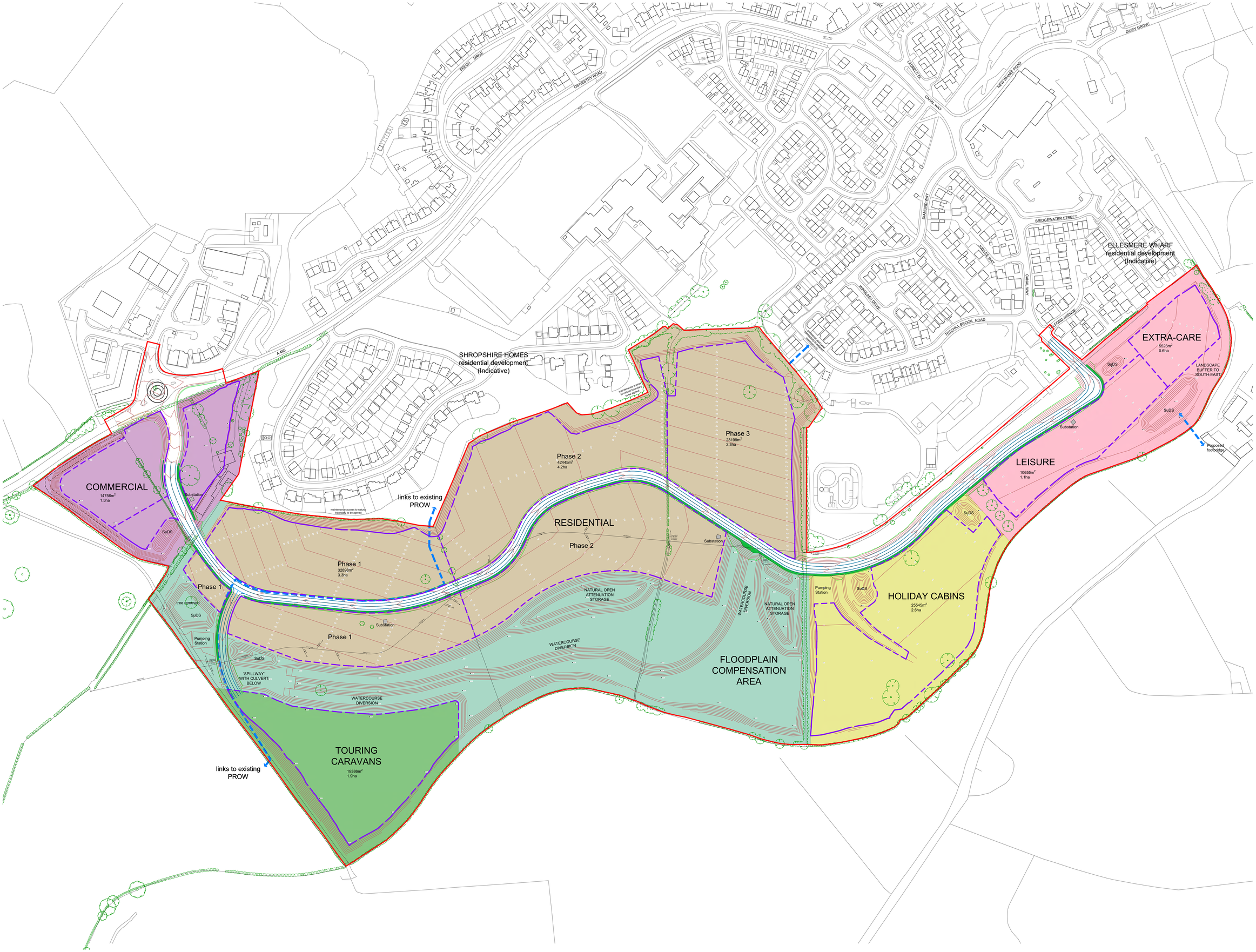
APPENDIX A



This line should measure 80mm when printed correctly

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Rev	Date	By	Chk	Description
P	17.03.23	EP	CW	Latest Information
Q	31.03.23	EP	CW	Indicative layout illustrated
R	06.04.23	EP	CW	Substations added
S	11.04.23	MJL	EP	Substations relocated.

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Project Name
Ellesmere Canalside Development

Client Name
Burbury Investments

Drawing Title
Indicative Masterplan

Scale
1:1250 @ A0

Project No.
5614

Status
S0

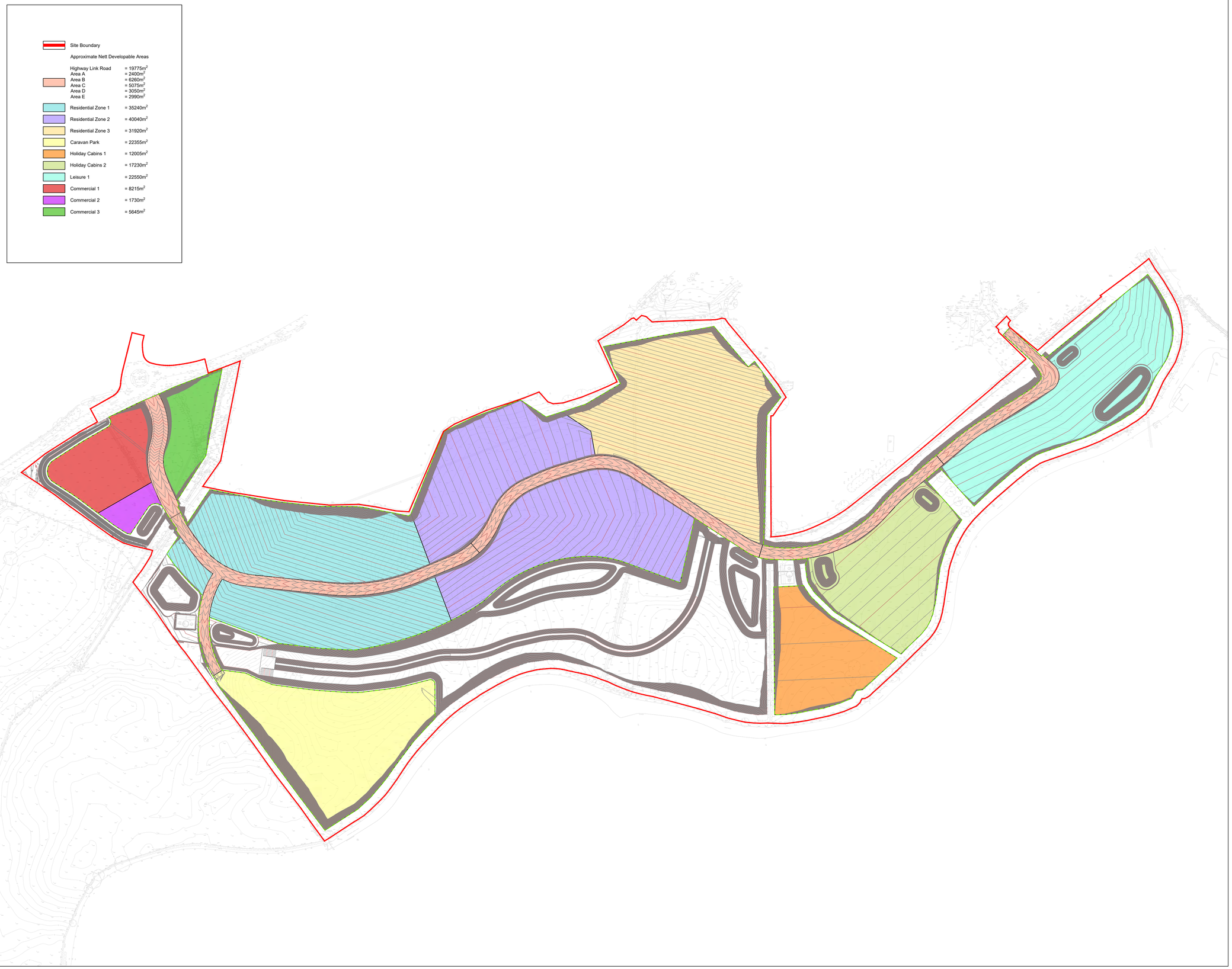
Purpose Of Issue
Work In Progress

Project	Org	Vol	Level	Form	Role
5614	RL	XX	00	DR	A

Number
PL500

Revision
S

APPENDIX B



Rev.	Description	Rev. by	Date
P4	References updated		12.04.2023

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Client
Formal Investments

Architect
Roberts Limbrick

Project
Ellesmere Wharf Phase 2

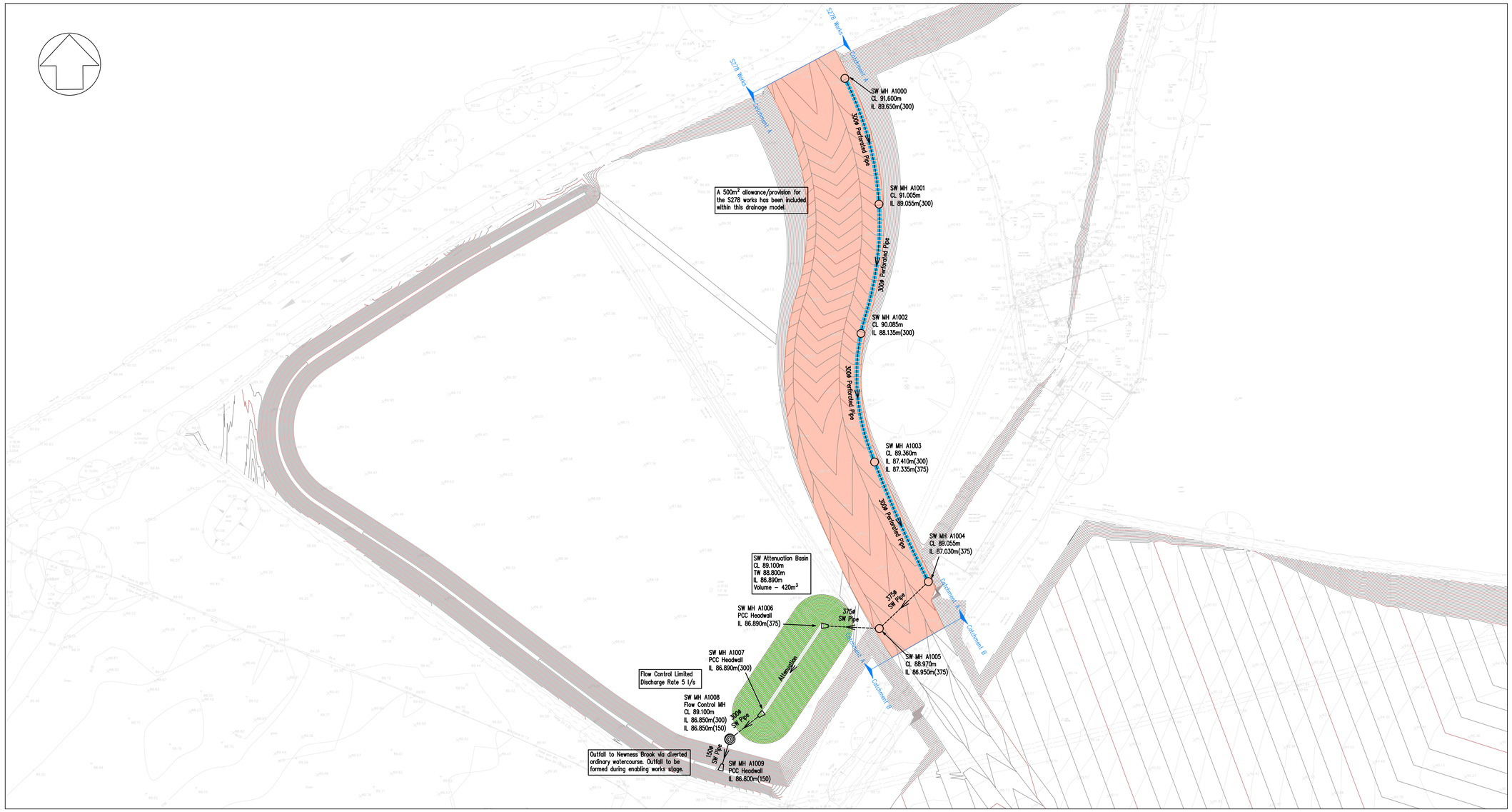
Title
Surface Water Strategy
Development Catchment

Date	22.02.2023	Drawn By	DOR
Size	A1	Checked By	DOR
Scale	1/2000	Approved By	DOR

Dwg. No. **C1581-SGI-ZZ-00-DR-C-0200** Rev **P4**

Filename : K:\projects\Active C1500-1599\C1581 Ellesmere Wharf Shropshire Phase 2\00 CIVILS\
Plot Date/Time : 13/05/2023 9:54 AM
Plot Name : C1581-SGI-ZZ-00-DR-C-0200 P4 - Surface Water Strategy - Catchment Plan.dwg

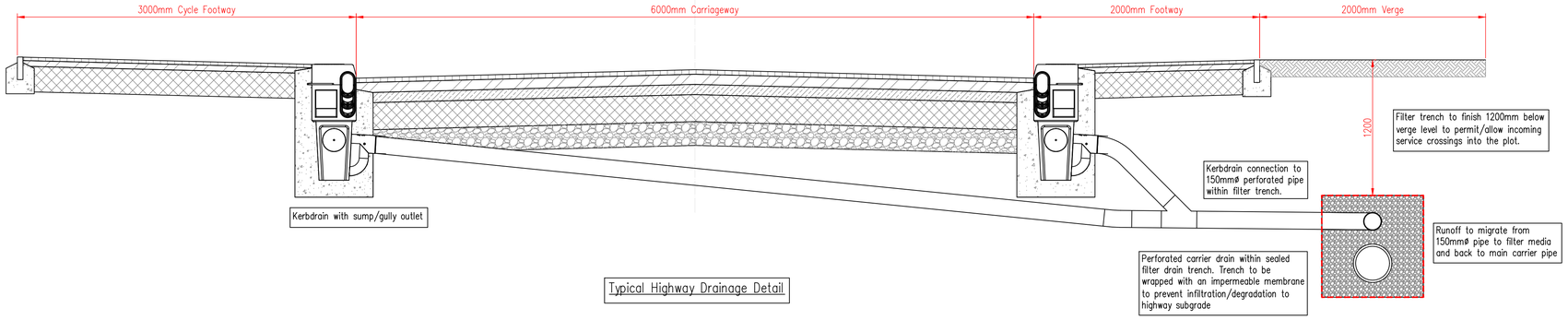
APPENDIX C1



SW Highway Drain – Solid Pipe	
SW Highway Drain – Perforated Pipe	
SW Chamber With 500mm Sump – ø TBC	
SW Chamber Flow Control – ø TBC	
SFA PCC Headwall – Size TBC	

Drainage notes

1. This drainage drawing is to be read in conjunction with all relevant Architect's, Engineer's drawings and specifications.
2. Do not scale this drawing. Any ambiguities, omissions and errors on the drawings shall be brought to the Engineer's attention immediately. All dimensions must be checked and verified on-site before construction commences.
3. All external underground drainage works are to be constructed in accordance with the Civil Engineering Specification for the Water Industry 7th Edition (CESWI), Sewers for Adoption 7th Edition (SFA), Shropshire Manual for Adoptable Roads & Transport (SMART) and any site-specific details provided on the contract drawings.
4. The contractor must survey any retained drainage on-site and report the line, level and condition of the existing drainage to the engineer. We would recommend that the existing drainage is cleansed before any surveying and that these works are undertaken before the contractor commences on-site.
5. Any redundant manholes are to be broken out to at least 600mm below formation level and backfilled with an approved compacted granular material.
6. Any redundant pipes up to and including 300mm diameter are to be filled with a 10:1 PFA/cement mix or broken out and backfilled with an approved compacted granular material. Any redundant pipes over 300mm diameter are to be broken out and backfilled with an approved compacted granular material.
7. Adoptable Drainage Pipes:- Surface water pipes serving the adoptable highway are to be BBA HAPAS approved products that conform to Highways England's Standards and Specifications. Alternatively, surface water pipes up to and including 300mm diameter can be Vitrified Clay in accordance with BS EN 295-1. Pipes greater than 300mm diameter can be Concrete Class 120 in accordance with BS EN 1916:2002.
8. All concrete manholes are to be in accordance with BS EN 1917. All plastic inspection chambers are to be in accordance with BS EN 13598.
9. All solid pipes irrespective of the depth shall have a bed and surround of 150mm of concrete grade ST4 concrete with sulphate resistant cement to SHW Clause 2602. In the case of twinwall plastic pipes the Contractor shall ensure that the pipes do not float when the concrete is placed. To maintain a degree of flexibility a 13mm fibreboard (Flexcell or similar0 shall be placed at each pipe joint to the full width of the surround.
10. All perforated pipes are to be wrapped in a Nylon stocking and placed within an impermeable filter media trench. Refer to typical details for further information.
11. All underground drainage must be protected during the construction phase where intermediate cover is less than 900mm.
12. All cover levels shown are approximate only. All manhole covers are to be set at the proposed finished pavement level.
13. For typical manhole construction details, pipe bedding/trench details and typical drainage details refer to SGi typical details drawing.
14. The external gully connections and channel/kerb drain connections are to be 150mm diameter unless otherwise stated. All gully and channel drain outlets to be trapped and roddable. All gully gratings and frames shall be D400 with a anti-theft captive hinge and automatic lock as standard. All gully gratings are to be installed to BD EN124:2015 with a minimum width of 450mm and a minimum waterway of 900cm2.
15. All manhole covers located within the road areas shall be Class D400 (150mm deep) and must achieve a silence in operation performance i.e. double triangular cover system with continuous elastomer gasket.
16. Covers within hard and soft landscaped areas with pedestrian traffic only shall be Class B125 150mm deep. Covers located within block/slab paving areas are to be recessed to suit the proposed paving and of the appropriate grade.
17. All manhole covers shall feature visible, durable and integral markings required by BS EN 124 i.e. marked S.W. (Surface Water) or F.W. (Foul Water).
18. Channels within Type 1 & 2 manholes must use pre-formed using clayware sections for pipes up to and including 300mm diameter. All manhole channels to be set at the appropriate level for the incoming and outgoing pipe gradients.
19. All manholes connections to be formed at soffit to soffit unless otherwise stated. All internal branch connections to be made with swept bends in the direction of flow in the main pipe.



