70015667-TN-202401

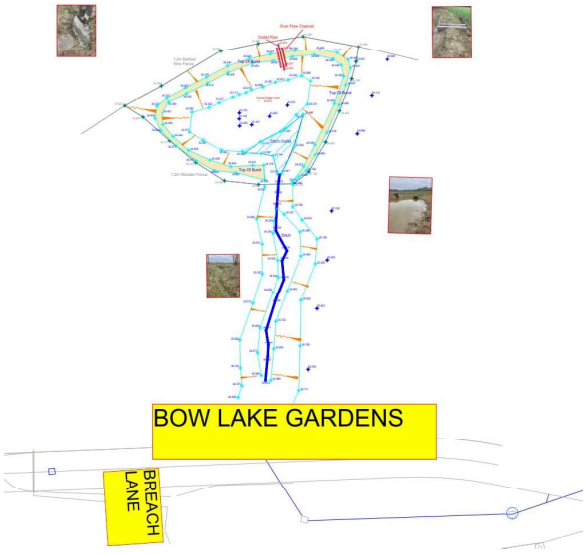
DATE:	21 May 2024	**CONFIDENTIALITY:**	Public
SUBJECT:	Bow Lake Gardens - As Built Drainage Basin Review		
PROJECT:	Church Road, Bishopstoke	**AUTHOR:**	Julien Blavignac [redacted]
CHECKED:	Luke Beeching / Oliver F[redacted]	**APPROVED:**	Luke Beeching [redacted]

WETLAND BASIN - AS BUILT REVIEW

Introduction

This Technical Note has been prepared to summarise the review of as-built information for the wetland basin at the Church Road development in Bishopstoke.

The basin is located on the edge of a wooded area, north of Bow Lake Gardens adjacent to the junction with Breach Lane. The nearest post code and associated grid coordinates are SO50 6JJ and (446548, 120256), respectively.



Wetland Basin location overview.

The wetland basin is a downstream component of a surface water drainage system that is serving the adjacent Vistry Homes (previously Bovis Homes) development and allows surface water runoff to be stored, before being released at a controlled rate to the downstream field and surrounding wider area.

The following documents were reviewed:

(1) WSP Wetland Basin Rehabilitation Works ref. 5667-SD-030 Rev P02 (dated 11.01/23).

(2) Overflow Pond, As Built Survey ref. 13124 (dated 13.01.24).

The review also included a list of responses to queries that were raised by WSP to the contractor via Vistry Homes.

WSP has relied on the information provided and has not conducted independent site inspection or survey following completion of the work.

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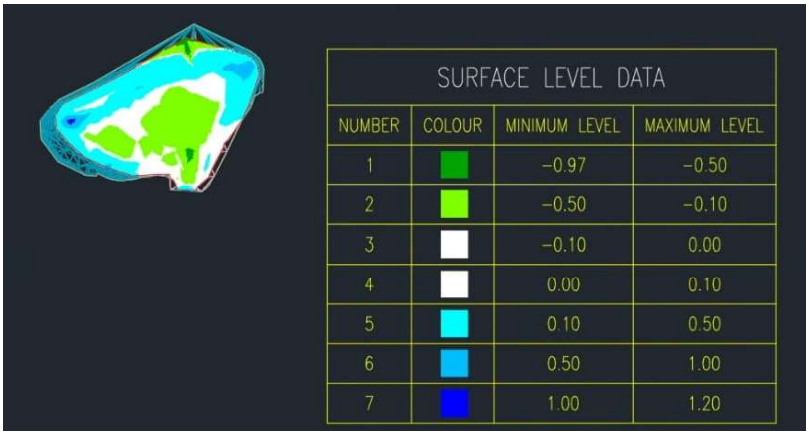
Comparison of as-built details against WSP Design

The review covered:

A. Volume review – Isopachyte comparison of design and as-built survey
B. Comparison of outfall details
C. Review of photos included on as-built survey drawing.
D. Input of the As Built Survey information into WSP's Microdrainage software model to assess the performance of the as built structure against the design.

A. VOLUME REVIEW – ISOPACHYTE

An isopachyte comparison & spot check was conducted which allowed the comparison of the as-built profile against WSP design information.



SURFACE LEVEL DATA

NUMBER	COLOUR	MINIMUM LEVEL	MAXIMUM LEVEL
1		-0.97	-0.50
2		-0.50	-0.10
3		-0.10	0.00
4		0.00	0.10
5		0.10	0.50
6		0.50	1.00
7		1.00	1.20

Isopachyte Summary.

The shade of green highlights areas of the basin where the constructed levels are lower than designed for.

The shade of blue highlights areas where constructed levels are higher than designed for.

Key sections have been produced, with solid lines showing the as-built profile and dashed lines showing the design profile.

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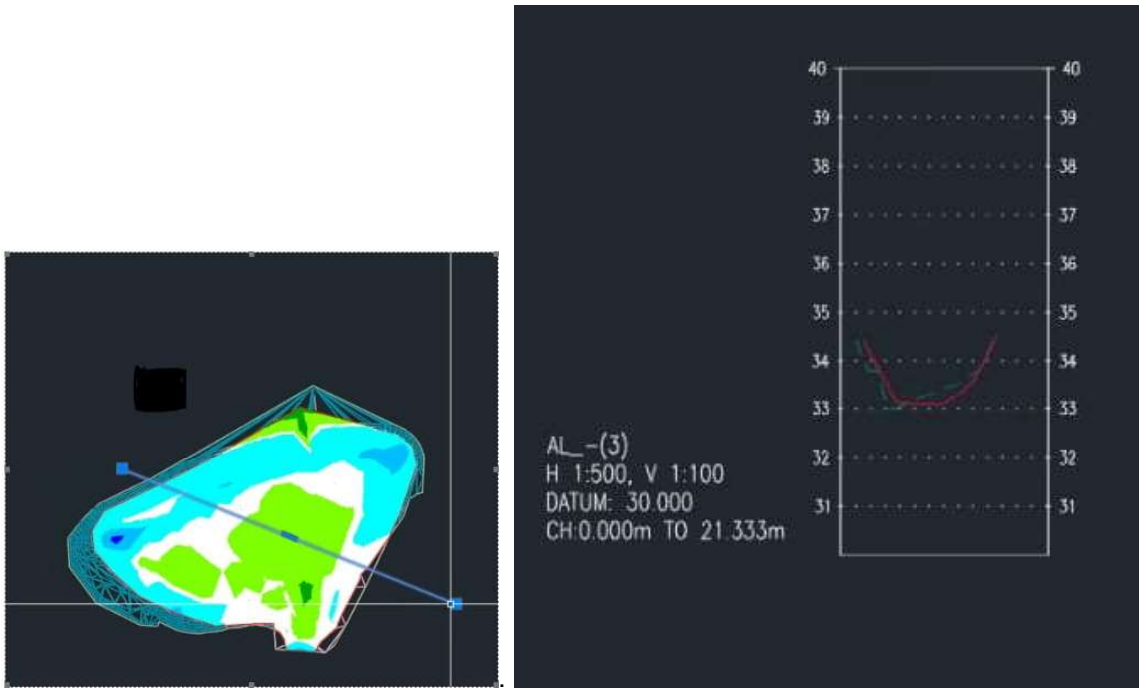
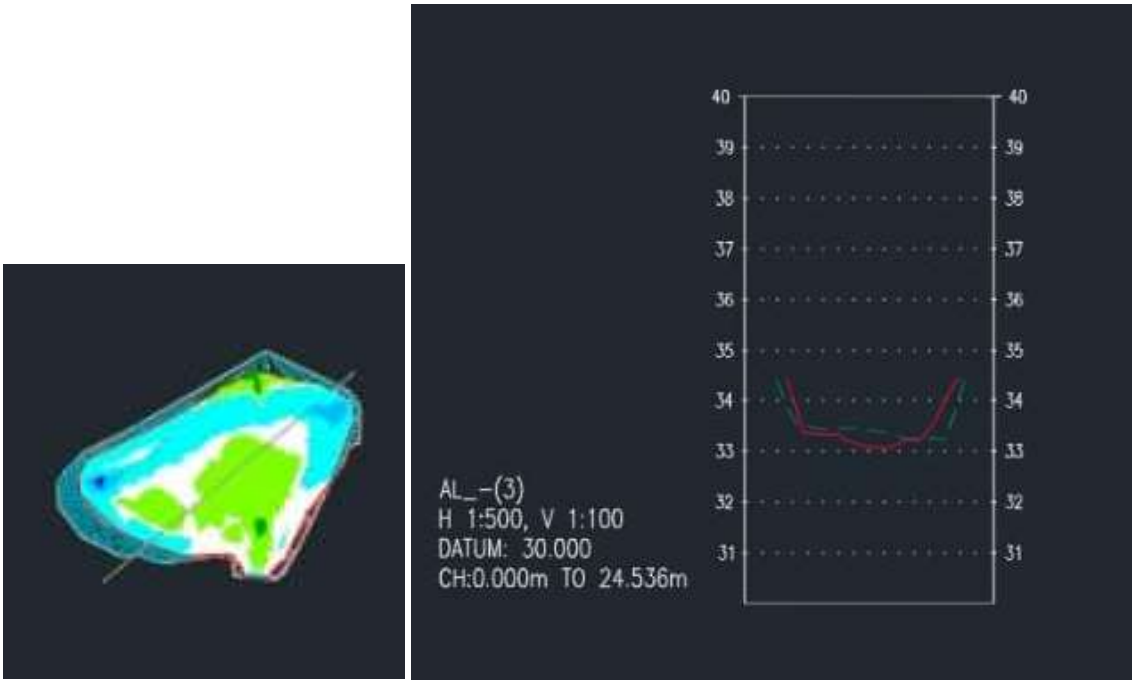


Isopachyte Section Profile N.1.



Isopachyte Section Profile N.2.

From observation, it was noted that the as-built basin has a profile that is close to the design one, with much of the Basin falling within a +/- 100mm range (highlighted by the colour white). Localised areas of higher-than-designed-for levels are indicated by the light blue colour. These areas fall within the range of +100mm to +500mm.

The crest of the basin embankment on its north side is slightly lower than designed for, with a reduction in basin crest level from a design level of 34.50m AOD to 34.39m AOD (at the lowest point).

Vistry Homes has confirmed that this variation is due to the proximity of the site boundary fence and existing trees, which meant the height of the bund was adjusted during construction. Refer to extract of key correspondence in Appendix.

B. COMPARISON OF OUTFALL DETAILS

The design specified a 90mm diam. outlet pipe to be set at 33.460m AOD.

The as-built survey confirms that the pipe outlet is set at a level of 33.442m AOD which is marginally lower (18mm). Although the pipe diameter is not shown on the as-built survey, it was confirmed to be 90mm in the follow up queries with the contractor.

The weir channel is set at 34.013 which is effectively the 34.010 design level. The as-built survey does not include key dimensions of the weir channel. But these have been confirmed to be as designed in subsequent correspondence. (refer to appendix for query correspondence details).

C. REVIEW OF PHOTOS INCLUDED ON AS-BUILT SURVEY DRAWING.

Photos included on As Built Survey.

Photos included in the survey show that gravel materials have been installed just downstream of the 90mm diameter pipe outlet. WSP design allowed for 40mm single size shingle to be installed in a 300mm depth gravel pit to help dissipate outflows from basin and reduce scour. 20mm shingle was originally installed which will not be as efficient in reducing the risk of erosion. We understand that this has since been replaced with 40mm single size shingle.

D. Input of the As Built Survey information into Microdrainage model to assess the performance OF THE AS BUILT STRUCTURE AGAINST WSP PROPOSALS.

A copy of WSP's MicroDrainage model was updated and assessed with the as-built information.

Our main observations and recommendations were as follows:

- The as-built shape of the basin slightly reduces the available storage volume, which means that the updated hydraulic model indicates an increased water level and discharge over the weir for the 1 in 100yr (climate change) storm event.
- The slightly lower 90mm diameter pipe results in an increased head of water and a marginal increase in the predicted 1yr discharge rate.
- The difference in the discharge for the 1yr rainfall event is 0.2 l/s or 2% of the agreed rate. This variation would not be material to downstream flood risk.
- The discharge in the 30yr rainfall event remains below the agreed rate.
- The discharge for the 100yr event is 3.1 l/s over the agreed 41.2 l/s rate (~7%). This is similarly unlikely to have a noticeable downstream effect in this kind of storm event, however it is a more significant increase and options were therefore considered to reduce the discharge back down to the agreed rate. Installing a 100 x 200 piece of treated timber (of at least 500mm length) within the weir channel and hence raising the weir level by 100mm would reduce the rate to 41.1 l/s. This was proposed be bolted to the installed timber arrangement. The modelled maximum water level increased to 34.275m AOD, which uses a portion of the available freeboard, but still leaves >100mm to the lowest point on the basin perimeter (34.390m AOD)

A copy of the MicroDrainage calculation outputs for the as-built basin and for the 100mm increase in the weir level is included in the Appendix. Summary tables are set out below.

Return Period	Agreed greenfield discharge rates (l/s)
1 year	11.0
30 year	29.2
100 year	41.2

Derived from rates set out in "Land North of Breach Lane, Flood Risk Assessment", produced by Mayer Brown Ltd., July 2013

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As-built basin			
Return Period	Critical Storm Duration	Peak Discharge Rate	Top Water Level
1 year	720 min	11.2 l/s	33.929m
30 year	180 min	19.2 l/s	34.076m
100 year (+30% CC)	120 min	44.3 l/s	34.192m

As-built basin with raised weir proposal (+100mm)			
Return Period	Critical Storm Duration	Peak Discharge Rate	Top Water Level
1 year	720 min	11.2 l/s	33.929m
30 year	240 min	15.1 l/s	34.137m
100 year (+30% CC)	180 min	41.1 l/s	34.275m

Summary of key points and WSP recommendations following initial review:

The main differences identified were:

- Variation to basin geometry, due to the site boundary and tree constraints.
- Reduction in basin crest level from design of 34.50m AOD to 34.39m AOD (at the lowest point) for the same reasons as above.
- 18mm lower outfall pipe level.

The above differences result in a small reduction of the basin's performance and target flow rates.

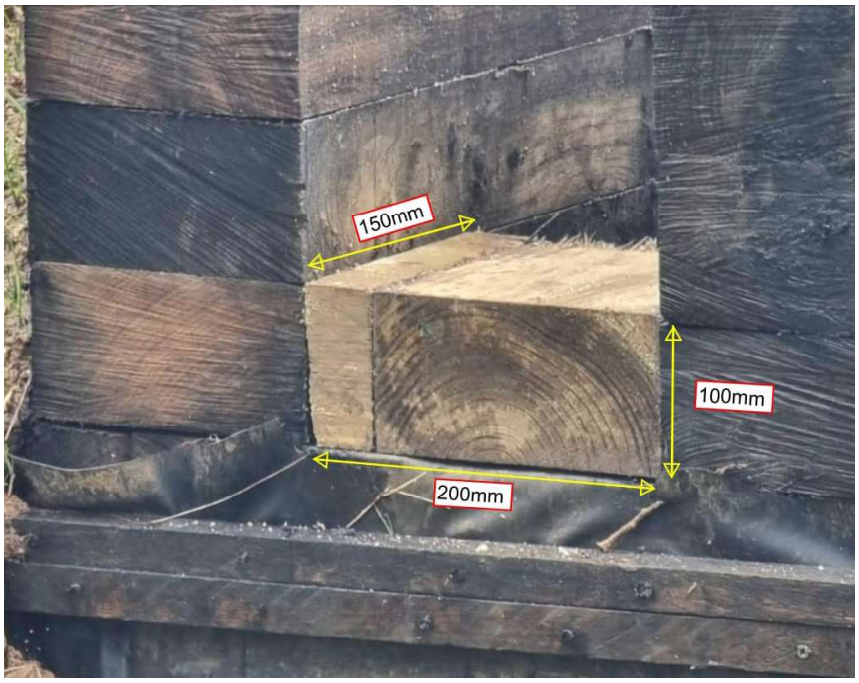
WSP therefore recommended that a piece of treated timber be installed within the weir channel to raise the weir level by 100mm to reduce peak flows within agreed discharge rates.

Further installation and second review

The weir level was raised at the basin outlet in early 2024 and a photo of the installed timber weir provided, together with confirmation of the dimensions. The installed weir is broadly in line with recommendations.

The height and width of the timber added to the weir channel are as proposed; the length is shorter than recommended (recommended length was 500mm, 150mm installed). Please refer to appendix for relevant correspondence.

