TECHNICAL DESIGN NOTE

Hydrock

Project Name	Watling Street, Park Street, St Albans
Design Note Title	Response to Lead Local Flood Authority Comments
Document Reference	20880-HYD-XX-XX-TN-DS-001
Author	Richard Hughes
Revision	P01
Date	23 August 2022

Introduction

This Technical Note has been prepared in connection with planning application reference 05/2022/0267 submitted to St Albans District Council in respect of the above scheme.

As part of the consultation process, a number of comments have been made by the Lead Local Flood Authority (LLFA). This Technical Note addresses the points raised in order to respond to the issues raised.

A copy of the LLFA email dated the 4th August 2022 is included in Appendix A.

It should be noted that a revised version of the Drainage Strategy report, reference 20880-HYD-XX-XX-RP-D-5001-P05 has now been issued incorporating the points set out below.

Response to LLFA Comments

The items raised by the LLFA are repeated below, as shown in italics, with the individual responses following on.

1. *"The approval in principle from Thames Water with regards to surface water discharge is set at a maximum flow of 2l/s into the public sewer located in Old Orchard. However, the Micro Drainage hydraulic modelling calculations submitted as part of the Drainage Strategy Report uses a vortex flow control on the outfall pipe (label 1.019 in the hydraulic model) set at 3.1l/s. The applicant should revise the hydraulic modelling and submit results in accordance with the Thames Water permissible discharge of 2l/s.".*

   The calculations have been updated to restrict the final discharge rate from the development to 2.0 l/s, as required by Thames Water.

   A set of the revised calculations is included in Appendix B.

2. *"The Micro Drainage hydraulic modelling calculations submitted as part of the Drainage Strategy Report includes a vortex flow control upstream of pipe label 1.007, for control on Basin 1. However, there is no flow control chamber shown on Drainage Strategy Plan submitted for planning. The applicant should confirm the locations of all flow controls and ensure that the surface water drainage information submitted is consistent".*

Notes have been added to the Drainage Strategy drawing indicating the locations of all flow control manholes.

A copy of the revised drawing is included in Appendix B.

3. *"With regards to the proposed surface water drainage outfall pipe (label 1.019 in the hydraulic model), the invert level at the upstream end is lower than the invert in the Thames Water public surface water chamber in Old Orchard (chamber number 5152). Consequently, the outfall pipe is shown as having a backfall, which will likely mean Thames Water will not adopt it and as a result, if the outfall pipe is not adoptable then the overall development surface water drainage infrastructure may also not be adoptable. Furthermore, a backfall of this nature (especially on the outfall pipe upstream of the final flow control chamber) will have significant operation and maintenance implications at that location. The applicant should substantiate the whole-life strategy in relation to this inverted outfall pipe, which should include confirmation of further consultation with Thames Water on this issue if the intention is to have the proposed surface water drainage infrastructure adoptable. If not adoptable, confirm what the whole-life strategy maintenance will be and if Thames Water will still permit a connection into their chamber from an inverted pipe. This updated strategy should confirm the whole-life operation and maintenance of the inverted outfall pipe*.

   The levels of the proposed surface water outfall have been corrected to remove the backfall on pipe length 1.019. This is now reflected in the amended calculations and drawings appended to this Technical Note.

4. *"The Environment Agency has confirmed that the site lies in a vulnerable groundwater area with a Source Protection Zone 2 and a principal aquifer. The applicant should confirm the infiltration strategy for Basin 1 and any other sustainable drainage features that are intended to infiltrate and that the Agency's advice ('that all risks to groundwater and surface waters from contamination need to be identified so that appropriate remedial action can be taken') has been followed.".*

   Basin 1 is an attenuation basin only, and is not intended to be an infiltration feature. There are no infiltration features on the proposed drainage system.

END

APPENDIX A

LLFA COMMENTS dated 4th AUGUST 2022

SITE:	Land Between Caravan Site And Watling Street Park Street St Albans Hertfordshire
DESCRIPTION:	Outline application (access) - Erection of up to 95 dwellings, including 40% affordable dwellings and 5% self-build and custom build dwellings, public open space, landscaping and associated infrastructure - AMENDED & ADDITIONAL INFORMATION
APPLICATION NO:	05/2022/0267
GRID REFERENCE:	TL1456104496
APPLICANT:	Mr Richard Martin
AGENT:	-
DATE OF THIS RESPONSE:	04/08/2022
RESPONSE BY:	RAB

Planning Authority Comments

This technical review has been carried out by RAB on behalf of St Albans District Council.

The application documents as submitted are insufficient for the Local Planning Authority to provide a detailed response at this stage. In order to provide a detailed response, the following information is required:

- The approval in principle from Thames Water with regards to surface water discharge is set at a maximum flow of 2l/s into the public sewer located in Old Orchard. However, the Micro Drainage hydraulic modelling calculations submitted as part of the Drainage Strategy Report uses a vortex flow control on the outfall pipe (label 1.019 in the hydraulic model) set at 3.1l/s. The applicant should revise the hydraulic modelling and submit results in accordance with the Thames Water permissible discharge of 2l/s.
- The Micro Drainage hydraulic modelling calculations submitted as part of the Drainage Strategy Report includes a vortex flow control upstream of pipe label 1.007, for control on Basin 1. However, there is no flow control chamber shown on Drainage Strategy Plan submitted for planning. The applicant

should confirm the locations of all flow controls and ensure that the surface water drainage information submitted is consistent.

