NOTES

1. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
2. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES.
3. CULVERTED DITCH LEVELS HAVE BEEN INTERPOLATED FROM SURVEY UNDERTAKEN BY LIGHTSOURCE SURVEYS LTD IN APRIL 2018
4. PROPOSALS ARE INDICATIVE ONLY TO DEMONSTRATE DRAINAGE STRATEGY AND ARE SUBJECT TO EVOLVE THROUGH DETAILED DESIGN
5. THE LEVELS SHOWN ON THIS DRAWING ARE PRELIMINARY AND SUBJECT TO CHANGE.
6. LIGHTING DESIGN IS INDICATIVE AND SUBJECT TO CHANGE AT DETAILED DESIGN.

LEGEND

- SITE BOUNDARY
- PROPOSED FOUL SEWER & MANHOLE
- PROPOSED SURFACE WATER SEWER & MANHOLE
- VORTEX FLOW CONTROL
- PROPOSED PERMEABLE PAVING
- PROPOSED HEADWALL
- INDICATIVE ATTENUATION BASIN
- BASIN EARTHWORKS EXTENT
- INDICATIVE SWALE

FOR PLANNING PURPOSES ONLY

| Rev | Amendments | Drn | Chk | App | Date |
|---|---|---|---|---|---|
| A | UPDATED TO CLIENT COMMENTS | NA | JH | GG | 15.12.20 |


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Job Title: HORTON HEATH, EASTLEIGH

Drawing Title: DRAINAGE STRATEGY

Client: EASTLEIGH BOROUGH COUNCIL

| Scale | Date | Designed |
|---|---|---|
| 1:500 @A0 | NOV 20 | NA |
| **Drawn** | **Checked** | **Approved** |
| JA | JW | JH |
| **Job No** | **Drawing No** | **Rev** |
| 19-367 | 19-367/001 | A |


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P:\19-367 - Horton Heath, Eastleigh\Tech\Acad\Drawings\000 Series\19-367-001 Preliminary Engineering Layout.dwg

## 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) | 100 | PIMP (%) | 100 |
| M5-60 (mm) | 19.900 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.350 | Minimum Backdrop Height (m) | 0.200 |
| Maximum Rainfall (mm/hr) | 50 | Maximum Backdrop Height (m) | 1.500 |
| 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 Soffits

### Time Area Diagram for Storm

| Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|---|---|---|---|
| 0-4 | 1.414 | 4-8 | 1.040 |

Total Area Contributing (ha) = 2.454

Total Pipe Volume (m³) = 45.831

### Network Design Table for Storm

« - Indicates pipe capacity < flow

| 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 | 40.587 | 0.338 | 120.0 | 0.119 | 4.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.001 | 25.643 | 0.154 | 167.0 | 0.168 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.002 | 8.304 | 0.073 | 113.8 | 0.055 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.003 | 31.868 | 0.878 | 36.3 | 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 | 4.47 | 24.500 | 0.119 | 0.0 | 0.0 | 0.0 | 1.43 | 101.4 | 16.1 |
| S1.001 | 50.00 | 4.82 | 24.162 | 0.287 | 0.0 | 0.0 | 0.0 | 1.21 | 85.8 | 38.9 |
| S1.002 | 50.00 | 4.92 | 24.008 | 0.342 | 0.0 | 0.0 | 0.0 | 1.47 | 104.1 | 46.3 |
| S1.003 | 50.00 | 5.12 | 23.935 | 0.342 | 0.0 | 0.0 | 0.0 | 2.62 | 185.0 | 46.3 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S2.000 | 23.284 | 1.070 | 21.8 | 0.026 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S2.001 | 21.960 | 0.380 | 57.8 | 0.022 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S2.002 | 16.908 | 0.170 | 99.5 | 0.057 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S2.003 | 24.842 | 0.392 | 63.3 | 0.037 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S1.004 | 16.046 | 0.320 | 50.1 | 0.055 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S1.005 | 17.345 | 0.220 | 78.8 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S1.006 | 23.830 | 0.510 | 46.7 | 0.047 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S3.000 | 9.939 | 0.060 | 167.0 | 0.117 | 4.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S3.001 | 35.991 | 1.258 | 28.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S1.007 | 37.037 | 0.720 | 51.4 | 0.097 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S1.008 | 10.316 | 0.210 | 49.1 | 0.062 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S4.000 | 3.556 | 0.024 | 150.0 | 0.155 | 4.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S4.001 | 7.069 | 0.824 | 8.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S1.009 | 13.903 | 0.140 | 99.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S1.010 | 27.102 | 0.087 | 313.0 | 0.012 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.011 | 35.652 | 0.101 | 353.0 | 0.026 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S2.000 | 50.00 | 4.18 | 25.220 | 0.026 | 0.0 | 0.0 | 0.0 | 2.17 | 38.3 | 3.5 |
| S2.001 | 50.00 | 4.39 | 24.075 | 0.048 | 0.0 | 0.0 | 0.0 | 1.72 | 68.5 | 6.5 |
| S2.002 | 50.00 | 4.61 | 23.695 | 0.105 | 0.0 | 0.0 | 0.0 | 1.31 | 52.1 | 14.2 |
| S2.003 | 50.00 | 4.86 | 23.525 | 0.142 | 0.0 | 0.0 | 0.0 | 1.65 | 65.5 | 19.2 |
| S1.004 | 50.00 | 5.22 | 22.983 | 0.539 | 0.0 | 0.0 | 0.0 | 2.56 | 283.2 | 73.0 |
| S1.005 | 50.00 | 5.37 | 22.663 | 0.539 | 0.0 | 0.0 | 0.0 | 2.04 | 225.6 | 73.0 |
| S1.006 | 50.00 | 5.52 | 22.443 | 0.586 | 0.0 | 0.0 | 0.0 | 2.66 | 293.4 | 79.4 |
| S3.000 | 50.00 | 4.16 | 23.400 | 0.117 | 0.0 | 0.0 | 0.0 | 1.01 | 40.1 | 15.8 |
| S3.001 | 50.00 | 4.41 | 23.340 | 0.117 | 0.0 | 0.0 | 0.0 | 2.46 | 97.6 | 15.8 |
| S1.007 | 50.00 | 5.76 | 21.933 | 0.800 | 0.0 | 0.0 | 0.0 | 2.53 | 279.6 | 108.3 |
| S1.008 | 50.00 | 5.83 | 21.213 | 0.862 | 0.0 | 0.0 | 0.0 | 2.59 | 286.1 | 116.7 |
| S4.000 | 50.00 | 4.06 | 22.000 | 0.155 | 0.0 | 0.0 | 0.0 | 1.07 | 42.4 | 21.0 |
| S4.001 | 50.00 | 4.08 | 21.976 | 0.155 | 0.0 | 0.0 | 0.0 | 4.49 | 178.7 | 21.0 |
| S1.009 | 50.00 | 5.95 | 21.003 | 1.017 | 0.0 | 0.0 | 0.0 | 1.82 | 200.8 | 137.7 |
| S1.010 | 50.00 | 6.35 | 20.788 | 1.029 | 0.0 | 0.0 | 0.0 | 1.14 | 181.9 | 139.3 |
| S1.011 | 50.00 | 6.90 | 20.701 | 1.055 | 0.0 | 0.0 | 0.0 | 1.08 | 171.2 | 142.9 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S5.000 | 20.356 | 0.136 | 150.0 | 0.016 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S5.001 | 16.440 | 0.110 | 150.0 | 0.011 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S5.002 | 15.744 | 0.183 | 86.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S5.003 | 48.654 | 1.478 | 32.9 | 0.035 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S5.004 | 27.487 | 0.325 | 84.6 | 0.072 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S5.005 | 54.568 | 0.775 | 70.4 | 0.265 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S1.012 | 70.733 | 0.700 | 101.0 | 1.000 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S5.000 | 50.00 | 4.41 | 23.906 | 0.016 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 2.2 |
| S5.001 | 50.00 | 4.75 | 23.770 | 0.027 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 3.7 |
| S5.002 | 50.00 | 4.99 | 23.661 | 0.027 | 0.0 | 0.0 | 0.0 | 1.08 | 19.2 | 3.7 |
| S5.003 | 50.00 | 5.45 | 23.478 | 0.062 | 0.0 | 0.0 | 0.0 | 1.76 | 31.1 | 8.4 |
| S5.004 | 50.00 | 5.77 | 21.925 | 0.134 | 0.0 | 0.0 | 0.0 | 1.42 | 56.6 | 18.1 |
| S5.005 | 50.00 | 6.36 | 21.600 | 0.399 | 0.0 | 0.0 | 0.0 | 1.56 | 62.0 | 54.0 |
| S1.012 | 50.00 | 7.65 | 20.600 | 2.454 | 0.0 | 0.0 | 0.0 | 1.56 | 110.6« | 332.3 |

