## Design Settings

| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Maximum Time of Concentration (mins) | 30.00 |
| Return Period (years) | 20 | Maximum Rainfall (mm/hr) | 50.0 |
| Additional Flow (%) | 0 | Minimum Velocity (m/s) | 0.75 |
| FSR Region | England and Wales | Connection Type | Level Soffits |
| M5-60 (mm) | 20.000 | Minimum Backdrop Height (m) | 0.500 |
| Ratio-R | 0.300 | Preferred Cover Depth (m) | 1.200 |
| CV | 0.750 | Include Intermediate Ground | ✓ |
| Time of Entry (mins) | 5.00 | Enforce best practice design rules | ✓ |

## Nodes

| Name | Area (ha) | T of E (mins) | Cover Level (m) | Diameter (mm) | Easting (m) | Northing (m) | Depth (m) |
|---|---|---|---|---|---|---|---|
| 1 | 0.310 | 5.00 | 78.141 | 20 | 373861.824 | 438462.689 | 1.575 |
| 2 | 0.000 | 5.00 | 78.283 | 1350 | 373850.080 | 438421.935 | 2.146 |
| 3 | 0.020 | 5.00 | 78.332 | 2100 | 373847.784 | 438415.822 | 2.382 |
| 4 | 0.041 | 5.00 | 77.277 | 2700 | 373819.543 | 438415.325 | 4.178 |
| 5 | 0.035 | 5.00 | 75.378 | 2700 | 373781.216 | 438425.101 | 2.378 |
| 6 | | | 75.131 | 1200 | 373775.381 | 438428.949 | 2.326 |

## Links

| Name | US Node | DS Node | Length (m) | ks (mm) / n | US IL (m) | DS IL (m) | Fall (m) | Slope (1:X) | Dia (mm) | T of C (mins) | Rain (mm/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 1 | 2 | 42.412 | 0.600 | 76.566 | 76.137 | 0.429 | 98.9 | 150 | 5.70 | 50.0 |
| 1.001 | 2 | 3 | 6.531 | 0.600 | 76.137 | 75.950 | 0.187 | 35.0 | 150 | 5.76 | 50.0 |
| 1.002 | 3 | 4 | 28.245 | 0.600 | 75.950 | 75.143 | 0.807 | 35.0 | 150 | 6.04 | 50.0 |
| 1.003 | 4 | 5 | 39.554 | 0.600 | 73.099 | 73.000 | 0.099 | 400.0 | 900 | 6.46 | 50.0 |
| 1.004 | 5 | 6 | 6.989 | 0.600 | 73.000 | 72.805 | 0.195 | 35.8 | 150 | 6.53 | 50.0 |

| Name | Vel (m/s) | Cap (l/s) | Flow (l/s) | US Depth (m) | DS Depth (m) | Σ Area (ha) | Σ Add Inflow (l/s) |
|---|---|---|---|---|---|---|---|
| 1.000 | 1.010 | 17.9 | 42.0 | 1.425 | 1.996 | 0.310 | 0.0 |
| 1.001 | 1.707 | 30.2 | 42.0 | 1.996 | 2.232 | 0.310 | 0.0 |
| 1.002 | 1.707 | 30.2 | 44.7 | 2.232 | 1.984 | 0.330 | 0.0 |
| 1.003 | 1.560 | 992.5 | 50.3 | 3.278 | 1.478 | 0.371 | 0.0 |
| 1.004 | 1.686 | 29.8 | 55.0 | 2.228 | 2.176 | 0.406 | 0.0 |

## Pipeline Schedule

| Link | Length (m) | Slope (1:X) | Dia (mm) | Link Type | US CL (m) | US IL (m) | US Depth (m) | DS CL (m) | DS IL (m) | DS Depth (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.000 | 42.412 | 98.9 | 150 | Circular | 78.141 | 76.566 | 1.425 | 78.283 | 76.137 | 1.996 |
| 1.001 | 6.531 | 35.0 | 150 | Circular | 78.283 | 76.137 | 1.996 | 78.332 | 75.950 | 2.232 |
| 1.002 | 28.245 | 35.0 | 150 | Circular | 78.332 | 75.950 | 2.232 | 77.277 | 75.143 | 1.984 |
| 1.003 | 39.554 | 400.0 | 900 | Circular | 77.277 | 73.099 | 3.278 | 75.378 | 73.000 | 1.478 |

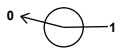
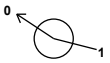
| Link | US Node | Dia (mm) | Node Type | MH Type | DS Node | Dia (mm) | Node Type | MH Type |
|---|---|---|---|---|---|---|---|---|
| 1.000 | 1 | 20 | Junction | | 2 | 1350 | Manhole | Adoptable |
| 1.001 | 2 | 1350 | Manhole | Adoptable | 3 | 2100 | Manhole | Adoptable |
| 1.002 | 3 | 2100 | Manhole | Adoptable | 4 | 2700 | Manhole | Adoptable |
| 1.003 | 4 | 2700 | Manhole | Adoptable | 5 | 2700 | Manhole | Adoptable |

