Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

D AND CG Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
299	1200	599	1500	1199	2100
449	1350	899	1800	1800	2700

>1800 Link+900 mm

SW CIRCULAR Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

225	375	525	750	900	1200	1500
300	450	600	825	1050	1350	1800

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
20	0.116	5.00	45.525	2700	386291.920	397019.620	2.099
21	0.063	5.00	45.825	2700	386288.109	397047.731	2.471
22	0.032	5.00	46.106	2700	386286.291	397065.152	2.796
23	0.024	5.00	46.204	2700	386280.152	397069.619	2.913
24	0.099	5.00	46.308	2700	386258.553	397142.233	3.011
25	0.106	5.00	46.110	2700	386264.071	397097.333	2.928
26	0.130	5.00	46.272	2700	386267.003	397068.137	3.164
28	0.095	5.00	46.113	1800	386201.076	397131.262	1.955
29	0.093	5.00	45.587	1800	386205.349	397089.201	1.609
30	0.053	5.00	45.951	1800	386208.318	397066.317	2.071
HB3	0.075	5.00	46.028	3000	386208.414	397061.250	3.070
104			45.941	1800	386200.733	397060.329	3.003

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	20	21	28.368	0.600	43.426	43.354	0.072	394.0	1050	5.27	50.0
1.001	21	22	17.516	0.600	43.354	43.310	0.044	398.1	1050	5.44	50.0
1.002	22	23	7.592	0.600	43.310	43.291	0.019	399.6	1050	5.52	50.0
1.003	23	26	13.232	0.600	43.291	43.258	0.033	401.0	1050	5.65	50.0
2.000	24	25	45.238	0.600	43.297	43.182	0.115	393.4	1200	5.40	50.0
2.001	25	26	29.343	0.600	43.182	43.108	0.074	396.5	1200	5.66	50.0
1.004	26	HB3	58.992	0.600	43.108	42.958	0.150	393.3	1200	6.19	50.0
3.000	28	29	42.277	0.600	44.158	43.978	0.180	234.9	300	5.69	50.0
3.001	29	30	23.076	0.600	43.978	43.880	0.098	235.5	300	6.07	50.0
3.002	30	HB3	5.068	0.600	43.880	43.858	0.022	230.4	300	6.15	50.0
1.005	HB3	104	7.736	0.600	42.958	42.938	0.020	386.8	600	6.29	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.730	1497.7	15.7	1.049	1.421	0.116	0.0	74	0.586
1.001	1.721	1489.9	24.3	1.421	1.746	0.179	0.0	91	0.664
1.002	1.717	1487.1	28.6	1.746	1.863	0.211	0.0	99	0.696
1.003	1.714	1484.5	31.8	1.863	1.964	0.235	0.0	104	0.717
2.000	1.880	2126.0	13.4	1.811	1.728	0.099	0.0	67	0.549
2.001	1.872	2117.4	27.8	1.728	1.964	0.205	0.0	93	0.678
1.004	1.880	2126.2	77.2	1.964	1.870	0.570	0.0	153	0.921
3.000	1.021	72.2	12.9	1.655	1.309	0.095	0.0	85	0.776
3.001	1.020	72.1	25.5	1.309	1.771	0.188	0.0	123	0.934
3.002	1.031	72.9	32.7	1.771	1.870	0.241	0.0	141	1.005
1.005	1.232	348.3	120.1	2.470	2.403	0.886	0.0	242	1.123

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	28.368	394.0	1050	SW CIRCULAR	45.525	43.426	1.049	45.825	43.354	1.421
1.001	17.516	398.1	1050	SW CIRCULAR	45.825	43.354	1.421	46.106	43.310	1.746
1.002	7.592	399.6	1050	SW CIRCULAR	46.106	43.310	1.746	46.204	43.291	1.863
1.003	13.232	401.0	1050	SW CIRCULAR	46.204	43.291	1.863	46.272	43.258	1.964
2.000	45.238	393.4	1200	SW CIRCULAR	46.308	43.297	1.811	46.110	43.182	1.728
2.001	29.343	396.5	1200	SW CIRCULAR	46.110	43.182	1.728	46.272	43.108	1.964
1.004	58.992	393.3	1200	SW CIRCULAR	46.272	43.108	1.964	46.028	42.958	1.870
3.000	42.277	234.9	300	SW CIRCULAR	46.113	44.158	1.655	45.587	43.978	1.309
3.001	23.076	235.5	300	SW CIRCULAR	45.587	43.978	1.309	45.951	43.880	1.771

