# LAND OFF OAKCROFT LANE
# STUBBINGTON

## Surface Water Drainage Calculations

AMc/20/MD/**5909**
17th September 2020

This following statement follows comments by Hampshire County Council with regard to the surface water drainage for the above development. This should be read in conjunction with the previously submitted development Flood Risk Assessment.

The surface water drainage calculations show the provisional development storm water drainage system for 1 year, 30 year & 100 year + 40% climate change storms. Surcharged outfall to the adjacent stream has also been assessed for the 100 year + 40% climate change storm.

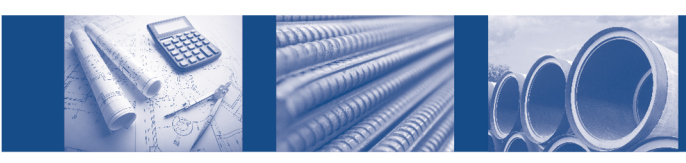
As confirmed within the Flood Risk Assessment the surface water drainage strategy for the development will be as follows:

Roof Runoff:-
Roof runoff will be collected by a conventional system of guttering and downpipes discharging to the gravity storm drain, where possible it will be discharged into the driveway stone sub base via cellular diffuser cells.

Private Drives & Parking Courts:-
All private drives and parking courts will either drain via a traditional gully system outfalling to a stone sub base prior to outfalling to a the main storm drain or via a permeable block paved system with a stone sub-base to provide some attenuation and an improvement in water quality.
The stone sub-base of the permeable block paving is to be lined with an impermeable membrane to prevent the ingress of groundwater.

Development Roads:-
Runoff from the highway areas will drain via deep trapped road gullies connecting directly to either the main piped storm drain.

Attenuation Tank:-
The attenuation tank has been designed to provide temporary storage to the development runoff, located within an area of open space it will restrict flows to the downstream network reducing the impact on the main end attenuation basin.



Attenuation Basin:-
The attenuation basins has been designed to provide final element of water cleansing together with the main storage to allow storm water to be temporarily stored within the basin before discharging into the existing watercourse at a controlled rate (Greenfield QBar).
The basin will include a permanently wet pond to allow for water based planting.

The main attenuation pond has been designed to manage the 1 in 100 year return storm plus an extra allowance of 40% for the potential predicted increase in peak rainfall up to 2115. The attenuation basin also includes sufficient volume for the required 10% urban creep.

The Micro Drainage results show that the proposed surface water drainage strategy offers a sustainable, safe and robust system which will afford complete flood risk protection to residents within the new development. They also show that the development drainage system can operate during periods when the downstream watercourse is surcharged

**Alistair McShane**
**FOR MJA CONSULTING**

**Appendix 1:**
**Surface Water Calculations**
**1, 30 & 100 year + 40% CC**

## STORM SEWER DESIGN by the Modified Rational Method

### Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

| | | | |
|---|---|---|---|
| Return Period (years) | 2 | PIMP (%) | 100 |
| M5-60 (mm) | 19.100 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.350 | Minimum Backdrop Height (m) | 0.000 |
| Maximum Rainfall (mm/hr) | 50 | Maximum Backdrop Height (m) | 0.000 |
| Maximum Time of Concentration (mins) | 30 | Min Design Depth for Optimisation (m) | 1.200 |
| Foul Sewage (l/s/ha) | 0.000 | Min Vel for Auto Design only (m/s) | 1.00 |
| Volumetric Runoff Coeff. | 0.750 | Min Slope for Optimisation (1:X) | 500 |

Designed with Level Inverts

### Time Area Diagram for Storm

| Time (mins) | Area (ha) |
|---|---|
| 0-4 | 0.000 |

Total Area Contributing (ha) = 0.000

Total Pipe Volume (m³) = 172.771

### 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) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | 50.517 | 0.300 | 168.4 | 0.000 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S2.000 | 10.797 | 0.070 | 154.2 | 0.000 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.001 | 58.429 | 0.345 | 169.4 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S3.000 | 45.478 | 0.635 | 71.6 | 0.000 | 5.00 | 0.0 | 0.600 | o | 300 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | 50.00 | 5.70 | 10.360 | 0.000 | 0.0 | 0.0 | 0.0 | 1.21 | 85.4 | 0.0 |
| S2.000 | 50.00 | 5.14 | 10.130 | 0.000 | 0.0 | 0.0 | 0.0 | 1.26 | 89.3 | 0.0 |
| S1.001 | 50.00 | 6.40 | 10.060 | 0.000 | 0.0 | 0.0 | 0.0 | 1.39 | 153.5 | 0.0 |
| S3.000 | 50.00 | 5.41 | 10.350 | 0.000 | 0.0 | 0.0 | 0.0 | 1.86 | 131.5 | 0.0 |

## 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) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.002 | 44.157 | 0.260 | 169.8 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.003 | 35.233 | 0.210 | 167.8 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S4.000 | 52.974 | 0.315 | 168.2 | 0.000 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S4.001 | 42.974 | 0.740 | 58.1 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S4.002 | 10.000 | 0.100 | 100.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.004 | 31.483 | 0.110 | 286.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.005 | 19.910 | 0.080 | 248.9 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.006 | 34.377 | 0.140 | 245.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.007 | 32.448 | 0.218 | 149.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.008 | 32.448 | 0.218 | 149.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.009 | 30.395 | 0.305 | 99.7 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S1.010 | 31.222 | 0.130 | 240.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S5.000 | 27.070 | 0.350 | 77.3 | 0.000 | 5.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S5.001 | 30.163 | 0.700 | 43.1 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S5.002 | 31.113 | 0.475 | 65.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S6.000 | 41.291 | 0.295 | 140.0 | 0.000 | 5.00 | 0.0 | 0.600 | o | 300 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.002 | 50.00 | 6.87 | 9.715 | 0.000 | 0.0 | 0.0 | 0.0 | 1.56 | 247.7 | 0.0 |
| S1.003 | 50.00 | 7.24 | 9.455 | 0.000 | 0.0 | 0.0 | 0.0 | 1.57 | 249.2 | 0.0 |
| S4.000 | 50.00 | 5.73 | 10.400 | 0.000 | 0.0 | 0.0 | 0.0 | 1.21 | 85.5 | 0.0 |
| S4.001 | 50.00 | 6.08 | 10.085 | 0.000 | 0.0 | 0.0 | 0.0 | 2.07 | 146.1 | 0.0 |
| S4.002 | 50.00 | 6.18 | 9.345 | 0.000 | 0.0 | 0.0 | 0.0 | 1.57 | 111.1 | 0.0 |
| S1.004 | 50.00 | 7.68 | 9.170 | 0.000 | 0.0 | 0.0 | 0.0 | 1.20 | 190.3 | 0.0 |
| S1.005 | 50.00 | 7.94 | 9.060 | 0.000 | 0.0 | 0.0 | 0.0 | 1.28 | 204.2 | 0.0 |
| S1.006 | 50.00 | 5.44 | 8.980 | 0.000 | 25.0 | 0.0 | 0.0 | 1.29 | 205.6 | 25.0 |
| S1.007 | 50.00 | 5.86 | 8.840 | 0.000 | 25.0 | 0.0 | 0.0 | 1.28 | 90.8 | 25.0 |
| S1.008 | 50.00 | 6.28 | 8.623 | 0.000 | 25.0 | 0.0 | 0.0 | 1.28 | 90.8 | 25.0 |
| S1.009 | 50.00 | 6.56 | 8.405 | 0.000 | 25.0 | 0.0 | 0.0 | 1.82 | 200.5 | 25.0 |
| S1.010 | 50.00 | 7.01 | 8.100 | 0.000 | 25.0 | 0.0 | 0.0 | 1.16 | 128.6 | 25.0 |
| S5.000 | 50.00 | 5.30 | 10.135 | 0.000 | 0.0 | 0.0 | 0.0 | 1.49 | 59.2 | 0.0 |
| S5.001 | 50.00 | 5.55 | 9.785 | 0.000 | 0.0 | 0.0 | 0.0 | 2.00 | 79.5 | 0.0 |
| S5.002 | 50.00 | 5.88 | 9.085 | 0.000 | 0.0 | 0.0 | 0.0 | 1.62 | 64.4 | 0.0 |
| S6.000 | 50.00 | 5.52 | 8.830 | 0.000 | 0.0 | 0.0 | 0.0 | 1.33 | 93.8 | 0.0 |

## 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) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S5.003 | 35.214 | 0.145 | 242.9 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S5.004 | 32.698 | 0.135 | 242.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S5.005 | 12.138 | 0.040 | 303.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S5.006 | 26.331 | 0.088 | 299.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S5.007 | 42.360 | 0.142 | 298.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S5.008 | 27.011 | 0.090 | 300.1 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.011 | 62.286 | 0.255 | 244.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S1.012 | 10.092 | 0.040 | 252.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S1.013 | 38.438 | 0.150 | 256.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S7.000 | 19.273 | 0.280 | 68.8 | 0.000 | 5.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S7.001 | 20.777 | 0.295 | 70.4 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S7.002 | 52.917 | 0.310 | 170.7 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S7.003 | 39.349 | 0.230 | 171.1 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S8.000 | 35.263 | 1.115 | 31.6 | 0.000 | 5.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S7.004 | 30.828 | 0.088 | 352.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S7.005 | 30.828 | 0.088 | 352.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S9.000 | 44.421 | 0.815 | 54.5 | 0.000 | 5.00 | 0.0 | 0.600 | o | 300 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S5.003 | 50.00 | 6.38 | 8.535 | 0.000 | 0.0 | 0.0 | 0.0 | 1.16 | 127.9 | 0.0 |
| S5.004 | 50.00 | 6.85 | 8.390 | 0.000 | 0.0 | 0.0 | 0.0 | 1.16 | 128.1 | 0.0 |
| S5.005 | 50.00 | 7.03 | 8.255 | 0.000 | 0.0 | 0.0 | 0.0 | 1.16 | 184.8 | 0.0 |
| S5.006 | 50.00 | 7.40 | 8.215 | 0.000 | 0.0 | 0.0 | 0.0 | 1.17 | 186.1 | 0.0 |
| S5.007 | 50.00 | 8.00 | 8.127 | 0.000 | 0.0 | 0.0 | 0.0 | 1.17 | 186.4 | 0.0 |
| S5.008 | 49.67 | 8.39 | 7.985 | 0.000 | 0.0 | 0.0 | 0.0 | 1.17 | 185.8 | 0.0 |
| S1.011 | 47.94 | 9.01 | 7.895 | 0.000 | 25.0 | 0.0 | 0.0 | 1.67 | 598.5 | 25.0 |
| S1.012 | 47.67 | 9.11 | 7.640 | 0.000 | 25.0 | 0.0 | 0.0 | 1.65 | 588.8 | 25.0 |
| S1.013 | 46.66 | 9.50 | 7.600 | 0.000 | 25.0 | 0.0 | 0.0 | 1.63 | 584.2 | 25.0 |
| S7.000 | 50.00 | 5.20 | 9.150 | 0.000 | 0.0 | 0.0 | 0.0 | 1.58 | 62.8 | 0.0 |
| S7.001 | 50.00 | 5.43 | 8.870 | 0.000 | 0.0 | 0.0 | 0.0 | 1.56 | 62.0 | 0.0 |
| S7.002 | 50.00 | 6.16 | 8.575 | 0.000 | 0.0 | 0.0 | 0.0 | 1.20 | 84.9 | 0.0 |
| S7.003 | 50.00 | 6.71 | 8.265 | 0.000 | 0.0 | 0.0 | 0.0 | 1.20 | 84.8 | 0.0 |
| S8.000 | 50.00 | 5.25 | 9.225 | 0.000 | 0.0 | 0.0 | 0.0 | 2.33 | 92.8 | 0.0 |
| S7.004 | 50.00 | 7.24 | 7.960 | 0.000 | 0.0 | 0.0 | 0.0 | 0.96 | 106.0 | 0.0 |
| S7.005 | 50.00 | 7.78 | 7.873 | 0.000 | 0.0 | 0.0 | 0.0 | 0.96 | 106.0 | 0.0 |
| S9.000 | 50.00 | 5.35 | 8.750 | 0.000 | 0.0 | 0.0 | 0.0 | 2.13 | 150.9 | 0.0 |