## Pipeline Schedule

| Link | Length (m) | Slope (1:X) | Dia (mm) | Link Type | US CL (m) | US IL (m) | US Depth (m) | DS CL (m) | DS IL (m) | DS Depth (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.004 | 6.989 | 35.8 | 150 | Circular | 75.378 | 73.000 | 2.228 | 75.131 | 72.805 | 2.176 |

| Link | US Node | Dia (mm) | Node Type | MH Type | DS Node | Dia (mm) | Node Type | MH Type |
|---|---|---|---|---|---|---|---|---|
| 1.004 | 5 | 2700 | Manhole | Adoptable | 6 | 1200 | Manhole | Adoptable |

## Manhole Schedule

| Node | Easting (m) | Northing (m) | CL (m) | Depth (m) | Dia (mm) | Connections | Link | IL (m) | Dia (mm) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 373861.824 | 438462.689 | 78.141 | 1.575 | 20 |  | 0 | 1.000 | 76.566 | 150 |
| 2 | 373850.080 | 438421.935 | 78.283 | 2.146 | 1350 |  | 1 | 1.000 | 76.137 | 150 |
| | | | | | | | 0 | 1.001 | 76.137 | 150 |
| 3 | 373847.784 | 438415.822 | 78.332 | 2.382 | 2100 |  | 1 | 1.001 | 75.950 | 150 |
| | | | | | | | 0 | 1.002 | 75.950 | 150 |
| 4 | 373819.543 | 438415.325 | 77.277 | 4.178 | 2700 |  | 1 | 1.002 | 75.143 | 150 |
| | | | | | | | 0 | 1.003 | 73.099 | 900 |
| 5 | 373781.216 | 438425.101 | 75.378 | 2.378 | 2700 |  | 1 | 1.003 | 73.000 | 900 |
| | | | | | | | 0 | 1.004 | 73.000 | 150 |
| 6 | 373775.381 | 438428.949 | 75.131 | 2.326 | 1200 |  | 1 | 1.004 | 72.805 | 150 |

## Simulation Settings

| | | | |
|---|---|---|---|
| Rainfall Methodology | FSR | Skip Steady State | x |
| FSR Region | England and Wales | Drain Down Time (mins) | 240 |
| M5-60 (mm) | 20.000 | Additional Storage (m³/ha) | 20.0 |
| Ratio-R | 0.400 | Check Discharge Rate(s) | x |
| Summer CV | 0.750 | Check Discharge Volume | x |
| Analysis Speed | Normal | | |

### Storm Durations

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

| Return Period (years) | Climate Change (CC %) | Additional Area (A %) | Additional Flow (Q %) |
|---|---|---|---|
| 1 | 0 | 0 | 0 |
| 30 | 40 | 0 | 0 |
| 100 | 50 | 0 | 0 |

## Node 5 Online Hydro-Brake® Control

| | | | |
|---|---|---|---|
| Flap Valve | x | Objective | (HE) Minimise upstream storage |
| Replaces Downstream Link | ✓ | Sump Available | ✓ |
| Invert Level (m) | 73.000 | Product Number | CTL-SHE-0055-2000-2400-2000 |
| Design Depth (m) | 2.400 | Min Outlet Diameter (m) | 0.075 |
| Design Flow (l/s) | 2.0 | Min Node Diameter (mm) | 1200 |

## Node 2 Online Orifice Control

| | | | | | |
|---|---|---|---|---|---|
| Flap Valve | x | Design Depth (m) | 0.800 | Discharge Coefficient | 0.600 |
| Replaces Downstream Link | ✓ | Design Flow (l/s) | 2.0 | | |
| Invert Level (m) | 76.137 | Diameter (m) | 0.020 | | |

## Node 1 Depth/Area Storage Structure

| | | | | | |
|---|---|---|---|---|---|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 1.0 | Invert Level (m) | 76.566 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity | 1.00 | Time to half empty (mins) | |

| Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) | Depth (m) | Area (m²) | Inf Area (m²) |
|---|---|---|---|---|---|---|---|---|
| 0.000 | 379.5 | 0.0 | 0.800 | 379.5 | 0.0 | 0.801 | 0.0 | 0.0 |