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	20	2700	Manhole	D AND CG	21	2700	Manhole	D AND CG
1.001	21	2700	Manhole	D AND CG	22	2700	Manhole	D AND CG
1.002	22	2700	Manhole	D AND CG	23	2700	Manhole	D AND CG
1.003	23	2700	Manhole	D AND CG	26	2700	Manhole	D AND CG
2.000	24	2700	Manhole	D AND CG	25	2700	Manhole	D AND CG
2.001	25	2700	Manhole	D AND CG	26	2700	Manhole	D AND CG
1.004	26	2700	Manhole	D AND CG	HB3	3000	Manhole	D AND CG
3.000	28	1800	Manhole	D AND CG	29	1800	Manhole	D AND CG
3.001	29	1800	Manhole	D AND CG	30	1800	Manhole	D AND CG

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
3.002	5.068	230.4	300	SW CIRCULAR	45.951	43.880	1.771	46.028	43.858	1.870
1.005	7.736	386.8	600	SW CIRCULAR	46.028	42.958	2.470	45.941	42.938	2.403

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
3.002	30	1800	Manhole	D AND CG	HB3	3000	Manhole	D AND CG
1.005	HB3	3000	Manhole	D AND CG	104	1800	Manhole	D AND CG

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	17.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	8.6
Summer CV	0.750	30 year (l/s)	19.1
Winter CV	0.840	100 year (l/s)	25.0
Analysis Speed	Detailed	Check Discharge Volume	x
Skip Steady State	✓		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node HB3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	42.958	Product Number	CTL-SHE-0140-8600-0700-8600
Design Depth (m)	0.700	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	8.6	Min Node Diameter (mm)	1200

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Node HB3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	43.550	Product Number	CTL-SHE-0129-8500-1450-8500
Design Depth (m)	1.450	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.5	Min Node Diameter (mm)	1200

