

Our Ref: 20108-SWD-CO-01 C01

27 November 2023

London Borough of Bromley

Water Environment Limited  
6 Coppergate Mews  
Brighton Road  
Surbiton  
London  
KT6 5NE

Tel: 020 8545 9720

[www.WaterEnvironment.co.uk](http://www.WaterEnvironment.co.uk)

**By Email:**

To whom it may concern,

**2-4 RINGS ROAD**  
**RESPONSE TO LLFA COMMENTS**

This letter has been prepared in response to the Lead Local Flood Authority's (LLFA) comments on the proposed Sustainable Drainage System (SuDS) Strategy for the site at Ringers Road, Bromley, planning reference 21/05585/FULL1. The comment from the LLFA was as follows:

*"The acceptance of Thames Water of a discharge rate of 5l/s is subject to LLFA's approval of the sequential approach to the disposal of surface water. We consider in this case that the proposed discharge of 5l/s is high and would require the applicant to increase its storage volume to restrict the rate to maximum of 2l/s for all events including the 1 in 100 year plus 40% climate change. I do not accept the findings of the submitted FRA."*

Water Environment Ltd have revised the SuDS strategy for the site and incorporated an area of crated storage in the courtyard area. The strategy proposes a stormwater drainage discharge rate of 2 l/s from site, connecting to the existing Thames Water stormwater sewer in Ringer's Road.

The updated MicroDrainage calculations and SuDS strategy drawing are appended to this letter. It is considered that the appended information satisfies the concerns raised by the LLFA.

Yours sincerely,

**Agnes Gannon**

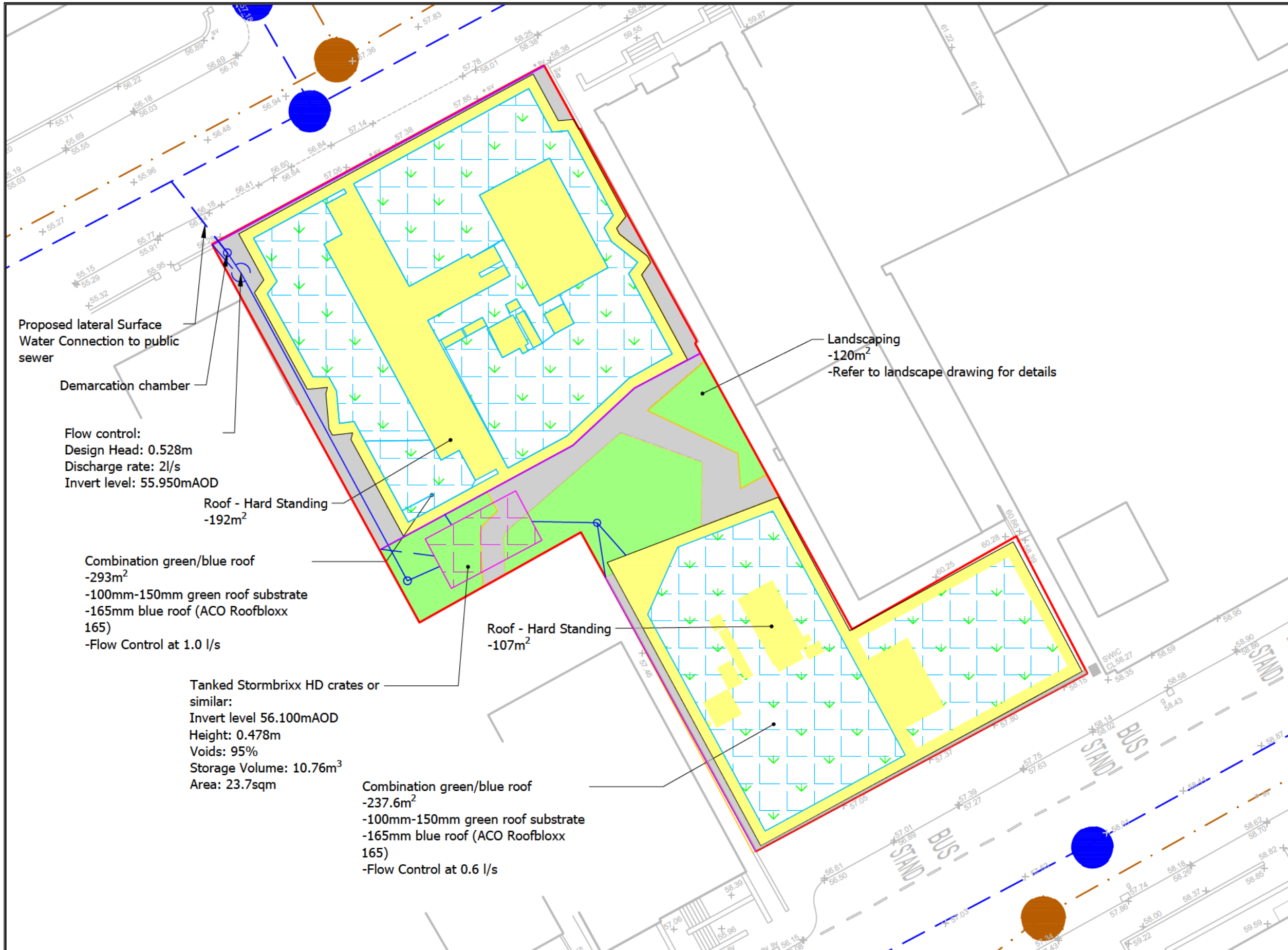
B Eng (Civil)