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## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) | Backdrop (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1 | 26.000 | 1.500 | Open Manhole | 1200 | S1.000 | 24.500 | 300 | | | | |
| S2 | 25.960 | 1.798 | Open Manhole | 1200 | S1.001 | 24.162 | 300 | S1.000 | 24.162 | 300 | |
| S3 | 25.660 | 1.652 | Open Manhole | 1200 | S1.002 | 24.008 | 300 | S1.001 | 24.008 | 300 | |
| S4 | 25.530 | 1.595 | Open Manhole | 1200 | S1.003 | 23.935 | 300 | S1.002 | 23.935 | 300 | |
| S5 | 26.570 | 1.350 | Open Manhole | 1200 | S2.000 | 25.220 | 150 | | | | |
| S6 | 25.500 | 1.425 | Open Manhole | 1200 | S2.001 | 24.075 | 225 | S2.000 | 24.150 | 150 | |
| S7 | 25.120 | 1.425 | Open Manhole | 1200 | S2.002 | 23.695 | 225 | S2.001 | 23.695 | 225 | |
| S8 | 24.950 | 1.425 | Open Manhole | 1200 | S2.003 | 23.525 | 225 | S2.002 | 23.525 | 225 | |
| S5 | 24.720 | 1.737 | Open Manhole | 1350 | S1.004 | 22.983 | 375 | S1.003 | 23.058 | 300 | |
| | | | | | | | | S2.003 | 23.133 | 225 | |
| S6 | 24.400 | 1.737 | Open Manhole | 1350 | S1.005 | 22.663 | 375 | S1.004 | 22.663 | 375 | |
| S7 | 24.180 | 1.737 | Open Manhole | 1350 | S1.006 | 22.443 | 375 | S1.005 | 22.443 | 375 | |
| S12 | 24.200 | 0.800 | Open Manhole | 1200 | S3.000 | 23.400 | 225 | | | | |
| S13 | 24.100 | 0.760 | Open Manhole | 1200 | S3.001 | 23.340 | 225 | S3.000 | 23.340 | 225 | |
| S8 | 23.670 | 1.737 | Open Manhole | 1350 | S1.007 | 21.933 | 375 | S1.006 | 21.933 | 375 | |
| | | | | | | | | S3.001 | 22.083 | 225 | |
| S9 | 22.950 | 1.737 | Open Manhole | 1350 | S1.008 | 21.213 | 375 | S1.007 | 21.213 | 375 | |
| S16 | 22.800 | 0.800 | Open Manhole | 1200 | S4.000 | 22.000 | 225 | | | | |
| S17 | 22.770 | 0.794 | Open Manhole | 1200 | S4.001 | 21.976 | 225 | S4.000 | 21.976 | 225 | |
| S10 | 22.740 | 1.737 | Open Manhole | 1350 | S1.009 | 21.003 | 375 | S1.008 | 21.003 | 375 | |
| | | | | | | | | S4.001 | 21.153 | 225 | |
| S11 | 22.600 | 1.812 | Open Manhole | 1350 | S1.010 | 20.788 | 450 | S1.009 | 20.863 | 375 | |
| S12 | 22.610 | 1.909 | Open Manhole | 1350 | S1.011 | 20.701 | 450 | S1.010 | 20.701 | 450 | |
| S21 | 25.256 | 1.350 | Open Manhole | 1200 | S5.000 | 23.906 | 150 | | | | |
| S22 | 25.560 | 1.789 | Open Manhole | 1200 | S5.001 | 23.770 | 150 | S5.000 | 23.770 | 150 | |
| S23 | 25.629 | 1.969 | Open Manhole | 1200 | S5.002 | 23.661 | 150 | S5.001 | 23.661 | 150 | |
| S24 | 24.828 | 1.350 | Open Manhole | 1200 | S5.003 | 23.478 | 150 | S5.002 | 23.478 | 150 | |
| S25 | 23.350 | 1.425 | Open Manhole | 1200 | S5.004 | 21.925 | 225 | S5.003 | 22.000 | 150 | |
| S26 | 22.500 | 0.900 | Open Manhole | 1200 | S5.005 | 21.600 | 225 | S5.004 | 21.600 | 225 | |
| S13 | 21.600 | 1.000 | Open Manhole | 1350 | S1.012 | 20.600 | 300 | S1.011 | 20.600 | 450 | |
| | | | | | | | | S5.005 | 20.825 | 225 | 150 |
| S | 20.300 | 0.400 | Open Manhole | 0 | | OUTFALL | | S1.012 | 19.900 | 300 | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S1 | 448968.087 | 116188.874 | 448968.087 | 116188.874 | Required | |
| S2 | 448988.565 | 116223.916 | 448988.565 | 116223.916 | Required | |
| S3 | 449000.622 | 116246.547 | 449000.622 | 116246.547 | Required | |
| S4 | 448993.375 | 116250.601 | 448993.375 | 116250.601 | Required | |
| S5 | 449078.021 | 116230.968 | 449078.021 | 116230.968 | Required | |
| S6 | 449067.137 | 116251.551 | 449067.137 | 116251.551 | Required | |
| S7 | 449047.734 | 116261.836 | 449047.734 | 116261.836 | Required | |
| S8 | 449031.330 | 116265.933 | 449031.330 | 116265.933 | Required | |
| S5 | 449009.624 | 116278.015 | 449009.624 | 116278.015 | Required | |
| S6 | 449017.409 | 116292.046 | 449017.409 | 116292.046 | Required | |
| S7 | 449023.687 | 116308.215 | 449023.687 | 116308.215 | Required | |
| S12 | 449076.056 | 116305.735 | 449076.056 | 116305.735 | Required | |
| S13 | 449067.426 | 116310.664 | 449067.426 | 116310.664 | Required | |
| S8 | 449036.172 | 116328.513 | 449036.172 | 116328.513 | Required | |
| S9 | 449054.673 | 116360.598 | 449054.673 | 116360.598 | Required | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S16 | 449066.690 | 116370.795 | 449066.690 | 116370.795 | Required | |
| S17 | 449063.134 | 116370.755 | 449063.134 | 116370.755 | Required | |
| S10 | 449056.066 | 116370.819 | 449056.066 | 116370.819 | Required | |
| S11 | 449056.098 | 116384.723 | 449056.098 | 116384.723 | Required | |
| S12 | 449066.588 | 116409.712 | 449066.588 | 116409.712 | Required | |
| S21 | 449131.816 | 116327.692 | 449131.816 | 116327.692 | Required | |
| S22 | 449141.616 | 116345.534 | 449141.616 | 116345.534 | Required | |
| S23 | 449149.058 | 116360.193 | 449149.058 | 116360.193 | Required | |
| S24 | 449144.224 | 116375.177 | 449144.224 | 116375.177 | Required | |
| S25 | 449099.208 | 116393.637 | 449099.208 | 116393.637 | Required | |
| S26 | 449109.638 | 116419.069 | 449109.638 | 116419.069 | Required | |
| S13 | 449061.635 | 116445.019 | 449061.635 | 116445.019 | Required | |
| S | 448995.104 | 116469.033 | | | No Entry | |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.000 | o | 300 | S1 | 26.000 | 24.500 | 1.200 | Open Manhole | 1200 |
| S1.001 | o | 300 | S2 | 25.960 | 24.162 | 1.498 | Open Manhole | 1200 |
| S1.002 | o | 300 | S3 | 25.660 | 24.008 | 1.352 | Open Manhole | 1200 |
| S1.003 | o | 300 | S4 | 25.530 | 23.935 | 1.295 | Open Manhole | 1200 |
| S2.000 | o | 150 | S5 | 26.570 | 25.220 | 1.200 | Open Manhole | 1200 |
| S2.001 | o | 225 | S6 | 25.500 | 24.075 | 1.200 | Open Manhole | 1200 |
| S2.002 | o | 225 | S7 | 25.120 | 23.695 | 1.200 | Open Manhole | 1200 |
| S2.003 | o | 225 | S8 | 24.950 | 23.525 | 1.200 | Open Manhole | 1200 |
| S1.004 | o | 375 | S5 | 24.720 | 22.983 | 1.362 | Open Manhole | 1350 |
| S1.005 | o | 375 | S6 | 24.400 | 22.663 | 1.362 | Open Manhole | 1350 |
| S1.006 | o | 375 | S7 | 24.180 | 22.443 | 1.362 | Open Manhole | 1350 |
| S3.000 | o | 225 | S12 | 24.200 | 23.400 | 0.575 | Open Manhole | 1200 |
| S3.001 | o | 225 | S13 | 24.100 | 23.340 | 0.535 | Open Manhole | 1200 |
| S1.007 | o | 375 | S8 | 23.670 | 21.933 | 1.362 | Open Manhole | 1350 |
| S1.008 | o | 375 | S9 | 22.950 | 21.213 | 1.362 | Open Manhole | 1350 |
| S4.000 | o | 225 | S16 | 22.800 | 22.000 | 0.575 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.000 | 40.587 | 120.0 | S2 | 25.960 | 24.162 | 1.498 | Open Manhole | 1200 |
| S1.001 | 25.643 | 167.0 | S3 | 25.660 | 24.008 | 1.352 | Open Manhole | 1200 |
| S1.002 | 8.304 | 113.8 | S4 | 25.530 | 23.935 | 1.295 | Open Manhole | 1200 |
| S1.003 | 31.868 | 36.3 | S5 | 24.720 | 23.058 | 1.362 | Open Manhole | 1350 |
| S2.000 | 23.284 | 21.8 | S6 | 25.500 | 24.150 | 1.200 | Open Manhole | 1200 |
| S2.001 | 21.960 | 57.8 | S7 | 25.120 | 23.695 | 1.200 | Open Manhole | 1200 |
| S2.002 | 16.908 | 99.5 | S8 | 24.950 | 23.525 | 1.200 | Open Manhole | 1200 |
| S2.003 | 24.842 | 63.3 | S5 | 24.720 | 23.133 | 1.362 | Open Manhole | 1350 |
| S1.004 | 16.046 | 50.1 | S6 | 24.400 | 22.663 | 1.362 | Open Manhole | 1350 |
| S1.005 | 17.345 | 78.8 | S7 | 24.180 | 22.443 | 1.362 | Open Manhole | 1350 |
| S1.006 | 23.830 | 46.7 | S8 | 23.670 | 21.933 | 1.362 | Open Manhole | 1350 |
| S3.000 | 9.939 | 167.0 | S13 | 24.100 | 23.340 | 0.535 | Open Manhole | 1200 |
| S3.001 | 35.991 | 28.6 | S8 | 23.670 | 22.083 | 1.362 | Open Manhole | 1350 |
| S1.007 | 37.037 | 51.4 | S9 | 22.950 | 21.213 | 1.362 | Open Manhole | 1350 |
| S1.008 | 10.316 | 49.1 | S10 | 22.740 | 21.003 | 1.362 | Open Manhole | 1350 |
| S4.000 | 3.556 | 150.0 | S17 | 22.770 | 21.976 | 0.569 | Open Manhole | 1200 |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S4.001 | o | 225 | S17 | 22.770 | 21.976 | 0.569 | Open Manhole | 1200 |
| S1.009 | o | 375 | S10 | 22.740 | 21.003 | 1.362 | Open Manhole | 1350 |
| S1.010 | o | 450 | S11 | 22.600 | 20.788 | 1.362 | Open Manhole | 1350 |
| S1.011 | o | 450 | S12 | 22.610 | 20.701 | 1.459 | Open Manhole | 1350 |
| S5.000 | o | 150 | S21 | 25.256 | 23.906 | 1.200 | Open Manhole | 1200 |
| S5.001 | o | 150 | S22 | 25.560 | 23.770 | 1.639 | Open Manhole | 1200 |
| S5.002 | o | 150 | S23 | 25.629 | 23.661 | 1.819 | Open Manhole | 1200 |
| S5.003 | o | 150 | S24 | 24.828 | 23.478 | 1.200 | Open Manhole | 1200 |
| S5.004 | o | 225 | S25 | 23.350 | 21.925 | 1.200 | Open Manhole | 1200 |
| S5.005 | o | 225 | S26 | 22.500 | 21.600 | 0.675 | Open Manhole | 1200 |
| S1.012 | o | 300 | S13 | 21.600 | 20.600 | 0.700 | Open Manhole | 1350 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S4.001 | 7.069 | 8.6 | S10 | 22.740 | 21.153 | 1.362 | Open Manhole | 1350 |
| S1.009 | 13.903 | 99.3 | S11 | 22.600 | 20.863 | 1.362 | Open Manhole | 1350 |
| S1.010 | 27.102 | 313.0 | S12 | 22.610 | 20.701 | 1.459 | Open Manhole | 1350 |
| S1.011 | 35.652 | 353.0 | S13 | 21.600 | 20.600 | 0.550 | Open Manhole | 1350 |
| S5.000 | 20.356 | 150.0 | S22 | 25.560 | 23.770 | 1.639 | Open Manhole | 1200 |
| S5.001 | 16.440 | 150.0 | S23 | 25.629 | 23.661 | 1.819 | Open Manhole | 1200 |
| S5.002 | 15.744 | 86.0 | S24 | 24.828 | 23.478 | 1.200 | Open Manhole | 1200 |
| S5.003 | 48.654 | 32.9 | S25 | 23.350 | 22.000 | 1.200 | Open Manhole | 1200 |
| S5.004 | 27.487 | 84.6 | S26 | 22.500 | 21.600 | 0.675 | Open Manhole | 1200 |
| S5.005 | 54.568 | 70.4 | S13 | 21.600 | 20.825 | 0.550 | Open Manhole | 1350 |
| S1.012 | 70.733 | 101.0 | S | 20.300 | 19.900 | 0.100 | Open Manhole | 0 |

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## Area Summary for Storm

| Pipe Number | PIMP Type | PIMP Name | PIMP (%) | Gross Area (ha) | Imp. Area (ha) | Pipe Total (ha) |
|---|---|---|---|---|---|---|
| 1.000 | - | - | 100 | 0.119 | 0.119 | 0.119 |
| 1.001 | - | - | 100 | 0.168 | 0.168 | 0.168 |
| 1.002 | - | - | 100 | 0.055 | 0.055 | 0.055 |
| 1.003 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 2.000 | - | - | 100 | 0.026 | 0.026 | 0.026 |
| 2.001 | - | - | 100 | 0.022 | 0.022 | 0.022 |
| 2.002 | - | - | 100 | 0.057 | 0.057 | 0.057 |
| 2.003 | - | - | 100 | 0.037 | 0.037 | 0.037 |
| 1.004 | - | - | 100 | 0.055 | 0.055 | 0.055 |
| 1.005 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.006 | - | - | 100 | 0.047 | 0.047 | 0.047 |
| 3.000 | - | - | 100 | 0.117 | 0.117 | 0.117 |
| 3.001 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.007 | - | - | 100 | 0.097 | 0.097 | 0.097 |
| 1.008 | - | - | 100 | 0.062 | 0.062 | 0.062 |
| 4.000 | - | - | 100 | 0.155 | 0.155 | 0.155 |
| 4.001 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.009 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.010 | - | - | 100 | 0.012 | 0.012 | 0.012 |
| 1.011 | - | - | 100 | 0.026 | 0.026 | 0.026 |
| 5.000 | - | - | 100 | 0.016 | 0.016 | 0.016 |
| 5.001 | - | - | 100 | 0.011 | 0.011 | 0.011 |
| 5.002 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 5.003 | - | - | 100 | 0.035 | 0.035 | 0.035 |
| 5.004 | - | - | 100 | 0.072 | 0.072 | 0.072 |
| 5.005 | - | - | 100 | 0.265 | 0.265 | 0.265 |
| 1.012 | - | - | 100 | 1.000 | 1.000 | 1.000 |
| | | | | Total | Total | Total |
| | | | | 2.454 | 2.454 | 2.454 |

## 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) |
|---|---|---|---|---|---|---|
| S1.012 | S | 20.300 | 19.900 | 0.000 | 0 | 0 |

## 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 Offline Controls | 0 |
| Number of Online Controls | 4 | Number of Storage Structures | 4 |

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## Simulation Criteria for Storm

Number of Time/Area Diagrams 0 Number of Real Time Controls 0

## Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Profile Type | Summer |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 19.900 | Storm Duration (mins) | 30 |
| Ratio R | 0.350 | | |

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## Online Controls for Storm

