007	0.007	0.007
1.015	-	-	100	0.004	0.004	0.004
1.016	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.011	0.011	0.011
6.001	-	-	100	0.011	0.011	0.011
6.002	-	-	100	0.019	0.019	0.019
6.003	-	-	100	0.050	0.050	0.050
6.004	-	-	100	0.000	0.000	0.000
6.005	-	-	100	0.000	0.000	0.000
1.017	-	-	100	0.000	0.000	0.000
1.018	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.988	0.988	0.988

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.018	S	20.300	19.882	0.000	0	0

Datum (m) 0.000 Offset (mins) 0

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Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1440	20.300	5760	20.300	10080	20.300	14400	20.300	18720	20.300
2880	20.300	7200	20.300	11520	20.300	15840	20.300	20160	20.300
4320	20.300	8640	20.300	12960	20.300	17280	20.300		

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	5
Number of Online Controls	5	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)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.900	Storm Duration (mins)	30
Ratio R	0.350		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SHBRAKE PP1, DS/PN: S1.001, Volume (m³): 1.7

Unit Reference	MD-SHE-0068-2000-0936-2000
Design Head (m)	0.936
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	68
Invert Level (m)	26.005
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.936	2.0
Flush-Flo™	0.287	2.0
Kick-Flo®	0.586	1.6
Mean Flow over Head Range	-	1.8

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	1.7	1.200	2.2	3.000	3.4	7.000	5.1
0.200	2.0	1.400	2.4	3.500	3.7	7.500	5.2
0.300	2.0	1.600	2.6	4.000	3.9	8.000	5.4
0.400	2.0	1.800	2.7	4.500	4.1	8.500	5.6
0.500	1.8	2.000	2.8	5.000	4.3	9.000	5.7
0.600	1.6	2.200	3.0	5.500	4.5	9.500	5.9
0.800	1.9	2.400	3.1	6.000	4.7		
1.000	2.1	2.600	3.2	6.500	4.9		

Orifice Manhole: SHBRAKE PP2, DS/PN: S2.001, Volume (m³): 2.1

Diameter (m) 0.045 Discharge Coefficient 0.600 Invert Level (m) 24.087

Hydro-Brake® Optimum Manhole: SHBRAKE PP3, DS/PN: S4.002, Volume (m³): 2.4

Unit Reference	MD-SHE-0143-1000-1170-1000
Design Head (m)	1.170
Design Flow (l/s)	10.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	143

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Hydro-Brake® Optimum Manhole: SHBRAKE PP3, DS/PN: S4.002, Volume (m³): 2.4

Invert Level (m)	21.425
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.170	10.0
Flush-Flo™	0.348	10.0
Kick-Flo®	0.763	8.2
Mean Flow over Head Range	-	8.6

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	5.2	1.200	10.1	3.000	15.6	7.000	23.4
0.200	9.5	1.400	10.9	3.500	16.8	7.500	24.2
0.300	10.0	1.600	11.6	4.000	17.9	8.000	25.0
0.400	10.0	1.800	12.2	4.500	18.9	8.500	25.7
0.500	9.8	2.000	12.9	5.000	19.9	9.000	26.4
0.600	9.5	2.200	13.5	5.500	20.9	9.500	27.1
0.800	8.4	2.400	14.0	6.000	21.7		
1.000	9.3	2.600	14.6	6.500	22.6		

Hydro-Brake® Optimum Manhole: SHBRAKE BASIN J, DS/PN: S6.005, Volume (m³): 1.7

Unit Reference	MD-SHE-0046-1000-1086-1000
Design Head (m)	1.086
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	46
Invert Level (m)	21.414
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.086	1.0
Flush-Flo™	0.202	0.8
Kick-Flo®	0.407	0.6
Mean Flow over Head Range	-	0.8

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

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Hydro-Brake® Optimum Manhole: SHBRAKE BASIN J, DS/PN: S6.005, Volume (m³): 1.7

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.7	1.200	1.0	3.000	1.6	7.000	2.3
0.200	0.8	1.400	1.1	3.500	1.7	7.500	2.4
0.300	0.8	1.600	1.2	4.000	1.8	8.000	2.5
0.400	0.7	1.800	1.3	4.500	1.9	8.500	2.6
0.500	0.7	2.000	1.3	5.000	2.0	9.000	2.6
0.600	0.8	2.200	1.4	5.500	2.1	9.500	2.7
0.800	0.9	2.400	1.4	6.000	2.2		
1.000	1.0	2.600	1.5	6.500	2.3		

Hydro-Brake® Optimum Manhole: SHBRAKE BASIN I, DS/PN: S1.018, Volume (m³): 9.0

Unit Reference	MD-SHE-0228-2960-1550-2960
Design Head (m)	1.550
Design Flow (l/s)	29.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	228
Invert Level (m)	20.050
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.550	29.6
Flush-Flo™	0.472	29.6
Kick-Flo®	1.039	24.4
Mean Flow over Head Range	-	25.4

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	7.6	1.200	26.2	3.000	40.6	7.000	61.2
0.200	22.8	1.400	28.2	3.500	43.8	7.500	63.3
0.300	28.5	1.600	30.0	4.000	46.7	8.000	65.3
0.400	29.4	1.800	31.8	4.500	49.4	8.500	67.3
0.500	29.5	2.000	33.4	5.000	52.0	9.000	69.2
0.600	29.3	2.200	35.0	5.500	54.5	9.500	71.0
0.800	28.3	2.400	36.5	6.000	56.8		
1.000	25.5	2.600	37.9	6.500	59.1		

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Storage Structures for Storm

Porous Car Park Manhole: SPP1, DS/PN: S1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	13.6
Membrane Percolation (mm/hr)	1000	Length (m)	16.6
Max Percolation (l/s)	62.7	Slope (1:X)	70.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	26.241	Membrane Depth (mm)	0

Porous Car Park Manhole: SPP2, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	20.4
Membrane Percolation (mm/hr)	1000	Length (m)	11.0
Max Percolation (l/s)	62.3	Slope (1:X)	300.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	24.217	Membrane Depth (mm)	0

Porous Car Park Manhole: SPP3, DS/PN: S5.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	31.1
Max Percolation (l/s)	86.4	Slope (1:X)	50.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	21.895	Membrane Depth (mm)	0

Tank or Pond Manhole: SBASIN J, DS/PN: S6.004

Invert Level (m) 21.600

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	280.0	0.900	592.0

Tank or Pond Manhole: SBASIN I, DS/PN: S1.017

Invert Level (m) 20.600

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	919.0	1.000	1624.0

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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 5
Number of Online Controls 5 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 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.900 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 100
Climate Change (%) 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	SPP1	180 Winter	100	+40%	100/15 Summer		
S1.001	SHBRAKE PP1	15 Winter	100	+40%	100/15 Summer		
S1.002	S3	15 Winter	100	+40%			
S1.003	S4	15 Winter	100	+40%			
S1.004	S5	15 Winter	100	+40%	100/15 Winter		
S2.000	SPP2	120 Winter	100	+40%	100/15 Summer		
S2.001	SHBRAKE PP2	15 Winter	100	+40%	100/15 Summer		
S2.002	S8	15 Winter	100	+40%	100/15 Summer		
S2.003	S9	15 Winter	100	+40%	100/15 Summer		
S1.005	S10	15 Winter	100	+40%	100/15 Summer		
S1.006	S11	15 Winter	100	+40%	100/15 Summer		
S1.007	S12	15 Winter	100	+40%	100/15 Summer		
S1.008	S13	15 Winter	100	+40%	100/15 Summer		
S3.000	S14	15 Winter	100	+40%	100/15 Summer	100/15 Summer	
S3.001	S15	15 Winter	100	+40%	100/15 Summer	100/15 Summer	
S1.009	S16	15 Winter	100	+40%	100/15 Summer	100/15 Winter	
S1.010	S17	15 Winter	100	+40%	100/15 Summer		
S1.011	S18	15 Winter	100	+40%	100/15 Summer		

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	SPP1		26.915	0.524	0.000	0.09			2.2
S1.001	SHBRAKE PP1		26.961	0.731	0.000	0.03			2.0
S1.002	S3		25.245	-0.123	0.000	0.42			24.6
S1.003	S4		24.938	-0.077	0.000	0.77			56.2
S1.004	S5		24.746	0.001	0.000	0.80			58.8
S2.000	SPP2		24.861	0.494	0.000	0.28		124	3.5
S2.001	SHBRAKE PP2		24.913	0.601	0.000	0.09			3.4
S2.002	S8		24.504	0.349	0.000	1.08			31.3
S2.003	S9		24.479	0.353	0.000	0.88			32.0
S1.005	S10		24.420	0.421	0.000	0.72			111.3
S1.006	S11		24.272	0.672	0.000	0.75			112.6
S1.007	S12		24.104	0.866	0.000	0.75			109.7
S1.008	S13		23.911	1.018	0.000	0.72			117.1
S3.000	S14		24.059	1.201	0.312	0.98			51.1
S3.001	S15		23.765	1.207	6.835	1.74			64.8
S1.009	S16		23.662	1.241	0.086	1.08			165.3
S1.010	S17		23.114	1.190	0.000	1.65			178.2
S1.011	S18		22.611	0.874	0.000	1.35			185.8

PN	US/MH Name	Status	Level Exceeded
S1.000	SPP1	SURCHARGED	
S1.001	SHBRAKE PP1	SURCHARGED	
S1.002	S3	OK	
S1.003	S4	OK	
S1.004	S5	SURCHARGED	
S2.000	SPP2	SURCHARGED	
S2.001	SHBRAKE PP2	SURCHARGED	
S2.002	S8	SURCHARGED	
S2.003	S9	SURCHARGED	
S1.005	S10	SURCHARGED	
S1.006	S11	SURCHARGED	
S1.007	S12	SURCHARGED	
S1.008	S13	FLOOD RISK	
S3.000	S14	FLOOD	2
S3.001	S15	FLOOD	4
S1.009	S16	FLOOD	1
S1.010	S17	FLOOD RISK	
S1.011	S18	FLOOD RISK	

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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
S4.000	S19	15 Winter	100	+40%	100/15 Summer		
S4.001	S20	15 Winter	100	+40%	100/15 Summer		
S5.000	SPP3	60 Winter	100	+40%	100/15 Summer		
S4.002	SHBRAKE PP3	15 Winter	100	+40%	100/15 Summer	100/15 Summer	
S1.012	S23	15 Winter	100	+40%	100/15 Summer		
S1.013	S24	15 Winter	100	+40%	100/15 Summer		
S1.014	S25	15 Winter	100	+40%	100/15 Summer		
S1.015	S26	15 Winter	100	+40%	100/15 Summer		
S1.016	S27	15 Winter	100	+40%	100/15 Summer		
S6.000	S28	15 Winter	100	+40%			
S6.001	S29	15 Winter	100	+40%	100/15 Summer		
S6.002	S30	15 Winter	100	+40%	100/15 Summer		
S6.003	S31	15 Winter	100	+40%	100/15 Summer		
S6.004	SBASIN J	480 Winter	100	+40%	100/120 Winter		
S6.005	SHBRAKE BASIN J	720 Winter	100	+40%	100/15 Summer		
S1.017	SBASIN I	180 Winter	100	+40%			
S1.018	SHBRAKE BASIN I	180 Winter	100	+40%	100/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
S4.000	S19		23.396	0.059	0.000	0.45		
S4.001	S20		23.191	0.887	0.000	0.71		
S5.000	SPP3		22.588	0.543	0.000	0.25		44
S4.002	SHBRAKE PP3		22.852	1.202	2.481	0.16		
S1.012	S23		21.931	0.564	0.000	2.71		
S1.013	S24		21.645	0.303	0.000	2.05		
S1.014	S25		21.511	0.189	0.000	1.20		
S1.015	S26		21.374	0.148	0.000	1.56		
S1.016	S27		21.233	0.057	0.000	1.27		
S6.000	S28		24.005	-0.051	0.000	0.51		
S6.001	S29		23.983	0.063	0.000	0.88		
S6.002	S30		23.916	0.186	0.000	0.71		
S6.003	S31		23.367	1.037	0.000	1.66		
S6.004	SBASIN J		21.785	0.035	0.000	0.10		
S6.005	SHBRAKE BASIN J		21.797	0.233	0.000	0.04		
S1.017	SBASIN I		20.859	-0.191	0.000	0.14		
S1.018	SHBRAKE BASIN I		20.845	0.495	0.000	0.29		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S4.000	S19	42.7	SURCHARGED	
S4.001	S20	63.7	SURCHARGED	
S5.000	SPP3	9.3	SURCHARGED	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S4.002	SHBRAKE PP3	10.0	FLOOD	4
S1.012	S23	207.9	SURCHARGED	
S1.013	S24	208.1	SURCHARGED	
S1.014	S25	210.7	SURCHARGED	
S1.015	S26	210.7	SURCHARGED	
S1.016	S27	210.3	SURCHARGED	
S6.000	S28	6.9	OK	
S6.001	S29	12.2	SURCHARGED	
S6.002	S30	19.3	SURCHARGED	
S6.003	S31	41.0	FLOOD RISK	
S6.004	SBASIN J	1.4	SURCHARGED	
S6.005	SHBRAKE BASIN J	0.8	SURCHARGED	
S1.017	SBASIN I	43.6	OK	
S1.018	SHBRAKE BASIN I	29.5	FLOOD RISK	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.900	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.088	4-8	1.045	8-12	0.218

Total Area Contributing (ha) = 1.351

Total Pipe Volume (m³) = 76.603

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
S7.000	18.040	0.120	150.0	0.028	4.00	0.0	0.600	o	150	Pipe/Conduit	
S7.001	10.579	0.071	150.0	0.004	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.002	22.892	0.153	150.0	0.029	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.003	22.797	0.137	167.0	0.044	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.004	22.670	0.136	166.7	0.018	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)
S7.000	50.00	4.37	22.118	0.028	0.0	0.0	0.0	0.82	14.5	3.8
S7.001	50.00	4.58	21.998	0.032	0.0	0.0	0.0	0.82	14.5	4.3
S7.002	50.00	5.05	21.927	0.061	0.0	0.0	0.0	0.82	14.5	8.3
S7.003	50.00	5.43	21.700	0.105	0.0	0.0	0.0	1.01	40.1	14.2
S7.004	50.00	5.80	21.563	0.123	0.0	0.0	0.0	1.01	40.2	16.7

