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)	14.000	Minimum Backdrop Height (m)	9.999
Ratio-R	0.200	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.103	5.00	137.700	1200	400650.188	340250.679	1.600
2	0.117	5.00	137.230	1200	400640.511	340276.111	1.530
3			137.820	1200	400644.084	340283.847	2.220
4	0.127	5.00	141.230	1200	400695.710	340295.248	3.230
5	0.090	5.00	139.080	1200	400660.494	340291.238	3.680
6	0.113	5.00	138.725	1200	400655.242	340309.789	4.525
7	0.125	5.00	139.793	1200	400697.260	340351.279	1.793
8	0.098	5.00	137.903	1200	400654.143	340351.444	4.003
9	0.089	5.00	137.000	1200	400629.252	340351.444	3.400
10			134.350	1200	400624.117	340363.446	0.999
11			134.350	1200	400611.709	340362.819	1.000
12			135.400	3000	400611.695	340355.098	2.100
13			134.250	1200	400603.225	340354.635	1.250

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	1	2	27.211	0.600	136.100	135.700	0.400	68.0	300	5.24	33.9
1.001	2	3	8.521	0.600	135.700	135.600	0.100	85.2	300	5.32	33.7
1.002	3	5	17.998	0.600	135.600	135.400	0.200	90.0	300	5.50	33.3
2.000	4	5	35.444	0.600	138.000	135.400	2.600	13.6	300	5.14	34.1
1.003	5	6	19.280	0.600	135.400	134.200	1.200	16.1	300	5.58	33.2
1.004	6	8	41.669	0.600	134.200	133.900	0.300	138.9	300	6.10	32.2
3.000	7	8	43.117	0.600	138.000	133.900	4.100	10.5	300	5.15	34.1
1.005	8	9	24.891	0.600	133.900	133.600	0.300	83.0	300	6.35	31.7
1.006	9	10	13.054	0.600	133.600	133.351	0.249	52.4	300	6.45	31.6

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	1.909	134.9	9.5	1.300	1.230	0.103	0.0	54	1.116
1.001	1.704	120.4	20.1	1.230	1.920	0.220	0.0	82	1.272
1.002	1.658	117.2	19.9	1.920	3.380	0.220	0.0	83	1.243
2.000	4.280	302.5	11.7	2.930	3.380	0.127	0.0	40	2.107
1.003	3.941	278.6	39.3	3.380	4.225	0.437	0.0	76	2.818
1.004	1.332	94.1	48.0	4.225	3.703	0.550	0.0	151	1.337
3.000	4.874	344.5	11.6	1.493	3.703	0.125	0.0	37	2.291
1.005	1.727	122.1	66.5	3.703	3.100	0.773	0.0	158	1.762
1.006	2.176	153.8	73.8	3.100	0.699	0.862	0.0	146	2.153

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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)
1.007	10	11	12.424	0.600	133.351	133.350	0.001	12423.8	675	7.36	30.1
1.008	11	12	7.721	0.600	133.350	133.300	0.050	154.4	300	7.47	29.9
1.009	12	13	8.483	0.600	133.300	133.000	0.300	28.3	300	7.51	29.8

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)
1.007	0.225	80.6	70.3	0.324	0.325	0.862	0.0	489	0.253
1.008	1.263	89.2	69.9	0.700	1.800	0.862	0.0	201	1.392
1.009	2.968	209.8	69.7	1.800	0.950	0.862	0.0	119	2.675

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	27.211	68.0	300	Circular_Default Sewer Type	137.700	136.100	1.300	137.230	135.700	1.230
1.001	8.521	85.2	300	Circular_Default Sewer Type	137.230	135.700	1.230	137.820	135.600	1.920
1.002	17.998	90.0	300	Circular_Default Sewer Type	137.820	135.600	1.920	139.080	135.400	3.380
2.000	35.444	13.6	300	Circular_Default Sewer Type	141.230	138.000	2.930	139.080	135.400	3.380
1.003	19.280	16.1	300	Circular_Default Sewer Type	139.080	135.400	3.380	138.725	134.200	4.225
1.004	41.669	138.9	300	Circular_Default Sewer Type	138.725	134.200	4.225	137.903	133.900	3.703
3.000	43.117	10.5	300	Circular_Default Sewer Type	139.793	138.000	1.493	137.903	133.900	3.703
1.005	24.891	83.0	300	Circular_Default Sewer Type	137.903	133.900	3.703	137.000	133.600	3.100
1.006	13.054	52.4	300	Circular_Default Sewer Type	137.000	133.600	3.100	134.350	133.351	0.699
1.007	12.424	12423.8	675	Circular_Default Sewer Type	134.350	133.351	0.324	134.350	133.350	0.325
1.008	7.721	154.4	300	Circular_Default Sewer Type	134.350	133.350	0.700	135.400	133.300	1.800
1.009	8.483	28.3	300	Circular_Default Sewer Type	135.400	133.300	1.800	134.250	133.000	0.950