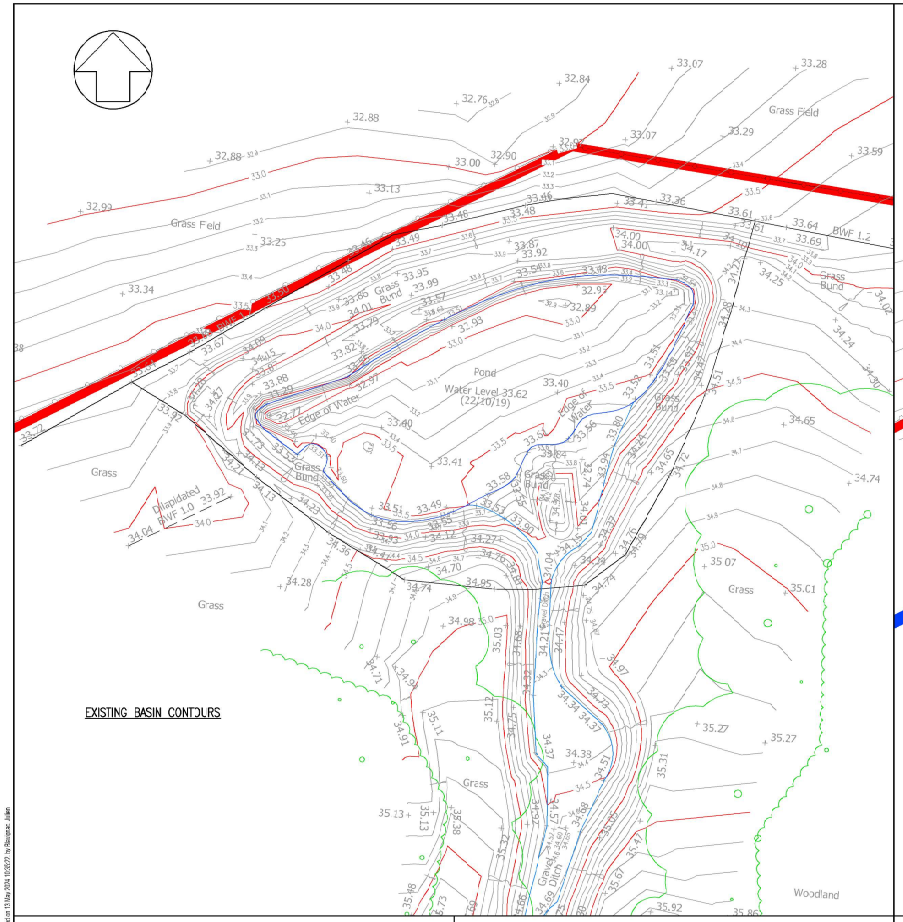
It is anticipated that this will have a small effect on the coefficient of discharge of the weir. This effect is expected to be small, and it is anticipated that the installed system should still operate in line with the hydraulic calculations.



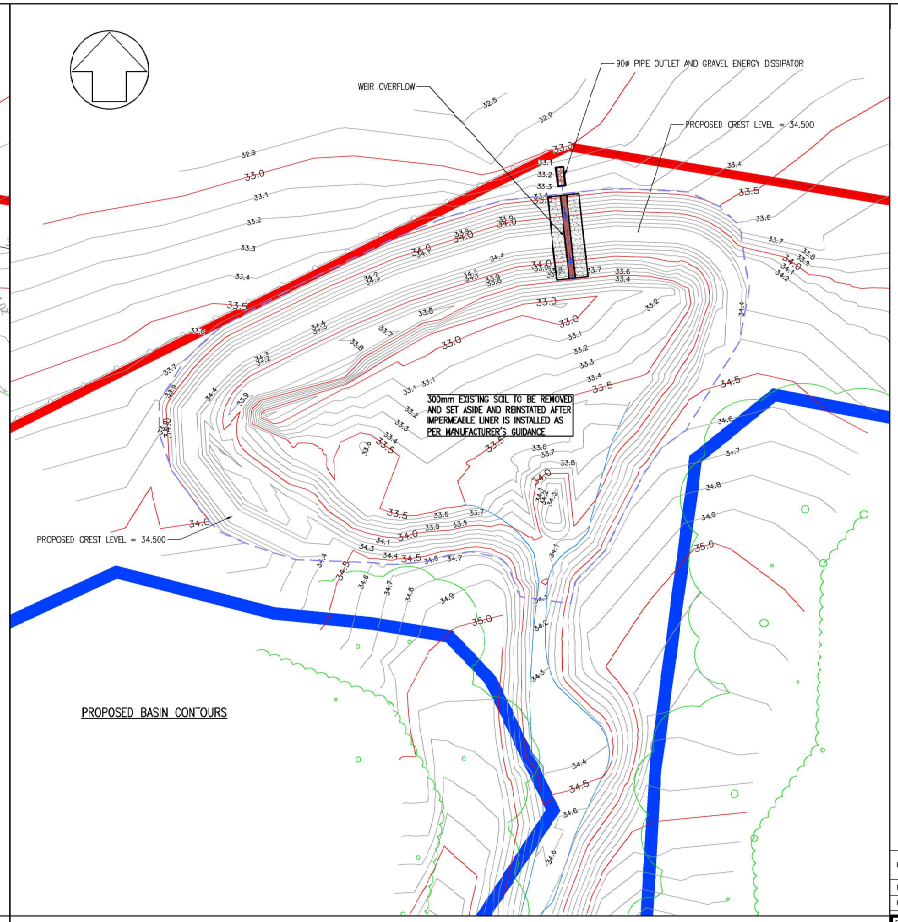
To install the additional weir height, two pieces of timber have been used. The installation may affect the longevity of the weir and WSP therefore recommends that the raised weir is added as a specific item to the periodic SUDS maintenance inspections so that if any damage or deterioration is noted, it can be repaired in a timely manner, to maintain operation in the 30yr and 100yr (climate change) rainfall events

APPENDIX:

- WSP Wetland Basin Rehabilitation Works ref. 5667-SD-030 Rev P02 (dated 11.01/23).
- Overflow Pond, As Built Survey ref. 13124 (dated 13.01.24).
- MicroDrainage models
- Key Extracts of Correspondence including Queries.



EXISTING BASIN CONTOURS



PROPOSED BASIN CONTOURS

DO NOT SCALE

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT DOCUMENTATION, DRAWINGS AND STANDARD DETAIL.
3. DIMENSIONS SHOULD NOT BE SCALED FROM THIS DRAWING. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
4. CONFLICTING INFORMATION SHOWN ON THE ENGINEER'S DRAWINGS OR DISCREPANCIES BETWEEN THE INFORMATION GIVEN BY THE ENGINEER AND THAT PROVIDED BY OTHERS MUST BE REFERRED TO THE ENGINEER BEFORE THE WORKS COMMENCE.
5. TOPOGRAPHICAL INFORMATION IS BASED ON EKOMPASS SURVEYS DRAWING EK/221019/HWA/TOP DATED OCTOBER 2019

KEY

- SITE BOUNDARY
- 10.000 PROPOSED LEVEL
- 34.100 EXISTING LEVEL
- MAJOR CONTOUR
- MINOR CONTOUR
- ORIGINAL SITE ROOT PROTECTION AREA
- EXTENT OF IMPERMEABLE LINER

UNTIL TECHNICAL APPROVAL HAS BEEN OBTAINED FROM THE RELEVANT LOCAL AUTHORITIES OR STATUTORY BODIES, IT SHOULD BE UNDERSTOOD THAT ALL DRAWINGS ARE ISSUED AS PRELIMINARY AND NOT FOR CONSTRUCTION. SHOULD THE CONTRACTOR AND / OR EMPLOYER COMMENCE WORK PRIOR TO APPROVAL BEING GIVEN, IT IS ENTIRELY AT THEIR OWN RISK.

REV	DATE	BY	DESCRIPTION	CHK	APP
P03	11/01/2023	OJF	INFILTRATION REMOVED FROM HYDRAULIC MODEL. COMPUTER MODEL BY KIERAN AND TABLE OF RESULTS UPDATED TO SUIT	AJW	LRB
P02	14/12/2022	KC	FIRST ISSUE	OJF	LRB

WITH REFERENCE TO THE HYDRAULIC CALCULATIONS DATED 14/12/2022 BY WSP, THE FOLLOWING DISCHARGE RATES HAVE BEEN CALCULATED FOR THE RELATIVE RETURN PERIOD CRITICAL DURATION EVENTS:

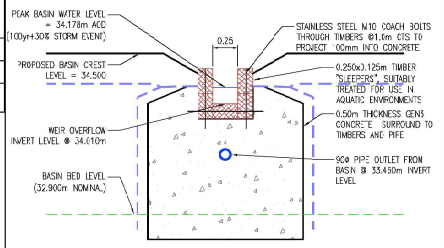
PROPOSED WETLAND BASIN

RETURN PERIOD	DURATION	PEAK DISCHARGE RATE	PEAK BASIN VOLUME	TOP WATER LEVEL
1yr	960min	11.0l/s	69.9m³	33.931m
30yr	360min	16.6l/s	89.0m³	34.057m
100yr (+30% climate change)	180min	41.2l/s	108.1m³	34.178m

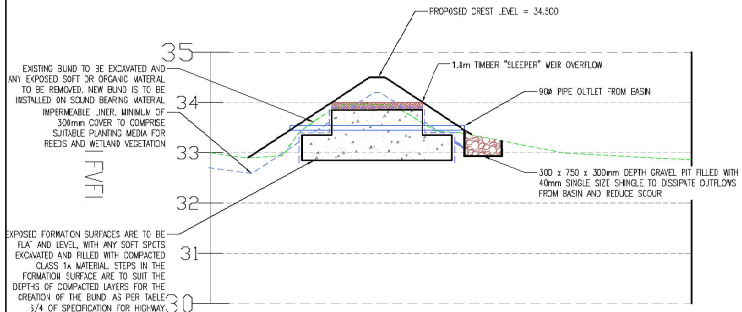
IMPORTANT:

THE BUND IS TO COMPRISE WELL COMPACTED CLASS 1A MATERIAL TO SPECIFICATION FOR HIGHWAY WORKS TABLE 6/1. INSTALLATION AND COMPACTION SHALL BE TO METHOD 2, TABLE 6/4, SUITABLE FOR THE CREATION OF SIDE SLOPES OF 1:1.5.

AN IMPERMEABLE LINER (GEOSYNTHETICS AQUABLOCK L4 HDPE OR SE GREENSEAL POND LINER OR SIMILAR APPROVED) IS TO BE INSTALLED 300mm BENEATH THE BASIN BED AND SIDE SLOPES TO LIMIT SEEPAGE AND SATURATION OF THE SUBSOIL. GEOMEMBRANE IS TO BE INSTALLED WITH ADEQUATE LAPS AT ALL JOINTS AND AT THE INTERFACE WITH THE CONCRETE OUTFALL STRUCTURE TO AVOID LEAKAGE THROUGH THE BASIN AND IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS



SECTION THROUGH OUTLET CONTROL
1:25



SECTION THROUGH OUTLET PIPE
1:50

DRAWING STATUS: S4 - FOR APPROVAL

wsp
Grosvenor House, 2 Grosvenor Square Southampton, SO15 2BE UK
T+44 (0) 2330 401700
wsp.com

CLIENT: VISTRY (BOVIS HOMES)

ARCHITECT: -

SITE/PROJECT: CHURCH ROAD, BISHOPSTOKE

TITLE: WETLAND BASIN REHABILITATION WORKS

SCALE @ A1	CHECKED	APPROVED
1:100 U.N.O	OJF	LRB

PROJECT NO	DESIGNED	DRAWN	DATE
70019287	JPS	KC	January 23

DRAWING No: 5667-SD-C30 REV: P02

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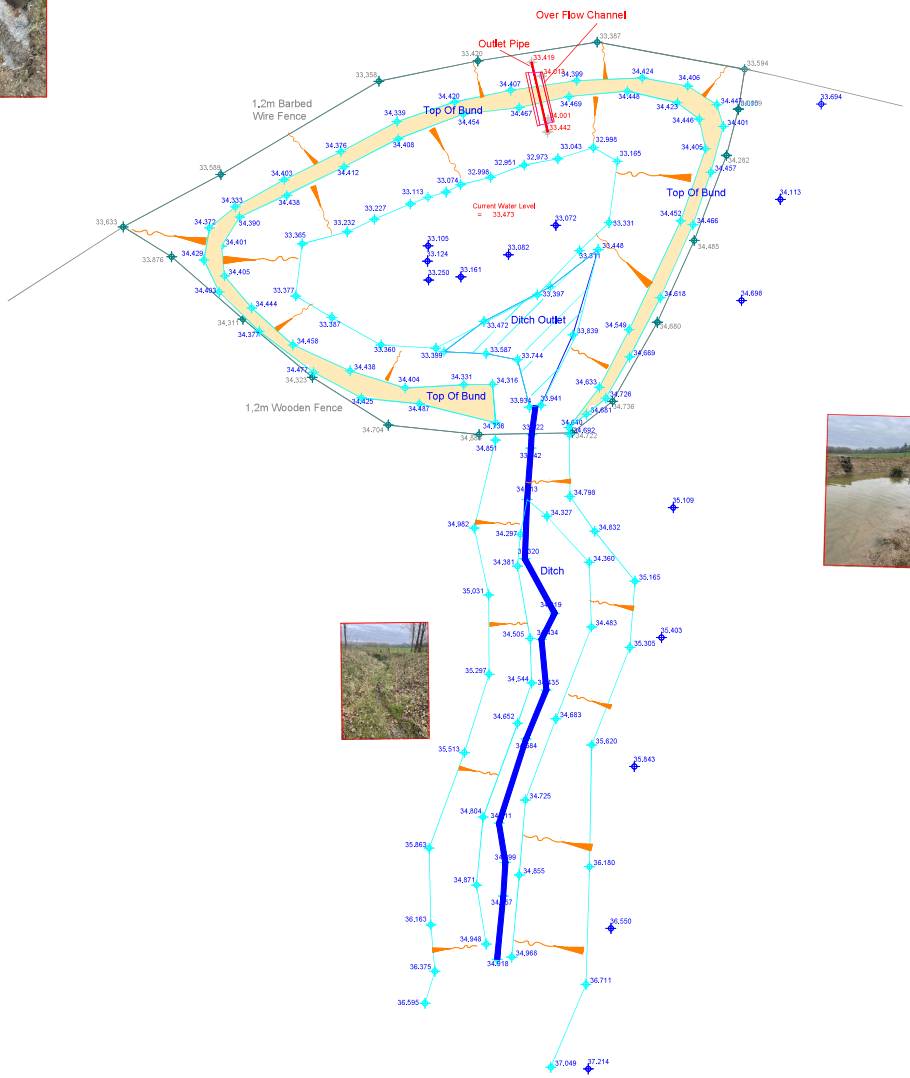
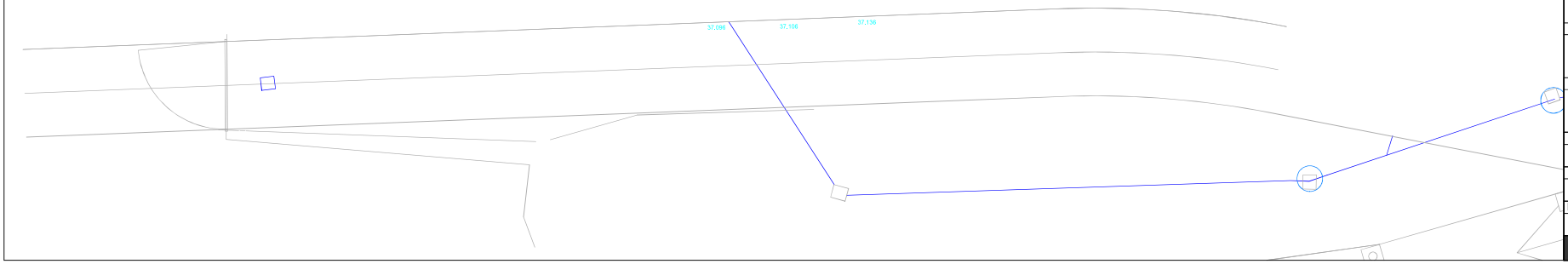
File name: \\WSP\UKSHO\SHO CORP PRIVATE\PROJECTS\70019287 - CHURCH ROAD, 40% CSF WORKS & NVC\DRAWINGS\SHO\PRIVATE\CIVIL\CS\STANDARD\CPT\01 SSW01_C30_SSW01.dwg, version: 13.May.2019, 16:10:07, by Rosanna Julian





NOTES

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Job Title:	Vistry Homes Bow Lake Gardens Eastleigh
Title:	Overflow Pond As Built Survey
Drawing No.	13124
Rev.:	
Date:	13/1/2024
Scale:	1:100
Drawn by:	C Wigmore
Checked by:	

INFORMATION

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Proposed - Storm (No Infil)

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.700	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.600
Maximum Rainfall (mm/hr)	550	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)	200

Designed with Level Soffits

Time Area Diagram for Proposed - Storm (No Infil)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.820	4-8	0.605

Total Area Contributing (ha) = 1.425

Total Pipe Volume (m³) = 223.482

Network Design Table for Proposed - Storm (No Infil)

- Indicates pipe length does not match coordinates

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	22.991	1.060	21.7	0.067	2.00	0.0	0.600		o	150	Pipe/Conduit	
S1.001	21.806	1.835	11.9	0.056	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.002	20.451	1.565	13.1	0.065	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.003	12.740	0.805	15.8	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.004	65.176	2.260	28.8	0.222	0.00	0.0	0.600		o	225	Pipe/Conduit	
S2.000	23.826	0.125	190.8	0.131	2.00	0.0	0.600		o	225	Pipe/Conduit	
S1.005	37.789	2.915	13.0	0.000	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	84.90	2.18	51.550	0.067	0.0	0.0	0.0	2.17	38.4	15.4
S1.001	83.69	2.30	50.490	0.123	0.0	0.0	0.0	2.94	51.9	27.9
S1.002	82.53	2.42	48.655	0.189	0.0	0.0	0.0	2.80	49.5	42.1
S1.003	81.76	2.51	47.090	0.189	0.0	0.0	0.0	2.54	45.0	42.1
S1.004	77.94	2.95	46.210	0.411	0.0	0.0	0.0	2.45	97.2	86.7
S2.000	82.54	2.42	44.075	0.131	0.0	0.0	0.0	0.94	37.5	29.2
S1.005	76.56	3.12	43.950	0.541	0.0	0.0	0.0	3.65	145.3	112.2