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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
S8.000	23.196	0.451	51.4	0.054	4.00	0.0	0.600	o	150	Pipe/Conduit	
S7.005	28.209	0.171	165.0	0.028	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.006	18.438	0.332	55.5	0.031	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.007	25.983	0.800	32.5	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.000	26.645	0.178	149.7	0.082	4.00	0.0	0.600	o	300	Pipe/Conduit	
S7.008	16.836	0.071	238.0	0.009	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.009	35.362	0.149	238.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.010	36.316	0.274	132.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S10.000	26.182	1.260	20.8	0.008	4.00	0.0	0.600	o	150	Pipe/Conduit	
S11.000	16.142	0.115	140.0	0.019	4.00	0.0	0.600	o	225	Pipe/Conduit	
S11.001	25.067	0.167	150.0	0.045	0.00	0.0	0.600	o	225	Pipe/Conduit	
S11.002	12.530	0.077	163.6	0.004	0.00	0.0	0.600	o	225	Pipe/Conduit	
S10.001	18.405	0.110	167.3	0.061	0.00	0.0	0.600	o	225	Pipe/Conduit	
S10.002	13.873	0.083	167.1	0.051	0.00	0.0	0.600	o	225	Pipe/Conduit	
S10.003	27.145	0.366	74.2	0.074	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)
S8.000	50.00	4.27	21.953	0.054	0.0	0.0	0.0	1.41	24.8	7.3
S7.005	50.00	6.26	21.427	0.205	0.0	0.0	0.0	1.02	40.4	27.8
S7.006	50.00	6.44	21.256	0.236	0.0	0.0	0.0	1.76	69.9	32.0
S7.007	50.00	6.59	20.849	0.253	0.0	0.0	0.0	2.77	195.7	34.3
S9.000	50.00	4.35	20.227	0.082	0.0	0.0	0.0	1.28	90.7	11.1
S7.008	50.00	6.87	20.049	0.344	0.0	0.0	0.0	1.01	71.7	46.6
S7.009	50.00	7.45	19.978	0.344	0.0	0.0	0.0	1.01	71.7	46.6
S7.010	50.00	7.90	19.830	0.344	0.0	0.0	0.0	1.36	96.4	46.6
S10.000	50.00	4.20	21.525	0.008	0.0	0.0	0.0	2.22	39.2	1.1
S11.000	50.00	4.24	20.549	0.019	0.0	0.0	0.0	1.10	43.9	2.6
S11.001	50.00	4.64	20.434	0.064	0.0	0.0	0.0	1.07	42.4	8.7
S11.002	50.00	4.84	20.267	0.068	0.0	0.0	0.0	1.02	40.5	9.2
S10.001	50.00	5.15	20.190	0.137	0.0	0.0	0.0	1.01	40.1	18.6
S10.002	50.00	5.37	20.080	0.188	0.0	0.0	0.0	1.01	40.1	25.5
S10.003	50.00	5.62	19.922	0.262	0.0	0.0	0.0	1.83	129.2	35.5

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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
S7.011	34.212	0.109	313.0	0.043	0.00	0.0	0.600	o	375	Pipe/Conduit	
S7.012	46.154	0.234	197.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S12.000	16.586	0.111	149.4	0.037	4.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	38.679	1.308	29.6	0.038	0.00	0.0	0.600	o	225	Pipe/Conduit	
S13.000	19.980	1.113	18.0	0.047	4.00	0.0	0.600	o	150	Pipe/Conduit	
S14.000	33.369	0.334	99.9	0.070	4.00	0.0	0.600	o	300	Pipe/Conduit	
S12.002	5.834	0.035	167.0	0.060	0.00	0.0	0.600	o	300	Pipe/Conduit	
S12.003	40.197	0.241	167.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S12.004	23.880	0.239	100.0	0.071	0.00	0.0	0.600	o	300	Pipe/Conduit	
S12.005	7.963	0.053	150.0	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
S12.006	24.831	0.104	238.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S12.007	5.947	0.025	238.0	0.060	0.00	0.0	0.600	o	300	Pipe/Conduit	
S12.008	6.270	0.117	53.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.000	4.196	0.250	16.8	0.041	4.00	0.0	0.600	o	150	Pipe/Conduit	
S15.001	15.978	0.107	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S15.002	36.799	0.220	167.0	0.045	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)
S7.011	50.00	8.46	19.481	0.649	0.0	0.0	0.0	1.02	112.5	87.9
S7.012	50.00	9.05	19.371	0.649	0.0	0.0	0.0	1.29	142.1	87.9
S12.000	50.00	4.26	21.708	0.037	0.0	0.0	0.0	1.07	42.4	5.0
S12.001	50.00	4.53	21.597	0.075	0.0	0.0	0.0	2.41	96.0	10.2
S13.000	50.00	4.14	21.477	0.047	0.0	0.0	0.0	2.39	42.2	6.4
S14.000	50.00	4.35	20.548	0.070	0.0	0.0	0.0	1.57	111.2	9.5
S12.002	50.00	4.61	20.214	0.252	0.0	0.0	0.0	1.21	85.8	34.1
S12.003	50.00	5.16	20.179	0.252	0.0	0.0	0.0	1.21	85.8	34.1
S12.004	50.00	5.41	19.938	0.323	0.0	0.0	0.0	1.57	111.1	43.7
S12.005	50.00	5.51	19.700	0.340	0.0	0.0	0.0	1.28	90.6	46.0
S12.006	50.00	5.92	19.646	0.340	0.0	0.0	0.0	1.01	71.7	46.0
S12.007	50.00	6.02	19.542	0.400	0.0	0.0	0.0	1.01	71.7	54.2
S12.008	50.00	6.07	19.517	0.400	0.0	0.0	0.0	2.15	152.1	54.2
S15.000	50.00	4.03	20.500	0.041	0.0	0.0	0.0	2.47	43.7	5.6
S15.001	50.00	4.35	20.250	0.041	0.0	0.0	0.0	0.82	14.5	5.6
S15.002	50.00	4.96	20.068	0.086	0.0	0.0	0.0	1.01	40.1	11.6

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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
S15.003	8.289	0.050	167.0	0.064	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.004	18.278	0.109	167.0	0.023	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.005	32.665	0.137	238.0	0.046	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.006	10.628	0.045	238.0	0.033	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.007	7.549	0.032	235.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S12.009	10.317	0.033	313.0	0.033	0.00	0.0	0.600	o	375	Pipe/Conduit	
S7.013	51.249	0.133	385.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.014	61.637	0.160	385.2	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.015	30.067	0.099	303.7	0.017	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.016	16.505	0.236	69.9	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S7.017	6.058	0.614	9.9	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)
S15.003	50.00	5.10	19.848	0.150	0.0	0.0	0.0	1.01	40.1	20.3
S15.004	50.00	5.40	19.798	0.173	0.0	0.0	0.0	1.01	40.1	23.4
S15.005	50.00	5.94	19.614	0.219	0.0	0.0	0.0	1.01	71.7	29.7
S15.006	50.00	6.11	19.477	0.252	0.0	0.0	0.0	1.01	71.7	34.1
S15.007	50.00	6.24	19.432	0.252	0.0	0.0	0.0	1.02	72.1	34.1
S12.009	50.00	6.40	19.325	0.685	0.0	0.0	0.0	1.02	112.5	92.8
S7.013	50.00	9.88	19.292	1.334	0.0	0.0	0.0	1.03	163.8«	180.6
S7.014	50.00	10.88	19.159	1.334	0.0	0.0	0.0	1.03	163.8«	180.6
S7.015	50.00	11.31	18.999	1.351	0.0	0.0	0.0	1.16	184.7	182.9
S7.016	50.00	11.42	18.900	1.351	0.0	0.0	0.0	2.43	387.1	182.9
S7.017	50.00	11.44	18.664	1.351	0.0	0.0	0.0	6.50	1034.0	182.9

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S36	23.468	1.350	Open Manhole	1200	S7.000	22.118	150				
S37	23.943	1.946	Open Manhole	1200	S7.001	21.998	150	S7.000	21.998	150	
S38	24.213	2.286	Open Manhole	1200	S7.002	21.927	150	S7.001	21.927	150	
S39	24.833	3.133	Open Manhole	1200	S7.003	21.700	225	S7.002	21.775	150	
S40	23.947	2.384	Open Manhole	1200	S7.004	21.563	225	S7.003	21.563	225	
S41	23.303	1.350	Open Manhole	1200	S8.000	21.953	150				
S42	23.580	2.153	Open Manhole	1200	S7.005	21.427	225	S7.004	21.427	225	
								S8.000	21.502	150	
S43	22.681	1.425	Open Manhole	1200	S7.006	21.256	225	S7.005	21.256	225	
S44	22.349	1.500	Open Manhole	1200	S7.007	20.849	300	S7.006	20.924	225	
S45	21.727	1.500	Open Manhole	1200	S9.000	20.227	300				
S46	22.073	2.024	Open Manhole	1200	S7.008	20.049	300	S7.007	20.049	300	
								S9.000	20.049	300	
S47	22.299	2.320	Open Manhole	1200	S7.009	19.978	300	S7.008	19.978	300	
S48	21.841	2.011	Open Manhole	1200	S7.010	19.830	300	S7.009	19.830	300	
S49	22.875	1.350	Open Manhole	1200	S10.000	21.525	150				
S50	21.974	1.425	Open Manhole	1200	S11.000	20.549	225				
S51	22.360	1.926	Open Manhole	1200	S11.001	20.434	225	S11.000	20.434	225	
S52	22.450	2.184	Open Manhole	1200	S11.002	20.267	225	S11.001	20.267	225	
S53	22.420	2.230	Open Manhole	1200	S10.001	20.190	225	S10.000	20.265	150	
								S11.002	20.190	225	
S54	22.000	1.920	Open Manhole	1200	S10.002	20.080	225	S10.001	20.080	225	
S55	21.700	1.778	Open Manhole	1200	S10.003	19.922	300	S10.002	19.997	225	
S56	21.414	1.933	Open Manhole	1350	S7.011	19.481	375	S7.010	19.556	300	
								S10.003	19.556	300	
S57	21.232	1.861	Open Manhole	1350	S7.012	19.371	375	S7.011	19.371	375	
S58	23.500	1.792	Open Manhole	1200	S12.000	21.708	225				
S59	23.150	1.553	Open Manhole	1200	S12.001	21.597	225	S12.000	21.597	225	
S60	22.827	1.350	Open Manhole	1200	S13.000	21.477	150				
S61	22.048	1.500	Open Manhole	1200	S14.000	20.548	300				
S62	22.556	2.342	Open Manhole	1200	S12.002	20.214	300	S12.001	20.289	225	
								S13.000	20.364	150	
								S14.000	20.214	300	
S63	22.335	2.156	Open Manhole	1200	S12.003	20.179	300	S12.002	20.179	300	
S64	21.617	1.679	Open Manhole	1200	S12.004	19.938	300	S12.003	19.938	300	
S65	21.180	1.480	Open Manhole	1200	S12.005	19.700	300	S12.004	19.700	300	
S66	21.059	1.413	Open Manhole	1200	S12.006	19.646	300	S12.005	19.646	300	
S67	20.921	1.379	Open Manhole	1200	S12.007	19.542	300	S12.006	19.542	300	

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diamete (mm)
S68	20.978	1.461	Open Manhole	1200	S12.008	19.517	300	S12.007	19.517	30
SPP4	21.300	0.800	Open Manhole	1200	S15.000	20.500	150			
SHBRAKE PP4	21.300	1.050	Open Manhole	1200	S15.001	20.250	150	S15.000	20.250	15
S71	21.220	1.152	Open Manhole	1200	S15.002	20.068	225	S15.001	20.143	15
S72	20.976	1.128	Open Manhole	1200	S15.003	19.848	225	S15.002	19.848	22
S73	20.965	1.167	Open Manhole	1200	S15.004	19.798	225	S15.003	19.798	22
S74	21.132	1.518	Open Manhole	1200	S15.005	19.614	300	S15.004	19.689	22
S75	21.207	1.730	Open Manhole	1200	S15.006	19.477	300	S15.005	19.477	30
S76	21.121	1.689	Open Manhole	1200	S15.007	19.432	300	S15.006	19.432	30
S77	21.033	1.707	Open Manhole	1350	S12.009	19.325	375	S12.008	19.400	30
								S15.007	19.400	30
S78	21.104	1.967	Open Manhole	1350	S7.013	19.292	450	S7.012	19.137	37
								S12.009	19.292	37
S79	21.080	1.921	Open Manhole	1350	S7.014	19.159	450	S7.013	19.159	45
S80	21.111	2.112	Open Manhole	1350	S7.015	18.999	450	S7.014	18.999	45
SBASIN K	20.100	1.200	Open Manhole	1350	S7.016	18.900	450	S7.015	18.900	45
SHBRAKE BASIN K	19.600	0.936	Open Manhole	1350	S7.017	18.664	450	S7.016	18.664	45
S	18.600	0.550	Open Manhole	0		OUTFALL		S7.017	18.050	45