- With regards to the proposed surface water drainage outfall pipe (label 1.019 in the hydraulic model), the invert level at the upstream end is lower than the invert in the Thames Water public surface water chamber in Old Orchard (chamber number 5152). Consequently, the outfall pipe is shown as having a backfall, which will likely mean Thames Water will not adopt it and as a result, if the outfall pipe is not adoptable then the overall development surface water drainage infrastructure may also not be adoptable. Furthermore, a backfall of this nature (especially on the outfall pipe upstream of the final flow control chamber) will have significant operation and maintenance implications at that location. The applicant should substantiate the whole-life strategy in relation to this inverted outfall pipe, which should include confirmation of further consultation with Thames Water on this issue if the intention is to have the proposed surface water drainage infrastructure adoptable. If not adoptable, confirm what the whole-life strategy maintenance will be and if Thames Water will still permit a connection into their chamber from an inverted pipe. This updated strategy should confirm the whole-life operation and maintenance of the inverted outfall pipe.
- The Environment Agency has confirmed that the site lies in a vulnerable groundwater area with a Source Protection Zone 2 and a principal aquifer. The applicant should confirm the infiltration strategy for Basin 1 and any other sustainable drainage features that are intended to infiltrate and that the Agency's advice ('*that all risks to groundwater and surface waters from contamination need to be identified so that appropriate remedial action can be taken*') has been followed.

Consequently, we advise that there is insufficient information to provide a detailed assessment of the proposals at this time. In order to satisfy the requirements of the Local Planning Authority, we advise that the applicant should ensure that the details above are submitted.

APPENDIX B

UPDATED MICRO DRAINAGE CALCULATIONS

UPDATED DRAINAGE STRATEGY PLAN

Existing Network Details for Storm

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
1.000	17.600	0.073	241.1	0.029	4.00	0.0	0.600		o	300	Pipe/Conduit
1.001	26.700	0.112	238.4	0.066	0.00	0.0	0.600		o	300	Pipe/Conduit
1.002	14.800	0.061	242.6	0.031	0.00	0.0	0.600		o	300	Pipe/Conduit
1.003	38.300	0.160	239.4	0.082	0.00	0.0	0.600		o	300	Pipe/Conduit
1.004	31.800	0.132	240.9	0.054	0.00	0.0	0.600		o	300	Pipe/Conduit
1.005	24.000	0.100	240.0	0.032	0.00	0.0	0.600		o	300	Pipe/Conduit
2.000	24.300	2.100	11.6	0.055	5.00	0.0	0.600		o	300	Pipe/Conduit
2.001	14.300	0.638	22.4	0.024	0.00	0.0	0.600		o	300	Pipe/Conduit
1.006	7.700	0.032	240.6	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit
1.007	8.500	0.035	242.9	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit
1.008	55.700	0.223	249.8	0.000	0.00	0.0		0.045	2 _/	300	1:2 Ditch
3.000	15.800	1.100	14.4	0.062	5.00	0.0	0.600		o	300	Pipe/Conduit
3.001	21.400	2.093	10.2	0.008	0.00	0.0	0.600		o	300	Pipe/Conduit
4.000	46.300	0.193	239.9	0.134	5.00	0.0	0.600		o	300	Pipe/Conduit
3.002	9.800	0.835	11.7	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit
1.009	65.500	0.512	127.9	0.000	0.00	0.0		0.045	2 _/	300	1:2 Ditch
1.010	23.400	0.060	390.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit
5.000	13.400	0.056	239.3	0.064	5.00	0.0	0.600		o	300	Pipe/Conduit
5.001	12.200	0.051	239.2	0.049	0.00	0.0	0.600		o	300	Pipe/Conduit
5.002	38.800	1.643	23.6	0.132	0.00	0.0	0.600		o	300	Pipe/Conduit
5.003	18.600	1.150	16.2	0.067	0.00	0.0	0.600		o	300	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.000	73.200	0.029	0.0	1.01	71.3
1.001	73.127	0.095	0.0	1.01	71.7
1.002	73.015	0.126	0.0	1.00	71.0
1.003	72.954	0.208	0.0	1.01	71.5
1.004	72.794	0.262	0.0	1.01	71.3
1.005	72.662	0.294	0.0	1.01	71.4
2.000	75.300	0.055	0.0	4.65	328.5
2.001	73.200	0.079	0.0	3.34	235.8
1.006	72.562	0.373	0.0	1.01	71.3
1.007	72.530	0.373	0.0	1.00	71.0
1.008	72.495	0.373	0.0	1.12	5567.1
3.000	76.300	0.062	0.0	4.17	294.7
3.001	75.200	0.070	0.0	4.94	349.5
4.000	73.300	0.134	0.0	1.01	71.4
3.002	73.107	0.204	0.0	4.61	326.2
1.009	72.272	0.577	0.0	1.83	14654.0
1.010	71.760	0.577	0.0	0.79	55.8
5.000	78.500	0.064	0.0	1.01	71.5
5.001	78.444	0.113	0.0	1.01	71.5
5.002	78.393	0.245	0.0	3.25	229.7
5.003	76.750	0.312	0.0	3.93	277.7