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Network Design Table for Proposed - Storm (No Infil)

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S3.000	7.600	0.130	58.5	0.042	2.00	0.0	0.600		o	225	Pipe/Conduit	
S1.006	6.811	0.875	7.8	0.047	0.00	0.0	0.600		o	375	Pipe/Conduit	
S4.000	24.756	0.235	105.3	0.057	2.00	0.0	0.600		o	225	Pipe/Conduit	
S1.007	36.218	1.200	30.2	0.078	0.00	0.0	0.600		o	375	Pipe/Conduit	
S5.000	44.736	3.945	11.3	0.090	2.00	0.0	0.600		o	150	Pipe/Conduit	
S5.001	22.741	0.325	70.0	0.026	0.00	0.0	0.600		o	225	Pipe/Conduit	
S5.002	35.094	0.205	171.2	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.008	11.383	0.730	15.6	0.096	0.00	0.0	0.600		o	375	Pipe/Conduit	
S6.000	24.351	0.170	143.2	0.066	2.00	0.0	0.600		o	225	Pipe/Conduit	
S1.009	23.512	0.780	30.1	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S1.010	13.206	0.295	44.8	0.093	0.00	0.0	0.600		o	375	Pipe/Conduit	
S1.011	29.141	0.590	49.4	0.035	0.00	0.0	0.600		o	375	Pipe/Conduit	
S7.000	10.000#	0.075	133.3	0.000	2.00	0.0	0.600		o	150	Pipe/Conduit	
S7.001	10.000#	0.075	133.3	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S7.002	10.561	0.140	75.4	0.000	0.00	0.0	0.600		ooo	-2	Pipe/Conduit	
S7.003	4.761	0.095	50.1	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.012	16.991	0.105	161.8	0.042	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.013	11.994	0.060	199.9	0.033	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)
S3.000	85.93	2.07	41.165	0.042	0.0	0.0	0.0	1.71	68.1	9.7
S1.006	76.43	3.14	40.885	0.630	0.0	0.0	0.0	6.53	721.0	130.3
S4.000	83.46	2.32	40.320	0.057	0.0	0.0	0.0	1.27	50.6	12.9
S1.007	75.04	3.32	39.935	0.764	0.0	0.0	0.0	3.31	365.4	155.3
S5.000	84.19	2.25	42.810	0.090	0.0	0.0	0.0	3.01	53.2	20.5
S5.001	81.90	2.49	38.790	0.116	0.0	0.0	0.0	1.57	62.2	25.7
S5.002	76.91	3.08	38.465	0.116	0.0	0.0	0.0	1.00	39.6	25.7
S1.008	74.74	3.36	38.110	0.976	0.0	0.0	0.0	4.61	509.0	197.6
S6.000	83.00	2.37	37.700	0.066	0.0	0.0	0.0	1.09	43.4	14.8
S1.009	73.88	3.48	37.380	1.042	0.0	0.0	0.0	3.31	365.7	208.5
S1.010	73.30	3.56	36.600	1.135	0.0	0.0	0.0	2.71	299.8	225.4
S1.011	72.01	3.75	36.305	1.170	0.0	0.0	0.0	2.58	285.3	228.2
S7.000	84.74	2.19	36.100	0.000	0.0	0.0	0.0	0.87	15.3	0.0
S7.001	82.89	2.38	36.025	0.000	0.0	0.0	0.0	0.87	15.3	0.0
S7.002	81.49	2.54	35.950	0.000	0.0	0.0	0.0	1.16	61.4	0.0
S7.003	81.10	2.58	35.810	0.000	0.0	0.0	0.0	1.85	73.6	0.0
S1.012	83.92	2.28	35.715	0.000	20.0	0.0	0.0	1.03	40.8	20.0
S1.013	81.87	2.49	35.610	0.033	20.0	0.0	0.0	0.92	36.6	27.3

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Network Design Table for Proposed - Storm (No Infil)

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.014	11.357	0.060	189.3	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.015	22.952	0.370	62.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S8.000	22.052	0.220	100.2	0.062	2.00	0.0	0.600		o	150	Pipe/Conduit	
S9.000	22.708	0.570	39.8	0.007	2.00	0.0	0.600		o	150	Pipe/Conduit	
S8.001	38.963	0.285	136.7	0.040	0.00	0.0	0.600		o	225	Pipe/Conduit	
S8.002	7.948	0.045	176.6	0.047	0.00	0.0	0.600		o	225	Pipe/Conduit	
S8.003	11.707	0.060	195.1	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.016	12.461	0.085	146.6	0.024	0.00	0.0	0.600		oo	-1	Pipe/Conduit	
S1.017	17.809#	0.633	28.1	0.000	0.00	0.0		0.030	2 _/	1000	1:2 Ditch	
S1.018	11.314#	0.780	14.5	0.000	0.00	0.0		0.030	2 _/	600	1:2 Ditch	
S1.019	5.000#	0.100	50.0	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)
S1.014	80.09	2.69	35.550	0.033	20.0	0.0	0.0	0.95	37.7	27.3
S1.015	78.15	2.92	35.490	0.033	20.0	0.0	0.0	1.66	66.1	27.3
S8.000	83.05	2.37	35.805	0.062	0.0	0.0	0.0	1.00	17.7	14.0
S9.000	84.30	2.24	36.155	0.007	0.0	0.0	0.0	1.60	28.3	1.6
S8.001	77.95	2.95	35.510	0.109	0.0	0.0	0.0	1.12	44.4	23.0
S8.002	76.87	3.08	35.225	0.156	0.0	0.0	0.0	0.98	39.0	32.5
S8.003	75.26	3.29	35.180	0.156	0.0	0.0	0.0	0.93	37.1	32.5
S1.016	84.16	2.25	35.120	0.000	10.0	0.0	0.0	0.83	29.3	10.0
S1.017	82.86	2.39	35.013	0.000	10.0	0.0	0.0	2.18	1048.7	10.0
S1.018	82.24	2.45	34.380	0.000	10.0	0.0	0.0	2.85	1024.5	10.0
S1.019	86.31	2.04	32.900	0.000	1.0	0.0	0.0	2.23	157.5	1.0

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Manhole Schedules for Proposed - Storm (No Infil)

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)
S1	53.165	1.615	Open Manhole	1200	S1.000	51.550	150				
S2	51.840	1.350	Open Manhole	1200	S1.001	50.490	150	S1.000	50.490	150	
S3	50.005	1.350	Open Manhole	1200	S1.002	48.655	150	S1.001	48.655	150	
S4	48.440	1.350	Open Manhole	1200	S1.003	47.090	150	S1.002	47.090	150	
S5	47.635	1.425	Open Manhole	1200	S1.004	46.210	225	S1.003	46.285	150	
S8	45.500	1.425	Open Manhole	1200	S2.000	44.075	225				
S9	45.510	1.560	Open Manhole	1200	S1.005	43.950	225	S1.004	43.950	225	
								S2.000	43.950	225	
S10	43.090	1.925	Open Manhole	1200	S3.000	41.165	225				
S11	43.065	2.180	Open Manhole	1350	S1.006	40.885	375	S1.005	41.035	225	
								S3.000	41.035	225	
S12	43.000	2.680	Open Manhole	1200	S4.000	40.320	225				
S13	42.600	2.665	Open Manhole	1350	S1.007	39.935	375	S1.006	40.010	375	75
								S4.000	40.085	225	
S14	44.160	1.350	Open Manhole	1200	S5.000	42.810	150				
S15	40.215	1.425	Open Manhole	1200	S5.001	38.790	225	S5.000	38.865	150	
S16	39.890	1.425	Open Manhole	1200	S5.002	38.465	225	S5.001	38.465	225	
S17	40.095	1.985	Open Manhole	1350	S1.008	38.110	375	S1.007	38.735	375	625
								S5.002	38.260	225	
S18	39.475	1.775	Open Manhole	1200	S6.000	37.700	225				
S19	39.310	1.930	Open Manhole	1350	S1.009	37.380	375	S1.008	37.380	375	
								S6.000	37.530	225	
S20	38.050	1.450	Open Manhole	1350	S1.010	36.600	375	S1.009	36.600	375	
S22	38.135	1.830	Open Manhole	1350	S1.011	36.305	375	S1.010	36.305	375	
STANK 2	38.570	2.470	Open Manhole	500	S7.000	36.100	150				
S24	38.790	2.765	Open Manhole	1200	S7.001	36.025	150	S7.000	36.025	150	
STANK 1	38.200	2.250	Open Manhole	500	S7.002	35.950	-2	S7.001	35.950	150	
S23A	37.720	1.910	Open Manhole	1200	S7.003	35.810	225	S7.002	35.810	-2	
S23	37.775	2.060	Open Manhole	1350	S1.012	35.715	225	S1.011	35.715	375	
								S7.003	35.715	225	
S27	37.675	2.065	Open Manhole	1200	S1.013	35.610	225	S1.012	35.610	225	
S28	37.420	1.870	Open Manhole	1200	S1.014	35.550	225	S1.013	35.550	225	
SHW1	37.291	1.801	Open Manhole	1	S1.015	35.490	225	S1.014	35.490	225	
S29	37.200	1.395	Open Manhole	1200	S8.000	35.805	150				
S30	37.505	1.350	Open Manhole	1200	S9.000	36.155	150				
S31	37.070	1.560	Open Manhole	1200	S8.001	35.510	225	S8.000	35.585	150	
								S9.000	35.585	150	
S32	36.640	1.415	Open Manhole	1200	S8.002	35.225	225	S8.001	35.225	225	
S33	36.720	1.540	Open Manhole	1200	S8.003	35.180	225	S8.002	35.180	225	
SHW2	36.981	1.861	Open Manhole	1200	S1.016	35.120	-1	S1.015	35.120	225	
								S8.003	35.120	225	
SHW3	36.900	1.887	Open Manhole	500	S1.017	35.013	1000	S1.016	35.035	-1	
SHW4	35.400	1.020	Open Manhole	500	S1.018	34.380	600	S1.017	34.380	1000	
SFIELD	34.300	1.400	Open Manhole	1 x 10000	S1.019	32.900	300	S1.018	33.600	600	700
SDUMMY	34.000	1.200	Open Manhole	0		OUTFALL		S1.019	32.800	300	

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PIPELINE SCHEDULES for Proposed - Storm (No Infil)

Upstream Manhole

- Indicates pipe length does not match coordinates

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	S1	53.165	51.550	1.465	Open Manhole	1200
S1.001	o	150	S2	51.840	50.490	1.200	Open Manhole	1200
S1.002	o	150	S3	50.005	48.655	1.200	Open Manhole	1200
S1.003	o	150	S4	48.440	47.090	1.200	Open Manhole	1200
S1.004	o	225	S5	47.635	46.210	1.200	Open Manhole	1200
S2.000	o	225	S8	45.500	44.075	1.200	Open Manhole	1200
S1.005	o	225	S9	45.510	43.950	1.335	Open Manhole	1200
S3.000	o	225	S10	43.090	41.165	1.700	Open Manhole	1200
S1.006	o	375	S11	43.065	40.885	1.805	Open Manhole	1350
S4.000	o	225	S12	43.000	40.320	2.455	Open Manhole	1200
S1.007	o	375	S13	42.600	39.935	2.290	Open Manhole	1350
S5.000	o	150	S14	44.160	42.810	1.200	Open Manhole	1200
S5.001	o	225	S15	40.215	38.790	1.200	Open Manhole	1200
S5.002	o	225	S16	39.890	38.465	1.200	Open Manhole	1200
S1.008	o	375	S17	40.095	38.110	1.610	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)
S1.000	22.991	21.7	S2	51.840	50.490	1.200	Open Manhole	1200
S1.001	21.806	11.9	S3	50.005	48.655	1.200	Open Manhole	1200
S1.002	20.451	13.1	S4	48.440	47.090	1.200	Open Manhole	1200
S1.003	12.740	15.8	S5	47.635	46.285	1.200	Open Manhole	1200
S1.004	65.176	28.8	S9	45.510	43.950	1.335	Open Manhole	1200
S2.000	23.826	190.8	S9	45.510	43.950	1.335	Open Manhole	1200
S1.005	37.789	13.0	S11	43.065	41.035	1.805	Open Manhole	1350
S3.000	7.600	58.5	S11	43.065	41.035	1.805	Open Manhole	1350
S1.006	6.811	7.8	S13	42.600	40.010	2.215	Open Manhole	1350
S4.000	24.756	105.3	S13	42.600	40.085	2.290	Open Manhole	1350
S1.007	36.218	30.2	S17	40.095	38.735	0.985	Open Manhole	1350
S5.000	44.736	11.3	S15	40.215	38.865	1.200	Open Manhole	1200
S5.001	22.741	70.0	S16	39.890	38.465	1.200	Open Manhole	1200
S5.002	35.094	171.2	S17	40.095	38.260	1.610	Open Manhole	1350
S1.008	11.383	15.6	S19	39.310	37.380	1.555	Open Manhole	1350

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PIPELINE SCHEDULES for Proposed - Storm (No Infil)

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)
S6.000	o	225	S18	39.475	37.700	1.550	Open Manhole	1200
S1.009	o	375	S19	39.310	37.380	1.555	Open Manhole	1350
S1.010	o	375	S20	38.050	36.600	1.075	Open Manhole	1350
S1.011	o	375	S22	38.135	36.305	1.455	Open Manhole	1350
S7.000	o	150	STANK 2	38.570	36.100	2.320	Open Manhole	500
S7.001	o	150	S24	38.790	36.025	2.615	Open Manhole	1200
S7.002	ooo	-2	STANK 1	38.200	35.950	2.100	Open Manhole	500
S7.003	o	225	S23A	37.720	35.810	1.760	Open Manhole	1200
S1.012	o	225	S23	37.775	35.715	1.835	Open Manhole	1350
S1.013	o	225	S27	37.675	35.610	1.840	Open Manhole	1200
S1.014	o	225	S28	37.420	35.550	1.645	Open Manhole	1200
S1.015	o	225	SHW1	37.291	35.490	1.576	Open Manhole	1
S8.000	o	150	S29	37.200	35.805	1.245	Open Manhole	1200
S9.000	o	150	S30	37.505	36.155	1.200	Open Manhole	1200
S8.001	o	225	S31	37.070	35.510	1.335	Open Manhole	1200
S8.002	o	225	S32	36.640	35.225	1.190	Open Manhole	1200
S8.003	o	225	S33	36.720	35.180	1.315	Open Manhole	1200
S1.016	oo	-1	SHW2	36.981	35.120	1.711	Open Manhole	1200
S1.017	2 _/	1000	SHW3	36.900	35.013	1.587	Open Manhole	500

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)
S6.000	24.351	143.2	S19	39.310	37.530	1.555	Open Manhole	1350
S1.009	23.512	30.1	S20	38.050	36.600	1.075	Open Manhole	1350
S1.010	13.206	44.8	S22	38.135	36.305	1.455	Open Manhole	1350
S1.011	29.141	49.4	S23	37.775	35.715	1.685	Open Manhole	1350
S7.000	10.000#	133.3	S24	38.790	36.025	2.615	Open Manhole	1200
S7.001	10.000#	133.3	STANK 1	38.200	35.950	2.100	Open Manhole	500
S7.002	10.561	75.4	S23A	37.720	35.810	1.760	Open Manhole	1200
S7.003	4.761	50.1	S23	37.775	35.715	1.910	Open Manhole	1350
S1.012	16.991	161.8	S27	37.675	35.610	1.840	Open Manhole	1200
S1.013	11.994	199.9	S28	37.420	35.550	1.645	Open Manhole	1200
S1.014	11.357	189.3	SHW1	37.291	35.490	1.576	Open Manhole	1
S1.015	22.952	62.0	SHW2	36.981	35.120	1.636	Open Manhole	1200
S8.000	22.052	100.2	S31	37.070	35.585	1.335	Open Manhole	1200
S9.000	22.708	39.8	S31	37.070	35.585	1.335	Open Manhole	1200
S8.001	38.963	136.7	S32	36.640	35.225	1.190	Open Manhole	1200
S8.002	7.948	176.6	S33	36.720	35.180	1.315	Open Manhole	1200
S8.003	11.707	195.1	SHW2	36.981	35.120	1.636	Open Manhole	1200
S1.016	12.461	146.6	SHW3	36.900	35.035	1.715	Open Manhole	500
S1.017	17.809#	28.1	SHW4	35.400	34.380	0.720	Open Manhole	500

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PIPELINE SCHEDULES for Proposed - Storm (No Infil)

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)
S1.018	2 _/	600	SHW4	35.400	34.380	0.720	Open Manhole	500
S1.019	o	300	SFIELD	34.300	32.900	1.100	Open Manhole	1 x 10000

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)
S1.018	11.314#	14.5	SFIELD	34.300	33.600	0.400	Open Manhole	1 x 10000
S1.019	5.000#	50.0	SDUMMY	34.000	32.800	0.900	Open Manhole	0