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S36	448992.587	116327.978	448992.587	116327.978	Required	
S37	448985.857	116311.241	448985.857	116311.241	Required	
S38	448989.434	116301.285	448989.434	116301.285	Required	
S39	449008.038	116287.947	449008.038	116287.947	Required	
S40	449019.154	116307.850	449019.154	116307.850	Required	
S41	449007.530	116337.460	449007.530	116337.460	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S42	449028.858	116328.338	449028.858	116328.338	Required	
S43	449039.874	116354.307	449039.874	116354.307	Required	
S44	449047.201	116371.227	449047.201	116371.227	Required	
S45	449031.926	116405.480	449031.926	116405.480	Required	
S46	449056.610	116395.447	449056.610	116395.447	Required	
S47	449062.783	116411.110	449062.783	116411.110	Required	
S48	449029.884	116424.076	449029.884	116424.076	Required	
S49	448967.246	116358.983	448967.246	116358.983	Required	
S50	449018.595	116384.260	449018.595	116384.260	Required	
S51	449012.058	116369.500	449012.058	116369.500	Required	
S52	448988.966	116379.255	448988.966	116379.255	Required	
S53	448977.088	116383.244	448977.088	116383.244	Required	
S54	448981.472	116401.120	448981.472	116401.120	Required	
S55	448985.596	116414.365	448985.596	116414.365	Required	
S56	448996.814	116439.084	448996.814	116439.084	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S57	448964.113	116449.142	448964.113	116449.142	Required	
S58	448957.772	116337.963	448957.772	116337.963	Required	
S59	448964.500	116353.123	448964.500	116353.123	Required	
S60	448921.130	116349.964	448921.130	116349.964	Required	
S61	448898.273	116381.495	448898.273	116381.495	Required	
S62	448928.945	116368.352	448928.945	116368.352	Required	
S63	448927.859	116374.084	448927.859	116374.084	Required	
S64	448943.265	116411.211	448943.265	116411.211	Required	
S65	448952.835	116433.089	448952.835	116433.089	Required	
S66	448950.611	116440.735	448950.611	116440.735	Required	
S67	448927.991	116450.978	448927.991	116450.978	Required	
S68	448922.146	116452.077	448922.146	116452.077	Required	
SPP4	448823.671	116465.983	448823.671	116465.983	Required	
SHBRAKE PP4	448824.565	116461.883	448824.565	116461.883	Required	
S71	448830.315	116446.975	448830.315	116446.975	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S72	448845.533	116480.480	448845.533	116480.480	Required	
S73	448853.466	116482.884	448853.466	116482.884	Required	
S74	448870.356	116475.897	448870.356	116475.897	Required	
S75	448900.346	116462.951	448900.346	116462.951	Required	
S76	448909.422	116457.420	448909.422	116457.420	Required	
S77	448916.514	116454.834	448916.514	116454.834	Required	
S78	448920.532	116464.336	448920.532	116464.336	Required	
S79	448873.150	116483.867	448873.150	116483.867	Required	
S80	448815.996	116506.943	448815.996	116506.943	Required	
SBASIN K	448823.779	116535.986	448823.779	116535.986	Required	
SHBRAKE BASIN K	448825.024	116552.444	448825.024	116552.444	Required	
S	448828.056	116557.689			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S7.000	o	150	S36	23.468	22.118	1.200	Open Manhole	1200
S7.001	o	150	S37	23.943	21.998	1.796	Open Manhole	1200
S7.002	o	150	S38	24.213	21.927	2.136	Open Manhole	1200
S7.003	o	225	S39	24.833	21.700	2.908	Open Manhole	1200
S7.004	o	225	S40	23.947	21.563	2.159	Open Manhole	1200
S8.000	o	150	S41	23.303	21.953	1.200	Open Manhole	1200
S7.005	o	225	S42	23.580	21.427	1.928	Open Manhole	1200
S7.006	o	225	S43	22.681	21.256	1.200	Open Manhole	1200
S7.007	o	300	S44	22.349	20.849	1.200	Open Manhole	1200
S9.000	o	300	S45	21.727	20.227	1.200	Open Manhole	1200
S7.008	o	300	S46	22.073	20.049	1.724	Open Manhole	1200
S7.009	o	300	S47	22.299	19.978	2.020	Open Manhole	1200
S7.010	o	300	S48	21.841	19.830	1.711	Open Manhole	1200
S10.000	o	150	S49	22.875	21.525	1.200	Open Manhole	1200
S11.000	o	225	S50	21.974	20.549	1.200	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)
S7.000	18.040	150.0	S37	23.943	21.998	1.796	Open Manhole	1200
S7.001	10.579	150.0	S38	24.213	21.927	2.136	Open Manhole	1200
S7.002	22.892	150.0	S39	24.833	21.775	2.908	Open Manhole	1200
S7.003	22.797	167.0	S40	23.947	21.563	2.159	Open Manhole	1200
S7.004	22.670	166.7	S42	23.580	21.427	1.928	Open Manhole	1200
S8.000	23.196	51.4	S42	23.580	21.502	1.928	Open Manhole	1200
S7.005	28.209	165.0	S43	22.681	21.256	1.200	Open Manhole	1200
S7.006	18.438	55.5	S44	22.349	20.924	1.200	Open Manhole	1200
S7.007	25.983	32.5	S46	22.073	20.049	1.724	Open Manhole	1200
S9.000	26.645	149.7	S46	22.073	20.049	1.724	Open Manhole	1200
S7.008	16.836	238.0	S47	22.299	19.978	2.020	Open Manhole	1200
S7.009	35.362	238.0	S48	21.841	19.830	1.711	Open Manhole	1200
S7.010	36.316	132.6	S56	21.414	19.556	1.558	Open Manhole	1350
S10.000	26.182	20.8	S53	22.420	20.265	2.005	Open Manhole	1200
S11.000	16.142	140.0	S51	22.360	20.434	1.701	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S11.001	o	225	S51	22.360	20.434	1.701	Open Manhole	1200
S11.002	o	225	S52	22.450	20.267	1.959	Open Manhole	1200
S10.001	o	225	S53	22.420	20.190	2.005	Open Manhole	1200
S10.002	o	225	S54	22.000	20.080	1.695	Open Manhole	1200
S10.003	o	300	S55	21.700	19.922	1.478	Open Manhole	1200
S7.011	o	375	S56	21.414	19.481	1.558	Open Manhole	1350
S7.012	o	375	S57	21.232	19.371	1.486	Open Manhole	1350
S12.000	o	225	S58	23.500	21.708	1.567	Open Manhole	1200
S12.001	o	225	S59	23.150	21.597	1.328	Open Manhole	1200
S13.000	o	150	S60	22.827	21.477	1.200	Open Manhole	1200
S14.000	o	300	S61	22.048	20.548	1.200	Open Manhole	1200
S12.002	o	300	S62	22.556	20.214	2.042	Open Manhole	1200
S12.003	o	300	S63	22.335	20.179	1.856	Open Manhole	1200
S12.004	o	300	S64	21.617	19.938	1.379	Open Manhole	1200
S12.005	o	300	S65	21.180	19.700	1.180	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)
S11.001	25.067	150.0	S52	22.450	20.267	1.959	Open Manhole	1200
S11.002	12.530	163.6	S53	22.420	20.190	2.005	Open Manhole	1200
S10.001	18.405	167.3	S54	22.000	20.080	1.695	Open Manhole	1200
S10.002	13.873	167.1	S55	21.700	19.997	1.478	Open Manhole	1200
S10.003	27.145	74.2	S56	21.414	19.556	1.558	Open Manhole	1350
S7.011	34.212	313.0	S57	21.232	19.371	1.486	Open Manhole	1350
S7.012	46.154	197.2	S78	21.104	19.137	1.592	Open Manhole	1350
S12.000	16.586	149.4	S59	23.150	21.597	1.328	Open Manhole	1200
S12.001	38.679	29.6	S62	22.556	20.289	2.042	Open Manhole	1200
S13.000	19.980	18.0	S62	22.556	20.364	2.042	Open Manhole	1200
S14.000	33.369	99.9	S62	22.556	20.214	2.042	Open Manhole	1200
S12.002	5.834	167.0	S63	22.335	20.179	1.856	Open Manhole	1200
S12.003	40.197	167.0	S64	21.617	19.938	1.379	Open Manhole	1200
S12.004	23.880	100.0	S65	21.180	19.700	1.180	Open Manhole	1200
S12.005	7.963	150.0	S66	21.059	19.646	1.113	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S12.006	o	300	S66	21.059	19.646	1.113	Open Manhole	1200
S12.007	o	300	S67	20.921	19.542	1.079	Open Manhole	1200
S12.008	o	300	S68	20.978	19.517	1.161	Open Manhole	1200
S15.000	o	150	SPP4	21.300	20.500	0.650	Open Manhole	1200
S15.001	o	150	SHBRAKE PP4	21.300	20.250	0.900	Open Manhole	1200
S15.002	o	225	S71	21.220	20.068	0.927	Open Manhole	1200
S15.003	o	225	S72	20.976	19.848	0.903	Open Manhole	1200
S15.004	o	225	S73	20.965	19.798	0.942	Open Manhole	1200
S15.005	o	300	S74	21.132	19.614	1.218	Open Manhole	1200
S15.006	o	300	S75	21.207	19.477	1.430	Open Manhole	1200
S15.007	o	300	S76	21.121	19.432	1.389	Open Manhole	1200
S12.009	o	375	S77	21.033	19.325	1.332	Open Manhole	1350
S7.013	o	450	S78	21.104	19.292	1.362	Open Manhole	1350
S7.014	o	450	S79	21.080	19.159	1.471	Open Manhole	1350
S7.015	o	450	S80	21.111	18.999	1.662	Open Manhole	1350
S7.016	o	450	SBASIN K	20.100	18.900	0.750	Open Manhole	1350
S7.017	o	450	SHBRAKE BASIN K	19.600	18.664	0.486	Open Manhole	1350

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)
S12.006	24.831	238.0	S67	20.921	19.542	1.079	Open Manhole	1200
S12.007	5.947	238.0	S68	20.978	19.517	1.161	Open Manhole	1200
S12.008	6.270	53.6	S77	21.033	19.400	1.332	Open Manhole	1350
S15.000	4.196	16.8	SHBRAKE PP4	21.300	20.250	0.900	Open Manhole	1200
S15.001	15.978	150.0	S71	21.220	20.143	0.927	Open Manhole	1200
S15.002	36.799	167.0	S72	20.976	19.848	0.903	Open Manhole	1200
S15.003	8.289	167.0	S73	20.965	19.798	0.942	Open Manhole	1200
S15.004	18.278	167.0	S74	21.132	19.689	1.218	Open Manhole	1200
S15.005	32.665	238.0	S75	21.207	19.477	1.430	Open Manhole	1200
S15.006	10.628	238.0	S76	21.121	19.432	1.389	Open Manhole	1200
S15.007	7.549	235.9	S77	21.033	19.400	1.332	Open Manhole	1350
S12.009	10.317	313.0	S78	21.104	19.292	1.437	Open Manhole	1350
S7.013	51.249	385.3	S79	21.080	19.159	1.471	Open Manhole	1350
S7.014	61.637	385.2	S80	21.111	18.999	1.662	Open Manhole	1350
S7.015	30.067	303.7	SBASIN K	20.100	18.900	0.750	Open Manhole	1350
S7.016	16.505	69.9	SHBRAKE BASIN K	19.600	18.664	0.486	Open Manhole	1350
S7.017	6.058	9.9	S	18.600	18.050	0.100	Open Manhole	0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
7.000	-	-	100	0.028	0.028	0.028
7.001	-	-	100	0.004	0.004	0.004
7.002	-	-	100	0.029	0.029	0.029
7.003	-	-	100	0.044	0.044	0.044
7.004	-	-	100	0.018	0.018	0.018
8.000	-	-	100	0.054	0.054	0.054
7.005	-	-	100	0.028	0.028	0.028
7.006	-	-	100	0.031	0.031	0.031
7.007	-	-	100	0.017	0.017	0.017
9.000	-	-	100	0.082	0.082	0.082
7.008	-	-	100	0.009	0.009	0.009
7.009	-	-	100	0.000	0.000	0.000
7.010	-	-	100	0.000	0.000	0.000
10.000	-	-	100	0.008	0.008	0.008
11.000	-	-	100	0.019	0.019	0.019
11.001	-	-	100	0.045	0.045	0.045
11.002	-	-	100	0.004	0.004	0.004
10.001	-	-	100	0.061	0.061	0.061
10.002	-	-	100	0.051	0.051	0.051
10.003	-	-	100	0.074	0.074	0.074
7.011	-	-	100	0.043	0.043	0.043
7.012	-	-	100	0.000	0.000	0.000
12.000	-	-	100	0.037	0.037	0.037
12.001	-	-	100	0.038	0.038	0.038
13.000	-	-	100	0.047	0.047	0.047
14.000	-	-	100	0.070	0.070	0.070
12.002	-	-	100	0.060	0.060	0.060
12.003	-	-	100	0.000	0.000	0.000
12.004	-	-	100	0.071	0.071	0.071
12.005	-	-	100	0.017	0.017	0.017
12.006	-	-	100	0.000	0.000	0.000
12.007	-	-	100	0.060	0.060	0.060
12.008	-	-	100	0.000	0.000	0.000
15.000	-	-	100	0.041	0.041	0.041
15.001	-	-	100	0.000	0.000	0.000
15.002	-	-	100	0.045	0.045	0.045
15.003	-	-	100	0.064	0.064	0.064
15.004	-	-	100	0.023	0.023	0.023
15.005	-	-	100	0.046	0.046	0.046
15.006	-	-	100	0.033	0.033	0.033
15.007	-	-	100	0.000	0.000	0.000
12.009	-	-	100	0.033	0.033	0.033
7.013	-	-	100	0.000	0.000	0.000
7.014	-	-	100	0.000	0.000	0.000
7.015	-	-	100	0.017	0.017	0.017
7.016	-	-	100	0.000	0.000	0.000
7.017	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.351	1.351	1.351

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Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S7.017	S	18.600	18.050	18.050	0	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1440	18.400	5760	18.400	10080	18.400	14400	18.400	18720	18.400
2880	18.400	7200	18.400	11520	18.400	15840	18.400	20160	18.400
4320	18.400	8640	18.400	12960	18.400	17280	18.400		

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	2
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)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.900	Storm Duration (mins)	30
Ratio R	0.350		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SHBRAKE PP4, DS/PN: S15.001, Volume (m³): 1.2

Unit Reference	MD-SHE-0061-1500-0750-1500
Design Head (m)	0.750
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	61
Invert Level (m)	20.250
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.750	1.5
Flush-Flo™	0.231	1.5
Kick-Flo®	0.479	1.2
Mean Flow over Head Range	-	1.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.3	1.200	1.9	3.000	2.8	7.000	4.2
0.200	1.5	1.400	2.0	3.500	3.0	7.500	4.3
0.300	1.5	1.600	2.1	4.000	3.2	8.000	4.5
0.400	1.4	1.800	2.2	4.500	3.4	8.500	4.6
0.500	1.3	2.000	2.3	5.000	3.6	9.000	4.7
0.600	1.4	2.200	2.4	5.500	3.7	9.500	4.9
0.800	1.5	2.400	2.5	6.000	3.9		
1.000	1.7	2.600	2.6	6.500	4.0		

Hydro-Brake® Optimum Manhole: SBASIN K, DS/PN: S7.016, Volume (m³): 6.3

Unit Reference	MD-SHE-0165-1360-1200-1360
Design Head (m)	1.200
Design Flow (l/s)	13.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	165
Invert Level (m)	18.900
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

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Hydro-Brake® Optimum Manhole: SBASIN K, DS/PN: S7.016, Volume (m³): 6.3

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	13.6
Flush-Flo™	0.364	13.6
Kick-Flo®	0.801	11.2
Mean Flow over Head Range	-	11.7

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	5.9	1.200	13.6	3.000	21.0	7.000	31.6
0.200	12.8	1.400	14.6	3.500	22.6	7.500	32.7
0.300	13.5	1.600	15.6	4.000	24.1	8.000	33.7
0.400	13.6	1.800	16.5	4.500	25.5	8.500	34.7
0.500	13.4	2.000	17.3	5.000	26.9	9.000	35.7
0.600	13.1	2.200	18.1	5.500	28.1	9.500	36.6
0.800	11.3	2.400	18.9	6.000	29.3		
1.000	12.5	2.600	19.6	6.500	30.5		

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Storage Structures for Storm

Porous Car Park Manhole: SPP4, DS/PN: S15.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	31.0
Max Percolation (l/s)	86.1	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	20.500	Membrane Depth (mm)	0

Tank or Pond Manhole: SBASIN K, DS/PN: S7.016

Invert Level (m) 18.900

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	807.0	1.200	1502.0

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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	2
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	0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.900	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S7.000	S36	15 Winter	100	+40%	100/15 Summer	100/15 Winter		
S7.001	S37	15 Winter	100	+40%	100/15 Summer			
S7.002	S38	15 Winter	100	+40%	100/15 Summer			
S7.003	S39	15 Winter	100	+40%	100/15 Summer			
S7.004	S40	15 Winter	100	+40%	100/15 Summer			
S8.000	S41	15 Winter	100	+40%	100/15 Summer			
S7.005	S42	15 Winter	100	+40%	100/15 Summer			
S7.006	S43	15 Winter	100	+40%	100/15 Summer			
S7.007	S44	15 Winter	100	+40%	100/15 Summer			
S9.000	S45	30 Winter	100	+40%	100/15 Summer	100/15 Summer		
S7.008	S46	15 Winter	100	+40%	100/15 Summer			
S7.009	S47	15 Winter	100	+40%	100/15 Summer			
S7.010	S48	15 Winter	100	+40%	100/15 Summer			
S10.000	S49	15 Winter	100	+40%	100/15 Summer			
S11.000	S50	15 Winter	100	+40%	100/15 Summer	100/15 Winter		

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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)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S7.000	S36	23.468	1.200	0.049	0.74			10.0	FLOOD
S7.001	S37	23.438	1.290	0.000	0.94			12.2	SURCHARGED
S7.002	S38	23.412	1.335	0.000	1.42			19.5	SURCHARGED
S7.003	S39	23.209	1.284	0.000	0.95			34.7	SURCHARGED
S7.004	S40	23.113	1.325	0.000	1.04			38.1	SURCHARGED
S8.000	S41	23.290	1.187	0.000	0.95			22.3	FLOOD RISK
S7.005	S42	22.979	1.327	0.000	1.81			67.9	SURCHARGED
S7.006	S43	22.458	0.977	0.000	1.20			75.6	FLOOD RISK
S7.007	S44	21.975	0.826	0.000	0.47			82.1	SURCHARGED
S9.000	S45	21.738	1.211	11.193	0.58			47.4	FLOOD
S7.008	S46	21.796	1.447	0.000	1.53			93.8	FLOOD RISK
S7.009	S47	21.712	1.433	0.000	1.42			93.8	SURCHARGED
S7.010	S48	21.577	1.447	0.000	1.06			94.2	FLOOD RISK
S10.000	S49	21.957	0.282	0.000	0.13			5.0	SURCHARGED
S11.000	S50	21.974	1.200	0.547	0.33			12.8	FLOOD