## 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) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S7.006 | 32.046 | 0.105 | 305.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S7.007 | 32.046 | 0.105 | 305.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S7.008 | 17.079 | 0.050 | 341.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S1.014 | 11.706 | 0.200 | 58.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S7.006 | 50.00 | 8.16 | 7.710 | 0.000 | 0.0 | 0.0 | 0.0 | 1.39 | 392.6 | 0.0 |
| S7.007 | 49.22 | 8.55 | 7.605 | 0.000 | 0.0 | 0.0 | 0.0 | 1.39 | 392.6 | 0.0 |
| S7.008 | 48.61 | 8.76 | 7.500 | 0.000 | 0.0 | 0.0 | 0.0 | 1.31 | 370.9 | 0.0 |
| S1.014 | 50.00 | 5.11 | 7.450 | 0.000 | 24.0 | 0.0 | 0.0 | 1.71 | 68.1 | 24.0 |

## Network Classifications for Storm

| PN | USMH Name | Pipe Dia (mm) | Min Cover Depth (m) | Max Cover Depth (m) | Pipe Type | MH Dia (mm) | MH Width (mm) | MH Ring Depth (m) | MH Type |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 300 | 1.127 | 1.375 | Unclassified | 1200 | 0 | 1.127 | Unclassified |
| S2.000 | S2 | 300 | 1.245 | 1.375 | Unclassified | 1200 | 0 | 1.245 | Unclassified |
| S1.001 | S2 | 375 | 1.300 | 1.865 | Unclassified | 1350 | 0 | 1.300 | Unclassified |
| S3.000 | S4 | 300 | 1.250 | 1.940 | Unclassified | 1200 | 0 | 1.250 | Unclassified |
| S1.002 | S3 | 450 | 1.705 | 1.790 | Unclassified | 1350 | 0 | 1.790 | Unclassified |
| S1.003 | S4 | 450 | 1.705 | 2.100 | Unclassified | 1350 | 0 | 1.705 | Unclassified |
| S4.000 | S7 | 300 | 1.100 | 1.115 | Unclassified | 1200 | 0 | 1.100 | Unclassified |
| S4.001 | S8 | 300 | 1.115 | 2.003 | Unclassified | 1200 | 0 | 1.115 | Unclassified |
| S4.002 | S9 | 300 | 2.003 | 2.250 | Unclassified | 1200 | 0 | 2.003 | Unclassified |
| S1.004 | S5 | 450 | 1.995 | 2.175 | Unclassified | 1350 | 0 | 2.175 | Unclassified |
| S1.005 | S6 | 450 | 1.830 | 1.995 | Unclassified | 1350 | 0 | 1.995 | Unclassified |
| S1.006 | S7 | 450 | 1.830 | 2.360 | Unclassified | 1350 | 0 | 1.830 | Unclassified |
| S1.007 | S8 | 300 | 2.113 | 2.510 | Unclassified | 1350 | 0 | 2.510 | Unclassified |
| S1.008 | S14 | 300 | 1.715 | 2.113 | Unclassified | 1200 | 0 | 2.113 | Unclassified |
| S1.009 | S9 | 375 | 1.455 | 1.640 | Unclassified | 1350 | 0 | 1.640 | Unclassified |
| S1.010 | S10 | 375 | 1.105 | 1.455 | Unclassified | 1350 | 0 | 1.455 | Unclassified |
| S5.000 | S15 | 225 | 1.200 | 1.200 | Unclassified | 1200 | 0 | 1.200 | Unclassified |
| S5.001 | S16 | 225 | 1.200 | 1.690 | Unclassified | 1200 | 0 | 1.200 | Unclassified |
| S5.002 | S17 | 225 | 1.200 | 1.690 | Unclassified | 1200 | 0 | 1.690 | Unclassified |
| S6.000 | S18 | 300 | 1.125 | 1.200 | Unclassified | 1200 | 0 | 1.125 | Unclassified |
| S5.003 | S18 | 375 | 0.985 | 1.125 | Unclassified | 1350 | 0 | 1.125 | Unclassified |
| S5.004 | S19 | 375 | 0.980 | 0.985 | Unclassified | 1350 | 0 | 0.985 | Unclassified |
| S5.005 | S20 | 450 | 0.885 | 0.905 | Unclassified | 1350 | 0 | 0.905 | Unclassified |
| S5.006 | S21 | 450 | 0.885 | 0.923 | Unclassified | 1350 | 0 | 0.885 | Unclassified |
| S5.007 | S22 | 450 | 0.923 | 1.015 | Unclassified | 1350 | 0 | 0.923 | Unclassified |
| S5.008 | S23 | 450 | 1.015 | 1.105 | Unclassified | 1350 | 0 | 1.015 | Unclassified |
| S1.011 | S11 | 675 | 0.880 | 1.060 | Unclassified | 1500 | 0 | 0.880 | Unclassified |
| S1.012 | S12 | 675 | 1.060 | 1.100 | Unclassified | 1500 | 0 | 1.060 | Unclassified |
| S1.013 | S13 | 675 | 0.875 | 1.100 | Unclassified | 1500 | 0 | 1.100 | Unclassified |
| S7.000 | S29 | 225 | 1.525 | 1.755 | Unclassified | 1200 | 0 | 1.525 | Unclassified |
| S7.001 | S30 | 225 | 1.755 | 1.825 | Unclassified | 1200 | 0 | 1.755 | Unclassified |
| S7.002 | S31 | 300 | 1.750 | 2.485 | Unclassified | 1200 | 0 | 1.750 | Unclassified |
| S7.003 | S32 | 300 | 2.295 | 2.485 | Unclassified | 1200 | 0 | 2.485 | Unclassified |
| S8.000 | S33 | 225 | 1.465 | 2.295 | Unclassified | 1200 | 0 | 1.465 | Unclassified |
| S7.004 | S33 | 375 | 1.955 | 2.295 | Unclassified | 1350 | 0 | 2.295 | Unclassified |
| S7.005 | S35 | 375 | 1.615 | 1.955 | Unclassified | 1350 | 0 | 1.955 | Unclassified |
| S9.000 | S35 | 300 | 1.285 | 1.540 | Unclassified | 1200 | 0 | 1.285 | Unclassified |
| S7.006 | S34 | 600 | 1.245 | 1.465 | Unclassified | 1500 | 0 | 1.465 | Unclassified |
| S7.007 | S38 | 600 | 0.900 | 1.245 | Unclassified | 1500 | 0 | 1.245 | Unclassified |
| S7.008 | S35 | 600 | 0.900 | 0.950 | Unclassified | 1500 | 0 | 0.900 | Unclassified |
| S1.014 | S15 | 225 | 0.525 | 1.325 | Unclassified | 1500 | 0 | 1.325 | Unclassified |

## 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) |
|---|---|---|---|---|---|---|
| S1.014 | S | 8.000 | 7.250 | 0.000 | 0 | 0 |

## Online Controls for Storm

### Hydro-Brake® Optimum Manhole: S8, DS/PN: S1.007, Volume (m³): 9.3

| | |
|---|---|
| Unit Reference | MD-SHE-0187-2000-1750-2000 |
| Design Head (m) | 1.750 |
| Design Flow (l/s) | 20.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 187 |
| Invert Level (m) | 8.840 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1800 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.750 | 19.9 |
| Flush-Flo™ | 0.515 | 19.9 |
| Kick-Flo® | 1.107 | 16.0 |
| Mean Flow over Head Range | - | 17.3 |

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) |
|---|---|---|---|---|---|---|---|
| 0.100 | 6.6 | 1.200 | 16.7 | 3.000 | 25.8 | 7.000 | 38.8 |
| 0.200 | 17.1 | 1.400 | 17.9 | 3.500 | 27.8 | 7.500 | 40.1 |
| 0.300 | 19.0 | 1.600 | 19.1 | 4.000 | 29.6 | 8.000 | 41.4 |
| 0.400 | 19.7 | 1.800 | 20.2 | 4.500 | 31.3 | 8.500 | 42.6 |
| 0.500 | 19.9 | 2.000 | 21.2 | 5.000 | 33.0 | 9.000 | 43.8 |
| 0.600 | 19.8 | 2.200 | 22.2 | 5.500 | 34.5 | 9.500 | 45.0 |
| 0.800 | 19.2 | 2.400 | 23.2 | 6.000 | 36.0 | | |
| 1.000 | 17.7 | 2.600 | 24.1 | 6.500 | 37.4 | | |

### Hydro-Brake® Optimum Manhole: S15, DS/PN: S1.014, Volume (m³): 20.4

| | |
|---|---|
| Unit Reference | MD-SHE-0212-2400-1250-2400 |
| Design Head (m) | 1.250 |
| Design Flow (l/s) | 24.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 212 |
| Invert Level (m) | 7.450 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1500 |

## Hydro-Brake® Optimum Manhole: S15, DS/PN: S1.014, Volume (m³): 20.4

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.250 | 24.0 |
| Flush-Flo™ | 0.397 | 24.0 |
| Kick-Flo® | 0.867 | 20.2 |
| Mean Flow over Head Range | - | 20.4 |

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 | 7.2 | 1.200 | 23.5 | 3.000 | 36.5 | 7.000 | 55.0 |
| 0.200 | 20.5 | 1.400 | 25.3 | 3.500 | 39.3 | 7.500 | 56.9 |
| 0.300 | 23.7 | 1.600 | 27.0 | 4.000 | 41.9 | 8.000 | 58.7 |
| 0.400 | 24.0 | 1.800 | 28.6 | 4.500 | 44.4 | 8.500 | 60.4 |
| 0.500 | 23.8 | 2.000 | 30.0 | 5.000 | 46.7 | 9.000 | 62.1 |
| 0.600 | 23.4 | 2.200 | 31.4 | 5.500 | 48.9 | 9.500 | 63.8 |
| 0.800 | 21.6 | 2.400 | 32.8 | 6.000 | 51.0 | | |
| 1.000 | 21.6 | 2.600 | 34.1 | 6.500 | 53.1 | | |

## Storage Structures for Storm

### Tank or Pond Manhole: S8, DS/PN: S1.007

Invert Level (m) 8.840

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|---|---|
| 0.000 | 350.0 | 0.700 | 350.0 | 1.400 | 350.0 | 2.100 | 350.0 |
| 0.100 | 350.0 | 0.800 | 350.0 | 1.500 | 350.0 | 2.200 | 350.0 |
| 0.200 | 350.0 | 0.900 | 350.0 | 1.600 | 350.0 | 2.300 | 350.0 |
| 0.300 | 350.0 | 1.000 | 350.0 | 1.700 | 350.0 | 2.400 | 350.0 |
| 0.400 | 350.0 | 1.100 | 350.0 | 1.800 | 350.0 | 2.500 | 350.0 |
| 0.500 | 350.0 | 1.200 | 350.0 | 1.900 | 350.0 | | |
| 0.600 | 350.0 | 1.300 | 350.0 | 2.000 | 350.0 | | |

### Tank or Pond Manhole: S15, DS/PN: S1.014

Invert Level (m) 7.500

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|---|---|
| 0.000 | 410.1 | 0.700 | 1930.6 | 1.400 | 2832.8 | 2.100 | 6309.2 |
| 0.100 | 441.6 | 0.800 | 2056.8 | 1.500 | 2965.3 | 2.200 | 6309.2 |
| 0.200 | 466.9 | 0.900 | 2189.3 | 1.600 | 6309.2 | 2.300 | 6309.2 |
| 0.300 | 504.7 | 1.000 | 2315.5 | 1.700 | 6309.2 | 2.400 | 6309.2 |
| 0.400 | 542.6 | 1.100 | 2429.0 | 1.800 | 6309.2 | 2.500 | 6309.2 |
| 0.500 | 1678.2 | 1.200 | 2555.2 | 1.900 | 6309.2 | | |
| 0.600 | 1804.4 | 1.300 | 2706.6 | 2.000 | 6309.2 | | |

### Time Area Diagram at Pipe Number S1.000 for Storm

Total Area (ha) 0.145

| Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 8 | 12 | 0.030 | 16 | 20 | 0.020 |
| 4 | 8 | 0.035 | 12 | 16 | 0.025 | | | |

### Time Area Diagram at Pipe Number S2.000 for Storm

Total Area (ha) 0.145

| Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 8 | 12 | 0.030 | 16 | 20 | 0.030 |
| 4 | 8 | 0.025 | 12 | 16 | 0.030 | | | |

## Time Area Diagram at Pipe Number S1.001 for Storm

Total Area (ha) 0.120

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.045 | 4 | 8 | 0.030 | 8 | 12 | 0.030 | 12 | 16 | 0.015 |

## Time Area Diagram at Pipe Number S3.000 for Storm

Total Area (ha) 0.135

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.040 | 8 | 12 | 0.030 | 16 | 20 | 0.015 |
| 4 | 8 | 0.030 | 12 | 16 | 0.020 | | | |