Existing Network Details for Storm

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
5.004	23.700	2.050	11.6	0.044	0.00	0.0	0.600		o	300	Pipe/Conduit
5.005	13.100	0.750	17.5	0.101	0.00	0.0	0.600		o	450	Pipe/Conduit
5.006	28.300	0.118	239.8	0.064	0.00	0.0	0.600		o	450	Pipe/Conduit
5.007	30.600	0.832	36.8	0.045	0.00	0.0	0.600		o	450	Pipe/Conduit
1.011	26.100	0.065	401.5	0.052	0.00	0.0	0.600		o	450	Pipe/Conduit
1.012	20.700	0.052	398.1	0.042	0.00	0.0	0.600		o	450	Pipe/Conduit
1.013	23.700	0.059	401.7	0.043	0.00	0.0	0.600		o	450	Pipe/Conduit
1.014	27.800	0.070	397.1	0.032	0.00	0.0	0.600		o	450	Pipe/Conduit
6.000	22.000	0.092	239.1	0.041	5.00	0.0	0.600		o	300	Pipe/Conduit
6.001	35.200	0.308	114.3	0.108	0.00	0.0	0.600		o	300	Pipe/Conduit
6.002	15.900	2.000	8.0	0.151	0.00	0.0	0.600		o	300	Pipe/Conduit
6.003	25.400	2.000	12.7	0.006	0.00	0.0	0.600		o	300	Pipe/Conduit
6.004	6.800	2.596	2.6	0.021	0.00	0.0	0.600		o	300	Pipe/Conduit
1.015	29.300	0.073	401.4	0.056	0.00	0.0	0.600		o	450	Pipe/Conduit
1.016	16.900	0.042	402.4	0.039	0.00	0.0	0.600		o	450	Pipe/Conduit
1.017	8.200	0.021	390.5	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit
7.000	22.000	2.050	10.7	0.000	5.00	0.0	0.600		o	300	Pipe/Conduit
7.001	13.400	0.600	22.3	0.105	0.00	0.0	0.600		o	300	Pipe/Conduit
7.002	16.600	0.850	19.5	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit
7.003	15.500	1.332	11.6	0.020	0.00	0.0	0.600		o	300	Pipe/Conduit
1.018	6.600	0.034	194.1	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit
1.019	54.700	0.344	159.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
5.004	75.600	0.356	0.0	4.65	328.6
5.005	73.550	0.457	0.0	4.88	776.6
5.006	72.800	0.521	0.0	1.31	208.1
5.007	72.682	0.566	0.0	3.36	534.5
1.011	71.700	1.195	0.0	1.01	160.4
1.012	71.635	1.237	0.0	1.01	161.1
1.013	71.583	1.280	0.0	1.01	160.3
1.014	71.524	1.312	0.0	1.01	161.3
6.000	78.600	0.041	0.0	1.01	71.6
6.001	78.508	0.149	0.0	1.47	103.9
6.002	78.200	0.300	0.0	5.61	396.5
6.003	76.200	0.306	0.0	4.44	313.5
6.004	74.200	0.327	0.0	9.78	691.4
1.015	71.454	1.695	0.0	1.01	160.4
1.016	71.381	1.734	0.0	1.01	160.2
1.017	71.339	1.734	0.0	1.02	162.7
7.000	77.850	0.000	0.0	4.83	341.1
7.001	75.800	0.105	0.0	3.34	236.2
7.002	75.200	0.105	0.0	3.57	252.6
7.003	74.350	0.125	0.0	4.63	327.6
1.018	71.318	1.859	0.0	1.46	231.5
1.019	71.284	1.859	0.0	1.24	88.0

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	1	74.700	73.200	1.200	Open Manhole	1200
1.001	o	300	2	74.600	73.127	1.173	Open Manhole	1200
1.002	o	300	3	74.400	73.015	1.085	Open Manhole	1200
1.003	o	300	4	74.300	72.954	1.046	Open Manhole	1200
1.004	o	300	5	74.300	72.794	1.206	Open Manhole	1200
1.005	o	300	6	75.000	72.662	2.038	Open Manhole	1200
2.000	o	300	7	76.800	75.300	1.200	Open Manhole	1200
2.001	o	300	8	75.150	73.200	1.650	Open Manhole	1200
1.006	o	300	9	74.000	72.562	1.138	Open Manhole	1200
1.007	o	300	10	74.000	72.530	1.170	Open Manhole	1200
1.008	2 _/	300	11	74.000	72.495	1.205	Open Manhole	1200
3.000	o	300	12	77.800	76.300	1.200	Open Manhole	1200
3.001	o	300	13	76.700	75.200	1.200	Open Manhole	1200
4.000	o	300	14	74.800	73.300	1.200	Open Manhole	1200
3.002	o	300	15	74.800	73.107	1.393	Open Manhole	1200
1.009	2 _/	300	16	74.200	72.272	1.628	Open Manhole	2653
1.010	o	300	17	74.000	71.760	1.940	Junction	
5.000	o	300	18	80.100	78.500	1.300	Open Manhole	1200
5.001	o	300	19	80.100	78.444	1.356	Open Manhole	1200
5.002	o	300	20	79.900	78.393	1.207	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	17.600	241.1	2	74.600	73.127	1.173	Open Manhole	1200
1.001	26.700	238.4	3	74.400	73.015	1.085	Open Manhole	1200
1.002	14.800	242.6	4	74.300	72.954	1.046	Open Manhole	1200
1.003	38.300	239.4	5	74.300	72.794	1.206	Open Manhole	1200
1.004	31.800	240.9	6	75.000	72.662	2.038	Open Manhole	1200
1.005	24.000	240.0	9	74.000	72.562	1.138	Open Manhole	1200
2.000	24.300	11.6	8	75.150	73.200	1.650	Open Manhole	1200
2.001	14.300	22.4	9	74.000	72.562	1.138	Open Manhole	1200
1.006	7.700	240.6	10	74.000	72.530	1.170	Open Manhole	1200
1.007	8.500	242.9	11	74.000	72.495	1.205	Open Manhole	1200
1.008	55.700	249.8	16	74.200	72.272	1.628	Open Manhole	2653
3.000	15.800	14.4	13	76.700	75.200	1.200	Open Manhole	1200
3.001	21.400	10.2	15	74.800	73.107	1.393	Open Manhole	1200
4.000	46.300	239.9	15	74.800	73.107	1.393	Open Manhole	1200
3.002	9.800	11.7	16	74.200	72.272	1.628	Open Manhole	2653
1.009	65.500	127.9	17	74.000	71.760	1.940	Junction	
1.010	23.400	390.0	26	74.000	71.700	2.000	Open Manhole	1200
5.000	13.400	239.3	19	80.100	78.444	1.356	Open Manhole	1200
5.001	12.200	239.2	20	79.900	78.393	1.207	Open Manhole	1200
5.002	38.800	23.6	21	78.250	76.750	1.200	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.003	o	300	21	78.250	76.750	1.200	Open Manhole	1200
5.004	o	300	22	77.700	75.600	1.800	Open Manhole	1200
5.005	o	450	23	75.050	73.550	1.050	Open Manhole	1200
5.006	o	450	24	74.300	72.800	1.050	Open Manhole	1200
5.007	o	450	25	74.100	72.682	0.968	Open Manhole	1200
1.011	o	450	26	74.000	71.700	1.850	Open Manhole	1200
1.012	o	450	27	74.500	71.635	2.415	Open Manhole	1200
1.013	o	450	28	74.500	71.583	2.467	Open Manhole	1200
1.014	o	450	29	74.400	71.524	2.426	Open Manhole	4175
6.000	o	300	30	80.100	78.600	1.200	Open Manhole	1200
6.001	o	300	31	80.150	78.508	1.342	Open Manhole	1200
6.002	o	300	32	79.700	78.200	1.200	Open Manhole	1200
6.003	o	300	33	77.700	76.200	1.200	Open Manhole	1200
6.004	o	300	34	75.700	74.200	1.200	Open Manhole	1200
1.015	o	450	35	75.100	71.454	3.196	Open Manhole	1200
1.016	o	450	36	75.500	71.381	3.669	Open Manhole	1200
1.017	o	450	37	74.900	71.339	3.111	Open Manhole	1200
7.000	o	300	38	79.350	77.850	1.200	Open Manhole	1200
7.001	o	300	39	77.300	75.800	1.200	Open Manhole	1200
7.002	o	300	40	76.700	75.200	1.200	Open Manhole	1200
7.003	o	300	41	75.850	74.350	1.200	Open Manhole	1200
1.018	o	450	42	74.000	71.318	2.232	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.003	18.600	16.2	22	77.700	75.600	1.800	Open Manhole	1200
5.004	23.700	11.6	23	75.050	73.550	1.200	Open Manhole	1200
5.005	13.100	17.5	24	74.300	72.800	1.050	Open Manhole	1200
5.006	28.300	239.8	25	74.100	72.682	0.968	Open Manhole	1200
5.007	30.600	36.8	26	74.000	71.850	1.700	Open Manhole	1200
1.011	26.100	401.5	27	74.500	71.635	2.415	Open Manhole	1200
1.012	20.700	398.1	28	74.500	71.583	2.467	Open Manhole	1200
1.013	23.700	401.7	29	74.400	71.524	2.426	Open Manhole	4175
1.014	27.800	397.1	35	75.100	71.454	3.196	Open Manhole	1200
6.000	22.000	239.1	31	80.150	78.508	1.342	Open Manhole	1200
6.001	35.200	114.3	32	79.700	78.200	1.200	Open Manhole	1200
6.002	15.900	8.0	33	77.700	76.200	1.200	Open Manhole	1200
6.003	25.400	12.7	34	75.700	74.200	1.200	Open Manhole	1200
6.004	6.800	2.6	35	75.100	71.604	3.196	Open Manhole	1200
1.015	29.300	401.4	36	75.500	71.381	3.669	Open Manhole	1200
1.016	16.900	402.4	37	74.900	71.339	3.111	Open Manhole	1200
1.017	8.200	390.5	42	74.000	71.318	2.232	Open Manhole	1200
7.000	22.000	10.7	39	77.300	75.800	1.200	Open Manhole	1200
7.001	13.400	22.3	40	76.700	75.200	1.200	Open Manhole	1200
7.002	16.600	19.5	41	75.850	74.350	1.200	Open Manhole	1200
7.003	15.500	11.6	42	74.000	73.018	0.682	Open Manhole	1200
1.018	6.600	194.1	43	74.300	71.284	2.566	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.019	o	300	43	74.300	71.284	2.716	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.019	54.700	159.0		72.160	70.940	0.920	Open Manhole	0