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Area Summary for Proposed - Storm (No Infil)

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.067	0.067	0.067
1.001	User	-	100	0.056	0.056	0.056
1.002	User	-	100	0.065	0.065	0.065
1.003	-	-	100	0.000	0.000	0.000
1.004	User	-	100	0.222	0.222	0.222
2.000	User	-	100	0.040	0.040	0.040
	User	-	100	0.021	0.021	0.061
	User	-	100	0.033	0.033	0.095
	User	-	100	0.036	0.036	0.131
1.005	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.042	0.042	0.042
1.006	User	-	100	0.047	0.047	0.047
4.000	User	-	100	0.057	0.057	0.057
1.007	User	-	100	0.029	0.029	0.029
	User	-	100	0.048	0.048	0.078
5.000	User	-	100	0.090	0.090	0.090
5.001	User	-	100	0.026	0.026	0.026
5.002	-	-	100	0.000	0.000	0.000
1.008	User	-	100	0.096	0.096	0.096
6.000	User	-	100	0.066	0.066	0.066
1.009	-	-	100	0.000	0.000	0.000
1.010	User	-	100	0.093	0.093	0.093
1.011	User	-	100	0.035	0.035	0.035
7.000	-	-	100	0.000	0.000	0.000
7.001	-	-	100	0.000	0.000	0.000
7.002	-	-	100	0.000	0.000	0.000
7.003	-	-	100	0.000	0.000	0.000
1.012	User	-	100	0.042	0.042	0.042
1.013	User	-	100	0.033	0.033	0.033
1.014	-	-	100	0.000	0.000	0.000
1.015	-	-	100	0.000	0.000	0.000
8.000	User	-	100	0.062	0.062	0.062
9.000	User	-	100	0.007	0.007	0.007
8.001	User	-	100	0.040	0.040	0.040
8.002	User	-	100	0.047	0.047	0.047
8.003	-	-	100	0.000	0.000	0.000
1.016	User	-	100	0.024	0.024	0.024
1.017	-	-	100	0.000	0.000	0.000
1.018	-	-	100	0.000	0.000	0.000
1.019	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.425	1.425	1.425

Free Flowing Outfall Details for Proposed - Storm (No Infil)

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.019	SDUMMY	34.000	32.800	0.000	0	0

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Simulation Criteria for Proposed - Storm (No Infil)

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	10.000
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)	2880
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	24

Number of Input Hydrographs	0	Number of Offline Controls	1	Number of Time/Area Diagrams	0
Number of Online Controls	6	Number of Storage Structures	6	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.700	Storm Duration (mins)	1440
Ratio R	0.350		

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Online Controls for Proposed - Storm (No Infil)

Orifice Manhole: S11, DS/PN: S1.006, Volume (m³): 4.8

Diameter (m) 0.275 Discharge Coefficient 0.600 Invert Level (m) 40.885

Orifice Manhole: S13, DS/PN: S1.007, Volume (m³): 5.4

Diameter (m) 0.225 Discharge Coefficient 0.600 Invert Level (m) 39.935

Orifice Manhole: S19, DS/PN: S1.009, Volume (m³): 4.8

Diameter (m) 0.200 Discharge Coefficient 0.600 Invert Level (m) 37.380

Hydro-Brake® Optimum Manhole: S24, DS/PN: S7.001, Volume (m³): 3.3

Unit Reference	MD-SHE-0082-4000-2000-4000
Design Head (m)	2.000
Design Flow (l/s)	4.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	82
Invert Level (m)	36.025
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	4.0	Kick-Flo®	0.729	2.5
Flush-Flo™	0.356	3.1	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)	Depth (m)	Flow (l/s)
0.100	2.4	0.800	2.6	2.000	4.0	4.000	5.5	7.000	7.2
0.200	3.0	1.000	2.9	2.200	4.2	4.500	5.8	7.500	7.4
0.300	3.1	1.200	3.2	2.400	4.3	5.000	6.1	8.000	7.7
0.400	3.1	1.400	3.4	2.600	4.5	5.500	6.4	8.500	7.9
0.500	3.1	1.600	3.6	3.000	4.8	6.000	6.7	9.000	8.1
0.600	2.9	1.800	3.8	3.500	5.2	6.500	6.9	9.500	8.3

Complex Manhole: S23, DS/PN: S1.012, Volume (m³): 6.2

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0147-1000-0900-1000
Design Head (m)	0.900
Design Flow (l/s)	10.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	147
Invert Level (m)	35.715
Minimum Outlet Pipe Diameter (mm)	225

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Hydro-Brake® Optimum

Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	10.0	Kick-Flo®	0.625	8.4
Flush-Flo™	0.283	10.0	Mean Flow over Head Range	-	8.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.3	0.800	9.5	2.000	14.6	4.000	20.3	7.000	26.5
0.200	9.8	1.000	10.5	2.200	15.2	4.500	21.5	7.500	27.4
0.300	10.0	1.200	11.4	2.400	15.9	5.000	22.6	8.000	28.3
0.400	9.8	1.400	12.3	2.600	16.5	5.500	23.6	8.500	29.1
0.500	9.5	1.600	13.1	3.000	17.7	6.000	24.6	9.000	30.0
0.600	8.8	1.800	13.9	3.500	19.0	6.500	25.6	9.500	30.7

Weir

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 37.300

Complex Manhole: SFIELD, DS/PN: S1.019, Volume (m³): 29.8

Orifice

Diameter (m) 0.090 Discharge Coefficient 0.600 Invert Level (m) 33.442

Weir

Discharge Coef 0.510 Width (m) 0.250 Invert Level (m) 34.013

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Offline Controls for Proposed - Storm (No Infil)

Pipe Manhole: STANK 1, DS/PN: S7.002, Loop to PN: S7.000

Diameter (m)	-3	Roughness k (mm)	0.600
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	20.000	Upstream Invert Level (m)	36.925

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Storage Structures for Proposed - Storm (No Infil)

Cellular Storage Manhole: S10, DS/PN: S3.000

Invert Level (m) 41.165 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	33.0	33.0	1.200	33.0	66.6	1.300	0.0	66.6

Cellular Storage Manhole: S12, DS/PN: S4.000

Invert Level (m) 40.320 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	66.5	66.5	1.200	66.5	106.1	1.300	0.0	106.1

Cellular Storage Manhole: S18, DS/PN: S6.000

Invert Level (m) 37.700 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	112.0	0.0	1.200	112.0	0.0	1.201	0.0	0.0

Cellular Storage Manhole: STANK 2, DS/PN: S7.000

Invert Level (m) 36.100 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	148.0	148.0	1.200	148.0	211.6	1.300	0.0	211.6

Cellular Storage Manhole: STANK 1, DS/PN: S7.002

Invert Level (m) 35.950 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	400.0	400.0	1.200	400.0	496.0	1.300	0.0	496.0

Infiltration Basin Manhole: SFIELD, DS/PN: S1.019

Invert Level (m) 33.000 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	0.0	0.100	0.0	0.200	0.0	0.300	0.0

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Infiltration Basin Manhole: SFIELD, DS/PN: S1.019

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.400	0.0	0.600	87.0	0.900	114.5	1.100	132.7
0.440	71.8	0.700	95.8	1.000	123.5	1.200	142.1
0.500	77.8	0.800	104.6	1.010	124.5	1.300	151.6

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 10.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.700 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 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
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)
S1.000	S1	15 minute 1 year Summer I+0%	53.165	51.609	-0.091	0.000	0.33		0.061
S1.001	S2	15 minute 1 year Summer I+0%	51.840	50.552	-0.088	0.000	0.35		0.071
S1.002	S3	15 minute 1 year Summer I+0%	50.005	48.733	-0.072	0.000	0.52		0.087
S1.003	S4	15 minute 1 year Summer I+0%	48.440	47.174	-0.066	0.000	0.60		0.095
S1.004	S5	15 minute 1 year Winter I+0%	47.635	46.325	-0.111	0.000	0.51		0.125
S2.000	S8	15 minute 1 year Summer I+0%	45.500	44.207	-0.093	0.000	0.58		0.144
S1.005	S9	15 minute 1 year Winter I+0%	45.510	44.062	-0.113	0.000	0.49		0.306
S3.000	S10	15 minute 1 year Winter I+0%	43.090	41.224	-0.166	0.000	0.11		1.904
S1.006	S11	15 minute 1 year Winter I+0%	43.065	41.239	-0.021	0.000	0.19		0.694
S4.000	S12	15 minute 1 year Winter I+0%	43.000	40.382	-0.163	0.000	0.14		3.991
S1.007	S13	15 minute 1 year Winter I+0%	42.600	40.486	0.176	0.000	0.21		1.861
S5.000	S14	15 minute 1 year Summer I+0%	44.160	42.867	-0.093	0.000	0.31		0.059
S5.001	S15	15 minute 1 year Summer I+0%	40.215	38.881	-0.134	0.000	0.33		0.098
S5.002	S16	15 minute 1 year Summer I+0%	39.890	38.577	-0.113	0.000	0.49		0.182
S1.008	S17	15 minute 1 year Winter I+0%	40.095	38.245	-0.240	0.000	0.28		0.192
S6.000	S18	30 minute 1 year Winter I+0%	39.475	37.835	-0.090	0.000	0.44		14.537
S1.009	S19	15 minute 1 year Summer I+0%	39.310	38.047	0.292	0.000	0.20		2.586
S1.010	S20	15 minute 1 year Winter I+0%	38.050	36.754	-0.221	0.000	0.35		0.298
S1.011	S22	15 minute 1 year Winter I+0%	38.135	36.624	-0.056	0.000	0.28		1.020
S7.000	STANK 2	180 minute 1 year Winter I+0%	38.570	36.118	-0.132	0.000	0.02		2.523
S7.001	S24	120 minute 1 year Winter I+0%	38.790	36.167	-0.008	0.000	0.02		0.254
S7.002	STANK 1	120 minute 1 year Winter I+0%	38.200	36.192	0.092	0.000	0.22	0.0	92.251
S7.003	S23A	15 minute 1 year Winter I+0%	37.720	36.376	0.341	0.000	0.19		1.149
S1.012	S23	15 minute 1 year Winter I+0%	37.775	36.576	0.636	0.000	0.27		4.360
S1.013	S27	15 minute 1 year Summer I+0%	37.675	35.718	-0.117	0.000	0.46		0.232
S1.014	S28	15 minute 1 year Summer I+0%	37.420	35.650	-0.125	0.000	0.41		0.218
S1.015	SHW1	15 minute 1 year Winter I+0%	37.291	35.568	-0.147	0.000	0.26		0.084
S8.000	S29	15 minute 1 year Summer I+0%	37.200	35.893	-0.062	0.000	0.62		0.094
S9.000	S30	15 minute 1 year Summer I+0%	37.505	36.176	-0.129	0.000	0.05		0.018
S8.001	S31	15 minute 1 year Summer I+0%	37.070	35.606	-0.129	0.000	0.36		0.105

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

PN	US/MH Name	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S1	3.665	11.9	OK
S1.001	S2	6.746	17.2	OK
S1.002	S3	10.316	24.3	OK
S1.003	S4	10.316	24.5	OK
S1.004	S5	25.168	47.6	OK
S2.000	S8	7.142	20.1	OK
S1.005	S9	33.172	64.5	OK
S3.000	S10	2.543	5.6	OK
S1.006	S11	38.577	69.0	OK
S4.000	S12	3.088	6.5	OK
S1.007	S13	46.347	69.9	SURCHARGED
S5.000	S14	4.922	16.0	OK
S5.001	S15	6.349	17.9	OK
S5.002	S16	6.349	18.3	OK
S1.008	S17	59.334	92.5	OK
S6.000	S18	2.540	17.5	OK
S1.009	S19	54.397	61.4	SURCHARGED
S1.010	S20	66.787	71.5	OK
S1.011	S22	68.949	69.9	OK
S7.000	STANK 2	-1.137	0.3	OK
S7.001	S24	-1.628	0.3	OK
S7.002	STANK 1	-31.246	9.6	SURCHARGED
S7.003	S23A	-37.609	8.5	SURCHARGED
S1.012	S23	31.888	9.9	SURCHARGED
S1.013	S27	33.179	13.1	OK
S1.014	S28	32.907	13.1	OK
S1.015	SHW1	32.972	13.1	OK
S8.000	S29	3.410	10.4	OK
S9.000	S30	0.375	1.2	OK
S8.001	S31	5.953	15.0	OK

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)
S8.002	S32	15 minute 1 year Winter I+0%	36.640	35.391	-0.059	0.000	0.56		0.502
S8.003	S33	15 minute 1 year Winter I+0%	36.720	35.374	-0.031	0.000	0.51		0.424
S1.016	SHW2	15 minute 1 year Winter I+0%	36.981	35.350	0.080	0.000	1.42		0.883
S1.017	SHW3	15 minute 1 year Winter I+0%	36.900	35.051	-1.849	0.000	0.00		0.035
S1.018	SHW4	15 minute 1 year Winter I+0%	35.400	34.426	-0.974	0.000	0.00		0.018
S1.019	SFIELD	720 minute 1 year Winter I+0%	34.300	33.929	0.729	0.000	0.18		47.982

PN	US/MH Name	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S8.002	S32	9.573	16.8	OK
S8.003	S33	9.559	16.1	OK
S1.016	SHW2	43.562	30.6	SURCHARGED
S1.017	SHW3	43.465	30.6	OK
S1.018	SHW4	43.370	30.6	OK
S1.019	SFIELD	339.786	11.2	SURCHARGED

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 10.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.700 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 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
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)
S1.000	S1	15 minute 30 year Summer I+0%	53.165	51.653	-0.047	0.000	0.80		0.111
S1.001	S2	15 minute 30 year Summer I+0%	51.840	50.626	-0.014	0.000	0.94		0.169
S1.002	S3	15 minute 30 year Winter I+0%	50.005	49.300	0.495	0.000	1.03		0.836
S1.003	S4	15 minute 30 year Winter I+0%	48.440	47.695	0.455	0.000	1.15		0.793
S1.004	S5	15 minute 30 year Winter I+0%	47.635	46.646	0.210	0.000	1.03		0.558
S2.000	S8	15 minute 30 year Summer I+0%	45.500	44.412	0.112	0.000	1.20		0.375
S1.005	S9	15 minute 30 year Summer I+0%	45.510	44.296	0.121	0.000	0.98		1.528
S3.000	S10	30 minute 30 year Winter I+0%	43.090	41.604	0.214	0.000	0.82		14.259
S1.006	S11	30 minute 30 year Winter I+0%	43.065	41.615	0.355	0.000	0.33		1.519
S4.000	S12	30 minute 30 year Winter I+0%	43.000	40.813	0.268	0.000	0.97		31.725
S1.007	S13	30 minute 30 year Winter I+0%	42.600	40.883	0.573	0.000	0.29		2.753
S5.000	S14	15 minute 30 year Summer I+0%	44.160	42.909	-0.051	0.000	0.76		0.106
S5.001	S15	15 minute 30 year Summer I+0%	40.215	38.981	-0.034	0.000	0.85		0.219
S5.002	S16	15 minute 30 year Summer I+0%	39.890	38.761	0.071	0.000	1.12		0.801
S1.008	S17	15 minute 30 year Winter I+0%	40.095	38.565	0.080	0.000	0.44		1.725
S6.000	S18	60 minute 30 year Winter I+0%	39.475	38.290	0.365	0.000	1.12		63.475
S1.009	S19	15 minute 30 year Winter I+0%	39.310	38.419	0.664	0.000	0.26		3.494
S1.010	S20	15 minute 30 year Winter I+0%	38.050	37.257	0.282	0.000	0.45		2.392
S1.011	S22	15 minute 30 year Winter I+0%	38.135	37.197	0.517	0.000	0.39		2.580
S7.000	STANK 2	600 minute 30 year Winter I+0%	38.570	36.455	0.205	0.000	0.24		50.025
S7.001	S24	600 minute 30 year Winter I+0%	38.790	36.459	0.284	0.000	0.19		0.647
S7.002	STANK 1	180 minute 30 year Winter I+0%	38.200	36.709	0.609	0.000	0.22	0.0	288.911
S7.003	S23A	180 minute 30 year Winter I+0%	37.720	36.769	0.734	0.000	0.22		1.593
S1.012	S23	15 minute 30 year Winter I+0%	37.775	37.110	1.170	0.000	0.33		5.197
S1.013	S27	15 minute 30 year Winter I+0%	37.675	35.805	-0.030	0.000	0.77		0.613
S1.014	S28	15 minute 30 year Winter I+0%	37.420	35.775	0.000	0.000	0.65		0.612
S1.015	SHW1	15 minute 30 year Winter I+0%	37.291	35.750	0.035	0.000	0.40		0.390
S8.000	S29	15 minute 30 year Summer I+0%	37.200	36.081	0.126	0.000	1.21		0.306
S9.000	S30	15 minute 30 year Summer I+0%	37.505	36.188	-0.117	0.000	0.11		0.032
S8.001	S31	15 minute 30 year Winter I+0%	37.070	35.902	0.167	0.000	0.68		0.943