## Time Area Diagram at Pipe Number S1.002 for Storm

Total Area (ha) 0.080

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.040 | 4 | 8 | 0.040 |

## Time Area Diagram at Pipe Number S1.003 for Storm

Total Area (ha) 0.145

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.040 | 8 | 12 | 0.030 | 16 | 20 | 0.020 |
| 4 | 8 | 0.030 | 12 | 16 | 0.025 | | | |

## Time Area Diagram at Pipe Number S4.000 for Storm

Total Area (ha) 0.105

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.045 | 4 | 8 | 0.030 | 8 | 12 | 0.030 |

## Time Area Diagram at Pipe Number S4.001 for Storm

Total Area (ha) 0.125

## Time Area Diagram at Pipe Number S4.001 for Storm

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.050 | 4 | 8 | 0.035 | 8 | 12 | 0.030 | 12 | 16 | 0.010 |

## Time Area Diagram at Pipe Number S4.002 for Storm

Total Area (ha) 0.060

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 4 | 8 | 0.030 |

## Time Area Diagram at Pipe Number S1.004 for Storm

Total Area (ha) 0.060

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 4 | 8 | 0.030 |

## Time Area Diagram at Pipe Number S1.005 for Storm

Total Area (ha) 0.105

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.045 | 4 | 8 | 0.030 | 8 | 12 | 0.030 |

## Time Area Diagram at Pipe Number S1.006 for Storm

Total Area (ha) 0.115

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.040 | 4 | 8 | 0.030 | 8 | 12 | 0.030 | 12 | 16 | 0.015 |

## Time Area Diagram at Pipe Number S1.007 for Storm

Total Area (ha) 0.030

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.030 |

## Time Area Diagram at Pipe Number S1.008 for Storm

Total Area (ha) 0.110

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 8 | 12 | 0.025 | 16 | 20 | 0.010 |
| 4 | 8 | 0.025 | 12 | 16 | 0.020 | | | |

## Time Area Diagram at Pipe Number S1.009 for Storm

Total Area (ha) 0.170

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.040 | 8 | 12 | 0.030 | 16 | 20 | 0.025 |
| 4 | 8 | 0.030 | 12 | 16 | 0.025 | 20 | 24 | 0.020 |

## Time Area Diagram at Pipe Number S1.010 for Storm

Total Area (ha) 0.085

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 4 | 8 | 0.025 | 8 | 12 | 0.020 | 12 | 16 | 0.010 |

## Time Area Diagram at Pipe Number S5.000 for Storm

Total Area (ha) 0.100

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 4 | 8 | 0.025 | 8 | 12 | 0.020 | 12 | 16 | 0.020 |

## Time Area Diagram at Pipe Number S5.001 for Storm

Total Area (ha) 0.080

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 4 | 8 | 0.025 | 8 | 12 | 0.020 |

## Time Area Diagram at Pipe Number S5.002 for Storm

Total Area (ha) 0.055

Time Area Diagram at Pipe Number S5.002 for Storm

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.020 | 8 | 12 | 0.010 |

Time Area Diagram at Pipe Number S6.000 for Storm

Total Area (ha) 0.135

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 8 | 12 | 0.030 | 16 | 20 | 0.020 |
| 4 | 8 | 0.030 | 12 | 16 | 0.020 | | | |

Time Area Diagram at Pipe Number S5.003 for Storm

Total Area (ha) 0.050

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.020 | 4 | 8 | 0.020 | 8 | 12 | 0.010 |

Time Area Diagram at Pipe Number S5.004 for Storm

Total Area (ha) 0.080

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 4 | 8 | 0.025 | 8 | 12 | 0.020 |

Time Area Diagram at Pipe Number S5.005 for Storm

Total Area (ha) 0.030

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.030 |

Time Area Diagram at Pipe Number S5.007 for Storm

Total Area (ha) 0.050

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 4 | 8 | 0.020 |

## Time Area Diagram at Pipe Number S5.008 for Storm

Total Area (ha) 0.125

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 8 | 12 | 0.025 | 16 | 20 | 0.020 |
| 4 | 8 | 0.030 | 12 | 16 | 0.020 | | | |

## Time Area Diagram at Pipe Number S1.011 for Storm

Total Area (ha) 0.040

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.015 |

## Time Area Diagram at Pipe Number S1.012 for Storm

Total Area (ha) 0.125

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 8 | 12 | 0.030 | 16 | 20 | 0.010 |
| 4 | 8 | 0.030 | 12 | 16 | 0.020 | | | |

## Time Area Diagram at Pipe Number S7.000 for Storm

Total Area (ha) 0.190

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.045 | 8 | 12 | 0.035 | 16 | 20 | 0.030 |
| 4 | 8 | 0.045 | 12 | 16 | 0.035 | | | |

## Time Area Diagram at Pipe Number S7.001 for Storm

Total Area (ha) 0.095

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 4 | 8 | 0.030 | 8 | 12 | 0.030 |

## Time Area Diagram at Pipe Number S7.002 for Storm

Total Area (ha) 0.055

## Time Area Diagram at Pipe Number S7.002 for Storm

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.020 | 8 | 12 | 0.010 |

## Time Area Diagram at Pipe Number S7.003 for Storm

Total Area (ha) 0.095

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 4 | 8 | 0.025 | 8 | 12 | 0.020 | 12 | 16 | 0.015 |

## Time Area Diagram at Pipe Number S8.000 for Storm

Total Area (ha) 0.075

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.020 | 8 | 12 | 0.015 | 12 | 16 | 0.015 |

## Time Area Diagram at Pipe Number S7.004 for Storm

Total Area (ha) 0.040

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.015 |

## Time Area Diagram at Pipe Number S7.005 for Storm

Total Area (ha) 0.075

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.020 | 8 | 12 | 0.015 | 12 | 16 | 0.015 |

## Time Area Diagram at Pipe Number S9.000 for Storm

Total Area (ha) 0.205

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.045 | 8 | 12 | 0.035 | 16 | 20 | 0.025 | 24 | 28 | 0.010 |
| 4 | 8 | 0.035 | 12 | 16 | 0.030 | 20 | 24 | 0.025 | | | |

## Time Area Diagram at Pipe Number S7.006 for Storm

Total Area (ha) 0.065

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.020 | 8 | 12 | 0.020 |

## Time Area Diagram at Pipe Number S7.007 for Storm

Total Area (ha) 0.045

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.020 | 4 | 8 | 0.015 | 8 | 12 | 0.010 |

## Time Area Diagram at Pipe Number S7.008 for Storm

Total Area (ha) 0.070

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 4 | 8 | 0.020 | 8 | 12 | 0.015 | 12 | 16 | 0.005 |

## 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 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 Storage Structures | 2 |
| Number of Online Controls | 2 | Number of Time/Area Diagrams | 38 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Ratio R | 0.350 |
| Region | England and Wales | Cv (Summer) | 0.750 |
| M5-60 (mm) | 19.100 | Cv (Winter) | 0.840 |

| | |
|---|---|
| Margin for Flood Risk Warning (mm) | 150.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | ON |
| DVD Status | ON |
| Inertia Status | ON |

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 30, 100 |
| Climate Change (%) | 0, 0, 40 |

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 30 Winter | 1 | +0% | 100/15 Winter | | | | 10.426 |
| S2.000 | S2 | 30 Winter | 1 | +0% | 100/15 Summer | | | | 10.201 |
| S1.001 | S2 | 30 Winter | 1 | +0% | 100/15 Summer | | | | 10.165 |
| S3.000 | S4 | 30 Winter | 1 | +0% | 100/30 Winter | | | | 10.401 |
| S1.002 | S3 | 30 Winter | 1 | +0% | 100/15 Summer | | | | 9.842 |
| S1.003 | S4 | 30 Winter | 1 | +0% | 30/60 Winter | | | | 9.597 |
| S4.000 | S7 | 15 Winter | 1 | +0% | 100/30 Winter | | | | 10.464 |
| S4.001 | S8 | 30 Winter | 1 | +0% | 100/15 Winter | | | | 10.156 |
| S4.002 | S9 | 15 Winter | 1 | +0% | 30/15 Winter | | | | 9.456 |
| S1.004 | S5 | 30 Winter | 1 | +0% | 30/15 Winter | | | | 9.381 |
| S1.005 | S6 | 30 Winter | 1 | +0% | 30/15 Winter | | | | 9.284 |
| S1.006 | S7 | 30 Winter | 1 | +0% | 30/15 Winter | | | | 9.204 |
| S1.007 | S8 | 120 Winter | 1 | +0% | 1/120 Winter | | | | 9.140 |
| S1.008 | S14 | 60 Winter | 1 | +0% | | | | | 8.729 |
| S1.009 | S9 | 60 Winter | 1 | +0% | 100/180 Winter | | | | 8.510 |
| S1.010 | S10 | 60 Winter | 1 | +0% | 30/180 Winter | | | | 8.241 |
| S5.000 | S15 | 30 Winter | 1 | +0% | | | | | 10.187 |
| S5.001 | S16 | 30 Winter | 1 | +0% | 100/15 Winter | | | | 9.848 |

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

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | -0.234 | 0.000 | 0.11 | | 8.9 | OK | |
| S2.000 | S2 | -0.229 | 0.000 | 0.13 | | 8.4 | OK | |
| S1.001 | S2 | -0.270 | 0.000 | 0.17 | | 25.1 | OK | |
| S3.000 | S4 | -0.249 | 0.000 | 0.07 | | 8.5 | OK | |
| S1.002 | S3 | -0.323 | 0.000 | 0.18 | | 39.4 | OK | |
| S1.003 | S4 | -0.308 | 0.000 | 0.22 | | 48.1 | OK | |
| S4.000 | S7 | -0.236 | 0.000 | 0.10 | | 8.2 | OK | |
| S4.001 | S8 | -0.229 | 0.000 | 0.13 | | 17.4 | OK | |
| S4.002 | S9 | -0.189 | 0.000 | 0.29 | | 23.3 | OK | |
| S1.004 | S5 | -0.239 | 0.000 | 0.45 | | 74.0 | OK | |
| S1.005 | S6 | -0.226 | 0.000 | 0.49 | | 81.7 | OK | |
| S1.006 | S7 | -0.226 | 0.000 | 0.50 | | 89.1 | OK | |
| S1.007 | S8 | 0.000 | 0.000 | 0.23 | | 19.0 | SURCHARGED | |
| S1.008 | S14 | -0.193 | 0.000 | 0.27 | | 22.8 | OK | |
| S1.009 | S9 | -0.270 | 0.000 | 0.17 | | 30.9 | OK | |
| S1.010 | S10 | -0.234 | 0.000 | 0.30 | | 34.5 | OK | |
| S5.000 | S15 | -0.173 | 0.000 | 0.12 | | 6.8 | OK | |
| S5.001 | S16 | -0.162 | 0.000 | 0.18 | | 13.1 | OK | |

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

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| S5.002 | S17 | 15 Winter | 1 | +0% | 100/15 Summer | | | | 9.168 |
| S6.000 | S18 | 30 Winter | 1 | +0% | 100/15 Winter | | | | 8.892 |
| S5.003 | S18 | 30 Winter | 1 | +0% | 100/15 Summer | | | | 8.664 |
| S5.004 | S19 | 30 Winter | 1 | +0% | 100/15 Summer | | | | 8.534 |
| S5.005 | S20 | 30 Winter | 1 | +0% | 100/30 Winter | | | | 8.416 |
| S5.006 | S21 | 30 Winter | 1 | +0% | 100/30 Winter | | | | 8.363 |
| S5.007 | S22 | 30 Winter | 1 | +0% | 100/30 Winter | | | | 8.277 |
| S5.008 | S23 | 30 Winter | 1 | +0% | 30/360 Winter | | | | 8.154 |
| S1.011 | S11 | 30 Winter | 1 | +0% | 100/180 Winter | | | | 8.067 |
| S1.012 | S12 | 360 Winter | 1 | +0% | 30/480 Summer | | | | 7.998 |
| S1.013 | S13 | 360 Winter | 1 | +0% | 30/180 Winter | | | | 7.991 |
| S7.000 | S29 | 30 Winter | 1 | +0% | 100/15 Summer | | | | 9.218 |
| S7.001 | S30 | 30 Winter | 1 | +0% | 100/15 Summer | | | | 8.960 |
| S7.002 | S31 | 30 Winter | 1 | +0% | 100/15 Summer | | | | 8.685 |
| S7.003 | S32 | 30 Winter | 1 | +0% | 30/120 Winter | | | | 8.392 |
| S8.000 | S33 | 30 Winter | 1 | +0% | | | | | 9.260 |
| S7.004 | S33 | 30 Winter | 1 | +0% | 30/60 Summer | | | | 8.125 |
| S7.005 | S35 | 30 Winter | 1 | +0% | 30/30 Winter | | | | 8.048 |
| S9.000 | S35 | 30 Winter | 1 | +0% | | | | | 8.803 |
| S7.006 | S34 | 360 Winter | 1 | +0% | 30/240 Winter | | | | 7.970 |
| S7.007 | S38 | 360 Winter | 1 | +0% | 30/240 Summer | | | | 7.970 |
| S7.008 | S35 | 360 Winter | 1 | +0% | 30/120 Summer | | | | 7.969 |
| S1.014 | S15 | 360 Winter | 1 | +0% | 1/15 Summer | | | | 7.968 |