Simulation Criteria for Storm

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.423		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 10, DS/PN: 1.007, Volume (m³): 2.1

Unit Reference	MD-SHE-0047-1000-1000-1000
Design Head (m)	1.000
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	47
Invert Level (m)	72.530
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.0	Kick-Flo®	0.415	0.7
Flush-Flo™	0.205	0.8	Mean Flow over Head Range	-	0.8

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

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	0.8	0.800	0.9	2.000	1.4	4.000	1.9	7.000	2.4
0.200	0.8	1.000	1.0	2.200	1.4	4.500	2.0	7.500	2.5
0.300	0.8	1.200	1.1	2.400	1.5	5.000	2.1	8.000	2.6
0.400	0.7	1.400	1.2	2.600	1.5	5.500	2.2	8.500	2.7
0.500	0.7	1.600	1.2	3.000	1.6	6.000	2.3	9.000	2.7
0.600	0.8	1.800	1.3	3.500	1.8	6.500	2.3	9.500	2.8

Hydro-Brake® Optimum Manhole: 43, DS/PN: 1.019, Volume (m³): 4.3

Unit Reference	MD-SHE-0053-2000-2700-2000
Design Head (m)	2.700
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	71.284
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.700	2.0	Kick-Flo®	0.471	0.9
Flush-Flo™	0.230	1.1	Mean Flow over Head Range	-	1.4

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.0	0.800	1.2	2.000	1.7	4.000	2.4	7.000	3.1
0.200	1.1	1.000	1.3	2.200	1.8	4.500	2.5	7.500	3.2
0.300	1.1	1.200	1.4	2.400	1.9	5.000	2.7	8.000	3.3
0.400	1.0	1.400	1.5	2.600	2.0	5.500	2.8	8.500	3.4
0.500	0.9	1.600	1.6	3.000	2.1	6.000	2.9	9.000	3.5
0.600	1.0	1.800	1.7	3.500	2.3	6.500	3.0	9.500	3.6

Storage Structures for Storm

Tank or Pond Manhole: 9, DS/PN: 1.006

Invert Level (m) 72.562

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	199.0	1.200	442.0	2.400	442.0	3.600	442.0	4.800	442.0
0.200	254.0	1.400	442.0	2.600	442.0	3.800	442.0	5.000	442.0
0.400	312.0	1.600	442.0	2.800	442.0	4.000	442.0		
0.600	375.0	1.800	442.0	3.000	442.0	4.200	442.0		
0.800	442.0	2.000	442.0	3.200	442.0	4.400	442.0		
1.000	442.0	2.200	442.0	3.400	442.0	4.600	442.0		