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

PN	US/MH Name	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S1	8.982	29.2	OK
S1.001	S2	16.532	46.1	OK
S1.002	S3	28.315	47.9	SURCHARGED
S1.003	S4	28.315	47.0	SURCHARGED
S1.004	S5	61.671	96.6	SURCHARGED
S2.000	S8	17.502	41.4	SURCHARGED
S1.005	S9	72.563	128.7	SURCHARGED
S3.000	S10	8.240	41.6	SURCHARGED
S1.006	S11	125.739	120.5	SURCHARGED
S4.000	S12	10.090	45.3	SURCHARGED
S1.007	S13	151.165	96.5	SURCHARGED
S5.000	S14	12.062	39.2	OK
S5.001	S15	15.560	45.8	OK
S5.002	S16	15.561	41.7	SURCHARGED
S1.008	S17	145.554	148.7	SURCHARGED
S6.000	S18	14.593	44.6	SURCHARGED
S1.009	S19	150.834	80.8	SURCHARGED
S1.010	S20	164.561	92.2	SURCHARGED
S1.011	S22	169.681	97.0	SURCHARGED
S7.000	STANK 2	-1.274	2.6	SURCHARGED
S7.001	S24	-1.384	2.4	SURCHARGED
S7.002	STANK 1	-213.532	9.6	SURCHARGED
S7.003	S23A	-215.011	9.6	SURCHARGED
S1.012	S23	33.095	11.9	SURCHARGED
S1.013	S27	37.645	21.8	OK
S1.014	S28	37.395	20.7	SURCHARGED
S1.015	SHW1	37.186	19.8	SURCHARGED
S8.000	S29	8.357	20.3	SURCHARGED
S9.000	S30	0.918	3.0	OK
S8.001	S31	16.342	28.6	SURCHARGED

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)
S8.002	S32	15 minute 30 year Winter I+0%	36.640	35.822	0.372	0.000	1.11		2.171
S8.003	S33	15 minute 30 year Winter I+0%	36.720	35.769	0.364	0.000	1.04		0.929
S1.016	SHW2	15 minute 30 year Winter I+0%	36.981	35.706	0.436	0.000	2.48		1.956
S1.017	SHW3	15 minute 30 year Winter I+0%	36.900	35.071	-1.829	0.000	0.00		0.056
S1.018	SHW4	15 minute 30 year Winter I+0%	35.400	34.444	-0.956	0.000	0.01		0.027
S1.019	SFIELD	180 minute 30 year Winter I+0%	34.300	34.076	0.876	0.000	0.30		67.310

PN	US/MH Name	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S8.002	S32	23.451	33.2	SURCHARGED
S8.003	S33	23.445	33.0	SURCHARGED
S1.016	SHW2	63.823	53.5	SURCHARGED
S1.017	SHW3	63.737	53.5	OK
S1.018	SHW4	63.653	53.5	OK
S1.019	SFIELD	240.456	19.2	FLOOD RISK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 10.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.700 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 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
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)
S1.000	S1	15 minute 100 year Summer I+30%	53.165	51.942	0.242	0.000	0.98		0.438
S1.001	S2	15 minute 100 year Winter I+30%	51.840	51.397	0.757	0.000	0.94		1.320
S1.002	S3	15 minute 100 year Winter I+30%	50.005	50.008	1.203	2.808	1.06		4.577
S1.003	S4	15 minute 100 year Winter I+30%	48.440	48.440	1.200	0.148	1.25		1.950
S1.004	S5	15 minute 100 year Winter I+30%	47.635	47.463	1.028	0.000	1.08		1.615
S2.000	S8	15 minute 100 year Winter I+30%	45.500	44.995	0.695	0.000	1.39		1.035
S1.005	S9	15 minute 100 year Winter I+30%	45.510	44.847	0.672	0.000	1.03		2.785
S3.000	S10	60 minute 100 year Winter I+30%	43.090	41.933	0.543	0.000	0.95		24.941
S1.006	S11	60 minute 100 year Winter I+30%	43.065	41.930	0.670	0.000	0.35		2.126
S4.000	S12	60 minute 100 year Winter I+30%	43.000	41.263	0.718	0.000	1.17		60.609
S1.007	S13	60 minute 100 year Winter I+30%	42.600	41.298	0.988	0.000	0.36		3.478
S5.000	S14	15 minute 100 year Summer I+30%	44.160	43.130	0.170	0.000	0.99		0.356
S5.001	S15	15 minute 100 year Winter I+30%	40.215	39.811	0.796	0.000	0.99		1.318
S5.002	S16	15 minute 100 year Winter I+30%	39.890	39.510	0.820	0.000	1.30		2.033
S1.008	S17	15 minute 100 year Winter I+30%	40.095	39.224	0.739	0.000	0.54		3.885
S6.000	S18	60 minute 100 year Winter I+30%	39.475	39.107	1.182	0.000	1.53		129.301
S1.009	S19	60 minute 100 year Winter I+30%	39.310	39.103	1.348	0.000	0.32		4.485
S1.010	S20	30 minute 100 year Winter I+30%	38.050	37.960	0.985	0.000	0.53		4.388
S1.011	S22	30 minute 100 year Winter I+30%	38.135	37.878	1.198	0.000	0.46		3.554
S7.000	STANK 2	960 minute 100 year Winter I+30%	38.570	36.903	0.653	0.000	0.28		113.065
S7.001	S24	960 minute 100 year Winter I+30%	38.790	36.906	0.731	0.000	0.20		1.152
S7.002	STANK 1	360 minute 100 year Winter I+30%	38.200	37.560	1.460	0.000	0.27	1.8	469.143
S7.003	S23A	360 minute 100 year Winter I+30%	37.720	37.576	1.541	0.000	0.26		2.507
S1.012	S23	30 minute 100 year Winter I+30%	37.775	37.751	1.811	0.000	0.40		6.115
S1.013	S27	15 minute 100 year Winter I+30%	37.675	36.258	0.423	0.000	0.83		1.352
S1.014	S28	15 minute 100 year Winter I+30%	37.420	36.219	0.444	0.000	0.68		1.180
S1.015	SHW1	15 minute 100 year Winter I+30%	37.291	36.187	0.472	0.000	0.44		0.428
S8.000	S29	15 minute 100 year Winter I+30%	37.200	36.631	0.676	0.000	1.31		0.929
S9.000	S30	15 minute 100 year Winter I+30%	37.505	36.458	0.153	0.000	0.17		0.337
S8.001	S31	15 minute 100 year Winter I+30%	37.070	36.454	0.719	0.000	0.73		1.810

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

PN	US/MH Name	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S1	15.121	35.7	SURCHARGED
S1.001	S2	31.173	46.3	SURCHARGED
S1.002	S3	47.676	49.5	FLOOD
S1.003	S4	47.750	51.2	FLOOD
S1.004	S5	103.891	101.8	FLOOD RISK
S2.000	S8	33.003	47.9	SURCHARGED
S1.005	S9	136.894	135.7	SURCHARGED
S3.000	S10	18.156	48.5	SURCHARGED
S1.006	S11	274.217	126.5	SURCHARGED
S4.000	S12	24.445	54.4	SURCHARGED
S1.007	S13	332.357	118.0	SURCHARGED
S5.000	S14	20.307	51.2	SURCHARGED
S5.001	S15	29.340	53.1	SURCHARGED
S5.002	S16	29.339	48.6	SURCHARGED
S1.008	S17	245.232	179.1	SURCHARGED
S6.000	S18	23.011	61.0	SURCHARGED
S1.009	S19	447.451	101.0	FLOOD RISK
S1.010	S20	297.411	107.8	FLOOD RISK
S1.011	S22	304.641	116.5	FLOOD RISK
S7.000	STANK 2	22.789	3.0	SURCHARGED
S7.001	S24	22.799	2.5	SURCHARGED
S7.002	STANK 1	-299.476	11.7	SURCHARGED
S7.003	S23A	-300.640	11.2	FLOOD RISK
S1.012	S23	41.654	14.6	FLOOD RISK
S1.013	S27	47.067	23.6	SURCHARGED
S1.014	S28	46.785	21.8	SURCHARGED
S1.015	SHW1	46.538	21.8	SURCHARGED
S8.000	S29	15.758	21.9	SURCHARGED
S9.000	S30	1.731	4.4	SURCHARGED
S8.001	S31	27.512	30.6	SURCHARGED

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)
S8.002	S32	15 minute 100 year Winter I+30%	36.640	36.324	0.874	0.000	1.48		2.739
S8.003	S33	15 minute 100 year Winter I+30%	36.720	36.229	0.824	0.000	1.36		1.449
S1.016	SHW2	15 minute 100 year Winter I+30%	36.981	36.118	0.848	0.000	3.31		2.429
S1.017	SHW3	15 minute 100 year Winter I+30%	36.900	35.082	-1.818	0.000	0.00		0.067
S1.018	SHW4	15 minute 100 year Winter I+30%	35.400	34.457	-0.943	0.000	0.01		0.032
S1.019	SFIELD	120 minute 100 year Winter I+30%	34.300	34.192	0.992	0.000	0.69		84.638

PN	US/MH Name	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S8.002	S32	39.480	44.4	SURCHARGED
S8.003	S33	39.462	43.1	SURCHARGED
S1.016	SHW2	91.572	71.4	SURCHARGED
S1.017	SHW3	91.470	71.4	OK
S1.018	SHW4	91.370	71.3	OK
S1.019	SFIELD	261.944	44.3	FLOOD RISK

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Proposed - Storm (No Infil)

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.700	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.600
Maximum Rainfall (mm/hr)	550	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)	200

Designed with Level Soffits

Time Area Diagram for Proposed - Storm (No Infil)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.820	4-8	0.605

Total Area Contributing (ha) = 1.425

Total Pipe Volume (m³) = 223.482

Network Design Table for Proposed - Storm (No Infil)

- Indicates pipe length does not match coordinates

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	22.991	1.060	21.7	0.067	2.00	0.0	0.600		o	150	Pipe/Conduit	
S1.001	21.806	1.835	11.9	0.056	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.002	20.451	1.565	13.1	0.065	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.003	12.740	0.805	15.8	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.004	65.176	2.260	28.8	0.222	0.00	0.0	0.600		o	225	Pipe/Conduit	
S2.000	23.826	0.125	190.8	0.131	2.00	0.0	0.600		o	225	Pipe/Conduit	
S1.005	37.789	2.915	13.0	0.000	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	84.90	2.18	51.550	0.067	0.0	0.0	0.0	2.17	38.4	15.4
S1.001	83.69	2.30	50.490	0.123	0.0	0.0	0.0	2.94	51.9	27.9
S1.002	82.53	2.42	48.655	0.189	0.0	0.0	0.0	2.80	49.5	42.1
S1.003	81.76	2.51	47.090	0.189	0.0	0.0	0.0	2.54	45.0	42.1
S1.004	77.94	2.95	46.210	0.411	0.0	0.0	0.0	2.45	97.2	86.7
S2.000	82.54	2.42	44.075	0.131	0.0	0.0	0.0	0.94	37.5	29.2
S1.005	76.56	3.12	43.950	0.541	0.0	0.0	0.0	3.65	145.3	112.2

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Network Design Table for Proposed - Storm (No Infil)

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S3.000	7.600	0.130	58.5	0.042	2.00	0.0	0.600		o	225	Pipe/Conduit	
S1.006	6.811	0.875	7.8	0.047	0.00	0.0	0.600		o	375	Pipe/Conduit	
S4.000	24.756	0.235	105.3	0.057	2.00	0.0	0.600		o	225	Pipe/Conduit	
S1.007	36.218	1.200	30.2	0.078	0.00	0.0	0.600		o	375	Pipe/Conduit	
S5.000	44.736	3.945	11.3	0.090	2.00	0.0	0.600		o	150	Pipe/Conduit	
S5.001	22.741	0.325	70.0	0.026	0.00	0.0	0.600		o	225	Pipe/Conduit	
S5.002	35.094	0.205	171.2	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.008	11.383	0.730	15.6	0.096	0.00	0.0	0.600		o	375	Pipe/Conduit	
S6.000	24.351	0.170	143.2	0.066	2.00	0.0	0.600		o	225	Pipe/Conduit	
S1.009	23.512	0.780	30.1	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S1.010	13.206	0.295	44.8	0.093	0.00	0.0	0.600		o	375	Pipe/Conduit	
S1.011	29.141	0.590	49.4	0.035	0.00	0.0	0.600		o	375	Pipe/Conduit	
S7.000	10.000#	0.075	133.3	0.000	2.00	0.0	0.600		o	150	Pipe/Conduit	
S7.001	10.000#	0.075	133.3	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S7.002	10.561	0.140	75.4	0.000	0.00	0.0	0.600		ooo	-2	Pipe/Conduit	
S7.003	4.761	0.095	50.1	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.012	16.991	0.105	161.8	0.042	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.013	11.994	0.060	199.9	0.033	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)
S3.000	85.93	2.07	41.165	0.042	0.0	0.0	0.0	1.71	68.1	9.7
S1.006	76.43	3.14	40.885	0.630	0.0	0.0	0.0	6.53	721.0	130.3
S4.000	83.46	2.32	40.320	0.057	0.0	0.0	0.0	1.27	50.6	12.9
S1.007	75.04	3.32	39.935	0.764	0.0	0.0	0.0	3.31	365.4	155.3
S5.000	84.19	2.25	42.810	0.090	0.0	0.0	0.0	3.01	53.2	20.5
S5.001	81.90	2.49	38.790	0.116	0.0	0.0	0.0	1.57	62.2	25.7
S5.002	76.91	3.08	38.465	0.116	0.0	0.0	0.0	1.00	39.6	25.7
S1.008	74.74	3.36	38.110	0.976	0.0	0.0	0.0	4.61	509.0	197.6
S6.000	83.00	2.37	37.700	0.066	0.0	0.0	0.0	1.09	43.4	14.8
S1.009	73.88	3.48	37.380	1.042	0.0	0.0	0.0	3.31	365.7	208.5
S1.010	73.30	3.56	36.600	1.135	0.0	0.0	0.0	2.71	299.8	225.4
S1.011	72.01	3.75	36.305	1.170	0.0	0.0	0.0	2.58	285.3	228.2
S7.000	84.74	2.19	36.100	0.000	0.0	0.0	0.0	0.87	15.3	0.0
S7.001	82.89	2.38	36.025	0.000	0.0	0.0	0.0	0.87	15.3	0.0
S7.002	81.49	2.54	35.950	0.000	0.0	0.0	0.0	1.16	61.4	0.0
S7.003	81.10	2.58	35.810	0.000	0.0	0.0	0.0	1.85	73.6	0.0
S1.012	83.92	2.28	35.715	0.000	20.0	0.0	0.0	1.03	40.8	20.0
S1.013	81.87	2.49	35.610	0.033	20.0	0.0	0.0	0.92	36.6	27.3

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Network Design Table for Proposed - Storm (No Infil)

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.014	11.357	0.060	189.3	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.015	22.952	0.370	62.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S8.000	22.052	0.220	100.2	0.062	2.00	0.0	0.600		o	150	Pipe/Conduit	
S9.000	22.708	0.570	39.8	0.007	2.00	0.0	0.600		o	150	Pipe/Conduit	
S8.001	38.963	0.285	136.7	0.040	0.00	0.0	0.600		o	225	Pipe/Conduit	
S8.002	7.948	0.045	176.6	0.047	0.00	0.0	0.600		o	225	Pipe/Conduit	
S8.003	11.707	0.060	195.1	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.016	12.461	0.085	146.6	0.024	0.00	0.0	0.600		oo	-1	Pipe/Conduit	
S1.017	17.809#	0.633	28.1	0.000	0.00	0.0		0.030	2 _/	1000	1:2 Ditch	
S1.018	11.314#	0.780	14.5	0.000	0.00	0.0		0.030	2 _/	600	1:2 Ditch	
S1.019	5.000#	0.100	50.0	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)
S1.014	80.09	2.69	35.550	0.033	20.0	0.0	0.0	0.95	37.7	27.3
S1.015	78.15	2.92	35.490	0.033	20.0	0.0	0.0	1.66	66.1	27.3
S8.000	83.05	2.37	35.805	0.062	0.0	0.0	0.0	1.00	17.7	14.0
S9.000	84.30	2.24	36.155	0.007	0.0	0.0	0.0	1.60	28.3	1.6
S8.001	77.95	2.95	35.510	0.109	0.0	0.0	0.0	1.12	44.4	23.0
S8.002	76.87	3.08	35.225	0.156	0.0	0.0	0.0	0.98	39.0	32.5
S8.003	75.26	3.29	35.180	0.156	0.0	0.0	0.0	0.93	37.1	32.5
S1.016	84.16	2.25	35.120	0.000	10.0	0.0	0.0	0.83	29.3	10.0
S1.017	82.86	2.39	35.013	0.000	10.0	0.0	0.0	2.18	1048.7	10.0
S1.018	82.24	2.45	34.380	0.000	10.0	0.0	0.0	2.85	1024.5	10.0
S1.019	86.31	2.04	32.900	0.000	1.0	0.0	0.0	2.23	157.5	1.0

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Manhole Schedules for Proposed - Storm (No Infil)