PN	US/MH Name	Level Exceeded
S7.000	S36	1
S7.001	S37	
S7.002	S38	
S7.003	S39	
S7.004	S40	
S8.000	S41	
S7.005	S42	
S7.006	S43	
S7.007	S44	
S9.000	S45	6
S7.008	S46	
S7.009	S47	
S7.010	S48	
S10.000	S49	
S11.000	S50	2

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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
S11.001	S51	15 Winter	100	+40%	100/15 Summer		
S11.002	S52	15 Winter	100	+40%	100/15 Summer		
S10.001	S53	15 Winter	100	+40%	100/15 Summer		
S10.002	S54	15 Winter	100	+40%	100/15 Summer		
S10.003	S55	15 Winter	100	+40%	100/15 Summer		
S7.011	S56	15 Winter	100	+40%	100/15 Summer	100/15 Winter	
S7.012	S57	15 Winter	100	+40%	100/15 Summer		
S12.000	S58	15 Winter	100	+40%	100/15 Summer		
S12.001	S59	15 Winter	100	+40%	100/15 Summer		
S13.000	S60	15 Winter	100	+40%	100/15 Summer		
S14.000	S61	15 Winter	100	+40%	100/15 Summer	100/15 Summer	
S12.002	S62	15 Winter	100	+40%	100/15 Summer		
S12.003	S63	15 Winter	100	+40%	100/15 Summer		
S12.004	S64	15 Winter	100	+40%	100/15 Summer		
S12.005	S65	30 Winter	100	+40%	100/15 Summer	100/15 Summer	
S12.006	S66	30 Winter	100	+40%	100/15 Summer	100/15 Summer	
S12.007	S67	30 Winter	100	+40%	100/15 Summer	100/15 Summer	
S12.008	S68	15 Winter	100	+40%	100/15 Summer		
S15.000	SPP4	60 Winter	100	+40%	100/15 Summer		
S15.001	SHBRAKE PP4	120 Winter	100	+40%	100/15 Summer		
S15.002	S71	15 Winter	100	+40%	100/15 Summer		
S15.003	S72	30 Winter	100	+40%	100/15 Summer	100/15 Summer	
S15.004	S73	15 Winter	100	+40%	100/15 Summer	100/15 Summer	
S15.005	S74	15 Winter	100	+40%	100/15 Summer		
S15.006	S75	15 Winter	100	+40%	100/15 Summer		
S15.007	S76	15 Winter	100	+40%	100/15 Summer		
S12.009	S77	15 Winter	100	+40%	100/15 Summer		
S7.013	S78	15 Winter	100	+40%	100/15 Summer		
S7.014	S79	15 Winter	100	+40%	100/15 Summer		
S7.015	S80	480 Winter	100	+40%	100/15 Summer		
S7.016	SBASIN K	480 Winter	100	+40%	100/30 Winter		
S7.017	SHBRAKE BASIN K	960 Winter	100	+40%			

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
S11.001	S51		22.008	1.349	0.000	0.57		
S11.002	S52		21.980	1.488	0.000	0.70		
S10.001	S53		21.953	1.538	0.000	1.18		
S10.002	S54		21.823	1.518	0.000	1.76		
S10.003	S55		21.603	1.381	0.000	0.78		
S7.011	S56		21.414	1.558	0.067	1.68		
S7.012	S57		21.120	1.373	0.000	1.27		
S12.000	S58		22.275	0.342	0.000	0.58		
S12.001	S59		22.241	0.419	0.000	0.47		
S13.000	S60		22.376	0.749	0.000	0.62		
S14.000	S61		22.050	1.202	2.134	0.38		

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
S12.002	S62		22.047	1.533	0.000	1.60		
S12.003	S63		21.910	1.431	0.000	1.19		
S12.004	S64		21.588	1.350	0.000	1.25		
S12.005	S65		21.190	1.191	10.551	1.45		
S12.006	S66		21.070	1.123	10.687	1.25		
S12.007	S67		20.932	1.089	10.230	2.27		
S12.008	S68		20.878	1.060	0.000	1.30		
S15.000	SPP4		20.814	0.164	0.000	0.11		
S15.001	SHBRAKE PP4		20.831	0.431	0.000	0.11		
S15.002	S71		21.058	0.764	0.000	0.52		
S15.003	S72		20.983	0.910	6.691	1.10		
S15.004	S73		20.966	0.943	0.799	1.21		
S15.005	S74		20.953	1.039	0.000	0.90		
S15.006	S75		20.909	1.132	0.000	1.22		
S15.007	S76		20.856	1.123	0.000	1.20		
S12.009	S77		20.829	1.128	0.000	2.05		
S7.013	S78		20.732	0.990	0.000	2.00		
S7.014	S79		20.237	0.628	0.000	1.89		
S7.015	S80		19.694	0.245	0.000	0.58		
S7.016	SBASIN K		19.688	0.338	0.000	0.05		
S7.017	SHBRAKE BASIN K		18.715	-0.399	0.000	0.03		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S11.001	S51	22.4	SURCHARGED	
S11.002	S52	24.4	SURCHARGED	
S10.001	S53	42.5	SURCHARGED	
S10.002	S54	61.5	FLOOD RISK	
S10.003	S55	90.3	FLOOD RISK	
S7.011	S56	169.5	FLOOD	1
S7.012	S57	166.1	FLOOD RISK	
S12.000	S58	22.1	SURCHARGED	
S12.001	S59	43.0	SURCHARGED	
S13.000	S60	24.5	SURCHARGED	
S14.000	S61	38.9	FLOOD	2
S12.002	S62	94.9	SURCHARGED	
S12.003	S63	95.2	SURCHARGED	
S12.004	S64	123.8	FLOOD RISK	
S12.005	S65	88.9	FLOOD	6
S12.006	S66	80.1	FLOOD	6
S12.007	S67	113.1	FLOOD	6
S12.008	S68	111.5	FLOOD RISK	
S15.000	SPP4	3.3	SURCHARGED	
S15.001	SHBRAKE PP4	1.5	SURCHARGED	
S15.002	S71	19.8	FLOOD RISK	
S15.003	S72	34.4	FLOOD	6

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S15.004	S73	43.7	FLOOD	4
S15.005	S74	59.0	FLOOD RISK	
S15.006	S75	69.3	FLOOD RISK	
S15.007	S76	63.9	FLOOD RISK	
S12.009	S77	167.6	FLOOD RISK	
S7.013	S78	297.6	SURCHARGED	
S7.014	S79	285.4	SURCHARGED	
S7.015	S80	92.6	SURCHARGED	
S7.016	SBASIN K	13.6	SURCHARGED	
S7.017	SHBRAKE BASIN K	13.6	OK	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.900	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.018	4-8	0.713	8-12	1.714	12-16	0.248

Total Area Contributing (ha) = 2.694

Total Pipe Volume (m³) = 274.840

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
S16.000	22.220	0.333	66.7	0.024	4.00	0.0	0.600	o	150	Pipe/Conduit	
S17.000	21.574	0.809	26.7	0.041	4.00	0.0	0.600	o	150	Pipe/Conduit	
S17.001	26.648	0.919	29.0	0.053	0.00	0.0	0.600	o	225	Pipe/Conduit	
S16.001	26.563	0.395	67.2	0.049	0.00	0.0	0.600	o	300	Pipe/Conduit	
S16.002	29.160	0.384	75.9	0.047	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)
S16.000	50.00	4.30	25.130	0.024	0.0	0.0	0.0	1.23	21.8	3.2
S17.000	50.00	4.18	26.525	0.041	0.0	0.0	0.0	1.96	34.6	5.6
S17.001	50.00	4.37	25.641	0.094	0.0	0.0	0.0	2.44	97.0	12.7
S16.001	50.00	4.60	24.647	0.167	0.0	0.0	0.0	1.92	135.7	22.6
S16.002	50.00	4.87	24.252	0.214	0.0	0.0	0.0	1.81	127.7	29.0

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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
S18.000	22.692	0.795	28.5	0.045	4.00	0.0	0.600	o	150	Pipe/Conduit	
S18.001	22.747	0.820	27.7	0.077	0.00	0.0	0.600	o	225	Pipe/Conduit	
S19.000	17.312	0.345	50.2	0.011	4.00	0.0	0.600	o	150	Pipe/Conduit	
S19.001	10.325	0.195	52.9	0.028	0.00	0.0	0.600	o	225	Pipe/Conduit	
S19.002	13.321	0.253	52.7	0.113	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.003	20.903	0.379	55.2	0.008	0.00	0.0	0.600	o	300	Pipe/Conduit	
S16.003	23.198	0.841	27.6	0.104	0.00	0.0	0.600	o	450	Pipe/Conduit	
S16.004	6.114	0.196	31.2	0.012	0.00	0.0	0.600	o	525	Pipe/Conduit	
S20.000	36.476	0.510	71.5	0.014	4.00	0.0	0.600	o	150	Pipe/Conduit	
S20.001	14.010	0.093	150.6	0.034	0.00	0.0	0.600	o	150	Pipe/Conduit	
S16.005	6.437	0.118	54.6	0.011	0.00	0.0	0.600	o	525	Pipe/Conduit	
S16.006	10.922	0.128	85.3	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S16.007	8.616	0.082	105.1	0.030	0.00	0.0	0.600	o	525	Pipe/Conduit	
S16.008	24.413	0.251	97.3	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S16.009	25.396	0.250	101.6	0.127	0.00	0.0	0.600	o	525	Pipe/Conduit	
S16.010	13.755	0.103	133.5	0.055	0.00	0.0	0.600	o	600	Pipe/Conduit	
S16.011	18.458	0.100	184.6	0.078	0.00	0.0	0.600	o	600	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)
S18.000	50.00	4.20	25.633	0.045	0.0	0.0	0.0	1.89	33.4	6.1
S18.001	50.00	4.35	24.763	0.122	0.0	0.0	0.0	2.49	99.2	16.5
S19.000	50.00	4.20	25.190	0.011	0.0	0.0	0.0	1.42	25.2	1.5
S19.001	50.00	4.30	24.770	0.039	0.0	0.0	0.0	1.80	71.6	5.3
S19.002	50.00	4.40	24.500	0.152	0.0	0.0	0.0	2.17	153.5	20.6
S19.003	50.00	4.56	24.247	0.160	0.0	0.0	0.0	2.12	150.0	21.7
S16.003	50.00	4.97	23.718	0.600	0.0	0.0	0.0	3.88	617.5	81.2
S16.004	50.00	4.99	22.802	0.612	0.0	0.0	0.0	4.02	870.4	82.9
S20.000	50.00	4.51	23.584	0.014	0.0	0.0	0.0	1.19	21.0	1.9
S20.001	50.00	4.80	23.074	0.048	0.0	0.0	0.0	0.82	14.4	6.5
S16.005	50.00	5.03	22.606	0.671	0.0	0.0	0.0	3.04	657.5	90.9
S16.006	50.00	5.10	22.488	0.671	0.0	0.0	0.0	2.43	525.2	90.9
S16.007	50.00	5.17	22.360	0.701	0.0	0.0	0.0	2.18	473.0	94.9
S16.008	50.00	5.35	22.278	0.701	0.0	0.0	0.0	2.27	491.7	94.9
S16.009	50.00	5.54	22.027	0.828	0.0	0.0	0.0	2.22	481.1	112.1
S16.010	50.00	5.64	21.702	0.883	0.0	0.0	0.0	2.11	595.4	119.6
S16.011	50.00	5.82	21.599	0.961	0.0	0.0	0.0	1.79	505.9	130.1

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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
S16.012	28.539	0.357	79.9	0.091	0.00	0.0	0.600	o	600	Pipe/Conduit	
S16.013	29.655	0.053	556.0	0.045	0.00	0.0	0.600	o	600	Pipe/Conduit	
S16.014	24.556	0.044	556.0	0.045	0.00	0.0	0.600	o	600	Pipe/Conduit	
S16.015	23.901	0.043	556.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S16.016	26.254	0.089	295.0	0.051	0.00	0.0	0.600	o	600	Pipe/Conduit	
S21.000	4.798	0.604	7.9	0.016	4.00	0.0	0.600	o	150	Pipe/Conduit	
S21.001	6.858	0.125	54.9	0.058	0.00	0.0	0.600	o	150	Pipe/Conduit	
S21.002	19.437	0.268	72.5	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	
S21.003	28.496	0.300	95.0	0.082	0.00	0.0	0.600	o	225	Pipe/Conduit	
S21.004	17.799	0.200	89.0	0.032	0.00	0.0	0.600	o	225	Pipe/Conduit	
S21.005	15.802	0.066	238.0	0.038	0.00	0.0	0.600	o	300	Pipe/Conduit	
S21.006	14.733	0.062	238.0	0.041	0.00	0.0	0.600	o	300	Pipe/Conduit	
S21.007	15.080	0.063	238.0	0.034	0.00	0.0	0.600	o	300	Pipe/Conduit	
S21.008	26.887	0.113	237.9	0.024	0.00	0.0	0.600	o	300	Pipe/Conduit	
S22.000	7.673	0.676	11.4	0.019	4.00	0.0	0.600	o	150	Pipe/Conduit	
S22.001	7.875	0.971	8.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S21.009	21.412	0.090	237.9	0.061	0.00	0.0	0.600	o	300	Pipe/Conduit	
S23.000	31.295	0.209	150.0	0.022	4.00	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)
S16.012	50.00	5.99	21.499	1.052	0.0	0.0	0.0	2.73	770.6	142.5
S16.013	50.00	6.47	21.142	1.097	0.0	0.0	0.0	1.03	290.0	148.5
S16.014	50.00	6.87	21.089	1.142	0.0	0.0	0.0	1.03	290.0	154.6
S16.015	50.00	7.26	21.044	1.142	0.0	0.0	0.0	1.03	290.0	154.6
S16.016	50.00	7.57	21.002	1.193	0.0	0.0	0.0	1.41	399.4	161.5
S21.000	50.00	4.02	23.754	0.016	0.0	0.0	0.0	3.60	63.6	2.2
S21.001	50.00	4.11	23.150	0.074	0.0	0.0	0.0	1.36	24.0	10.0
S21.002	50.00	4.32	22.950	0.098	0.0	0.0	0.0	1.54	61.1	13.3
S21.003	50.00	4.67	22.682	0.180	0.0	0.0	0.0	1.34	53.4	24.4
S21.004	50.00	4.88	22.382	0.212	0.0	0.0	0.0	1.39	55.1	28.7
S21.005	50.00	5.14	22.107	0.250	0.0	0.0	0.0	1.01	71.7	33.9
S21.006	50.00	5.39	22.041	0.291	0.0	0.0	0.0	1.01	71.7	39.4
S21.007	50.00	5.63	21.979	0.325	0.0	0.0	0.0	1.01	71.7	44.0
S21.008	50.00	6.08	21.915	0.349	0.0	0.0	0.0	1.01	71.7	47.3
S22.000	50.00	4.04	23.599	0.019	0.0	0.0	0.0	3.01	53.1	2.6
S22.001	50.00	4.08	22.923	0.019	0.0	0.0	0.0	3.56	62.9	2.6
S21.009	50.00	6.43	21.802	0.429	0.0	0.0	0.0	1.01	71.7	58.1
S23.000	50.00	4.64	23.661	0.022	0.0	0.0	0.0	0.82	14.5	3.0