Tank or Pond Manhole: 42, DS/PN: 1.018

Invert Level (m) 71.318

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	300.0	1.200	300.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	300.0	1.400	300.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	300.0	1.600	300.0	2.800	0.0	4.000	0.0		
0.600	300.0	1.800	300.0	3.000	0.0	4.200	0.0		
0.800	300.0	2.000	300.0	3.200	0.0	4.400	0.0		
1.000	300.0	2.001	0.0	3.400	0.0	4.600	0.0		

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000
Region	England and Wales	Ratio R	0.423
Cv (Summer)	0.750		
Cv (Winter)	0.840		

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	1	+0%	100/15 Summer				73.258
1.001	2	15 Winter	1	+0%	100/15 Summer				73.216
1.002	3	15 Winter	1	+0%	30/15 Summer				73.124
1.003	4	15 Winter	1	+0%	30/15 Summer	100/15 Summer			73.082
1.004	5	15 Winter	1	+0%	30/15 Summer				72.938
1.005	6	15 Winter	1	+0%	30/15 Summer				72.817
2.000	7	15 Winter	1	+0%					75.333
2.001	8	15 Winter	1	+0%	100/1440 Winter				73.245
1.006	9	480 Winter	1	+0%	30/30 Winter				72.788
1.007	10	480 Winter	1	+0%	30/30 Summer				72.787
1.008	11	120 Winter	1	+0%					72.511
3.000	12	15 Winter	1	+0%					76.337
3.001	13	15 Winter	1	+0%					75.235
4.000	14	15 Winter	1	+0%	100/15 Summer				73.409
3.002	15	15 Winter	1	+0%	100/480 Winter				73.177
1.009	16	15 Winter	1	+0%					72.401
1.010	17	2880 Winter	1	+0%	1/480 Winter				72.333
5.000	18	15 Winter	1	+0%	100/15 Winter				78.584
5.001	19	15 Winter	1	+0%	100/15 Summer				78.548
5.002	20	15 Winter	1	+0%					78.469
5.003	21	15 Winter	1	+0%					76.831
5.004	22	15 Winter	1	+0%					75.678
5.005	23	15 Winter	1	+0%	100/15 Summer				73.652
5.006	24	15 Winter	1	+0%	100/15 Summer	100/15 Winter			72.986
5.007	25	15 Winter	1	+0%	100/15 Summer				72.797
1.011	26	2880 Winter	1	+0%	1/720 Winter				72.333
1.012	27	2880 Winter	1	+0%	1/480 Winter				72.332
1.013	28	2880 Winter	1	+0%	1/360 Winter				72.332
1.014	29	2880 Winter	1	+0%	1/240 Winter				72.332
6.000	30	15 Winter	1	+0%					78.661
6.001	31	15 Winter	1	+0%					78.598
6.002	32	15 Winter	1	+0%					78.266

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.242	0.000	0.07		4.4	OK	
1.001	2	-0.211	0.000	0.19		12.2	OK	
1.002	3	-0.191	0.000	0.26		15.7	OK	
1.003	4	-0.172	0.000	0.37		24.8	OK	2
1.004	5	-0.156	0.000	0.46		30.1	OK	
1.005	6	-0.145	0.000	0.52		33.2	OK	
2.000	7	-0.267	0.000	0.03		7.8	OK	
2.001	8	-0.255	0.000	0.05		10.6	OK	
1.006	9	-0.074	0.000	0.02		0.9	OK	
1.007	10	-0.043	0.000	0.02		0.8	OK	
1.008	11	-1.489	0.000	0.00		0.8	OK	
3.000	12	-0.263	0.000	0.04		8.8	OK	
3.001	13	-0.265	0.000	0.03		9.7	OK	
4.000	14	-0.191	0.000	0.27		18.4	OK	
3.002	15	-0.230	0.000	0.12		28.1	OK	
1.009	16	-1.799	0.000	0.00		27.0	OK	
1.010	17	0.273	0.000	0.03		1.6	SURCHARGED*	
5.000	18	-0.216	0.000	0.15		9.1	OK	
5.001	19	-0.196	0.000	0.26		14.9	OK	
5.002	20	-0.224	0.000	0.14		30.6	OK	
5.003	21	-0.219	0.000	0.16		38.7	OK	
5.004	22	-0.222	0.000	0.15		44.0	OK	
5.005	23	-0.348	0.000	0.11		56.1	OK	
5.006	24	-0.264	0.000	0.36		63.3	OK	1
5.007	25	-0.335	0.000	0.15		68.2	OK	
1.011	26	0.183	0.000	0.03		4.3	SURCHARGED	
1.012	27	0.247	0.000	0.03		4.3	SURCHARGED	
1.013	28	0.299	0.000	0.03		4.3	SURCHARGED	
1.014	29	0.358	0.000	0.03		4.2	SURCHARGED	
6.000	30	-0.239	0.000	0.09		5.7	OK	
6.001	31	-0.210	0.000	0.20		18.6	OK	
6.002	32	-0.234	0.000	0.11		36.6	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
6.003	33	15 Winter	1	+0%					76.273	-0.227
6.004	34	15 Winter	1	+0%					74.263	-0.237
1.015	35	2880 Winter	1	+0%	1/180 Winter				72.333	0.429
1.016	36	2880 Winter	1	+0%	1/120 Winter				72.333	0.502
1.017	37	2880 Winter	1	+0%	1/120 Summer				72.333	0.544
7.000	38	240 Winter	1	+0%					77.850	-0.300
7.001	39	15 Winter	1	+0%					75.850	-0.250
7.002	40	15 Winter	1	+0%					75.247	-0.253
7.003	41	15 Winter	1	+0%					74.395	-0.255
1.018	42	2880 Winter	1	+0%	1/60 Winter				72.332	0.564
1.019	43	2880 Winter	1	+0%	1/15 Summer				72.577	0.993