### Hydro-Brake® Optimum Manhole: S13, DS/PN: S3.001, Volume (m³): 1.2

| | |
|---|---|
| Unit Reference | MD-SHE-0137-8000-0560-8000 |
| Design Head (m) | 0.560 |
| Design Flow (l/s) | 8.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 137 |
| Invert Level (m) | 23.340 |
| Minimum Outlet Pipe Diameter (mm) | 150 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 0.560 | 8.0 |
| Flush-Flo™ | 0.216 | 8.0 |
| Kick-Flo® | 0.424 | 7.0 |
| Mean Flow over Head Range | - | 6.5 |

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

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 5.0 | 1.200 | 11.4 | 3.000 | 17.7 | 7.000 | 26.6 |
| 0.200 | 8.0 | 1.400 | 12.3 | 3.500 | 19.1 | 7.500 | 27.5 |
| 0.300 | 7.8 | 1.600 | 13.1 | 4.000 | 20.3 | 8.000 | 28.4 |
| 0.400 | 7.3 | 1.800 | 13.9 | 4.500 | 21.5 | 8.500 | 29.3 |
| 0.500 | 7.6 | 2.000 | 14.6 | 5.000 | 22.6 | 9.000 | 30.2 |
| 0.600 | 8.3 | 2.200 | 15.3 | 5.500 | 23.7 | 9.500 | 31.0 |
| 0.800 | 9.5 | 2.400 | 15.9 | 6.000 | 24.6 | | |
| 1.000 | 10.5 | 2.600 | 16.5 | 6.500 | 25.6 | | |

### Hydro-Brake® Optimum Manhole: S17, DS/PN: S4.001, Volume (m³): 1.0

| | |
|---|---|
| Unit Reference | MD-SHE-0209-2100-0524-2100 |
| Design Head (m) | 0.524 |
| Design Flow (l/s) | 21.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 209 |
| Invert Level (m) | 21.976 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1200 |

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## Hydro-Brake® Optimum Manhole: S17, DS/PN: S4.001, Volume (m³): 1.0

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 0.524 | 21.0 |
| Flush-Flo™ | 0.293 | 21.0 |
| Kick-Flo® | 0.448 | 19.5 |
| Mean Flow over Head Range | - | 15.8 |

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 | 7.1 | 1.200 | 31.2 | 3.000 | 48.5 | 7.000 | 73.0 |
| 0.200 | 20.1 | 1.400 | 33.6 | 3.500 | 52.3 | 7.500 | 75.6 |
| 0.300 | 21.0 | 1.600 | 35.8 | 4.000 | 55.8 | 8.000 | 78.1 |
| 0.400 | 20.3 | 1.800 | 37.9 | 4.500 | 59.1 | 8.500 | 80.6 |
| 0.500 | 20.5 | 2.000 | 39.9 | 5.000 | 62.2 | 9.000 | 82.9 |
| 0.600 | 22.4 | 2.200 | 41.8 | 5.500 | 64.6 | 9.500 | 85.2 |
| 0.800 | 25.7 | 2.400 | 43.6 | 6.000 | 67.5 | | |
| 1.000 | 28.6 | 2.600 | 45.3 | 6.500 | 70.3 | | |

## Hydro-Brake® Optimum Manhole: S26, DS/PN: S5.005, Volume (m³): 2.1

| | |
|---|---|
| Unit Reference | MD-SHE-0048-1000-0900-1000 |
| Design Head (m) | 0.900 |
| Design Flow (l/s) | 1.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 48 |
| Invert Level (m) | 21.600 |
| Minimum Outlet Pipe Diameter (mm) | 75 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 0.900 | 1.0 |
| Flush-Flo™ | 0.212 | 0.9 |
| Kick-Flo® | 0.428 | 0.7 |
| Mean Flow over Head Range | - | 0.8 |

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 | 0.8 | 0.300 | 0.9 | 0.500 | 0.8 | 0.800 | 0.9 |
| 0.200 | 0.9 | 0.400 | 0.8 | 0.600 | 0.8 | 1.000 | 1.0 |

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Hydro-Brake® Optimum Manhole: S26, DS/PN: S5.005, Volume (m³): 2.1

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 1.200 | 1.1 | 2.400 | 1.6 | 5.000 | 2.2 | 8.000 | 2.7 |
| 1.400 | 1.2 | 2.600 | 1.6 | 5.500 | 2.3 | 8.500 | 2.8 |
| 1.600 | 1.3 | 3.000 | 1.7 | 6.000 | 2.4 | 9.000 | 2.9 |
| 1.800 | 1.4 | 3.500 | 1.8 | 6.500 | 2.5 | 9.500 | 2.9 |
| 2.000 | 1.4 | 4.000 | 2.0 | 7.000 | 2.5 | | |
| 2.200 | 1.5 | 4.500 | 2.1 | 7.500 | 2.6 | | |

Hydro-Brake® Optimum Manhole: S13, DS/PN: S1.012, Volume (m³): 9.0

| | |
|---|---|
| Unit Reference | MD-SHE-0235-2960-1000-2960 |
| Design Head (m) | 1.000 |
| Design Flow (l/s) | 29.6 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 235 |
| Invert Level (m) | 20.600 |
| Minimum Outlet Pipe Diameter (mm) | 300 |
| Suggested Manhole Diameter (mm) | 1500 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.000 | 29.6 |
| Flush-Flo™ | 0.379 | 29.5 |
| Kick-Flo® | 0.744 | 25.7 |
| Mean Flow over Head Range | - | 24.4 |

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 | 7.8 | 1.200 | 32.3 | 3.000 | 50.2 | 7.000 | 75.7 |
| 0.200 | 23.7 | 1.400 | 34.8 | 3.500 | 54.1 | 7.500 | 78.3 |
| 0.300 | 29.2 | 1.600 | 37.1 | 4.000 | 57.7 | 8.000 | 80.8 |
| 0.400 | 29.5 | 1.800 | 39.2 | 4.500 | 61.1 | 8.500 | 83.2 |
| 0.500 | 29.1 | 2.000 | 41.3 | 5.000 | 64.3 | 9.000 | 85.6 |
| 0.600 | 28.4 | 2.200 | 43.2 | 5.500 | 67.3 | 9.500 | 87.9 |
| 0.800 | 26.6 | 2.400 | 45.1 | 6.000 | 70.3 | | |
| 1.000 | 29.6 | 2.600 | 46.8 | 6.500 | 73.0 | | |

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## Storage Structures for Storm

### Porous Car Park Manhole: S12, DS/PN: S3.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 20.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 40.1 |
| Max Percolation (l/s) | 222.8 | Slope (1:X) | 40.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 23.400 | Membrane Depth (mm) | 0 |

### Porous Car Park Manhole: S16, DS/PN: S4.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 17.1 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 80.0 |
| Max Percolation (l/s) | 380.0 | Slope (1:X) | 40.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 22.000 | Membrane Depth (mm) | 0 |

### Tank or Pond Manhole: S26, DS/PN: S5.005

Invert Level (m) 21.600

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 280.0 | 0.900 | 592.0 |

### Tank or Pond Manhole: S13, DS/PN: S1.012

Invert Level (m) 20.600

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 919.0 | 1.000 | 1624.0 |

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## 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) | 100 | PIMP (%) | 100 |
| M5-60 (mm) | 19.900 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.350 | Minimum Backdrop Height (m) | 0.200 |
| Maximum Rainfall (mm/hr) | 50 | Maximum Backdrop Height (m) | 1.500 |
| 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 Soffits

### Time Area Diagram for Storm

| Time (mins) | Area (ha) | Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|---|---|---|---|---|---|
| 0-4 | 0.405 | 4-8 | 1.058 | 8-12 | 0.062 |

Total Area Contributing (ha) = 1.526

Total Pipe Volume (m³) = 77.938

### Network Design Table for Storm

« - Indicates pipe capacity < flow

| 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 | 22.797 | 0.250 | 91.2 | 0.023 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S1.001 | 19.510 | 0.500 | 39.0 | 0.020 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S2.000 | 11.397 | 0.076 | 150.0 | 0.044 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S2.001 | 30.322 | 0.202 | 150.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | 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 | 4.36 | 23.300 | 0.023 | 0.0 | 0.0 | 0.0 | 1.05 | 18.6 | 3.1 |
| S1.001 | 50.00 | 4.56 | 23.050 | 0.043 | 0.0 | 0.0 | 0.0 | 1.62 | 28.6 | 5.8 |
| S2.000 | 50.00 | 4.23 | 23.630 | 0.044 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 6.0 |
| S2.001 | 50.00 | 4.85 | 23.554 | 0.044 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 6.0 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S2.002 | 26.658 | 0.202 | 132.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S2.003 | 6.973 | 0.600 | 11.6 | 0.132 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S1.002 | 31.372 | 0.800 | 39.2 | 0.019 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S1.003 | 18.438 | 0.350 | 52.7 | 0.039 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S1.004 | 42.815 | 0.256 | 167.0 | 0.023 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.005 | 76.810 | 1.143 | 67.2 | 0.082 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S3.000 | 24.924 | 0.360 | 69.2 | 0.113 | 4.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S3.001 | 30.693 | 0.710 | 43.2 | 0.044 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S3.002 | 33.968 | 0.540 | 62.9 | 0.085 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S1.006 | 43.520 | 0.174 | 250.1 | 0.137 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.007 | 45.500 | 0.326 | 139.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S4.000 | 28.917 | 0.310 | 93.3 | 0.063 | 4.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S4.001 | 44.372 | 0.480 | 92.4 | 0.158 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S4.002 | 14.994 | 0.250 | 60.0 | 0.073 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S4.003 | 8.401 | 0.170 | 49.4 | 0.019 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S4.004 | 33.199 | 0.400 | 83.0 | 0.083 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S4.005 | 32.300 | 0.430 | 75.1 | 0.094 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S2.002 | 50.00 | 5.36 | 23.352 | 0.044 | 0.0 | 0.0 | 0.0 | 0.87 | 15.4 | 6.0 |
| S2.003 | 50.00 | 5.40 | 23.150 | 0.176 | 0.0 | 0.0 | 0.0 | 2.97 | 52.5 | 23.8 |
| S1.002 | 50.00 | 5.65 | 22.475 | 0.238 | 0.0 | 0.0 | 0.0 | 2.10 | 83.3 | 32.2 |
| S1.003 | 50.00 | 5.82 | 21.675 | 0.277 | 0.0 | 0.0 | 0.0 | 1.81 | 71.8 | 37.5 |
| S1.004 | 50.00 | 6.41 | 21.250 | 0.300 | 0.0 | 0.0 | 0.0 | 1.21 | 85.8 | 40.6 |
| S1.005 | 50.00 | 7.07 | 20.993 | 0.382 | 0.0 | 0.0 | 0.0 | 1.92 | 135.8 | 51.7 |
| S3.000 | 50.00 | 4.22 | 21.460 | 0.113 | 0.0 | 0.0 | 0.0 | 1.89 | 133.7 | 15.3 |
| S3.001 | 50.00 | 4.43 | 21.100 | 0.157 | 0.0 | 0.0 | 0.0 | 2.40 | 169.5 | 21.3 |
| S3.002 | 50.00 | 4.68 | 20.315 | 0.242 | 0.0 | 0.0 | 0.0 | 2.29 | 252.7 | 32.8 |
| S1.006 | 50.00 | 7.64 | 19.700 | 0.761 | 0.0 | 0.0 | 0.0 | 1.28 | 203.7 | 103.0 |
| S1.007 | 50.00 | 8.08 | 19.526 | 0.761 | 0.0 | 0.0 | 0.0 | 1.72 | 273.4 | 103.0 |
| S4.000 | 50.00 | 4.36 | 21.465 | 0.063 | 0.0 | 0.0 | 0.0 | 1.35 | 53.8 | 8.5 |
| S4.001 | 50.00 | 4.75 | 21.005 | 0.221 | 0.0 | 0.0 | 0.0 | 1.89 | 208.2 | 29.9 |
| S4.002 | 50.00 | 4.85 | 20.525 | 0.294 | 0.0 | 0.0 | 0.0 | 2.34 | 258.8 | 39.8 |
| S4.003 | 50.00 | 4.91 | 20.275 | 0.313 | 0.0 | 0.0 | 0.0 | 2.58 | 285.3 | 42.4 |
| S4.004 | 50.00 | 5.19 | 20.105 | 0.396 | 0.0 | 0.0 | 0.0 | 1.99 | 219.8 | 53.6 |
| S4.005 | 50.00 | 5.42 | 19.630 | 0.490 | 0.0 | 0.0 | 0.0 | 2.35 | 373.4 | 66.4 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.008 | 49.622 | 0.124 | 400.2 | 0.132 | 0.00 | 0.0 | 0.600 | o | 525 | Pipe/Conduit | |
| S1.009 | 58.552 | 0.101 | 579.7 | 0.143 | 0.00 | 0.0 | 0.600 | o | 525 | Pipe/Conduit | |
| S1.010 | 24.688 | 0.700 | 35.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.008 | 50.00 | 8.82 | 19.125 | 1.383 | 0.0 | 0.0 | 0.0 | 1.11 | 241.0 | 187.3 |
| S1.009 | 50.00 | 9.88 | 19.001 | 1.526 | 0.0 | 0.0 | 0.0 | 0.92 | 199.8« | 206.6 |
| S1.010 | 50.00 | 10.01 | 18.900 | 1.526 | 0.0 | 0.0 | 0.0 | 3.06 | 337.9 | 206.6 |