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|
| S5.002 | S17 | -0.142 | 0.000 | 0.29 | | 17.7 | OK | |
| S6.000 | S18 | -0.238 | 0.000 | 0.09 | | 8.3 | OK | |
| S5.003 | S18 | -0.246 | 0.000 | 0.26 | | 29.7 | OK | |
| S5.004 | S19 | -0.231 | 0.000 | 0.31 | | 35.6 | OK | |
| S5.005 | S20 | -0.289 | 0.000 | 0.28 | | 37.2 | OK | |
| S5.006 | S21 | -0.302 | 0.000 | 0.24 | | 37.1 | OK | |
| S5.007 | S22 | -0.300 | 0.000 | 0.24 | | 40.1 | OK | |
| S5.008 | S23 | -0.281 | 0.000 | 0.30 | | 47.3 | OK | |
| S1.011 | S11 | -0.503 | 0.000 | 0.15 | | 77.7 | OK | |
| S1.012 | S12 | -0.317 | 0.000 | 0.12 | | 42.7 | OK | |
| S1.013 | S13 | -0.284 | 0.000 | 0.09 | | 42.3 | OK | |
| S7.000 | S29 | -0.157 | 0.000 | 0.20 | | 11.4 | OK | |
| S7.001 | S30 | -0.135 | 0.000 | 0.33 | | 18.8 | OK | |
| S7.002 | S31 | -0.190 | 0.000 | 0.29 | | 23.0 | OK | |
| S7.003 | S32 | -0.173 | 0.000 | 0.37 | | 29.3 | OK | |
| S8.000 | S33 | -0.190 | 0.000 | 0.06 | | 5.1 | OK | |
| S7.004 | S33 | -0.210 | 0.000 | 0.39 | | 37.0 | OK | |
| S7.005 | S35 | -0.200 | 0.000 | 0.45 | | 41.8 | OK | |
| S9.000 | S35 | -0.247 | 0.000 | 0.07 | | 10.3 | OK | |

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

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|
| S7.006 | S34 | -0.340 | 0.000 | 0.06 | | 19.1 | OK | |
| S7.007 | S38 | -0.235 | 0.000 | 0.06 | | 19.0 | OK | |
| S7.008 | S35 | -0.131 | 0.000 | 0.07 | | 19.1 | OK | |
| S1.014 | S15 | 0.293 | 0.000 | 0.41 | | 24.0 | SURCHARGED | |

## 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 Storage Structures | 2 |
| Number of Online Controls | 2 | Number of Time/Area Diagrams | 38 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Ratio R | 0.350 |
| Region | England and Wales | Cv (Summer) | 0.750 |
| M5-60 (mm) | 19.100 | Cv (Winter) | 0.840 |

| | |
|---|---|
| Margin for Flood Risk Warning (mm) | 150.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | ON |
| DVD Status | ON |
| Inertia Status | ON |

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 30, 100 |
| Climate Change (%) | 0, 0, 40 |

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 30 Winter | 30 | +0% | 100/15 Winter | | | | 10.466 |
| S2.000 | S2 | 30 Winter | 30 | +0% | 100/15 Summer | | | | 10.256 |
| S1.001 | S2 | 30 Winter | 30 | +0% | 100/15 Summer | | | | 10.232 |
| S3.000 | S4 | 30 Winter | 30 | +0% | 100/30 Winter | | | | 10.433 |
| S1.002 | S3 | 120 Winter | 30 | +0% | 100/15 Summer | | | | 10.030 |
| S1.003 | S4 | 120 Winter | 30 | +0% | 30/60 Winter | | | | 9.988 |
| S4.000 | S7 | 15 Winter | 30 | +0% | 100/30 Winter | | | | 10.502 |
| S4.001 | S8 | 30 Winter | 30 | +0% | 100/15 Winter | | | | 10.200 |
| S4.002 | S9 | 180 Winter | 30 | +0% | 30/15 Winter | | | | 9.934 |
| S1.004 | S5 | 180 Winter | 30 | +0% | 30/15 Winter | | | | 9.930 |
| S1.005 | S6 | 180 Winter | 30 | +0% | 30/15 Winter | | | | 9.854 |
| S1.006 | S7 | 180 Winter | 30 | +0% | 30/15 Winter | | | | 9.757 |
| S1.007 | S8 | 180 Winter | 30 | +0% | 1/120 Winter | | | | 9.678 |
| S1.008 | S14 | 30 Winter | 30 | +0% | | | | | 8.759 |
| S1.009 | S9 | 30 Winter | 30 | +0% | 100/180 Winter | | | | 8.551 |
| S1.010 | S10 | 480 Winter | 30 | +0% | 30/180 Winter | | | | 8.501 |
| S5.000 | S15 | 30 Winter | 30 | +0% | | | | | 10.220 |
| S5.001 | S16 | 30 Winter | 30 | +0% | 100/15 Winter | | | | 9.889 |

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

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | -0.194 | 0.000 | 0.27 | | 22.0 | OK | |
| S2.000 | S2 | -0.174 | 0.000 | 0.31 | | 20.8 | OK | |
| S1.001 | S2 | -0.203 | 0.000 | 0.43 | | 61.7 | OK | |
| S3.000 | S4 | -0.217 | 0.000 | 0.17 | | 20.9 | OK | |
| S1.002 | S3 | -0.135 | 0.000 | 0.28 | | 61.7 | OK | |
| S1.003 | S4 | 0.083 | 0.000 | 0.35 | | 76.0 | SURCHARGED | |
| S4.000 | S7 | -0.198 | 0.000 | 0.25 | | 20.0 | OK | |
| S4.001 | S8 | -0.185 | 0.000 | 0.31 | | 42.7 | OK | |
| S4.002 | S9 | 0.289 | 0.000 | 0.29 | | 22.6 | SURCHARGED | |
| S1.004 | S5 | 0.310 | 0.000 | 0.50 | | 83.0 | SURCHARGED | |
| S1.005 | S6 | 0.344 | 0.000 | 0.53 | | 87.3 | SURCHARGED | |
| S1.006 | S7 | 0.327 | 0.000 | 0.52 | | 93.4 | SURCHARGED | |
| S1.007 | S8 | 0.538 | 0.000 | 0.24 | | 19.9 | SURCHARGED | |
| S1.008 | S14 | -0.163 | 0.000 | 0.43 | | 35.4 | OK | |
| S1.009 | S9 | -0.229 | 0.000 | 0.32 | | 57.1 | OK | |
| S1.010 | S10 | 0.026 | 0.000 | 0.30 | | 33.9 | SURCHARGED | |
| S5.000 | S15 | -0.140 | 0.000 | 0.30 | | 16.7 | OK | |
| S5.001 | S16 | -0.121 | 0.000 | 0.44 | | 32.3 | OK | |

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

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| S5.002 | S17 | 15 Winter | 30 | +0% | 100/15 Summer | | | | 9.228 |
| S6.000 | S18 | 30 Winter | 30 | +0% | 100/15 Winter | | | | 8.928 |
| S5.003 | S18 | 30 Winter | 30 | +0% | 100/15 Summer | | | | 8.753 |
| S5.004 | S19 | 30 Winter | 30 | +0% | 100/15 Summer | | | | 8.638 |
| S5.005 | S20 | 30 Winter | 30 | +0% | 100/30 Winter | | | | 8.528 |
| S5.006 | S21 | 360 Winter | 30 | +0% | 100/30 Winter | | | | 8.468 |
| S5.007 | S22 | 360 Winter | 30 | +0% | 100/30 Winter | | | | 8.457 |
| S5.008 | S23 | 360 Winter | 30 | +0% | 30/360 Winter | | | | 8.435 |
| S1.011 | S11 | 360 Winter | 30 | +0% | 100/180 Winter | | | | 8.402 |
| S1.012 | S12 | 480 Winter | 30 | +0% | 30/480 Summer | | | | 8.315 |
| S1.013 | S13 | 720 Winter | 30 | +0% | 30/180 Winter | | | | 8.285 |
| S7.000 | S29 | 30 Winter | 30 | +0% | 100/15 Summer | | | | 9.262 |
| S7.001 | S30 | 30 Winter | 30 | +0% | 100/15 Summer | | | | 9.026 |
| S7.002 | S31 | 30 Winter | 30 | +0% | 100/15 Summer | | | | 8.762 |
| S7.003 | S32 | 120 Winter | 30 | +0% | 30/120 Winter | | | | 8.568 |
| S8.000 | S33 | 30 Winter | 30 | +0% | | | | | 9.282 |
| S7.004 | S33 | 240 Winter | 30 | +0% | 30/60 Summer | | | | 8.475 |
| S7.005 | S35 | 360 Summer | 30 | +0% | 30/30 Winter | | | | 8.393 |
| S9.000 | S35 | 30 Winter | 30 | +0% | | | | | 8.835 |
| S7.006 | S34 | 240 Winter | 30 | +0% | 30/240 Winter | | | | 8.310 |
| S7.007 | S38 | 720 Winter | 30 | +0% | 30/240 Summer | | | | 8.282 |
| S7.008 | S35 | 720 Winter | 30 | +0% | 30/120 Summer | | | | 8.281 |
| S1.014 | S15 | 720 Winter | 30 | +0% | 1/15 Summer | | | | 8.281 |

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|
| S5.002 | S17 | -0.082 | 0.000 | 0.72 | | 43.5 | OK | |
| S6.000 | S18 | -0.202 | 0.000 | 0.23 | | 20.4 | OK | |
| S5.003 | S18 | -0.157 | 0.000 | 0.63 | | 73.0 | OK | |
| S5.004 | S19 | -0.127 | 0.000 | 0.77 | | 87.5 | OK | |
| S5.005 | S20 | -0.177 | 0.000 | 0.68 | | 91.2 | OK | |
| S5.006 | S21 | -0.197 | 0.000 | 0.16 | | 25.2 | OK | |
| S5.007 | S22 | -0.120 | 0.000 | 0.16 | | 27.5 | OK | |
| S5.008 | S23 | 0.000 | 0.000 | 0.21 | | 33.0 | SURCHARGED | |
| S1.011 | S11 | -0.168 | 0.000 | 0.13 | | 71.0 | OK | |
| S1.012 | S12 | 0.000 | 0.000 | 0.18 | | 63.3 | SURCHARGED | |
| S1.013 | S13 | 0.010 | 0.000 | 0.11 | | 50.9 | SURCHARGED | |
| S7.000 | S29 | -0.113 | 0.000 | 0.50 | | 28.1 | OK | |
| S7.001 | S30 | -0.069 | 0.000 | 0.82 | | 46.1 | OK | |
| S7.002 | S31 | -0.113 | 0.000 | 0.70 | | 56.5 | OK | |
| S7.003 | S32 | 0.003 | 0.000 | 0.55 | | 43.5 | SURCHARGED | |
| S8.000 | S33 | -0.168 | 0.000 | 0.14 | | 12.6 | OK | |
| S7.004 | S33 | 0.140 | 0.000 | 0.35 | | 32.7 | SURCHARGED | |
| S7.005 | S35 | 0.145 | 0.000 | 0.37 | | 34.7 | SURCHARGED | |
| S9.000 | S35 | -0.215 | 0.000 | 0.18 | | 25.4 | OK | |

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

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|
| S7.006 | S34 | 0.000 | 0.000 | 0.15 | | 49.7 | SURCHARGED | |
| S7.007 | S38 | 0.077 | 0.000 | 0.08 | | 25.9 | SURCHARGED | |
| S7.008 | S35 | 0.181 | 0.000 | 0.10 | | 27.9 | SURCHARGED | |
| S1.014 | S15 | 0.606 | 0.000 | 0.41 | | 24.0 | SURCHARGED | |