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)
S1	53.165	1.615	Open Manhole	1200	S1.000	51.550	150				
S2	51.840	1.350	Open Manhole	1200	S1.001	50.490	150	S1.000	50.490	150	
S3	50.005	1.350	Open Manhole	1200	S1.002	48.655	150	S1.001	48.655	150	
S4	48.440	1.350	Open Manhole	1200	S1.003	47.090	150	S1.002	47.090	150	
S5	47.635	1.425	Open Manhole	1200	S1.004	46.210	225	S1.003	46.285	150	
S8	45.500	1.425	Open Manhole	1200	S2.000	44.075	225				
S9	45.510	1.560	Open Manhole	1200	S1.005	43.950	225	S1.004	43.950	225	
								S2.000	43.950	225	
S10	43.090	1.925	Open Manhole	1200	S3.000	41.165	225				
S11	43.065	2.180	Open Manhole	1350	S1.006	40.885	375	S1.005	41.035	225	
								S3.000	41.035	225	
S12	43.000	2.680	Open Manhole	1200	S4.000	40.320	225				
S13	42.600	2.665	Open Manhole	1350	S1.007	39.935	375	S1.006	40.010	375	75
								S4.000	40.085	225	
S14	44.160	1.350	Open Manhole	1200	S5.000	42.810	150				
S15	40.215	1.425	Open Manhole	1200	S5.001	38.790	225	S5.000	38.865	150	
S16	39.890	1.425	Open Manhole	1200	S5.002	38.465	225	S5.001	38.465	225	
S17	40.095	1.985	Open Manhole	1350	S1.008	38.110	375	S1.007	38.735	375	625
								S5.002	38.260	225	
S18	39.475	1.775	Open Manhole	1200	S6.000	37.700	225				
S19	39.310	1.930	Open Manhole	1350	S1.009	37.380	375	S1.008	37.380	375	
								S6.000	37.530	225	
S20	38.050	1.450	Open Manhole	1350	S1.010	36.600	375	S1.009	36.600	375	
S22	38.135	1.830	Open Manhole	1350	S1.011	36.305	375	S1.010	36.305	375	
STANK 2	38.570	2.470	Open Manhole	500	S7.000	36.100	150				
S24	38.790	2.765	Open Manhole	1200	S7.001	36.025	150	S7.000	36.025	150	
STANK 1	38.200	2.250	Open Manhole	500	S7.002	35.950	-2	S7.001	35.950	150	
S23A	37.720	1.910	Open Manhole	1200	S7.003	35.810	225	S7.002	35.810	-2	
S23	37.775	2.060	Open Manhole	1350	S1.012	35.715	225	S1.011	35.715	375	
								S7.003	35.715	225	
S27	37.675	2.065	Open Manhole	1200	S1.013	35.610	225	S1.012	35.610	225	
S28	37.420	1.870	Open Manhole	1200	S1.014	35.550	225	S1.013	35.550	225	
SHW1	37.291	1.801	Open Manhole	1	S1.015	35.490	225	S1.014	35.490	225	
S29	37.200	1.395	Open Manhole	1200	S8.000	35.805	150				
S30	37.505	1.350	Open Manhole	1200	S9.000	36.155	150				
S31	37.070	1.560	Open Manhole	1200	S8.001	35.510	225	S8.000	35.585	150	
								S9.000	35.585	150	
S32	36.640	1.415	Open Manhole	1200	S8.002	35.225	225	S8.001	35.225	225	
S33	36.720	1.540	Open Manhole	1200	S8.003	35.180	225	S8.002	35.180	225	
SHW2	36.981	1.861	Open Manhole	1200	S1.016	35.120	-1	S1.015	35.120	225	
								S8.003	35.120	225	
SHW3	36.900	1.887	Open Manhole	500	S1.017	35.013	1000	S1.016	35.035	-1	
SHW4	35.400	1.020	Open Manhole	500	S1.018	34.380	600	S1.017	34.380	1000	
SFIELD	34.300	1.400	Open Manhole	1 x 10000	S1.019	32.900	300	S1.018	33.600	600	700
SDUMMY	34.000	1.200	Open Manhole	0		OUTFALL		S1.019	32.800	300	

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PIPELINE SCHEDULES for Proposed - Storm (No Infil)

Upstream Manhole

- Indicates pipe length does not match coordinates

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	S1	53.165	51.550	1.465	Open Manhole	1200
S1.001	o	150	S2	51.840	50.490	1.200	Open Manhole	1200
S1.002	o	150	S3	50.005	48.655	1.200	Open Manhole	1200
S1.003	o	150	S4	48.440	47.090	1.200	Open Manhole	1200
S1.004	o	225	S5	47.635	46.210	1.200	Open Manhole	1200
S2.000	o	225	S8	45.500	44.075	1.200	Open Manhole	1200
S1.005	o	225	S9	45.510	43.950	1.335	Open Manhole	1200
S3.000	o	225	S10	43.090	41.165	1.700	Open Manhole	1200
S1.006	o	375	S11	43.065	40.885	1.805	Open Manhole	1350
S4.000	o	225	S12	43.000	40.320	2.455	Open Manhole	1200
S1.007	o	375	S13	42.600	39.935	2.290	Open Manhole	1350
S5.000	o	150	S14	44.160	42.810	1.200	Open Manhole	1200
S5.001	o	225	S15	40.215	38.790	1.200	Open Manhole	1200
S5.002	o	225	S16	39.890	38.465	1.200	Open Manhole	1200
S1.008	o	375	S17	40.095	38.110	1.610	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)
S1.000	22.991	21.7	S2	51.840	50.490	1.200	Open Manhole	1200
S1.001	21.806	11.9	S3	50.005	48.655	1.200	Open Manhole	1200
S1.002	20.451	13.1	S4	48.440	47.090	1.200	Open Manhole	1200
S1.003	12.740	15.8	S5	47.635	46.285	1.200	Open Manhole	1200
S1.004	65.176	28.8	S9	45.510	43.950	1.335	Open Manhole	1200
S2.000	23.826	190.8	S9	45.510	43.950	1.335	Open Manhole	1200
S1.005	37.789	13.0	S11	43.065	41.035	1.805	Open Manhole	1350
S3.000	7.600	58.5	S11	43.065	41.035	1.805	Open Manhole	1350
S1.006	6.811	7.8	S13	42.600	40.010	2.215	Open Manhole	1350
S4.000	24.756	105.3	S13	42.600	40.085	2.290	Open Manhole	1350
S1.007	36.218	30.2	S17	40.095	38.735	0.985	Open Manhole	1350
S5.000	44.736	11.3	S15	40.215	38.865	1.200	Open Manhole	1200
S5.001	22.741	70.0	S16	39.890	38.465	1.200	Open Manhole	1200
S5.002	35.094	171.2	S17	40.095	38.260	1.610	Open Manhole	1350
S1.008	11.383	15.6	S19	39.310	37.380	1.555	Open Manhole	1350

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PIPELINE SCHEDULES for Proposed - Storm (No Infil)

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)
S6.000	o	225	S18	39.475	37.700	1.550	Open Manhole	1200
S1.009	o	375	S19	39.310	37.380	1.555	Open Manhole	1350
S1.010	o	375	S20	38.050	36.600	1.075	Open Manhole	1350
S1.011	o	375	S22	38.135	36.305	1.455	Open Manhole	1350
S7.000	o	150	STANK 2	38.570	36.100	2.320	Open Manhole	500
S7.001	o	150	S24	38.790	36.025	2.615	Open Manhole	1200
S7.002	ooo	-2	STANK 1	38.200	35.950	2.100	Open Manhole	500
S7.003	o	225	S23A	37.720	35.810	1.760	Open Manhole	1200
S1.012	o	225	S23	37.775	35.715	1.835	Open Manhole	1350
S1.013	o	225	S27	37.675	35.610	1.840	Open Manhole	1200
S1.014	o	225	S28	37.420	35.550	1.645	Open Manhole	1200
S1.015	o	225	SHW1	37.291	35.490	1.576	Open Manhole	1
S8.000	o	150	S29	37.200	35.805	1.245	Open Manhole	1200
S9.000	o	150	S30	37.505	36.155	1.200	Open Manhole	1200
S8.001	o	225	S31	37.070	35.510	1.335	Open Manhole	1200
S8.002	o	225	S32	36.640	35.225	1.190	Open Manhole	1200
S8.003	o	225	S33	36.720	35.180	1.315	Open Manhole	1200
S1.016	oo	-1	SHW2	36.981	35.120	1.711	Open Manhole	1200
S1.017	2 _/	1000	SHW3	36.900	35.013	1.587	Open Manhole	500

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)
S6.000	24.351	143.2	S19	39.310	37.530	1.555	Open Manhole	1350
S1.009	23.512	30.1	S20	38.050	36.600	1.075	Open Manhole	1350
S1.010	13.206	44.8	S22	38.135	36.305	1.455	Open Manhole	1350
S1.011	29.141	49.4	S23	37.775	35.715	1.685	Open Manhole	1350
S7.000	10.000#	133.3	S24	38.790	36.025	2.615	Open Manhole	1200
S7.001	10.000#	133.3	STANK 1	38.200	35.950	2.100	Open Manhole	500
S7.002	10.561	75.4	S23A	37.720	35.810	1.760	Open Manhole	1200
S7.003	4.761	50.1	S23	37.775	35.715	1.910	Open Manhole	1350
S1.012	16.991	161.8	S27	37.675	35.610	1.840	Open Manhole	1200
S1.013	11.994	199.9	S28	37.420	35.550	1.645	Open Manhole	1200
S1.014	11.357	189.3	SHW1	37.291	35.490	1.576	Open Manhole	1
S1.015	22.952	62.0	SHW2	36.981	35.120	1.636	Open Manhole	1200
S8.000	22.052	100.2	S31	37.070	35.585	1.335	Open Manhole	1200
S9.000	22.708	39.8	S31	37.070	35.585	1.335	Open Manhole	1200
S8.001	38.963	136.7	S32	36.640	35.225	1.190	Open Manhole	1200
S8.002	7.948	176.6	S33	36.720	35.180	1.315	Open Manhole	1200
S8.003	11.707	195.1	SHW2	36.981	35.120	1.636	Open Manhole	1200
S1.016	12.461	146.6	SHW3	36.900	35.035	1.715	Open Manhole	500
S1.017	17.809#	28.1	SHW4	35.400	34.380	0.720	Open Manhole	500

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PIPELINE SCHEDULES for Proposed - Storm (No Infil)

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)
S1.018	2 _/	600	SHW4	35.400	34.380	0.720	Open Manhole	500
S1.019	o	300	SFIELD	34.300	32.900	1.100	Open Manhole	1 x 10000

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)
S1.018	11.314#	14.5	SFIELD	34.300	33.600	0.400	Open Manhole	1 x 10000
S1.019	5.000#	50.0	SDUMMY	34.000	32.800	0.900	Open Manhole	0

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Area Summary for Proposed - Storm (No Infil)

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.067	0.067	0.067
1.001	User	-	100	0.056	0.056	0.056
1.002	User	-	100	0.065	0.065	0.065
1.003	-	-	100	0.000	0.000	0.000
1.004	User	-	100	0.222	0.222	0.222
2.000	User	-	100	0.040	0.040	0.040
	User	-	100	0.021	0.021	0.061
	User	-	100	0.033	0.033	0.095
	User	-	100	0.036	0.036	0.131
1.005	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.042	0.042	0.042
1.006	User	-	100	0.047	0.047	0.047
4.000	User	-	100	0.057	0.057	0.057
1.007	User	-	100	0.029	0.029	0.029
	User	-	100	0.048	0.048	0.078
5.000	User	-	100	0.090	0.090	0.090
5.001	User	-	100	0.026	0.026	0.026
5.002	-	-	100	0.000	0.000	0.000
1.008	User	-	100	0.096	0.096	0.096
6.000	User	-	100	0.066	0.066	0.066
1.009	-	-	100	0.000	0.000	0.000
1.010	User	-	100	0.093	0.093	0.093
1.011	User	-	100	0.035	0.035	0.035
7.000	-	-	100	0.000	0.000	0.000
7.001	-	-	100	0.000	0.000	0.000
7.002	-	-	100	0.000	0.000	0.000
7.003	-	-	100	0.000	0.000	0.000
1.012	User	-	100	0.042	0.042	0.042
1.013	User	-	100	0.033	0.033	0.033
1.014	-	-	100	0.000	0.000	0.000
1.015	-	-	100	0.000	0.000	0.000
8.000	User	-	100	0.062	0.062	0.062
9.000	User	-	100	0.007	0.007	0.007
8.001	User	-	100	0.040	0.040	0.040
8.002	User	-	100	0.047	0.047	0.047
8.003	-	-	100	0.000	0.000	0.000
1.016	User	-	100	0.024	0.024	0.024
1.017	-	-	100	0.000	0.000	0.000
1.018	-	-	100	0.000	0.000	0.000
1.019	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.425	1.425	1.425

Free Flowing Outfall Details for Proposed - Storm (No Infil)

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.019	SDUMMY	34.000	32.800	0.000	0	0

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Simulation Criteria for Proposed - Storm (No Infil)

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	10.000
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)	2880
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	24

Number of Input Hydrographs	0	Number of Offline Controls	1	Number of Time/Area Diagrams	0
Number of Online Controls	6	Number of Storage Structures	6	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.700	Storm Duration (mins)	1440
Ratio R	0.350		

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Online Controls for Proposed - Storm (No Infil)

Orifice Manhole: S11, DS/PN: S1.006, Volume (m³): 4.8

Diameter (m) 0.275 Discharge Coefficient 0.600 Invert Level (m) 40.885

Orifice Manhole: S13, DS/PN: S1.007, Volume (m³): 5.4

Diameter (m) 0.225 Discharge Coefficient 0.600 Invert Level (m) 39.935

Orifice Manhole: S19, DS/PN: S1.009, Volume (m³): 4.8

Diameter (m) 0.200 Discharge Coefficient 0.600 Invert Level (m) 37.380

Hydro-Brake® Optimum Manhole: S24, DS/PN: S7.001, Volume (m³): 3.3

Unit Reference	MD-SHE-0082-4000-2000-4000
Design Head (m)	2.000
Design Flow (l/s)	4.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	82
Invert Level (m)	36.025
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	4.0	Kick-Flo®	0.729	2.5
Flush-Flo™	0.356	3.1	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)	Depth (m)	Flow (l/s)
0.100	2.4	0.800	2.6	2.000	4.0	4.000	5.5	7.000	7.2
0.200	3.0	1.000	2.9	2.200	4.2	4.500	5.8	7.500	7.4
0.300	3.1	1.200	3.2	2.400	4.3	5.000	6.1	8.000	7.7
0.400	3.1	1.400	3.4	2.600	4.5	5.500	6.4	8.500	7.9
0.500	3.1	1.600	3.6	3.000	4.8	6.000	6.7	9.000	8.1
0.600	2.9	1.800	3.8	3.500	5.2	6.500	6.9	9.500	8.3

Complex Manhole: S23, DS/PN: S1.012, Volume (m³): 6.2

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0147-1000-0900-1000
Design Head (m)	0.900
Design Flow (l/s)	10.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	147
Invert Level (m)	35.715
Minimum Outlet Pipe Diameter (mm)	225

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Hydro-Brake® Optimum

Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	10.0	Kick-Flo®	0.625	8.4
Flush-Flo™	0.283	10.0	Mean Flow over Head Range	-	8.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.3	0.800	9.5	2.000	14.6	4.000	20.3	7.000	26.5
0.200	9.8	1.000	10.5	2.200	15.2	4.500	21.5	7.500	27.4
0.300	10.0	1.200	11.4	2.400	15.9	5.000	22.6	8.000	28.3
0.400	9.8	1.400	12.3	2.600	16.5	5.500	23.6	8.500	29.1
0.500	9.5	1.600	13.1	3.000	17.7	6.000	24.6	9.000	30.0
0.600	8.8	1.800	13.9	3.500	19.0	6.500	25.6	9.500	30.7

Weir

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 37.300

Complex Manhole: SFIELD, DS/PN: S1.019, Volume (m³): 29.8

Orifice

Diameter (m) 0.090 Discharge Coefficient 0.600 Invert Level (m) 33.442

Weir

Discharge Coef 0.510 Width (m) 0.250 Invert Level (m) 34.113

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Offline Controls for Proposed - Storm (No Infil)

Pipe Manhole: STANK 1, DS/PN: S7.002, Loop to PN: S7.000

Diameter (m)	-3	Roughness k (mm)	0.600
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	20.000	Upstream Invert Level (m)	36.925

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Storage Structures for Proposed - Storm (No Infil)

Cellular Storage Manhole: S10, DS/PN: S3.000

Invert Level (m) 41.165 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	33.0	33.0	1.200	33.0	66.6	1.300	0.0	66.6

Cellular Storage Manhole: S12, DS/PN: S4.000

Invert Level (m) 40.320 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	66.5	66.5	1.200	66.5	106.1	1.300	0.0	106.1

Cellular Storage Manhole: S18, DS/PN: S6.000

Invert Level (m) 37.700 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	112.0	0.0	1.200	112.0	0.0	1.201	0.0	0.0

Cellular Storage Manhole: STANK 2, DS/PN: S7.000

Invert Level (m) 36.100 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	148.0	148.0	1.200	148.0	211.6	1.300	0.0	211.6

Cellular Storage Manhole: STANK 1, DS/PN: S7.002

Invert Level (m) 35.950 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	400.0	400.0	1.200	400.0	496.0	1.300	0.0	496.0

Infiltration Basin Manhole: SFIELD, DS/PN: S1.019

Invert Level (m) 33.000 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	0.0	0.100	0.0	0.200	0.0	0.300	0.0

