

Morwenna Parkin

From: Morwenna Parkin
Sent: 02 March 2018 16:47
To: [REDACTED]
Subject: [REDACTED]

Dear Southern Water,

Previously sewer records were received for Pound Place, Littlehampton, BN16 4AL (ref 281024)
However this map does not indicate that there is any foul drainage in close proximity to the site.

Are there any further records that you can give or suggest a suitable connection point that would be good for pound place please?

Kind regards,
Morwenna Parkin
Project Engineer
MEng BEng (INT) Hons CMICE



CONSULTING CIVIL & STRUCTURAL ENGINEERING DES

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Appendix F Arun District Council - Supplementary Requirements for SW Drainage Proposals

Supplementary Requirements for Surface Water Drainage Proposals

Any proposed surface water scheme must consider sustainable drainage principles.

SuDS Selection

The following destinations must be considered for surface runoff in order of preference:

1. Discharge into the ground (infiltration);
2. Controlled discharge to a surface water body;
3. Controlled discharge to a surface water sewer.

Surface water must not be discharged into the foul sewer system. Infiltration structures include soakaways, basins, swales and permeable paving. Discharge to surface water bodies and surface water sewers must be restricted to an agreed rate.

SuDS selection hierarchy based on:

CIRIA C753 - The SuDS Manual

BS8582:2013 – Code of Practice for Surface Water Management for Development Sites

Approved Document H of the Building Regulations

Infiltration Drainage Design

Infiltration rates for soakage structures are to be based on percolation tests undertaken in the winter period at the location and depth of the proposed structures. The percolation tests must be carried out in accordance with BRE 365, CIRIA R156 or a similar approved method, and cater for the 1 in 10 year storm event between the invert of the lowest entry pipe into the infiltration structure and the base. For the purpose of design, the percolation rate must be applied to the sides of the infiltration structure only and the rate for the base must be zero. This does not apply to infiltration basins or permeable pavements, whereby the percolation rate is applied to the base only. There must be provision to ensure that there is capacity in the system to contain the 1 in 100 year storm event plus 40% on stored volumes, as an allowance for climate change. The infiltration structure should also drain 50% of its total volume in 24 hours or less for both the 1 in 10 and 1 in 100 year (plus 40%) storm events, in order to provide spare capacity for subsequent storms.

Any infiltration drainage design must include adequate winter groundwater monitoring data to determine the highest winter groundwater table. Residential developments in excess of five properties will require ground water monitoring to be carried out between October and March inclusive. The extent of monitoring required for smaller developments will be subject to agreement with the Council's Engineers.

Adequate freeboard must be provided between the base of the soakaway structure and the highest recorded groundwater level identified in that location.

Restricted Discharge

Discharge to a watercourse or surface water sewer must be restricted to the estimated mean greenfield runoff rate (Q_{bat}) by means of a controlled outflow (or restricted to existing runoff rates for brownfield sites). This can be derived from IH124 or a similar approved method. Any storage design must be submitted with groundwater monitoring data where applicable to ensure there will be no detrimental effect on the structure or storage. Storage areas are preferred to be in an 'open' form such as ponds, rather than underground tanks.

Flow Exceedance Routes

The drainage design should show flow routes through the proposed development, demonstrating where surface water will be conveyed for three types of flow:

1. Low flow routes

Regular flow from source control features such as permeable pavements should travel in low flow channels through the development in a controlled way contributing to landscape quality.

2. Overflows

In the event of local blockages or surcharge a simple overflow arrangement should allow water to bypass the obstruction and return to the management train sequence until conditions return to normal.

3. Exceedance routes

When SuDS are overwhelmed by exceptional rainfall, then exceedance routes are required to protect people and property. These provide unobstructed overland flow routes from the development and should be considered for all drainage schemes. Exceedance routes should also be protected from future changes in land use.

Culverting a Watercourse

Culverting (piping) a watercourse is not advised unless there is no alternative. The resulting reduction in storage volume, flow capacity and habitat potential would be unacceptable. Culverted watercourses are also more difficult to maintain due to the limited accessibility.

Land Drainage Consent must be sought from the Lead Local Flood Authority (West Sussex County Council), or its agent (Arun District Council – land.drainage@arun.gov.uk), prior to starting any works (temporary or permanent) that affect the flow of water in the watercourse. Such works may include culverting, channel diversion and the installation of trash screens.

The development layout must take account of any existing watercourses (open or culverted) to ensure that future access for maintenance is not restricted.

See also:

Land Drainage Act 1991 (amended 1994)

Maintenance and Management

Ditches and watercourses (including culverts) should retain a three metre easement with access that allows for its future maintenance.

Details of the maintenance and management of the SuDS system are to be set out in writing in a site specific maintenance manual. This manual shall include details of the financial management and arrangements for the replacement of components at the end of the manufacturers recommended design life. This document is then to be submitted as part of the planning process.

References

The Building Regulations 2000

Drainage and waste disposal

Approved document H

ISBN: 1-859462-08-1

Building Research Establishment,

Soakaway Design – Digest 365 (BRE 365)

ISBN: 1 86081 604 5, 1991

Centre for Ecology and Hydrology

Flood Estimation for Small Catchments - IH Report 124

Marshall, D.C.W. & Bayliss, A.C.

ISBN: 0948540621, 1994

CIRIA

C697 The SUDs Manual

Woods-Ballard, B.; Kellagher, R. et al

ISBN: 978-0-86017-697-8, 2007

CIRIA

R156 Infiltration Drainage – Manual of Good Practice

Bettess, R.