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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
S23.001	6.332	0.042	150.0	0.044	0.00	0.0	0.600	o	150	Pipe/Conduit	
S23.002	12.179	1.548	7.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S21.010	38.483	0.100	384.8	0.017	0.00	0.0	0.600	o	450	Pipe/Conduit	
S21.011	23.055	0.060	384.2	0.054	0.00	0.0	0.600	o	450	Pipe/Conduit	
S21.012	38.011	0.084	452.5	0.061	0.00	0.0	0.600	o	525	Pipe/Conduit	
S21.013	31.029	0.068	456.3	0.115	0.00	0.0	0.600	o	525	Pipe/Conduit	
S21.014	12.375	0.187	66.2	0.030	0.00	0.0	0.600	o	525	Pipe/Conduit	
S16.017	32.829	0.059	556.0	0.068	0.00	0.0	0.600	o	600	Pipe/Conduit	
S16.018	35.912	0.214	167.8	0.083	0.00	0.0	0.600	o	600	Pipe/Conduit	
S16.019	32.324	0.500	64.6	0.051	0.00	0.0	0.600	o	600	Pipe/Conduit	
S16.020	24.523	0.498	49.2	0.056	0.00	0.0	0.600	o	600	Pipe/Conduit	
S24.000	6.160	0.297	20.7	0.035	4.00	0.0	0.600	o	150	Pipe/Conduit	
S24.001	7.988	0.122	65.5	0.043	0.00	0.0	0.600	o	150	Pipe/Conduit	
S24.002	28.632	0.451	63.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S24.003	30.090	0.501	60.1	0.044	0.00	0.0	0.600	o	225	Pipe/Conduit	
S24.004	12.984	0.139	93.4	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	
S25.000	6.940	0.179	38.8	0.020	4.00	0.0	0.600	o	150	Pipe/Conduit	
S25.001	24.162	0.161	150.1	0.021	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)
S23.001	50.00	4.77	23.452	0.066	0.0	0.0	0.0	0.82	14.5	8.9
S23.002	50.00	4.82	23.410	0.066	0.0	0.0	0.0	3.61	63.9	8.9
S21.010	50.00	7.05	21.562	0.512	0.0	0.0	0.0	1.03	163.9	69.3
S21.011	50.00	7.42	21.462	0.566	0.0	0.0	0.0	1.03	164.0	76.6
S21.012	50.00	8.03	21.327	0.627	0.0	0.0	0.0	1.05	226.5	84.9
S21.013	50.00	8.52	21.243	0.742	0.0	0.0	0.0	1.04	225.6	100.5
S21.014	50.00	8.60	21.175	0.772	0.0	0.0	0.0	2.76	596.7	104.5
S16.017	50.00	9.13	20.913	2.033	0.0	0.0	0.0	1.03	290.0	275.3
S16.018	50.00	9.45	20.853	2.116	0.0	0.0	0.0	1.88	530.7	286.5
S16.019	50.00	9.63	20.639	2.167	0.0	0.0	0.0	3.03	857.3	293.4
S16.020	50.00	9.75	20.139	2.223	0.0	0.0	0.0	3.48	982.8	301.0
S24.000	50.00	4.05	21.825	0.035	0.0	0.0	0.0	2.22	39.3	4.7
S24.001	50.00	4.15	21.528	0.078	0.0	0.0	0.0	1.24	22.0	10.6
S24.002	50.00	4.53	21.406	0.078	0.0	0.0	0.0	1.26	22.3	10.6
S24.003	50.00	4.83	20.880	0.122	0.0	0.0	0.0	1.69	67.2	16.5
S24.004	50.00	4.99	20.379	0.164	0.0	0.0	0.0	1.35	53.8	22.2
S25.000	50.00	4.07	20.736	0.020	0.0	0.0	0.0	1.62	28.7	2.7
S25.001	50.00	4.45	20.482	0.041	0.0	0.0	0.0	1.06	42.3	5.6

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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
S25.002	12.137	0.081	149.8	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	
S24.005	21.790	0.092	238.0	0.019	0.00	0.0	0.600	o	300	Pipe/Conduit	
S24.006	18.221	0.047	385.0	0.006	0.00	0.0	0.600	o	450	Pipe/Conduit	
S16.021	34.545	0.062	556.0	0.089	0.00	0.0	0.600	o	675	Pipe/Conduit	
S16.022	18.175	0.033	556.0	0.032	0.00	0.0	0.600	o	675	Pipe/Conduit	
S16.023	19.666	0.035	556.0	0.016	0.00	0.0	0.600	o	675	Pipe/Conduit	
S16.024	24.490	0.044	556.0	0.005	0.00	0.0	0.600	o	675	Pipe/Conduit	
S16.025	20.152	0.036	556.0	0.043	0.00	0.0	0.600	o	675	Pipe/Conduit	
S16.026	92.652	0.156	593.9	0.014	0.00	0.0	0.600	o	675	Pipe/Conduit	
S16.027	90.121	0.251	359.0	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	
S16.028	39.872	1.950	20.4	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)
S25.002	50.00	4.64	20.321	0.083	0.0	0.0	0.0	1.07	42.4	11.2
S24.005	50.00	5.35	20.165	0.266	0.0	0.0	0.0	1.01	71.7	36.0
S24.006	50.00	5.64	19.923	0.272	0.0	0.0	0.0	1.03	163.8	36.8
S16.021	50.00	10.27	19.566	2.584	0.0	0.0	0.0	1.10	395.2	349.9
S16.022	50.00	10.54	19.504	2.616	0.0	0.0	0.0	1.10	395.2	354.2
S16.023	50.00	10.84	19.472	2.632	0.0	0.0	0.0	1.10	395.2	356.4
S16.024	50.00	11.21	19.436	2.637	0.0	0.0	0.0	1.10	395.2	357.1
S16.025	50.00	11.51	19.392	2.680	0.0	0.0	0.0	1.10	395.2	362.9
S16.026	50.00	12.96	19.356	2.694	0.0	0.0	0.0	1.07	382.2	364.8
S16.027	50.00	14.05	19.200	2.694	0.0	0.0	0.0	1.38	492.9	364.8
S16.028	50.00	14.20	18.949	2.694	0.0	0.0	0.0	4.51	717.6	364.8

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Ba
S83	26.480	1.350	Open Manhole	1200	S16.000	25.130	150				
S84	27.875	1.350	Open Manhole	1200	S17.000	26.525	150				
S85	27.066	1.425	Open Manhole	1200	S17.001	25.641	225	S17.000	25.716	150	
S86	26.147	1.500	Open Manhole	1200	S16.001	24.647	300	S16.000	24.797	150	
								S17.001	24.722	225	
S87	25.752	1.500	Open Manhole	1200	S16.002	24.252	300	S16.001	24.252	300	
S88	26.983	1.350	Open Manhole	1200	S18.000	25.633	150				
S89	26.188	1.425	Open Manhole	1200	S18.001	24.763	225	S18.000	24.838	150	
S90	26.540	1.350	Open Manhole	1200	S19.000	25.190	150				
S91	26.195	1.425	Open Manhole	1200	S19.001	24.770	225	S19.000	24.845	150	
S92	26.000	1.500	Open Manhole	1200	S19.002	24.500	300	S19.001	24.575	225	
S93	25.747	1.500	Open Manhole	1200	S19.003	24.247	300	S19.002	24.247	300	
S94	25.368	1.650	Open Manhole	1350	S16.003	23.718	450	S16.002	23.868	300	
								S18.001	23.943	225	
								S19.003	23.868	300	
S95	24.527	1.725	Open Manhole	1500	S16.004	22.802	525	S16.003	22.877	450	
S96	24.934	1.350	Open Manhole	1200	S20.000	23.584	150				
S97	24.424	1.350	Open Manhole	1200	S20.001	23.074	150	S20.000	23.074	150	
S98	24.346	1.740	Open Manhole	1500	S16.005	22.606	525	S16.004	22.606	525	
								S20.001	22.981	150	
S99	24.213	1.725	Open Manhole	1500	S16.006	22.488	525	S16.005	22.488	525	
S100	24.085	1.725	Open Manhole	1500	S16.007	22.360	525	S16.006	22.360	525	
S101	24.003	1.725	Open Manhole	1500	S16.008	22.278	525	S16.007	22.278	525	
S102	23.752	1.725	Open Manhole	1500	S16.009	22.027	525	S16.008	22.027	525	
S103	23.502	1.800	Open Manhole	1500	S16.010	21.702	600	S16.009	21.777	525	
S104	23.400	1.801	Open Manhole	1500	S16.011	21.599	600	S16.010	21.599	600	
S105	23.300	1.801	Open Manhole	1500	S16.012	21.499	600	S16.011	21.499	600	
S106	23.540	2.398	Open Manhole	1500	S16.013	21.142	600	S16.012	21.142	600	
S107	23.900	2.811	Open Manhole	1500	S16.014	21.089	600	S16.013	21.089	600	
S108	24.100	3.056	Open Manhole	1500	S16.015	21.044	600	S16.014	21.044	600	
S109	23.960	2.958	Open Manhole	1500	S16.016	21.002	600	S16.015	21.002	600	
SPP5	24.554	0.800	Open Manhole	1200	S21.000	23.754	150				
SHBRAKE PP5	24.500	1.350	Open Manhole	1200	S21.001	23.150	150	S21.000	23.150	150	
S112	24.375	1.425	Open Manhole	1200	S21.002	22.950	225	S21.001	23.025	150	
S113	24.107	1.425	Open Manhole	1200	S21.003	22.682	225	S21.002	22.682	225	
S114	23.807	1.425	Open Manhole	1200	S21.004	22.382	225	S21.003	22.382	225	
S115	23.607	1.500	Open Manhole	1200	S21.005	22.107	300	S21.004	22.182	225	
S116	23.593	1.553	Open Manhole	1200	S21.006	22.041	300	S21.005	22.041	300	

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Ba
S117	23.716	1.737	Open Manhole	1200	S21.007	21.979	300	S21.006	21.979	300	
S118	23.862	1.947	Open Manhole	1200	S21.008	21.915	300	S21.007	21.915	300	
SPP6	24.399	0.800	Open Manhole	1200	S22.000	23.599	150				
SHBRAKE PP6	24.273	1.350	Open Manhole	1200	S22.001	22.923	150	S22.000	22.923	150	
S121	24.134	2.332	Open Manhole	1200	S21.009	21.802	300	S21.008	21.802	300	
								S22.001	21.952	150	
S122	25.011	1.350	Open Manhole	1200	S23.000	23.661	150				
S123	25.196	1.744	Open Manhole	1200	S23.001	23.452	150	S23.000	23.452	150	
S124	25.035	1.625	Open Manhole	1200	S23.002	23.410	150	S23.001	23.410	150	
S125	24.700	3.138	Open Manhole	1350	S21.010	21.562	450	S21.009	21.712	300	
								S23.002	21.862	150	
S126	23.700	2.238	Open Manhole	1350	S21.011	21.462	450	S21.010	21.462	450	
S127	23.470	2.143	Open Manhole	1500	S21.012	21.327	525	S21.011	21.402	450	
S128	23.250	2.007	Open Manhole	1500	S21.013	21.243	525	S21.012	21.243	525	
S129	23.500	2.325	Open Manhole	1500	S21.014	21.175	525	S21.013	21.175	525	
S130	23.600	2.687	Open Manhole	1500	S16.017	20.913	600	S16.016	20.913	600	
								S21.014	20.988	525	
S131	23.200	2.347	Open Manhole	1500	S16.018	20.853	600	S16.017	20.853	600	
S132	22.600	1.961	Open Manhole	1500	S16.019	20.639	600	S16.018	20.639	600	
S133	22.100	1.961	Open Manhole	1500	S16.020	20.139	600	S16.019	20.139	600	
SPP7	22.625	0.800	Open Manhole	1200	S24.000	21.825	150				
SHBRAKE PP7	22.878	1.350	Open Manhole	1200	S24.001	21.528	150	S24.000	21.528	150	
S136	22.756	1.350	Open Manhole	1200	S24.002	21.406	150	S24.001	21.406	150	
S137	22.305	1.425	Open Manhole	1200	S24.003	20.880	225	S24.002	20.955	150	
S138	21.804	1.425	Open Manhole	1200	S24.004	20.379	225	S24.003	20.379	225	
SPP8	21.536	0.800	Open Manhole	1200	S25.000	20.736	150				
SHBRAKE PP8	21.790	1.308	Open Manhole	1200	S25.001	20.482	225	S25.000	20.557	150	
S141	21.518	1.197	Open Manhole	1200	S25.002	20.321	225	S25.001	20.321	225	
S142	21.537	1.372	Open Manhole	1200	S24.005	20.165	300	S24.004	20.240	225	
								S25.002	20.240	225	
S143	21.713	1.790	Open Manhole	1350	S24.006	19.923	450	S24.005	20.073	300	
S144	21.900	2.334	Open Manhole	1500	S16.021	19.566	675	S16.020	19.641	600	
								S24.006	19.876	450	
S145	22.040	2.536	Open Manhole	1500	S16.022	19.504	675	S16.021	19.504	675	
S146	22.230	2.758	Open Manhole	1500	S16.023	19.472	675	S16.022	19.472	675	
S147	22.300	2.864	Open Manhole	1500	S16.024	19.436	675	S16.023	19.436	675	
S148	22.150	2.758	Open Manhole	1500	S16.025	19.392	675	S16.024	19.392	675	
S149	21.900	2.544	Open Manhole	1500	S16.026	19.356	675	S16.025	19.356	675	

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diamete (mm)
SBASIN L	20.100	0.900	Open Manhole	1500	S16.027	19.200	675	S16.026	19.200	67
SHBRAKE BASIN L	20.000	1.051	Open Manhole	1500	S16.028	18.949	450	S16.027	18.949	67
S	17.500	0.501	Open Manhole	0		OUTFALL		S16.028	16.999	45