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Infiltration Basin Manhole: SFIELD, DS/PN: S1.019

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.439	0.0	0.600	87.0	0.900	114.5	1.100	132.7
0.440	71.8	0.700	95.8	1.000	123.5	1.200	142.1
0.500	77.8	0.800	104.6	1.010	124.5	1.300	151.6

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 10.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.700 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 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
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)
S1.000	S1	15 minute 1 year Summer I+0%	53.165	51.609	-0.091	0.000	0.33		0.061
S1.001	S2	15 minute 1 year Summer I+0%	51.840	50.552	-0.088	0.000	0.35		0.071
S1.002	S3	15 minute 1 year Summer I+0%	50.005	48.733	-0.072	0.000	0.52		0.087
S1.003	S4	15 minute 1 year Summer I+0%	48.440	47.174	-0.066	0.000	0.60		0.095
S1.004	S5	15 minute 1 year Winter I+0%	47.635	46.325	-0.111	0.000	0.51		0.125
S2.000	S8	15 minute 1 year Summer I+0%	45.500	44.207	-0.093	0.000	0.58		0.144
S1.005	S9	15 minute 1 year Winter I+0%	45.510	44.062	-0.113	0.000	0.49		0.306
S3.000	S10	15 minute 1 year Winter I+0%	43.090	41.224	-0.166	0.000	0.11		1.904
S1.006	S11	15 minute 1 year Winter I+0%	43.065	41.239	-0.021	0.000	0.19		0.694
S4.000	S12	15 minute 1 year Winter I+0%	43.000	40.382	-0.163	0.000	0.14		3.991
S1.007	S13	15 minute 1 year Winter I+0%	42.600	40.486	0.176	0.000	0.21		1.861
S5.000	S14	15 minute 1 year Summer I+0%	44.160	42.867	-0.093	0.000	0.31		0.059
S5.001	S15	15 minute 1 year Summer I+0%	40.215	38.881	-0.134	0.000	0.33		0.098
S5.002	S16	15 minute 1 year Summer I+0%	39.890	38.577	-0.113	0.000	0.49		0.182
S1.008	S17	15 minute 1 year Winter I+0%	40.095	38.245	-0.240	0.000	0.28		0.192
S6.000	S18	30 minute 1 year Winter I+0%	39.475	37.835	-0.090	0.000	0.44		14.537
S1.009	S19	15 minute 1 year Summer I+0%	39.310	38.047	0.292	0.000	0.20		2.586
S1.010	S20	15 minute 1 year Winter I+0%	38.050	36.754	-0.221	0.000	0.35		0.298
S1.011	S22	15 minute 1 year Winter I+0%	38.135	36.624	-0.056	0.000	0.28		1.020
S7.000	STANK 2	180 minute 1 year Winter I+0%	38.570	36.118	-0.132	0.000	0.02		2.523
S7.001	S24	120 minute 1 year Winter I+0%	38.790	36.167	-0.008	0.000	0.02		0.254
S7.002	STANK 1	120 minute 1 year Winter I+0%	38.200	36.192	0.092	0.000	0.22	0.0	92.246
S7.003	S23A	15 minute 1 year Winter I+0%	37.720	36.376	0.341	0.000	0.19		1.149
S1.012	S23	15 minute 1 year Winter I+0%	37.775	36.576	0.636	0.000	0.27		4.360
S1.013	S27	15 minute 1 year Summer I+0%	37.675	35.718	-0.117	0.000	0.46		0.232
S1.014	S28	15 minute 1 year Summer I+0%	37.420	35.650	-0.125	0.000	0.41		0.218
S1.015	SHW1	15 minute 1 year Winter I+0%	37.291	35.568	-0.147	0.000	0.26		0.084
S8.000	S29	15 minute 1 year Summer I+0%	37.200	35.893	-0.062	0.000	0.62		0.094
S9.000	S30	15 minute 1 year Summer I+0%	37.505	36.176	-0.129	0.000	0.05		0.018
S8.001	S31	15 minute 1 year Summer I+0%	37.070	35.606	-0.129	0.000	0.36		0.105

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

PN	US/MH Name	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S1	3.665	11.9	OK
S1.001	S2	6.746	17.2	OK
S1.002	S3	10.316	24.3	OK
S1.003	S4	10.316	24.5	OK
S1.004	S5	25.168	47.6	OK
S2.000	S8	7.142	20.1	OK
S1.005	S9	33.172	64.5	OK
S3.000	S10	2.543	5.6	OK
S1.006	S11	38.577	69.0	OK
S4.000	S12	3.088	6.5	OK
S1.007	S13	46.347	69.9	SURCHARGED
S5.000	S14	4.922	16.0	OK
S5.001	S15	6.349	17.9	OK
S5.002	S16	6.349	18.3	OK
S1.008	S17	59.334	92.5	OK
S6.000	S18	2.540	17.5	OK
S1.009	S19	54.397	61.4	SURCHARGED
S1.010	S20	66.787	71.5	OK
S1.011	S22	68.949	69.9	OK
S7.000	STANK 2	-1.137	0.3	OK
S7.001	S24	-1.627	0.3	OK
S7.002	STANK 1	-31.241	9.6	SURCHARGED
S7.003	S23A	-37.609	8.5	SURCHARGED
S1.012	S23	31.888	9.9	SURCHARGED
S1.013	S27	33.179	13.1	OK
S1.014	S28	32.907	13.1	OK
S1.015	SHW1	32.972	13.1	OK
S8.000	S29	3.410	10.4	OK
S9.000	S30	0.375	1.2	OK
S8.001	S31	5.953	15.0	OK

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)
S8.002	S32	15 minute 1 year Winter I+0%	36.640	35.391	-0.059	0.000	0.56		0.502
S8.003	S33	15 minute 1 year Winter I+0%	36.720	35.374	-0.031	0.000	0.51		0.424
S1.016	SHW2	15 minute 1 year Winter I+0%	36.981	35.350	0.080	0.000	1.42		0.883
S1.017	SHW3	15 minute 1 year Winter I+0%	36.900	35.051	-1.849	0.000	0.00		0.035
S1.018	SHW4	15 minute 1 year Winter I+0%	35.400	34.426	-0.974	0.000	0.00		0.018
S1.019	SFIELD	720 minute 1 year Winter I+0%	34.300	33.929	0.729	0.000	0.18		47.048

PN	US/MH Name	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S8.002	S32	9.573	16.8	OK
S8.003	S33	9.559	16.1	OK
S1.016	SHW2	43.562	30.6	SURCHARGED
S1.017	SHW3	43.465	30.6	OK
S1.018	SHW4	43.370	30.6	OK
S1.019	SFIELD	340.719	11.2	SURCHARGED

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 10.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.700 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 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
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)
S1.000	S1	15 minute 30 year Summer I+0%	53.165	51.653	-0.047	0.000	0.80		0.111
S1.001	S2	15 minute 30 year Summer I+0%	51.840	50.626	-0.014	0.000	0.94		0.169
S1.002	S3	15 minute 30 year Winter I+0%	50.005	49.300	0.495	0.000	1.03		0.836
S1.003	S4	15 minute 30 year Winter I+0%	48.440	47.695	0.455	0.000	1.15		0.793
S1.004	S5	15 minute 30 year Winter I+0%	47.635	46.646	0.210	0.000	1.03		0.558
S2.000	S8	15 minute 30 year Summer I+0%	45.500	44.412	0.112	0.000	1.20		0.375
S1.005	S9	15 minute 30 year Summer I+0%	45.510	44.296	0.121	0.000	0.98		1.528
S3.000	S10	30 minute 30 year Winter I+0%	43.090	41.604	0.214	0.000	0.82		14.259
S1.006	S11	30 minute 30 year Winter I+0%	43.065	41.615	0.355	0.000	0.33		1.519
S4.000	S12	30 minute 30 year Winter I+0%	43.000	40.813	0.268	0.000	0.97		31.725
S1.007	S13	30 minute 30 year Winter I+0%	42.600	40.883	0.573	0.000	0.29		2.753
S5.000	S14	15 minute 30 year Summer I+0%	44.160	42.909	-0.051	0.000	0.76		0.106
S5.001	S15	15 minute 30 year Summer I+0%	40.215	38.981	-0.034	0.000	0.85		0.219
S5.002	S16	15 minute 30 year Summer I+0%	39.890	38.761	0.071	0.000	1.12		0.801
S1.008	S17	15 minute 30 year Winter I+0%	40.095	38.565	0.080	0.000	0.44		1.725
S6.000	S18	60 minute 30 year Winter I+0%	39.475	38.290	0.365	0.000	1.12		63.475
S1.009	S19	15 minute 30 year Winter I+0%	39.310	38.419	0.664	0.000	0.26		3.494
S1.010	S20	15 minute 30 year Winter I+0%	38.050	37.257	0.282	0.000	0.45		2.392
S1.011	S22	15 minute 30 year Winter I+0%	38.135	37.197	0.517	0.000	0.39		2.580
S7.000	STANK 2	600 minute 30 year Winter I+0%	38.570	36.455	0.205	0.000	0.25		50.025
S7.001	S24	600 minute 30 year Winter I+0%	38.790	36.459	0.284	0.000	0.19		0.647
S7.002	STANK 1	180 minute 30 year Winter I+0%	38.200	36.709	0.609	0.000	0.22	0.0	288.911
S7.003	S23A	180 minute 30 year Winter I+0%	37.720	36.769	0.734	0.000	0.22		1.593
S1.012	S23	15 minute 30 year Winter I+0%	37.775	37.110	1.170	0.000	0.33		5.197
S1.013	S27	15 minute 30 year Winter I+0%	37.675	35.805	-0.030	0.000	0.77		0.613
S1.014	S28	15 minute 30 year Winter I+0%	37.420	35.775	0.000	0.000	0.65		0.612
S1.015	SHW1	15 minute 30 year Winter I+0%	37.291	35.750	0.035	0.000	0.40		0.390
S8.000	S29	15 minute 30 year Summer I+0%	37.200	36.081	0.126	0.000	1.21		0.306
S9.000	S30	15 minute 30 year Summer I+0%	37.505	36.188	-0.117	0.000	0.11		0.032
S8.001	S31	15 minute 30 year Winter I+0%	37.070	35.902	0.167	0.000	0.68		0.943

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

PN	US/MH Name	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S1	8.982	29.2	OK
S1.001	S2	16.532	46.1	OK
S1.002	S3	28.315	47.9	SURCHARGED
S1.003	S4	28.315	47.0	SURCHARGED
S1.004	S5	61.671	96.6	SURCHARGED
S2.000	S8	17.502	41.4	SURCHARGED
S1.005	S9	72.563	128.7	SURCHARGED
S3.000	S10	8.240	41.6	SURCHARGED
S1.006	S11	125.739	120.5	SURCHARGED
S4.000	S12	10.090	45.3	SURCHARGED
S1.007	S13	151.165	96.5	SURCHARGED
S5.000	S14	12.062	39.2	OK
S5.001	S15	15.560	45.8	OK
S5.002	S16	15.561	41.7	SURCHARGED
S1.008	S17	145.554	148.7	SURCHARGED
S6.000	S18	14.593	44.6	SURCHARGED
S1.009	S19	150.834	80.8	SURCHARGED
S1.010	S20	164.561	92.2	SURCHARGED
S1.011	S22	169.681	97.0	SURCHARGED
S7.000	STANK 2	-1.280	2.7	SURCHARGED
S7.001	S24	-1.462	2.4	SURCHARGED
S7.002	STANK 1	-213.566	9.5	SURCHARGED
S7.003	S23A	-215.053	9.5	SURCHARGED
S1.012	S23	33.095	11.9	SURCHARGED
S1.013	S27	37.645	21.8	OK
S1.014	S28	37.395	20.7	SURCHARGED
S1.015	SHW1	37.186	19.8	SURCHARGED
S8.000	S29	8.357	20.3	SURCHARGED
S9.000	S30	0.918	3.0	OK
S8.001	S31	16.342	28.6	SURCHARGED

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)
S8.002	S32	15 minute 30 year Winter I+0%	36.640	35.822	0.372	0.000	1.11		2.171
S8.003	S33	15 minute 30 year Winter I+0%	36.720	35.769	0.364	0.000	1.04		0.929
S1.016	SHW2	15 minute 30 year Winter I+0%	36.981	35.706	0.436	0.000	2.48		1.956
S1.017	SHW3	15 minute 30 year Winter I+0%	36.900	35.071	-1.829	0.000	0.00		0.056
S1.018	SHW4	15 minute 30 year Winter I+0%	35.400	34.444	-0.956	0.000	0.01		0.027
S1.019	SFIELD	240 minute 30 year Winter I+0%	34.300	34.137	0.937	0.000	0.24		75.248

PN	US/MH Name	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S8.002	S32	23.451	33.2	SURCHARGED
S8.003	S33	23.445	33.0	SURCHARGED
S1.016	SHW2	63.823	53.5	SURCHARGED
S1.017	SHW3	63.737	53.5	OK
S1.018	SHW4	63.653	53.5	OK
S1.019	SFIELD	313.945	15.1	FLOOD RISK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 10.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 6 Number of Storage Structures 6 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.700 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 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
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)
S1.000	S1	15 minute 100 year Summer I+30%	53.165	51.942	0.242	0.000	0.98		0.438
S1.001	S2	15 minute 100 year Winter I+30%	51.840	51.397	0.757	0.000	0.94		1.320
S1.002	S3	15 minute 100 year Winter I+30%	50.005	50.008	1.203	2.808	1.06		4.577
S1.003	S4	15 minute 100 year Winter I+30%	48.440	48.440	1.200	0.148	1.25		1.950
S1.004	S5	15 minute 100 year Winter I+30%	47.635	47.463	1.028	0.000	1.08		1.615
S2.000	S8	15 minute 100 year Winter I+30%	45.500	44.995	0.695	0.000	1.39		1.035
S1.005	S9	15 minute 100 year Winter I+30%	45.510	44.847	0.672	0.000	1.03		2.785
S3.000	S10	60 minute 100 year Winter I+30%	43.090	41.933	0.543	0.000	0.95		24.941
S1.006	S11	60 minute 100 year Winter I+30%	43.065	41.930	0.670	0.000	0.35		2.126
S4.000	S12	60 minute 100 year Winter I+30%	43.000	41.263	0.718	0.000	1.17		60.609
S1.007	S13	60 minute 100 year Winter I+30%	42.600	41.298	0.988	0.000	0.36		3.478
S5.000	S14	15 minute 100 year Summer I+30%	44.160	43.130	0.170	0.000	0.99		0.356
S5.001	S15	15 minute 100 year Winter I+30%	40.215	39.811	0.796	0.000	0.99		1.318
S5.002	S16	15 minute 100 year Winter I+30%	39.890	39.510	0.820	0.000	1.30		2.033
S1.008	S17	15 minute 100 year Winter I+30%	40.095	39.224	0.739	0.000	0.54		3.885
S6.000	S18	60 minute 100 year Winter I+30%	39.475	39.107	1.182	0.000	1.53		129.301
S1.009	S19	60 minute 100 year Winter I+30%	39.310	39.103	1.348	0.000	0.32		4.485
S1.010	S20	30 minute 100 year Winter I+30%	38.050	37.960	0.985	0.000	0.53		4.388
S1.011	S22	30 minute 100 year Winter I+30%	38.135	37.878	1.198	0.000	0.46		3.554
S7.000	STANK 2	960 minute 100 year Winter I+30%	38.570	36.903	0.653	0.000	0.28		113.065
S7.001	S24	960 minute 100 year Winter I+30%	38.790	36.906	0.731	0.000	0.20		1.152
S7.002	STANK 1	360 minute 100 year Winter I+30%	38.200	37.560	1.460	0.000	0.29	1.8	469.143
S7.003	S23A	360 minute 100 year Winter I+30%	37.720	37.576	1.541	0.000	0.28		2.507
S1.012	S23	30 minute 100 year Winter I+30%	37.775	37.751	1.811	0.000	0.40		6.115
S1.013	S27	15 minute 100 year Winter I+30%	37.675	36.258	0.423	0.000	0.83		1.352
S1.014	S28	15 minute 100 year Winter I+30%	37.420	36.219	0.444	0.000	0.68		1.180
S1.015	SHW1	15 minute 100 year Winter I+30%	37.291	36.187	0.472	0.000	0.44		0.428
S8.000	S29	15 minute 100 year Winter I+30%	37.200	36.631	0.676	0.000	1.31		0.929
S9.000	S30	15 minute 100 year Winter I+30%	37.505	36.458	0.153	0.000	0.17		0.337
S8.001	S31	15 minute 100 year Winter I+30%	37.070	36.454	0.719	0.000	0.73		1.810