ISBN: 0 86017 457 3

British Standards Institution

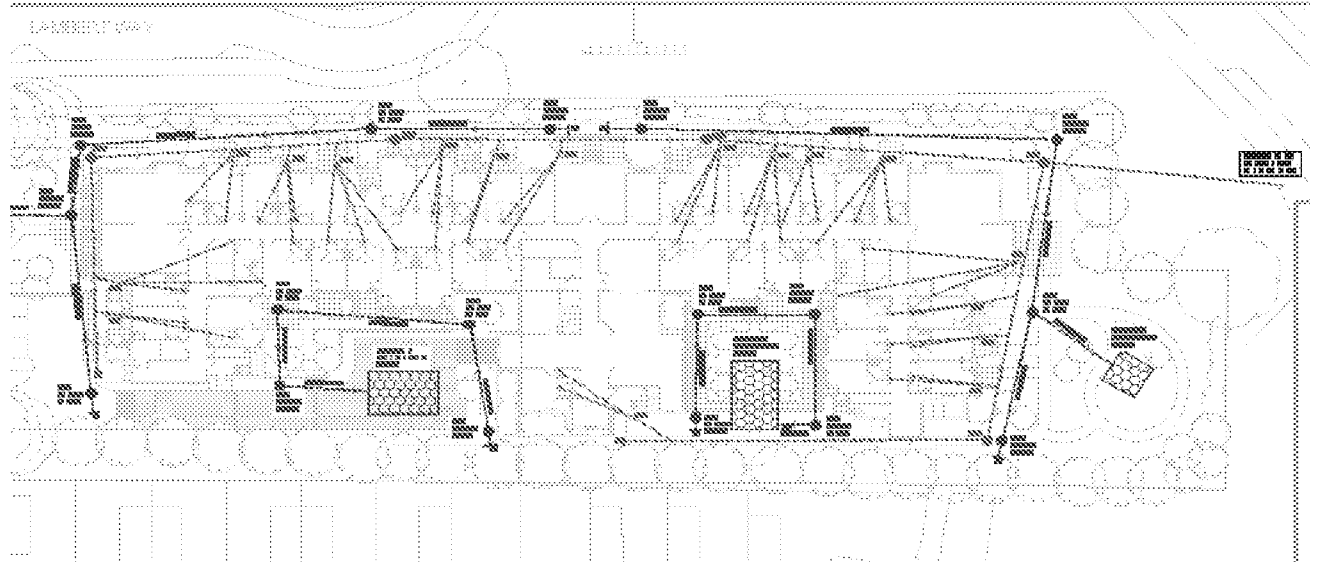
BS8582:2013 – Code of Practice for Surface Water Management for Development Sites

ISBN: 978 0 580 76700 5

Appendix G Foul Water Drainage Calculations



Project: Pound Place Angmering				
Details: Foul Drainage Calculations				Project Number: 18 031
Produced By: MP	Date: Nov-18	Checked By: JB	Date: Nov-18	Section/Page No/Revision 1 / 1 / 2
Ref.	Calculations			Output



Project:

Pound Place Angmering

Details:

EXTRACTS OF BUILDING REGS

Project Number:

18 031

Produced By:

MP

Date:

Nov-18

Checked By:

Date:

Section/Page No/Revision

1 / 2 / 2

Ref.

Calculations

Output

RELEVANT EXTRACTS FROM APPROVED DOCUMENT H1 (as of May 2016)

Diagram 9 Discharge capacities of foul drains running 0.75 proportional depth

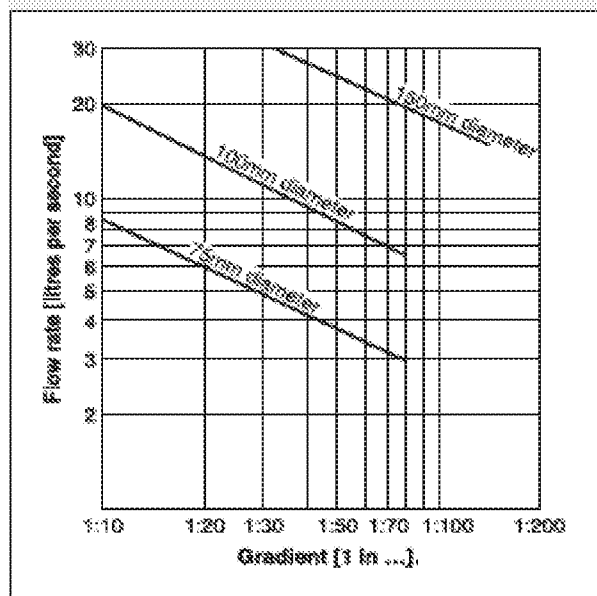


Table 6 Recommended minimum gradients for foul drains

Peak flow (litres/sec)	Pipe size (mm)	Minimum gradient (1 in ...)	Maximum capacity (litres/sec)
< 1	75	1:40	4.1
	100	1:40	9.2
> 1	75	1:80	2.8
	100	1:80*	6.3
	150	1:160†	15.0

Notes:

* Minimum of 1 WC

† Minimum of 5 WCs

Table 10 Limits of cover for thermoplastics (nominal ring stiffness SN4) pipes in any width of trench

Nominal size	Laid in fields	Laid in light roads	Laid in main roads
100mm – 300mm	0.6m – 7m	0.9m – 7m	0.9m – 7m

Notes:

- For drains and sewers less than 1.5m deep and there is a risk of excavation adjacent to the drain and depth, special calculation is necessary, see BS EN 1295.
- All pipes assumed to be in accordance with the relevant standard listed in Table 7 with nominal ring stiffness SN4; other strengths and sizes of pipe are available, consult manufacturers.
- Bedding assumed to be Class S2 with 80% compaction and average soil conditions.
- Alternative designs using different pipe strengths and/or bedding types may offer more appropriate or economic options using the procedures set out in BS EN 1295.
- Minimum depth is set to 1.5m irrespective of pipe strength to cover loss of side support from parallel excavations.

Project: Pound Place Angmering				
Details: EXTRACTS OF BUILDING REGS				Project Number: 18 031
Produced By: MP	Date: Nov-18	Checked By:	Date:	Section/Page No/Revision 1 / 3 / 2
Ref.	Calculations			Output

RELEVANT EXTRACTS FROM APPROVED DOCUMENT H1 (as of May 2016)

H1 FOUL DRAINAGE

Table 12 Minimum dimensions for manholes

Type	Size of largest pipe (DN)	Min. internal dimensions ¹		Min. clear opening size ¹	
		Rectangular length and width	Circular diameter	Rectangular length and width	Circular diameter
Manhole					
< 1.5m deep to soffit	≤ 150	750 x 675 ¹	1000 ²	750 x 675 ²	na ³
	225	1200 x 675	1200	1200 x 675 ²	
	300	1200 x 750	1200		
	>300	1800 x (DN+450)	The larger of 1800 or (DN+450)		
>1.5m deep to soffit	≤ 225	1200 x 1000	1200	900 x 600	600
	300	1200 x 1075	1200		
	375-450	1350 x 1225	1200		
	>450	1800 x (DN+775)	The larger of 1800 or (DN+775)		
Manhole shaft ⁴					
> 3.0m deep to soffit of pipe	Steps ⁵	1050 x 800	1050	600 x 600	600
	Ladder ⁶	1200 x 800	1200		
	Winch ⁷	900 x 800	900	600 x 600	600

Notes:

1. Larger sizes may be required for manholes on bends or where there are junctions.
2. May be reduced to 600 by 600 where required by highway loading considerations, subject to a safe system of work being specified.
3. Not applicable due to working space needed.
4. Minimum height of chamber in shafted manhole 2m from benching to underside of reducing slab.
5. Min. clear space between ladder or steps and the opposite face of the shaft should be approximately 600mm.
6. Winch only – no steps or ladders, permanent or removable.
7. The minimum size of any manhole serving a sewer (i.e. any drain serving more than one property) should be 1200mm x 675mm rectangular or 1200mm diameter.