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S83	448979.295	116209.306	448979.295	116209.306	Required	
S84	449009.983	116166.014	449009.983	116166.014	Required	
S85	448991.251	116176.718	448991.251	116176.718	Required	
S86	448968.185	116190.062	448968.185	116190.062	Required	
S87	448955.061	116166.967	448955.061	116166.967	Required	
S88	448980.318	116119.221	448980.318	116119.221	Required	
S89	448960.569	116130.397	448960.569	116130.397	Required	
S90	448932.767	116083.487	448932.767	116083.487	Required	
S91	448928.164	116100.175	448928.164	116100.175	Required	
S92	448927.524	116110.481	448927.524	116110.481	Required	
S93	448930.161	116123.538	448930.161	116123.538	Required	
S94	448940.750	116141.561	448940.750	116141.561	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S95	448920.712	116153.250	448920.712	116153.250	Required	
S96	448932.005	116199.217	448932.005	116199.217	Required	
S97	448913.416	116167.833	448913.416	116167.833	Required	
S98	448914.630	116153.876	448914.630	116153.876	Required	
S99	448908.940	116150.866	448908.940	116150.866	Required	
S100	448903.265	116141.534	448903.265	116141.534	Required	
S101	448895.106	116138.765	448895.106	116138.765	Required	
S102	448870.692	116138.765	448870.692	116138.765	Required	
S103	448845.297	116138.610	448845.297	116138.610	Required	
S104	448831.542	116138.594	448831.542	116138.594	Required	
S105	448832.691	116157.017	448832.691	116157.017	Required	
S106	448833.700	116185.538	448833.700	116185.538	Required	
S107	448834.209	116215.189	448834.209	116215.189	Required	
S108	448838.209	116239.416	448838.209	116239.416	Required	
S109	448845.006	116262.330	448845.006	116262.330	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SPP5	448895.542	116193.301	448895.542	116193.301	Required	
SHBRAKE PP5	448893.095	116189.174	448893.095	116189.174	Required	
S112	448889.814	116183.151	448889.814	116183.151	Required	
S113	448872.850	116192.640	448872.850	116192.640	Required	
S114	448877.692	116220.722	448877.692	116220.722	Required	
S115	448882.613	116237.828	448882.613	116237.828	Required	
S116	448891.179	116251.106	448891.179	116251.106	Required	
S117	448902.143	116260.947	448902.143	116260.947	Required	
S118	448915.514	116267.921	448915.514	116267.921	Required	
SPP6	448936.044	116260.653	448936.044	116260.653	Required	
SHBRAKE PP6	448939.116	116267.684	448939.116	116267.684	Required	
S121	448941.390	116275.224	448941.390	116275.224	Required	
S122	448953.713	116237.146	448953.713	116237.146	Required	
S123	448969.021	116264.441	448969.021	116264.441	Required	
S124	448965.940	116269.974	448965.940	116269.974	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S125	448961.875	116281.454	448961.875	116281.454	Required	
S126	448947.787	116317.266	448947.787	116317.266	Required	
S127	448926.252	116309.033	448926.252	116309.033	Required	
S128	448889.581	116299.030	448889.581	116299.030	Required	
S129	448859.761	116290.455	448859.761	116290.455	Required	
S130	448847.547	116288.461	448847.547	116288.461	Required	
S131	448837.027	116319.559	448837.027	116319.559	Required	
S132	448824.202	116353.103	448824.202	116353.103	Required	
S133	448809.278	116381.775	448809.278	116381.775	Required	
SPP7	448867.145	116340.867	448867.145	116340.867	Required	
SHBRAKE PP7	448869.260	116346.652	448869.260	116346.652	Required	
S136	448862.547	116350.981	448862.547	116350.981	Required	
S137	448851.783	116377.512	448851.783	116377.512	Required	
S138	448841.757	116405.882	448841.757	116405.882	Required	
SPP8	448874.308	116418.947	448874.308	116418.947	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SHBRAKE PP8	448871.111	116412.787	448871.111	116412.787	Required	
S141	448848.765	116421.977	448848.765	116421.977	Required	
S142	448837.275	116418.068	448837.275	116418.068	Required	
S143	448816.824	116410.547	448816.824	116410.547	Required	
S144	448799.690	116404.345	448799.690	116404.345	Required	
S145	448791.513	116437.908	448791.513	116437.908	Required	
S146	448785.082	116454.907	448785.082	116454.907	Required	
S147	448776.845	116472.765	448776.845	116472.765	Required	
S148	448775.997	116497.240	448775.997	116497.240	Required	
S149	448777.019	116517.366	448777.019	116517.366	Required	
SBASIN L	448721.521	116591.558	448721.521	116591.558	Required	
SHBRAKE BASIN L	448668.896	116664.718	448668.896	116664.718	Required	
S	448693.220	116696.311			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S16.000	o	150	S83	26.480	25.130	1.200	Open Manhole	1200
S17.000	o	150	S84	27.875	26.525	1.200	Open Manhole	1200
S17.001	o	225	S85	27.066	25.641	1.200	Open Manhole	1200
S16.001	o	300	S86	26.147	24.647	1.200	Open Manhole	1200
S16.002	o	300	S87	25.752	24.252	1.200	Open Manhole	1200
S18.000	o	150	S88	26.983	25.633	1.200	Open Manhole	1200
S18.001	o	225	S89	26.188	24.763	1.200	Open Manhole	1200
S19.000	o	150	S90	26.540	25.190	1.200	Open Manhole	1200
S19.001	o	225	S91	26.195	24.770	1.200	Open Manhole	1200
S19.002	o	300	S92	26.000	24.500	1.200	Open Manhole	1200
S19.003	o	300	S93	25.747	24.247	1.200	Open Manhole	1200
S16.003	o	450	S94	25.368	23.718	1.200	Open Manhole	1350
S16.004	o	525	S95	24.527	22.802	1.200	Open Manhole	1500
S20.000	o	150	S96	24.934	23.584	1.200	Open Manhole	1200
S20.001	o	150	S97	24.424	23.074	1.200	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)
S16.000	22.220	66.7	S86	26.147	24.797	1.200	Open Manhole	1200
S17.000	21.574	26.7	S85	27.066	25.716	1.200	Open Manhole	1200
S17.001	26.648	29.0	S86	26.147	24.722	1.200	Open Manhole	1200
S16.001	26.563	67.2	S87	25.752	24.252	1.200	Open Manhole	1200
S16.002	29.160	75.9	S94	25.368	23.868	1.200	Open Manhole	1350
S18.000	22.692	28.5	S89	26.188	24.838	1.200	Open Manhole	1200
S18.001	22.747	27.7	S94	25.368	23.943	1.200	Open Manhole	1350
S19.000	17.312	50.2	S91	26.195	24.845	1.200	Open Manhole	1200
S19.001	10.325	52.9	S92	26.000	24.575	1.200	Open Manhole	1200
S19.002	13.321	52.7	S93	25.747	24.247	1.200	Open Manhole	1200
S19.003	20.903	55.2	S94	25.368	23.868	1.200	Open Manhole	1350
S16.003	23.198	27.6	S95	24.527	22.877	1.200	Open Manhole	1500
S16.004	6.114	31.2	S98	24.346	22.606	1.215	Open Manhole	1500
S20.000	36.476	71.5	S97	24.424	23.074	1.200	Open Manhole	1200
S20.001	14.010	150.6	S98	24.346	22.981	1.215	Open Manhole	1500

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S16.005	o	525	S98	24.346	22.606	1.215	Open Manhole	1500
S16.006	o	525	S99	24.213	22.488	1.200	Open Manhole	1500
S16.007	o	525	S100	24.085	22.360	1.200	Open Manhole	1500
S16.008	o	525	S101	24.003	22.278	1.200	Open Manhole	1500
S16.009	o	525	S102	23.752	22.027	1.200	Open Manhole	1500
S16.010	o	600	S103	23.502	21.702	1.200	Open Manhole	1500
S16.011	o	600	S104	23.400	21.599	1.201	Open Manhole	1500
S16.012	o	600	S105	23.300	21.499	1.201	Open Manhole	1500
S16.013	o	600	S106	23.540	21.142	1.798	Open Manhole	1500
S16.014	o	600	S107	23.900	21.089	2.211	Open Manhole	1500
S16.015	o	600	S108	24.100	21.044	2.456	Open Manhole	1500
S16.016	o	600	S109	23.960	21.002	2.358	Open Manhole	1500
S21.000	o	150	SPP5	24.554	23.754	0.650	Open Manhole	1200
S21.001	o	150	SHBRAKE PP5	24.500	23.150	1.200	Open Manhole	1200
S21.002	o	225	S112	24.375	22.950	1.200	Open Manhole	1200
S21.003	o	225	S113	24.107	22.682	1.200	Open Manhole	1200
S21.004	o	225	S114	23.807	22.382	1.200	Open Manhole	1200
S21.005	o	300	S115	23.607	22.107	1.200	Open Manhole	1200
S21.006	o	300	S116	23.593	22.041	1.253	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)
S16.005	6.437	54.6	S99	24.213	22.488	1.200	Open Manhole	1500
S16.006	10.922	85.3	S100	24.085	22.360	1.200	Open Manhole	1500
S16.007	8.616	105.1	S101	24.003	22.278	1.200	Open Manhole	1500
S16.008	24.413	97.3	S102	23.752	22.027	1.200	Open Manhole	1500
S16.009	25.396	101.6	S103	23.502	21.777	1.200	Open Manhole	1500
S16.010	13.755	133.5	S104	23.400	21.599	1.201	Open Manhole	1500
S16.011	18.458	184.6	S105	23.300	21.499	1.201	Open Manhole	1500
S16.012	28.539	79.9	S106	23.540	21.142	1.798	Open Manhole	1500
S16.013	29.655	556.0	S107	23.900	21.089	2.211	Open Manhole	1500
S16.014	24.556	556.0	S108	24.100	21.044	2.456	Open Manhole	1500
S16.015	23.901	556.0	S109	23.960	21.002	2.358	Open Manhole	1500
S16.016	26.254	295.0	S130	23.600	20.913	2.087	Open Manhole	1500
S21.000	4.798	7.9	SHBRAKE PP5	24.500	23.150	1.200	Open Manhole	1200
S21.001	6.858	54.9	S112	24.375	23.025	1.200	Open Manhole	1200
S21.002	19.437	72.5	S113	24.107	22.682	1.200	Open Manhole	1200
S21.003	28.496	95.0	S114	23.807	22.382	1.200	Open Manhole	1200
S21.004	17.799	89.0	S115	23.607	22.182	1.200	Open Manhole	1200
S21.005	15.802	238.0	S116	23.593	22.041	1.253	Open Manhole	1200
S21.006	14.733	238.0	S117	23.716	21.979	1.437	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S21.007	o	300	S117	23.716	21.979	1.437	Open Manhole	1200
S21.008	o	300	S118	23.862	21.915	1.647	Open Manhole	1200
S22.000	o	150	SPP6	24.399	23.599	0.650	Open Manhole	1200
S22.001	o	150	SHBRAKE PP6	24.273	22.923	1.200	Open Manhole	1200
S21.009	o	300	S121	24.134	21.802	2.032	Open Manhole	1200
S23.000	o	150	S122	25.011	23.661	1.200	Open Manhole	1200
S23.001	o	150	S123	25.196	23.452	1.594	Open Manhole	1200
S23.002	o	150	S124	25.035	23.410	1.475	Open Manhole	1200
S21.010	o	450	S125	24.700	21.562	2.688	Open Manhole	1350
S21.011	o	450	S126	23.700	21.462	1.788	Open Manhole	1350
S21.012	o	525	S127	23.470	21.327	1.618	Open Manhole	1500
S21.013	o	525	S128	23.250	21.243	1.482	Open Manhole	1500
S21.014	o	525	S129	23.500	21.175	1.800	Open Manhole	1500
S16.017	o	600	S130	23.600	20.913	2.087	Open Manhole	1500
S16.018	o	600	S131	23.200	20.853	1.747	Open Manhole	1500
S16.019	o	600	S132	22.600	20.639	1.361	Open Manhole	1500

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)
S21.007	15.080	238.0	S118	23.862	21.915	1.647	Open Manhole	1200
S21.008	26.887	237.9	S121	24.134	21.802	2.031	Open Manhole	1200
S22.000	7.673	11.4	SHBRAKE PP6	24.273	22.923	1.200	Open Manhole	1200
S22.001	7.875	8.1	S121	24.134	21.952	2.032	Open Manhole	1200
S21.009	21.412	237.9	S125	24.700	21.712	2.688	Open Manhole	1350
S23.000	31.295	150.0	S123	25.196	23.452	1.594	Open Manhole	1200
S23.001	6.332	150.0	S124	25.035	23.410	1.475	Open Manhole	1200
S23.002	12.179	7.9	S125	24.700	21.862	2.688	Open Manhole	1350
S21.010	38.483	384.8	S126	23.700	21.462	1.788	Open Manhole	1350
S21.011	23.055	384.2	S127	23.470	21.402	1.618	Open Manhole	1500
S21.012	38.011	452.5	S128	23.250	21.243	1.482	Open Manhole	1500
S21.013	31.029	456.3	S129	23.500	21.175	1.800	Open Manhole	1500
S21.014	12.375	66.2	S130	23.600	20.988	2.087	Open Manhole	1500
S16.017	32.829	556.0	S131	23.200	20.853	1.747	Open Manhole	1500
S16.018	35.912	167.8	S132	22.600	20.639	1.361	Open Manhole	1500
S16.019	32.324	64.6	S133	22.100	20.139	1.361	Open Manhole	1500

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S16.020	o	600	S133	22.100	20.139	1.361	Open Manhole	1500
S24.000	o	150	SPP7	22.625	21.825	0.650	Open Manhole	1200
S24.001	o	150	SHBRAKE PP7	22.878	21.528	1.200	Open Manhole	1200
S24.002	o	150	S136	22.756	21.406	1.200	Open Manhole	1200
S24.003	o	225	S137	22.305	20.880	1.200	Open Manhole	1200
S24.004	o	225	S138	21.804	20.379	1.200	Open Manhole	1200
S25.000	o	150	SPP8	21.536	20.736	0.650	Open Manhole	1200
S25.001	o	225	SHBRAKE PP8	21.790	20.482	1.083	Open Manhole	1200
S25.002	o	225	S141	21.518	20.321	0.972	Open Manhole	1200
S24.005	o	300	S142	21.537	20.165	1.072	Open Manhole	1200
S24.006	o	450	S143	21.713	19.923	1.340	Open Manhole	1350
S16.021	o	675	S144	21.900	19.566	1.659	Open Manhole	1500
S16.022	o	675	S145	22.040	19.504	1.861	Open Manhole	1500
S16.023	o	675	S146	22.230	19.472	2.083	Open Manhole	1500
S16.024	o	675	S147	22.300	19.436	2.189	Open Manhole	1500
S16.025	o	675	S148	22.150	19.392	2.083	Open Manhole	1500
S16.026	o	675	S149	21.900	19.356	1.869	Open Manhole	1500

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)
S16.020	24.523	49.2	S144	21.900	19.641	1.659	Open Manhole	1500
S24.000	6.160	20.7	SHBRAKE PP7	22.878	21.528	1.200	Open Manhole	1200
S24.001	7.988	65.5	S136	22.756	21.406	1.200	Open Manhole	1200
S24.002	28.632	63.5	S137	22.305	20.955	1.200	Open Manhole	1200
S24.003	30.090	60.1	S138	21.804	20.379	1.200	Open Manhole	1200
S24.004	12.984	93.4	S142	21.537	20.240	1.072	Open Manhole	1200
S25.000	6.940	38.8	SHBRAKE PP8	21.790	20.557	1.083	Open Manhole	1200
S25.001	24.162	150.1	S141	21.518	20.321	0.972	Open Manhole	1200
S25.002	12.137	149.8	S142	21.537	20.240	1.072	Open Manhole	1200
S24.005	21.790	238.0	S143	21.713	20.073	1.340	Open Manhole	1350
S24.006	18.221	385.0	S144	21.900	19.876	1.574	Open Manhole	1500
S16.021	34.545	556.0	S145	22.040	19.504	1.861	Open Manhole	1500
S16.022	18.175	556.0	S146	22.230	19.472	2.083	Open Manhole	1500
S16.023	19.666	556.0	S147	22.300	19.436	2.189	Open Manhole	1500
S16.024	24.490	556.0	S148	22.150	19.392	2.083	Open Manhole	1500
S16.025	20.152	556.0	S149	21.900	19.356	1.869	Open Manhole	1500
S16.026	92.652	593.9	SBASIN L	20.100	19.200	0.225	Open Manhole	1500

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S16.027	o	675	SBASIN L	20.100	19.200	0.225	Open Manhole	1500
S16.028	o	450	SHBRAKE BASIN L	20.000	18.949	0.601	Open Manhole	1500