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## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) | Backdrop (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1 | 24.650 | 1.350 | Open Manhole | 1200 | S1.000 | 23.300 | 150 | | | | |
| S2 | 24.400 | 1.350 | Open Manhole | 1200 | S1.001 | 23.050 | 150 | S1.000 | 23.050 | 150 | |
| S3 | 24.680 | 1.050 | Open Manhole | 1200 | S2.000 | 23.630 | 150 | | | | |
| S4 | 24.550 | 0.996 | Open Manhole | 1200 | S2.001 | 23.554 | 150 | S2.000 | 23.554 | 150 | |
| S5 | 24.230 | 0.878 | Open Manhole | 1200 | S2.002 | 23.352 | 150 | S2.001 | 23.352 | 150 | |
| S6 | 23.950 | 0.800 | Open Manhole | 1200 | S2.003 | 23.150 | 150 | S2.002 | 23.150 | 150 | |
| S3 | 23.900 | 1.425 | Open Manhole | 1200 | S1.002 | 22.475 | 225 | S1.001 | 22.550 | 150 | |
| | | | | | | | | S2.003 | 22.550 | 150 | |
| S4 | 23.100 | 1.425 | Open Manhole | 1200 | S1.003 | 21.675 | 225 | S1.002 | 21.675 | 225 | |
| S5 | 22.750 | 1.500 | Open Manhole | 1200 | S1.004 | 21.250 | 300 | S1.003 | 21.325 | 225 | |
| S6 | 22.600 | 1.607 | Open Manhole | 1200 | S1.005 | 20.993 | 300 | S1.004 | 20.993 | 300 | |
| S11 | 22.960 | 1.500 | Open Manhole | 1200 | S3.000 | 21.460 | 300 | | | | |
| S12 | 22.600 | 1.500 | Open Manhole | 1200 | S3.001 | 21.100 | 300 | S3.000 | 21.100 | 300 | |
| S13 | 21.890 | 1.575 | Open Manhole | 1350 | S3.002 | 20.315 | 375 | S3.001 | 20.390 | 300 | |
| S7 | 21.550 | 1.850 | Open Manhole | 1350 | S1.006 | 19.700 | 450 | S1.005 | 19.850 | 300 | |
| | | | | | | | | S3.002 | 19.775 | 375 | |
| S8 | 21.300 | 1.774 | Open Manhole | 1350 | S1.007 | 19.526 | 450 | S1.006 | 19.526 | 450 | |
| S16 | 22.890 | 1.425 | Open Manhole | 1200 | S4.000 | 21.465 | 225 | | | | |
| S17 | 22.580 | 1.575 | Open Manhole | 1350 | S4.001 | 21.005 | 375 | S4.000 | 21.155 | 225 | |
| S18 | 22.100 | 1.575 | Open Manhole | 1350 | S4.002 | 20.525 | 375 | S4.001 | 20.525 | 375 | |
| S19 | 21.850 | 1.575 | Open Manhole | 1350 | S4.003 | 20.275 | 375 | S4.002 | 20.275 | 375 | |
| S20 | 21.680 | 1.575 | Open Manhole | 1350 | S4.004 | 20.105 | 375 | S4.003 | 20.105 | 375 | |
| S21 | 21.280 | 1.650 | Open Manhole | 1350 | S4.005 | 19.630 | 450 | S4.004 | 19.705 | 375 | |
| S9 | 20.950 | 1.825 | Open Manhole | 1500 | S1.008 | 19.125 | 525 | S1.007 | 19.200 | 450 | |
| | | | | | | | | S4.005 | 19.200 | 450 | |
| S10 | 21.150 | 2.149 | Open Manhole | 1500 | S1.009 | 19.001 | 525 | S1.008 | 19.001 | 525 | |
| S11 | 20.100 | 1.200 | Open Manhole | 1500 | S1.010 | 18.900 | 375 | S1.009 | 18.900 | 525 | |
| S | 18.800 | 0.600 | Open Manhole | 0 | | OUTFALL | | S1.010 | 18.200 | 375 | |

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S1 | 449008.038 | 116287.947 | 449008.038 | 116287.947 | Required | |
| S2 | 449019.154 | 116307.850 | 449019.154 | 116307.850 | Required | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S3 | 448988.550 | 116299.780 | 448988.550 | 116299.780 | Required | |
| S4 | 448985.291 | 116310.701 | 448985.291 | 116310.701 | Required | |
| S5 | 448996.761 | 116338.770 | 448996.761 | 116338.770 | Required | |
| S6 | 449021.196 | 116328.110 | 449021.196 | 116328.110 | Required | |
| S3 | 449027.630 | 116325.423 | 449027.630 | 116325.423 | Required | |
| S4 | 449039.874 | 116354.307 | 449039.874 | 116354.307 | Required | |
| S5 | 449047.201 | 116371.227 | 449047.201 | 116371.227 | Required | |
| S6 | 449063.769 | 116410.706 | 449063.769 | 116410.706 | Required | |
| S11 | 448964.030 | 116353.688 | 448964.030 | 116353.688 | Required | |
| S12 | 448973.887 | 116376.579 | 448973.887 | 116376.579 | Required | |
| S13 | 448982.022 | 116406.174 | 448982.022 | 116406.174 | Required | |
| S7 | 448992.196 | 116438.582 | 448992.196 | 116438.582 | Required | |
| S8 | 448950.703 | 116451.708 | 448950.703 | 116451.708 | Required | |
| S16 | 448917.674 | 116342.138 | 448917.674 | 116342.138 | Required | |
| S17 | 448930.186 | 116368.208 | 448930.186 | 116368.208 | Required | |

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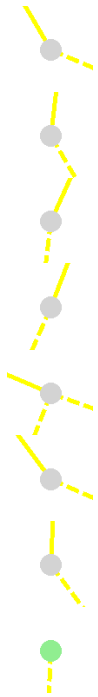
## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S18 | 448889.321 | 116385.498 | 448889.321 | 116385.498 | Required | |
| S19 | 448881.742 | 116398.436 | 448881.742 | 116398.436 | Required | |
| S20 | 448882.734 | 116406.779 | 448882.734 | 116406.779 | Required | |
| S21 | 448896.297 | 116437.081 | 448896.297 | 116437.081 | Required | |
| S9 | 448907.926 | 116467.214 | 448907.926 | 116467.214 | Required | |
| S10 | 448862.345 | 116486.826 | 448862.345 | 116486.826 | Required | |
| S11 | 448827.261 | 116533.703 | 448827.261 | 116533.703 | Required | |
| S | 448828.439 | 116558.363 | | | No Entry | |



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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.000 | o | 150 | S1 | 24.650 | 23.300 | 1.200 | Open Manhole | 1200 |
| S1.001 | o | 150 | S2 | 24.400 | 23.050 | 1.200 | Open Manhole | 1200 |
| S2.000 | o | 150 | S3 | 24.680 | 23.630 | 0.900 | Open Manhole | 1200 |
| S2.001 | o | 150 | S4 | 24.550 | 23.554 | 0.846 | Open Manhole | 1200 |
| S2.002 | o | 150 | S5 | 24.230 | 23.352 | 0.728 | Open Manhole | 1200 |
| S2.003 | o | 150 | S6 | 23.950 | 23.150 | 0.650 | Open Manhole | 1200 |
| S1.002 | o | 225 | S3 | 23.900 | 22.475 | 1.200 | Open Manhole | 1200 |
| S1.003 | o | 225 | S4 | 23.100 | 21.675 | 1.200 | Open Manhole | 1200 |
| S1.004 | o | 300 | S5 | 22.750 | 21.250 | 1.200 | Open Manhole | 1200 |
| S1.005 | o | 300 | S6 | 22.600 | 20.993 | 1.307 | Open Manhole | 1200 |
| S3.000 | o | 300 | S11 | 22.960 | 21.460 | 1.200 | Open Manhole | 1200 |
| S3.001 | o | 300 | S12 | 22.600 | 21.100 | 1.200 | Open Manhole | 1200 |
| S3.002 | o | 375 | S13 | 21.890 | 20.315 | 1.200 | Open Manhole | 1350 |
| S1.006 | o | 450 | S7 | 21.550 | 19.700 | 1.400 | Open Manhole | 1350 |
| S1.007 | o | 450 | S8 | 21.300 | 19.526 | 1.324 | Open Manhole | 1350 |
| S4.000 | o | 225 | S16 | 22.890 | 21.465 | 1.200 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.000 | 22.797 | 91.2 | S2 | 24.400 | 23.050 | 1.200 | Open Manhole | 1200 |
| S1.001 | 19.510 | 39.0 | S3 | 23.900 | 22.550 | 1.200 | Open Manhole | 1200 |
| S2.000 | 11.397 | 150.0 | S4 | 24.550 | 23.554 | 0.846 | Open Manhole | 1200 |
| S2.001 | 30.322 | 150.0 | S5 | 24.230 | 23.352 | 0.728 | Open Manhole | 1200 |
| S2.002 | 26.658 | 132.0 | S6 | 23.950 | 23.150 | 0.650 | Open Manhole | 1200 |
| S2.003 | 6.973 | 11.6 | S3 | 23.900 | 22.550 | 1.200 | Open Manhole | 1200 |
| S1.002 | 31.372 | 39.2 | S4 | 23.100 | 21.675 | 1.200 | Open Manhole | 1200 |
| S1.003 | 18.438 | 52.7 | S5 | 22.750 | 21.325 | 1.200 | Open Manhole | 1200 |
| S1.004 | 42.815 | 167.0 | S6 | 22.600 | 20.993 | 1.307 | Open Manhole | 1200 |
| S1.005 | 76.810 | 67.2 | S7 | 21.550 | 19.850 | 1.400 | Open Manhole | 1350 |
| S3.000 | 24.924 | 69.2 | S12 | 22.600 | 21.100 | 1.200 | Open Manhole | 1200 |
| S3.001 | 30.693 | 43.2 | S13 | 21.890 | 20.390 | 1.200 | Open Manhole | 1350 |
| S3.002 | 33.968 | 62.9 | S7 | 21.550 | 19.775 | 1.400 | Open Manhole | 1350 |
| S1.006 | 43.520 | 250.1 | S8 | 21.300 | 19.526 | 1.324 | Open Manhole | 1350 |
| S1.007 | 45.500 | 139.6 | S9 | 20.950 | 19.200 | 1.300 | Open Manhole | 1500 |
| S4.000 | 28.917 | 93.3 | S17 | 22.580 | 21.155 | 1.200 | Open Manhole | 1350 |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S4.001 | o | 375 | S17 | 22.580 | 21.005 | 1.200 | Open Manhole | 1350 |
| S4.002 | o | 375 | S18 | 22.100 | 20.525 | 1.200 | Open Manhole | 1350 |
| S4.003 | o | 375 | S19 | 21.850 | 20.275 | 1.200 | Open Manhole | 1350 |
| S4.004 | o | 375 | S20 | 21.680 | 20.105 | 1.200 | Open Manhole | 1350 |
| S4.005 | o | 450 | S21 | 21.280 | 19.630 | 1.200 | Open Manhole | 1350 |
| S1.008 | o | 525 | S9 | 20.950 | 19.125 | 1.300 | Open Manhole | 1500 |
| S1.009 | o | 525 | S10 | 21.150 | 19.001 | 1.624 | Open Manhole | 1500 |
| S1.010 | o | 375 | S11 | 20.100 | 18.900 | 0.825 | Open Manhole | 1500 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S4.001 | 44.372 | 92.4 | S18 | 22.100 | 20.525 | 1.200 | Open Manhole | 1350 |
| S4.002 | 14.994 | 60.0 | S19 | 21.850 | 20.275 | 1.200 | Open Manhole | 1350 |
| S4.003 | 8.401 | 49.4 | S20 | 21.680 | 20.105 | 1.200 | Open Manhole | 1350 |
| S4.004 | 33.199 | 83.0 | S21 | 21.280 | 19.705 | 1.200 | Open Manhole | 1350 |
| S4.005 | 32.300 | 75.1 | S9 | 20.950 | 19.200 | 1.300 | Open Manhole | 1500 |
| S1.008 | 49.622 | 400.2 | S10 | 21.150 | 19.001 | 1.624 | Open Manhole | 1500 |
| S1.009 | 58.552 | 579.7 | S11 | 20.100 | 18.900 | 0.675 | Open Manhole | 1500 |
| S1.010 | 24.688 | 35.3 | S | 18.800 | 18.200 | 0.225 | Open Manhole | 0 |