**Principal Engineer**

**Encl.**

**20108-SWD-DP-01-C02**

**20108-SWD-MH-01-C01**



Proposed lateral Surface Water Connection to public sewer

Demarcation chamber

Flow control:  
Design Head: 0.528m  
Discharge rate: 2l/s  
Invert level: 55.950m AOD

Roof - Hard Standing  
-192m<sup>2</sup>

Combination green/blue roof  
-293m<sup>2</sup>  
-100mm-150mm green roof substrate  
-165mm blue roof (ACO Roofbloxx 165)  
-Flow Control at 1.0 l/s

Tanked Stormbrixx HD crates or similar:  
Invert level 56.100m AOD  
Height: 0.478m  
Voids: 95%  
Storage Volume: 10.76m<sup>3</sup>  
Area: 23.7sqm

Combination green/blue roof  
-237.6m<sup>2</sup>  
-100mm-150mm green roof substrate  
-165mm blue roof (ACO Roofbloxx 165)  
-Flow Control at 0.6 l/s

Landscaping  
-120m<sup>2</sup>  
-Refer to landscape drawing for details

### Legend

- Tanked drainage sub-base (30% voids)
- Green Roof
- Blue Roof
- Tanked crated storage
- Hard paving
- Roof - No SuDS
- Permeable Landscaping
- Private Surface Water Sewer
- Adopted Surface Water Sewer
- Adopted Foul Sewer

**NOTES**  
 1. Dimensions in metres and levels in m AOD unless otherwise stated. Do not scale.  
 2. This drawing is for planning only, not for construction  
 3. Drawing to read with Water Environment SuDS Report Rev E  
 4. Site layout as per Hollaway Studio Drawing NO18.085 100.04 R3 and ETLA Drawing No RNG-EDL-ZZ-XX-DR-L-207\_P2  
 5. Strategy based on Mircodrainge Network Modelling  
 6. All pipes shown as indicative  
 7. Thames Water (TW) asset details taken from TW Asset Plan - connection level to be surveyed

**WE WATER | ENVIRONMENT**  
 6 Coppergate Mews · Brighton Road · Surbiton · London · KT6 5NE  
 Tel: 020 8545 9720  
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 Web: www.waterenvironment.co.uk

CO2	27/11/23	Strategy amended following LLFA comments	AMG	TC
REV	DATE	AMENDMENTS	DR	AP

CLIENT: Ringer Road Properties Ltd  
 PROJECT: 2-4 Ringer Road  
 DRAWING: Outline SuDS