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

PN	US/MH Name	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S1.000	S1	15.121	35.7	SURCHARGED
S1.001	S2	31.173	46.3	SURCHARGED
S1.002	S3	47.676	49.5	FLOOD
S1.003	S4	47.750	51.2	FLOOD
S1.004	S5	103.891	101.8	FLOOD RISK
S2.000	S8	33.003	47.9	SURCHARGED
S1.005	S9	136.894	135.7	SURCHARGED
S3.000	S10	18.156	48.5	SURCHARGED
S1.006	S11	274.217	126.5	SURCHARGED
S4.000	S12	24.445	54.4	SURCHARGED
S1.007	S13	332.357	118.0	SURCHARGED
S5.000	S14	20.307	51.2	SURCHARGED
S5.001	S15	29.340	53.1	SURCHARGED
S5.002	S16	29.339	48.6	SURCHARGED
S1.008	S17	245.232	179.1	SURCHARGED
S6.000	S18	23.011	61.0	SURCHARGED
S1.009	S19	447.451	101.0	FLOOD RISK
S1.010	S20	297.411	107.8	FLOOD RISK
S1.011	S22	304.641	116.5	FLOOD RISK
S7.000	STANK 2	22.789	3.0	SURCHARGED
S7.001	S24	22.799	2.5	SURCHARGED
S7.002	STANK 1	-298.723	12.8	SURCHARGED
S7.003	S23A	-300.091	12.1	FLOOD RISK
S1.012	S23	41.654	14.6	FLOOD RISK
S1.013	S27	47.067	23.6	SURCHARGED
S1.014	S28	46.785	21.8	SURCHARGED
S1.015	SHW1	46.538	21.8	SURCHARGED
S8.000	S29	15.758	21.9	SURCHARGED
S9.000	S30	1.731	4.4	SURCHARGED
S8.001	S31	27.512	30.6	SURCHARGED

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Proposed - Storm (No Infil)

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)
S8.002	S32	15 minute 100 year Winter I+30%	36.640	36.324	0.874	0.000	1.48		2.739
S8.003	S33	15 minute 100 year Winter I+30%	36.720	36.229	0.824	0.000	1.36		1.449
S1.016	SHW2	15 minute 100 year Winter I+30%	36.981	36.118	0.848	0.000	3.31		2.429
S1.017	SHW3	15 minute 100 year Winter I+30%	36.900	35.082	-1.818	0.000	0.00		0.067
S1.018	SHW4	15 minute 100 year Winter I+30%	35.400	34.457	-0.943	0.000	0.01		0.032
S1.019	SFIELD	180 minute 100 year Winter I+30%	34.300	34.275	1.075	0.000	0.64		97.133

PN	US/MH Name	Discharge Vol (m³)	Pipe Flow (l/s)	Status
S8.002	S32	39.480	44.4	SURCHARGED
S8.003	S33	39.462	43.1	SURCHARGED
S1.016	SHW2	91.572	71.4	SURCHARGED
S1.017	SHW3	91.470	71.4	OK
S1.018	SHW4	91.370	71.3	OK
S1.019	SFIELD	383.099	41.1	FLOOD RISK

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Blavignac, Julien

Subject: RE: Bow Lake Gardens

From: [redacted]
Sent: Friday, April 19, 2024 10:27 AM
To: Beeching, Luke [redacted]
Subject: RE: Bow Lake Gardens

Hi Luke,

I've contacted the Contractor and they have confirmed it is 150mm deep.

Please can your report be updated with this 'as built' information and reissued.

Noted on the future maintenance.

Regards

James

James Hammond
Senior Technical Manager

[redacted]

Vistry Thames Valley
550 Oracle Parkway | Thames Valley Park
Reading I RG6 1PT [redacted]

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From: Beeching, Luke [redacted]
Sent: Thursday, April 18, 2024 5:26 PM
To: James Hammond [redacted]
Subject: RE: Bow Lake Gardens

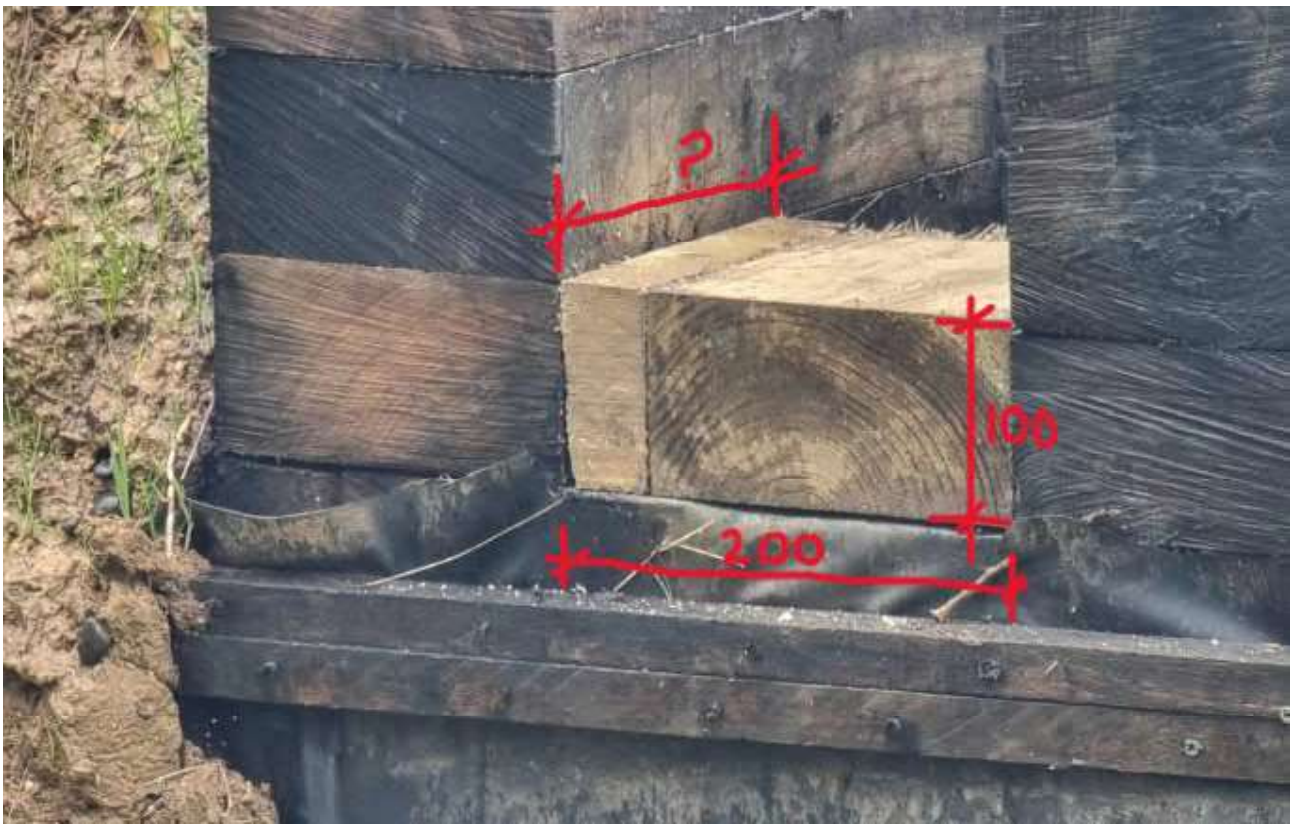
NOTE: Email originated outside of Vistry Group.

Hi James,

Thanks for confirming that the timber is treated and is fixed securely to the larger weir structure by coach screws.

The installed timber shown in the photograph appears to be shorter than the 500mm minimum length suggested (marked up extract below). This will have a small effect on the coefficient of discharge of the weir, which would

affect the flow rate. However this effect is expected to be small and the installed system should still operate in line with the hydraulic calculations and flow rates set out in my e-mail of 04 March, below.



We have some concerns with the quality of the installation and that it is formed from two pieces of timber, but this relates to the longevity and future maintenance rather than the immediate operation. We'd recommend that this element is added as a specific item to note when the periodic SUDS maintenance inspections take place, so that if there is any damage or deterioration it can be acted on at an appropriate time.

Kind regards,

Luke

Luke Beeching
Associate Director
CEng MICE MCIHT

[redacted]

WSP UK Ltd.
Grosvenor House, 2 Grosvenor Square
Southampton
SO15 2BE United Kingdom

wsp.com

From: James Hammond [redacted]
Sent: Wednesday, April 17, 2024 12:07 PM

To: Beeching, Luke [redacted]
Subject: RE: Bow Lake Gardens

Hi Luke,

Responses as follows:

Dimensions of the installed block; = 100 x 200
That it is a treated timber; = yes
How it is secured in place? = coach screws

Regards

James

James Hammond
Senior Technical Manager

[redacted]

Vistry Thames Valley
550 Oracle Parkway | Thames Valley Park
Reading I RG6 1PT | [redacted]

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From: Beeching, Luke [redacted]
Sent: Wednesday, April 17, 2024 10:13 AM
To: James Hammond [redacted]
Subject: RE: Bow Lake Gardens

NOTE: Email originated outside of Vistry Group.

Hi James,

Thanks for the photo. Are you able to confirm:

a) Dimensions of the installed block;
b) That it is a treated timber;
c) How it is secured in place?

Kind regards,

Luke

wsp

Luke Beeching
Associate Director
CEng MICE MCIHT

[redacted]

WSP UK Ltd.
Grosvenor House, 2 Grosvenor Square
Southampton
SO15 2BE United Kingdom

wsp.com

From: James Hammond [redacted]
Sent: Tuesday, April 16, 2024 5:35 PM
To: Beeching, Luke [redacted]
Subject: RE: Bow Lake Gardens

Hi Luke,

The Council have asked that the report is updated to show the additional timber (photo attached) as being 'compliant' with the recommendations in your report.

Please can you review and add an addendum to what was sent previously.

Regards

James

James Hammond
Senior Technical Manager

[redacted]

Vistry Thames Valley
550 Oracle Parkway | Thames Valley Park
Reading I RG6 1PT [redacted]

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From: Beeching, Luke <Luke.Beeching@wsp.com>
Sent: Monday, March 4, 2024 4:22 PM
To: James Hammond <James.Hammond@vistry.co.uk>; [redacted]
Subject: RE: Bow Lake Gardens

NOTE: Email originated outside of Vistry Group.

Hi James,

Thank you for the responses to our queries. Further to my e-mail below we have now completed the review of the as-built information provided.

The main differences identified are:

- Variation to basin geometry, which we understand to be due to the site boundary and tree constraints as per your comments below
- Reduction in basin crest level from intended 34.50m AOD to 34.39m AOD (at the lowest point) for the same reasons as above
- 18mm lower outfall pipe level

In relation to the gravel at the outfall, a larger stone size, such as the 40mm specified, would be preferable to reduce erosion risk.

<u>Review of updated modelling</u>
The as-built shape of the basin slightly reduces the available storage volume, which means that the updated hydraulic model indicates an increased water level and discharge over the weir for the 1 in 100 year (climate change) storm event. The slightly lower 90mm diameter pipe results in an increased head of water and a marginal increase in the predicted 1 year discharge rate.

The difference in the discharge for the 1 year rainfall event is 0.2 l/s or 2% of the agreed rate and would not be material to downstream flood risk, so we believe should be acceptable to Eastleigh Borough Council as local planning authority.

The discharge in the 30 year rainfall event remains below the agreed rate.

The discharge for the 100 year event is 3.1 l/s over the agreed 41.2 l/s rate (~7%). This is similarly unlikely to have a noticeable downstream effect in this kind of storm event, however it is a more significant increase and we have therefore looked at options to reduce the modelled discharge back down to the agreed rate. Installing a 100 x 200 piece of treated timber (of at least 500mm length) within the weir channel and hence raising the weir level by 100mm would reduce the modelled rate to 41.1 l/s. This could be bolted to the installed timber arrangement. The maximum water level increases to 34.275m AOD, which uses some of the available freeboard, but still leaves >100mm to the lowest point on the basin perimeter (34.390m AOD)

We've attached the microdrainage calculation outputs for the as-built basin and for the option with a 100mm increase in the weir level, and summary tables are set out below.

Agreed discharge rates are:

Return Period	Agreed greenfield discharge rates (l/s)
1 year	11.0
30 year	29.2
100 year	41.2

Derived from rates set out in "Land North of Breach Lane, Flood Risk Assessment", produced by Mayer Brown Ltd., July 2013

As-built basin			
Return Period	Critical Storm Duration	Peak Discharge Rate	Top Water Level
1 year	720 min	11.2 l/s	33.929m

30 year	180 min	19.2 l/s	34.076m
100 year (+30% CC)	120 min	44.3 l/s	34.192m

As-built basin with raised weir proposal (+100mm)			
Return Period	Critical Storm Duration	Peak Discharge Rate	Top Water Level
1 year	720 min	11.2 l/s	33.929m
30 year	240 min	15.1 l/s	34.137m
100 year (+30% CC)	180 min	41.1 l/s	34.275m

Please let me know if you have any queries or would like to discuss any of the above.

Kind regards,

Luke

Luke Beeching
Associate Director
CEng MICE MCIHT

[redacted]

WSP UK Ltd.
Grosvenor House, 2 Grosvenor Square
Southampton
SO15 2BE United Kingdom

wsp.com

From: James Hammond [redacted]
Sent: Thursday, February 8, 2024 8:28 AM
To: Beeching, Luke [redacted]
Subject: RE: Bow Lake Gardens

Hi Luke,

Please find below, responses in red from our Contractor:

To complete the review and provide comments please could you provide confirmation on the following points:

- Width, length and vertical depth of the installed weir – the as-built installation detail appears to be different to that proposed. In particular the sectional width of the overflow channel appears to be greater than 250mm = This is 250 mm wide
- Confirmation that the installed pipe is 90mm diameter – no dimension is given on the survey = Yes 90 mm Dia
- Confirmation whether the pipe levels given for the outfall are invert or crown of pipe = Invert of pipe

We also have the following initial comments / queries:

- The gravel at the outfall looks to be smaller than the 40mm single size stone specified.= 20 mm was installed, I can get this changed to 40 mm if required
- Thank you for the confirmation that the liner has been installed, and this can be seen at the upstream end of the pipe outfall in one of the photos. It appears to be missing on the downstream face of the control structure – can it be confirmed that it is has been wrapped beneath the bank crest as indicated on the design section? = Yes the linear was wrapped beneath as the design
- The basin crest is slightly lower than the design, which will reduce the available freeboard. = Due to the close proximity of the boundary fence, if we made the height of the bund any higher we would have needed to reduce the internal size of the wetland basin (the banks would be to steep other wise)

Regards

James

James Hammond
Senior Technical Manager

[redacted]

Vistry Thames Valley
550 Oracle Parkway | Thames Valley Park
Reading I RG6 1PT | [redacted]

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From: Beeching, Luke [redacted]
Sent: Wednesday, February 7, 2024 10:32 AM
To: James Hammond [redacted]
Subject: RE: Bow Lake Gardens

NOTE: Email originated outside of Vistry Group.

Hi James,

We have carried an initial review of the as-built basin information, including:

- Isopachyte comparison & spot check of sections against our drawing.
- Comparison of outfall detail
- Review of low-resolution photos included on as-built survey drawing

To complete the review and provide comments please could you provide confirmation on the following points:

- Width, length and vertical depth of the installed weir – the as-built installation detail appears to be different to that proposed. In particular the sectional width of the overflow channel appears to be greater than 250mm
- Confirmation that the installed pipe is 90mm diameter – no dimension is given on the survey
- Confirmation whether the pipe levels given for the outfall are invert or crown of pipe

We also have the following initial comments / queries:

- The gravel at the outfall looks to be smaller than the 40mm single size stone specified.

- Thank you for the confirmation that the liner has been installed, and this can be seen at the upstream end of the pipe outfall in one of the photos. It appears to be missing on the downstream face of the control structure – can it be confirmed that it is has been wrapped beneath the bank crest as indicated on the design section?
- The basin crest is slightly lower than the design, which will reduce the available freeboard.

Kind regards,

Luke

Luke Beeching
Associate Director
CEng MICE MCIHT

[redacted]

WSP UK Ltd.
Grosvenor House, 2 Grosvenor Square
Southampton
SO15 2BE United Kingdom

wsp.com

From: James Hammond [redacted]
Sent: Monday, February 5, 2024 10:39 AM
[redacted]
Cc: Beeching, Luke [redacted]; [redacted]
Subject: RE: Bow Lake Gardens

Hi [redacted] Luke,

Please can you provide an update on the below.

Regards

James

James Hammond
Senior Technical Manager

[redacted]

Vistry Thames Valley
550 Oracle Parkway | Thames Valley Park
Reading I RG6 1PT | [redacted]

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From: James Hammond [redacted]
Sent: Thursday, January 25, 2024 10:31 AM
To: Purcell, Simon [redacted]
Subject: RE: Bow Lake Gardens

Hi Simon,

Thank you.

Yes, the liner was installed.

Regards

James

James Hammond
Senior Technical Manager

[redacted]

Vistry Thames Valley
550 Oracle Parkway | Thames Valley Park
Reading I RG6 1PT [redacted]

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From: Purcell, Simon [redacted]
Sent: Thursday, January 25, 2024 10:26 AM
To: James Hammond [redacted]
Subject: RE: Bow Lake Gardens

NOTE: Email originated outside of Vistry Group.

Hi james
Luke is currently reviewing

One point - did you install a liner?

Simon Purcell
Director
Bsc, Msc (Distinction) CEng MICE
Director

[redacted]

WSP House, Unit 9
The Chase

Hertford SG13 7NN

wsp.com

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From: James Hammond [redacted]
Sent: Thursday, January 25, 2024 9:52 AM
To: Purcell, Simon [redacted]
Subject: RE: Bow Lake Gardens

Hi Simon,

Please can you provide an update on the below.

Regards

James

James Hammond
Senior Technical Manager

[redacted]

Vistry Thames Valley
550 Oracle Parkway | Thames Valley Park
Reading I RG6 1PT | [redacted]

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