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## Area Summary for Storm

| Pipe Number | PIMP Type | PIMP Name | PIMP (%) | Gross Area (ha) | Imp. Area (ha) | Pipe Total (ha) |
|---|---|---|---|---|---|---|
| 1.000 | - | - | 100 | 0.023 | 0.023 | 0.023 |
| 1.001 | - | - | 100 | 0.020 | 0.020 | 0.020 |
| 2.000 | - | - | 100 | 0.044 | 0.044 | 0.044 |
| 2.001 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 2.002 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 2.003 | - | - | 100 | 0.132 | 0.132 | 0.132 |
| 1.002 | - | - | 100 | 0.019 | 0.019 | 0.019 |
| 1.003 | - | - | 100 | 0.039 | 0.039 | 0.039 |
| 1.004 | - | - | 100 | 0.023 | 0.023 | 0.023 |
| 1.005 | - | - | 100 | 0.082 | 0.082 | 0.082 |
| 3.000 | - | - | 100 | 0.113 | 0.113 | 0.113 |
| 3.001 | - | - | 100 | 0.044 | 0.044 | 0.044 |
| 3.002 | - | - | 100 | 0.085 | 0.085 | 0.085 |
| 1.006 | - | - | 100 | 0.137 | 0.137 | 0.137 |
| 1.007 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 4.000 | - | - | 100 | 0.063 | 0.063 | 0.063 |
| 4.001 | - | - | 100 | 0.158 | 0.158 | 0.158 |
| 4.002 | - | - | 100 | 0.073 | 0.073 | 0.073 |
| 4.003 | - | - | 100 | 0.019 | 0.019 | 0.019 |
| 4.004 | - | - | 100 | 0.083 | 0.083 | 0.083 |
| 4.005 | - | - | 100 | 0.094 | 0.094 | 0.094 |
| 1.008 | - | - | 100 | 0.132 | 0.132 | 0.132 |
| 1.009 | - | - | 100 | 0.143 | 0.143 | 0.143 |
| 1.010 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| | | | | Total | Total | Total |
| | | | | 1.526 | 1.526 | 1.526 |

## 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) |
|---|---|---|---|---|---|---|
| S1.010 | S | 18.800 | 18.200 | 0.000 | 0 | 0 |

## 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 | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

## Synthetic Rainfall Details

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## Simulation Criteria for Storm

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Profile Type | Summer |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 19.900 | Storm Duration (mins) | 30 |
| Ratio R | 0.350 | | |

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## Online Controls for Storm

### Hydro-Brake® Optimum Manhole: S6, DS/PN: S2.003, Volume (m³): 1.4

| | |
|---|---|
| Unit Reference | MD-SHE-0090-3000-0500-3000 |
| Design Head (m) | 0.500 |
| Design Flow (l/s) | 3.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 90 |
| Invert Level (m) | 23.150 |
| Minimum Outlet Pipe Diameter (mm) | 150 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 0.500 | 3.0 |
| Flush-Flo™ | 0.157 | 3.0 |
| Kick-Flo® | 0.355 | 2.6 |
| Mean Flow over Head Range | - | 2.5 |

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

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 2.8 | 1.200 | 4.5 | 3.000 | 6.9 | 7.000 | 10.4 |
| 0.200 | 3.0 | 1.400 | 4.8 | 3.500 | 7.4 | 7.500 | 10.7 |
| 0.300 | 2.8 | 1.600 | 5.1 | 4.000 | 7.9 | 8.000 | 11.1 |
| 0.400 | 2.7 | 1.800 | 5.4 | 4.500 | 8.4 | 8.500 | 11.4 |
| 0.500 | 3.0 | 2.000 | 5.7 | 5.000 | 8.8 | 9.000 | 11.8 |
| 0.600 | 3.3 | 2.200 | 6.0 | 5.500 | 9.2 | 9.500 | 12.1 |
| 0.800 | 3.7 | 2.400 | 6.2 | 6.000 | 9.6 | | |
| 1.000 | 4.1 | 2.600 | 6.4 | 6.500 | 10.0 | | |

### Hydro-Brake® Optimum Manhole: S11, DS/PN: S1.010, Volume (m³): 14.5

| | |
|---|---|
| Unit Reference | MD-SHE-0165-1360-1200-1360 |
| Design Head (m) | 1.200 |
| Design Flow (l/s) | 13.6 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 165 |
| Invert Level (m) | 18.900 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1500 |

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## Hydro-Brake® Optimum Manhole: S11, DS/PN: S1.010, Volume (m³): 14.5

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.200 | 13.6 |
| Flush-Flo™ | 0.364 | 13.6 |
| Kick-Flo® | 0.801 | 11.2 |
| Mean Flow over Head Range | - | 11.7 |

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 | 5.9 | 1.200 | 13.6 | 3.000 | 21.0 | 7.000 | 31.6 |
| 0.200 | 12.8 | 1.400 | 14.6 | 3.500 | 22.6 | 7.500 | 32.7 |
| 0.300 | 13.5 | 1.600 | 15.6 | 4.000 | 24.1 | 8.000 | 33.7 |
| 0.400 | 13.6 | 1.800 | 16.5 | 4.500 | 25.5 | 8.500 | 34.7 |
| 0.500 | 13.4 | 2.000 | 17.3 | 5.000 | 26.9 | 9.000 | 35.7 |
| 0.600 | 13.1 | 2.200 | 18.1 | 5.500 | 28.1 | 9.500 | 36.6 |
| 0.800 | 11.3 | 2.400 | 18.9 | 6.000 | 29.3 | | |
| 1.000 | 12.5 | 2.600 | 19.6 | 6.500 | 30.5 | | |

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## Storage Structures for Storm

### Porous Car Park Manhole: S6, DS/PN: S2.003

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 92.3 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 12.4 |
| Max Percolation (l/s) | 317.9 | Slope (1:X) | 100.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 23.150 | Membrane Depth (mm) | 0 |

### Tank or Pond Manhole: S11, DS/PN: S1.010

Invert Level (m) 18.900

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 807.0 | 1.200 | 1502.0 |

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## 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) | 100 | PIMP (%) | 100 |
| M5-60 (mm) | 19.900 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.350 | Minimum Backdrop Height (m) | 0.200 |
| Maximum Rainfall (mm/hr) | 50 | Maximum Backdrop Height (m) | 1.500 |
| 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 Soffits

### Time Area Diagram for Storm

| Time (mins) | Area (ha) | Time (mins) | Area (ha) | Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|---|---|---|---|---|---|---|---|
| 0-4 | 0.035 | 4-8 | 0.771 | 8-12 | 1.500 | 12-16 | 0.026 |