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
1.002	3	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable
2.000	4	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable
1.003	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.004	6	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
3.000	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
1.005	8	1200	Manhole	Adoptable	9	1200	Manhole	Adoptable
1.006	9	1200	Manhole	Adoptable	10	1200	Manhole	Adoptable
1.007	10	1200	Manhole	Adoptable	11	1200	Manhole	Adoptable
1.008	11	1200	Manhole	Adoptable	12	3000	Manhole	Adoptable
1.009	12	3000	Manhole	Adoptable	13	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	400650.188	340250.679	137.700	1.600	1200	0	1.000	136.100	300

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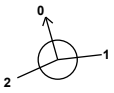
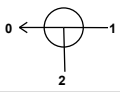
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
2	400640.511	340276.111	137.230	1.530	1200	1  0	1.000 1.001	135.700 135.700	300 300
3	400644.084	340283.847	137.820	2.220	1200	1  0	1.001 1.002	135.600 135.600	300 300
4	400695.710	340295.248	141.230	3.230	1200	 0	2.000	138.000	300
5	400660.494	340291.238	139.080	3.680	1200	1 2  0	2.000 1.002 1.003	135.400 135.400 135.400	300 300 300
6	400655.242	340309.789	138.725	4.525	1200	1  0	1.003 1.004	134.200 134.200	300 300
7	400697.260	340351.279	139.793	1.793	1200	 0	3.000	138.000	300
8	400654.143	340351.444	137.903	4.003	1200	1 2  0	3.000 1.004 1.005	133.900 133.900 133.900	300 300 300
9	400629.252	340351.444	137.000	3.400	1200	1  0	1.005 1.006	133.600 133.600	300 300
10	400624.117	340363.446	134.350	0.999	1200	1  0	1.006 1.007	133.351 133.351	300 675
11	400611.709	340362.819	134.350	1.000	1200	1  0	1.007 1.008	133.350 133.350	675 300
12	400611.695	340355.098	135.400	2.100	3000	1  0	1.008 1.009	133.300 133.300	300 300
13	400603.225	340354.635	134.250	1.250	1200	1 	1.009	133.000	300

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Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	✓
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	14.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.200	Check Discharge Rate(s)	✓
Summer CV	0.750	Check Discharge Volume	✓
Winter CV	0.840	100 year 360 minute (m³)	
Analysis Speed	Normal		

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	40	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		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 12 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	133.300	Product Number	CTL-SHE-0149-1000-0800-1000
Design Depth (m)	0.800	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	10.0	Min Node Diameter (mm)	1200

Node 12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	133.350
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	667.0	0.0	1.050	1089.0	0.0	1.051	0.0	0.0

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.36%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	136.149	0.049	8.2	0.1195	0.0000	OK
15 minute winter	2	10	135.783	0.083	17.3	0.2199	0.0000	OK
15 minute winter	3	11	135.681	0.081	17.0	0.0916	0.0000	OK
15 minute winter	4	10	138.037	0.037	10.1	0.0714	0.0000	OK
15 minute winter	5	11	135.470	0.070	33.8	0.1132	0.0000	OK
15 minute winter	6	11	134.345	0.145	42.3	0.2363	0.0000	OK
15 minute winter	7	10	138.035	0.035	9.9	0.0875	0.0000	OK
15 minute winter	8	11	134.057	0.157	59.3	0.2542	0.0000	OK
15 minute winter	9	11	133.759	0.159	65.9	0.2625	0.0000	OK
15 minute winter	10	11	133.580	0.229	65.6	0.2591	0.0000	OK
15 minute winter	11	11	133.550	0.200	64.9	0.2257	0.0000	OK
360 minute winter	12	248	133.444	0.144	17.6	65.6573	0.0000	OK
15 minute summer	13	1	133.000	0.000	4.1	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	1	1.000	2	8.1	0.703	0.060	0.3174	
15 minute winter	2	1.001	3	17.0	1.095	0.141	0.1320	
15 minute winter	3	1.002	5	17.0	1.230	0.145	0.2497	
15 minute winter	4	2.000	5	10.0	1.182	0.033	0.3081	
15 minute winter	5	1.003	6	33.6	1.488	0.121	0.4448	
15 minute winter	6	1.004	8	42.6	1.201	0.453	1.4785	
15 minute winter	7	3.000	8	9.8	0.743	0.028	0.8976	
15 minute winter	8	1.005	9	59.3	1.581	0.486	0.9340	
15 minute winter	9	1.006	10	65.6	1.363	0.427	0.6235	
15 minute winter	10	1.007	11	64.9	0.668	0.805	1.2095	
15 minute winter	11	1.008	12	65.4	2.149	0.733	0.2392	
360 minute winter	12	Hydro-Brake®	13	8.6				151.3