**Results for 1 year Critical Storm Duration. Lowest mass balance: 98.20%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 600 minute summer | 1 | 525 | 76.674 | 0.108 | 5.9 | 41.3910 | 0.0000 | OK |
| 600 minute summer | 2 | 525 | 76.674 | 0.537 | 0.9 | 0.7678 | 0.0000 | SURCHARGED |
| 15 minute summer | 3 | 11 | 75.981 | 0.031 | 2.8 | 0.1118 | 0.0000 | OK |
| 240 minute summer | 4 | 172 | 73.277 | 0.178 | 2.9 | 1.0543 | 0.0000 | OK |
| 240 minute summer | 5 | 176 | 73.276 | 0.276 | 3.1 | 1.6618 | 0.0000 | SURCHARGED |
| 15 minute summer | 6 | 1 | 72.805 | 0.000 | 1.2 | 0.0000 | 0.0000 | OK |

| Link Event (Upstream Depth) | US Node | Link | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|---|---|---|---|---|---|---|---|---|
| 600 minute summer | 1 | 1.000 | 2 | 0.9 | 0.151 | 0.053 | 0.6611 | |
| 600 minute summer | 2 | Orifice | 3 | 0.6 | | | | |
| 15 minute summer | 3 | 1.002 | 4 | 2.7 | 1.055 | 0.090 | 0.0727 | |
| 240 minute summer | 4 | 1.003 | 5 | 2.0 | 0.107 | 0.002 | 5.0091 | |
| 240 minute summer | 5 | Hydro-Brake® | 6 | 1.2 | | | | 27.4 |

**Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 98.20%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 960 minute summer | 1 | 960 | 76.978 | 0.412 | 12.9 | 157.9003 | 0.0000 | SURCHARGED |
| 960 minute summer | 2 | 960 | 76.977 | 0.840 | 0.9 | 1.2020 | 0.0000 | SURCHARGED |
| 15 minute summer | 3 | 11 | 76.009 | 0.059 | 9.6 | 0.2138 | 0.0000 | OK |
| 360 minute summer | 4 | 360 | 74.027 | 0.928 | 6.1 | 5.4957 | 0.0000 | SURCHARGED |
| 360 minute summer | 5 | 360 | 74.027 | 1.027 | 5.3 | 6.1826 | 0.0000 | SURCHARGED |
| 15 minute summer | 6 | 1 | 72.805 | 0.000 | 1.2 | 0.0000 | 0.0000 | OK |

| Link Event (Upstream Depth) | US Node | Link | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|---|---|---|---|---|---|---|---|---|
| 960 minute summer | 1 | 1.000 | 2 | 0.9 | 0.181 | 0.049 | 0.7467 | |
| 960 minute summer | 2 | Orifice | 3 | 0.8 | | | | |
| 15 minute summer | 3 | 1.002 | 4 | 9.4 | 1.492 | 0.312 | 0.1784 | |
| 360 minute summer | 4 | 1.003 | 5 | 2.1 | 0.136 | 0.002 | 25.0683 | |
| 360 minute summer | 5 | Hydro-Brake® | 6 | 1.4 | | | | 41.6 |

**Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 98.20%**

| Node Event | US Node | Peak (mins) | Level (m) | Depth (m) | Inflow (l/s) | Node Vol (m³) | Flood (m³) | Status |
|---|---|---|---|---|---|---|---|---|
| 1440 minute summer | 1 | 1440 | 77.162 | 0.596 | 12.5 | 228.4781 | 0.0000 | SURCHARGED |
| 1440 minute summer | 2 | 1440 | 77.161 | 1.024 | 0.8 | 1.4651 | 0.0000 | SURCHARGED |
| 15 minute summer | 3 | 10 | 76.021 | 0.071 | 13.3 | 0.2576 | 0.0000 | OK |
| 360 minute summer | 4 | 320 | 75.174 | 2.075 | 8.4 | 12.2900 | 0.0000 | SURCHARGED |
| 360 minute summer | 5 | 320 | 75.174 | 2.174 | 7.1 | 13.0893 | 0.0000 | FLOOD RISK |
| 15 minute summer | 6 | 1 | 72.805 | 0.000 | 1.2 | 0.0000 | 0.0000 | OK |

| Link Event (Upstream Depth) | US Node | Link | DS Node | Outflow (l/s) | Velocity (m/s) | Flow/Cap | Link Vol (m³) | Discharge Vol (m³) |
|---|---|---|---|---|---|---|---|---|
| 1440 minute summer | 1 | 1.000 | 2 | 0.8 | 0.179 | 0.047 | 0.7467 | |
| 1440 minute summer | 2 | Orifice | 3 | 0.8 | | | | |
| 15 minute summer | 3 | 1.002 | 4 | 13.0 | 1.622 | 0.432 | 0.2270 | |
| 360 minute summer | 4 | 1.003 | 5 | 2.7 | 0.131 | 0.003 | 25.0683 | |
| 360 minute summer | 5 | Hydro-Brake® | 6 | 1.9 | | | | 53.6 |