Table 13 Maximum spacing of access points in metres

From	To Access Fitting		To Junction	To Inspection chamber	To Manhole
	Small	Large			
Start of external drain ¹	12	12	–	22	45
Rodding eye	22	22	22	45	45
Access fitting: small 150 diam. and 150 x 100 large 225 x 100	–	–	12	22	22
	–	–	22	45	45
Inspection chamber shallow	22	45	22	45	45
Manhole and inspection chamber deep	–	–	–	45	90 ²

Notes:

1. Stack or ground floor appliance
2. May be up to 200 for man-entry size drains and sewers

Project: Pound Place Angmering				
Details: Foul Drainage Overview				Project Number: 18 031
Produced By: MP	Date: Nov-18	Checked By: JB	Date: Nov-18	Section/Page No/Revision 2 / 1 / 2
Ref.	Calculations			Output

FOUL WATER DRAINAGE FLOW RATES

BASED ON BS EN 752 - 4:1998

Type of Appliance	WC	Wash Hand Basin	Baths	Showers	Kitchen Sink	Washing Machine	Dish Washer
CARE HOME GF	40	40	2	35	2		
CARE HOME FF	42	42	2	36	2		
CARE HOME SF	3	3	0	2			
Total No. Provided	85	85	4	73	4	0	0
Typical Discharge Unit	1.8	0.3	0.6	0.4	0.6	0.6	0.6
Total Discharge Unit	153	25.5	2.4	29.2	2.4	0	0

TOTAL DISCHARGE UNITS FOR ALL APPLIANCES	212.5
FREQUENCY FACTOR FOR BUILDING USAGE (To C1)	0.5
TOTAL UNATTENUATED FLOW, Q =	7.29 Litres/sec

Table C.1 — Typical frequency factors (k_{DU})

Type of building	k_{DU}
Dwelling, guesthouse, office (intermittent use)	0.5
Hospital, school, restaurant, hotel (frequent use)	0.7
Toilets and/or shower open to the public (congested use)	1.0
Laboratory buildings (special use)	1.2

Table C.2 — Typical values of discharge units (DU)

Type of appliance	DU
Washbasin, shower	0.3 to 0.6
Urinal	0.3 to 0.8
Bath, kitchen sink	0.8 to 1.3
Dishwasher	0.2 to 0.8
Household washing machine	0.5 to 0.8
Commercial washing machine	1.0 to 1.5
WCs (4.0 l to 9.0 l cistern)	1.2 to 2.5
Floor drains (DN 50 to DN 100)	0.6 to 2.0

The discharge unit will depend on the type of drainage system inside the building and the size of the appliance. Where no specific information is available, the higher value should be used.

$$Q = k_{DU} \sqrt{\sum DU} \quad (C.1)$$

where

- Q is the wastewater design flow rate, in litres per second;
- k_{DU} is a frequency factor, dimensionless;
- DU is the discharge unit (a characteristic value of the rate of wastewater outflow of a sanitary appliance), dimensionless.

Project: Pound Place Angmering				
Details: Total Foul Flow				Project Number: 18 031
Produced By: MP	Date: Nov-18	Checked By: JB	Date: Nov-18	Section/Page No/Revision 1 / 6 / 2

Ref.	Calculations	Output
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FW01	TYPE OF APPLIANCE						
	WC	Wash Hand Basin	Baths	Showers	Kitchen Sink	Washing Machine	Dish Washer
2ND FLOOR							
1ST FLOOR	4	4	1	3	1		
GROUND FLOOR	4	4	1	3	1		
Total No. Provided	8	8	2	6	2	0	0
Typical Discharge Unit	1.8	0.3	0.6	0.4	0.6	0.6	0.6
Total Discharge Unit	14.4	2.4	1.2	2.4	1.2	0	0

TOTAL DISCHARGE UNITS FOR ALL APPLIANCES	21.6
FREQUENCY FACTOR FOR BUILDING USEAGE (Tb C1)	0.5
TOTAL UNATTENUATED FLOW, Q =	2.32 Litres/sec

FW02	TYPE OF APPLIANCE						
	WC	Wash Hand Basin	Baths	Showers	Kitchen Sink	Washing Machine	Dish Washer
FROM PREVIOUS RUN	8	8	2	6	2	0	0
2ND FLOOR	3	3		2			
1ST FLOOR	9	9		8			
GROUND FLOOR	8	8		7			
Total No. Provided	28	28	2	23	2	0	0
Typical Discharge Unit	1.8	0.3	0.6	0.4	0.6	0.6	0.6
Total Discharge Unit	50.4	8.4	1.2	9.2	1.2	0	0

TOTAL DISCHARGE UNITS FOR ALL APPLIANCES	70.4
FREQUENCY FACTOR FOR BUILDING USEAGE (Tb C1)	0.5
TOTAL UNATTENUATED FLOW, Q =	4.20 Litres/sec

FW03	TYPE OF APPLIANCE						
	WC	Wash Hand Basin	Baths	Showers	Kitchen Sink	Washing Machine	Dish Washer
FROM PREVIOUS RUN	28	28	2	23	2	0	0
2ND FLOOR							
1ST FLOOR	8	8		7			
GROUND FLOOR	7	7		7			
Total No. Provided	43	43	2	37	2	0	0
Typical Discharge Unit	1.8	0.3	0.6	0.4	0.6	0.6	0.6
Total Discharge Unit	77.4	12.9	1.2	14.8	1.2	0	0

TOTAL DISCHARGE UNITS FOR ALL APPLIANCES	107.5
FREQUENCY FACTOR FOR BUILDING USEAGE (Tb C1)	0.5
TOTAL UNATTENUATED FLOW, Q =	5.18 Litres/sec

Project: Pound Place Angmering				
Details: Total Foul Flow				Project Number: 18 031
Produced By: MP	Date: Nov-18	Checked By: JB	Date: Nov-18	Section/Page No/Revision 1 / 7 / 2