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
6.003	33	0.000	0.13		37.4	OK	
6.004	34	0.000	0.10		39.9	OK	
1.015	35	0.000	0.04		5.7	SURCHARGED	
1.016	36	0.000	0.05		5.8	SURCHARGED	
1.017	37	0.000	0.06		5.7	SURCHARGED	
7.000	38	0.000	0.00		0.0	OK	
7.001	39	0.000	0.07		12.7	OK	
7.002	40	0.000	0.06		12.5	OK	
7.003	41	0.000	0.05		15.0	OK	
1.018	42	0.000	0.10		14.0	SURCHARGED	
1.019	43	0.000	0.02		1.3	SURCHARGED	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm) 20.000 Cv (Summer)	0.750
Region England and Wales		Ratio R 0.423 Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+0%	100/15 Summer				73.382
1.001	2	15 Winter	30	+0%	100/15 Summer				73.374
1.002	3	15 Winter	30	+0%	30/15 Summer				73.343
1.003	4	15 Winter	30	+0%	30/15 Summer	100/15 Summer			73.311
1.004	5	15 Winter	30	+0%	30/15 Summer				73.181
1.005	6	960 Winter	30	+0%	30/15 Summer				73.063
2.000	7	15 Winter	30	+0%					75.350
2.001	8	15 Winter	30	+0%	100/1440 Winter				73.275
1.006	9	960 Winter	30	+0%	30/30 Winter				73.062
1.007	10	960 Winter	30	+0%	30/30 Summer				73.145
1.008	11	2880 Winter	30	+0%					73.013
3.000	12	15 Winter	30	+0%					76.360
3.001	13	15 Winter	30	+0%					75.257
4.000	14	15 Winter	30	+0%	100/15 Summer				73.486
3.002	15	15 Winter	30	+0%	100/480 Winter				73.221
1.009	16	2880 Winter	30	+0%					73.013
1.010	17	2880 Winter	30	+0%	1/480 Winter				73.013
5.000	18	15 Winter	30	+0%	100/15 Winter				78.654
5.001	19	15 Winter	30	+0%	100/15 Summer				78.630
5.002	20	15 Winter	30	+0%					78.529
5.003	21	15 Winter	30	+0%					76.896
5.004	22	15 Winter	30	+0%					75.741
5.005	23	15 Winter	30	+0%	100/15 Summer				73.732
5.006	24	15 Summer	30	+0%	100/15 Summer	100/15 Winter			73.250
5.007	25	2880 Winter	30	+0%	100/15 Summer				73.013
1.011	26	2880 Winter	30	+0%	1/720 Winter				73.013
1.012	27	2880 Winter	30	+0%	1/480 Winter				73.013
1.013	28	2880 Winter	30	+0%	1/360 Winter				73.012
1.014	29	2880 Winter	30	+0%	1/240 Winter				73.013
6.000	30	15 Winter	30	+0%					78.710
6.001	31	15 Winter	30	+0%					78.670
6.002	32	15 Winter	30	+0%					78.318

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.118	0.000	0.17		10.3	OK	
1.001	2	-0.053	0.000	0.49		31.7	OK	
1.002	3	0.028	0.000	0.62		37.1	SURCHARGED	
1.003	4	0.057	0.000	0.91		60.1	SURCHARGED	2
1.004	5	0.087	0.000	1.12		72.8	SURCHARGED	
1.005	6	0.101	0.000	0.09		6.0	SURCHARGED	
2.000	7	-0.250	0.000	0.07		19.2	OK	
2.001	8	-0.225	0.000	0.14		27.9	OK	
1.006	9	0.200	0.000	0.06		3.0	SURCHARGED	
1.007	10	0.315	0.000	0.02		0.8	SURCHARGED	
1.008	11	-0.987	0.000	0.00		0.9	OK	
3.000	12	-0.240	0.000	0.09		21.6	OK	
3.001	13	-0.243	0.000	0.08		24.4	OK	
4.000	14	-0.114	0.000	0.67		45.2	OK	
3.002	15	-0.186	0.000	0.30		69.4	OK	
1.009	16	-1.187	0.000	0.00		2.5	OK	
1.010	17	0.953	0.000	0.03		1.8	SURCHARGED*	
5.000	18	-0.146	0.000	0.38		22.3	OK	
5.001	19	-0.114	0.000	0.69		40.0	OK	
5.002	20	-0.164	0.000	0.42		88.8	OK	
5.003	21	-0.154	0.000	0.47		113.4	OK	
5.004	22	-0.159	0.000	0.44		129.2	OK	
5.005	23	-0.268	0.000	0.34		166.1	OK	
5.006	24	0.000	0.000	1.03		183.1	OK	1
5.007	25	-0.119	0.000	0.01		5.0	OK	
1.011	26	0.863	0.000	0.04		6.1	SURCHARGED	
1.012	27	0.928	0.000	0.05		6.3	SURCHARGED	
1.013	28	0.979	0.000	0.05		6.5	SURCHARGED	
1.014	29	1.039	0.000	0.05		6.3	SURCHARGED	
6.000	30	-0.190	0.000	0.22		14.0	OK	
6.001	31	-0.138	0.000	0.55		53.0	OK	
6.002	32	-0.182	0.000	0.32		108.7	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
6.003	33	15 Winter	30	+0%					76.332	-0.168
6.004	34	15 Winter	30	+0%					74.311	-0.189
1.015	35	2880 Winter	30	+0%	1/180 Winter				73.014	1.110
1.016	36	2880 Winter	30	+0%	1/120 Winter				73.013	1.182
1.017	37	2880 Winter	30	+0%	1/120 Summer				73.013	1.224
7.000	38	240 Winter	30	+0%					77.850	-0.300
7.001	39	15 Winter	30	+0%					75.891	-0.209
7.002	40	15 Winter	30	+0%					75.286	-0.214
7.003	41	15 Summer	30	+0%					74.432	-0.218
1.018	42	2880 Winter	30	+0%	1/60 Winter				73.012	1.244
1.019	43	2880 Winter	30	+0%	1/15 Summer				73.256	1.672