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	92.521	26.180	30 year 360 minute summer	26.939	6.932
1 year 15 minute winter	64.927	26.180	30 year 360 minute winter	17.511	6.932
1 year 30 minute summer	60.022	16.984	30 year 480 minute summer	20.981	5.545
1 year 30 minute winter	42.121	16.984	30 year 480 minute winter	13.940	5.545
1 year 60 minute summer	40.398	10.676	30 year 600 minute summer	17.039	4.661
1 year 60 minute winter	26.839	10.676	30 year 600 minute winter	11.642	4.661
1 year 120 minute summer	24.980	6.602	30 year 720 minute summer	15.093	4.045
1 year 120 minute winter	16.596	6.602	30 year 720 minute winter	10.143	4.045
1 year 180 minute summer	19.271	4.959	30 year 960 minute summer	12.278	3.233
1 year 180 minute winter	12.527	4.959	30 year 960 minute winter	8.133	3.233
1 year 240 minute summer	15.301	4.043	30 year 1440 minute summer	8.788	2.355
1 year 240 minute winter	10.165	4.043	30 year 1440 minute winter	5.906	2.355
1 year 360 minute summer	11.775	3.030	100 year +45% CC 15 minute summer	423.061	119.712
1 year 360 minute winter	7.654	3.030	100 year +45% CC 15 minute winter	296.885	119.712
1 year 480 minute summer	9.342	2.469	100 year +45% CC 30 minute summer	278.374	78.770
1 year 480 minute winter	6.207	2.469	100 year +45% CC 30 minute winter	195.350	78.770
1 year 600 minute summer	7.682	2.101	100 year +45% CC 60 minute summer	187.417	49.529
1 year 600 minute winter	5.249	2.101	100 year +45% CC 60 minute winter	124.515	49.529
1 year 720 minute summer	6.859	1.838	100 year +45% CC 120 minute summer	114.312	30.209
1 year 720 minute winter	4.609	1.838	100 year +45% CC 120 minute winter	75.946	30.209
1 year 960 minute summer	5.653	1.489	100 year +45% CC 180 minute summer	86.951	22.375
1 year 960 minute winter	3.745	1.489	100 year +45% CC 180 minute winter	56.520	22.375
1 year 1440 minute summer	4.127	1.106	100 year +45% CC 240 minute summer	68.114	18.001
1 year 1440 minute winter	2.773	1.106	100 year +45% CC 240 minute winter	45.253	18.001
30 year 15 minute summer	226.195	64.005	100 year +45% CC 360 minute summer	51.133	13.158
30 year 15 minute winter	158.733	64.005	100 year +45% CC 360 minute winter	33.238	13.158
30 year 30 minute summer	147.452	41.724	100 year +45% CC 480 minute summer	39.658	10.480
30 year 30 minute winter	103.475	41.724	100 year +45% CC 480 minute winter	26.348	10.480
30 year 60 minute summer	98.615	26.061	100 year +45% CC 600 minute summer	32.099	8.780
30 year 60 minute winter	65.517	26.061	100 year +45% CC 600 minute winter	21.932	8.780
30 year 120 minute summer	59.946	15.842	100 year +45% CC 720 minute summer	28.365	7.602
30 year 120 minute winter	39.827	15.842	100 year +45% CC 720 minute winter	19.063	7.602
30 year 180 minute summer	45.598	11.734	100 year +45% CC 960 minute summer	22.984	6.052
30 year 180 minute winter	29.640	11.734	100 year +45% CC 960 minute winter	15.225	6.052
30 year 240 minute summer	35.759	9.450	100 year +45% CC 1440 minute summer	16.353	4.383
30 year 240 minute winter	23.758	9.450	100 year +45% CC 1440 minute winter	10.990	4.383

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	20	11	43.495	0.069	13.8	0.4696	0.0000	OK
60 minute winter	21	59	43.488	0.134	11.0	0.8354	0.0000	OK
60 minute winter	22	59	43.489	0.179	12.8	1.0640	0.0000	OK
60 minute winter	23	59	43.488	0.197	14.1	1.1595	0.0000	OK
60 minute winter	24	59	43.490	0.193	11.1	1.2313	0.0000	OK
60 minute winter	25	60	43.489	0.307	19.6	1.9794	0.0000	OK
60 minute winter	26	58	43.487	0.379	30.7	2.4815	0.0000	OK
15 minute winter	28	11	44.236	0.078	11.3	0.2740	0.0000	OK
15 minute winter	29	11	44.094	0.116	21.9	0.4283	0.0000	OK
15 minute winter	30	11	44.021	0.141	27.4	0.4319	0.0000	OK
60 minute winter	HB3	57	43.487	0.529	31.3	4.0006	0.0000	OK
15 minute summer	104	1	42.938	0.000	8.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	20	1.000	21	13.3	0.466	0.009	0.8224	
60 minute winter	21	1.001	22	10.9	0.459	0.007	1.4100	
60 minute winter	22	1.002	23	12.6	0.480	0.008	0.7927	
60 minute winter	23	1.003	26	13.6	0.587	0.009	1.6517	
60 minute winter	24	2.000	25	-7.6	0.303	-0.004	7.7398	
60 minute winter	25	2.001	26	10.5	0.301	0.005	7.8040	
60 minute winter	26	1.004	HB3	15.5	0.220	0.007	23.0869	
15 minute winter	28	3.000	29	10.9	0.563	0.151	0.8361	
15 minute winter	29	3.001	30	21.5	0.746	0.298	0.6652	
15 minute winter	30	3.002	HB3	27.2	0.901	0.373	0.1532	
60 minute winter	HB3	Hydro-Brake®	104	8.6				79.5
60 minute winter	HB3	Hydro-Brake®	104	0.0				0.0