Total Area Contributing (ha) = 2.332

Total Pipe Volume (m³) = 207.839

### Network Design Table for Storm

« - Indicates pipe capacity < flow

| 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 | 24.705 | 0.500 | 49.4 | 0.019 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S1.001 | 15.427 | 0.240 | 64.3 | 0.017 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S1.002 | 27.977 | 0.680 | 41.1 | 0.028 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S2.000 | 6.893 | 0.600 | 11.5 | 0.114 | 4.00 | 0.0 | 0.600 | o | 150 | 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 | 4.29 | 25.390 | 0.019 | 0.0 | 0.0 | 0.0 | 1.43 | 25.4 | 2.6 |
| S1.001 | 50.00 | 4.49 | 24.890 | 0.036 | 0.0 | 0.0 | 0.0 | 1.26 | 22.2 | 4.9 |
| S1.002 | 50.00 | 4.79 | 24.650 | 0.064 | 0.0 | 0.0 | 0.0 | 1.57 | 27.8 | 8.7 |
| S2.000 | 50.00 | 4.04 | 25.450 | 0.114 | 0.0 | 0.0 | 0.0 | 2.99 | 52.8 | 15.4 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S2.001 | 19.226 | 0.880 | 21.8 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S3.000 | 32.098 | 0.430 | 74.6 | 0.032 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S1.003 | 26.440 | 0.901 | 29.3 | 0.133 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S4.000 | 21.932 | 0.231 | 94.9 | 0.085 | 4.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S5.000 | 8.227 | 0.600 | 13.7 | 0.084 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S5.001 | 10.622 | 0.071 | 149.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S4.001 | 27.932 | 0.319 | 87.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S6.000 | 34.804 | 0.374 | 93.1 | 0.012 | 4.00 | 0.0 | 0.600 | o | 100 | Pipe/Conduit | |
| S4.002 | 15.195 | 0.091 | 167.0 | 0.075 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.004 | 8.061 | 0.069 | 116.8 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.005 | 17.287 | 0.170 | 101.7 | 0.037 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.006 | 16.284 | 0.180 | 90.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.007 | 37.029 | 0.350 | 105.8 | 0.358 | 0.00 | 0.0 | 0.600 | o | 525 | Pipe/Conduit | |
| S1.008 | 13.150 | 0.188 | 70.0 | 0.040 | 0.00 | 0.0 | 0.600 | o | 525 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S2.001 | 50.00 | 4.19 | 24.850 | 0.114 | 0.0 | 0.0 | 0.0 | 2.16 | 38.2 | 15.4 |
| S3.000 | 50.00 | 4.46 | 24.400 | 0.032 | 0.0 | 0.0 | 0.0 | 1.16 | 20.6 | 4.3 |
| S1.003 | 50.00 | 4.94 | 23.820 | 0.343 | 0.0 | 0.0 | 0.0 | 2.91 | 205.9 | 46.4 |
| S4.000 | 50.00 | 4.27 | 23.635 | 0.085 | 0.0 | 0.0 | 0.0 | 1.34 | 53.4 | 11.5 |
| S5.000 | 50.00 | 4.05 | 24.150 | 0.084 | 0.0 | 0.0 | 0.0 | 2.74 | 48.3 | 11.4 |
| S5.001 | 50.00 | 4.27 | 23.550 | 0.084 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 11.4 |
| S4.001 | 50.00 | 4.61 | 23.404 | 0.169 | 0.0 | 0.0 | 0.0 | 1.40 | 55.6 | 22.9 |
| S6.000 | 50.00 | 4.73 | 23.584 | 0.012 | 0.0 | 0.0 | 0.0 | 0.80 | 6.3 | 1.6 |
| S4.002 | 50.00 | 4.94 | 23.010 | 0.256 | 0.0 | 0.0 | 0.0 | 1.21 | 85.8 | 34.7 |
| S1.004 | 50.00 | 5.01 | 22.769 | 0.599 | 0.0 | 0.0 | 0.0 | 1.88 | 299.0 | 81.1 |
| S1.005 | 50.00 | 5.15 | 22.700 | 0.636 | 0.0 | 0.0 | 0.0 | 2.02 | 320.6 | 86.1 |
| S1.006 | 50.00 | 5.28 | 22.530 | 0.636 | 0.0 | 0.0 | 0.0 | 2.14 | 340.1 | 86.1 |
| S1.007 | 50.00 | 5.56 | 22.275 | 0.994 | 0.0 | 0.0 | 0.0 | 2.18 | 471.4 | 134.6 |
| S1.008 | 50.00 | 5.65 | 21.925 | 1.034 | 0.0 | 0.0 | 0.0 | 2.68 | 580.1 | 140.0 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.009 | 20.519 | 0.300 | 68.4 | 0.107 | 0.00 | 0.0 | 0.600 | o | 525 | Pipe/Conduit | |
| S1.010 | 28.429 | 0.142 | 200.2 | 0.027 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S1.011 | 29.718 | 0.074 | 400.0 | 0.018 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S1.012 | 24.592 | 0.065 | 380.0 | 0.024 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S1.013 | 23.904 | 0.065 | 370.0 | 0.024 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S1.014 | 24.742 | 0.096 | 258.8 | 0.024 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S7.000 | 31.603 | 0.540 | 58.5 | 0.027 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S7.001 | 18.030 | 0.120 | 150.3 | 0.044 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S8.000 | 32.916 | 0.350 | 94.0 | 0.032 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S9.000 | 5.378 | 0.600 | 9.0 | 0.041 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S9.001 | 6.852 | 0.050 | 137.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S8.001 | 27.638 | 0.510 | 54.2 | 0.066 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S7.002 | 38.852 | 0.839 | 46.3 | 0.031 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S7.003 | 23.133 | 0.139 | 166.4 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S7.004 | 38.011 | 0.160 | 238.0 | 0.101 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S7.005 | 31.029 | 0.130 | 238.0 | 0.076 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S7.006 | 12.853 | 0.251 | 51.2 | 0.080 | 0.00 | 0.0 | 0.600 | o | 375 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.009 | 50.00 | 5.77 | 21.737 | 1.141 | 0.0 | 0.0 | 0.0 | 2.71 | 586.9 | 154.5 |
| S1.010 | 50.00 | 6.05 | 21.362 | 1.168 | 0.0 | 0.0 | 0.0 | 1.72 | 485.6 | 158.2 |
| S1.011 | 50.00 | 6.46 | 21.220 | 1.186 | 0.0 | 0.0 | 0.0 | 1.21 | 342.5 | 160.6 |
| S1.012 | 50.00 | 6.79 | 21.146 | 1.210 | 0.0 | 0.0 | 0.0 | 1.24 | 351.5 | 163.8 |
| S1.013 | 50.00 | 7.10 | 21.081 | 1.234 | 0.0 | 0.0 | 0.0 | 1.26 | 356.3 | 167.1 |
| S1.014 | 50.00 | 7.38 | 21.017 | 1.258 | 0.0 | 0.0 | 0.0 | 1.51 | 426.7 | 170.3 |
| S7.000 | 50.00 | 4.40 | 23.550 | 0.027 | 0.0 | 0.0 | 0.0 | 1.32 | 23.3 | 3.7 |
| S7.001 | 50.00 | 4.77 | 23.010 | 0.071 | 0.0 | 0.0 | 0.0 | 0.82 | 14.4 | 9.6 |
| S8.000 | 50.00 | 4.53 | 23.750 | 0.032 | 0.0 | 0.0 | 0.0 | 1.04 | 18.3 | 4.3 |
| S9.000 | 50.00 | 4.03 | 24.050 | 0.041 | 0.0 | 0.0 | 0.0 | 3.39 | 59.8 | 5.6 |
| S9.001 | 50.00 | 4.16 | 23.450 | 0.041 | 0.0 | 0.0 | 0.0 | 0.86 | 15.1 | 5.6 |
| S8.001 | 50.00 | 4.79 | 23.325 | 0.139 | 0.0 | 0.0 | 0.0 | 1.78 | 70.8 | 18.8 |
| S7.002 | 50.00 | 5.12 | 22.815 | 0.241 | 0.0 | 0.0 | 0.0 | 1.93 | 76.6 | 32.6 |
| S7.003 | 50.00 | 5.40 | 21.826 | 0.241 | 0.0 | 0.0 | 0.0 | 1.40 | 154.8 | 32.6 |
| S7.004 | 50.00 | 5.94 | 21.687 | 0.342 | 0.0 | 0.0 | 0.0 | 1.17 | 129.2 | 46.3 |
| S7.005 | 50.00 | 6.38 | 21.527 | 0.418 | 0.0 | 0.0 | 0.0 | 1.17 | 129.2 | 56.6 |
| S7.006 | 50.00 | 6.47 | 21.397 | 0.498 | 0.0 | 0.0 | 0.0 | 2.54 | 280.2 | 67.4 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.015 | 34.210 | 0.171 | 200.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S1.016 | 35.912 | 0.400 | 89.8 | 0.000 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S1.017 | 32.324 | 0.359 | 90.0 | 0.030 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S1.018 | 24.558 | 0.364 | 67.5 | 0.020 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S10.000 | 11.822 | 0.700 | 16.9 | 0.111 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S10.001 | 37.337 | 0.400 | 93.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S10.002 | 29.760 | 0.540 | 55.1 | 0.064 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S11.000 | 5.120 | 0.600 | 8.5 | 0.059 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S11.001 | 10.428 | 0.070 | 149.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S12.000 | 5.178 | 0.600 | 8.6 | 0.044 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S12.001 | 7.268 | 0.070 | 103.8 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S11.002 | 16.418 | 0.109 | 150.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S11.003 | 9.150 | 0.061 | 150.0 | 0.026 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S10.003 | 20.118 | 0.120 | 167.0 | 0.033 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S10.004 | 14.743 | 0.062 | 238.0 | 0.032 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.015 | 50.00 | 7.71 | 20.921 | 1.756 | 0.0 | 0.0 | 0.0 | 1.72 | 485.8 | 237.8 |
| S1.016 | 50.00 | 7.94 | 20.750 | 1.756 | 0.0 | 0.0 | 0.0 | 2.57 | 726.9 | 237.8 |
| S1.017 | 50.00 | 8.15 | 20.350 | 1.786 | 0.0 | 0.0 | 0.0 | 2.57 | 725.9 | 241.8 |
| S1.018 | 50.00 | 8.29 | 19.991 | 1.806 | 0.0 | 0.0 | 0.0 | 2.97 | 839.1 | 244.6 |
| S10.000 | 50.00 | 4.08 | 21.900 | 0.111 | 0.0 | 0.0 | 0.0 | 2.46 | 43.5 | 15.0 |
| S10.001 | 50.00 | 4.68 | 21.200 | 0.111 | 0.0 | 0.0 | 0.0 | 1.04 | 18.4 | 15.0 |
| S10.002 | 50.00 | 5.04 | 20.800 | 0.175 | 0.0 | 0.0 | 0.0 | 1.36 | 24.0 | 23.7 |
| S11.000 | 50.00 | 4.02 | 21.100 | 0.059 | 0.0 | 0.0 | 0.0 | 3.47 | 61.3 | 8.0 |
| S11.001 | 50.00 | 4.24 | 20.500 | 0.059 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 8.0 |
| S12.000 | 50.00 | 4.03 | 21.100 | 0.044 | 0.0 | 0.0 | 0.0 | 3.45 | 61.0 | 6.0 |
| S12.001 | 50.00 | 4.15 | 20.500 | 0.044 | 0.0 | 0.0 | 0.0 | 0.99 | 17.4 | 6.0 |
| S11.002 | 50.00 | 4.57 | 20.430 | 0.103 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 13.9 |
| S11.003 | 50.00 | 4.71 | 20.246 | 0.129 | 0.0 | 0.0 | 0.0 | 1.07 | 42.4 | 17.5 |
| S10.003 | 50.00 | 5.32 | 20.110 | 0.337 | 0.0 | 0.0 | 0.0 | 1.21 | 85.8 | 45.6 |
| S10.004 | 50.00 | 5.56 | 19.989 | 0.369 | 0.0 | 0.0 | 0.0 | 1.01 | 71.7 | 50.0 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1.019 | 40.838 | 0.095 | 430.0 | 0.029 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S1.020 | 31.552 | 0.061 | 520.0 | 0.018 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S1.021 | 24.611 | 0.047 | 520.0 | 0.016 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S1.022 | 21.617 | 0.042 | 520.0 | 0.026 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S1.023 | 95.128 | 0.107 | 889.0 | 0.068 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S1.024 | 108.605 | 2.400 | 45.3 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.019 | 50.00 | 8.83 | 19.552 | 2.204 | 0.0 | 0.0 | 0.0 | 1.26 | 450.0 | 298.4 |
| S1.020 | 50.00 | 9.29 | 19.457 | 2.222 | 0.0 | 0.0 | 0.0 | 1.14 | 408.8 | 300.9 |
| S1.021 | 50.00 | 9.65 | 19.396 | 2.238 | 0.0 | 0.0 | 0.0 | 1.14 | 408.8 | 303.1 |
| S1.022 | 50.00 | 9.96 | 19.349 | 2.264 | 0.0 | 0.0 | 0.0 | 1.14 | 408.8 | 306.6 |
| S1.023 | 50.00 | 11.78 | 19.307 | 2.332 | 0.0 | 0.0 | 0.0 | 0.87 | 311.6« | 315.8 |
| S1.024 | 50.00 | 12.56 | 19.200 | 2.332 | 0.0 | 0.0 | 0.0 | 2.34 | 165.7« | 315.8 |

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## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) | Backdrop (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S1 | 26.740 | 1.350 | Open Manhole | 1200 | S1.000 | 25.390 | 150 | | | | |
| S2 | 26.240 | 1.350 | Open Manhole | 1200 | S1.001 | 24.890 | 150 | S1.000 | 24.890 | 150 | |
| S3 | 26.000 | 1.350 | Open Manhole | 1200 | S1.002 | 24.650 | 150 | S1.001 | 24.650 | 150 | |
| S6 | 26.350 | 0.900 | Open Manhole | 1200 | S2.000 | 25.450 | 150 | | | | |
| S7 | 26.200 | 1.350 | Open Manhole | 1200 | S2.001 | 24.850 | 150 | S2.000 | 24.850 | 150 | |
| S8 | 25.750 | 1.350 | Open Manhole | 1200 | S3.000 | 24.400 | 150 | | | | |
| S4 | 25.370 | 1.550 | Open Manhole | 1200 | S1.003 | 23.820 | 300 | S1.002 | 23.970 | 150 | |
| | | | | | | | | S2.001 | 23.970 | 150 | |
| | | | | | | | | S3.000 | 23.970 | 150 | |
| S10 | 25.060 | 1.425 | Open Manhole | 1200 | S4.000 | 23.635 | 225 | | | | |
| S11 | 24.950 | 0.800 | Open Manhole | 1200 | S5.000 | 24.150 | 150 | | | | |
| S12 | 24.900 | 1.350 | Open Manhole | 1200 | S5.001 | 23.550 | 150 | S5.000 | 23.550 | 150 | |
| S11 | 24.850 | 1.446 | Open Manhole | 1200 | S4.001 | 23.404 | 225 | S4.000 | 23.404 | 225 | |
| | | | | | | | | S5.001 | 23.479 | 150 | |
| S14 | 24.934 | 1.350 | Open Manhole | 1200 | S6.000 | 23.584 | 100 | | | | |
| S11 | 24.560 | 1.550 | Open Manhole | 1200 | S4.002 | 23.010 | 300 | S4.001 | 23.085 | 225 | |
| | | | | | | | | S6.000 | 23.210 | 100 | |
| S5 | 24.420 | 1.651 | Open Manhole | 1350 | S1.004 | 22.769 | 450 | S1.003 | 22.919 | 300 | |
| | | | | | | | | S4.002 | 22.919 | 300 | |
| S6 | 24.350 | 1.650 | Open Manhole | 1350 | S1.005 | 22.700 | 450 | S1.004 | 22.700 | 450 | |
| S7 | 24.180 | 1.650 | Open Manhole | 1350 | S1.006 | 22.530 | 450 | S1.005 | 22.530 | 450 | |
| S8 | 24.000 | 1.725 | Open Manhole | 1500 | S1.007 | 22.275 | 525 | S1.006 | 22.350 | 450 | |
| S9 | 23.650 | 1.725 | Open Manhole | 1500 | S1.008 | 21.925 | 525 | S1.007 | 21.925 | 525 | |
| S10 | 23.500 | 1.763 | Open Manhole | 1500 | S1.009 | 21.737 | 525 | S1.008 | 21.737 | 525 | |
| S11 | 23.200 | 1.838 | Open Manhole | 1500 | S1.010 | 21.362 | 600 | S1.009 | 21.437 | 525 | |
| S12 | 23.160 | 1.940 | Open Manhole | 1500 | S1.011 | 21.220 | 600 | S1.010 | 21.220 | 600 | |
| S13 | 23.460 | 2.314 | Open Manhole | 1500 | S1.012 | 21.146 | 600 | S1.011 | 21.146 | 600 | |
| S14 | 23.700 | 2.619 | Open Manhole | 1500 | S1.013 | 21.081 | 600 | S1.012 | 21.081 | 600 | |
| S15 | 23.493 | 2.477 | Open Manhole | 1500 | S1.014 | 21.017 | 600 | S1.013 | 21.017 | 600 | |
| S27 | 24.900 | 1.350 | Open Manhole | 1200 | S7.000 | 23.550 | 150 | | | | |
| S28 | 24.840 | 1.830 | Open Manhole | 1200 | S7.001 | 23.010 | 150 | S7.000 | 23.010 | 150 | |
| S29 | 25.100 | 1.350 | Open Manhole | 1200 | S8.000 | 23.750 | 150 | | | | |
| S30 | 24.850 | 0.800 | Open Manhole | 1200 | S9.000 | 24.050 | 150 | | | | |
| S31 | 24.800 | 1.350 | Open Manhole | 1200 | S9.001 | 23.450 | 150 | S9.000 | 23.450 | 150 | |
| S30 | 24.750 | 1.425 | Open Manhole | 1200 | S8.001 | 23.325 | 225 | S8.000 | 23.400 | 150 | |
| | | | | | | | | S9.001 | 23.400 | 150 | |
| S29 | 24.430 | 1.615 | Open Manhole | 1200 | S7.002 | 22.815 | 225 | S7.001 | 22.890 | 150 | |
| | | | | | | | | S8.001 | 22.815 | 225 | |