Typical Highway Drainage Detail

Rev.	Description	Rev. by	Date

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Client
Formal Investments

Architect
Roberts Limbrick

Project
Canalside Development, Ellesmere

Title
Surface Water Strategy
Preliminary Drainage - Highway A

Date	22.02.2023	Drawn By	DOR
Size	A1	Checked By	DOR
Scale	1/2000	Approved By	DOR

Dwg. No. **C1581-SGI-ZZ-00-DR-C-0208** Rev **P2**

Filename: K:\projects\Old Nos C1000-C1999\C1581 Ellesmere Urban\ Shropshire Phase 2\006 CIVILS\
Plot Date/Time: 15/02/2023 10:43 AM
Plot Scale: 1:1 Plot Size: A1 Layout: Surface Water Strategy - Highway A.dwg

APPENDIX C2

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	30.007	0.595	50.4	0.104	2.50	0.0		0.075	→|o|→		Filter Drain	
1.001	30.009	0.920	32.6	0.054	0.00	0.0		0.075	→|o|→		Filter Drain	
1.002	29.962	0.725	41.3	0.054	0.00	0.0		0.075	→|o|→		Filter Drain	
1.003	29.994	0.305	98.3	0.054	0.00	0.0		0.075	→|o|→		Filter Drain	
1.004	15.510	0.080	193.9	0.054	0.00	0.0	0.600		o	375	Pipe/Conduit	
1.005	11.938	0.060	200.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.006	15.001	0.001	15001.0	0.000	0.00	0.0		0.035	→_/		Pond/Tank	
1.007	8.000	0.039	205.1	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.008	13.829	0.050	276.6	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)
1.000	0.00	1.00	89.650	0.104	0.0	0.0	0.0	0.34	85.1	0.0
1.001	0.00	1.00	89.055	0.158	0.0	0.0	0.0	0.42	105.9	0.0
1.002	0.00	1.00	88.135	0.212	0.0	0.0	0.0	0.37	94.1	0.0
1.003	0.00	1.00	87.335	0.266	0.0	0.0	0.0	0.26	79.2	0.0
1.004	0.00	1.00	87.030	0.320	0.0	0.0	0.0	1.30	143.3	0.0
1.005	0.00	1.00	86.950	0.320	0.0	0.0	0.0	1.11	78.3	0.0
1.006	0.00	1.00	86.890	0.320	0.0	0.0	0.0	0.15	4159.7	0.0
1.007	0.00	1.00	86.889	0.320	0.0	0.0	0.0	1.09	77.3	0.0
1.008	0.00	1.00	86.850	0.320	0.0	0.0	0.0	0.60	10.6	0.0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.104	0.104	0.104
1.001	-	-	100	0.054	0.054	0.054
1.002	-	-	100	0.054	0.054	0.054
1.003	-	-	100	0.054	0.054	0.054
1.004	-	-	100	0.054	0.054	0.054
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.320	0.320	0.320

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)
1.008	A1009	88.700	86.800	0.000	0	0

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: A1008, DS/PN: 1.008, Volume (m³): 3.0

Unit Reference	MD-SHE-0098-5000-1500-5000
Design Head (m)	1.500
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	86.850
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	5.0	Kick-Flo®	0.878	3.9
Flush-Flo™	0.431	4.9	Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	0.800	4.3	2.000	5.7	4.000	7.9	7.000	10.3
0.200	4.4	1.000	4.1	2.200	6.0	4.500	8.4	7.500	10.7
0.300	4.8	1.200	4.5	2.400	6.2	5.000	8.8	8.000	11.0
0.400	4.9	1.400	4.8	2.600	6.5	5.500	9.2	8.500	11.3
0.500	4.9	1.600	5.1	3.000	6.9	6.000	9.6	9.000	11.6
0.600	4.8	1.800	5.4	3.500	7.4	6.500	10.0	9.500	11.9

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Storage Structures for Storm

Filter Drain Pipe: 1.000

Manning's N	0.075	Trench Length (m)	30.0
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	50.4
Invert Level (m)	89.650	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.001

Manning's N	0.075	Trench Length (m)	30.0
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	32.6
Invert Level (m)	89.055	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.002

Manning's N	0.075	Trench Length (m)	30.0
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	41.3
Invert Level (m)	88.135	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.003

Manning's N	0.075	Trench Length (m)	30.0
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.375
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	98.3
Invert Level (m)	87.335	Cap Volume Depth (m)	0.825
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Tank or Pond Pipe: 1.006

Manning's N 0.035 Invert Level (m) 86.890

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	24.5	1.910	418.0	1.911	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	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	5	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Point
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 339198 334094 SJ 39198 34094	Cv (Winter)	1.000

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
Return Period(s) (years)	2, 5, 30, 100
Climate Change (%)	0, 0, 0, 45

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)	Flooded Volume (m³)
1.000	A1000	15 Summer	2	+0%	100/15 Summer				89.855	-0.545	0.000
1.001	A1001	15 Summer	2	+0%	100/15 Summer				89.246	-0.559	0.000
1.002	A1002	15 Summer	2	+0%	100/15 Summer				88.357	-0.528	0.000
1.003	A1003	15 Summer	2	+0%	100/15 Summer				87.623	-0.537	0.000
1.004	A1004	180 Summer	2	+0%	30/15 Summer				87.266	-0.139	0.000
1.005	A1005	180 Summer	2	+0%	2/120 Summer				87.264	0.014	0.000
1.006	A1006	180 Summer	2	+0%					87.260	-1.440	0.000
1.007	A1007	180 Summer	2	+0%	2/30 Summer				87.260	0.071	0.000
1.008	A1008	120 Winter	2	+0%	2/15 Summer				87.349	0.349	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	A1000	0.29		3	25.0	OK	
1.001	A1001	0.29		5	30.5	OK	
1.002	A1002	0.37		6	34.3	OK	
1.003	A1003	0.46		5	36.5	OK	
1.004	A1004	0.18			20.5	OK	
1.005	A1005	0.32			19.6	SURCHARGED	
1.006	A1006	0.00			19.1	OK	
1.007	A1007	0.12			6.7	SURCHARGED	
1.008	A1008	0.50			4.9	SURCHARGED	

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5 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	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	5	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Point
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 339198 334094 SJ 39198 34094	Cv (Winter)	1.000

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
Return Period(s) (years)	2, 5, 30, 100
Climate Change (%)	0, 0, 0, 45

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)	Flooded Volume (m³)
1.000	A1000	15 Summer	5	+0%	100/15 Summer				89.912	-0.488	0.000
1.001	A1001	15 Summer	5	+0%	100/15 Summer				89.296	-0.509	0.000
1.002	A1002	15 Summer	5	+0%	100/15 Summer				88.423	-0.462	0.000
1.003	A1003	15 Summer	5	+0%	100/15 Summer				87.713	-0.447	0.000
1.004	A1004	120 Summer	5	+0%	30/15 Summer				87.394	-0.011	0.000
1.005	A1005	120 Summer	5	+0%	2/120 Summer				87.392	0.142	0.000
1.006	A1006	120 Summer	5	+0%					87.389	-1.311	0.000
1.007	A1007	120 Summer	5	+0%	2/30 Summer				87.389	0.200	0.000
1.008	A1008	120 Summer	5	+0%	2/15 Summer				87.458	0.458	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	A1000	0.41		3	35.1	OK	
1.001	A1001	0.40		5	42.7	OK	
1.002	A1002	0.50		6	47.3	OK	
1.003	A1003	0.63		4	49.8	OK	
1.004	A1004	0.29			32.3	OK	
1.005	A1005	0.50			30.8	SURCHARGED	
1.006	A1006	0.00			30.3	OK	
1.007	A1007	0.12			7.1	SURCHARGED	
1.008	A1008	0.50			4.9	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 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	1	Number of Storage Structures	5	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Point
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 339198 334094 SJ 39198 34094	Cv (Winter)	1.000

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
Return Period(s) (years)	2, 5, 30, 100
Climate Change (%)	0, 0, 0, 45

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)	Flooded Volume (m³)
1.000	A1000	15 Summer	30	+0%	100/15 Summer				90.168	-0.232	0.000
1.001	A1001	15 Summer	30	+0%	100/15 Summer				89.507	-0.298	0.000
1.002	A1002	15 Summer	30	+0%	100/15 Summer				88.655	-0.230	0.000
1.003	A1003	30 Summer	30	+0%	100/15 Summer				88.041	-0.119	0.000
1.004	A1004	120 Winter	30	+0%	30/15 Summer				87.697	0.292	0.000
1.005	A1005	120 Winter	30	+0%	2/120 Summer				87.694	0.444	0.000
1.006	A1006	120 Winter	30	+0%					87.692	-1.008	0.000
1.007	A1007	120 Winter	30	+0%	2/30 Summer				87.692	0.503	0.000
1.008	A1008	120 Winter	30	+0%	2/15 Summer				87.772	0.772	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	A1000	0.75		3	63.4	OK	
1.001	A1001	0.72		4	76.5	OK	
1.002	A1002	0.85		4	79.4	OK	
1.003	A1003	1.04		6	82.1	OK	
1.004	A1004	0.38			41.9	SURCHARGED	
1.005	A1005	0.68			41.5	SURCHARGED	
1.006	A1006	0.00			41.1	OK	
1.007	A1007	0.12			6.9	SURCHARGED	
1.008	A1008	0.50			4.9	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 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	1	Number of Storage Structures	5	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Point
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 339198 334094 SJ 39198 34094	Cv (Winter)	1.000

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
Return Period(s) (years)	2, 5, 30, 100
Climate Change (%)	0, 0, 0, 45

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)	Flooded Volume (m³)
1.000	A1000	15 Summer	100	+45%	100/15 Summer				91.097	0.697	0.000
1.001	A1001	15 Summer	100	+45%	100/15 Summer				90.352	0.547	0.000
1.002	A1002	30 Summer	100	+45%	100/15 Summer				89.668	0.783	0.000
1.003	A1003	60 Summer	100	+45%	100/15 Summer				88.707	0.547	0.000
1.004	A1004	180 Winter	100	+45%	30/15 Summer				88.204	0.799	0.000
1.005	A1005	180 Winter	100	+45%	2/120 Summer				88.200	0.950	0.000
1.006	A1006	180 Winter	100	+45%					88.196	-0.504	0.000
1.007	A1007	180 Winter	100	+45%	2/30 Summer				88.196	1.007	0.000
1.008	A1008	180 Summer	100	+45%	2/15 Summer				88.387	1.387	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	A1000	1.30		5	110.8	SURCHARGED	
1.001	A1001	1.08		6	114.2	SURCHARGED	
1.002	A1002	1.17		10	109.9	SURCHARGED	
1.003	A1003	1.51		76	119.3	SURCHARGED	
1.004	A1004	0.54			60.3	SURCHARGED	
1.005	A1005	0.98			60.0	SURCHARGED	
1.006	A1006	0.01			59.6	OK	
1.007	A1007	0.14			8.0	SURCHARGED	
1.008	A1008	0.50			4.9	SURCHARGED	

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APPENDIX C3

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	30.007	0.595	50.4	0.104	2.50	0.0		0.075	→|o|→		Filter Drain	
1.001	30.009	0.920	32.6	0.054	0.00	0.0		0.075	→|o|→		Filter Drain	
1.002	29.962	0.725	41.3	0.054	0.00	0.0		0.075	→|o|→		Filter Drain	
1.003	29.994	0.305	98.3	0.054	0.00	0.0		0.075	→|o|→		Filter Drain	
1.004	15.510	0.080	193.9	0.054	0.00	0.0	0.600		o	375	Pipe/Conduit	
1.005	11.938	0.060	200.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.006	15.001	0.001	15001.0	0.000	0.00	0.0		0.035	→_/		Pond/Tank	
1.007	8.000	0.039	205.1	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.008	13.829	0.050	276.6	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)
1.000	0.00	1.00	89.650	0.104	0.0	0.0	0.0	0.34	85.1	0.0
1.001	0.00	1.00	89.055	0.158	0.0	0.0	0.0	0.42	105.9	0.0
1.002	0.00	1.00	88.135	0.212	0.0	0.0	0.0	0.37	94.1	0.0
1.003	0.00	1.00	87.335	0.266	0.0	0.0	0.0	0.26	79.2	0.0
1.004	0.00	1.00	87.030	0.320	0.0	0.0	0.0	1.30	143.3	0.0
1.005	0.00	1.00	86.950	0.320	0.0	0.0	0.0	1.11	78.3	0.0
1.006	0.00	1.00	86.890	0.320	0.0	0.0	0.0	0.15	4159.7	0.0
1.007	0.00	1.00	86.889	0.320	0.0	0.0	0.0	1.09	77.3	0.0
1.008	0.00	1.00	86.850	0.320	0.0	0.0	0.0	0.60	10.6	0.0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.104	0.104	0.104
1.001	-	-	100	0.054	0.054	0.054
1.002	-	-	100	0.054	0.054	0.054
1.003	-	-	100	0.054	0.054	0.054
1.004	-	-	100	0.054	0.054	0.054
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.320	0.320	0.320

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.008	A1009	88.700	86.800	0.000	0	0

Datum (m) 86.800 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	0.590	36	0.590	71	0.590	106	0.590	141	0.590	176	0.590	211	0.590	246	0.590
2	0.590	37	0.590	72	0.590	107	0.590	142	0.590	177	0.590	212	0.590	247	0.590
3	0.590	38	0.590	73	0.590	108	0.590	143	0.590	178	0.590	213	0.590	248	0.590
4	0.590	39	0.590	74	0.590	109	0.590	144	0.590	179	0.590	214	0.590	249	0.590
5	0.590	40	0.590	75	0.590	110	0.590	145	0.590	180	0.590	215	0.590	250	0.590
6	0.590	41	0.590	76	0.590	111	0.590	146	0.590	181	0.590	216	0.590	251	0.590
7	0.590	42	0.590	77	0.590	112	0.590	147	0.590	182	0.590	217	0.590	252	0.590
8	0.590	43	0.590	78	0.590	113	0.590	148	0.590	183	0.590	218	0.590	253	0.590
9	0.590	44	0.590	79	0.590	114	0.590	149	0.590	184	0.590	219	0.590	254	0.590
10	0.590	45	0.590	80	0.590	115	0.590	150	0.590	185	0.590	220	0.590	255	0.590
11	0.590	46	0.590	81	0.590	116	0.590	151	0.590	186	0.590	221	0.590	256	0.590
12	0.590	47	0.590	82	0.590	117	0.590	152	0.590	187	0.590	222	0.590	257	0.590
13	0.590	48	0.590	83	0.590	118	0.590	153	0.590	188	0.590	223	0.590	258	0.590
14	0.590	49	0.590	84	0.590	119	0.590	154	0.590	189	0.590	224	0.590	259	0.590
15	0.590	50	0.590	85	0.590	120	0.590	155	0.590	190	0.590	225	0.590	260	0.590
16	0.590	51	0.590	86	0.590	121	0.590	156	0.590	191	0.590	226	0.590	261	0.590
17	0.590	52	0.590	87	0.590	122	0.590	157	0.590	192	0.590	227	0.590	262	0.590
18	0.590	53	0.590	88	0.590	123	0.590	158	0.590	193	0.590	228	0.590	263	0.590
19	0.590	54	0.590	89	0.590	124	0.590	159	0.590	194	0.590	229	0.590	264	0.590
20	0.590	55	0.590	90	0.590	125	0.590	160	0.590	195	0.590	230	0.590	265	0.590
21	0.590	56	0.590	91	0.590	126	0.590	161	0.590	196	0.590	231	0.590	266	0.590
22	0.590	57	0.590	92	0.590	127	0.590	162	0.590	197	0.590	232	0.590	267	0.590
23	0.590	58	0.590	93	0.590	128	0.590	163	0.590	198	0.590	233	0.590	268	0.590
24	0.590	59	0.590	94	0.590	129	0.590	164	0.590	199	0.590	234	0.590	269	0.590
25	0.590	60	0.590	95	0.590	130	0.590	165	0.590	200	0.590	235	0.590	270	0.590
26	0.590	61	0.590	96	0.590	131	0.590	166	0.590	201	0.590	236	0.590	271	0.590
27	0.590	62	0.590	97	0.590	132	0.590	167	0.590	202	0.590	237	0.590	272	0.590
28	0.590	63	0.590	98	0.590	133	0.590	168	0.590	203	0.590	238	0.590	273	0.590
29	0.590	64	0.590	99	0.590	134	0.590	169	0.590	204	0.590	239	0.590	274	0.590
30	0.590	65	0.590	100	0.590	135	0.590	170	0.590	205	0.590	240	0.590	275	0.590
31	0.590	66	0.590	101	0.590	136	0.590	171	0.590	206	0.590	241	0.590	276	0.590
32	0.590	67	0.590	102	0.590	137	0.590	172	0.590	207	0.590	242	0.590	277	0.590
33	0.590	68	0.590	103	0.590	138	0.590	173	0.590	208	0.590	243	0.590	278	0.590
34	0.590	69	0.590	104	0.590	139	0.590	174	0.590	209	0.590	244	0.590	279	0.590
35	0.590	70	0.590	105	0.590	140	0.590	175	0.590	210	0.590	245	0.590	280	0.590