SCALE @A3: 1:250  
 DATE: 14/04/23  
 DRAWN: CB  
 CHECKED: GE  
 APPROVED: GL  
 DRAWING NO: 20108-SWD-PD-01  
 REVISION: C02


Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
2.000	User	-	100	0.004	0.004	0.004
	User	-	100	0.003	0.003	0.007
	User	-	100	0.002	0.002	0.009
	User	-	100	0.000	0.000	0.010
	User	-	100	0.000	0.000	0.010
	User	-	100	0.001	0.001	0.011
	User	-	100	0.000	0.000	0.012
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.013	0.013	0.013
	User	-	100	0.004	0.004	0.017
	User	-	100	0.001	0.001	0.017
	User	-	100	0.000	0.000	0.017
	User	-	100	0.001	0.001	0.019
4.000	-	-	100	0.000	0.000	0.000
3.001	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.000	0.000	0.000
1.003	User	-	100	0.024	0.024	0.024
				Total	Total	Total
				0.054	0.054	0.054

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D, L (mm)	W (mm)
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S1.003	S	58.200	55.539	0.000	0	0
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Micro Drainage	Network 2017.1.2	

Online Controls for Storm

Orifice Manhole: S2, DS/PN: S1.001, Volume (m³): 0.3

Diameter (m) 0.027 Discharge Coefficient 0.600 Invert Level (m) 59.000

Orifice Manhole: S5, DS/PN: S3.001, Volume (m³): 0.3

Diameter (m) 0.035 Discharge Coefficient 0.600 Invert Level (m) 59.000

Hydro-Brake® Optimum Manhole: S3, DS/PN: S1.003, Volume (m³): 1.5

Unit Reference	MD-SHE-0073-2000-0628-2000
Design Head (m)	0.628
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	73
Invert Level (m)	55.950
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)	0.628	2.0	Kick-Flo®	0.413	1.7
Flush-Flo™	0.187	2.0	Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.9	1.200	2.7	3.000	4.1	7.000	6.1
0.200	2.0	1.400	2.9	3.500	4.4	7.500	6.3
0.300	1.9	1.600	3.1	4.000	4.7	8.000	6.5
0.400	1.7	1.800	3.2	4.500	5.0	8.500	6.7
0.500	1.8	2.000	3.4	5.000	5.2	9.000	6.9
0.600	2.0	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.2	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.8	6.500	5.9		

Storage Structures for Storm

Cellular Storage Manhole: S2, DS/PN: S1.001

Invert Level (m) 59.000 Safety Factor 2.0  
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.97  
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	237.6	0.0	0.166	0.4	0.0
0.165	237.6	0.0			

Cellular Storage Manhole: S5, DS/PN: S3.001

Invert Level (m) 59.000 Safety Factor 2.0  
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95  
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	293.0	0.0	0.166	0.4	0.0
0.165	293.0	0.0			

Cellular Storage Manhole: S3, DS/PN: S1.003


Invert Level (m) 56.100 Safety Factor 2.0  
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95  
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf. Area (m <sup>2</sup> )
0.000	23.7	0.0	0.479	0.4	0.0
0.478	23.7	0.0			

Time Area Diagram for Green Roof at Pipe Number S1.000 (Storm)

Area (m<sup>3</sup>) 238 Evaporation (mm/day) 3  
 Depression Storage (mm) 5 Decay Coefficient 0.050

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.004325	16	20	0.001943	32	36	0.000873	48	52	0.000392
4	8	0.003541	20	24	0.001591	36	40	0.000715	52	56	0.000321
8	12	0.002899	24	28	0.001303	40	44	0.000585	56	60	0.000263
12	16	0.002374	28	32	0.001067	44	48	0.000479	60	64	0.000215

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Micro Drainage		Network 2017.1.2


Time Area Diagram for Green Roof at Pipe Number S1.000 (Storm)

Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)
64	68	0.000176	80	84	0.000079	96	100	0.000036	112	116	0.000016
68	72	0.000144	84	88	0.000065	100	104	0.000029	116	120	0.000013
72	76	0.000118	88	92	0.000053	104	108	0.000024			
76	80	0.000097	92	96	0.000043	108	112	0.000020			