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)
S16.027	90.121	359.0	SHBRAKE BASIN L	20.000	18.949	0.376	Open Manhole	1500
S16.028	39.872	20.4	S	17.500	16.999	0.051	Open Manhole	0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
16.000	-	-	100	0.024	0.024	0.024
17.000	-	-	100	0.041	0.041	0.041
17.001	-	-	100	0.053	0.053	0.053
16.001	-	-	100	0.049	0.049	0.049
16.002	-	-	100	0.047	0.047	0.047
18.000	-	-	100	0.045	0.045	0.045
18.001	-	-	100	0.077	0.077	0.077
19.000	-	-	100	0.011	0.011	0.011
19.001	-	-	100	0.028	0.028	0.028
19.002	-	-	100	0.113	0.113	0.113
19.003	-	-	100	0.008	0.008	0.008
16.003	-	-	100	0.104	0.104	0.104
16.004	-	-	100	0.012	0.012	0.012
20.000	-	-	100	0.014	0.014	0.014
20.001	-	-	100	0.034	0.034	0.034
16.005	-	-	100	0.011	0.011	0.011
16.006	-	-	100	0.000	0.000	0.000
16.007	-	-	100	0.030	0.030	0.030
16.008	-	-	100	0.000	0.000	0.000
16.009	-	-	100	0.127	0.127	0.127
16.010	-	-	100	0.055	0.055	0.055
16.011	-	-	100	0.078	0.078	0.078
16.012	-	-	100	0.091	0.091	0.091
16.013	-	-	100	0.045	0.045	0.045
16.014	-	-	100	0.045	0.045	0.045
16.015	-	-	100	0.000	0.000	0.000
16.016	-	-	100	0.051	0.051	0.051
21.000	-	-	100	0.016	0.016	0.016
21.001	-	-	100	0.058	0.058	0.058
21.002	-	-	100	0.024	0.024	0.024
21.003	-	-	100	0.082	0.082	0.082
21.004	-	-	100	0.032	0.032	0.032
21.005	-	-	100	0.038	0.038	0.038
21.006	-	-	100	0.041	0.041	0.041
21.007	-	-	100	0.034	0.034	0.034
21.008	-	-	100	0.024	0.024	0.024
22.000	-	-	100	0.019	0.019	0.019
22.001	-	-	100	0.000	0.000	0.000
21.009	-	-	100	0.061	0.061	0.061
23.000	-	-	100	0.022	0.022	0.022
23.001	-	-	100	0.044	0.044	0.044
23.002	-	-	100	0.000	0.000	0.000
21.010	-	-	100	0.017	0.017	0.017
21.011	-	-	100	0.054	0.054	0.054
21.012	-	-	100	0.061	0.061	0.061
21.013	-	-	100	0.115	0.115	0.115
21.014	-	-	100	0.030	0.030	0.030
16.017	-	-	100	0.068	0.068	0.068
16.018	-	-	100	0.083	0.083	0.083
16.019	-	-	100	0.051	0.051	0.051
16.020	-	-	100	0.056	0.056	0.056

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
24.000	-	-	100	0.035	0.035	0.035
24.001	-	-	100	0.043	0.043	0.043
24.002	-	-	100	0.000	0.000	0.000
24.003	-	-	100	0.044	0.044	0.044
24.004	-	-	100	0.042	0.042	0.042
25.000	-	-	100	0.020	0.020	0.020
25.001	-	-	100	0.021	0.021	0.021
25.002	-	-	100	0.042	0.042	0.042
24.005	-	-	100	0.019	0.019	0.019
24.006	-	-	100	0.006	0.006	0.006
16.021	-	-	100	0.089	0.089	0.089
16.022	-	-	100	0.032	0.032	0.032
16.023	-	-	100	0.016	0.016	0.016
16.024	-	-	100	0.005	0.005	0.005
16.025	-	-	100	0.043	0.043	0.043
16.026	-	-	100	0.014	0.014	0.014
16.027	-	-	100	0.000	0.000	0.000
16.028	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				2.694	2.694	2.694

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S16.028	S	17.500	16.999	17.000	0	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1440	17.500	5760	17.500	10080	17.500	14400	17.500	18720	17.500
2880	17.500	7200	17.500	11520	17.500	15840	17.500	20160	17.500
4320	17.500	8640	17.500	12960	17.500	17280	17.500		

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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	5
Number of Online Controls	5	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)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.900	Storm Duration (mins)	30
Ratio R	0.350		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SHBRAKE PP5, DS/PN: S21.001, Volume (m³): 1.6

Unit Reference	MD-SHE-0087-3500-1104-3500
Design Head (m)	1.104
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	87
Invert Level (m)	23.150
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.104	3.5
Flush-Flo™	0.334	3.5
Kick-Flo®	0.689	2.8
Mean Flow over Head Range	-	3.1

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	2.7	1.200	3.6	3.000	5.6	7.000	8.3
0.200	3.3	1.400	3.9	3.500	6.0	7.500	8.6
0.300	3.5	1.600	4.2	4.000	6.4	8.000	8.9
0.400	3.5	1.800	4.4	4.500	6.7	8.500	9.1
0.500	3.4	2.000	4.6	5.000	7.1	9.000	9.4
0.600	3.2	2.200	4.8	5.500	7.4	9.500	9.6
0.800	3.0	2.400	5.0	6.000	7.7		
1.000	3.3	2.600	5.2	6.500	8.0		

Hydro-Brake® Optimum Manhole: SHBRAKE PP6, DS/PN: S22.001, Volume (m³): 1.6

Unit Reference	MD-SHE-0055-1500-1176-1500
Design Head (m)	1.176
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	55
Invert Level (m)	22.923
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

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Hydro-Brake® Optimum Manhole: SHBRAKE PP6, DS/PN: S22.001, Volume (m³): 1.6

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.176	1.5
Flush-Flo™	0.245	1.2
Kick-Flo®	0.496	1.0
Mean Flow over Head Range	-	1.2

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	1.1	1.200	1.5	3.000	2.3	7.000	3.4
0.200	1.2	1.400	1.6	3.500	2.5	7.500	3.5
0.300	1.2	1.600	1.7	4.000	2.6	8.000	3.6
0.400	1.2	1.800	1.8	4.500	2.8	8.500	3.7
0.500	1.0	2.000	1.9	5.000	2.9	9.000	3.8
0.600	1.1	2.200	2.0	5.500	3.0	9.500	3.9
0.800	1.3	2.400	2.1	6.000	3.2		
1.000	1.4	2.600	2.1	6.500	3.3		

Hydro-Brake® Optimum Manhole: SHBRAKE PP7, DS/PN: S24.001, Volume (m³): 1.6

Unit Reference	MD-SHE-0061-1500-0797-1500
Design Head (m)	0.797
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	61
Invert Level (m)	21.528
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.797	1.5
Flush-Flo™	0.247	1.5
Kick-Flo®	0.506	1.2
Mean Flow over Head Range	-	1.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.3	0.300	1.5	0.500	1.2	0.800	1.5
0.200	1.5	0.400	1.4	0.600	1.3	1.000	1.7

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Hydro-Brake® Optimum Manhole: SHBRAKE PP7, DS/PN: S24.001, Volume (m³): 1.6

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.200	1.8	2.400	2.5	5.000	3.5	8.000	4.3
1.400	1.9	2.600	2.6	5.500	3.6	8.500	4.5
1.600	2.1	3.000	2.7	6.000	3.8	9.000	4.6
1.800	2.2	3.500	2.9	6.500	3.9	9.500	4.7
2.000	2.3	4.000	3.1	7.000	4.1		
2.200	2.4	4.500	3.3	7.500	4.2		

Hydro-Brake® Optimum Manhole: SHBRAKE PP8, DS/PN: S25.001, Volume (m³): 1.6

Unit Reference	MD-SHE-0051-1000-0679-1000
Design Head (m)	0.679
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	51
Invert Level (m)	20.557
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.679	1.0
Flush-Flo™	0.213	1.0
Kick-Flo®	0.435	0.8
Mean Flow over Head Range	-	0.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.9	1.200	1.3	3.000	2.0	7.000	2.9
0.200	1.0	1.400	1.4	3.500	2.1	7.500	3.0
0.300	1.0	1.600	1.5	4.000	2.2	8.000	3.1
0.400	0.9	1.800	1.5	4.500	2.4	8.500	3.2
0.500	0.9	2.000	1.6	5.000	2.5	9.000	3.3
0.600	0.9	2.200	1.7	5.500	2.6	9.500	3.4
0.800	1.1	2.400	1.8	6.000	2.7		
1.000	1.2	2.600	1.8	6.500	2.8		

Hydro-Brake® Optimum Manhole: SHBRAKE BASIN L, DS/PN: S16.028, Volume (m³): 33.6

Unit Reference	MD-SHE-0265-3960-1150-3960
Design Head (m)	1.150
Design Flow (l/s)	39.6

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Hydro-Brake® Optimum Manhole: SHBRAKE BASIN L, DS/PN: S16.028, Volume (m³): 33.6

Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	265
Invert Level (m)	18.949
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.150	39.6
Flush-Flo™	0.428	39.6
Kick-Flo®	0.852	34.3
Mean Flow over Head Range	-	32.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.4	1.200	40.4	3.000	62.9	7.000	95.0
0.200	27.2	1.400	43.5	3.500	67.8	7.500	98.2
0.300	38.7	1.600	46.4	4.000	72.3	8.000	101.4
0.400	39.6	1.800	49.1	4.500	76.6	8.500	104.4
0.500	39.4	2.000	51.7	5.000	80.6	9.000	107.4
0.600	38.8	2.200	54.1	5.500	84.4	9.500	110.2
0.800	36.0	2.400	56.5	6.000	88.1		
1.000	37.0	2.600	58.7	6.500	91.6		

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Storage Structures for Storm

Porous Car Park Manhole: SPP5, DS/PN: S21.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	16.2
Max Percolation (l/s)	45.0	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	23.754	Membrane Depth (mm)	0

Porous Car Park Manhole: SPP6, DS/PN: S22.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	18.7
Max Percolation (l/s)	51.9	Slope (1:X)	60.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	23.599	Membrane Depth (mm)	0

Porous Car Park Manhole: SPP7, DS/PN: S24.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.0
Membrane Percolation (mm/hr)	1000	Length (m)	31.9
Max Percolation (l/s)	97.5	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	21.825	Membrane Depth (mm)	0

Porous Car Park Manhole: SPP8, DS/PN: S25.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.0
Membrane Percolation (mm/hr)	1000	Length (m)	17.7
Max Percolation (l/s)	54.1	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	20.736	Membrane Depth (mm)	0

Tank or Pond Manhole: SBASIN L, DS/PN: S16.027

Invert Level (m) 19.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1788.0	0.900	3216.0

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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 5
Number of Online Controls 5 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 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.900 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 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)
S16.000	S83	15 Winter	100	+40%					25.226
S17.000	S84	15 Winter	100	+40%					26.626
S17.001	S85	15 Summer	100	+40%					25.775
S16.001	S86	15 Winter	100	+40%					24.921
S16.002	S87	15 Winter	100	+40%	100/15 Summer				24.681
S18.000	S88	15 Winter	100	+40%					25.744
S18.001	S89	15 Summer	100	+40%					24.923
S19.000	S90	15 Winter	100	+40%					25.246
S19.001	S91	15 Summer	100	+40%					24.870
S19.002	S92	15 Summer	100	+40%					24.697
S19.003	S93	15 Winter	100	+40%					24.462
S16.003	S94	15 Winter	100	+40%	100/15 Summer				24.361
S16.004	S95	15 Winter	100	+40%	100/15 Summer				24.158
S20.000	S96	15 Winter	100	+40%	100/15 Summer				24.166
S20.001	S97	15 Winter	100	+40%	100/15 Summer				24.144
S16.005	S98	15 Winter	100	+40%	100/15 Summer				24.044
S16.006	S99	15 Winter	100	+40%	100/15 Summer				23.917
S16.007	S100	15 Winter	100	+40%	100/15 Summer				23.807

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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)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S16.000	S83	-0.054	0.000	0.73			15.1	OK	
S17.000	S84	-0.049	0.000	0.79			25.9	OK	
S17.001	S85	-0.091	0.000	0.66			59.3	OK	
S16.001	S86	-0.026	0.000	0.84			102.4	OK	
S16.002	S87	0.129	0.000	1.08			125.0	SURCHARGED	
S18.000	S88	-0.039	0.000	0.90			28.4	OK	
S18.001	S89	-0.065	0.000	0.85			77.0	OK	
S19.000	S90	-0.094	0.000	0.30			6.9	OK	
S19.001	S91	-0.125	0.000	0.41			24.6	OK	
S19.002	S92	-0.103	0.000	0.76			96.0	OK	
S19.003	S93	-0.085	0.000	0.77			101.1	OK	
S16.003	S94	0.193	0.000	0.68			347.4	SURCHARGED	
S16.004	S95	0.831	0.000	0.99			337.7	SURCHARGED	
S20.000	S96	0.432	0.000	0.39			8.0	SURCHARGED	
S20.001	S97	0.920	0.000	1.49			19.8	FLOOD RISK	
S16.005	S98	0.913	0.000	1.35			356.6	SURCHARGED	
S16.006	S99	0.904	0.000	1.27			347.6	FLOOD RISK	
S16.007	S100	0.922	0.000	1.42			353.9	FLOOD RISK	

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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
S16.008	S101	15 Winter	100	+40%	100/15 Summer		
S16.009	S102	30 Winter	100	+40%	100/15 Summer		
S16.010	S103	30 Winter	100	+40%	100/15 Summer		
S16.011	S104	30 Winter	100	+40%	100/15 Summer		
S16.012	S105	30 Winter	100	+40%	100/15 Summer	100/15 Winter	
S16.013	S106	30 Winter	100	+40%	100/15 Summer		
S16.014	S107	30 Winter	100	+40%	100/15 Summer		
S16.015	S108	30 Winter	100	+40%	100/15 Summer		
S16.016	S109	30 Winter	100	+40%	100/15 Summer		
S21.000	SPP5	60 Winter	100	+40%	100/15 Summer		
S21.001	SHBRAKE PP5	15 Winter	100	+40%	100/15 Summer		
S21.002	S112	15 Winter	100	+40%	100/15 Summer		
S21.003	S113	15 Winter	100	+40%	100/15 Summer		
S21.004	S114	15 Winter	100	+40%	100/15 Summer		
S21.005	S115	30 Winter	100	+40%	100/15 Summer	100/30 Winter	
S21.006	S116	30 Winter	100	+40%	100/15 Summer		
S21.007	S117	30 Winter	100	+40%	100/15 Summer		
S21.008	S118	30 Winter	100	+40%	100/15 Summer		
S22.000	SPP6	60 Winter	100	+40%	100/15 Winter		
S22.001	SHBRAKE PP6	60 Winter	100	+40%	100/15 Summer		
S21.009	S121	30 Winter	100	+40%	100/15 Summer		
S23.000	S122	15 Winter	100	+40%	100/15 Summer		
S23.001	S123	15 Winter	100	+40%	100/15 Summer		
S23.002	S124	15 Winter	100	+40%			
S21.010	S125	30 Winter	100	+40%	100/15 Summer		
S21.011	S126	30 Winter	100	+40%	100/15 Summer		
S21.012	S127	30 Winter	100	+40%	100/15 Summer		
S21.013	S128	30 Winter	100	+40%	100/15 Summer		
S21.014	S129	30 Winter	100	+40%	100/15 Summer		
S16.017	S130	30 Winter	100	+40%	100/15 Summer		
S16.018	S131	30 Winter	100	+40%	100/15 Summer		
S16.019	S132	30 Winter	100	+40%	100/15 Summer		
S16.020	S133	30 Winter	100	+40%	100/15 Summer		
S24.000	SPP7	180 Winter	100	+40%	100/15 Summer		
S24.001	SHBRAKE PP7	180 Winter	100	+40%	100/15 Summer		
S24.002	S136	30 Winter	100	+40%	100/30 Winter		
S24.003	S137	30 Winter	100	+40%	100/15 Summer		
S24.004	S138	30 Winter	100	+40%	100/15 Summer		
S25.000	SPP8	180 Winter	100	+40%	100/15 Summer		
S25.001	SHBRAKE PP8	180 Winter	100	+40%	100/15 Summer		
S25.002	S141	30 Winter	100	+40%	100/15 Summer	100/30 Winter	
S24.005	S142	30 Winter	100	+40%	100/15 Summer	100/30 Winter	
S24.006	S143	30 Winter	100	+40%	100/15 Summer		
S16.021	S144	30 Winter	100	+40%	100/15 Summer		
S16.022	S145	30 Winter	100	+40%	100/15 Summer		
S16.023	S146	30 Winter	100	+40%	100/15 Summer		
S16.024	S147	30 Winter	100	+40%	100/15 Summer		
S16.025	S148	30 Winter	100	+40%	100/15 Summer		
S16.026	S149	30 Winter	100	+40%	100/15 Summer		