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Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
281	0.590	342	0.590	403	0.590	464	0.590	525	0.590	586	0.590	647	0.590	708	0.590
282	0.590	343	0.590	404	0.590	465	0.590	526	0.590	587	0.590	648	0.590	709	0.590
283	0.590	344	0.590	405	0.590	466	0.590	527	0.590	588	0.590	649	0.590	710	0.590
284	0.590	345	0.590	406	0.590	467	0.590	528	0.590	589	0.590	650	0.590	711	0.590
285	0.590	346	0.590	407	0.590	468	0.590	529	0.590	590	0.590	651	0.590	712	0.590
286	0.590	347	0.590	408	0.590	469	0.590	530	0.590	591	0.590	652	0.590	713	0.590
287	0.590	348	0.590	409	0.590	470	0.590	531	0.590	592	0.590	653	0.590	714	0.590
288	0.590	349	0.590	410	0.590	471	0.590	532	0.590	593	0.590	654	0.590	715	0.590
289	0.590	350	0.590	411	0.590	472	0.590	533	0.590	594	0.590	655	0.590	716	0.590
290	0.590	351	0.590	412	0.590	473	0.590	534	0.590	595	0.590	656	0.590	717	0.590
291	0.590	352	0.590	413	0.590	474	0.590	535	0.590	596	0.590	657	0.590	718	0.590
292	0.590	353	0.590	414	0.590	475	0.590	536	0.590	597	0.590	658	0.590	719	0.590
293	0.590	354	0.590	415	0.590	476	0.590	537	0.590	598	0.590	659	0.590	720	0.590
294	0.590	355	0.590	416	0.590	477	0.590	538	0.590	599	0.590	660	0.590	721	0.590
295	0.590	356	0.590	417	0.590	478	0.590	539	0.590	600	0.590	661	0.590	722	0.590
296	0.590	357	0.590	418	0.590	479	0.590	540	0.590	601	0.590	662	0.590	723	0.590
297	0.590	358	0.590	419	0.590	480	0.590	541	0.590	602	0.590	663	0.590	724	0.590
298	0.590	359	0.590	420	0.590	481	0.590	542	0.590	603	0.590	664	0.590	725	0.590
299	0.590	360	0.590	421	0.590	482	0.590	543	0.590	604	0.590	665	0.590	726	0.590
300	0.590	361	0.590	422	0.590	483	0.590	544	0.590	605	0.590	666	0.590	727	0.590
301	0.590	362	0.590	423	0.590	484	0.590	545	0.590	606	0.590	667	0.590	728	0.590
302	0.590	363	0.590	424	0.590	485	0.590	546	0.590	607	0.590	668	0.590	729	0.590
303	0.590	364	0.590	425	0.590	486	0.590	547	0.590	608	0.590	669	0.590	730	0.590
304	0.590	365	0.590	426	0.590	487	0.590	548	0.590	609	0.590	670	0.590	731	0.590
305	0.590	366	0.590	427	0.590	488	0.590	549	0.590	610	0.590	671	0.590	732	0.590
306	0.590	367	0.590	428	0.590	489	0.590	550	0.590	611	0.590	672	0.590	733	0.590
307	0.590	368	0.590	429	0.590	490	0.590	551	0.590	612	0.590	673	0.590	734	0.590
308	0.590	369	0.590	430	0.590	491	0.590	552	0.590	613	0.590	674	0.590	735	0.590
309	0.590	370	0.590	431	0.590	492	0.590	553	0.590	614	0.590	675	0.590	736	0.590
310	0.590	371	0.590	432	0.590	493	0.590	554	0.590	615	0.590	676	0.590	737	0.590
311	0.590	372	0.590	433	0.590	494	0.590	555	0.590	616	0.590	677	0.590	738	0.590
312	0.590	373	0.590	434	0.590	495	0.590	556	0.590	617	0.590	678	0.590	739	0.590
313	0.590	374	0.590	435	0.590	496	0.590	557	0.590	618	0.590	679	0.590	740	0.590
314	0.590	375	0.590	436	0.590	497	0.590	558	0.590	619	0.590	680	0.590	741	0.590
315	0.590	376	0.590	437	0.590	498	0.590	559	0.590	620	0.590	681	0.590	742	0.590
316	0.590	377	0.590	438	0.590	499	0.590	560	0.590	621	0.590	682	0.590	743	0.590
317	0.590	378	0.590	439	0.590	500	0.590	561	0.590	622	0.590	683	0.590	744	0.590
318	0.590	379	0.590	440	0.590	501	0.590	562	0.590	623	0.590	684	0.590	745	0.590
319	0.590	380	0.590	441	0.590	502	0.590	563	0.590	624	0.590	685	0.590	746	0.590
320	0.590	381	0.590	442	0.590	503	0.590	564	0.590	625	0.590	686	0.590	747	0.590
321	0.590	382	0.590	443	0.590	504	0.590	565	0.590	626	0.590	687	0.590	748	0.590
322	0.590	383	0.590	444	0.590	505	0.590	566	0.590	627	0.590	688	0.590	749	0.590
323	0.590	384	0.590	445	0.590	506	0.590	567	0.590	628	0.590	689	0.590	750	0.590
324	0.590	385	0.590	446	0.590	507	0.590	568	0.590	629	0.590	690	0.590	751	0.590
325	0.590	386	0.590	447	0.590	508	0.590	569	0.590	630	0.590	691	0.590	752	0.590
326	0.590	387	0.590	448	0.590	509	0.590	570	0.590	631	0.590	692	0.590	753	0.590
327	0.590	388	0.590	449	0.590	510	0.590	571	0.590	632	0.590	693	0.590	754	0.590
328	0.590	389	0.590	450	0.590	511	0.590	572	0.590	633	0.590	694	0.590	755	0.590
329	0.590	390	0.590	451	0.590	512	0.590	573	0.590	634	0.590	695	0.590	756	0.590
330	0.590	391	0.590	452	0.590	513	0.590	574	0.590	635	0.590	696	0.590	757	0.590
331	0.590	392	0.590	453	0.590	514	0.590	575	0.590	636	0.590	697	0.590	758	0.590
332	0.590	393	0.590	454	0.590	515	0.590	576	0.590	637	0.590	698	0.590	759	0.590
333	0.590	394	0.590	455	0.590	516	0.590	577	0.590	638	0.590	699	0.590	760	0.590
334	0.590	395	0.590	456	0.590	517	0.590	578	0.590	639	0.590	700	0.590	761	0.590
335	0.590	396	0.590	457	0.590	518	0.590	579	0.590	640	0.590	701	0.590	762	0.590
336	0.590	397	0.590	458	0.590	519	0.590	580	0.590	641	0.590	702	0.590	763	0.590
337	0.590	398	0.590	459	0.590	520	0.590	581	0.590	642	0.590	703	0.590	764	0.590
338	0.590	399	0.590	460	0.590	521	0.590	582	0.590	643	0.590	704	0.590	765	0.590
339	0.590	400	0.590	461	0.590	522	0.590	583	0.590	644	0.590	705	0.590	766	0.590
340	0.590	401	0.590	462	0.590	523	0.590	584	0.590	645	0.590	706	0.590	767	0.590
341	0.590	402	0.590	463	0.590	524	0.590	585	0.590	646	0.590	707	0.590	768	0.590

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Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
769	0.590	830	0.590	891	0.590	952	0.590	1013	0.590	1074	0.590	1135	0.590	1196	0.590
770	0.590	831	0.590	892	0.590	953	0.590	1014	0.590	1075	0.590	1136	0.590	1197	0.590
771	0.590	832	0.590	893	0.590	954	0.590	1015	0.590	1076	0.590	1137	0.590	1198	0.590
772	0.590	833	0.590	894	0.590	955	0.590	1016	0.590	1077	0.590	1138	0.590	1199	0.590
773	0.590	834	0.590	895	0.590	956	0.590	1017	0.590	1078	0.590	1139	0.590	1200	0.590
774	0.590	835	0.590	896	0.590	957	0.590	1018	0.590	1079	0.590	1140	0.590	1201	0.590
775	0.590	836	0.590	897	0.590	958	0.590	1019	0.590	1080	0.590	1141	0.590	1202	0.590
776	0.590	837	0.590	898	0.590	959	0.590	1020	0.590	1081	0.590	1142	0.590	1203	0.590
777	0.590	838	0.590	899	0.590	960	0.590	1021	0.590	1082	0.590	1143	0.590	1204	0.590
778	0.590	839	0.590	900	0.590	961	0.590	1022	0.590	1083	0.590	1144	0.590	1205	0.590
779	0.590	840	0.590	901	0.590	962	0.590	1023	0.590	1084	0.590	1145	0.590	1206	0.590
780	0.590	841	0.590	902	0.590	963	0.590	1024	0.590	1085	0.590	1146	0.590	1207	0.590
781	0.590	842	0.590	903	0.590	964	0.590	1025	0.590	1086	0.590	1147	0.590	1208	0.590
782	0.590	843	0.590	904	0.590	965	0.590	1026	0.590	1087	0.590	1148	0.590	1209	0.590
783	0.590	844	0.590	905	0.590	966	0.590	1027	0.590	1088	0.590	1149	0.590	1210	0.590
784	0.590	845	0.590	906	0.590	967	0.590	1028	0.590	1089	0.590	1150	0.590	1211	0.590
785	0.590	846	0.590	907	0.590	968	0.590	1029	0.590	1090	0.590	1151	0.590	1212	0.590
786	0.590	847	0.590	908	0.590	969	0.590	1030	0.590	1091	0.590	1152	0.590	1213	0.590
787	0.590	848	0.590	909	0.590	970	0.590	1031	0.590	1092	0.590	1153	0.590	1214	0.590
788	0.590	849	0.590	910	0.590	971	0.590	1032	0.590	1093	0.590	1154	0.590	1215	0.590
789	0.590	850	0.590	911	0.590	972	0.590	1033	0.590	1094	0.590	1155	0.590	1216	0.590
790	0.590	851	0.590	912	0.590	973	0.590	1034	0.590	1095	0.590	1156	0.590	1217	0.590
791	0.590	852	0.590	913	0.590	974	0.590	1035	0.590	1096	0.590	1157	0.590	1218	0.590
792	0.590	853	0.590	914	0.590	975	0.590	1036	0.590	1097	0.590	1158	0.590	1219	0.590
793	0.590	854	0.590	915	0.590	976	0.590	1037	0.590	1098	0.590	1159	0.590	1220	0.590
794	0.590	855	0.590	916	0.590	977	0.590	1038	0.590	1099	0.590	1160	0.590	1221	0.590
795	0.590	856	0.590	917	0.590	978	0.590	1039	0.590	1100	0.590	1161	0.590	1222	0.590
796	0.590	857	0.590	918	0.590	979	0.590	1040	0.590	1101	0.590	1162	0.590	1223	0.590
797	0.590	858	0.590	919	0.590	980	0.590	1041	0.590	1102	0.590	1163	0.590	1224	0.590
798	0.590	859	0.590	920	0.590	981	0.590	1042	0.590	1103	0.590	1164	0.590	1225	0.590
799	0.590	860	0.590	921	0.590	982	0.590	1043	0.590	1104	0.590	1165	0.590	1226	0.590
800	0.590	861	0.590	922	0.590	983	0.590	1044	0.590	1105	0.590	1166	0.590	1227	0.590
801	0.590	862	0.590	923	0.590	984	0.590	1045	0.590	1106	0.590	1167	0.590	1228	0.590
802	0.590	863	0.590	924	0.590	985	0.590	1046	0.590	1107	0.590	1168	0.590	1229	0.590
803	0.590	864	0.590	925	0.590	986	0.590	1047	0.590	1108	0.590	1169	0.590	1230	0.590
804	0.590	865	0.590	926	0.590	987	0.590	1048	0.590	1109	0.590	1170	0.590	1231	0.590
805	0.590	866	0.590	927	0.590	988	0.590	1049	0.590	1110	0.590	1171	0.590	1232	0.590
806	0.590	867	0.590	928	0.590	989	0.590	1050	0.590	1111	0.590	1172	0.590	1233	0.590
807	0.590	868	0.590	929	0.590	990	0.590	1051	0.590	1112	0.590	1173	0.590	1234	0.590
808	0.590	869	0.590	930	0.590	991	0.590	1052	0.590	1113	0.590	1174	0.590	1235	0.590
809	0.590	870	0.590	931	0.590	992	0.590	1053	0.590	1114	0.590	1175	0.590	1236	0.590
810	0.590	871	0.590	932	0.590	993	0.590	1054	0.590	1115	0.590	1176	0.590	1237	0.590
811	0.590	872	0.590	933	0.590	994	0.590	1055	0.590	1116	0.590	1177	0.590	1238	0.590
812	0.590	873	0.590	934	0.590	995	0.590	1056	0.590	1117	0.590	1178	0.590	1239	0.590
813	0.590	874	0.590	935	0.590	996	0.590	1057	0.590	1118	0.590	1179	0.590	1240	0.590
814	0.590	875	0.590	936	0.590	997	0.590	1058	0.590	1119	0.590	1180	0.590	1241	0.590
815	0.590	876	0.590	937	0.590	998	0.590	1059	0.590	1120	0.590	1181	0.590	1242	0.590
816	0.590	877	0.590	938	0.590	999	0.590	1060	0.590	1121	0.590	1182	0.590	1243	0.590
817	0.590	878	0.590	939	0.590	1000	0.590	1061	0.590	1122	0.590	1183	0.590	1244	0.590
818	0.590	879	0.590	940	0.590	1001	0.590	1062	0.590	1123	0.590	1184	0.590	1245	0.590
819	0.590	880	0.590	941	0.590	1002	0.590	1063	0.590	1124	0.590	1185	0.590	1246	0.590
820	0.590	881	0.590	942	0.590	1003	0.590	1064	0.590	1125	0.590	1186	0.590	1247	0.590
821	0.590	882	0.590	943	0.590	1004	0.590	1065	0.590	1126	0.590	1187	0.590	1248	0.590
822	0.590	883	0.590	944	0.590	1005	0.590	1066	0.590	1127	0.590	1188	0.590	1249	0.590
823	0.590	884	0.590	945	0.590	1006	0.590	1067	0.590	1128	0.590	1189	0.590	1250	0.590
824	0.590	885	0.590	946	0.590	1007	0.590	1068	0.590	1129	0.590	1190	0.590	1251	0.590
825	0.590	886	0.590	947	0.590	1008	0.590	1069	0.590	1130	0.590	1191	0.590	1252	0.590
826	0.590	887	0.590	948	0.590	1009	0.590	1070	0.590	1131	0.590	1192	0.590	1253	0.590
827	0.590	888	0.590	949	0.590	1010	0.590	1071	0.590	1132	0.590	1193	0.590	1254	0.590
828	0.590	889	0.590	950	0.590	1011	0.590	1072	0.590	1133	0.590	1194	0.590	1255	0.590
829	0.590	890	0.590	951	0.590	1012	0.590	1073	0.590	1134	0.590	1195	0.590	1256	0.590