Time Area Diagram for Green Roof at Pipe Number S4.000 (Storm)

Area (m<sup>3</sup>) 293 Evaporation (mm/day) 3  
Depression Storage (mm) 5 Decay Coefficient 0.050

Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)	Time (mins) From:	Time (mins) To:	Area (ha)
0	4	0.005324	32	36	0.001075	64	68	0.000217	96	100	0.000044
4	8	0.004359	36	40	0.000880	68	72	0.000178	100	104	0.000036
8	12	0.003569	40	44	0.000721	72	76	0.000145	104	108	0.000029
12	16	0.002922	44	48	0.000590	76	80	0.000119	108	112	0.000024
16	20	0.002392	48	52	0.000483	80	84	0.000098	112	116	0.000020
20	24	0.001959	52	56	0.000395	84	88	0.000080	116	120	0.000016
24	28	0.001604	56	60	0.000324	88	92	0.000065			
28	32	0.001313	60	64	0.000265	92	96	0.000054			

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

Simulation Criteria

Areal Reduction Factor 1.000    Additional Flow - % of Total Flow 0.000  
Hot Start (mins) 0    MADD Factor \* 10m³/ha Storage 2.000  
Hot Start Level (mm) 0    Inlet Coefficient 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 2  
Number of Online Controls 3    Number of Storage Structures 3    Number of Real Time Controls 0


Synthetic Rainfall Details

Rainfall Model FEH  
FEH Rainfall Version 2013  
Site Location GB 540233 168902 TQ 40233 68902  
Data Type Point  
Cv (Summer) 1.000  
Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0    DVD Status OFF  
Analysis Timestep Fine Inertia Status OFF  
DTS Status ON

Profile(s) Summer and Winter  
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440  
Return Period(s) (years) 2, 30, 100  
Climate Change (%) 0, 0, 40


PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	120 Summer	2	+0%					59.081
S2.000	S2	15 Summer	2	+0%					59.074
S1.001	S2	1440 Summer	2	+0%					59.033
S1.002	S4	1440 Summer	2	+0%	100/15 Summer				56.208
S3.000	S4	15 Summer	2	+0%					59.079
S4.000	S5	120 Summer	2	+0%					59.084
S3.001	S5	960 Summer	2	+0%					59.037
S3.002	S8	960 Summer	2	+0%	100/15 Summer				56.211
S1.003	S3	15 Summer	2	+0%	2/15 Summer				56.123

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

PN	US/MH Name	Surcharged		Flooded		Pipe		Level Exceeded
		Depth (m)	Volume (m <sup>3</sup> )	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	
S1.000	S1	-0.119	0.000	0.10		1.4	FLOOD RISK	
S2.000	S2	-0.126	0.000	0.09		2.4	FLOOD RISK	
S1.001	S2	-0.117	0.000	0.01		0.2	FLOOD RISK	
S1.002	S4	-0.142	0.000	0.01		0.2	OK	
S3.000	S4	-0.121	0.000	0.14		4.0	FLOOD RISK	
S4.000	S5	-0.116	0.000	0.12		1.7	FLOOD RISK	
S3.001	S5	-0.113	0.000	0.01		0.3	FLOOD RISK	
S3.002	S8	-0.139	0.000	0.02		0.3	OK	
S1.003	S3	0.023	0.000	0.09		2.0	SURCHARGED	



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

Simulation Criteria

Areal Reduction Factor 1.000    Additional Flow - % of Total Flow 0.000  
Hot Start (mins) 0    MADD Factor \* 10m³/ha Storage 2.000  
Hot Start Level (mm) 0    Inlet Coefficient 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 2  
Number of Online Controls 3    Number of Storage Structures 3    Number of Real Time Controls 0


Synthetic Rainfall Details

Rainfall Model FEH  
FEH Rainfall Version 2013  
Site Location GB 540233 168902 TQ 40233 68902  
Data Type Point  
Cv (Summer) 1.000  
Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0    DVD Status OFF  
Analysis Timestep Fine Inertia Status OFF  
DTS Status ON