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.36%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	136.175	0.075	19.2	0.1824	0.0000	OK
15 minute winter	2	10	135.836	0.136	40.8	0.3623	0.0000	OK
15 minute winter	3	10	135.730	0.130	40.1	0.1466	0.0000	OK
15 minute winter	4	10	138.056	0.056	23.7	0.1079	0.0000	OK
15 minute winter	5	10	135.509	0.109	80.0	0.1760	0.0000	OK
15 minute winter	6	12	134.830	0.630	100.4	1.0274	0.0000	SURCHARGED
15 minute winter	7	10	138.052	0.052	23.3	0.1322	0.0000	OK
15 minute winter	8	12	134.510	0.610	131.8	0.9890	0.0000	SURCHARGED
15 minute winter	9	12	134.101	0.501	138.3	0.8286	0.0000	SURCHARGED
15 minute winter	10	12	133.792	0.440	138.5	0.4982	0.0000	OK
15 minute winter	11	12	133.778	0.428	137.8	0.4840	0.0000	SURCHARGED
480 minute winter	12	352	133.617	0.317	32.5	194.6162	0.0000	SURCHARGED
15 minute summer	13	1	133.000	0.000	8.1	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	1	1.000	2	19.0	0.855	0.141	0.6115	
15 minute winter	2	1.001	3	40.1	1.332	0.333	0.2566	
15 minute winter	3	1.002	5	39.8	1.539	0.340	0.4693	
15 minute winter	4	2.000	5	23.5	1.498	0.078	0.5695	
15 minute winter	5	1.003	6	79.3	1.697	0.285	0.9006	
15 minute winter	6	1.004	8	92.5	1.347	0.983	2.9343	
15 minute winter	7	3.000	8	23.1	0.984	0.067	1.6952	
15 minute winter	8	1.005	9	125.3	1.779	1.026	1.7528	
15 minute winter	9	1.006	10	138.5	1.966	0.900	0.9193	
15 minute winter	10	1.007	11	137.8	0.697	1.710	3.0138	
15 minute winter	11	1.008	12	137.6	2.549	1.542	0.3854	
480 minute winter	12	Hydro-Brake®	13	10.0				337.5

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.36%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	1	20	136.501	0.401	33.1	0.9687	0.0000	SURCHARGED
30 minute summer	2	20	136.488	0.788	70.7	2.0962	0.0000	SURCHARGED
30 minute summer	3	20	136.461	0.861	68.2	0.9737	0.0000	SURCHARGED
15 minute winter	4	10	138.075	0.075	42.0	0.1434	0.0000	OK
30 minute summer	5	20	136.417	1.017	122.8	1.6471	0.0000	SURCHARGED
30 minute summer	6	20	136.211	2.011	135.2	3.2777	0.0000	SURCHARGED
15 minute winter	7	10	138.069	0.069	41.3	0.1753	0.0000	OK
15 minute winter	8	12	135.600	1.700	188.0	2.7563	0.0000	SURCHARGED
15 minute winter	9	12	134.782	1.182	199.7	1.9563	0.0000	SURCHARGED
15 minute winter	10	12	134.132	0.781	200.5	0.8834	0.0000	FLOOD RISK
15 minute winter	11	12	134.118	0.768	201.0	0.8690	0.0000	FLOOD RISK
720 minute winter	12	585	133.937	0.637	44.9	465.7362	0.0000	SURCHARGED
15 minute summer	13	1	133.000	0.000	9.9	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)
30 minute summer	1	1.000	2	33.1	0.950	0.245	1.9162	
30 minute summer	2	1.001	3	68.2	1.440	0.566	0.6000	
30 minute summer	3	1.002	5	60.4	1.538	0.515	1.2674	
15 minute winter	4	2.000	5	41.8	1.669	0.138	1.4907	
30 minute summer	5	1.003	6	105.0	1.702	0.377	1.3577	
30 minute summer	6	1.004	8	125.8	1.786	1.336	2.9343	
15 minute winter	7	3.000	8	41.0	1.121	0.119	1.7838	
15 minute winter	8	1.005	9	177.6	2.522	1.455	1.7528	
15 minute winter	9	1.006	10	200.5	2.848	1.304	0.9193	
15 minute winter	10	1.007	11	201.0	0.709	2.493	4.4351	
15 minute winter	11	1.008	12	201.6	3.510	2.259	0.4751	
720 minute winter	12	Hydro-Brake®	13	10.0				453.3

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