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Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1257	0.590	1280	0.590	1303	0.590	1326	0.590	1349	0.590	1372	0.590	1395	0.590	1418	0.590
1258	0.590	1281	0.590	1304	0.590	1327	0.590	1350	0.590	1373	0.590	1396	0.590	1419	0.590
1259	0.590	1282	0.590	1305	0.590	1328	0.590	1351	0.590	1374	0.590	1397	0.590	1420	0.590
1260	0.590	1283	0.590	1306	0.590	1329	0.590	1352	0.590	1375	0.590	1398	0.590	1421	0.590
1261	0.590	1284	0.590	1307	0.590	1330	0.590	1353	0.590	1376	0.590	1399	0.590	1422	0.590
1262	0.590	1285	0.590	1308	0.590	1331	0.590	1354	0.590	1377	0.590	1400	0.590	1423	0.590
1263	0.590	1286	0.590	1309	0.590	1332	0.590	1355	0.590	1378	0.590	1401	0.590	1424	0.590
1264	0.590	1287	0.590	1310	0.590	1333	0.590	1356	0.590	1379	0.590	1402	0.590	1425	0.590
1265	0.590	1288	0.590	1311	0.590	1334	0.590	1357	0.590	1380	0.590	1403	0.590	1426	0.590
1266	0.590	1289	0.590	1312	0.590	1335	0.590	1358	0.590	1381	0.590	1404	0.590	1427	0.590
1267	0.590	1290	0.590	1313	0.590	1336	0.590	1359	0.590	1382	0.590	1405	0.590	1428	0.590
1268	0.590	1291	0.590	1314	0.590	1337	0.590	1360	0.590	1383	0.590	1406	0.590	1429	0.590
1269	0.590	1292	0.590	1315	0.590	1338	0.590	1361	0.590	1384	0.590	1407	0.590	1430	0.590
1270	0.590	1293	0.590	1316	0.590	1339	0.590	1362	0.590	1385	0.590	1408	0.590	1431	0.590
1271	0.590	1294	0.590	1317	0.590	1340	0.590	1363	0.590	1386	0.590	1409	0.590	1432	0.590
1272	0.590	1295	0.590	1318	0.590	1341	0.590	1364	0.590	1387	0.590	1410	0.590	1433	0.590
1273	0.590	1296	0.590	1319	0.590	1342	0.590	1365	0.590	1388	0.590	1411	0.590	1434	0.590
1274	0.590	1297	0.590	1320	0.590	1343	0.590	1366	0.590	1389	0.590	1412	0.590	1435	0.590
1275	0.590	1298	0.590	1321	0.590	1344	0.590	1367	0.590	1390	0.590	1413	0.590	1436	0.590
1276	0.590	1299	0.590	1322	0.590	1345	0.590	1368	0.590	1391	0.590	1414	0.590	1437	0.590
1277	0.590	1300	0.590	1323	0.590	1346	0.590	1369	0.590	1392	0.590	1415	0.590	1438	0.590
1278	0.590	1301	0.590	1324	0.590	1347	0.590	1370	0.590	1393	0.590	1416	0.590	1439	0.590
1279	0.590	1302	0.590	1325	0.590	1348	0.590	1371	0.590	1394	0.590	1417	0.590	1440	0.590

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: A1008, DS/PN: 1.008, Volume (m³): 3.0

Unit Reference	MD-SHE-0098-5000-1500-5000
Design Head (m)	1.500
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	86.850
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	5.0	Kick-Flo®	0.878	3.9
Flush-Flo™	0.431	4.9	Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	0.800	4.3	2.000	5.7	4.000	7.9	7.000	10.3
0.200	4.4	1.000	4.1	2.200	6.0	4.500	8.4	7.500	10.7
0.300	4.8	1.200	4.5	2.400	6.2	5.000	8.8	8.000	11.0
0.400	4.9	1.400	4.8	2.600	6.5	5.500	9.2	8.500	11.3
0.500	4.9	1.600	5.1	3.000	6.9	6.000	9.6	9.000	11.6
0.600	4.8	1.800	5.4	3.500	7.4	6.500	10.0	9.500	11.9

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Storage Structures for Storm

Filter Drain Pipe: 1.000

Manning's N	0.075	Trench Length (m)	30.0
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	50.4
Invert Level (m)	89.650	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.001

Manning's N	0.075	Trench Length (m)	30.0
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	32.6
Invert Level (m)	89.055	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.002

Manning's N	0.075	Trench Length (m)	30.0
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	41.3
Invert Level (m)	88.135	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.003

Manning's N	0.075	Trench Length (m)	30.0
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.375
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	98.3
Invert Level (m)	87.335	Cap Volume Depth (m)	0.825
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Tank or Pond Pipe: 1.006

Manning's N 0.035 Invert Level (m) 86.890

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	24.5	1.910	418.0	1.911	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	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	5	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Point
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 339198 334094 SJ 39198 34094	Cv (Winter)	1.000

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
Return Period(s) (years)	2, 5, 30, 100
Climate Change (%)	0, 0, 0, 45

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)	Flooded Volume (m³)
1.000	A1000	15 Summer	2	+0%	100/15 Summer				89.855	-0.545	0.000
1.001	A1001	15 Summer	2	+0%	100/15 Summer				89.246	-0.559	0.000
1.002	A1002	15 Summer	2	+0%	100/15 Summer				88.357	-0.528	0.000
1.003	A1003	15 Summer	2	+0%	100/15 Summer				87.623	-0.537	0.000
1.004	A1004	960 Summer	2	+0%	2/120 Summer				87.493	0.088	0.000
1.005	A1005	960 Summer	2	+0%	2/30 Summer				87.492	0.242	0.000
1.006	A1006	960 Summer	2	+0%					87.490	-1.210	0.000
1.007	A1007	960 Summer	2	+0%	2/15 Summer				87.490	0.301	0.000
1.008	A1008	1440 Winter	2	+0%	2/15 Summer				87.558	0.558	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	A1000	0.29		3	25.0	OK	
1.001	A1001	0.29		5	30.5	OK	
1.002	A1002	0.37		6	34.3	OK	
1.003	A1003	0.46		5	36.5	OK	
1.004	A1004	0.06			6.4	SURCHARGED	
1.005	A1005	0.10			6.3	SURCHARGED	
1.006	A1006	0.00			6.2	OK	
1.007	A1007	0.12			6.9	SURCHARGED	
1.008	A1008	0.50			4.9	SURCHARGED	

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5 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 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 5 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 339198 334094 SJ 39198 34094 Cv (Winter) 1.000

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
Return Period(s) (years) 2, 5, 30, 100
Climate Change (%) 0, 0, 0, 45

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)	Flooded Volume (m³)
1.000	A1000	15 Summer	5	+0%	100/15 Summer				89.912	-0.488	0.000
1.001	A1001	15 Summer	5	+0%	100/15 Summer				89.296	-0.509	0.000
1.002	A1002	15 Summer	5	+0%	100/15 Summer				88.423	-0.462	0.000
1.003	A1003	15 Summer	5	+0%	100/15 Summer				87.713	-0.447	0.000
1.004	A1004	720 Summer	5	+0%	2/120 Summer				87.551	0.146	0.000
1.005	A1005	720 Summer	5	+0%	2/30 Summer				87.549	0.299	0.000
1.006	A1006	720 Summer	5	+0%					87.546	-1.154	0.000
1.007	A1007	720 Summer	5	+0%	2/15 Summer				87.546	0.357	0.000
1.008	A1008	960 Summer	5	+0%	2/15 Summer				87.722	0.722	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	A1000	0.41		3	35.1	OK	
1.001	A1001	0.40		5	42.7	OK	
1.002	A1002	0.50		6	47.3	OK	
1.003	A1003	0.63		4	49.8	OK	
1.004	A1004	0.09			9.8	SURCHARGED	
1.005	A1005	0.16			9.7	SURCHARGED	
1.006	A1006	0.00			9.7	OK	
1.007	A1007	0.10			5.9	SURCHARGED	
1.008	A1008	0.50			4.9	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 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	1	Number of Storage Structures	5	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Point
FEH Rainfall Version	2013	Cv (Summer)	1.000
Site Location	GB 339198 334094 SJ 39198 34094	Cv (Winter)	1.000

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
Return Period(s) (years)	2, 5, 30, 100
Climate Change (%)	0, 0, 0, 45

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)	Flooded Volume (m³)
1.000	A1000	15 Summer	30	+0%	100/15 Summer				90.168	-0.232	0.000
1.001	A1001	15 Summer	30	+0%	100/15 Summer				89.507	-0.298	0.000
1.002	A1002	15 Summer	30	+0%	100/15 Summer				88.655	-0.230	0.000
1.003	A1003	30 Summer	30	+0%	100/15 Summer				88.041	-0.119	0.000
1.004	A1004	360 Summer	30	+0%	2/120 Summer				87.773	0.368	0.000
1.005	A1005	360 Summer	30	+0%	2/30 Summer				87.771	0.521	0.000
1.006	A1006	360 Summer	30	+0%					87.767	-0.933	0.000
1.007	A1007	360 Summer	30	+0%	2/15 Summer				87.767	0.578	0.000
1.008	A1008	480 Summer	30	+0%	2/15 Summer				87.915	0.915	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	A1000	0.75		3	63.4	OK	
1.001	A1001	0.72		4	76.5	OK	
1.002	A1002	0.85		4	79.4	OK	
1.003	A1003	1.04		6	82.1	OK	
1.004	A1004	0.24			26.9	SURCHARGED	
1.005	A1005	0.44			26.7	SURCHARGED	
1.006	A1006	0.00			26.6	OK	
1.007	A1007	0.12			6.9	SURCHARGED	
1.008	A1008	0.50			4.8	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 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 1 Number of Storage Structures 5 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 339198 334094 SJ 39198 34094 Cv (Winter) 1.000

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
Return Period(s) (years) 2, 5, 30, 100
Climate Change (%) 0, 0, 0, 45

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	A1000	15 Summer	100	+45%	100/15 Summer				91.097	0.697	0.000
1.001	A1001	15 Summer	100	+45%	100/15 Summer				90.352	0.547	0.000
1.002	A1002	30 Summer	100	+45%	100/15 Summer				89.673	0.788	0.000
1.003	A1003	60 Summer	100	+45%	100/15 Summer				88.727	0.567	0.000
1.004	A1004	240 Summer	100	+45%	2/120 Summer				88.258	0.853	0.000
1.005	A1005	240 Summer	100	+45%	2/30 Summer				88.255	1.005	0.000
1.006	A1006	240 Summer	100	+45%					88.251	-0.449	0.000
1.007	A1007	240 Summer	100	+45%	2/15 Summer				88.251	1.062	0.000
1.008	A1008	240 Summer	100	+45%	2/15 Summer				88.440	1.440	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	A1000	1.30		5	110.8	SURCHARGED	
1.001	A1001	1.08		6	114.2	SURCHARGED	
1.002	A1002	1.17		10	109.5	SURCHARGED	
1.003	A1003	1.50			118.5	SURCHARGED	
1.004	A1004	0.64			70.7	SURCHARGED	
1.005	A1005	1.15			70.3	SURCHARGED	
1.006	A1006	0.01			69.9	OK	
1.007	A1007	0.20			11.7	SURCHARGED	
1.008	A1008	0.50			4.9	SURCHARGED	

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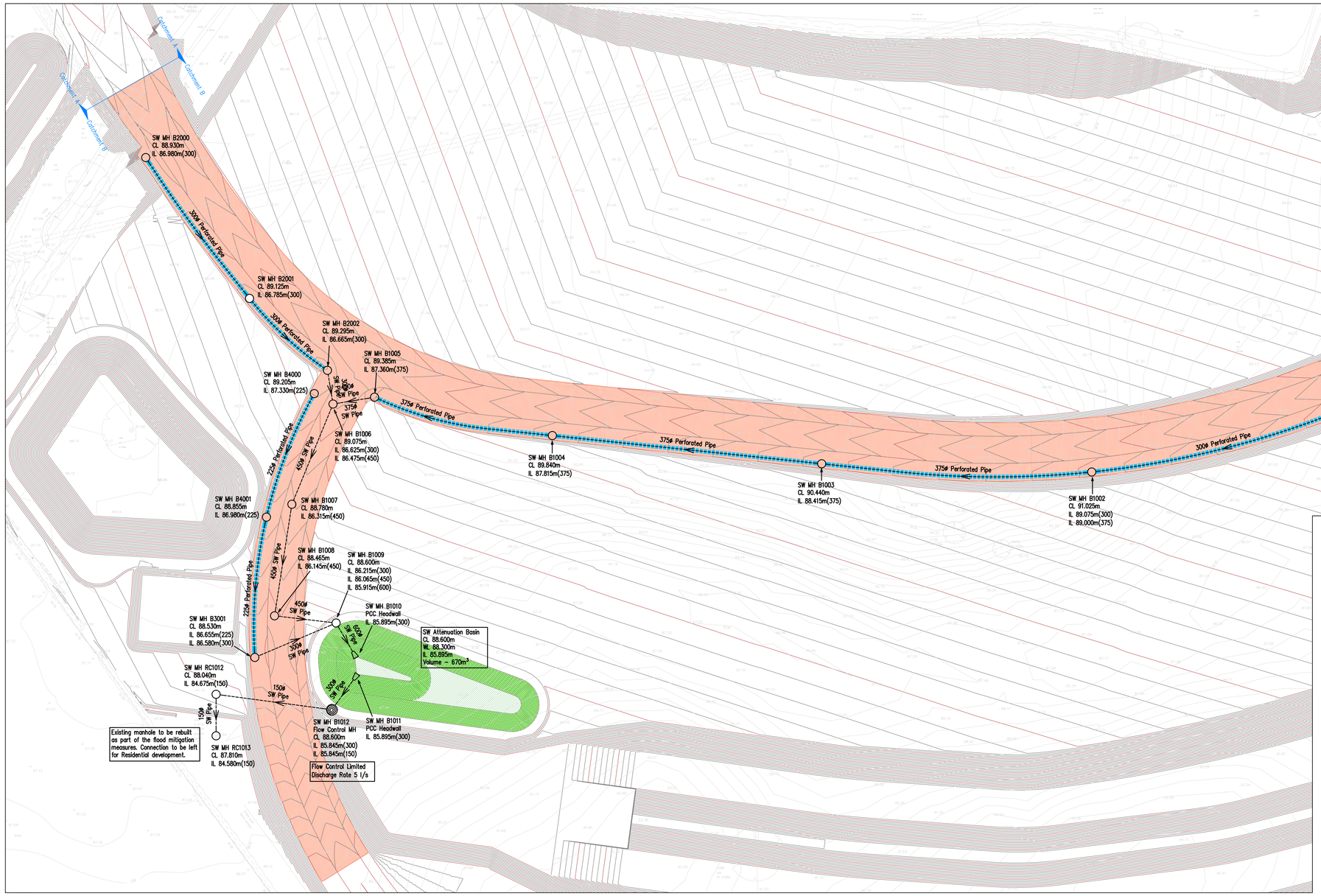
APPENDIX D1

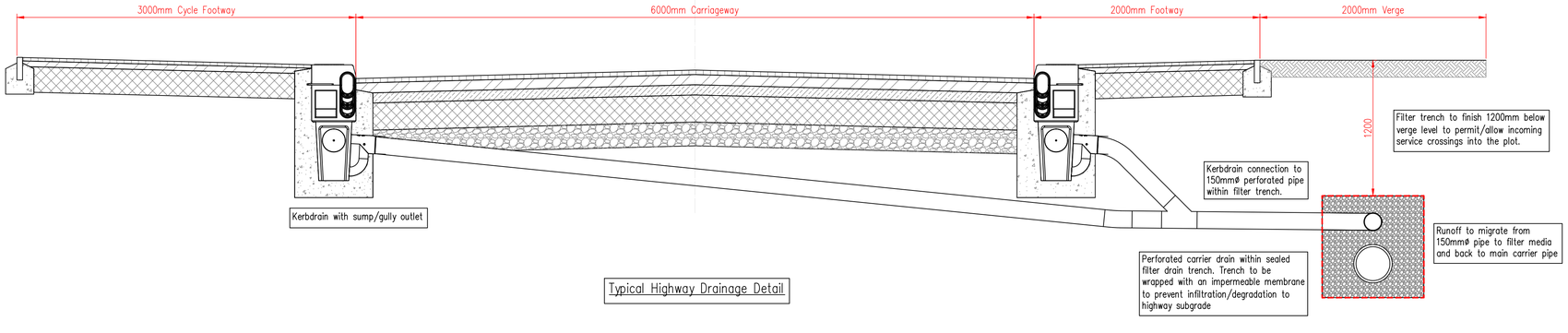


SW Highway Drain – Solid Pipe	
SW Highway Drain – Perforated Pipe	
SW Chamber With 500mm Sump – ø TBC	
SW Chamber Flow Control – ø TBC	
SFA PCC Headwall – Size TBC	

Drainage notes

1. This drainage drawing is to be read in conjunction with all relevant Architect's, Engineer's drawings and specifications.
2. Do not scale this drawing. Any ambiguities, omissions and errors on the drawings shall be brought to the Engineer's attention immediately. All dimensions must be checked and verified on-site before construction commences.
3. All external underground drainage works are to be constructed in accordance with the Civil Engineering Specification for the Water Industry 7th Edition (CESWI), Sewers for Adoption 7th Edition (SFA), Shropshire Manual for Adoptable Roads & Transport (SMART) and any site-specific details provided on the contract drawings.
4. The contractor must survey any retained drainage on-site and report the line, level and condition of the existing drainage to the engineer. We would recommend that the existing drainage is cleansed before any surveying and that these works are undertaken before the contractor commences on-site.
5. Any redundant manholes are to be broken out to at least 600mm below formation level and backfilled with an approved compacted granular material.
6. Any redundant pipes up to and including 300mm diameter are to be filled with a 10:1 PFA/cement mix or broken out and backfilled with an approved compacted granular material. Any redundant pipes over 300mm diameter we to be broken out and backfilled with an approved compacted granular material.
7. Adoptable Drainage Pipes:- Surface water pipes serving the adoptable highway are to be BBA HAPAS approved products that conform to Highways England's Standards and Specifications. Alternatively, surface water pipes up to and including 300mm diameter can be Vitrified Clay in accordance with BS EN 295-1. Pipes greater than 300mm diameter can be Concrete Class 120 in accordance with BS EN 1916:2002.
8. All concrete manholes are to be in accordance with BS EN 1917. All plastic inspection chambers are to be in accordance with BS EN 13598.