Ref.	Calculations	Output
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FW04	TYPE OF APPLIANCE						
	WC	Wash Hand Basin	Baths	Showers	Kitchen Sink	Washing Machine	Dish Washer
FROM PREVIOUS RUN	0	0	0	0	0	0	0
2ND FLOOR							
1ST FLOOR	2	2		2			
GROUND FLOOR	2	2					
Total No. Provided	4	4	0	2	0	0	0
Typical Discharge Unit	1.8	0.3	0.6	0.4	0.6	0.6	0.6
Total Discharge Unit	7.2	1.2	0	0.8	0	0	0

TOTAL DISCHARGE UNITS FOR ALL APPLIANCES	9.2
FREQUENCY FACTOR FOR BUILDING USEAGE (Tb C1)	0.5
TOTAL UNATTENUATED FLOW, Q =	1.52 Litres/sec

FW05	TYPE OF APPLIANCE						
	WC	Wash Hand Basin	Baths	Showers	Kitchen Sink	Washing Machine	Dish Washer
FROM PREVIOUS RUN	47	47	2	39	2	0	0
2ND FLOOR							
1ST FLOOR	19	19	1	18	1		
GROUND FLOOR	19	19	1	16	1		
Total No. Provided	85	85	4	73	4	0	0
Typical Discharge Unit	1.8	0.3	0.6	0.4	0.6	0.6	0.6
Total Discharge Unit	153	25.5	2.4	29.2	2.4	0	0

TOTAL DISCHARGE UNITS FOR ALL APPLIANCES	212.5
FREQUENCY FACTOR FOR BUILDING USEAGE (Tb C1)	0.5
TOTAL UNATTENUATED FLOW, Q =	7.29 Litres/sec

Appendix H Proposed Plan of Site Drainage

ARUN DISTRICT COUNCIL A/9/19/PL

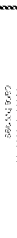
For this section, we will use the approach, common in the literature of studying group, to *test* hypotheses in terms of group-level variables. For example, we will test whether the relationship between group-level variables is stronger for individuals in the more cohesive or less cohesive groups. This approach is useful for testing hypotheses about group-level processes, and for understanding the conditions under which the relationship between individual-level variables is stronger or weaker. However, it is important to note that this approach does not allow us to test hypotheses about individual-level processes, or about the relationship between individual-level variables. For example, we cannot test whether the relationship between individual-level variables is stronger for individuals in the more cohesive or less cohesive groups. This is because the approach does not allow us to control for individual-level variables. Therefore, we will use the approach to test hypotheses about group-level processes, and to understand the conditions under which the relationship between individual-level variables is stronger or weaker.

- Yasuhiko Oishi, *Director of Corporate Data Center*

MATERIALS AND METHODS

2000-2001

WATER, LAND, AND FOREST IN THE



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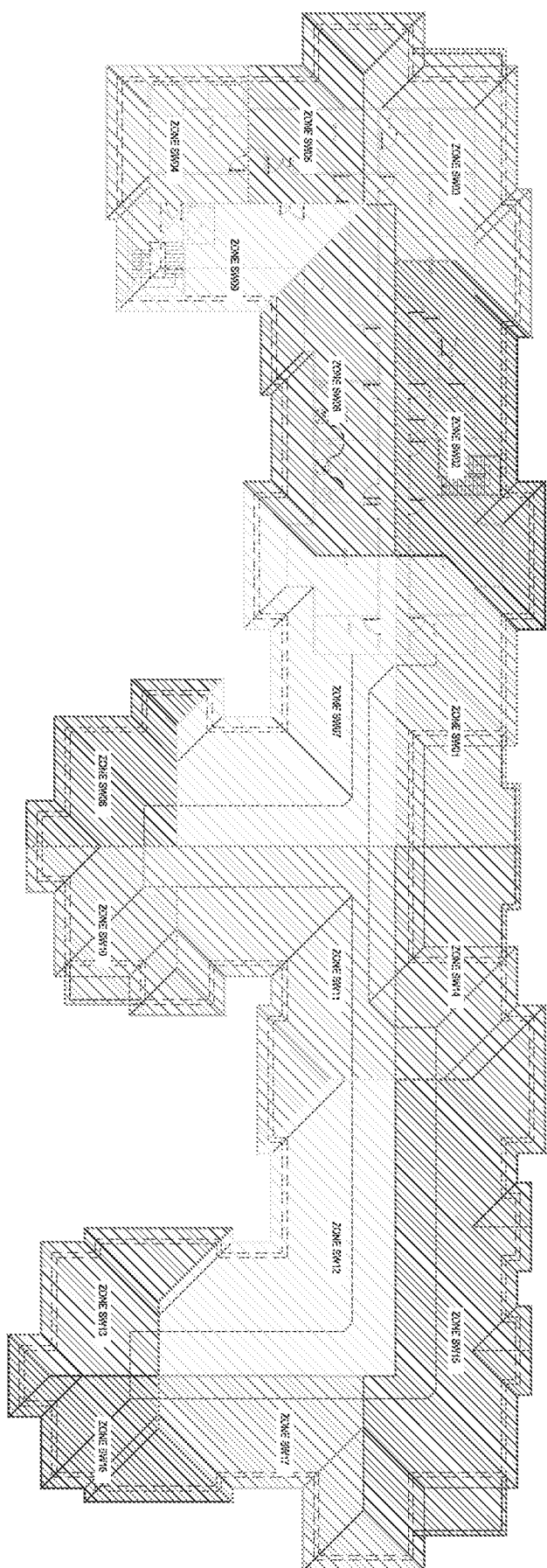
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ST

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KAPITÄLSTÄRKE: ACCO FAREAS		
ZINSS	AREA 101	AREA 102
SW01	12,50%	0,1250%
SW02	160,00%	0,1600%
SW03	14,50%	0,1450%
SW04	28,00%	0,2800%
SW05	95,50%	0,9550%
SW06	82,00%	0,8200%
SW07	22,50%	0,2250%
SW08	71,50%	0,7150%
SW09	68,00%	0,6800%
SW10	86,00%	0,8600%
SW11	153,50%	0,1535%
SW12	220,50%	0,2205%
SW13	82,00%	0,8200%
SW14	12,50%	0,1250%
SW15	75,00%	0,7500%
SW16	70,00%	0,7000%
SW17	112,50%	0,1125%

1521-1522: KUBU' PHU-662.