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## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) | Backdrop (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S30 | 23.401 | 1.575 | Open Manhole | 1350 | S7.003 | 21.826 | 375 | S7.002 | 21.976 | 225 | |
| S31 | 23.590 | 1.903 | Open Manhole | 1350 | S7.004 | 21.687 | 375 | S7.003 | 21.687 | 375 | |
| S32 | 23.680 | 2.153 | Open Manhole | 1350 | S7.005 | 21.527 | 375 | S7.004 | 21.527 | 375 | |
| S33 | 23.400 | 2.003 | Open Manhole | 1350 | S7.006 | 21.397 | 375 | S7.005 | 21.397 | 375 | |
| S16 | 23.100 | 2.179 | Open Manhole | 1500 | S1.015 | 20.921 | 600 | S1.014 | 20.921 | 600 | |
| | | | | | | | | S7.006 | 21.146 | 375 | |
| S17 | 22.650 | 1.900 | Open Manhole | 1500 | S1.016 | 20.750 | 600 | S1.015 | 20.750 | 600 | |
| S18 | 22.150 | 1.800 | Open Manhole | 1500 | S1.017 | 20.350 | 600 | S1.016 | 20.350 | 600 | |
| S19 | 21.790 | 1.799 | Open Manhole | 1500 | S1.018 | 19.991 | 600 | S1.017 | 19.991 | 600 | |
| S42 | 22.700 | 0.800 | Open Manhole | 1200 | S10.000 | 21.900 | 150 | | | | |
| S43 | 22.550 | 1.350 | Open Manhole | 1200 | S10.001 | 21.200 | 150 | S10.000 | 21.200 | 150 | |
| S44 | 22.150 | 1.350 | Open Manhole | 1200 | S10.002 | 20.800 | 150 | S10.001 | 20.800 | 150 | |
| S45 | 21.900 | 0.800 | Open Manhole | 1200 | S11.000 | 21.100 | 150 | | | | |
| S46 | 21.850 | 1.350 | Open Manhole | 1200 | S11.001 | 20.500 | 150 | S11.000 | 20.500 | 150 | |
| S47 | 21.900 | 0.800 | Open Manhole | 1200 | S12.000 | 21.100 | 150 | | | | |
| S48 | 21.850 | 1.350 | Open Manhole | 1200 | S12.001 | 20.500 | 150 | S12.000 | 20.500 | 150 | |
| S47 | 21.800 | 1.370 | Open Manhole | 1200 | S11.002 | 20.430 | 150 | S11.001 | 20.430 | 150 | |
| | | | | | | | | S12.001 | 20.430 | 150 | |
| S48 | 22.000 | 1.754 | Open Manhole | 1200 | S11.003 | 20.246 | 225 | S11.002 | 20.321 | 150 | |
| S45 | 21.910 | 1.800 | Open Manhole | 1200 | S10.003 | 20.110 | 300 | S10.002 | 20.260 | 150 | |
| | | | | | | | | S11.003 | 20.185 | 225 | |
| S46 | 21.710 | 1.721 | Open Manhole | 1200 | S10.004 | 19.989 | 300 | S10.003 | 19.989 | 300 | |
| S20 | 21.540 | 1.988 | Open Manhole | 1500 | S1.019 | 19.552 | 675 | S1.018 | 19.627 | 600 | |
| | | | | | | | | S10.004 | 19.927 | 300 | |
| S21 | 21.660 | 2.203 | Open Manhole | 1500 | S1.020 | 19.457 | 675 | S1.019 | 19.457 | 675 | |
| S22 | 21.600 | 2.204 | Open Manhole | 1500 | S1.021 | 19.396 | 675 | S1.020 | 19.396 | 675 | |
| S23 | 21.350 | 2.001 | Open Manhole | 1500 | S1.022 | 19.349 | 675 | S1.021 | 19.349 | 675 | |
| S24 | 21.232 | 1.925 | Open Manhole | 1500 | S1.023 | 19.307 | 675 | S1.022 | 19.307 | 675 | |
| S25 | 20.100 | 0.900 | Open Manhole | 1500 | S1.024 | 19.200 | 300 | S1.023 | 19.200 | 675 | |
| S | 17.400 | 0.600 | Open Manhole | 0 | | OUTFALL | | S1.024 | 16.800 | 300 | |

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S1 | 448931.014 | 116077.783 | 448931.014 | 116077.783 | Required | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S2 | 448925.019 | 116101.749 | 448925.019 | 116101.749 | Required | |
| S3 | 448927.356 | 116116.998 | 448927.356 | 116116.998 | Required | |
| S6 | 448963.423 | 116128.577 | 448963.423 | 116128.577 | Required | |
| S7 | 448957.441 | 116132.002 | 448957.441 | 116132.002 | Required | |
| S8 | 448956.901 | 116169.300 | 448956.901 | 116169.300 | Required | |
| S4 | 448940.757 | 116141.557 | 448940.757 | 116141.557 | Required | |
| S10 | 448871.611 | 116195.631 | 448871.611 | 116195.631 | Required | |
| S11 | 448899.461 | 116200.555 | 448899.461 | 116200.555 | Required | |
| S12 | 448895.443 | 116193.376 | 448895.443 | 116193.376 | Required | |
| S11 | 448890.267 | 116184.100 | 448890.267 | 116184.100 | Required | |
| S14 | 448932.005 | 116199.217 | 448932.005 | 116199.217 | Required | |
| S11 | 448914.027 | 116169.416 | 448914.027 | 116169.416 | Required | |
| S5 | 448917.816 | 116154.701 | 448917.816 | 116154.701 | Required | |
| S6 | 448910.245 | 116151.932 | 448910.245 | 116151.932 | Required | |
| S7 | 448898.461 | 116139.284 | 448898.461 | 116139.284 | Required | |



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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S8 | 448882.348 | 116136.931 | 448882.348 | 116136.931 | Required | |
| S9 | 448845.320 | 116136.832 | 448845.320 | 116136.832 | Required | |
| S10 | 448832.171 | 116136.603 | 448832.171 | 116136.603 | Required | |
| S11 | 448833.298 | 116157.091 | 448833.298 | 116157.091 | Required | |
| S12 | 448834.137 | 116185.508 | 448834.137 | 116185.508 | Required | |
| S13 | 448834.008 | 116215.225 | 448834.008 | 116215.225 | Required | |
| S14 | 448837.897 | 116239.508 | 448837.897 | 116239.508 | Required | |
| S15 | 448845.006 | 116262.330 | 448845.006 | 116262.330 | Required | |
| S27 | 448953.713 | 116237.146 | 448953.713 | 116237.146 | Required | |
| S28 | 448969.149 | 116264.724 | 448969.149 | 116264.724 | Required | |
| S29 | 448903.662 | 116265.943 | 448903.662 | 116265.943 | Required | |
| S30 | 448934.635 | 116263.654 | 448934.635 | 116263.654 | Required | |
| S31 | 448937.576 | 116268.156 | 448937.576 | 116268.156 | Required | |
| S30 | 448935.404 | 116274.655 | 448935.404 | 116274.655 | Required | |
| S29 | 448962.215 | 116281.367 | 448962.215 | 116281.367 | Required | |



