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Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Level Name (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.002	45.690	43.650	42.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha	Storage 2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	200	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	15
Ratio R	0.360		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: BLUE ROOF HB, DS/PN: 3.001, Volume (m³): 0.4

Unit Reference	MD-SCU-0067-3600-0550-3600
Design Head (m)	0.550
Design Flow (l/s)	3.6
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	67
Invert Level (m)	47.450
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.550	3.6
Flush-Flo™	0.093	1.7
Kick-Flo®	0.101	1.7
Mean Flow over Head Range	-	2.4

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)
0.100	1.7	1.200	5.2	3.000	8.0	7.000	12.0
0.200	2.3	1.400	5.6	3.500	8.6	7.500	12.4
0.300	2.7	1.600	5.9	4.000	9.1	8.000	12.8
0.400	3.1	1.800	6.3	4.500	9.7	8.500	13.2
0.500	3.4	2.000	6.6	5.000	10.2	9.000	13.6
0.600	3.7	2.200	6.9	5.500	10.6	9.500	14.0
0.800	4.3	2.400	7.2	6.000	11.1		
1.000	4.8	2.600	7.4	6.500	11.5		

Hydro-Brake® Optimum Manhole: SW7, DS/PN: 1.002, Volume (m³): 6.0

Unit Reference	MD-SCU-0167-3500-1600-3500
Design Head (m)	1.600
Design Flow (l/s)	35.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	167
Invert Level (m)	43.700
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

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Hydro-Brake® Optimum Manhole: SW7, DS/PN: 1.002, Volume (m³): 6.0

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	35.0
Flush-Flo™	0.202	14.8
Kick-Flo®	0.251	14.5
Mean Flow over Head Range	-	23.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.6	1.200	30.5	3.000	47.4	7.000	71.6
0.200	14.8	1.400	32.8	3.500	51.1	7.500	74.0
0.300	15.8	1.600	35.0	4.000	54.5	8.000	76.4
0.400	18.1	1.800	37.0	4.500	57.7	8.500	78.7
0.500	20.1	2.000	39.0	5.000	60.7	9.000	80.9
0.600	21.9	2.200	40.8	5.500	63.6	9.500	83.1
0.800	25.1	2.400	42.6	6.000	66.4		
1.000	27.9	2.600	44.2	6.500	69.0		

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Storage Structures for Storm

Cellular Storage Manhole: BLUE ROOF, DS/PN: 3.000

Invert Level (m) 47.500 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	1588.0	0.0	0.150	1176.0	0.0
0.085	1588.0	0.0	0.151	0.0	0.0
0.086	1176.0	0.0			

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

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 1

Number of Online Controls 2

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.358

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 18.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status OFF

DVD Status ON

Inertia Status ON

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440

Return Period(s) (years) 1, 30, 100, 1000

Climate Change (%) 0, 0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow
1.000	SW1	15 Winter	1	+0%	1000/15 Winter		
1.001	SW2	15 Winter	1	+0%	1000/15 Summer		
2.000	SW3	15 Winter	1	+0%	1000/15 Summer		
2.001	SW4	15 Winter	1	+0%	100/15 Summer	1000/15 Summer	
3.000	BLUE ROOF	960 Winter	1	+0%	1000/240 Winter	1000/240 Winter	
3.001	BLUE ROOF HB	960 Winter	1	+0%	1000/240 Winter	1000/240 Winter	
3.002	SW6	960 Winter	1	+0%	1000/15 Summer		
2.002	SW5	15 Winter	1	+0%	30/15 Winter		
1.002	SW7	15 Winter	1	+0%	30/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
1.000	SW1		45.503	-0.172	0.000	0.12		4.6
1.001	SW2		45.244	-0.174	0.000	0.12		4.6
2.000	SW3		45.029	-0.196	0.000	0.04		4.2
2.001	SW4		44.033	-0.255	0.000	0.05		4.2

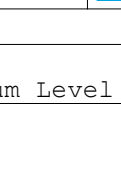
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
3.000	BLUE ROOF		47.523	-0.202	0.000	0.02	774	0.7
3.001	BLUE ROOF HB		47.491	-0.184	0.000	0.00		0.7
3.002	SW6		45.005	-0.220	0.000	0.00		0.7
2.002	SW5		43.872	-0.223	0.000	0.11		7.0
1.002	SW7		43.843	-0.157	0.000	0.18		11.1

PN	US/MH Name	Level Status	Exceeded
1.000	SW1	OK	
1.001	SW2	OK	
2.000	SW3	OK	
2.001	SW4	OK	6
3.000	BLUE ROOF	OK	5
3.001	BLUE ROOF HB	OK	6
3.002	SW6	OK	
2.002	SW5	OK	
1.002	SW7	OK	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.358
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

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

Profile(s)