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S16.008	S101		23.691	0.888	0.000	0.86			329.7
S16.009	S102		23.578	1.026	0.000	0.82			314.6
S16.010	S103		23.438	1.136	0.000	0.95			328.9
S16.011	S104		23.381	1.182	0.000	1.01			350.3
S16.012	S105		23.310	1.211	10.449	0.62			373.5
S16.013	S106		23.256	1.514	0.000	1.59			374.2
S16.014	S107		23.190	1.501	0.000	1.75			374.2
S16.015	S108		23.108	1.464	0.000	1.71			359.5
S16.016	S109		23.035	1.433	0.000	1.15			365.5
S21.000	SPP5		24.245	0.341	0.000	0.07		58	3.3
S21.001	SHBRAKE PP5		24.251	0.951	0.000	0.17			3.5
S21.002	S112		24.037	0.862	0.000	0.28			15.2
S21.003	S113		24.014	1.107	0.000	0.93			45.9
S21.004	S114		23.796	1.189	0.000	1.16			57.4
S21.005	S115		23.609	1.202	1.271	1.04			62.8
S21.006	S116		23.589	1.248	0.000	1.28			76.8
S21.007	S117		23.548	1.269	0.000	1.46			88.2
S21.008	S118		23.479	1.264	0.000	1.47			95.0
S22.000	SPP6		23.799	0.050	0.000	0.08		37	3.9
S22.001	SHBRAKE PP6		23.795	0.722	0.000	0.02			1.3
S21.009	S121		23.354	1.252	0.000	1.88			118.6
S23.000	S122		24.136	0.325	0.000	0.91			12.6
S23.001	S123		23.971	0.368	0.000	3.06			37.3
S23.002	S124		23.499	-0.061	0.000	0.65			37.5
S21.010	S125		23.202	1.190	0.000	1.01			147.2
S21.011	S126		23.144	1.232	0.000	1.19			161.0
S21.012	S127		23.089	1.237	0.000	0.87			170.8
S21.013	S128		23.041	1.273	0.000	1.05			199.7
S21.014	S129		22.982	1.282	0.000	0.60			198.9
S16.017	S130		22.943	1.430	0.000	2.37			569.0
S16.018	S131		22.645	1.191	0.000	1.32			585.3
S16.019	S132		22.290	1.051	0.000	0.84			592.4
S16.020	S133		21.944	1.205	0.000	0.85			601.7
S24.000	SPP7		22.295	0.320	0.000	0.04			1.4
S24.001	SHBRAKE PP7		22.294	0.616	0.000	0.08			1.5
S24.002	S136		21.600	0.044	0.000	0.13			2.7
S24.003	S137		21.593	0.488	0.000	0.36			22.6
S24.004	S138		21.569	0.965	0.000	0.86			39.9
S25.000	SPP8		21.094	0.208	0.000	0.05		168	1.3
S25.001	SHBRAKE PP8		21.093	0.386	0.000	0.02			1.0
S25.002	S141		21.521	0.975	3.211	0.80			29.1
S24.005	S142		21.540	1.075	3.588	0.97			61.5
S24.006	S143		21.579	1.206	0.000	0.44			56.2
S16.021	S144		21.585	1.344	0.000	1.97			635.0
S16.022	S145		21.354	1.174	0.000	2.80			636.9
S16.023	S146		21.118	0.971	0.000	2.64			637.2
S16.024	S147		20.873	0.762	0.000	2.24			633.3
S16.025	S148		20.623	0.556	0.000	2.60			640.3

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S16.026	S149		20.365	0.334	0.000	1.78			623.7

PN	US/MH Name	Status	Level Exceeded
S16.008	S101	SURCHARGED	
S16.009	S102	FLOOD RISK	
S16.010	S103	FLOOD RISK	
S16.011	S104	FLOOD RISK	
S16.012	S105	FLOOD	2
S16.013	S106	FLOOD RISK	
S16.014	S107	SURCHARGED	
S16.015	S108	SURCHARGED	
S16.016	S109	SURCHARGED	
S21.000	SPP5	SURCHARGED	
S21.001	SHBRAKE PP5	FLOOD RISK	
S21.002	S112	SURCHARGED	
S21.003	S113	FLOOD RISK	
S21.004	S114	FLOOD RISK	
S21.005	S115	FLOOD	1
S21.006	S116	FLOOD RISK	
S21.007	S117	FLOOD RISK	
S21.008	S118	SURCHARGED	
S22.000	SPP6	SURCHARGED	
S22.001	SHBRAKE PP6	SURCHARGED	
S21.009	S121	SURCHARGED	
S23.000	S122	SURCHARGED	
S23.001	S123	SURCHARGED	
S23.002	S124	OK	
S21.010	S125	SURCHARGED	
S21.011	S126	SURCHARGED	
S21.012	S127	SURCHARGED	
S21.013	S128	FLOOD RISK	
S21.014	S129	SURCHARGED	
S16.017	S130	SURCHARGED	
S16.018	S131	SURCHARGED	
S16.019	S132	SURCHARGED	
S16.020	S133	FLOOD RISK	
S24.000	SPP7	SURCHARGED	
S24.001	SHBRAKE PP7	SURCHARGED	
S24.002	S136	SURCHARGED	
S24.003	S137	SURCHARGED	
S24.004	S138	FLOOD RISK	
S25.000	SPP8	SURCHARGED	
S25.001	SHBRAKE PP8	SURCHARGED	
S25.002	S141	FLOOD	1
S24.005	S142	FLOOD	1

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

PN	US/MH Name	Status	Level Exceeded
S24.006	S143	FLOOD RISK	
S16.021	S144	SURCHARGED	
S16.022	S145	SURCHARGED	
S16.023	S146	SURCHARGED	
S16.024	S147	SURCHARGED	
S16.025	S148	SURCHARGED	
S16.026	S149	SURCHARGED	

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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
S16.027	SBASIN L	360 Winter	100	+40%			
S16.028	SHBRAKE BASIN L	240 Winter	100	+40%	100/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
S16.027	SBASIN L		19.805	-0.070	0.000	0.11		
S16.028	SHBRAKE BASIN L		19.832	0.433	0.000	0.06		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S16.027	SBASIN L	47.9	FLOOD RISK	
S16.028	SHBRAKE BASIN L	39.6	FLOOD RISK	

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APPENDIX C

Water Management Strategy

NOTES

1. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
2. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES.
3. CULVERTED DITCH LEVELS HAVE BEEN INTERPOLATED FROM SURVEY UNDERTAKEN BY LIGHTSOURCE SURVEYS LTD IN APRIL 2018
4. PROPOSALS ARE INDICATIVE ONLY TO DEMONSTRATE DRAINAGE STRATEGY AND ARE SUBJECT TO EVOLVE THROUGH DETAILED DESIGN
5. THE LEVELS SHOWN ON THIS DRAWING ARE PRELIMINARY AND SUBJECT TO CHANGE.
6. LIGHTING DESIGN IS INDICATIVE AND SUBJECT TO CHANGE AT DETAILED DESIGN.
7. IN COMPLIANCE WITH CDM REGULATIONS 2015, ODYSSEY HAS FOLLOWED ITS DESIGN RISK MANAGEMENT PROCESS FOR HAZARD ELIMINATION AND RISK REDUCTION IN DEVELOPING THE ODYSSEY DESIGNS SHOWN ON THIS DRAWING.
8. ABNORMAL OR UNUSUAL RESIDUAL RISKS MAY BE INDICATED BY USE OF HEALTH AND SAFETY SYMBOLS WHERE IT IS CONSIDERED THAT SUCH RISK MAY NOT NORMALLY BE EXPECTED BY COMPETENT PERSONS OR CONTRACTORS WITH NECESSARY SKILLS, KNOWLEDGE AND EXPERIENCE TO BE ENGAGED ON WORK OF THIS NATURE OR TYPE.

LEGEND

- SITE BOUNDARY
- PROPOSED FOUL SEWER & MANHOLE
- PROPOSED SURFACE WATER SEWER & MANHOLE
- VORTEX FLOW CONTROL
- PROPOSED PERMEABLE PAVING
- PROPOSED HEADWALL
- INDICATIVE ATTENUATION BASIN
- BASIN EARTHWORKS EXTENT
- INDICATIVE RAIN GARDEN
- PROPOSED SWALE

FOR PLANNING PURPOSES ONLY

Rev	Amendments	Drn	Chk	App	Date
C	UPDATED TO SUIT NEW LAYOUT	NA	JH	GG	24.05.21
B	UPDATED TO INCLUDE CDM INFORMATION	NA	JH	GG	12.02.21
A	UPDATED TO CLIENT COMMENTS	NA	JH	GG	15.12.20

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Job Title
HORTON HEATH, EASTLEIGH

Drawing Title
DRAINAGE STRATEGY

Client
EASTLEIGH BOROUGH COUNCIL

Scale	Date	Designed
1:500 @A0	NOV 20	NA
Drawn	Checked	Approved
JA	JW	JH
Job No	Drawing No	Rev
19-367	19-367/001	C

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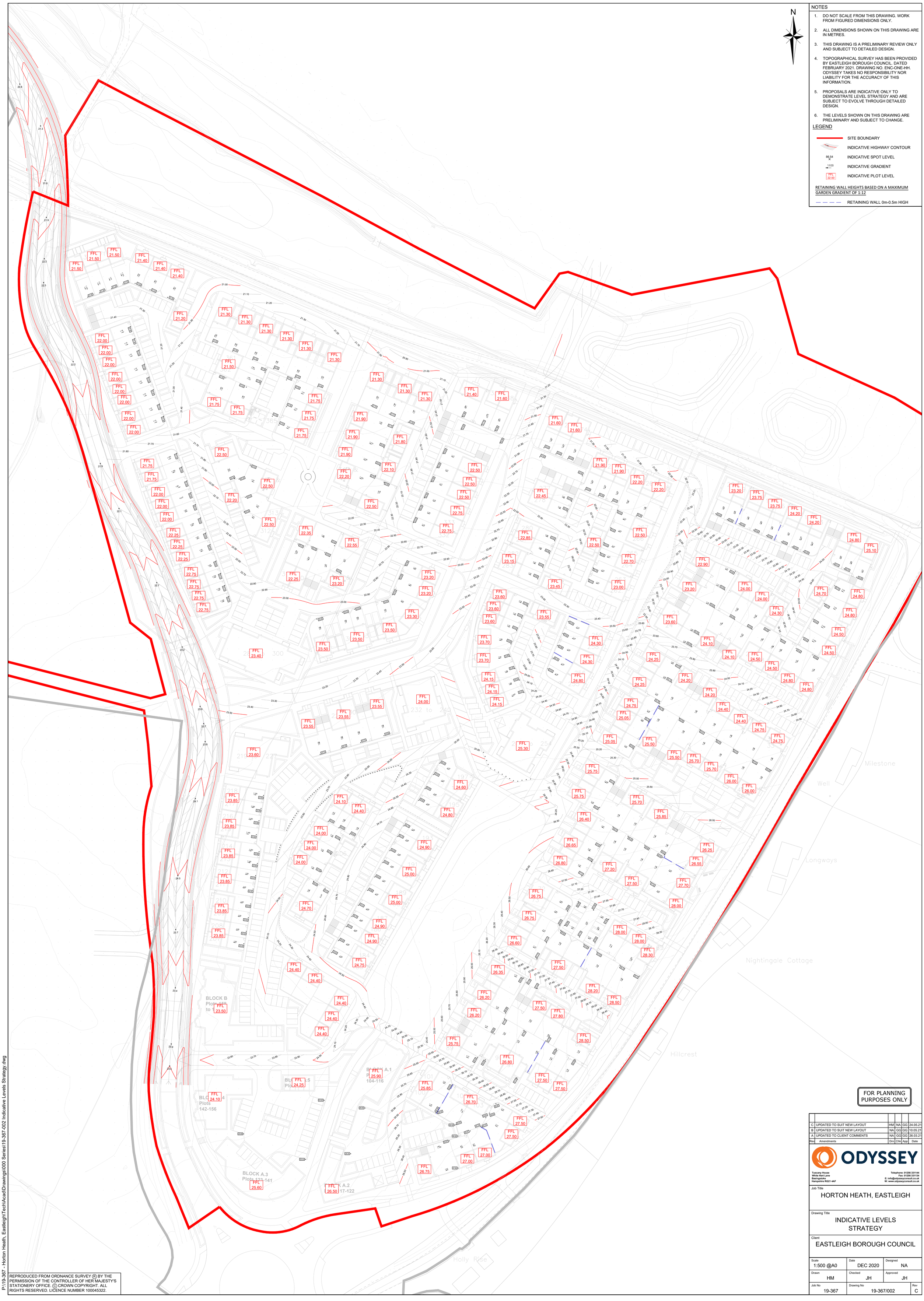

NOTES

1. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
2. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES.
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6. THE LEVELS SHOWN ON THIS DRAWING ARE PRELIMINARY AND SUBJECT TO CHANGE.

LEGEND

- SITE BOUNDARY
- INDICATIVE HIGHWAY CONTOUR
- 86.54 INDICATIVE SPOT LEVEL
- 1:00 INDICATIVE GRADIENT
- FFL 22.00 INDICATIVE PLOT LEVEL

RETAINING WALL HEIGHTS BASED ON A MAXIMUM GARDEN GRADIENT OF 1:12

- RETAINING WALL 0m-0.5m HIGH

FOR PLANNING PURPOSES ONLY

Rev	Amendments	Drn	Chk	App	Date
C	UPDATED TO SUIT NEW LAYOUT	HM	NA	GG	24.05.21
B	UPDATED TO SUIT NEW LAYOUT	NA	GG	GG	10.05.21
A	UPDATED TO CLIENT COMMENTS	NA	GG	GG	26.03.21

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Job Title
HORTON HEATH, EASTLEIGH

Drawing Title
INDICATIVE LEVELS STRATEGY

Client
EASTLEIGH BOROUGH COUNCIL

Scale	Date	Designed
1:500 @A0	DEC 2020	NA
Drawn	**Checked**	**Approved**
HM	JH	JH

Job No	Drawing No	Rev
19-367	19-367/002	C

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