1. All solid pipes irrespective of the depth shall have a bed and surround of 150mm of concrete grade ST4 concrete with sulphate resistant cement to SHW Clause 2602. In the case of twinwall plastic pipes the Contractor shall ensure that the pipes do not float when the concrete is placed. To maintain a degree of flexibility a 13mm fibreboard (Flexcell or similar) shall be placed at each pipe joint to the full width of the surround.
2. All perforated pipes are to be wrapped in a Nylon stocking and placed within an impermeable filter media trench. Refer to typical details for further information.
3. All underground drainage must be protected during the construction phase where intermediate cover is less than 900mm.
4. All cover levels shown are approximate only. All manhole covers are to be set at the proposed finished pavement level.
5. For typical manhole construction details, pipe bedding/trench details and typical drainage details refer to SGI typical details drawing.
6. The external gully connections and channel/kerb drain connections are to be 150mm diameter unless otherwise stated. All gully and channel drain outlets to be trapped and roddable. All gully gratings and frames shall be D400 with a anti-theft captive hinge and automatic lock as standard. All gully gratings are to be installed to BD EN124:2015 with a minimum width of 450mm and a minimum waterway of 900cm2.
7. All manhole covers located within the road areas shall be Class D400 (150mm deep) and must achieve a silence in operation performance i.e. double triangular cover system with continuous elastomer gasket.
8. Covers within hard and soft landscaped areas with pedestrian traffic only shall be Class B125 150mm deep. Covers located within block/slab paving areas are to be recessed to suit the proposed paving and of the appropriate grade.
9. All manhole covers shall feature visible, durable and integral markings required by BS EN 124 i.e. marked S.W. (Surface Water) or F.W. (Foul Water).
10. Channels within Type 1 & 2 manholes must use pre-formed using clayware sections for pipes up to and including 300mm diameter. All manhole channels to be set at the appropriate level for the incoming and outgoing pipe gradients.
11. All manholes connections to be formed at soffit to soffit unless otherwise stated. All internal branch connections to be made with swept bends in the direction of flow in the main pipe.



Typical Highway Drainage Detail

Rev.	Description	Rev. by	Date

Shepherd Gilmour
Consulting Engineers
3rd Floor Phoenix House,
45 Cross Street,
Manchester, M2 4JF
T: 0161 837 1500 W: www.sginfrastructure.co.uk

Client
Formal Investments

Architect
Roberts Limbrick

Project
Canalside Development, Ellesmere

Title
Surface Water Strategy
Preliminary Drainage - Highway B

Date	22.02.2023	Drawn By	DOR
Size	A1	Checked By	DOR
Scale	1:500	Approved By	DOR

Dwg. No. **C1581-SGI-ZZ-00-DR-C-0209** Rev **P2**

APPENDIX D2

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	59.943	0.575	104.2	0.072	2.50	0.0		0.075	→|o|→		Filter Drain	
1.001	60.012	0.585	102.6	0.072	0.00	0.0		0.075	→|o|→		Filter Drain	
1.002	59.999	0.585	102.6	0.072	0.00	0.0		0.075	→|o|→		Filter Drain	
1.003	59.763	0.600	99.6	0.072	0.00	0.0		0.075	→|o|→		Filter Drain	
1.004	40.743	0.455	89.5	0.072	0.00	0.0		0.075	→|o|→		Filter Drain	
1.005	9.323	0.810	11.5	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
2.000	38.760	0.195	198.8	0.072	2.50	0.0		0.075	→|o|→		Filter Drain	
2.001	23.589	0.120	196.6	0.029	0.00	0.0		0.075	→|o|→		Filter Drain	
2.002	7.559	0.040	189.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.006	24.000	0.160	150.0	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
1.007	25.000	0.170	147.1	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
1.008	13.731	0.080	171.6	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
3.000	43.812	0.930	47.1	0.054	2.50	0.0		0.075	→|o|→		Filter Drain	
4.000	29.438	0.350	84.1	0.039	2.50	0.0		0.075	→|o|→		Filter Drain	
4.001	31.298	0.325	96.3	0.039	0.00	0.0		0.075	→|o|→		Filter Drain	
3.001	19.557	0.365	53.6	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.009	8.848	0.020	442.4	0.000	0.00	0.0	0.600		o	600	Pipe/Conduit	
1.010	3.682	0.001	3681.8	0.000	0.00	0.0		0.035	→_/		Pond/Tank	
1.011	9.704	0.049	198.1	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.012	25.901	1.170	22.1	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)
1.000	0.00	1.00	90.235	0.072	0.0	0.0	0.0	0.24	59.2	0.0
1.001	0.00	1.00	89.660	0.144	0.0	0.0	0.0	0.24	59.7	0.0
1.002	0.00	1.00	89.000	0.216	0.0	0.0	0.0	0.26	77.5	0.0
1.003	0.00	1.00	88.415	0.288	0.0	0.0	0.0	0.26	78.7	0.0
1.004	0.00	1.00	87.815	0.360	0.0	0.0	0.0	0.28	83.0	0.0
1.005	0.00	1.00	87.360	0.360	0.0	0.0	0.0	6.02	957.1	0.0
2.000	0.00	1.00	86.980	0.072	0.0	0.0	0.0	0.17	42.9	0.0
2.001	0.00	1.00	86.785	0.101	0.0	0.0	0.0	0.17	43.1	0.0
2.002	0.00	1.00	86.665	0.101	0.0	0.0	0.0	1.14	80.6	0.0
1.006	0.00	1.00	86.475	0.461	0.0	0.0	0.0	1.66	263.6	0.0
1.007	0.00	1.00	86.315	0.461	0.0	0.0	0.0	1.67	266.3	0.0
1.008	0.00	1.00	86.145	0.461	0.0	0.0	0.0	1.55	246.3	0.0
3.000	0.00	1.00	87.585	0.054	0.0	0.0	0.0	0.32	67.1	0.0
4.000	0.00	1.00	87.330	0.039	0.0	0.0	0.0	0.24	50.2	0.0
4.001	0.00	1.00	86.980	0.078	0.0	0.0	0.0	0.22	46.9	0.0
3.001	0.00	1.00	86.580	0.132	0.0	0.0	0.0	2.15	152.2	0.0
1.009	0.00	1.00	85.915	0.593	0.0	0.0	0.0	1.15	325.5	0.0
1.010	0.00	1.00	85.895	0.593	0.0	0.0	0.0	0.48	86182.8	0.0
1.011	0.00	1.00	85.894	0.593	0.0	0.0	0.0	1.11	78.7	0.0
1.012	0.00	1.00	85.845	0.593	0.0	0.0	0.0	2.15	38.0	0.0

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.013	9.194	0.138	66.6	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)
1.013	0.00	1.00	84.675	0.593	0.0	0.0	0.0	1.23	21.8	0.0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.072	0.072	0.072
1.001	-	-	100	0.072	0.072	0.072
1.002	-	-	100	0.072	0.072	0.072
1.003	-	-	100	0.072	0.072	0.072
1.004	-	-	100	0.072	0.072	0.072
1.005	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.072	0.072	0.072
2.001	-	-	100	0.029	0.029	0.029
2.002	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.054	0.054	0.054
4.000	-	-	100	0.039	0.039	0.039
4.001	-	-	100	0.039	0.039	0.039
3.001	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.000	0.000	0.000
1.012	-	-	100	0.000	0.000	0.000
1.013	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.593	0.593	0.593

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)
1.013	RC1013	88.700	84.537	0.000	0	0

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: B1012, DS/PN: 1.012, Volume (m³): 3.7

Unit Reference	MD-SCU-0056-5000-2455-5000
Design Head (m)	2.455
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	56
Invert Level (m)	85.845
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)	2.455	5.0	Kick-Flo®	0.085	1.1
Flush-Flo™	0.085	1.1	Mean Flow over Head Range	-	3.4

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	1.2	0.800	3.0	2.000	4.5	4.000	6.3	7.000	8.2
0.200	1.6	1.000	3.3	2.200	4.7	4.500	6.7	7.500	8.5
0.300	1.9	1.200	3.6	2.400	4.9	5.000	7.0	8.000	8.8
0.400	2.2	1.400	3.8	2.600	5.1	5.500	7.3	8.500	9.0
0.500	2.4	1.600	4.1	3.000	5.5	6.000	7.6	9.000	9.3
0.600	2.6	1.800	4.3	3.500	5.9	6.500	7.9	9.500	9.5

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Storage Structures for Storm

Filter Drain Pipe: 1.000

Manning's N	0.075	Trench Length (m)	59.9
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	104.2
Invert Level (m)	90.235	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.001

Manning's N	0.075	Trench Length (m)	60.0
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	102.6
Invert Level (m)	89.660	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.002

Manning's N	0.075	Trench Length (m)	60.0
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.375
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	102.6
Invert Level (m)	89.000	Cap Volume Depth (m)	0.825
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.003

Manning's N	0.075	Trench Length (m)	59.8
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.375
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	99.6
Invert Level (m)	88.415	Cap Volume Depth (m)	0.825
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.004

Manning's N	0.075	Trench Length (m)	40.7
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.375
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	89.5
Invert Level (m)	87.815	Cap Volume Depth (m)	0.825
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 2.000

Manning's N	0.075	Trench Length (m)	38.8
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	198.8
Invert Level (m)	86.980	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

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Filter Drain Pipe: 2.001

Manning's N	0.075	Trench Length (m)	23.6
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	196.6
Invert Level (m)	86.785	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 3.000

Manning's N	0.075	Trench Length (m)	43.8
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.225
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	47.1
Invert Level (m)	87.585	Cap Volume Depth (m)	0.675
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 4.000

Manning's N	0.075	Trench Length (m)	29.4
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.225
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	84.1
Invert Level (m)	87.330	Cap Volume Depth (m)	0.675
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 4.001

Manning's N	0.075	Trench Length (m)	31.3
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.225
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	96.3
Invert Level (m)	86.980	Cap Volume Depth (m)	0.675
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Tank or Pond Pipe: 1.010

Manning's N 0.035 Invert Level (m) 85.895

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	28.0	0.005	30.0	1.400	210.0	1.405	340.0	2.405	655.0

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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 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 339198 334094 SJ 39198 34094 Cv (Winter) 1.000

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
Return Period(s) (years) 2, 5, 30, 100
Climate Change (%) 0, 0, 0, 45

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)	Flooded Volume (m³)
1.000	B1000	15 Summer	2	+0%	100/15 Summer				90.439	-0.546	0.000
1.001	B1001	15 Summer	2	+0%	100/15 Summer				89.857	-0.553	0.000
1.002	B1002	30 Summer	2	+0%	100/30 Summer				89.180	-0.645	0.000
1.003	B1003	60 Summer	2	+0%	100/30 Summer				88.593	-0.647	0.000
1.004	B1004	120 Summer	2	+0%	100/30 Summer				87.996	-0.644	0.000
1.005	B1005	120 Summer	2	+0%	100/30 Summer				87.417	-0.393	0.000
2.000	B2000	15 Summer	2	+0%	100/15 Summer				87.237	-0.493	0.000
2.001	B2001	15 Summer	2	+0%	30/240 Summer				86.990	-0.545	0.000
2.002	B2002	360 Winter	2	+0%	5/120 Summer				86.951	-0.014	0.000
1.006	B1006	360 Winter	2	+0%	2/240 Summer				86.951	0.026	0.000
1.007	B1007	360 Winter	2	+0%	2/120 Summer				86.950	0.185	0.000
1.008	B1008	360 Winter	2	+0%	2/30 Summer				86.949	0.354	0.000
3.000	B3000	15 Summer	2	+0%	100/15 Summer				87.730	-0.530	0.000
4.000	B4000	15 Summer	2	+0%	100/60 Summer				87.471	-0.534	0.000
4.001	B4001	15 Summer	2	+0%	100/15 Summer				87.154	-0.501	0.000
3.001	B3001	360 Winter	2	+0%	2/180 Summer				86.949	0.069	0.000
1.009	B1009	360 Winter	2	+0%	2/30 Summer				86.949	0.434	0.000
1.010	B1010	360 Winter	2	+0%					86.948	-1.352	0.000
1.011	B1011	360 Winter	2	+0%	2/15 Summer				86.948	0.754	0.000
1.012	B1012	360 Winter	2	+0%	2/15 Summer				87.009	1.014	0.000
1.013	RC1012	360 Winter	2	+0%					84.718	-0.107	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	B1000	0.23		3	13.5	OK	
1.001	B1001	0.28		7	16.7	OK	
1.002	B1002	0.23		9	18.0	OK	
1.003	B1003	0.23		12	18.2	OK	
1.004	B1004	0.24		20	19.8	OK	

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	B1005	0.04			19.8	OK	
2.000	B2000	0.28		5	11.9	OK	
2.001	B2001	0.29		8	12.6	OK	
2.002	B2002	0.05			3.0	OK	
1.006	B1006	0.06			13.1	SURCHARGED	
1.007	B1007	0.05			11.9	SURCHARGED	
1.008	B1008	0.07			11.4	SURCHARGED	
3.000	B3000	0.19		3	12.5	OK	
4.000	B4000	0.17		3	8.8	OK	
4.001	B4001	0.27		6	12.6	OK	
3.001	B3001	0.03			3.9	SURCHARGED	
1.009	B1009	0.09			14.5	SURCHARGED	
1.010	B1010	0.00			14.4	OK	
1.011	B1011	0.09			5.3	SURCHARGED	
1.012	B1012	0.10			3.5	SURCHARGED	
1.013	RC1012	0.18			3.5	OK	

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5 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 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 339198 334094 SJ 39198 34094 Cv (Winter) 1.000

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
Return Period(s) (years) 2, 5, 30, 100
Climate Change (%) 0, 0, 0, 45

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)	Flooded Volume (m³)
1.000	B1000	15 Summer	5	+0%	100/15 Summer				90.496	-0.489	0.000
1.001	B1001	15 Summer	5	+0%	100/15 Summer				89.913	-0.497	0.000
1.002	B1002	30 Summer	5	+0%	100/30 Summer				89.224	-0.601	0.000
1.003	B1003	30 Summer	5	+0%	100/30 Summer				88.637	-0.603	0.000
1.004	B1004	60 Winter	5	+0%	100/30 Summer				88.036	-0.604	0.000
1.005	B1005	60 Winter	5	+0%	100/30 Summer				87.427	-0.383	0.000
2.000	B2000	15 Summer	5	+0%	100/15 Summer				87.336	-0.394	0.000
2.001	B2001	360 Winter	5	+0%	30/240 Summer				87.149	-0.386	0.000
2.002	B2002	360 Winter	5	+0%	5/120 Summer				87.148	0.183	0.000
1.006	B1006	360 Winter	5	+0%	2/240 Summer				87.148	0.223	0.000
1.007	B1007	360 Winter	5	+0%	2/120 Summer				87.146	0.381	0.000
1.008	B1008	360 Winter	5	+0%	2/30 Summer				87.145	0.550	0.000
3.000	B3000	15 Summer	5	+0%	100/15 Summer				87.767	-0.493	0.000
4.000	B4000	15 Summer	5	+0%	100/60 Summer				87.507	-0.498	0.000
4.001	B4001	15 Summer	5	+0%	100/15 Summer				87.202	-0.453	0.000
3.001	B3001	360 Winter	5	+0%	2/180 Summer				87.145	0.265	0.000
1.009	B1009	360 Winter	5	+0%	2/30 Summer				87.144	0.629	0.000
1.010	B1010	360 Winter	5	+0%					87.144	-1.156	0.000
1.011	B1011	360 Winter	5	+0%	2/15 Summer				87.144	0.950	0.000
1.012	B1012	360 Winter	5	+0%	2/15 Summer				87.336	1.341	0.000
1.013	RC1012	360 Summer	5	+0%					84.720	-0.105	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	B1000	0.32		3	18.6	OK	
1.001	B1001	0.40		7	23.8	OK	
1.002	B1002	0.33		9	25.7	OK	
1.003	B1003	0.33		10	25.9	OK	
1.004	B1004	0.33		20	27.7	OK	

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	B1005	0.05			27.7	OK	
2.000	B2000	0.39		4	16.6	OK	
2.001	B2001	0.09		155	3.8	OK	
2.002	B2002	0.06			3.7	SURCHARGED	
1.006	B1006	0.07			15.9	SURCHARGED	
1.007	B1007	0.07			14.8	SURCHARGED	
1.008	B1008	0.09			14.5	SURCHARGED	
3.000	B3000	0.26		3	17.6	OK	
4.000	B4000	0.24		3	11.9	OK	
4.001	B4001	0.37		6	17.5	OK	
3.001	B3001	0.04			4.8	SURCHARGED	
1.009	B1009	0.11			18.5	SURCHARGED	
1.010	B1010	0.00			18.4	OK	
1.011	B1011	0.19			11.7	SURCHARGED	
1.012	B1012	0.10			3.7	SURCHARGED	
1.013	RC1012	0.19			3.7	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 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 1 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 339198 334094 SJ 39198 34094 Cv (Winter) 1.000