Drainage Design Report

Flow

v6.0

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Network

Storm Network

Filename

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User

Last

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Caus

Tel:

<http://support.causeway.com>

Rainfall Methodology	FSR
Return Period (years)	100
Additional Flow (%)	0
FSR Region	England and Wales
MS-60 (mm)	20.000
Ratio-R	0.400
CV	0.750
Time of Entry (mins)	5.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Enforce best practice design rules	✓

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)	Notes
✓ SW01	0.013	5.00		14.800	Manhole	Adoptable	1200				1.400	
✓ SW02	0.017	5.00		14.800	Manhole	Adoptable	1200				1.533	
✓ SW03	0.014	5.00		14.800	Manhole	Adoptable	1200				1.740	
✓ SW04	0.010	5.00		14.800	Manhole	Adoptable	1200				1.656	
✓ SW05	0.009	5.00		14.800	Manhole	Adoptable	1200				1.795	
✓ SOAKAWAY 1				14.800	Manhole	Adoptable	1200				1.857	
✓ SW06	0.006	5.00		14.800	Manhole	Adoptable	1200				1.350	
✓ SW07	0.022	5.00		14.800	Manhole	Adoptable	1200				1.434	
✓ SW08	0.016	5.00		14.800	Manhole	Adoptable	1200				1.573	
✓ SW09	0.007	5.00		14.800	Manhole	Adoptable	1200				1.632	
✓ SOAKAWAY 2				14.800	Manhole	Adoptable	1200				1.693	
✓ SW10	0.003	5.00		14.800	Manhole	Adoptable	1200				0.900	
✓ SW11	0.019	5.00		14.800	Manhole	Adoptable	1200				0.980	
✓ SW12	0.020	5.00		14.800	Manhole	Adoptable	1200				1.065	
✓ SW13	0.006	5.00		14.800	Manhole	Adoptable	1200				1.152	
✓ SOAKAWAY 3				14.800	Manhole	Adoptable	1200				1.179	
✓ SW14	0.014	5.00		14.800	Manhole	Adoptable	1200				1.350	
✓ SW15	0.026	5.00		14.800	Manhole	Adoptable	1200				1.650	
✓ SW16	0.006	5.00		14.800	Manhole	Adoptable	1200				1.668	
✓ SW17	0.012	5.00		14.800	Manhole	Adoptable	1200				1.783	
✓ SOAKAWAY 4				14.800	Manhole	Adoptable	1200				1.856	
✓ G1	0.006	5.00		13.200	Manhole	Adoptable	1200				0.800	
✓ G2	0.006	5.00		13.200	Manhole	Adoptable	1200				0.795	
✓ A				13.300	Manhole	Adoptable	1200				0.927	
✓ B				13.950	Manhole	Adoptable	1200				1.684	
✓ SOAKAWAY 5				14.850	Manhole	Adoptable	1200				2.601	

Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	OS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)	Con Offset (m)	Min DS IL (m)
1.001	SW01	SW02	20.000	0.800Cobblesmk White		13.400	13.267	0.133	150.0	150.0	150.0Crosser	5.41	50.0		
1.002	SW02	SW03	31.000	0.800Cobblesmk White		13.267	13.000	0.267	150.0	150.0	150.0Crosser	8.04	50.0		
1.003	SW03	SW05	8.300	0.800Cobblesmk White		13.000	13.000	0.000	150.0	150.0	150.0Crosser	8.21	50.0		
1.004	SW04	SW05	20.800	0.800Cobblesmk White		13.144	13.000	0.144	150.0	150.0	150.0Crosser	5.43	50.0		
1.005	SW05	SOAKAWAY 1	9.300	0.800Cobblesmk White		13.100	12.940	0.060	150.0	150.0	150.0Crosser	6.40	50.0		
2.001	SW06	SW07	12.600	0.800Cobblesmk White		13.450	13.388	0.062	150.0	150.0	150.0Crosser	5.25	50.0		
2.002	SW07	SW08	20.800	0.800Cobblesmk White		13.388	13.227	0.161	150.0	150.0	150.0Crosser	5.08	50.0		
2.003	SW08	SW09	8.900	0.800Cobblesmk White		13.227	13.186	0.041	150.0	150.0	150.0Crosser	5.88	50.0		
2.004	SW08	SOAKAWAY 2	8.200	0.800Cobblesmk White		13.186	13.107	0.079	150.0	150.0	150.0Crosser	6.05	50.0		
3.001	SW10	SW11	12.000	0.800Cobblesmk White		13.900	13.820	0.080	150.0	150.0	150.0Crosser	6.24	50.0		
3.002	SW11	SW12	12.700	0.800Cobblesmk White		13.820	13.790	0.030	150.0	150.0	150.0Crosser	5.50	50.0		
3.003	SW12	SW13	13.000	0.800Cobblesmk White		13.790	13.843	0.053	150.0	150.0	150.0Crosser	6.77	50.0		
3.004	SW13	SOAKAWAY 3	4.000	0.800Cobblesmk White		13.843	13.801	0.042	148.1	148.1	150.0Crosser	8.25	50.0		
4.001	SW14	SW15	45.000	0.800Cobblesmk White		13.801	13.150	0.650	150.0	150.0	150.0Crosser	8.90	50.0		
4.002	SW15	SW17	20.000	0.800Cobblesmk White		13.150	13.017	0.133	150.0	150.0	150.0Crosser	8.20	50.0		
4.003	SW16	SW17	14.600	0.800Cobblesmk White		13.114	13.017	0.097	150.0	150.0	150.0Crosser	5.20	50.0		
4.004	SW17	SOAKAWAY 4	11.000	0.800Cobblesmk White		13.017	12.844	0.073	150.0	150.0	150.0Crosser	8.50	50.0		
5.001	SO1	A	4.689	0.800Cobblesmk White		12.400	12.375	0.025	150.0	150.0	150.0Crosser	5.11	50.0		
5.002	SO2	A	4.769	0.800Cobblesmk White		12.405	12.375	0.030	150.0	150.0	150.0Crosser	5.13	50.0		
5.003	A	B	13.600	0.800Cobblesmk White		12.375	12.238	0.037	150.0	150.0	150.0Crosser	5.47	50.0		
5.004	B	SOAKAWAY 5	5.550	0.800Cobblesmk White		12.238	12.240	0.002	150.0	150.0	150.0Crosser	5.62	50.0		