## 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 Storage Structures | 2 |
| Number of Online Controls | 2 | Number of Time/Area Diagrams | 38 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Ratio R | 0.350 |
| Region | England and Wales | Cv (Summer) | 0.750 |
| M5-60 (mm) | 19.100 | Cv (Winter) | 0.840 |

| | |
|---|---|
| Margin for Flood Risk Warning (mm) | 150.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | ON |
| DVD Status | ON |
| Inertia Status | ON |

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 1, 30, 100 |
| Climate Change (%) | 0, 0, 40 |

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 30 Winter | 100 | +40% | 100/15 Winter | | | | 11.030 |
| S2.000 | S2 | 30 Winter | 100 | +40% | 100/15 Summer | | | | 11.012 |
| S1.001 | S2 | 180 Winter | 100 | +40% | 100/15 Summer | | | | 11.000 |
| S3.000 | S4 | 180 Winter | 100 | +40% | 100/30 Winter | | | | 10.972 |
| S1.002 | S3 | 180 Winter | 100 | +40% | 100/15 Summer | | | | 10.961 |
| S1.003 | S4 | 240 Winter | 100 | +40% | 30/60 Winter | | | | 10.901 |
| S4.000 | S7 | 180 Winter | 100 | +40% | 100/30 Winter | | | | 10.885 |
| S4.001 | S8 | 180 Winter | 100 | +40% | 100/15 Winter | | | | 10.881 |
| S4.002 | S9 | 180 Winter | 100 | +40% | 30/15 Winter | | | | 10.873 |
| S1.004 | S5 | 180 Winter | 100 | +40% | 30/15 Winter | | | | 10.869 |
| S1.005 | S6 | 240 Winter | 100 | +40% | 30/15 Winter | | | | 10.789 |
| S1.006 | S7 | 240 Winter | 100 | +40% | 30/15 Winter | | | | 10.706 |
| S1.007 | S8 | 240 Winter | 100 | +40% | 1/120 Winter | | | | 10.620 |
| S1.008 | S14 | 720 Winter | 100 | +40% | | | | | 8.825 |
| S1.009 | S9 | 720 Winter | 100 | +40% | 100/180 Winter | | | | 8.799 |
| S1.010 | S10 | 720 Winter | 100 | +40% | 30/180 Winter | | | | 8.783 |
| S5.000 | S15 | 30 Winter | 100 | +40% | | | | | 10.255 |
| S5.001 | S16 | 30 Winter | 100 | +40% | 100/15 Winter | | | | 10.132 |

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

| PN | US/MH Name | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 0.370 | 0.000 | 0.46 | | 37.0 | SURCHARGED | |
| S2.000 | S2 | 0.582 | 0.000 | 0.59 | | 39.3 | SURCHARGED | |
| S1.001 | S2 | 0.565 | 0.000 | 0.39 | | 55.8 | SURCHARGED | |
| S3.000 | S4 | 0.322 | 0.000 | 0.15 | | 19.1 | SURCHARGED | |
| S1.002 | S3 | 0.796 | 0.000 | 0.34 | | 75.2 | SURCHARGED | |
| S1.003 | S4 | 0.996 | 0.000 | 0.35 | | 76.5 | SURCHARGED | |
| S4.000 | S7 | 0.185 | 0.000 | 0.19 | | 15.1 | SURCHARGED | |
| S4.001 | S8 | 0.496 | 0.000 | 0.24 | | 33.1 | SURCHARGED | |
| S4.002 | S9 | 1.228 | 0.000 | 0.50 | | 39.3 | SURCHARGED | |
| S1.004 | S5 | 1.249 | 0.000 | 0.83 | | 136.0 | SURCHARGED | |
| S1.005 | S6 | 1.279 | 0.000 | 0.74 | | 122.5 | SURCHARGED | |
| S1.006 | S7 | 1.276 | 0.000 | 0.75 | | 134.9 | SURCHARGED | |
| S1.007 | S8 | 1.480 | 0.000 | 0.24 | | 20.1 | SURCHARGED | |
| S1.008 | S14 | -0.098 | 0.000 | 0.30 | | 25.1 | OK | |
| S1.009 | S9 | 0.019 | 0.000 | 0.19 | | 33.6 | SURCHARGED | |
| S1.010 | S10 | 0.308 | 0.000 | 0.33 | | 37.9 | SURCHARGED | |
| S5.000 | S15 | -0.105 | 0.000 | 0.56 | | 30.5 | OK | |
| S5.001 | S16 | 0.122 | 0.000 | 0.75 | | 55.5 | SURCHARGED | |

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

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| S5.002 | S17 | 30 Winter | 100 | +40% | 100/15 Summer | | | |
| S6.000 | S18 | 30 Winter | 100 | +40% | 100/15 Winter | | | |
| S5.003 | S18 | 30 Winter | 100 | +40% | 100/15 Summer | | | |
| S5.004 | S19 | 360 Winter | 100 | +40% | 100/15 Summer | | | |
| S5.005 | S20 | 360 Winter | 100 | +40% | 100/30 Winter | | | |
| S5.006 | S21 | 360 Winter | 100 | +40% | 100/30 Winter | | | |
| S5.007 | S22 | 360 Winter | 100 | +40% | 100/30 Winter | | | |
| S5.008 | S23 | 360 Winter | 100 | +40% | 30/360 Winter | | | |
| S1.011 | S11 | 960 Winter | 100 | +40% | 100/180 Winter | | | |
| S1.012 | S12 | 1440 Winter | 100 | +40% | 30/480 Summer | | | |
| S1.013 | S13 | 1440 Winter | 100 | +40% | 30/180 Winter | | | |
| S7.000 | S29 | 30 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.001 | S30 | 30 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.002 | S31 | 30 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.003 | S32 | 30 Winter | 100 | +40% | 30/120 Winter | | | |
| S8.000 | S33 | 30 Winter | 100 | +40% | | | | |
| S7.004 | S33 | 30 Winter | 100 | +40% | 30/60 Summer | | | |
| S7.005 | S35 | 1440 Winter | 100 | +40% | 30/30 Winter | | | |
| S9.000 | S35 | 30 Winter | 100 | +40% | | | | |
| S7.006 | S34 | 1440 Winter | 100 | +40% | 30/240 Winter | | | |
| S7.007 | S38 | 1440 Winter | 100 | +40% | 30/240 Summer | | | |
| S7.008 | S35 | 1440 Winter | 100 | +40% | 30/120 Summer | | | |
| S1.014 | S15 | 1440 Winter | 100 | +40% | 1/15 Summer | | | |

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| S5.002 | S17 | 9.764 | 0.454 | 0.000 | 1.18 | | 71.2 | SURCHARGED | |
| S6.000 | S18 | 9.227 | 0.097 | 0.000 | 0.42 | | 36.6 | SURCHARGED | |
| S5.003 | S18 | 9.111 | 0.201 | 0.000 | 1.06 | | 121.3 | SURCHARGED | |
| S5.004 | S19 | 8.968 | 0.203 | 0.000 | 0.38 | | 43.5 | SURCHARGED | |
| S5.005 | S20 | 8.872 | 0.167 | 0.000 | 0.34 | | 46.0 | SURCHARGED | |
| S5.006 | S21 | 8.864 | 0.199 | 0.000 | 0.29 | | 46.0 | SURCHARGED | |
| S5.007 | S22 | 8.794 | 0.217 | 0.000 | 0.30 | | 50.3 | SURCHARGED | |
| S5.008 | S23 | 8.718 | 0.283 | 0.000 | 0.39 | | 61.0 | SURCHARGED | |
| S1.011 | S11 | 8.696 | 0.126 | 0.000 | 0.12 | | 62.5 | SURCHARGED | |
| S1.012 | S12 | 8.661 | 0.346 | 0.000 | 0.17 | | 60.7 | SURCHARGED | |
| S1.013 | S13 | 8.658 | 0.383 | 0.000 | 0.12 | | 59.7 | SURCHARGED | |
| S7.000 | S29 | 10.287 | 0.912 | 0.000 | 0.91 | | 51.3 | SURCHARGED | |
| S7.001 | S30 | 10.084 | 0.989 | 0.000 | 1.35 | | 76.3 | SURCHARGED | |
| S7.002 | S31 | 9.542 | 0.667 | 0.000 | 1.13 | | 90.2 | SURCHARGED | |
| S7.003 | S32 | 9.161 | 0.596 | 0.000 | 1.47 | | 115.9 | SURCHARGED | |
| S8.000 | S33 | 9.303 | -0.147 | 0.000 | 0.26 | | 23.0 | OK | |
| S7.004 | S33 | 8.718 | 0.383 | 0.000 | 1.55 | | 145.6 | SURCHARGED | |
| S7.005 | S35 | 8.657 | 0.410 | 0.000 | 0.20 | | 18.8 | SURCHARGED | |
| S9.000 | S35 | 8.868 | -0.182 | 0.000 | 0.33 | | 46.4 | OK | |

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

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| S7.006 | S34 | 8.655 | 0.345 | 0.000 | 0.08 | | 26.9 | SURCHARGED | |
| S7.007 | S38 | 8.655 | 0.450 | 0.000 | 0.09 | | 28.0 | SURCHARGED | |
| S7.008 | S35 | 8.655 | 0.555 | 0.000 | 0.11 | | 30.0 | SURCHARGED | |
| S1.014 | S15 | 8.654 | 0.979 | 0.000 | 0.41 | | 24.0 | SURCHARGED | |

**Appendix 2:**
**Surface Water Calculations**
**100 year + 40% CC Surcharged Outfall**

## STORM SEWER DESIGN by the Modified Rational Method

### Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

| | | | |
|---|---|---|---|
| Return Period (years) | 2 | PIMP (%) | 100 |
| M5-60 (mm) | 19.100 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.350 | Minimum Backdrop Height (m) | 0.000 |
| Maximum Rainfall (mm/hr) | 50 | Maximum Backdrop Height (m) | 0.000 |
| Maximum Time of Concentration (mins) | 30 | Min Design Depth for Optimisation (m) | 1.200 |
| Foul Sewage (l/s/ha) | 0.000 | Min Vel for Auto Design only (m/s) | 1.00 |
| Volumetric Runoff Coeff. | 0.750 | Min Slope for Optimisation (1:X) | 500 |

Designed with Level Inverts

### 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) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | 50.517 | 0.300 | 168.4 | 0.000 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S2.000 | 10.797 | 0.070 | 154.2 | 0.000 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.001 | 58.429 | 0.345 | 169.4 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S3.000 | 45.478 | 0.635 | 71.6 | 0.000 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.002 | 44.157 | 0.260 | 169.8 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.003 | 35.233 | 0.210 | 167.8 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S4.000 | 52.974 | 0.315 | 168.2 | 0.000 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S4.001 | 42.974 | 0.740 | 58.1 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | 50.00 | 5.70 | 10.360 | 0.000 | 0.0 | 0.0 | 0.0 | 1.21 | 85.4 | 0.0 |
| S2.000 | 50.00 | 5.14 | 10.130 | 0.000 | 0.0 | 0.0 | 0.0 | 1.26 | 89.3 | 0.0 |
| S1.001 | 50.00 | 6.40 | 10.060 | 0.000 | 0.0 | 0.0 | 0.0 | 1.39 | 153.5 | 0.0 |
| S3.000 | 50.00 | 5.41 | 10.350 | 0.000 | 0.0 | 0.0 | 0.0 | 1.86 | 131.5 | 0.0 |
| S1.002 | 50.00 | 6.87 | 9.715 | 0.000 | 0.0 | 0.0 | 0.0 | 1.56 | 247.7 | 0.0 |
| S1.003 | 50.00 | 7.24 | 9.455 | 0.000 | 0.0 | 0.0 | 0.0 | 1.57 | 249.2 | 0.0 |
| S4.000 | 50.00 | 5.73 | 10.400 | 0.000 | 0.0 | 0.0 | 0.0 | 1.21 | 85.5 | 0.0 |
| S4.001 | 50.00 | 6.08 | 10.085 | 0.000 | 0.0 | 0.0 | 0.0 | 2.07 | 146.1 | 0.0 |