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
Return Period(s) (years) 2, 5, 30, 100
Climate Change (%) 0, 0, 0, 45

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)	Flooded Volume (m³)
1.000	B1000	15 Summer	30	+0%	100/15 Summer				90.749	-0.236	0.000
1.001	B1001	30 Summer	30	+0%	100/15 Summer				90.069	-0.341	0.000
1.002	B1002	30 Summer	30	+0%	100/30 Summer				89.329	-0.496	0.000
1.003	B1003	60 Summer	30	+0%	100/30 Summer				88.763	-0.477	0.000
1.004	B1004	60 Summer	30	+0%	100/30 Summer				88.180	-0.460	0.000
1.005	B1005	360 Winter	30	+0%	100/30 Summer				87.554	-0.256	0.000
2.000	B2000	15 Summer	30	+0%	100/15 Summer				87.730	0.000	0.000
2.001	B2001	360 Winter	30	+0%	30/240 Summer				87.555	0.020	0.000
2.002	B2002	360 Winter	30	+0%	5/120 Summer				87.553	0.588	0.000
1.006	B1006	360 Winter	30	+0%	2/240 Summer				87.553	0.628	0.000
1.007	B1007	360 Winter	30	+0%	2/120 Summer				87.551	0.786	0.000
1.008	B1008	360 Winter	30	+0%	2/30 Summer				87.550	0.955	0.000
3.000	B3000	15 Summer	30	+0%	100/15 Summer				87.906	-0.354	0.000
4.000	B4000	15 Summer	30	+0%	100/60 Summer				87.638	-0.367	0.000
4.001	B4001	360 Winter	30	+0%	100/15 Summer				87.551	-0.104	0.000
3.001	B3001	360 Winter	30	+0%	2/180 Summer				87.549	0.669	0.000
1.009	B1009	360 Winter	30	+0%	2/30 Summer				87.549	1.034	0.000
1.010	B1010	360 Winter	30	+0%					87.548	-0.752	0.000
1.011	B1011	360 Winter	30	+0%	2/15 Summer				87.548	1.354	0.000
1.012	B1012	240 Winter	30	+0%	2/15 Summer				87.738	1.743	0.000
1.013	RC1012	240 Summer	30	+0%					84.723	-0.102	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	B1000	0.57		3	33.8	OK	
1.001	B1001	0.69		7	41.4	OK	
1.002	B1002	0.58		10	45.2	OK	
1.003	B1003	0.61		14	48.3	OK	
1.004	B1004	0.65		24	53.4	OK	

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	B1005	0.04			21.5	OK	
2.000	B2000	0.69		4	29.6	OK	
2.001	B2001	0.12			5.0	SURCHARGED	
2.002	B2002	0.07			4.4	SURCHARGED	
1.006	B1006	0.11			24.1	SURCHARGED	
1.007	B1007	0.11			23.9	SURCHARGED	
1.008	B1008	0.14			23.8	SURCHARGED	
3.000	B3000	0.48		3	32.3	OK	
4.000	B4000	0.41		3	20.5	OK	
4.001	B4001	0.09		291	4.1	OK	
3.001	B3001	0.05			6.1	SURCHARGED	
1.009	B1009	0.18			28.5	SURCHARGED	
1.010	B1010	0.00			28.3	OK	
1.011	B1011	0.12			7.2	SURCHARGED	
1.012	B1012	0.12			4.2	SURCHARGED	
1.013	RC1012	0.22			4.2	OK	

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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 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 1 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 339198 334094 SJ 39198 34094 Cv (Winter) 1.000

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
Return Period(s) (years) 2, 5, 30, 100
Climate Change (%) 0, 0, 0, 45

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	B1000	15 Summer	100	+45%	100/15 Summer				91.273	0.288	0.000
1.001	B1001	30 Summer	100	+45%	100/15 Summer				90.773	0.363	0.000
1.002	B1002	60 Summer	100	+45%	100/30 Summer				90.247	0.422	0.000
1.003	B1003	60 Summer	100	+45%	100/30 Summer				89.634	0.394	0.000
1.004	B1004	60 Summer	100	+45%	100/30 Summer				88.830	0.190	0.000
1.005	B1005	360 Winter	100	+45%	100/30 Summer				88.243	0.433	0.000
2.000	B2000	360 Winter	100	+45%	100/15 Summer				88.246	0.516	0.000
2.001	B2001	360 Winter	100	+45%	30/240 Summer				88.244	0.709	0.000
2.002	B2002	360 Winter	100	+45%	5/120 Summer				88.242	1.277	0.000
1.006	B1006	360 Winter	100	+45%	2/240 Summer				88.241	1.316	0.000
1.007	B1007	360 Winter	100	+45%	2/120 Summer				88.239	1.474	0.000
1.008	B1008	360 Winter	100	+45%	2/30 Summer				88.237	1.642	0.000
3.000	B3000	15 Summer	100	+45%	100/15 Summer				88.278	0.018	0.000
4.000	B4000	360 Winter	100	+45%	100/60 Summer				88.238	0.233	0.000
4.001	B4001	360 Winter	100	+45%	100/15 Summer				88.237	0.582	0.000
3.001	B3001	360 Winter	100	+45%	2/180 Summer				88.235	1.355	0.000
1.009	B1009	360 Winter	100	+45%	2/30 Summer				88.235	1.720	0.000
1.010	B1010	360 Winter	100	+45%					88.235	-0.065	0.000
1.011	B1011	360 Winter	100	+45%	2/15 Summer				88.234	2.040	0.000
1.012	B1012	360 Winter	100	+45%	2/15 Summer				88.303	2.308	0.000
1.013	RC1012	360 Winter	100	+45%					84.726	-0.099	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	B1000	0.98		7	58.2	SURCHARGED	
1.001	B1001	1.31		10	78.1	SURCHARGED	

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	B1002	1.05		15	81.3	SURCHARGED	
1.003	B1003	1.16		20	91.4	SURCHARGED	
1.004	B1004	1.23		29	101.5	SURCHARGED	
1.005	B1005	0.08			40.1	SURCHARGED	
2.000	B2000	0.17			7.4	SURCHARGED	
2.001	B2001	0.24			10.2	SURCHARGED	
2.002	B2002	0.17			10.0	SURCHARGED	
1.006	B1006	0.23			49.9	SURCHARGED	
1.007	B1007	0.22			49.6	SURCHARGED	
1.008	B1008	0.29			49.4	FLOOD RISK	
3.000	B3000	0.96		3	64.3	SURCHARGED	
4.000	B4000	0.07			3.3	SURCHARGED	
4.001	B4001	0.14			6.7	SURCHARGED	
3.001	B3001	0.08			10.9	FLOOD RISK	
1.009	B1009	0.37			59.9	SURCHARGED	
1.010	B1010	0.00			59.6	FLOOD RISK	
1.011	B1011	0.10			6.4	FLOOD RISK	
1.012	B1012	0.14			4.9	FLOOD RISK	
1.013	RC1012	0.26			4.9	OK	

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APPENDIX D3

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	59.943	0.575	104.2	0.072	2.50	0.0		0.075	→|o|→		Filter Drain	
1.001	60.012	0.585	102.6	0.072	0.00	0.0		0.075	→|o|→		Filter Drain	
1.002	59.999	0.585	102.6	0.072	0.00	0.0		0.075	→|o|→		Filter Drain	
1.003	59.763	0.600	99.6	0.072	0.00	0.0		0.075	→|o|→		Filter Drain	
1.004	40.743	0.455	89.5	0.072	0.00	0.0		0.075	→|o|→		Filter Drain	
1.005	9.323	0.810	11.5	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
2.000	38.760	0.195	198.8	0.072	2.50	0.0		0.075	→|o|→		Filter Drain	
2.001	23.589	0.120	196.6	0.029	0.00	0.0		0.075	→|o|→		Filter Drain	
2.002	7.559	0.040	189.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.006	24.000	0.160	150.0	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
1.007	25.000	0.170	147.1	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
1.008	13.731	0.080	171.6	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
3.000	43.812	0.930	47.1	0.054	2.50	0.0		0.075	→|o|→		Filter Drain	
4.000	29.438	0.350	84.1	0.039	2.50	0.0		0.075	→|o|→		Filter Drain	
4.001	31.298	0.325	96.3	0.039	0.00	0.0		0.075	→|o|→		Filter Drain	
3.001	19.557	0.365	53.6	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.009	8.848	0.020	442.4	0.000	0.00	0.0	0.600		o	600	Pipe/Conduit	
1.010	3.682	0.001	3681.8	0.000	0.00	0.0		0.035	→_/		Pond/Tank	
1.011	9.704	0.049	198.1	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.012	25.901	1.170	22.1	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)
1.000	0.00	1.00	90.235	0.072	0.0	0.0	0.0	0.24	59.2	0.0
1.001	0.00	1.00	89.660	0.144	0.0	0.0	0.0	0.24	59.7	0.0
1.002	0.00	1.00	89.000	0.216	0.0	0.0	0.0	0.26	77.5	0.0
1.003	0.00	1.00	88.415	0.288	0.0	0.0	0.0	0.26	78.7	0.0
1.004	0.00	1.00	87.815	0.360	0.0	0.0	0.0	0.28	83.0	0.0
1.005	0.00	1.00	87.360	0.360	0.0	0.0	0.0	6.02	957.1	0.0
2.000	0.00	1.00	86.980	0.072	0.0	0.0	0.0	0.17	42.9	0.0
2.001	0.00	1.00	86.785	0.101	0.0	0.0	0.0	0.17	43.1	0.0
2.002	0.00	1.00	86.665	0.101	0.0	0.0	0.0	1.14	80.6	0.0
1.006	0.00	1.00	86.475	0.461	0.0	0.0	0.0	1.66	263.6	0.0
1.007	0.00	1.00	86.315	0.461	0.0	0.0	0.0	1.67	266.3	0.0
1.008	0.00	1.00	86.145	0.461	0.0	0.0	0.0	1.55	246.3	0.0
3.000	0.00	1.00	87.585	0.054	0.0	0.0	0.0	0.32	67.1	0.0
4.000	0.00	1.00	87.330	0.039	0.0	0.0	0.0	0.24	50.2	0.0
4.001	0.00	1.00	86.980	0.078	0.0	0.0	0.0	0.22	46.9	0.0
3.001	0.00	1.00	86.580	0.132	0.0	0.0	0.0	2.15	152.2	0.0
1.009	0.00	1.00	85.915	0.593	0.0	0.0	0.0	1.15	325.5	0.0
1.010	0.00	1.00	85.895	0.593	0.0	0.0	0.0	0.48	86182.8	0.0
1.011	0.00	1.00	85.894	0.593	0.0	0.0	0.0	1.11	78.7	0.0
1.012	0.00	1.00	85.845	0.593	0.0	0.0	0.0	2.15	38.0	0.0

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.013	9.194	0.138	66.6	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)
1.013	0.00	1.00	84.675	0.593	0.0	0.0	0.0	1.23	21.8	0.0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.072	0.072	0.072
1.001	-	-	100	0.072	0.072	0.072
1.002	-	-	100	0.072	0.072	0.072
1.003	-	-	100	0.072	0.072	0.072
1.004	-	-	100	0.072	0.072	0.072
1.005	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.072	0.072	0.072
2.001	-	-	100	0.029	0.029	0.029
2.002	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.054	0.054	0.054
4.000	-	-	100	0.039	0.039	0.039
4.001	-	-	100	0.039	0.039	0.039
3.001	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.000	0.000	0.000
1.011	-	-	100	0.000	0.000	0.000
1.012	-	-	100	0.000	0.000	0.000
1.013	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.593	0.593	0.593

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.013	RC1013	88.700	84.537	0.000	0	0

Datum (m) 84.580 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	2.420	24	2.420	47	2.420	70	2.420	93	2.420	116	2.420	139	2.420	162	2.420
2	2.420	25	2.420	48	2.420	71	2.420	94	2.420	117	2.420	140	2.420	163	2.420
3	2.420	26	2.420	49	2.420	72	2.420	95	2.420	118	2.420	141	2.420	164	2.420
4	2.420	27	2.420	50	2.420	73	2.420	96	2.420	119	2.420	142	2.420	165	2.420
5	2.420	28	2.420	51	2.420	74	2.420	97	2.420	120	2.420	143	2.420	166	2.420
6	2.420	29	2.420	52	2.420	75	2.420	98	2.420	121	2.420	144	2.420	167	2.420
7	2.420	30	2.420	53	2.420	76	2.420	99	2.420	122	2.420	145	2.420	168	2.420
8	2.420	31	2.420	54	2.420	77	2.420	100	2.420	123	2.420	146	2.420	169	2.420
9	2.420	32	2.420	55	2.420	78	2.420	101	2.420	124	2.420	147	2.420	170	2.420
10	2.420	33	2.420	56	2.420	79	2.420	102	2.420	125	2.420	148	2.420	171	2.420
11	2.420	34	2.420	57	2.420	80	2.420	103	2.420	126	2.420	149	2.420	172	2.420
12	2.420	35	2.420	58	2.420	81	2.420	104	2.420	127	2.420	150	2.420	173	2.420
13	2.420	36	2.420	59	2.420	82	2.420	105	2.420	128	2.420	151	2.420	174	2.420
14	2.420	37	2.420	60	2.420	83	2.420	106	2.420	129	2.420	152	2.420	175	2.420
15	2.420	38	2.420	61	2.420	84	2.420	107	2.420	130	2.420	153	2.420	176	2.420
16	2.420	39	2.420	62	2.420	85	2.420	108	2.420	131	2.420	154	2.420	177	2.420
17	2.420	40	2.420	63	2.420	86	2.420	109	2.420	132	2.420	155	2.420	178	2.420
18	2.420	41	2.420	64	2.420	87	2.420	110	2.420	133	2.420	156	2.420	179	2.420
19	2.420	42	2.420	65	2.420	88	2.420	111	2.420	134	2.420	157	2.420	180	2.420
20	2.420	43	2.420	66	2.420	89	2.420	112	2.420	135	2.420	158	2.420	181	2.420
21	2.420	44	2.420	67	2.420	90	2.420	113	2.420	136	2.420	159	2.420	182	2.420
22	2.420	45	2.420	68	2.420	91	2.420	114	2.420	137	2.420	160	2.420	183	2.420
23	2.420	46	2.420	69	2.420	92	2.420	115	2.420	138	2.420	161	2.420	184	2.420