Name	US Node	DS Node	Vel (m/s)	Cap (lit)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	I Area (ha)	Z-Axis Inflow (lit/s)	Pro Depth (mm)	Pro Velocity (m/s)	Notes
3.001	S0001	S0002	1.1	14.5	1.8	1.250	1.350	1.250	1.350	0.113	0.00	0.0	0.55	Downstream Depth is less than the specified minimum
3.002	S0002	S0003	1.1	14.5	4.1	1.350	1.500	1.350	1.500	0.190	0.00	0.0	0.70	Downstream Depth is less than the specified minimum
3.003	S0003	S0004	1.1	14.5	8.0	1.500	1.650	1.500	1.650	0.240	0.00	0.0	0.75	Downstream Depth is less than the specified minimum
3.004	S0004	S0005	1.1	14.5	1.4	1.500	1.650	1.500	1.650	0.113	0.00	0.0	0.51	Downstream Depth is less than the specified minimum
3.005	S0005	S0006/0000/1	1.1	14.5	8.5	1.650	1.700	1.650	1.700	0.033	0.00	0.0	0.65	Downstream Depth is less than the specified minimum
3.006	S0006	S0007	1.1	14.5	1.1	1.700	1.750	1.700	1.750	0.038	0.00	0.0	0.60	Downstream Depth is less than the specified minimum
3.007	S0007	S0008	1.1	14.5	4.1	1.750	1.850	1.750	1.850	0.100	0.00	0.0	0.70	Downstream Depth is less than the specified minimum
3.008	S0008	S0009	1.1	14.5	6.2	1.850	1.950	1.850	1.950	0.140	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.009	S0009	S0010/0000/1	1.1	14.5	7.2	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.010	S0010	S0011	1.1	14.5	1.1	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.011	S0011	S0012	1.1	14.5	3.7	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.012	S0012	S0013	1.1	14.5	6.4	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.013	S0013	S0014/0000/1	1.1	14.5	7.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.014	S0014	S0015	1.1	14.5	1.9	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.015	S0015	S0016	1.1	14.5	5.4	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.016	S0016	S0017	1.1	14.5	1.1	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.017	S0017	S0018/0000/1	1.1	14.5	1.1	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.018	S0018	S0019	1.1	14.5	1.1	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.019	S0019	S0020/0000/1	1.1	14.5	1.1	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.020	S0020	S0021	1.1	14.5	0.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.021	S0021	S0022	1.1	14.5	0.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.022	S0022	S0023	1.1	14.5	0.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.023	S0023	S0024	1.1	14.5	1.9	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.024	S0024	S0025	1.1	14.5	1.9	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.025	S0025	S0026	1.1	14.5	0.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.026	S0026	S0027	1.1	14.5	0.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.027	S0027	S0028	1.1	14.5	0.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.028	S0028	S0029	1.1	14.5	0.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.029	S0029	S0030	1.1	14.5	0.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.030	S0030	S0031	1.1	14.5	0.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.031	S0031	S0032	1.1	14.5	0.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.032	S0032	S0033	1.1	14.5	0.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.033	S0033	S0034	1.1	14.5	0.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum
3.034	S0034	S0035	1.1	14.5	0.6	1.950	1.950	1.950	1.950	0.000	0.00	0.0	0.81	Downstream Depth is less than the specified minimum

Link ID	Length (m)	Slope (1:33)	Dia (mm)	Link Type	US CL (mm)	US A (mm)	US Depth (m)	US CL (mm)	DS A (mm)	DS Depth (m)	DS Node ID	Dia (mm)	Walls (mm)	Node Type	SH Type	DS Node ID	Dia (mm)	Walls (mm)	Node Type	MM Type
1.001	20.000	150.0	150.0	150.0x150.0	14.800	13.400	1.200	14.800	13.285	1.315	SW401	1200	1200	Manhole	Manhole	SW402	1200	1200	Manhole	Manhole
1.002	31.000	150.0	150.0	150.0x150.0	14.800	13.800	1.200	14.800	13.800	1.300	SW402	1200	1200	Manhole	Manhole	SW403	1200	1200	Manhole	Manhole
1.003	8.300	150.0	150.0	150.0x150.0	14.800	13.080	1.500	14.800	13.080	1.620	SW403	1200	1200	Manhole	Manhole	SW404	1200	1200	Manhole	Manhole
1.004	20.000	150.0	150.0	150.0x150.0	14.800	13.140	1.300	14.800	13.140	1.460	SW404	1200	1200	Manhole	Manhole	SW405	1200	1200	Manhole	Manhole
1.005	9.300	150.0	150.0	150.0x150.0	14.800	13.200	1.845	14.800	13.200	1.700	SW405	1200	1200	Manhole	Manhole	SOANAWAY 1	1200	1200	Manhole	Manhole
2.001	12.000	150.0	150.0	150.0x150.0	14.800	13.400	1.200	14.800	13.285	1.215	SW406	1200	1200	Manhole	Manhole	SW407	1200	1200	Manhole	Manhole
2.002	20.000	150.0	150.0	150.0x150.0	14.800	13.380	1.284	14.800	13.277	1.423	SW407	1200	1200	Manhole	Manhole	SW408	1200	1200	Manhole	Manhole
2.003	8.900	150.0	150.0	150.0x150.0	14.800	13.320	1.423	14.800	13.180	1.440	SW408	1200	1200	Manhole	Manhole	SW409	1200	1200	Manhole	Manhole
2.004	9.200	150.0	150.0	150.0x150.0	14.800	13.180	1.492	14.800	13.107	1.543	SW409	1200	1200	Manhole	Manhole	SOANAWAY 2	1200	1200	Manhole	Manhole
3.001	12.000	150.0	150.0	150.0x150.0	14.800	13.800	1.100	14.800	13.800	1.100	SW410	1200	1200	Manhole	Manhole	SW411	1200	1200	Manhole	Manhole
3.002	12.700	150.0	150.0	150.0x150.0	14.800	13.820	0.800	14.800	13.730	0.700	SW411	1200	1200	Manhole	Manhole	SW412	1200	1200	Manhole	Manhole
3.003	13.000	150.0	150.0	150.0x150.0	14.800	13.750	0.575	14.800	13.640	0.460	SW412	1200	1200	Manhole	Manhole	SW413	1200	1200	Manhole	Manhole
3.004	4.000	143.1	143.1	143.1x143.1	14.800	13.640	1.000	14.800	13.620	1.000	SW413	1200	1200	Manhole	Manhole	SOANAWAY 3	1200	1200	Manhole	Manhole
4.001	43.000	150.0	150.0	150.0x150.0	14.800	13.400	1.200	14.800	13.180	1.520	SW414	1200	1200	Manhole	Manhole	SW415	1200	1200	Manhole	Manhole
4.002	20.000	150.0	150.0	150.0x150.0	14.800	13.130	1.500	14.800	13.012	1.600	SW415	1200	1200	Manhole	Manhole	SW416	1200	1200	Manhole	Manhole
4.003	14.800	150.0	150.0	150.0x150.0	14.800	13.110	1.500	14.800	12.995	1.605	SW416	1200	1200	Manhole	Manhole	SW417	1200	1200	Manhole	Manhole
4.004	11.000	150.0	150.0	150.0x150.0	14.800	13.010	1.000	14.800	12.940	1.700	SW417	1200	1200	Manhole	Manhole	SOANAWAY 4	1200	1200	Manhole	Manhole
5.001	4.000	150.0	150.0	150.0x150.0	13.200	12.400	0.100	13.200	12.310	0.100	SW418	1200	1200	Manhole	Manhole	SW419	1200	1200	Manhole	Manhole
5.002	4.700	150.0	150.0	150.0x150.0	13.200	12.400	0.000	13.200	12.310	0.000	SW419	1200	1200	Manhole	Manhole	SW420	1200	1200	Manhole	Manhole
5.003	13.000	150.0	150.0	150.0x150.0	13.200	12.370	0.800	13.200	12.280	1.560	SW420	1200	1200	Manhole	Manhole	SW421	1200	1200	Manhole	Manhole
5.004	3.300	150.0	150.0	150.0x150.0	13.800	12.800	1.500	13.800	12.100	2.100	SW421	1200	1200	Manhole	Manhole	SOANAWAY 5	1200	1200	Manhole	Manhole