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
6.003	33	0.000	0.39		110.2	OK	
6.004	34	0.000	0.29		117.2	OK	
1.015	35	0.000	0.07		9.2	SURCHARGED	
1.016	36	0.000	0.08		9.5	SURCHARGED	
1.017	37	0.000	0.10		9.4	SURCHARGED	
7.000	38	0.000	0.00		0.0	OK	
7.001	39	0.000	0.20		39.2	OK	
7.002	40	0.000	0.18		39.2	OK	
7.003	41	0.000	0.17		46.6	OK	
1.018	42	0.000	0.12		16.7	SURCHARGED	
1.019	43	0.000	0.02		1.6	SURCHARGED	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm) 20.000	Cv (Summer) 0.750
Region England and Wales		Ratio R 0.423	Cv (Winter) 0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+40%	100/15 Summer				74.483
1.001	2	15 Winter	100	+40%	100/15 Summer				74.466
1.002	3	15 Winter	100	+40%	30/15 Summer				74.387
1.003	4	15 Winter	100	+40%	30/15 Summer	100/15 Summer			74.301
1.004	5	15 Winter	100	+40%	30/15 Summer				73.943
1.005	6	5760 Winter	100	+40%	30/15 Summer				73.722
2.000	7	15 Winter	100	+40%					75.369
2.001	8	5760 Winter	100	+40%	100/1440 Winter				73.722
1.006	9	5760 Winter	100	+40%	30/30 Winter				73.722
1.007	10	2880 Winter	100	+40%	30/30 Summer				73.828
1.008	11	2880 Winter	100	+40%					73.777
3.000	12	15 Winter	100	+40%					76.380
3.001	13	15 Winter	100	+40%					75.276
4.000	14	2880 Winter	100	+40%	100/15 Summer				73.778
3.002	15	2880 Winter	100	+40%	100/480 Winter				73.778
1.009	16	2880 Winter	100	+40%					73.778
1.010	17	2880 Winter	100	+40%	1/480 Winter				73.778
5.000	18	15 Winter	100	+40%	100/15 Winter				78.801
5.001	19	15 Winter	100	+40%	100/15 Summer				78.766
5.002	20	15 Winter	100	+40%					78.591
5.003	21	15 Winter	100	+40%					76.967
5.004	22	15 Winter	100	+40%					75.817
5.005	23	15 Winter	100	+40%	100/15 Summer				74.523
5.006	24	15 Winter	100	+40%	100/15 Summer	100/15 Winter			74.301
5.007	25	15 Winter	100	+40%	100/15 Summer				73.998
1.011	26	2880 Winter	100	+40%	1/720 Winter				73.780
1.012	27	2880 Winter	100	+40%	1/480 Winter				73.780
1.013	28	2880 Winter	100	+40%	1/360 Winter				73.780
1.014	29	2880 Winter	100	+40%	1/240 Winter				73.780
6.000	30	15 Winter	100	+40%					78.802
6.001	31	15 Winter	100	+40%					78.775
6.002	32	15 Winter	100	+40%					78.366