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Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
185	2.420	246	2.420	307	2.420	368	2.420	429	2.420	490	2.420	551	2.420	612	2.420
186	2.420	247	2.420	308	2.420	369	2.420	430	2.420	491	2.420	552	2.420	613	2.420
187	2.420	248	2.420	309	2.420	370	2.420	431	2.420	492	2.420	553	2.420	614	2.420
188	2.420	249	2.420	310	2.420	371	2.420	432	2.420	493	2.420	554	2.420	615	2.420
189	2.420	250	2.420	311	2.420	372	2.420	433	2.420	494	2.420	555	2.420	616	2.420
190	2.420	251	2.420	312	2.420	373	2.420	434	2.420	495	2.420	556	2.420	617	2.420
191	2.420	252	2.420	313	2.420	374	2.420	435	2.420	496	2.420	557	2.420	618	2.420
192	2.420	253	2.420	314	2.420	375	2.420	436	2.420	497	2.420	558	2.420	619	2.420
193	2.420	254	2.420	315	2.420	376	2.420	437	2.420	498	2.420	559	2.420	620	2.420
194	2.420	255	2.420	316	2.420	377	2.420	438	2.420	499	2.420	560	2.420	621	2.420
195	2.420	256	2.420	317	2.420	378	2.420	439	2.420	500	2.420	561	2.420	622	2.420
196	2.420	257	2.420	318	2.420	379	2.420	440	2.420	501	2.420	562	2.420	623	2.420
197	2.420	258	2.420	319	2.420	380	2.420	441	2.420	502	2.420	563	2.420	624	2.420
198	2.420	259	2.420	320	2.420	381	2.420	442	2.420	503	2.420	564	2.420	625	2.420
199	2.420	260	2.420	321	2.420	382	2.420	443	2.420	504	2.420	565	2.420	626	2.420
200	2.420	261	2.420	322	2.420	383	2.420	444	2.420	505	2.420	566	2.420	627	2.420
201	2.420	262	2.420	323	2.420	384	2.420	445	2.420	506	2.420	567	2.420	628	2.420
202	2.420	263	2.420	324	2.420	385	2.420	446	2.420	507	2.420	568	2.420	629	2.420
203	2.420	264	2.420	325	2.420	386	2.420	447	2.420	508	2.420	569	2.420	630	2.420
204	2.420	265	2.420	326	2.420	387	2.420	448	2.420	509	2.420	570	2.420	631	2.420
205	2.420	266	2.420	327	2.420	388	2.420	449	2.420	510	2.420	571	2.420	632	2.420
206	2.420	267	2.420	328	2.420	389	2.420	450	2.420	511	2.420	572	2.420	633	2.420
207	2.420	268	2.420	329	2.420	390	2.420	451	2.420	512	2.420	573	2.420	634	2.420
208	2.420	269	2.420	330	2.420	391	2.420	452	2.420	513	2.420	574	2.420	635	2.420
209	2.420	270	2.420	331	2.420	392	2.420	453	2.420	514	2.420	575	2.420	636	2.420
210	2.420	271	2.420	332	2.420	393	2.420	454	2.420	515	2.420	576	2.420	637	2.420
211	2.420	272	2.420	333	2.420	394	2.420	455	2.420	516	2.420	577	2.420	638	2.420
212	2.420	273	2.420	334	2.420	395	2.420	456	2.420	517	2.420	578	2.420	639	2.420
213	2.420	274	2.420	335	2.420	396	2.420	457	2.420	518	2.420	579	2.420	640	2.420
214	2.420	275	2.420	336	2.420	397	2.420	458	2.420	519	2.420	580	2.420	641	2.420
215	2.420	276	2.420	337	2.420	398	2.420	459	2.420	520	2.420	581	2.420	642	2.420
216	2.420	277	2.420	338	2.420	399	2.420	460	2.420	521	2.420	582	2.420	643	2.420
217	2.420	278	2.420	339	2.420	400	2.420	461	2.420	522	2.420	583	2.420	644	2.420
218	2.420	279	2.420	340	2.420	401	2.420	462	2.420	523	2.420	584	2.420	645	2.420
219	2.420	280	2.420	341	2.420	402	2.420	463	2.420	524	2.420	585	2.420	646	2.420
220	2.420	281	2.420	342	2.420	403	2.420	464	2.420	525	2.420	586	2.420	647	2.420
221	2.420	282	2.420	343	2.420	404	2.420	465	2.420	526	2.420	587	2.420	648	2.420
222	2.420	283	2.420	344	2.420	405	2.420	466	2.420	527	2.420	588	2.420	649	2.420
223	2.420	284	2.420	345	2.420	406	2.420	467	2.420	528	2.420	589	2.420	650	2.420
224	2.420	285	2.420	346	2.420	407	2.420	468	2.420	529	2.420	590	2.420	651	2.420
225	2.420	286	2.420	347	2.420	408	2.420	469	2.420	530	2.420	591	2.420	652	2.420
226	2.420	287	2.420	348	2.420	409	2.420	470	2.420	531	2.420	592	2.420	653	2.420
227	2.420	288	2.420	349	2.420	410	2.420	471	2.420	532	2.420	593	2.420	654	2.420
228	2.420	289	2.420	350	2.420	411	2.420	472	2.420	533	2.420	594	2.420	655	2.420
229	2.420	290	2.420	351	2.420	412	2.420	473	2.420	534	2.420	595	2.420	656	2.420
230	2.420	291	2.420	352	2.420	413	2.420	474	2.420	535	2.420	596	2.420	657	2.420
231	2.420	292	2.420	353	2.420	414	2.420	475	2.420	536	2.420	597	2.420	658	2.420
232	2.420	293	2.420	354	2.420	415	2.420	476	2.420	537	2.420	598	2.420	659	2.420
233	2.420	294	2.420	355	2.420	416	2.420	477	2.420	538	2.420	599	2.420	660	2.420
234	2.420	295	2.420	356	2.420	417	2.420	478	2.420	539	2.420	600	2.420	661	2.420
235	2.420	296	2.420	357	2.420	418	2.420	479	2.420	540	2.420	601	2.420	662	2.420
236	2.420	297	2.420	358	2.420	419	2.420	480	2.420	541	2.420	602	2.420	663	2.420
237	2.420	298	2.420	359	2.420	420	2.420	481	2.420	542	2.420	603	2.420	664	2.420
238	2.420	299	2.420	360	2.420	421	2.420	482	2.420	543	2.420	604	2.420	665	2.420
239	2.420	300	2.420	361	2.420	422	2.420	483	2.420	544	2.420	605	2.420	666	2.420
240	2.420	301	2.420	362	2.420	423	2.420	484	2.420	545	2.420	606	2.420	667	2.420
241	2.420	302	2.420	363	2.420	424	2.420	485	2.420	546	2.420	607	2.420	668	2.420
242	2.420	303	2.420	364	2.420	425	2.420	486	2.420	547	2.420	608	2.420	669	2.420
243	2.420	304	2.420	365	2.420	426	2.420	487	2.420	548	2.420	609	2.420	670	2.420
244	2.420	305	2.420	366	2.420	427	2.420	488	2.420	549	2.420	610	2.420	671	2.420
245	2.420	306	2.420	367	2.420	428	2.420	489	2.420	550	2.420	611	2.420	672	2.420

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Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
673	2.420	734	2.420	795	2.420	856	2.420	917	2.420	978	2.420	1039	2.420	1100	2.420
674	2.420	735	2.420	796	2.420	857	2.420	918	2.420	979	2.420	1040	2.420	1101	2.420
675	2.420	736	2.420	797	2.420	858	2.420	919	2.420	980	2.420	1041	2.420	1102	2.420
676	2.420	737	2.420	798	2.420	859	2.420	920	2.420	981	2.420	1042	2.420	1103	2.420
677	2.420	738	2.420	799	2.420	860	2.420	921	2.420	982	2.420	1043	2.420	1104	2.420
678	2.420	739	2.420	800	2.420	861	2.420	922	2.420	983	2.420	1044	2.420	1105	2.420
679	2.420	740	2.420	801	2.420	862	2.420	923	2.420	984	2.420	1045	2.420	1106	2.420
680	2.420	741	2.420	802	2.420	863	2.420	924	2.420	985	2.420	1046	2.420	1107	2.420
681	2.420	742	2.420	803	2.420	864	2.420	925	2.420	986	2.420	1047	2.420	1108	2.420
682	2.420	743	2.420	804	2.420	865	2.420	926	2.420	987	2.420	1048	2.420	1109	2.420
683	2.420	744	2.420	805	2.420	866	2.420	927	2.420	988	2.420	1049	2.420	1110	2.420
684	2.420	745	2.420	806	2.420	867	2.420	928	2.420	989	2.420	1050	2.420	1111	2.420
685	2.420	746	2.420	807	2.420	868	2.420	929	2.420	990	2.420	1051	2.420	1112	2.420
686	2.420	747	2.420	808	2.420	869	2.420	930	2.420	991	2.420	1052	2.420	1113	2.420
687	2.420	748	2.420	809	2.420	870	2.420	931	2.420	992	2.420	1053	2.420	1114	2.420
688	2.420	749	2.420	810	2.420	871	2.420	932	2.420	993	2.420	1054	2.420	1115	2.420
689	2.420	750	2.420	811	2.420	872	2.420	933	2.420	994	2.420	1055	2.420	1116	2.420
690	2.420	751	2.420	812	2.420	873	2.420	934	2.420	995	2.420	1056	2.420	1117	2.420
691	2.420	752	2.420	813	2.420	874	2.420	935	2.420	996	2.420	1057	2.420	1118	2.420
692	2.420	753	2.420	814	2.420	875	2.420	936	2.420	997	2.420	1058	2.420	1119	2.420
693	2.420	754	2.420	815	2.420	876	2.420	937	2.420	998	2.420	1059	2.420	1120	2.420
694	2.420	755	2.420	816	2.420	877	2.420	938	2.420	999	2.420	1060	2.420	1121	2.420
695	2.420	756	2.420	817	2.420	878	2.420	939	2.420	1000	2.420	1061	2.420	1122	2.420
696	2.420	757	2.420	818	2.420	879	2.420	940	2.420	1001	2.420	1062	2.420	1123	2.420
697	2.420	758	2.420	819	2.420	880	2.420	941	2.420	1002	2.420	1063	2.420	1124	2.420
698	2.420	759	2.420	820	2.420	881	2.420	942	2.420	1003	2.420	1064	2.420	1125	2.420
699	2.420	760	2.420	821	2.420	882	2.420	943	2.420	1004	2.420	1065	2.420	1126	2.420
700	2.420	761	2.420	822	2.420	883	2.420	944	2.420	1005	2.420	1066	2.420	1127	2.420
701	2.420	762	2.420	823	2.420	884	2.420	945	2.420	1006	2.420	1067	2.420	1128	2.420
702	2.420	763	2.420	824	2.420	885	2.420	946	2.420	1007	2.420	1068	2.420	1129	2.420
703	2.420	764	2.420	825	2.420	886	2.420	947	2.420	1008	2.420	1069	2.420	1130	2.420
704	2.420	765	2.420	826	2.420	887	2.420	948	2.420	1009	2.420	1070	2.420	1131	2.420
705	2.420	766	2.420	827	2.420	888	2.420	949	2.420	1010	2.420	1071	2.420	1132	2.420
706	2.420	767	2.420	828	2.420	889	2.420	950	2.420	1011	2.420	1072	2.420	1133	2.420
707	2.420	768	2.420	829	2.420	890	2.420	951	2.420	1012	2.420	1073	2.420	1134	2.420
708	2.420	769	2.420	830	2.420	891	2.420	952	2.420	1013	2.420	1074	2.420	1135	2.420
709	2.420	770	2.420	831	2.420	892	2.420	953	2.420	1014	2.420	1075	2.420	1136	2.420
710	2.420	771	2.420	832	2.420	893	2.420	954	2.420	1015	2.420	1076	2.420	1137	2.420
711	2.420	772	2.420	833	2.420	894	2.420	955	2.420	1016	2.420	1077	2.420	1138	2.420
712	2.420	773	2.420	834	2.420	895	2.420	956	2.420	1017	2.420	1078	2.420	1139	2.420
713	2.420	774	2.420	835	2.420	896	2.420	957	2.420	1018	2.420	1079	2.420	1140	2.420
714	2.420	775	2.420	836	2.420	897	2.420	958	2.420	1019	2.420	1080	2.420	1141	2.420
715	2.420	776	2.420	837	2.420	898	2.420	959	2.420	1020	2.420	1081	2.420	1142	2.420
716	2.420	777	2.420	838	2.420	899	2.420	960	2.420	1021	2.420	1082	2.420	1143	2.420
717	2.420	778	2.420	839	2.420	900	2.420	961	2.420	1022	2.420	1083	2.420	1144	2.420
718	2.420	779	2.420	840	2.420	901	2.420	962	2.420	1023	2.420	1084	2.420	1145	2.420
719	2.420	780	2.420	841	2.420	902	2.420	963	2.420	1024	2.420	1085	2.420	1146	2.420
720	2.420	781	2.420	842	2.420	903	2.420	964	2.420	1025	2.420	1086	2.420	1147	2.420
721	2.420	782	2.420	843	2.420	904	2.420	965	2.420	1026	2.420	1087	2.420	1148	2.420
722	2.420	783	2.420	844	2.420	905	2.420	966	2.420	1027	2.420	1088	2.420	1149	2.420
723	2.420	784	2.420	845	2.420	906	2.420	967	2.420	1028	2.420	1089	2.420	1150	2.420
724	2.420	785	2.420	846	2.420	907	2.420	968	2.420	1029	2.420	1090	2.420	1151	2.420
725	2.420	786	2.420	847	2.420	908	2.420	969	2.420	1030	2.420	1091	2.420	1152	2.420
726	2.420	787	2.420	848	2.420	909	2.420	970	2.420	1031	2.420	1092	2.420	1153	2.420
727	2.420	788	2.420	849	2.420	910	2.420	971	2.420	1032	2.420	1093	2.420	1154	2.420
728	2.420	789	2.420	850	2.420	911	2.420	972	2.420	1033	2.420	1094	2.420	1155	2.420
729	2.420	790	2.420	851	2.420	912	2.420	973	2.420	1034	2.420	1095	2.420	1156	2.420
730	2.420	791	2.420	852	2.420	913	2.420	974	2.420	1035	2.420	1096	2.420	1157	2.420
731	2.420	792	2.420	853	2.420	914	2.420	975	2.420	1036	2.420	1097	2.420	1158	2.420
732	2.420	793	2.420	854	2.420	915	2.420	976	2.420	1037	2.420	1098	2.420	1159	2.420
733	2.420	794	2.420	855	2.420	916	2.420	977	2.420	1038	2.420	1099	2.420	1160	2.420

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Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1161	2.420	1196	2.420	1231	2.420	1266	2.420	1301	2.420	1336	2.420	1371	2.420	1406	2.420
1162	2.420	1197	2.420	1232	2.420	1267	2.420	1302	2.420	1337	2.420	1372	2.420	1407	2.420
1163	2.420	1198	2.420	1233	2.420	1268	2.420	1303	2.420	1338	2.420	1373	2.420	1408	2.420
1164	2.420	1199	2.420	1234	2.420	1269	2.420	1304	2.420	1339	2.420	1374	2.420	1409	2.420
1165	2.420	1200	2.420	1235	2.420	1270	2.420	1305	2.420	1340	2.420	1375	2.420	1410	2.420
1166	2.420	1201	2.420	1236	2.420	1271	2.420	1306	2.420	1341	2.420	1376	2.420	1411	2.420
1167	2.420	1202	2.420	1237	2.420	1272	2.420	1307	2.420	1342	2.420	1377	2.420	1412	2.420
1168	2.420	1203	2.420	1238	2.420	1273	2.420	1308	2.420	1343	2.420	1378	2.420	1413	2.420
1169	2.420	1204	2.420	1239	2.420	1274	2.420	1309	2.420	1344	2.420	1379	2.420	1414	2.420
1170	2.420	1205	2.420	1240	2.420	1275	2.420	1310	2.420	1345	2.420	1380	2.420	1415	2.420
1171	2.420	1206	2.420	1241	2.420	1276	2.420	1311	2.420	1346	2.420	1381	2.420	1416	2.420
1172	2.420	1207	2.420	1242	2.420	1277	2.420	1312	2.420	1347	2.420	1382	2.420	1417	2.420
1173	2.420	1208	2.420	1243	2.420	1278	2.420	1313	2.420	1348	2.420	1383	2.420	1418	2.420
1174	2.420	1209	2.420	1244	2.420	1279	2.420	1314	2.420	1349	2.420	1384	2.420	1419	2.420
1175	2.420	1210	2.420	1245	2.420	1280	2.420	1315	2.420	1350	2.420	1385	2.420	1420	2.420
1176	2.420	1211	2.420	1246	2.420	1281	2.420	1316	2.420	1351	2.420	1386	2.420	1421	2.420
1177	2.420	1212	2.420	1247	2.420	1282	2.420	1317	2.420	1352	2.420	1387	2.420	1422	2.420
1178	2.420	1213	2.420	1248	2.420	1283	2.420	1318	2.420	1353	2.420	1388	2.420	1423	2.420
1179	2.420	1214	2.420	1249	2.420	1284	2.420	1319	2.420	1354	2.420	1389	2.420	1424	2.420
1180	2.420	1215	2.420	1250	2.420	1285	2.420	1320	2.420	1355	2.420	1390	2.420	1425	2.420
1181	2.420	1216	2.420	1251	2.420	1286	2.420	1321	2.420	1356	2.420	1391	2.420	1426	2.420
1182	2.420	1217	2.420	1252	2.420	1287	2.420	1322	2.420	1357	2.420	1392	2.420	1427	2.420
1183	2.420	1218	2.420	1253	2.420	1288	2.420	1323	2.420	1358	2.420	1393	2.420	1428	2.420
1184	2.420	1219	2.420	1254	2.420	1289	2.420	1324	2.420	1359	2.420	1394	2.420	1429	2.420
1185	2.420	1220	2.420	1255	2.420	1290	2.420	1325	2.420	1360	2.420	1395	2.420	1430	2.420
1186	2.420	1221	2.420	1256	2.420	1291	2.420	1326	2.420	1361	2.420	1396	2.420	1431	2.420
1187	2.420	1222	2.420	1257	2.420	1292	2.420	1327	2.420	1362	2.420	1397	2.420	1432	2.420
1188	2.420	1223	2.420	1258	2.420	1293	2.420	1328	2.420	1363	2.420	1398	2.420	1433	2.420
1189	2.420	1224	2.420	1259	2.420	1294	2.420	1329	2.420	1364	2.420	1399	2.420	1434	2.420
1190	2.420	1225	2.420	1260	2.420	1295	2.420	1330	2.420	1365	2.420	1400	2.420	1435	2.420
1191	2.420	1226	2.420	1261	2.420	1296	2.420	1331	2.420	1366	2.420	1401	2.420	1436	2.420
1192	2.420	1227	2.420	1262	2.420	1297	2.420	1332	2.420	1367	2.420	1402	2.420	1437	2.420
1193	2.420	1228	2.420	1263	2.420	1298	2.420	1333	2.420	1368	2.420	1403	2.420	1438	2.420
1194	2.420	1229	2.420	1264	2.420	1299	2.420	1334	2.420	1369	2.420	1404	2.420	1439	2.420
1195	2.420	1230	2.420	1265	2.420	1300	2.420	1335	2.420	1370	2.420	1405	2.420	1440	2.420

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: B1012, DS/PN: 1.012, Volume (m³): 3.7