## 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) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S4.002 | 10.000 | 0.100 | 100.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.004 | 31.483 | 0.110 | 286.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.005 | 19.910 | 0.080 | 248.9 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.006 | 34.377 | 0.140 | 245.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.007 | 32.448 | 0.218 | 149.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.008 | 32.448 | 0.218 | 149.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.009 | 30.395 | 0.305 | 99.7 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S1.010 | 31.222 | 0.130 | 240.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S5.000 | 27.070 | 0.350 | 77.3 | 0.000 | 5.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S5.001 | 30.163 | 0.700 | 43.1 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S5.002 | 31.113 | 0.475 | 65.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S6.000 | 41.291 | 0.295 | 140.0 | 0.000 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S5.003 | 35.214 | 0.145 | 242.9 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S5.004 | 32.698 | 0.135 | 242.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S5.005 | 12.138 | 0.040 | 303.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S5.006 | 26.331 | 0.088 | 299.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S5.007 | 42.360 | 0.142 | 298.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S5.008 | 27.011 | 0.090 | 300.1 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S4.002 | 50.00 | 6.18 | 9.345 | 0.000 | 0.0 | 0.0 | 0.0 | 1.57 | 111.1 | 0.0 |
| S1.004 | 50.00 | 7.68 | 9.170 | 0.000 | 0.0 | 0.0 | 0.0 | 1.20 | 190.3 | 0.0 |
| S1.005 | 50.00 | 7.94 | 9.060 | 0.000 | 0.0 | 0.0 | 0.0 | 1.28 | 204.2 | 0.0 |
| S1.006 | 50.00 | 5.44 | 8.980 | 0.000 | 25.0 | 0.0 | 0.0 | 1.29 | 205.6 | 25.0 |
| S1.007 | 50.00 | 5.86 | 8.840 | 0.000 | 25.0 | 0.0 | 0.0 | 1.28 | 90.8 | 25.0 |
| S1.008 | 50.00 | 6.28 | 8.623 | 0.000 | 25.0 | 0.0 | 0.0 | 1.28 | 90.8 | 25.0 |
| S1.009 | 50.00 | 6.56 | 8.405 | 0.000 | 25.0 | 0.0 | 0.0 | 1.82 | 200.5 | 25.0 |
| S1.010 | 50.00 | 7.01 | 8.100 | 0.000 | 25.0 | 0.0 | 0.0 | 1.16 | 128.6 | 25.0 |
| S5.000 | 50.00 | 5.30 | 10.135 | 0.000 | 0.0 | 0.0 | 0.0 | 1.49 | 59.2 | 0.0 |
| S5.001 | 50.00 | 5.55 | 9.785 | 0.000 | 0.0 | 0.0 | 0.0 | 2.00 | 79.5 | 0.0 |
| S5.002 | 50.00 | 5.88 | 9.085 | 0.000 | 0.0 | 0.0 | 0.0 | 1.62 | 64.4 | 0.0 |
| S6.000 | 50.00 | 5.52 | 8.830 | 0.000 | 0.0 | 0.0 | 0.0 | 1.33 | 93.8 | 0.0 |
| S5.003 | 50.00 | 6.38 | 8.535 | 0.000 | 0.0 | 0.0 | 0.0 | 1.16 | 127.9 | 0.0 |
| S5.004 | 50.00 | 6.85 | 8.390 | 0.000 | 0.0 | 0.0 | 0.0 | 1.16 | 128.1 | 0.0 |
| S5.005 | 50.00 | 7.03 | 8.255 | 0.000 | 0.0 | 0.0 | 0.0 | 1.16 | 184.8 | 0.0 |
| S5.006 | 50.00 | 7.40 | 8.215 | 0.000 | 0.0 | 0.0 | 0.0 | 1.17 | 186.1 | 0.0 |
| S5.007 | 50.00 | 8.00 | 8.127 | 0.000 | 0.0 | 0.0 | 0.0 | 1.17 | 186.4 | 0.0 |
| S5.008 | 49.67 | 8.39 | 7.985 | 0.000 | 0.0 | 0.0 | 0.0 | 1.17 | 185.8 | 0.0 |

## 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) | HYD SECT | DIA (mm) | Section Type | Auto Design |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.011 | 62.286 | 0.255 | 244.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S1.012 | 10.092 | 0.040 | 252.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S1.013 | 38.438 | 0.150 | 256.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S7.000 | 19.273 | 0.280 | 68.8 | 0.000 | 5.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S7.001 | 20.777 | 0.295 | 70.4 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S7.002 | 52.917 | 0.310 | 170.7 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S7.003 | 39.349 | 0.230 | 171.1 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S8.000 | 35.263 | 1.115 | 31.6 | 0.000 | 5.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S7.004 | 30.828 | 0.088 | 352.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S7.005 | 30.828 | 0.088 | 352.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S9.000 | 44.421 | 0.815 | 54.5 | 0.000 | 5.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S7.006 | 32.046 | 0.105 | 305.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S7.007 | 32.046 | 0.105 | 305.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S7.008 | 17.079 | 0.050 | 341.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S1.014 | 11.706 | 0.200 | 58.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.011 | 47.94 | 9.01 | 7.895 | 0.000 | 25.0 | 0.0 | 0.0 | 1.67 | 598.5 | 25.0 |
| S1.012 | 47.67 | 9.11 | 7.640 | 0.000 | 25.0 | 0.0 | 0.0 | 1.65 | 588.8 | 25.0 |
| S1.013 | 46.66 | 9.50 | 7.600 | 0.000 | 25.0 | 0.0 | 0.0 | 1.63 | 584.2 | 25.0 |
| S7.000 | 50.00 | 5.20 | 9.150 | 0.000 | 0.0 | 0.0 | 0.0 | 1.58 | 62.8 | 0.0 |
| S7.001 | 50.00 | 5.43 | 8.870 | 0.000 | 0.0 | 0.0 | 0.0 | 1.56 | 62.0 | 0.0 |
| S7.002 | 50.00 | 6.16 | 8.575 | 0.000 | 0.0 | 0.0 | 0.0 | 1.20 | 84.9 | 0.0 |
| S7.003 | 50.00 | 6.71 | 8.265 | 0.000 | 0.0 | 0.0 | 0.0 | 1.20 | 84.8 | 0.0 |
| S8.000 | 50.00 | 5.25 | 9.225 | 0.000 | 0.0 | 0.0 | 0.0 | 2.33 | 92.8 | 0.0 |
| S7.004 | 50.00 | 7.24 | 7.960 | 0.000 | 0.0 | 0.0 | 0.0 | 0.96 | 106.0 | 0.0 |
| S7.005 | 50.00 | 7.78 | 7.873 | 0.000 | 0.0 | 0.0 | 0.0 | 0.96 | 106.0 | 0.0 |
| S9.000 | 50.00 | 5.35 | 8.750 | 0.000 | 0.0 | 0.0 | 0.0 | 2.13 | 150.9 | 0.0 |
| S7.006 | 50.00 | 8.16 | 7.710 | 0.000 | 0.0 | 0.0 | 0.0 | 1.39 | 392.6 | 0.0 |
| S7.007 | 49.22 | 8.55 | 7.605 | 0.000 | 0.0 | 0.0 | 0.0 | 1.39 | 392.6 | 0.0 |
| S7.008 | 48.61 | 8.76 | 7.500 | 0.000 | 0.0 | 0.0 | 0.0 | 1.31 | 370.9 | 0.0 |
| S1.014 | 50.00 | 5.11 | 7.450 | 0.000 | 24.0 | 0.0 | 0.0 | 1.71 | 68.1 | 24.0 |

## 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) |
|---|---|---|---|---|---|---|
| S1.014 | S | 8.000 | 7.250 | 0.000 | 0 | 0 |

Datum (m) 0.000 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 8.000 | 210 | 8.000 | 415 | 8.000 | 620 | 8.000 | 825 | 8.000 | 1030 | 8.000 |
| 10 | 8.000 | 215 | 8.000 | 420 | 8.000 | 625 | 8.000 | 830 | 8.000 | 1035 | 8.000 |
| 15 | 8.000 | 220 | 8.000 | 425 | 8.000 | 630 | 8.000 | 835 | 8.000 | 1040 | 8.000 |
| 20 | 8.000 | 225 | 8.000 | 430 | 8.000 | 635 | 8.000 | 840 | 8.000 | 1045 | 8.000 |
| 25 | 8.000 | 230 | 8.000 | 435 | 8.000 | 640 | 8.000 | 845 | 8.000 | 1050 | 8.000 |
| 30 | 8.000 | 235 | 8.000 | 440 | 8.000 | 645 | 8.000 | 850 | 8.000 | 1055 | 8.000 |
| 35 | 8.000 | 240 | 8.000 | 445 | 8.000 | 650 | 8.000 | 855 | 8.000 | 1060 | 8.000 |
| 40 | 8.000 | 245 | 8.000 | 450 | 8.000 | 655 | 8.000 | 860 | 8.000 | 1065 | 8.000 |
| 45 | 8.000 | 250 | 8.000 | 455 | 8.000 | 660 | 8.000 | 865 | 8.000 | 1070 | 8.000 |
| 50 | 8.000 | 255 | 8.000 | 460 | 8.000 | 665 | 8.000 | 870 | 8.000 | 1075 | 8.000 |
| 55 | 8.000 | 260 | 8.000 | 465 | 8.000 | 670 | 8.000 | 875 | 8.000 | 1080 | 8.000 |
| 60 | 8.000 | 265 | 8.000 | 470 | 8.000 | 675 | 8.000 | 880 | 8.000 | 1085 | 8.000 |
| 65 | 8.000 | 270 | 8.000 | 475 | 8.000 | 680 | 8.000 | 885 | 8.000 | 1090 | 8.000 |
| 70 | 8.000 | 275 | 8.000 | 480 | 8.000 | 685 | 8.000 | 890 | 8.000 | 1095 | 8.000 |
| 75 | 8.000 | 280 | 8.000 | 485 | 8.000 | 690 | 8.000 | 895 | 8.000 | 1100 | 8.000 |
| 80 | 8.000 | 285 | 8.000 | 490 | 8.000 | 695 | 8.000 | 900 | 8.000 | 1105 | 8.000 |
| 85 | 8.000 | 290 | 8.000 | 495 | 8.000 | 700 | 8.000 | 905 | 8.000 | 1110 | 8.000 |
| 90 | 8.000 | 295 | 8.000 | 500 | 8.000 | 705 | 8.000 | 910 | 8.000 | 1115 | 8.000 |
| 95 | 8.000 | 300 | 8.000 | 505 | 8.000 | 710 | 8.000 | 915 | 8.000 | 1120 | 8.000 |
| 100 | 8.000 | 305 | 8.000 | 510 | 8.000 | 715 | 8.000 | 920 | 8.000 | 1125 | 8.000 |
| 105 | 8.000 | 310 | 8.000 | 515 | 8.000 | 720 | 8.000 | 925 | 8.000 | 1130 | 8.000 |
| 110 | 8.000 | 315 | 8.000 | 520 | 8.000 | 725 | 8.000 | 930 | 8.000 | 1135 | 8.000 |
| 115 | 8.000 | 320 | 8.000 | 525 | 8.000 | 730 | 8.000 | 935 | 8.000 | 1140 | 8.000 |
| 120 | 8.000 | 325 | 8.000 | 530 | 8.000 | 735 | 8.000 | 940 | 8.000 | 1145 | 8.000 |
| 125 | 8.000 | 330 | 8.000 | 535 | 8.000 | 740 | 8.000 | 945 | 8.000 | 1150 | 8.000 |
| 130 | 8.000 | 335 | 8.000 | 540 | 8.000 | 745 | 8.000 | 950 | 8.000 | 1155 | 8.000 |
| 135 | 8.000 | 340 | 8.000 | 545 | 8.000 | 750 | 8.000 | 955 | 8.000 | 1160 | 8.000 |
| 140 | 8.000 | 345 | 8.000 | 550 | 8.000 | 755 | 8.000 | 960 | 8.000 | 1165 | 8.000 |
| 145 | 8.000 | 350 | 8.000 | 555 | 8.000 | 760 | 8.000 | 965 | 8.000 | 1170 | 8.000 |
| 150 | 8.000 | 355 | 8.000 | 560 | 8.000 | 765 | 8.000 | 970 | 8.000 | 1175 | 8.000 |
| 155 | 8.000 | 360 | 8.000 | 565 | 8.000 | 770 | 8.000 | 975 | 8.000 | 1180 | 8.000 |
| 160 | 8.000 | 365 | 8.000 | 570 | 8.000 | 775 | 8.000 | 980 | 8.000 | 1185 | 8.000 |
| 165 | 8.000 | 370 | 8.000 | 575 | 8.000 | 780 | 8.000 | 985 | 8.000 | 1190 | 8.000 |
| 170 | 8.000 | 375 | 8.000 | 580 | 8.000 | 785 | 8.000 | 990 | 8.000 | 1195 | 8.000 |
| 175 | 8.000 | 380 | 8.000 | 585 | 8.000 | 790 | 8.000 | 995 | 8.000 | 1200 | 8.000 |
| 180 | 8.000 | 385 | 8.000 | 590 | 8.000 | 795 | 8.000 | 1000 | 8.000 | 1205 | 8.000 |
| 185 | 8.000 | 390 | 8.000 | 595 | 8.000 | 800 | 8.000 | 1005 | 8.000 | 1210 | 8.000 |
| 190 | 8.000 | 395 | 8.000 | 600 | 8.000 | 805 | 8.000 | 1010 | 8.000 | 1215 | 8.000 |
| 195 | 8.000 | 400 | 8.000 | 605 | 8.000 | 810 | 8.000 | 1015 | 8.000 | 1220 | 8.000 |
| 200 | 8.000 | 405 | 8.000 | 610 | 8.000 | 815 | 8.000 | 1020 | 8.000 | 1225 | 8.000 |
| 205 | 8.000 | 410 | 8.000 | 615 | 8.000 | 820 | 8.000 | 1025 | 8.000 | 1230 | 8.000 |