Node ID	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Node Type	MH Type	Link ID	IL (m)	Dia (mm)	Link Type
SW01			14.800	1.400	1200		Manhole	Adaptable				
									0 1.001	13.400	150 Circular	
SW02			14.800	1.533	1200		Manhole	Adaptable	1 1.001	13.267	150 Circular	
									0 1.002	13.267	150 Circular	
SW03			14.800	1.740	1200		Manhole	Adaptable	1 1.002	13.080	150 Circular	
									0 1.003	13.080	150 Circular	
SW04			14.800	1.650	1200		Manhole	Adaptable				
									0 1.004	13.144	150 Circular	
SW05			14.800	1.795	1200		Manhole	Adaptable	1 1.004	13.093	150 Circular	
									2 1.003	13.093	150 Circular	
									0 1.005	13.093	150 Circular	
SOAKAWAY 1			14.800	1.857	1200		Manhole	Adaptable	1 1.005	12.943	150 Circular	
SW06			14.800	1.350	1200		Manhole	Adaptable				
									0 2.001	13.450	150 Circular	
SW07			14.800	1.434	1200		Manhole	Adaptable	1 2.001	13.308	150 Circular	

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3		13.950	1.664	1200	Manhole	Autopipe	1	5.003	12.290	100Circular
							0	5.004	12.290	100Circular
SOAKAWAY 5		14.850	2.601	1200	Manhole	Autopipe	1	5.004	12.249	100Circular

Rainfall Methodology	FSR	Return Period (years)	Climate Change (%)
FSR Region	England and Wales	10	40
MS-60 (mm)	20,000	100	40
Ratio-R	0.400		
Summer CV	0.750		
Winter CV	0.840		
Analysis Speed	Normal		
Drain Down Time (mins)	240		
Additional Storage (m ³ /ha)	0.0		
Storm Durations (mins)	15		
	30		
	60		
	120		
	180		
	240		
	360		
	480		
	600		
	720		
	960		
	1440		
Check Discharge Rate(s)	✓		
1 year (l/s)	0.3		
30 year (l/s)	0.7		
100 year (l/s)	1.0		
Check Discharge Volume	✓		
100 year +40% 360 minute (m ³)	46		

Site Makeup	Greenfield
Greenfield Method	3H124
Positively Drained Area (ha)	0.323
SAAR (mm)	720
Soil Index	2
SPR	0.30
Region	7
Growth Factor 1 year	0.85
Growth Factor 30 years	2.40
Growth Factor 100 years	3.10
Betterment (%)	50
QBar	0.6
Q 1 year (l/s)	0.3
Q 30 year (l/s)	0.7
Q 100 year (l/s)	1.0

Site Makeup	Greenfield
Greenfield Method	FSR/FEH
Positively Drained Area (ha)	0.323
Soil Index	2
SPR	0.30
CWI	108.148
Return Period (years)	100
Climate Change (%)	40
Storm Duration (mins)	360
Betterment (%)	50
PR	0.325
Runoff Volume (m3)	46

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Default Values		Overrides							
Entry Loss (manhole)	0.250								
Exit Loss (manhole)	0.250								
Entry Loss (junction)	0.000								
Exit Loss (junction)	0.000								
Flood Risk (m)	0.300								

Node Size	✓
Node Losses	✓
Link Size	✓
Minimum Diameter (mm)	150
Link Length	✓
Maximum Length (m)	100,000
Coordinates	✓
Accuracy (m)	1,000
Crossings	✓
Cover Depth	✓
Minimum Cover Depth (m)	
Maximum Cover Depth (m)	3,000
Backdrops	✓
Minimum Backdrop Height (m)	
Maximum Backdrop Height (m)	1,500
Full Bore Velocity	✓
Minimum Full Bore Velocity (m/s)	
Maximum Full Bore Velocity (m/s)	3,000
Proportional Velocity	✓
Return Period (years)	
Minimum Proportional Velocity (m/s)	0.750
Maximum Proportional Velocity (m/s)	3,000
Surcharged Depth	✓
Return Period (years)	
Maximum Surcharged Depth (m)	0.100
Flooding	✓
Return Period (years)	30
Discharge Rates	✓
1 year (l/s)	
30 year (l/s)	
100 year (l/s)	
Discharge Volume	✓

100 year 360 minute (m ³)	
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Results for 10 year +40% Critical Storm Duration. Lowest mass balance: 99.78%