Unit Reference	MD-SCU-0056-5000-2455-5000
Design Head (m)	2.455
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	56
Invert Level (m)	85.845
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)	2.455	5.0	Kick-Flo®	0.085	1.1
Flush-Flo™	0.085	1.1	Mean Flow over Head Range	-	3.4

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	1.2	0.800	3.0	2.000	4.5	4.000	6.3	7.000	8.2
0.200	1.6	1.000	3.3	2.200	4.7	4.500	6.7	7.500	8.5
0.300	1.9	1.200	3.6	2.400	4.9	5.000	7.0	8.000	8.8
0.400	2.2	1.400	3.8	2.600	5.1	5.500	7.3	8.500	9.0
0.500	2.4	1.600	4.1	3.000	5.5	6.000	7.6	9.000	9.3
0.600	2.6	1.800	4.3	3.500	5.9	6.500	7.9	9.500	9.5

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Storage Structures for Storm

Filter Drain Pipe: 1.000

Manning's N	0.075	Trench Length (m)	59.9
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	104.2
Invert Level (m)	90.235	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.001

Manning's N	0.075	Trench Length (m)	60.0
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	102.6
Invert Level (m)	89.660	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.002

Manning's N	0.075	Trench Length (m)	60.0
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.375
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	102.6
Invert Level (m)	89.000	Cap Volume Depth (m)	0.825
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.003

Manning's N	0.075	Trench Length (m)	59.8
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.375
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	99.6
Invert Level (m)	88.415	Cap Volume Depth (m)	0.825
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 1.004

Manning's N	0.075	Trench Length (m)	40.7
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.375
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	89.5
Invert Level (m)	87.815	Cap Volume Depth (m)	0.825
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 2.000

Manning's N	0.075	Trench Length (m)	38.8
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	198.8
Invert Level (m)	86.980	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

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Filter Drain Pipe: 2.001

Manning's N	0.075	Trench Length (m)	23.6
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.300
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	196.6
Invert Level (m)	86.785	Cap Volume Depth (m)	0.750
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 3.000

Manning's N	0.075	Trench Length (m)	43.8
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.225
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	47.1
Invert Level (m)	87.585	Cap Volume Depth (m)	0.675
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 4.000

Manning's N	0.075	Trench Length (m)	29.4
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.225
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	84.1
Invert Level (m)	87.330	Cap Volume Depth (m)	0.675
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Filter Drain Pipe: 4.001

Manning's N	0.075	Trench Length (m)	31.3
Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.225
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.000
Safety Factor	1.0	Number of Pipes	1
Porosity	0.30	Slope (1:X)	96.3
Invert Level (m)	86.980	Cap Volume Depth (m)	0.675
Trench Width (m)	0.9	Cap Infiltration Depth (m)	0.000

Tank or Pond Pipe: 1.010

Manning's N 0.035 Invert Level (m) 85.895

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	28.0	0.005	30.0	1.400	210.0	1.405	340.0	2.405	655.0

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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 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 339198 334094 SJ 39198 34094 Cv (Winter) 1.000

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
Return Period(s) (years) 2, 5, 30, 100
Climate Change (%) 0, 0, 0, 45

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)
1.000	B1000	15 Summer	2	+0%	100/15 Summer				90.439	-0.546
1.001	B1001	15 Summer	2	+0%	100/15 Summer				89.857	-0.553
1.002	B1002	30 Summer	2	+0%	100/30 Summer				89.180	-0.645
1.003	B1003	60 Summer	2	+0%	100/30 Summer				88.593	-0.647
1.004	B1004	120 Summer	2	+0%	100/30 Summer				87.996	-0.644
1.005	B1005	120 Summer	2	+0%	100/30 Summer				87.417	-0.393
2.000	B2000	1440 Winter	2	+0%	100/15 Summer				87.247	-0.483
2.001	B2001	1440 Winter	2	+0%	30/180 Summer				87.247	-0.288
2.002	B2002	1440 Winter	2	+0%	2/120 Summer				87.247	0.282
1.006	B1006	1440 Winter	2	+0%	2/120 Summer				87.247	0.322
1.007	B1007	1440 Winter	2	+0%	2/60 Summer				87.246	0.481
1.008	B1008	1440 Winter	2	+0%	2/30 Summer				87.246	0.651
3.000	B3000	15 Summer	2	+0%	100/15 Summer				87.730	-0.530
4.000	B4000	15 Summer	2	+0%	100/60 Summer				87.471	-0.534
4.001	B4001	1440 Winter	2	+0%	30/480 Summer				87.246	-0.409
3.001	B3001	1440 Winter	2	+0%	2/120 Summer				87.245	0.365
1.009	B1009	1440 Winter	2	+0%	2/15 Summer				87.245	0.730
1.010	B1010	1440 Winter	2	+0%	100/360 Summer	100/360 Summer			87.245	-1.055
1.011	B1011	1440 Winter	2	+0%	2/15 Summer	100/360 Summer			87.245	1.051
1.012	B1012	600 Winter	2	+0%	2/15 Summer				87.385	1.390
1.013	RC1012	1440 Winter	2	+0%	2/15 Summer				87.006	2.181

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	B1000	0.000	0.23		3	13.5	OK	
1.001	B1001	0.000	0.28		7	16.7	OK	
1.002	B1002	0.000	0.23		9	18.0	OK	
1.003	B1003	0.000	0.23		12	18.3	OK	
1.004	B1004	0.000	0.24		20	19.9	OK	

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	B1005	0.000	0.04			19.9	OK	
2.000	B2000	0.000	0.02		477	0.7	OK	
2.001	B2001	0.000	0.02		525	0.9	OK	
2.002	B2002	0.000	0.01			0.8	SURCHARGED	
1.006	B1006	0.000	0.02			4.0	SURCHARGED	
1.007	B1007	0.000	0.02			4.0	SURCHARGED	
1.008	B1008	0.000	0.02			4.0	SURCHARGED	
3.000	B3000	0.000	0.19		3	12.5	OK	
4.000	B4000	0.000	0.17		3	8.8	OK	
4.001	B4001	0.000	0.01		408	0.7	OK	
3.001	B3001	0.000	0.01			1.1	SURCHARGED	
1.009	B1009	0.000	0.03			4.8	SURCHARGED	
1.010	B1010	0.000	0.00			4.8	OK	12
1.011	B1011	0.000	0.15			9.4	SURCHARGED	12
1.012	B1012	0.000	0.04			1.6	SURCHARGED	
1.013	RC1012	0.000	2.26			43.6	SURCHARGED	

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5 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 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 339198 334094 SJ 39198 34094 Cv (Winter) 1.000

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
Return Period(s) (years) 2, 5, 30, 100
Climate Change (%) 0, 0, 0, 45

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)
1.000	B1000	15 Summer	5	+0%	100/15 Summer				90.496	-0.489
1.001	B1001	15 Summer	5	+0%	100/15 Summer				89.913	-0.497
1.002	B1002	30 Summer	5	+0%	100/30 Summer				89.224	-0.601
1.003	B1003	30 Summer	5	+0%	100/30 Summer				88.637	-0.603
1.004	B1004	60 Winter	5	+0%	100/30 Summer				88.036	-0.604
1.005	B1005	60 Winter	5	+0%	100/30 Summer				87.427	-0.383
2.000	B2000	1440 Summer	5	+0%	100/15 Summer				87.379	-0.351
2.001	B2001	1440 Summer	5	+0%	30/180 Summer				87.378	-0.157
2.002	B2002	1440 Summer	5	+0%	2/120 Summer				87.378	0.413
1.006	B1006	1440 Summer	5	+0%	2/120 Summer				87.378	0.453
1.007	B1007	1440 Summer	5	+0%	2/60 Summer				87.378	0.613
1.008	B1008	1440 Summer	5	+0%	2/30 Summer				87.377	0.782
3.000	B3000	15 Summer	5	+0%	100/15 Summer				87.767	-0.493
4.000	B4000	15 Summer	5	+0%	100/60 Summer				87.507	-0.498
4.001	B4001	1440 Summer	5	+0%	30/480 Summer				87.377	-0.278
3.001	B3001	1440 Summer	5	+0%	2/120 Summer				87.377	0.497
1.009	B1009	1440 Summer	5	+0%	2/15 Summer				87.377	0.862
1.010	B1010	1440 Summer	5	+0%	100/360 Summer	100/360 Summer			87.376	-0.924
1.011	B1011	1440 Summer	5	+0%	2/15 Summer	100/360 Summer			87.376	1.182
1.012	B1012	1440 Summer	5	+0%	2/15 Summer				87.575	1.580
1.013	RC1012	1440 Summer	5	+0%	2/15 Summer				87.007	2.182

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	B1000	0.000	0.32		3	18.6	OK	
1.001	B1001	0.000	0.40		7	23.8	OK	
1.002	B1002	0.000	0.33		9	25.7	OK	
1.003	B1003	0.000	0.33		10	25.9	OK	
1.004	B1004	0.000	0.33		20	27.7	OK	

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	B1005	0.000	0.05			27.7	OK	
2.000	B2000	0.000	0.02		572	1.0	OK	
2.001	B2001	0.000	0.03		666	1.1	OK	
2.002	B2002	0.000	0.02			1.0	SURCHARGED	
1.006	B1006	0.000	0.04			8.1	SURCHARGED	
1.007	B1007	0.000	0.04			8.0	SURCHARGED	
1.008	B1008	0.000	0.05			8.0	SURCHARGED	
3.000	B3000	0.000	0.26		3	17.6	OK	
4.000	B4000	0.000	0.24		3	11.9	OK	
4.001	B4001	0.000	0.02		495	1.1	OK	
3.001	B3001	0.000	0.01			1.8	SURCHARGED	
1.009	B1009	0.000	0.06			9.6	SURCHARGED	
1.010	B1010	0.000	0.00			9.6	OK	12
1.011	B1011	0.000	0.19			11.5	SURCHARGED	12
1.012	B1012	0.000	0.11			4.0	SURCHARGED	
1.013	RC1012	0.000	2.27			43.7	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 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 1 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 339198 334094 SJ 39198 34094 Cv (Winter) 1.000

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
Return Period(s) (years) 2, 5, 30, 100
Climate Change (%) 0, 0, 0, 45

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)
1.000	B1000	15 Summer	30	+0%	100/15 Summer				90.749	-0.236
1.001	B1001	30 Summer	30	+0%	100/15 Summer				90.069	-0.341
1.002	B1002	30 Summer	30	+0%	100/30 Summer				89.329	-0.496
1.003	B1003	60 Summer	30	+0%	100/30 Summer				88.763	-0.477
1.004	B1004	60 Summer	30	+0%	100/30 Summer				88.180	-0.460
1.005	B1005	1440 Summer	30	+0%	100/30 Summer				87.694	-0.116
2.000	B2000	15 Summer	30	+0%	100/15 Summer				87.730	0.000
2.001	B2001	1440 Summer	30	+0%	30/180 Summer				87.695	0.160
2.002	B2002	1440 Summer	30	+0%	2/120 Summer				87.693	0.728
1.006	B1006	1440 Summer	30	+0%	2/120 Summer				87.693	0.768
1.007	B1007	1440 Summer	30	+0%	2/60 Summer				87.693	0.928
1.008	B1008	1440 Summer	30	+0%	2/30 Summer				87.692	1.097
3.000	B3000	15 Summer	30	+0%	100/15 Summer				87.906	-0.354
4.000	B4000	1440 Summer	30	+0%	100/60 Summer				87.693	-0.312
4.001	B4001	1440 Summer	30	+0%	30/480 Summer				87.693	0.038
3.001	B3001	1440 Summer	30	+0%	2/120 Summer				87.691	0.811
1.009	B1009	1440 Summer	30	+0%	2/15 Summer				87.691	1.176
1.010	B1010	1440 Summer	30	+0%	100/360 Summer	100/360 Summer			87.691	-0.609
1.011	B1011	1440 Summer	30	+0%	2/15 Summer	100/360 Summer			87.691	1.497
1.012	B1012	1440 Summer	30	+0%	2/15 Summer				87.761	1.766
1.013	RC1012	1440 Summer	30	+0%	2/15 Summer				87.009	2.184

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	B1000	0.000	0.57		3	33.8	OK	
1.001	B1001	0.000	0.69		7	41.4	OK	
1.002	B1002	0.000	0.58		10	45.2	OK	
1.003	B1003	0.000	0.61		14	48.3	OK	
1.004	B1004	0.000	0.65		24	53.4	OK	

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	B1005	0.000	0.02			10.9	OK	
2.000	B2000	0.000	0.69		4	29.6	OK	
2.001	B2001	0.000	0.05		931	2.1	SURCHARGED	
2.002	B2002	0.000	0.03			1.9	SURCHARGED	
1.006	B1006	0.000	0.06			12.6	SURCHARGED	
1.007	B1007	0.000	0.06			12.5	SURCHARGED	
1.008	B1008	0.000	0.07			12.5	SURCHARGED	
3.000	B3000	0.000	0.48		3	32.3	OK	
4.000	B4000	0.000	0.02		564	0.9	OK	
4.001	B4001	0.000	0.03		705	1.5	SURCHARGED	
3.001	B3001	0.000	0.02			2.5	SURCHARGED	
1.009	B1009	0.000	0.09			14.7	SURCHARGED	
1.010	B1010	0.000	0.00			14.6	OK	12
1.011	B1011	0.000	0.20			12.5	SURCHARGED	12
1.012	B1012	0.000	0.12			4.3	SURCHARGED	
1.013	RC1012	0.000	2.29			44.1	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 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 1 Number of Storage Structures 11 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 1.000
Site Location GB 339198 334094 SJ 39198 34094 Cv (Winter) 1.000

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
Return Period(s) (years) 2, 5, 30, 100
Climate Change (%) 0, 0, 0, 45

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	B1000	15 Summer	100	+45%	100/15 Summer				91.273	0.288
1.001	B1001	30 Summer	100	+45%	100/15 Summer				90.773	0.363
1.002	B1002	60 Summer	100	+45%	100/30 Summer				90.247	0.422
1.003	B1003	60 Summer	100	+45%	100/30 Summer				89.634	0.394
1.004	B1004	60 Summer	100	+45%	100/30 Summer				88.830	0.190
1.005	B1005	720 Winter	100	+45%	100/30 Summer				88.317	0.507
2.000	B2000	600 Winter	100	+45%	100/15 Summer				88.322	0.592
2.001	B2001	720 Winter	100	+45%	30/180 Summer				88.319	0.784
2.002	B2002	720 Winter	100	+45%	2/120 Summer				88.317	1.352
1.006	B1006	720 Winter	100	+45%	2/120 Summer				88.316	1.391
1.007	B1007	720 Winter	100	+45%	2/60 Summer				88.314	1.549
1.008	B1008	720 Winter	100	+45%	2/30 Summer				88.313	1.718
3.000	B3000	720 Winter	100	+45%	100/15 Summer				88.315	0.055
4.000	B4000	720 Winter	100	+45%	100/60 Summer				88.316	0.311
4.001	B4001	720 Winter	100	+45%	30/480 Summer				88.315	0.660
3.001	B3001	720 Winter	100	+45%	2/120 Summer				88.312	1.432
1.009	B1009	720 Winter	100	+45%	2/15 Summer				88.311	1.796
1.010	B1010	720 Winter	100	+45%	100/360 Summer	100/360 Summer			88.311	0.011
1.011	B1011	720 Winter	100	+45%	2/15 Summer	100/360 Summer			88.311	2.117
1.012	B1012	1440 Summer	100	+45%	2/15 Summer				88.501	2.506
1.013	RC1012	1440 Winter	100	+45%	2/15 Summer				87.013	2.188

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	B1000	0.000	0.98		7	58.2	SURCHARGED	
1.001	B1001	0.000	1.31		10	78.1	SURCHARGED	

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.002	B1002	0.000	1.05		15	81.3	SURCHARGED	
1.003	B1003	0.000	1.16		20	91.4	SURCHARGED	
1.004	B1004	0.000	1.23		29	101.5	SURCHARGED	
1.005	B1005	0.000	0.04			22.2	SURCHARGED	
2.000	B2000	0.000	0.12			5.2	SURCHARGED	
2.001	B2001	0.000	0.14			6.2	SURCHARGED	
2.002	B2002	0.000	0.10			6.1	SURCHARGED	
1.006	B1006	0.000	0.13			28.1	SURCHARGED	
1.007	B1007	0.000	0.13			28.0	SURCHARGED	
1.008	B1008	0.000	0.17			27.9	FLOOD RISK	
3.000	B3000	0.000	0.04			2.7	SURCHARGED	
4.000	B4000	0.000	0.04			2.0	SURCHARGED	
4.001	B4001	0.000	0.09			4.2	SURCHARGED	
3.001	B3001	0.000	0.05			6.8	FLOOD RISK	
1.009	B1009	0.000	0.21			34.6	FLOOD RISK	
1.010	B1010	10.881	0.00			34.5	FLOOD	12
1.011	B1011	11.056	0.11			6.6	FLOOD	12
1.012	B1012	0.000	0.14			5.0	FLOOD RISK	
1.013	RC1012	0.000	2.32			44.6	SURCHARGED	

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