## 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1235 | 8.000 | 1270 | 8.000 | 1305 | 8.000 | 1340 | 8.000 | 1375 | 8.000 | 1410 | 8.000 |
| 1240 | 8.000 | 1275 | 8.000 | 1310 | 8.000 | 1345 | 8.000 | 1380 | 8.000 | 1415 | 8.000 |
| 1245 | 8.000 | 1280 | 8.000 | 1315 | 8.000 | 1350 | 8.000 | 1385 | 8.000 | 1420 | 8.000 |
| 1250 | 8.000 | 1285 | 8.000 | 1320 | 8.000 | 1355 | 8.000 | 1390 | 8.000 | 1425 | 8.000 |
| 1255 | 8.000 | 1290 | 8.000 | 1325 | 8.000 | 1360 | 8.000 | 1395 | 8.000 | 1430 | 8.000 |
| 1260 | 8.000 | 1295 | 8.000 | 1330 | 8.000 | 1365 | 8.000 | 1400 | 8.000 | 1435 | 8.000 |
| 1265 | 8.000 | 1300 | 8.000 | 1335 | 8.000 | 1370 | 8.000 | 1405 | 8.000 | 1440 | 8.000 |

## Simulation Criteria for Storm

| | | | |
|---|---|---|---|
| Volumetric Runoff Coeff | 0.750 | Additional Flow - % of Total Flow | 0.000 |
| Areal Reduction Factor | 1.000 | MADD Factor * 10m³/ha Storage | 2.000 |
| Hot Start (mins) | 0 | Inlet Coeffiecient | 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 | 2 |
| Number of Online Controls | 2 | Number of Time/Area Diagrams | 38 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

## Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Profile Type | Summer |
| Return Period (years) | 2 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 19.100 | Storm Duration (mins) | 30 |
| Ratio R | 0.350 | | |

## Online Controls for Storm

### Hydro-Brake® Optimum Manhole: S8, DS/PN: S1.007, Volume (m³): 9.3

| | |
|---|---|
| Unit Reference | MD-SHE-0187-2000-1750-2000 |
| Design Head (m) | 1.750 |
| Design Flow (l/s) | 20.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 187 |
| Invert Level (m) | 8.840 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1800 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.750 | 19.9 |
| Flush-Flo™ | 0.515 | 19.9 |
| Kick-Flo® | 1.107 | 16.0 |
| Mean Flow over Head Range | - | 17.3 |

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) |
|---|---|---|---|---|---|---|---|
| 0.100 | 6.6 | 1.200 | 16.7 | 3.000 | 25.8 | 7.000 | 38.8 |
| 0.200 | 17.1 | 1.400 | 17.9 | 3.500 | 27.8 | 7.500 | 40.1 |
| 0.300 | 19.0 | 1.600 | 19.1 | 4.000 | 29.6 | 8.000 | 41.4 |
| 0.400 | 19.7 | 1.800 | 20.2 | 4.500 | 31.3 | 8.500 | 42.6 |
| 0.500 | 19.9 | 2.000 | 21.2 | 5.000 | 33.0 | 9.000 | 43.8 |
| 0.600 | 19.8 | 2.200 | 22.2 | 5.500 | 34.5 | 9.500 | 45.0 |
| 0.800 | 19.2 | 2.400 | 23.2 | 6.000 | 36.0 | | |
| 1.000 | 17.7 | 2.600 | 24.1 | 6.500 | 37.4 | | |

### Hydro-Brake® Optimum Manhole: S15, DS/PN: S1.014, Volume (m³): 20.4

| | |
|---|---|
| Unit Reference | MD-SHE-0212-2400-1250-2400 |
| Design Head (m) | 1.250 |
| Design Flow (l/s) | 24.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 212 |
| Invert Level (m) | 7.450 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1500 |

## Hydro-Brake® Optimum Manhole: S15, DS/PN: S1.014, Volume (m³): 20.4

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.250 | 24.0 |
| Flush-Flo™ | 0.397 | 24.0 |
| Kick-Flo® | 0.867 | 20.2 |
| Mean Flow over Head Range | - | 20.4 |

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 | 7.2 | 1.200 | 23.5 | 3.000 | 36.5 | 7.000 | 55.0 |
| 0.200 | 20.5 | 1.400 | 25.3 | 3.500 | 39.3 | 7.500 | 56.9 |
| 0.300 | 23.7 | 1.600 | 27.0 | 4.000 | 41.9 | 8.000 | 58.7 |
| 0.400 | 24.0 | 1.800 | 28.6 | 4.500 | 44.4 | 8.500 | 60.4 |
| 0.500 | 23.8 | 2.000 | 30.0 | 5.000 | 46.7 | 9.000 | 62.1 |
| 0.600 | 23.4 | 2.200 | 31.4 | 5.500 | 48.9 | 9.500 | 63.8 |
| 0.800 | 21.6 | 2.400 | 32.8 | 6.000 | 51.0 | | |
| 1.000 | 21.6 | 2.600 | 34.1 | 6.500 | 53.1 | | |

## Storage Structures for Storm

### Tank or Pond Manhole: S8, DS/PN: S1.007

Invert Level (m) 8.840

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|---|---|
| 0.000 | 350.0 | 0.700 | 350.0 | 1.400 | 350.0 | 2.100 | 350.0 |
| 0.100 | 350.0 | 0.800 | 350.0 | 1.500 | 350.0 | 2.200 | 350.0 |
| 0.200 | 350.0 | 0.900 | 350.0 | 1.600 | 350.0 | 2.300 | 350.0 |
| 0.300 | 350.0 | 1.000 | 350.0 | 1.700 | 350.0 | 2.400 | 350.0 |
| 0.400 | 350.0 | 1.100 | 350.0 | 1.800 | 350.0 | 2.500 | 350.0 |
| 0.500 | 350.0 | 1.200 | 350.0 | 1.900 | 350.0 | | |
| 0.600 | 350.0 | 1.300 | 350.0 | 2.000 | 350.0 | | |

### Tank or Pond Manhole: S15, DS/PN: S1.014

Invert Level (m) 7.500

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|---|---|
| 0.000 | 410.1 | 0.700 | 1930.6 | 1.400 | 2832.8 | 2.100 | 6309.2 |
| 0.100 | 441.6 | 0.800 | 2056.8 | 1.500 | 2965.3 | 2.200 | 6309.2 |
| 0.200 | 466.9 | 0.900 | 2189.3 | 1.600 | 6309.2 | 2.300 | 6309.2 |
| 0.300 | 504.7 | 1.000 | 2315.5 | 1.700 | 6309.2 | 2.400 | 6309.2 |
| 0.400 | 542.6 | 1.100 | 2429.0 | 1.800 | 6309.2 | 2.500 | 6309.2 |
| 0.500 | 1678.2 | 1.200 | 2555.2 | 1.900 | 6309.2 | | |
| 0.600 | 1804.4 | 1.300 | 2706.6 | 2.000 | 6309.2 | | |

### Time Area Diagram at Pipe Number S1.000 for Storm

Total Area (ha) 0.145

| Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 8 | 12 | 0.030 | 16 | 20 | 0.020 |
| 4 | 8 | 0.035 | 12 | 16 | 0.025 | | | |

### Time Area Diagram at Pipe Number S2.000 for Storm

Total Area (ha) 0.145

| Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 8 | 12 | 0.030 | 16 | 20 | 0.030 |
| 4 | 8 | 0.025 | 12 | 16 | 0.030 | | | |

## Time Area Diagram at Pipe Number S1.001 for Storm

Total Area (ha) 0.120

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.045 | 4 | 8 | 0.030 | 8 | 12 | 0.030 | 12 | 16 | 0.015 |

## Time Area Diagram at Pipe Number S3.000 for Storm

Total Area (ha) 0.135

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.040 | 8 | 12 | 0.030 | 16 | 20 | 0.015 |
| 4 | 8 | 0.030 | 12 | 16 | 0.020 | | | |

## Time Area Diagram at Pipe Number S1.002 for Storm

Total Area (ha) 0.080

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.040 | 4 | 8 | 0.040 |

## Time Area Diagram at Pipe Number S1.003 for Storm

Total Area (ha) 0.145

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.040 | 8 | 12 | 0.030 | 16 | 20 | 0.020 |
| 4 | 8 | 0.030 | 12 | 16 | 0.025 | | | |

## Time Area Diagram at Pipe Number S4.000 for Storm

Total Area (ha) 0.105

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.045 | 4 | 8 | 0.030 | 8 | 12 | 0.030 |

## Time Area Diagram at Pipe Number S4.001 for Storm

Total Area (ha) 0.125

## Time Area Diagram at Pipe Number S4.001 for Storm

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.050 | 4 | 8 | 0.035 | 8 | 12 | 0.030 | 12 | 16 | 0.010 |

## Time Area Diagram at Pipe Number S4.002 for Storm

Total Area (ha) 0.060

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 4 | 8 | 0.030 |

## Time Area Diagram at Pipe Number S1.004 for Storm

Total Area (ha) 0.060

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 4 | 8 | 0.030 |

## Time Area Diagram at Pipe Number S1.005 for Storm

Total Area (ha) 0.105

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.045 | 4 | 8 | 0.030 | 8 | 12 | 0.030 |

## Time Area Diagram at Pipe Number S1.006 for Storm

Total Area (ha) 0.115

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.040 | 4 | 8 | 0.030 | 8 | 12 | 0.030 | 12 | 16 | 0.015 |

## Time Area Diagram at Pipe Number S1.007 for Storm

Total Area (ha) 0.030

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.030 |

## Time Area Diagram at Pipe Number S1.008 for Storm

Total Area (ha) 0.110

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 8 | 12 | 0.025 | 16 | 20 | 0.010 |
| 4 | 8 | 0.025 | 12 | 16 | 0.020 | | | |

## Time Area Diagram at Pipe Number S1.009 for Storm

Total Area (ha) 0.170

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.040 | 8 | 12 | 0.030 | 16 | 20 | 0.025 |
| 4 | 8 | 0.030 | 12 | 16 | 0.025 | 20 | 24 | 0.020 |

## Time Area Diagram at Pipe Number S1.010 for Storm

Total Area (ha) 0.085

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 4 | 8 | 0.025 | 8 | 12 | 0.020 | 12 | 16 | 0.010 |

## Time Area Diagram at Pipe Number S5.000 for Storm

Total Area (ha) 0.100

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 4 | 8 | 0.025 | 8 | 12 | 0.020 | 12 | 16 | 0.020 |

## Time Area Diagram at Pipe Number S5.001 for Storm

Total Area (ha) 0.080

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 4 | 8 | 0.025 | 8 | 12 | 0.020 |

## Time Area Diagram at Pipe Number S5.002 for Storm

Total Area (ha) 0.055

Time Area Diagram at Pipe Number S5.002 for Storm

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.020 | 8 | 12 | 0.010 |

Time Area Diagram at Pipe Number S6.000 for Storm

Total Area (ha) 0.135

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 8 | 12 | 0.030 | 16 | 20 | 0.020 |
| 4 | 8 | 0.030 | 12 | 16 | 0.020 | | | |

Time Area Diagram at Pipe Number S5.003 for Storm

Total Area (ha) 0.050

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.020 | 4 | 8 | 0.020 | 8 | 12 | 0.010 |

Time Area Diagram at Pipe Number S5.004 for Storm

Total Area (ha) 0.080

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 4 | 8 | 0.025 | 8 | 12 | 0.020 |