Event	US Node ID	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link ID	DS Node ID	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	SW01	84	13.512	0.112	1.5	0.1267	0.00000K		1.001	SW02	1.5	0.381	0.104	0.3172	
120 minute winter	SW02	84	13.512	0.245	3.6	0.2779	0.00000K		1.002	SW03	3.6	0.499	0.242	0.6437	
120 minute winter	SW03	96	13.511	0.431	5.2	0.5101	0.00000K		1.003	SW05	4.6	0.458	0.319	0.1491	
120 minute winter	SW04	96	13.511	0.397	1.2	0.4148	0.00000K		1.004	SW05	1.0	0.198	0.087	0.3079	
120 minute winter	SW05	96	13.511	0.508	8.9	0.5719	0.00000K		1.005	SOAKAWAY 1	6.3	0.781	0.435	0.1637	
120 minute winter	SOAKAWAY 1	96	13.510	0.587	6.3	11.9780	0.00000K		Infiltration		1.8				
15 minute winter	SW06	12	13.502	0.052	3.1	0.0591	0.00000K		2.001	SW07	3.1	0.557	0.217	0.1308	
15 minute winter	SW07	11	13.499	0.133	11.4	0.1505	0.00000K		2.002	SW08	10.0	0.637	0.694	0.3549	
15 minute winter	SW08	11	13.495	0.208	18.0	0.2358	0.00000K		2.003	SW09	15.4	0.875	1.055	0.1587	
15 minute winter	SW09	11	13.944	0.179	17.9	0.1889	0.00000K		2.004	SOAKAWAY 2	17.7	1.413	1.224	0.1594	
30 minute winter	SOAKAWAY 2	24	13.257	0.153	14.8	5.7842	0.00000K		Infiltration		7.8				
15 minute winter	SW10	12	13.985	0.005	3.1	0.0741	0.00000K		3.001	SW11	3.0	0.384	0.211	0.1476	
15 minute winter	SW11	10	13.981	0.141	10.3	0.1599	0.00000K		3.002	SW12	8.9	0.813	0.812	0.2211	
15 minute winter	SW12	12	13.925	0.199	16.1	0.2152	0.00000K		3.003	SW13	15.8	0.866	1.091	0.2238	
15 minute winter	SW13	12	13.810	0.162	16.7	0.1835	0.00000K		3.004	SOAKAWAY 3	18.4	1.528	1.265	0.0894	
30 minute winter	SOAKAWAY 3	23	13.788	0.147	15.2	6.0613	0.00000K		Infiltration		8.0				
15 minute winter	SW14	10	13.511	0.061	5.3	0.0594	0.00000K		4.001	SW15	5.1	0.458	0.354	0.5482	
15 minute winter	SW15	12	13.488	0.753	15.0	0.2891	0.00000K		4.002	SW17	12.1	0.732	0.838	0.3521	
15 minute winter	SW16	13	13.310	0.198	3.1	0.2223	0.00000K		4.003	SW17	2.2	0.238	0.152	0.2570	
15 minute winter	SW17	13	13.303	0.291	17.8	0.3294	0.00000K		4.004	SOAKAWAY 4	17.0	1.768	1.177	0.1937	
30 minute winter	SOAKAWAY 4	24	13.228	0.284	14.0	4.9879	0.00000K		Infiltration		9.5				
15 minute winter	G1	11	12.458	0.065	2.3	0.0658	0.00000K		5.001	A	2.2	0.431	0.448	0.0231	
15 minute winter	G2	11	12.480	0.055	2.3	0.0618	0.00000K		5.002	A	2.2	0.443	0.451	0.0280	
15 minute winter	A	11	12.451	0.078	4.4	0.0881	0.00000K		5.003	B	4.4	0.674	0.882	0.0850	
15 minute summer	B	9	12.378	0.093	4.2	0.1052	0.00000K		5.004	SOAKAWAY 5	4.4	1.156	0.894	0.0218	
120 minute winter	SOAKAWAY 5	80	12.315	0.068	1.4	2.5483	0.00000K		Infiltration		0.4				

Results for 100 year +40% Critical Storm Duration. Lowest mass balance: 99.75%											
Event	US Node ID	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link ID	OS Node ID	Outflow (l/s)
120 minute winter	SW01	110	14.479	1.079	2.6	1.2209	0.0000	3.0000	1.001	SW002	2.3
120 minute winter	SW02	110	14.479	1.212	5.5	1.3711	0.0000	3.0000	1.002	SW003	5.1
120 minute winter	SW03	110	14.473	1.413	7.9	1.5036	0.0000	3.0000	1.003	SW005	7.4
120 minute winter	SW04	110	14.477	1.333	2.6	1.5077	0.0000	3.0000	1.004	SW005	1.5
120 minute winter	SW05	110	14.477	1.472	10.7	1.6546	0.0000	3.0000	1.005	SOAKAWAY 1	10.3
120 minute winter	SOAKAWAY 1	110	14.475	1.532	10.3	17.7429	0.0000	OK	Infiltration		2.3
15 minute winter	SW06	12	13.935	0.485	5.0	0.5483	0.0000	3.0000	2.001	SW007	4.7
15 minute winter	SW07	12	13.925	0.599	16.2	0.6327	0.0000	3.0000	2.002	SW008	15.1
15 minute winter	SW08	12	13.747	0.523	24.2	0.5376	0.0000	3.0000	2.003	SW008	21.2
15 minute winter	SW09	12	13.544	0.376	27.3	0.4249	0.0000	3.0000	2.004	SOAKAWAY 2	26.3
30 minute winter	SOAKAWAY 2	26	13.949	0.242	22.1	9.3442	0.0000	OK	Infiltration		12.9
15 minute winter	SW10	12	14.366	0.466	5.0	0.5266	0.0000	3.0000	3.001	SW011	4.7
15 minute winter	SW11	12	14.356	0.536	14.6	0.6067	0.0000	3.0000	3.002	SW012	13.8
15 minute winter	SW12	12	14.256	0.523	25.1	0.5916	0.0000	3.0000	3.003	SW013	24.3
15 minute winter	SW13	12	13.959	0.311	28.7	0.3519	0.0000	3.0000	3.004	SOAKAWAY 3	20.2
30 minute winter	SOAKAWAY 3	24	13.861	0.243	23.6	9.8356	0.0000	OK	Infiltration		11.0
15 minute winter	SW14	12	13.949	0.489	3.8	0.5641	0.0000	3.0000	4.001	SW015	6.9
15 minute winter	SW15	12	13.862	0.732	22.3	0.6282	0.0000	3.0000	4.002	SW017	18.6
15 minute winter	SW16	13	13.633	0.519	5.0	0.5674	0.0000	3.0000	4.003	SW017	3.3
15 minute winter	SW17	13	13.627	0.610	26.1	0.6601	0.0000	3.0000	4.004	SOAKAWAY 4	26.9
30 minute winter	SOAKAWAY 4	24	13.410	0.466	23.2	7.5933	0.0000	OK	Infiltration		15.5
15 minute winter	G1	12	12.577	0.177	3.6	0.2002	0.0000	3.0000	5.001	A	3.2
15 minute winter	G2	12	12.579	0.174	3.8	0.1987	0.0000	3.0000	5.002	A	3.2
15 minute winter	A	12	12.562	0.169	6.5	0.2139	0.0000	3.0000	5.003	B	6.2
15 minute winter	B	7	12.414	0.128	6.2	0.1449	0.0000	3.0000	5.004	SOAKAWAY 5	6.2
120 minute winter	SOAKAWAY 5	92	12.361	0.112	2.4	4.3416	0.0000	OK	Infiltration		0.7