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The Cart Lodge Lullingstone Lane Eynsford DA4 0HZ	Tribeca Plot A CombinedOutflow Attenuation	
Date 11/01/2024	Designed by M.Evans	
File UBB_PlotA_Channels-Baude...	Checked by	
Micro Drainage		Network 2020.1.3

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

- 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)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.000	7.296	0.073	100.0	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	4.761	0.048	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	49.159	0.489	100.5	0.006	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.002	6.500#	0.066	98.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.003	7.908	0.079	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.000	50.00	5.12	20.660	0.013	0.0	0.0	0.0	1.00	17.8	1.8
S2.001	50.00	5.20	20.568	0.013	0.0	0.0	0.0	1.00	17.8	1.8
S3.000	50.00	5.82	21.172	0.006	0.0	0.0	0.0	1.00	17.7	0.8
S2.002	50.00	5.90	19.854	0.019	0.0	0.0	0.0	1.32	52.5	2.6
S2.003	50.00	6.03	19.347	0.019	0.0	0.0	0.0	1.00	17.8	2.6

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
2.000	-	-	100	0.013	0.013	0.013
2.001	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.006	0.006	0.006
2.002	-	-	100	0.000	0.000	0.000
2.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.019	0.019	0.019

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)
S2.003	S	21.426	19.268	0.000	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	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	1	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	5
FEH Rainfall Version	2013
Site Location	GB 529623 183745 TQ 29623 83745
Data Type	Point
Summer Storms	Yes
Winter Storms	No
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

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Online Controls for Storm

Orifice Manhole: S3, DS/PN: S2.001, Volume (m³): 1.2

Diameter (m) 0.026 Discharge Coefficient 0.600 Invert Level (m) 20.568

Hydro-Brake® Optimum Manhole: S5, DS/PN: S2.003, Volume (m³): 2.6

Unit Reference MD-SHE-0067-2000-1000-2000
Design Head (m) 1.000
Design Flow (l/s) 2.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 67
Invert Level (m) 19.347
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)	1.000	2.0	Kick-Flo®	0.599	1.6
Flush-Flo™	0.296	1.9	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	1.6	1.200	2.2	3.000	3.3	7.000	4.9
0.200	1.9	1.400	2.3	3.500	3.5	7.500	5.1
0.300	1.9	1.600	2.5	4.000	3.8	8.000	5.2
0.400	1.9	1.800	2.6	4.500	4.0	8.500	5.4
0.500	1.8	2.000	2.7	5.000	4.2	9.000	5.5
0.600	1.6	2.200	2.9	5.500	4.4	9.500	5.7
0.800	1.8	2.400	3.0	6.000	4.6		
1.000	2.0	2.600	3.1	6.500	4.7		

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<u>Offline Controls for Storm</u> <u>Weir Manhole: S5, DS/PN: S2.003, Loop to PN: None</u> Discharge Coef 0.544 Width (m) 0.200 Invert Level (m) 20.314		
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Storage Structures for Storm

Cellular Storage Manhole: S3, DS/PN: S2.001

Invert Level (m) 20.587 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 ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	26.2	0.0	0.211	0.0	0.0
0.210	26.2	0.0			

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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 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 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
 FEH Rainfall Version 2013
 Site Location GB 529623 183745 TQ 29623 83745
 Data Type Point
 Cv (Summer) 0.750
 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.000	S1	15 Winter	2	+0%	100/60 Winter				20.698
S2.001	S3	120 Winter	2	+0%	100/15 Summer				20.628
S3.000	S3	15 Winter	2	+0%					21.195
S2.002	S4	15 Winter	2	+0%	100/15 Winter				19.881
S2.003	S5	15 Winter	2	+0%	30/15 Summer			0	19.413

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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		Flow / Overflow		Half Drain	Pipe	Level	
		Depth (m)	Volume (m ³)	Cap.	(l/s)	Time (mins)	Flow (l/s)	Status	Exceeded
S2.000	S1	-0.112	0.000	0.14			2.2	OK	
S2.001	S3	-0.090	0.000	0.02		54	0.3	OK	
S3.000	S3	-0.127	0.000	0.06			1.0	OK	
S2.002	S4	-0.198	0.000	0.03			1.2	OK	
S2.003	S5	-0.084	0.000	0.08	0.0		1.2	OK	

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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 1 Number of Time/Area Diagrams 0
 Number of Online Controls 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
 FEH Rainfall Version 2013
 Site Location GB 529623 183745 TQ 29623 83745
 Data Type Point
 Cv (Summer) 0.750
 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.000	S1	15 Winter	30	+0%	100/60 Winter				20.724
S2.001	S3	120 Winter	30	+0%	100/15 Summer				20.705
S3.000	S3	15 Winter	30	+0%					21.211
S2.002	S4	15 Winter	30	+0%	100/15 Winter				19.897
S2.003	S5	15 Winter	30	+0%	30/15 Summer			0	19.655

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

PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Cap.	(l/s)	Time (mins)	Flow (l/s)		
S2.000	S1	-0.086	0.000	0.37			5.6	OK	
S2.001	S3	-0.013	0.000	0.04		84	0.5	OK	
S3.000	S3	-0.111	0.000	0.15			2.6	OK	
S2.002	S4	-0.182	0.000	0.08			2.9	OK	
S2.003	S5	0.158	0.000	0.13	0.0		1.9	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet 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	1	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 529623 183745 TQ 29623 83745
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
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)
S2.000	S1	180 Winter	100	+40%	100/60 Winter				21.088
S2.001	S3	180 Winter	100	+40%	100/15 Summer				21.085
S3.000	S3	15 Winter	100	+40%					21.226
S2.002	S4	15 Winter	100	+40%	100/15 Winter				20.088
S2.003	S5	15 Winter	100	+40%	30/15 Summer			0	20.087

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Micro Drainage	Network 2020.1.3	

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

PN	US/MH	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status	Level Exceeded
	Name	Depth (m)	Volume (m³)			Time (mins)	Flow (l/s)		
S2.000	S1	0.278	0.000	0.17			2.5	SURCHARGED	
S2.001	S3	0.367	0.000	0.07		130	1.0	SURCHARGED	
S3.000	S3	-0.096	0.000	0.28			4.9	OK	
S2.002	S4	0.009	0.000	0.15			5.3	SURCHARGED	
S2.003	S5	0.590	0.000	0.13	0.0		1.9	SURCHARGED	