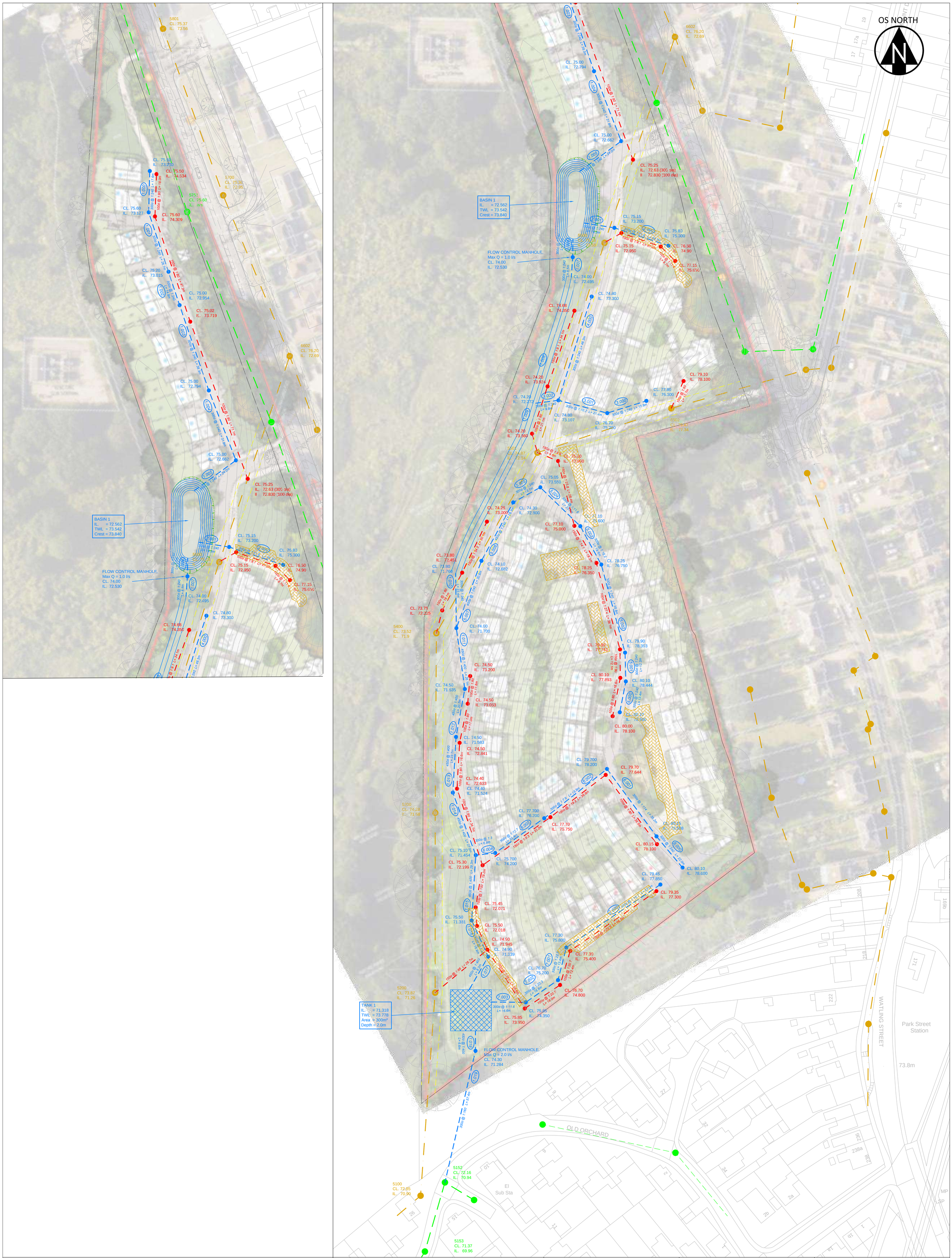
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.983	0.000	0.25		15.2	FLOOD RISK	
1.001	2	1.039	0.000	0.79		50.6	FLOOD RISK	
1.002	3	1.072	0.000	1.11		66.0	FLOOD RISK	
1.003	4	1.047	0.725	1.57		104.0	FLOOD	2
1.004	5	0.849	0.000	1.99		129.7	SURCHARGED	
1.005	6	0.760	0.000	0.04		2.4	SURCHARGED	
2.000	7	-0.231	0.000	0.12		34.9	OK	
2.001	8	0.222	0.000	0.00		0.7	SURCHARGED	
1.006	9	0.860	0.000	0.11		5.7	FLOOD RISK	
1.007	10	0.998	0.000	0.02		0.8	FLOOD RISK	
1.008	11	-0.223	0.000	0.00		0.8	FLOOD RISK	
3.000	12	-0.220	0.000	0.16		39.3	OK	
3.001	13	-0.224	0.000	0.14		44.4	OK	
4.000	14	0.178	0.000	0.03		2.1	SURCHARGED	
3.002	15	0.371	0.000	0.01		3.2	SURCHARGED	
1.009	16	-0.422	0.000	0.00		2.8	OK	
1.010	17	1.718	0.000	0.05		2.7	FLOOD RISK*	
5.000	18	0.001	0.000	0.69		40.5	SURCHARGED	
5.001	19	0.022	0.000	1.26		73.3	SURCHARGED	
5.002	20	-0.102	0.000	0.76		162.0	OK	
5.003	21	-0.083	0.000	0.86		206.2	OK	
5.004	22	-0.083	0.000	0.80		234.1	OK	
5.005	23	0.523	0.000	0.58		284.7	SURCHARGED	
5.006	24	1.051	1.346	1.73		306.6	FLOOD	1
5.007	25	0.866	0.000	0.72		330.9	FLOOD RISK	
1.011	26	1.630	0.000	0.05		6.5	FLOOD RISK	
1.012	27	1.695	0.000	0.05		6.7	SURCHARGED	
1.013	28	1.747	0.000	0.05		6.9	SURCHARGED	
1.014	29	1.806	0.000	0.05		6.7	SURCHARGED	
6.000	30	-0.098	0.000	0.41		25.7	OK	
6.001	31	-0.033	0.000	0.99		94.8	OK	
6.002	32	-0.134	0.000	0.59		196.5	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
6.003	33	15 Winter	100	+40%					76.389	-0.111
6.004	34	15 Winter	100	+40%					74.356	-0.144
1.015	35	2880 Winter	100	+40%	1/180 Winter				73.780	1.876
1.016	36	2880 Winter	100	+40%	1/120 Winter				73.779	1.948
1.017	37	2880 Winter	100	+40%	1/120 Summer				73.778	1.989
7.000	38	240 Winter	100	+40%					77.850	-0.300
7.001	39	15 Winter	100	+40%					75.925	-0.175
7.002	40	15 Winter	100	+40%					75.319	-0.181
7.003	41	15 Summer	100	+40%					74.464	-0.186
1.018	42	2880 Winter	100	+40%	1/60 Winter				73.778	2.010
1.019	43	2880 Winter	100	+40%	1/15 Summer				73.778	2.194

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
6.003	33	0.000	0.71		199.7	OK	
6.004	34	0.000	0.53		212.7	OK	
1.015	35	0.000	0.08		10.4	SURCHARGED	
1.016	36	0.000	0.09		10.8	SURCHARGED	
1.017	37	0.000	0.11		10.7	SURCHARGED	
7.000	38	0.000	0.00		0.0	OK	
7.001	39	0.000	0.37		71.2	OK	
7.002	40	0.000	0.33		71.2	OK	
7.003	41	0.000	0.31		84.8	OK	
1.018	42	0.000	0.14		19.9	FLOOD RISK	
1.019	43	0.000	0.02		1.9	SURCHARGED	



Key

- Existing public foul sewer
- Existing public surface water sewer
- Proposed surface water sewer
- Proposed foul water sewer
- Proposed permeable paving
- Proposed underground attenuation tank
- Proposed attenuation basin

REVISIONS

Rev	Date	Description	By	Ckd	App
P06	13/10/22	Planning layout updated.	RJH		
P05	07/10/22	Planning layout updated.	RJH		
P04	23/08/22	SW amended *1.010* to *1.019*. Flow control notes added.	RJH		
P03	10/03/22	Surface water discharge rate amended.	RJH		
P02	07/12/21	Redrawn.	RJH		
P01	14/09/21	First Issue.	SBH	RJH	RJH

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PROJECT
WATLING STREET, ST ALBANS

TITLE
PROPOSED FOUL & SURFACE WATER DRAINAGE STRATEGY

HYDROCK PROJECT NO.
20880-IOCB

SCALE @ A0
1 : 500

STATUS DESCRIPTION
INFORMATION

STATUS
S2

DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)
20880-HYD-XX-XX-DR-D-2200

REVISION
P06