Time Area Diagram at Pipe Number S5.005 for Storm

Total Area (ha) 0.030

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.030 |

Time Area Diagram at Pipe Number S5.007 for Storm

Total Area (ha) 0.050

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 4 | 8 | 0.020 |

## Time Area Diagram at Pipe Number S5.008 for Storm

Total Area (ha) 0.125

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 8 | 12 | 0.025 | 16 | 20 | 0.020 |
| 4 | 8 | 0.030 | 12 | 16 | 0.020 | | | |

## Time Area Diagram at Pipe Number S1.011 for Storm

Total Area (ha) 0.040

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.015 |

## Time Area Diagram at Pipe Number S1.012 for Storm

Total Area (ha) 0.125

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 8 | 12 | 0.030 | 16 | 20 | 0.010 |
| 4 | 8 | 0.030 | 12 | 16 | 0.020 | | | |

## Time Area Diagram at Pipe Number S7.000 for Storm

Total Area (ha) 0.190

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.045 | 8 | 12 | 0.035 | 16 | 20 | 0.030 |
| 4 | 8 | 0.045 | 12 | 16 | 0.035 | | | |

## Time Area Diagram at Pipe Number S7.001 for Storm

Total Area (ha) 0.095

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 4 | 8 | 0.030 | 8 | 12 | 0.030 |

## Time Area Diagram at Pipe Number S7.002 for Storm

Total Area (ha) 0.055

## Time Area Diagram at Pipe Number S7.002 for Storm

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.020 | 8 | 12 | 0.010 |

## Time Area Diagram at Pipe Number S7.003 for Storm

Total Area (ha) 0.095

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.035 | 4 | 8 | 0.025 | 8 | 12 | 0.020 | 12 | 16 | 0.015 |

## Time Area Diagram at Pipe Number S8.000 for Storm

Total Area (ha) 0.075

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.020 | 8 | 12 | 0.015 | 12 | 16 | 0.015 |

## Time Area Diagram at Pipe Number S7.004 for Storm

Total Area (ha) 0.040

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.015 |

## Time Area Diagram at Pipe Number S7.005 for Storm

Total Area (ha) 0.075

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.020 | 8 | 12 | 0.015 | 12 | 16 | 0.015 |

## Time Area Diagram at Pipe Number S9.000 for Storm

Total Area (ha) 0.205

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.045 | 8 | 12 | 0.035 | 16 | 20 | 0.025 | 24 | 28 | 0.010 |
| 4 | 8 | 0.035 | 12 | 16 | 0.030 | 20 | 24 | 0.025 | | | |

## Time Area Diagram at Pipe Number S7.006 for Storm

Total Area (ha) 0.065

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.025 | 4 | 8 | 0.020 | 8 | 12 | 0.020 |

## Time Area Diagram at Pipe Number S7.007 for Storm

Total Area (ha) 0.045

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.020 | 4 | 8 | 0.015 | 8 | 12 | 0.010 |

## Time Area Diagram at Pipe Number S7.008 for Storm

Total Area (ha) 0.070

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.030 | 4 | 8 | 0.020 | 8 | 12 | 0.015 | 12 | 16 | 0.005 |

## 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 Storage Structures | 2 |
| Number of Online Controls | 2 | Number of Time/Area Diagrams | 38 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

### Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | | FSR | Ratio R 0.350 |
| Region | England and Wales | Cv (Summer) | 0.750 |
| M5-60 (mm) | 19.100 | Cv (Winter) | 0.840 |

| | |
|---|---|
| Margin for Flood Risk Warning (mm) | 150.0 |
| Analysis Timestep | 2.5 Second Increment (Extended) |
| DTS Status | ON |
| DVD Status | ON |
| Inertia Status | ON |

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |
| Return Period(s) (years) | 100 |
| Climate Change (%) | 40 |

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 30 Winter | 100 | +40% | 100/15 Winter | | | |
| S2.000 | S2 | 30 Winter | 100 | +40% | 100/15 Summer | | | |
| S1.001 | S2 | 180 Winter | 100 | +40% | 100/15 Summer | | | |
| S3.000 | S4 | 180 Winter | 100 | +40% | 100/30 Winter | | | |
| S1.002 | S3 | 180 Winter | 100 | +40% | 100/15 Summer | | | |
| S1.003 | S4 | 240 Winter | 100 | +40% | 100/15 Summer | | | |
| S4.000 | S7 | 180 Winter | 100 | +40% | 100/30 Winter | | | |
| S4.001 | S8 | 180 Winter | 100 | +40% | 100/15 Winter | | | |
| S4.002 | S9 | 180 Winter | 100 | +40% | 100/15 Summer | | | |
| S1.004 | S5 | 180 Winter | 100 | +40% | 100/15 Summer | | | |
| S1.005 | S6 | 240 Winter | 100 | +40% | 100/15 Summer | | | |
| S1.006 | S7 | 240 Winter | 100 | +40% | 100/15 Summer | | | |
| S1.007 | S8 | 240 Winter | 100 | +40% | 100/15 Summer | | | |
| S1.008 | S14 | 1440 Winter | 100 | +40% | 100/480 Winter | | | |
| S1.009 | S9 | 1440 Winter | 100 | +40% | 100/180 Winter | | | |
| S1.010 | S10 | 1440 Winter | 100 | +40% | 100/30 Summer | | | |
| S5.000 | S15 | 30 Winter | 100 | +40% | | | | |
| S5.001 | S16 | 30 Winter | 100 | +40% | 100/15 Winter | | | |

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

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | S1 | 11.030 | 0.370 | 0.000 | 0.46 | | 37.0 | SURCHARGED | |
| S2.000 | S2 | 11.012 | 0.582 | 0.000 | 0.59 | | 39.3 | SURCHARGED | |
| S1.001 | S2 | 10.999 | 0.564 | 0.000 | 0.39 | | 55.8 | SURCHARGED | |
| S3.000 | S4 | 10.971 | 0.321 | 0.000 | 0.15 | | 19.1 | SURCHARGED | |
| S1.002 | S3 | 10.961 | 0.796 | 0.000 | 0.34 | | 75.2 | SURCHARGED | |
| S1.003 | S4 | 10.899 | 0.994 | 0.000 | 0.35 | | 76.5 | SURCHARGED | |
| S4.000 | S7 | 10.884 | 0.184 | 0.000 | 0.19 | | 15.1 | SURCHARGED | |
| S4.001 | S8 | 10.880 | 0.495 | 0.000 | 0.24 | | 33.1 | SURCHARGED | |
| S4.002 | S9 | 10.872 | 1.227 | 0.000 | 0.50 | | 39.3 | SURCHARGED | |
| S1.004 | S5 | 10.868 | 1.248 | 0.000 | 0.83 | | 136.0 | SURCHARGED | |
| S1.005 | S6 | 10.786 | 1.276 | 0.000 | 0.74 | | 122.5 | SURCHARGED | |
| S1.006 | S7 | 10.703 | 1.273 | 0.000 | 0.75 | | 134.9 | SURCHARGED | |
| S1.007 | S8 | 10.617 | 1.477 | 0.000 | 0.24 | | 20.1 | SURCHARGED | |
| S1.008 | S14 | 8.965 | 0.042 | 0.000 | 0.30 | | 24.5 | SURCHARGED | |
| S1.009 | S9 | 8.938 | 0.158 | 0.000 | 0.18 | | 31.2 | SURCHARGED | |
| S1.010 | S10 | 8.922 | 0.447 | 0.000 | 0.30 | | 34.0 | SURCHARGED | |
| S5.000 | S15 | 10.255 | -0.105 | 0.000 | 0.56 | | 30.5 | OK | |
| S5.001 | S16 | 10.132 | 0.122 | 0.000 | 0.75 | | 55.5 | SURCHARGED | |

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

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| S5.002 | S17 | 30 Winter | 100 | +40% | 100/15 Summer | | | |
| S6.000 | S18 | 30 Winter | 100 | +40% | 100/15 Winter | | | |
| S5.003 | S18 | 30 Winter | 100 | +40% | 100/15 Summer | | | |
| S5.004 | S19 | 360 Winter | 100 | +40% | 100/15 Summer | | | |
| S5.005 | S20 | 480 Winter | 100 | +40% | 100/30 Winter | | | |
| S5.006 | S21 | 480 Winter | 100 | +40% | 100/30 Winter | | | |
| S5.007 | S22 | 480 Winter | 100 | +40% | 100/30 Winter | | | |
| S5.008 | S23 | 1440 Winter | 100 | +40% | 100/15 Winter | | | |
| S1.011 | S11 | 1440 Winter | 100 | +40% | 100/120 Winter | | | |
| S1.012 | S12 | 1440 Winter | 100 | +40% | 100/60 Winter | | | |
| S1.013 | S13 | 1440 Winter | 100 | +40% | 100/60 Summer | | | |
| S7.000 | S29 | 30 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.001 | S30 | 30 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.002 | S31 | 30 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.003 | S32 | 30 Winter | 100 | +40% | 100/15 Summer | | | |
| S8.000 | S33 | 30 Winter | 100 | +40% | | | | |
| S7.004 | S33 | 1440 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.005 | S35 | 1440 Winter | 100 | +40% | 100/15 Summer | | | |
| S9.000 | S35 | 30 Winter | 100 | +40% | | | | |
| S7.006 | S34 | 1440 Winter | 100 | +40% | 100/30 Summer | | | |
| S7.007 | S38 | 1440 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.008 | S35 | 1440 Winter | 100 | +40% | 100/15 Summer | | | |
| S1.014 | S15 | 1440 Winter | 100 | +40% | 100/15 Summer | | | |

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| S5.002 | S17 | 9.764 | 0.454 | 0.000 | 1.18 | | 71.2 | SURCHARGED | |
| S6.000 | S18 | 9.227 | 0.097 | 0.000 | 0.42 | | 36.6 | SURCHARGED | |
| S5.003 | S18 | 9.111 | 0.201 | 0.000 | 1.06 | | 121.3 | SURCHARGED | |
| S5.004 | S19 | 9.031 | 0.266 | 0.000 | 0.38 | | 43.2 | SURCHARGED | |
| S5.005 | S20 | 8.939 | 0.234 | 0.000 | 0.27 | | 36.8 | SURCHARGED | |
| S5.006 | S21 | 8.932 | 0.267 | 0.000 | 0.23 | | 36.8 | SURCHARGED | |
| S5.007 | S22 | 8.873 | 0.296 | 0.000 | 0.24 | | 40.1 | SURCHARGED | |
| S5.008 | S23 | 8.842 | 0.407 | 0.000 | 0.15 | | 22.9 | SURCHARGED | |
| S1.011 | S11 | 8.837 | 0.267 | 0.000 | 0.11 | | 55.9 | SURCHARGED | |
| S1.012 | S12 | 8.832 | 0.517 | 0.000 | 0.17 | | 60.2 | SURCHARGED | |
| S1.013 | S13 | 8.830 | 0.555 | 0.000 | 0.12 | | 60.0 | SURCHARGED | |
| S7.000 | S29 | 10.289 | 0.914 | 0.000 | 0.91 | | 51.4 | SURCHARGED | |
| S7.001 | S30 | 10.085 | 0.990 | 0.000 | 1.35 | | 76.2 | SURCHARGED | |
| S7.002 | S31 | 9.544 | 0.669 | 0.000 | 1.12 | | 90.1 | SURCHARGED | |
| S7.003 | S32 | 9.183 | 0.618 | 0.000 | 1.47 | | 115.7 | SURCHARGED | |
| S8.000 | S33 | 9.303 | -0.147 | 0.000 | 0.26 | | 23.0 | OK | |
| S7.004 | S33 | 8.828 | 0.493 | 0.000 | 0.17 | | 16.1 | SURCHARGED | |
| S7.005 | S35 | 8.827 | 0.580 | 0.000 | 0.19 | | 18.3 | SURCHARGED | |
| S9.000 | S35 | 8.868 | -0.182 | 0.000 | 0.33 | | 46.4 | OK | |

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

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume ($m^3$) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| S7.006 | S34 | 8.827 | 0.517 | 0.000 | 0.08 | | 26.2 | SURCHARGED | |
| S7.007 | S38 | 8.826 | 0.621 | 0.000 | 0.09 | | 27.5 | SURCHARGED | |
| S7.008 | S35 | 8.826 | 0.726 | 0.000 | 0.11 | | 29.5 | SURCHARGED | |
| S1.014 | S15 | 8.825 | 1.150 | 0.000 | 0.43 | | 25.1 | SURCHARGED | |