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	20	98	43.860	0.434	10.7	2.9625	0.0000	OK
120 minute winter	21	94	43.859	0.505	14.7	3.1516	0.0000	OK
120 minute winter	22	98	43.858	0.548	12.8	3.2624	0.0000	OK
120 minute winter	23	98	43.858	0.567	13.6	3.3374	0.0000	OK
120 minute winter	24	96	43.859	0.562	11.2	3.5860	0.0000	OK
120 minute winter	25	96	43.858	0.676	17.1	4.3595	0.0000	OK
120 minute winter	26	96	43.858	0.750	27.0	4.9096	0.0000	OK
15 minute winter	28	10	44.283	0.125	27.7	0.4401	0.0000	OK
15 minute winter	29	11	44.194	0.216	54.0	0.8012	0.0000	OK
15 minute winter	30	11	44.124	0.244	66.9	0.7470	0.0000	OK
120 minute winter	HB3	96	43.859	0.901	29.1	6.8096	0.0000	SURCHARGED
15 minute summer	104	1	42.938	0.000	8.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	20	1.000	21	8.9	0.388	0.006	10.5879	
120 minute winter	21	1.001	22	9.9	0.430	0.007	7.5820	
120 minute winter	22	1.002	23	12.7	0.439	0.009	3.5314	
120 minute winter	23	1.003	26	15.6	0.512	0.010	6.5095	
120 minute winter	24	2.000	25	8.0	0.242	0.004	26.5027	
120 minute winter	25	2.001	26	13.7	0.263	0.006	20.4649	
120 minute winter	26	1.004	HB3	18.4	0.223	0.009	48.6386	
15 minute winter	28	3.000	29	26.9	0.671	0.372	1.7334	
15 minute winter	29	3.001	30	52.4	0.903	0.727	1.3371	
15 minute winter	30	3.002	HB3	66.9	1.192	0.918	0.2835	
120 minute winter	HB3	Hydro-Brake®	104	9.7				176.3
120 minute winter	HB3	Hydro-Brake®	104	8.3				55.2

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	20	144	45.395	1.969	15.1	13.4529	0.0000	FLOOD RISK
180 minute winter	21	144	45.395	2.041	19.6	12.7257	0.0000	SURCHARGED
180 minute winter	22	144	45.395	2.085	14.3	12.4123	0.0000	SURCHARGED
180 minute winter	23	144	45.395	2.104	10.6	12.3902	0.0000	SURCHARGED
180 minute winter	24	144	45.393	2.096	16.7	13.3805	0.0000	SURCHARGED
180 minute winter	25	144	45.394	2.212	19.8	14.2688	0.0000	SURCHARGED
180 minute winter	26	144	45.394	2.286	32.0	14.9696	0.0000	SURCHARGED
180 minute winter	28	144	45.396	1.238	12.4	4.3525	0.0000	SURCHARGED
180 minute winter	29	144	45.396	1.418	24.5	5.2489	0.0000	FLOOD RISK
180 minute winter	30	144	45.395	1.515	31.5	4.6312	0.0000	SURCHARGED
180 minute winter	HB3	144	45.394	2.436	40.8	18.4111	0.0000	SURCHARGED
15 minute summer	104	1	42.938	0.000	10.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	20	1.000	21	11.4	0.343	0.008	24.4713	
180 minute winter	21	1.001	22	11.2	0.376	0.008	15.1099	
180 minute winter	22	1.002	23	7.7	0.387	0.005	6.5491	
180 minute winter	23	1.003	26	9.9	0.510	0.007	11.4144	
180 minute winter	24	2.000	25	-6.1	0.245	-0.003	50.9701	
180 minute winter	25	2.001	26	11.1	0.272	0.005	33.0610	
180 minute winter	26	1.004	HB3	16.7	0.228	0.008	66.4668	
180 minute winter	28	3.000	29	12.4	0.577	0.172	2.9771	
180 minute winter	29	3.001	30	24.6	0.762	0.341	1.6250	
180 minute winter	30	3.002	HB3	31.0	0.931	0.425	0.3569	
180 minute winter	HB3	Hydro-Brake®	104	15.5				265.3
180 minute winter	HB3	Hydro-Brake®	104	9.5				157.5

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