	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100, 1000
Climate Change (%)	0, 0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow
1.000	SW1	15 Winter	30	+0%	1000/15 Winter		
1.001	SW2	15 Winter	30	+0%	1000/15 Summer		
2.000	SW3	15 Winter	30	+0%	1000/15 Summer		
2.001	SW4	15 Winter	30	+0%	100/15 Summer	1000/15 Summer	
3.000	BLUE ROOF	480 Winter	30	+0%	1000/240 Winter	1000/240 Winter	
3.001	BLUE ROOF HB	480 Winter	30	+0%	1000/240 Winter	1000/240 Winter	
3.002	SW6	480 Winter	30	+0%	1000/15 Summer		
2.002	SW5	15 Winter	30	+0%	30/15 Winter		
1.002	SW7	15 Winter	30	+0%	30/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
1.000	SW1		45.535	-0.140	0.000	0.29		11.2
1.001	SW2		45.276	-0.142	0.000	0.29		11.1
2.000	SW3		45.047	-0.178	0.000	0.10		10.3
2.001	SW4		44.128	-0.160	0.000	0.13		9.9

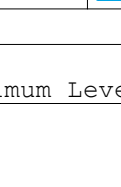
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
3.000	BLUE ROOF		47.546	-0.179	0.000	0.05	568	1.7
3.001	BLUE ROOF HB		47.535	-0.140	0.000	0.01		1.7
3.002	SW6		45.012	-0.213	0.000	0.01		1.7
2.002	SW5		44.122	0.027	0.000	0.21		13.5
1.002	SW7		44.119	0.119	0.000	0.30		18.3

PN	US/MH Name	Status	Level Exceeded
1.000	SW1	OK	
1.001	SW2	OK	
2.000	SW3	OK	
2.001	SW4	OK	6
3.000	BLUE ROOF	OK	5
3.001	BLUE ROOF HB	OK	6
3.002	SW6	OK	
2.002	SW5	SURCHARGED	
1.002	SW7	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.358
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

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

Profile(s)

Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100, 1000
Climate Change (%)	0, 0, 40, 40

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) Surge	First (Y) Flood	First (Z) Overflow
1.000	SW1	15 Winter	100	+40%	1000/15 Winter		
1.001	SW2	15 Winter	100	+40%	1000/15 Summer		
2.000	SW3	15 Winter	100	+40%	1000/15 Summer		
2.001	SW4	15 Winter	100	+40%	100/15 Summer	1000/15 Summer	
3.000	BLUE ROOF HB	480 Winter	100	+40%	1000/240 Winter	1000/240 Winter	
3.001	BLUE ROOF HB	480 Winter	100	+40%	1000/240 Winter	1000/240 Winter	
3.002	SW6	15 Winter	100	+40%	1000/15 Summer		
2.002	SW5	15 Winter	100	+40%	30/15 Winter		
1.002	SW7	15 Winter	100	+40%	30/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
1.000	SW1		45.569	-0.106	0.000	0.53		20.2

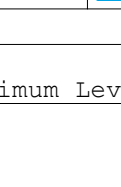
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Overflow Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
1.001	SW2		45.309	-0.109	0.000	0.53		20.0
2.000	SW3		45.092	-0.133	0.000	0.17		18.6
2.001	SW4		45.071	0.783	0.000	0.19		14.5
3.000	BLUE ROOF		47.591	-0.134	0.000	0.06		1.9
3.001	BLUE ROOF HB		47.589	-0.086	0.000	0.01		1.9
3.002	SW6		45.060	-0.165	0.000	0.01		1.4
2.002	SW5		45.059	0.964	0.000	0.29		18.2
1.002	SW7		45.041	1.041	0.000	0.52		32.1

PN	US/MH Name	Status	Level Exceeded
1.000	SW1	OK	
1.001	SW2	OK	
2.000	SW3	OK	
2.001	SW4	FLOOD RISK	6
3.000	BLUE ROOF	OK	5
3.001	BLUE ROOF HB	OK	6
3.002	SW6	OK	
2.002	SW5	SURCHARGED	
1.002	SW7	SURCHARGED	

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1000 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.358
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.000	Cv (Winter)	0.840

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

Profile(s)

Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100, 1000
Climate Change (%)	0, 0, 40, 40

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) Surge	First (Y) Flood	First (Z) Overflow
1.000	SW1	15 Winter	1000	+40%	1000/15 Winter		
1.001	SW2	15 Winter	1000	+40%	1000/15 Summer		
2.000	SW3	15 Summer	1000	+40%	1000/15 Summer		
2.001	SW4	30 Winter	1000	+40%	100/15 Summer	1000/15 Summer	
3.000	BLUE ROOF HB	480 Winter	1000	+40%	1000/240 Winter	1000/240 Winter	
3.001	BLUE ROOF HB	480 Winter	1000	+40%	1000/240 Winter	1000/240 Winter	
3.002	SW6	15 Winter	1000	+40%	1000/15 Summer		
2.002	SW5	15 Winter	1000	+40%	30/15 Winter		
1.002	SW7	15 Winter	1000	+40%	30/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
1.000	SW1		45.692	0.017	0.000	0.85		32.4

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