Profile(s) Summer and Winter  
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440  
Return Period(s) (years) 2, 30, 100  
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	30	Summer	30	+0%				59.101
S2.000	S2	15	Summer	30	+0%				59.089
S1.001	S2	480	Summer	30	+0%				59.066
S1.002	S4	30	Summer	30	+0%	100/15	Summer		56.247
S3.000	S4	15	Summer	30	+0%				59.098
S4.000	S5	30	Summer	30	+0%				59.107
S3.001	S5	480	Summer	30	+0%				59.072
S3.002	S8	30	Summer	30	+0%	100/15	Summer		56.247
S1.003	S3	30	Summer	30	+0%	2/15	Summer		56.247

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Micro Drainage		Network 2017.1.2

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

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m <sup>3</sup> )	Flow / Cap.	Overflow (l/s)			
S1.000	S1	-0.099	0.000	0.25		3.6	FLOOD RISK	
S2.000	S2	-0.111	0.000	0.21		6.0	FLOOD RISK	
S1.001	S2	-0.084	0.000	0.01		0.3	FLOOD RISK	
S1.002	S4	-0.103	0.000	0.01		0.2	OK	
S3.000	S4	-0.102	0.000	0.35		9.8	FLOOD RISK	
S4.000	S5	-0.093	0.000	0.31		4.4	FLOOD RISK	
S3.001	S5	-0.078	0.000	0.02		0.6	FLOOD RISK	
S3.002	S8	-0.103	0.000	0.02		0.3	OK	
S1.003	S3	0.147	0.000	0.09		2.0	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 \* 10m<sup>3</sup>/ha Storage 2.000  
Hot Start Level (mm) 0    Inlet Coeffiecient 0.800  
Manhole Headloss Coeff (Global) 0.500    Flow per Person per Day (l/per/day) 0.000  
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0    Number of Offline Controls 0    Number of Time/Area Diagrams 2  
Number of Online Controls 3    Number of Storage Structures 3    Number of Real Time Controls 0


Synthetic Rainfall Details

Rainfall Model FEH  
FEH Rainfall Version 2013  
Site Location GB 540233 168902 TQ 40233 68902  
Data Type Point  
Cv (Summer) 1.000  
Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 300.0    DVD Status OFF  
Analysis Timestep Fine Inertia Status OFF  
DTS Status ON

Profile(s) Summer and Winter  
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440  
Return Period(s) (years) 2, 30, 100  
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1 960	Summer	100	+40%					59.130
S2.000	S2 960	Summer	100	+40%					59.130
S1.001	S2 960	Summer	100	+40%					59.130
S1.002	S4 120	Summer	100	+40%	100/15	Summer			56.518
S3.000	S4 480	Summer	100	+40%					59.139
S4.000	S5 480	Summer	100	+40%					59.140
S3.001	S5 480	Summer	100	+40%					59.139
S3.002	S8 120	Summer	100	+40%	100/15	Summer			56.518
S1.003	S3 120	Summer	100	+40%	2/15	Summer			56.517

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

PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m <sup>3</sup> )	Cap.	(l/s)	Flow (l/s)		
S1.000	S1	-0.070	0.000	0.14		1.9	FLOOD RISK	
S2.000	S2	-0.070	0.000	0.03		1.0	FLOOD RISK	
S1.001	S2	-0.020	0.000	0.02		0.5	FLOOD RISK	
S1.002	S4	0.168	0.000	0.03		0.5	SURCHARGED	
S3.000	S4	-0.061	0.000	0.10		2.8	FLOOD RISK	
S4.000	S5	-0.060	0.000	0.27		3.7	FLOOD RISK	
S3.001	S5	-0.011	0.000	0.03		0.9	FLOOD RISK	
S3.002	S8	0.168	0.000	0.04		0.8	SURCHARGED	
S1.003	S3	0.417	0.000	0.09		2.0	SURCHARGED	