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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S30 | 448947.800 | 116317.447 | 448947.800 | 116317.447 | Required | |
| S31 | 448926.252 | 116309.033 | 448926.252 | 116309.033 | Required | |
| S32 | 448889.581 | 116299.030 | 448889.581 | 116299.030 | Required | |
| S33 | 448859.761 | 116290.455 | 448859.761 | 116290.455 | Required | |
| S16 | 448847.392 | 116286.957 | 448847.392 | 116286.957 | Required | |
| S17 | 448837.027 | 116319.559 | 448837.027 | 116319.559 | Required | |
| S18 | 448824.202 | 116353.103 | 448824.202 | 116353.103 | Required | |
| S19 | 448809.278 | 116381.775 | 448809.278 | 116381.775 | Required | |
| S42 | 448866.282 | 116347.134 | 448866.282 | 116347.134 | Required | |
| S43 | 448856.340 | 116353.529 | 448856.340 | 116353.529 | Required | |
| S44 | 448843.021 | 116388.410 | 448843.021 | 116388.410 | Required | |
| S45 | 448826.391 | 116442.773 | 448826.391 | 116442.773 | Required | |
| S46 | 448830.978 | 116440.499 | 448830.978 | 116440.499 | Required | |
| S47 | 448846.562 | 116446.635 | 448846.562 | 116446.635 | Required | |
| S48 | 448843.954 | 116442.162 | 448843.954 | 116442.162 | Required | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S47 | 448840.321 | 116435.868 | 448840.321 | 116435.868 | Required | |
| S48 | 448841.021 | 116419.464 | 448841.021 | 116419.464 | Required | |
| S45 | 448832.460 | 116416.233 | 448832.460 | 116416.233 | Required | |
| S46 | 448813.639 | 116409.129 | 448813.639 | 116409.129 | Required | |
| S20 | 448799.681 | 116404.380 | 448799.681 | 116404.380 | Required | |
| S21 | 448789.709 | 116443.983 | 448789.709 | 116443.983 | Required | |
| S22 | 448776.496 | 116472.634 | 448776.496 | 116472.634 | Required | |
| S23 | 448775.997 | 116497.240 | 448775.997 | 116497.240 | Required | |
| S24 | 448778.733 | 116518.684 | 448778.733 | 116518.684 | Required | |
| S25 | 448716.625 | 116590.739 | 448716.625 | 116590.739 | Required | |
| S | 448684.937 | 116694.619 | | | No Entry | |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.000 | o | 150 | S1 | 26.740 | 25.390 | 1.200 | Open Manhole | 1200 |
| S1.001 | o | 150 | S2 | 26.240 | 24.890 | 1.200 | Open Manhole | 1200 |
| S1.002 | o | 150 | S3 | 26.000 | 24.650 | 1.200 | Open Manhole | 1200 |
| S2.000 | o | 150 | S6 | 26.350 | 25.450 | 0.750 | Open Manhole | 1200 |
| S2.001 | o | 150 | S7 | 26.200 | 24.850 | 1.200 | Open Manhole | 1200 |
| S3.000 | o | 150 | S8 | 25.750 | 24.400 | 1.200 | Open Manhole | 1200 |
| S1.003 | o | 300 | S4 | 25.370 | 23.820 | 1.250 | Open Manhole | 1200 |
| S4.000 | o | 225 | S10 | 25.060 | 23.635 | 1.200 | Open Manhole | 1200 |
| S5.000 | o | 150 | S11 | 24.950 | 24.150 | 0.650 | Open Manhole | 1200 |
| S5.001 | o | 150 | S12 | 24.900 | 23.550 | 1.200 | Open Manhole | 1200 |
| S4.001 | o | 225 | S11 | 24.850 | 23.404 | 1.221 | Open Manhole | 1200 |
| S6.000 | o | 100 | S14 | 24.934 | 23.584 | 1.250 | Open Manhole | 1200 |
| S4.002 | o | 300 | S11 | 24.560 | 23.010 | 1.250 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.000 | 24.705 | 49.4 | S2 | 26.240 | 24.890 | 1.200 | Open Manhole | 1200 |
| S1.001 | 15.427 | 64.3 | S3 | 26.000 | 24.650 | 1.200 | Open Manhole | 1200 |
| S1.002 | 27.977 | 41.1 | S4 | 25.370 | 23.970 | 1.250 | Open Manhole | 1200 |
| S2.000 | 6.893 | 11.5 | S7 | 26.200 | 24.850 | 1.200 | Open Manhole | 1200 |
| S2.001 | 19.226 | 21.8 | S4 | 25.370 | 23.970 | 1.250 | Open Manhole | 1200 |
| S3.000 | 32.098 | 74.6 | S4 | 25.370 | 23.970 | 1.250 | Open Manhole | 1200 |
| S1.003 | 26.440 | 29.3 | S5 | 24.420 | 22.919 | 1.201 | Open Manhole | 1350 |
| S4.000 | 21.932 | 94.9 | S11 | 24.850 | 23.404 | 1.221 | Open Manhole | 1200 |
| S5.000 | 8.227 | 13.7 | S12 | 24.900 | 23.550 | 1.200 | Open Manhole | 1200 |
| S5.001 | 10.622 | 149.6 | S11 | 24.850 | 23.479 | 1.221 | Open Manhole | 1200 |
| S4.001 | 27.932 | 87.6 | S11 | 24.560 | 23.085 | 1.250 | Open Manhole | 1200 |
| S6.000 | 34.804 | 93.1 | S11 | 24.560 | 23.210 | 1.250 | Open Manhole | 1200 |
| S4.002 | 15.195 | 167.0 | S5 | 24.420 | 22.919 | 1.201 | Open Manhole | 1350 |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.004 | o | 450 | S5 | 24.420 | 22.769 | 1.201 | Open Manhole | 1350 |
| S1.005 | o | 450 | S6 | 24.350 | 22.700 | 1.200 | Open Manhole | 1350 |
| S1.006 | o | 450 | S7 | 24.180 | 22.530 | 1.200 | Open Manhole | 1350 |
| S1.007 | o | 525 | S8 | 24.000 | 22.275 | 1.200 | Open Manhole | 1500 |
| S1.008 | o | 525 | S9 | 23.650 | 21.925 | 1.200 | Open Manhole | 1500 |
| S1.009 | o | 525 | S10 | 23.500 | 21.737 | 1.238 | Open Manhole | 1500 |
| S1.010 | o | 600 | S11 | 23.200 | 21.362 | 1.238 | Open Manhole | 1500 |
| S1.011 | o | 600 | S12 | 23.160 | 21.220 | 1.340 | Open Manhole | 1500 |
| S1.012 | o | 600 | S13 | 23.460 | 21.146 | 1.714 | Open Manhole | 1500 |
| S1.013 | o | 600 | S14 | 23.700 | 21.081 | 2.019 | Open Manhole | 1500 |
| S1.014 | o | 600 | S15 | 23.493 | 21.017 | 1.877 | Open Manhole | 1500 |
| S7.000 | o | 150 | S27 | 24.900 | 23.550 | 1.200 | Open Manhole | 1200 |
| S7.001 | o | 150 | S28 | 24.840 | 23.010 | 1.680 | Open Manhole | 1200 |
| S8.000 | o | 150 | S29 | 25.100 | 23.750 | 1.200 | Open Manhole | 1200 |
| S9.000 | o | 150 | S30 | 24.850 | 24.050 | 0.650 | Open Manhole | 1200 |
| S9.001 | o | 150 | S31 | 24.800 | 23.450 | 1.200 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.004 | 8.061 | 116.8 | S6 | 24.350 | 22.700 | 1.200 | Open Manhole | 1350 |
| S1.005 | 17.287 | 101.7 | S7 | 24.180 | 22.530 | 1.200 | Open Manhole | 1350 |
| S1.006 | 16.284 | 90.5 | S8 | 24.000 | 22.350 | 1.200 | Open Manhole | 1500 |
| S1.007 | 37.029 | 105.8 | S9 | 23.650 | 21.925 | 1.200 | Open Manhole | 1500 |
| S1.008 | 13.150 | 70.0 | S10 | 23.500 | 21.737 | 1.238 | Open Manhole | 1500 |
| S1.009 | 20.519 | 68.4 | S11 | 23.200 | 21.437 | 1.238 | Open Manhole | 1500 |
| S1.010 | 28.429 | 200.2 | S12 | 23.160 | 21.220 | 1.340 | Open Manhole | 1500 |
| S1.011 | 29.718 | 400.0 | S13 | 23.460 | 21.146 | 1.714 | Open Manhole | 1500 |
| S1.012 | 24.592 | 380.0 | S14 | 23.700 | 21.081 | 2.019 | Open Manhole | 1500 |
| S1.013 | 23.904 | 370.0 | S15 | 23.493 | 21.017 | 1.877 | Open Manhole | 1500 |
| S1.014 | 24.742 | 258.8 | S16 | 23.100 | 20.921 | 1.579 | Open Manhole | 1500 |
| S7.000 | 31.603 | 58.5 | S28 | 24.840 | 23.010 | 1.680 | Open Manhole | 1200 |
| S7.001 | 18.030 | 150.3 | S29 | 24.430 | 22.890 | 1.390 | Open Manhole | 1200 |
| S8.000 | 32.916 | 94.0 | S30 | 24.750 | 23.400 | 1.200 | Open Manhole | 1200 |
| S9.000 | 5.378 | 9.0 | S31 | 24.800 | 23.450 | 1.200 | Open Manhole | 1200 |
| S9.001 | 6.852 | 137.0 | S30 | 24.750 | 23.400 | 1.200 | Open Manhole | 1200 |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S8.001 | o | 225 | S30 | 24.750 | 23.325 | 1.200 | Open Manhole | 1200 |
| S7.002 | o | 225 | S29 | 24.430 | 22.815 | 1.390 | Open Manhole | 1200 |
| S7.003 | o | 375 | S30 | 23.401 | 21.826 | 1.200 | Open Manhole | 1350 |
| S7.004 | o | 375 | S31 | 23.590 | 21.687 | 1.528 | Open Manhole | 1350 |
| S7.005 | o | 375 | S32 | 23.680 | 21.527 | 1.778 | Open Manhole | 1350 |
| S7.006 | o | 375 | S33 | 23.400 | 21.397 | 1.628 | Open Manhole | 1350 |
| S1.015 | o | 600 | S16 | 23.100 | 20.921 | 1.579 | Open Manhole | 1500 |
| S1.016 | o | 600 | S17 | 22.650 | 20.750 | 1.300 | Open Manhole | 1500 |
| S1.017 | o | 600 | S18 | 22.150 | 20.350 | 1.200 | Open Manhole | 1500 |
| S1.018 | o | 600 | S19 | 21.790 | 19.991 | 1.199 | Open Manhole | 1500 |
| S10.000 | o | 150 | S42 | 22.700 | 21.900 | 0.650 | Open Manhole | 1200 |
| S10.001 | o | 150 | S43 | 22.550 | 21.200 | 1.200 | Open Manhole | 1200 |
| S10.002 | o | 150 | S44 | 22.150 | 20.800 | 1.200 | Open Manhole | 1200 |
| S11.000 | o | 150 | S45 | 21.900 | 21.100 | 0.650 | Open Manhole | 1200 |
| S11.001 | o | 150 | S46 | 21.850 | 20.500 | 1.200 | Open Manhole | 1200 |
| S12.000 | o | 150 | S47 | 21.900 | 21.100 | 0.650 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S8.001 | 27.638 | 54.2 | S29 | 24.430 | 22.815 | 1.390 | Open Manhole | 1200 |
| S7.002 | 38.852 | 46.3 | S30 | 23.401 | 21.976 | 1.200 | Open Manhole | 1350 |
| S7.003 | 23.133 | 166.4 | S31 | 23.590 | 21.687 | 1.528 | Open Manhole | 1350 |
| S7.004 | 38.011 | 238.0 | S32 | 23.680 | 21.527 | 1.778 | Open Manhole | 1350 |
| S7.005 | 31.029 | 238.0 | S33 | 23.400 | 21.397 | 1.628 | Open Manhole | 1350 |
| S7.006 | 12.853 | 51.2 | S16 | 23.100 | 21.146 | 1.579 | Open Manhole | 1500 |
| S1.015 | 34.210 | 200.0 | S17 | 22.650 | 20.750 | 1.300 | Open Manhole | 1500 |
| S1.016 | 35.912 | 89.8 | S18 | 22.150 | 20.350 | 1.200 | Open Manhole | 1500 |
| S1.017 | 32.324 | 90.0 | S19 | 21.790 | 19.991 | 1.199 | Open Manhole | 1500 |
| S1.018 | 24.558 | 67.5 | S20 | 21.540 | 19.627 | 1.313 | Open Manhole | 1500 |
| S10.000 | 11.822 | 16.9 | S43 | 22.550 | 21.200 | 1.200 | Open Manhole | 1200 |
| S10.001 | 37.337 | 93.3 | S44 | 22.150 | 20.800 | 1.200 | Open Manhole | 1200 |
| S10.002 | 29.760 | 55.1 | S45 | 21.910 | 20.260 | 1.500 | Open Manhole | 1200 |
| S11.000 | 5.120 | 8.5 | S46 | 21.850 | 20.500 | 1.200 | Open Manhole | 1200 |
| S11.001 | 10.428 | 149.0 | S47 | 21.800 | 20.430 | 1.220 | Open Manhole | 1200 |
| S12.000 | 5.178 | 8.6 | S48 | 21.850 | 20.500 | 1.200 | Open Manhole | 1200 |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S12.001 | o | 150 | S48 | 21.850 | 20.500 | 1.200 | Open Manhole | 1200 |
| S11.002 | o | 150 | S47 | 21.800 | 20.430 | 1.220 | Open Manhole | 1200 |
| S11.003 | o | 225 | S48 | 22.000 | 20.246 | 1.529 | Open Manhole | 1200 |
| S10.003 | o | 300 | S45 | 21.910 | 20.110 | 1.500 | Open Manhole | 1200 |
| S10.004 | o | 300 | S46 | 21.710 | 19.989 | 1.421 | Open Manhole | 1200 |
| S1.019 | o | 675 | S20 | 21.540 | 19.552 | 1.313 | Open Manhole | 1500 |
| S1.020 | o | 675 | S21 | 21.660 | 19.457 | 1.528 | Open Manhole | 1500 |
| S1.021 | o | 675 | S22 | 21.600 | 19.396 | 1.529 | Open Manhole | 1500 |
| S1.022 | o | 675 | S23 | 21.350 | 19.349 | 1.326 | Open Manhole | 1500 |
| S1.023 | o | 675 | S24 | 21.232 | 19.307 | 1.250 | Open Manhole | 1500 |
| S1.024 | o | 300 | S25 | 20.100 | 19.200 | 0.600 | Open Manhole | 1500 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S12.001 | 7.268 | 103.8 | S47 | 21.800 | 20.430 | 1.220 | Open Manhole | 1200 |
| S11.002 | 16.418 | 150.0 | S48 | 22.000 | 20.321 | 1.529 | Open Manhole | 1200 |
| S11.003 | 9.150 | 150.0 | S45 | 21.910 | 20.185 | 1.500 | Open Manhole | 1200 |
| S10.003 | 20.118 | 167.0 | S46 | 21.710 | 19.989 | 1.421 | Open Manhole | 1200 |
| S10.004 | 14.743 | 238.0 | S20 | 21.540 | 19.927 | 1.313 | Open Manhole | 1500 |
| S1.019 | 40.838 | 430.0 | S21 | 21.660 | 19.457 | 1.528 | Open Manhole | 1500 |
| S1.020 | 31.552 | 520.0 | S22 | 21.600 | 19.396 | 1.529 | Open Manhole | 1500 |
| S1.021 | 24.611 | 520.0 | S23 | 21.350 | 19.349 | 1.326 | Open Manhole | 1500 |
| S1.022 | 21.617 | 520.0 | S24 | 21.232 | 19.307 | 1.249 | Open Manhole | 1500 |
| S1.023 | 95.128 | 889.0 | S25 | 20.100 | 19.200 | 0.225 | Open Manhole | 1500 |
| S1.024 | 108.605 | 45.3 | S | 17.400 | 16.800 | 0.300 | Open Manhole | 0 |

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## Area Summary for Storm

| Pipe Number | PIMP Type | PIMP Name | PIMP (%) | Gross Area (ha) | Imp. Area (ha) | Pipe Total (ha) |
|---|---|---|---|---|---|---|
| 1.000 | - | - | 100 | 0.019 | 0.019 | 0.019 |
| 1.001 | - | - | 100 | 0.017 | 0.017 | 0.017 |
| 1.002 | - | - | 100 | 0.028 | 0.028 | 0.028 |
| 2.000 | - | - | 100 | 0.114 | 0.114 | 0.114 |
| 2.001 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 3.000 | - | - | 100 | 0.032 | 0.032 | 0.032 |
| 1.003 | - | - | 100 | 0.133 | 0.133 | 0.133 |
| 4.000 | - | - | 100 | 0.085 | 0.085 | 0.085 |
| 5.000 | - | - | 100 | 0.084 | 0.084 | 0.084 |
| 5.001 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 4.001 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 6.000 | - | - | 100 | 0.012 | 0.012 | 0.012 |
| 4.002 | - | - | 100 | 0.075 | 0.075 | 0.075 |
| 1.004 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.005 | - | - | 100 | 0.037 | 0.037 | 0.037 |
| 1.006 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.007 | - | - | 100 | 0.358 | 0.358 | 0.358 |
| 1.008 | - | - | 100 | 0.040 | 0.040 | 0.040 |
| 1.009 | - | - | 100 | 0.107 | 0.107 | 0.107 |
| 1.010 | - | - | 100 | 0.027 | 0.027 | 0.027 |
| 1.011 | - | - | 100 | 0.018 | 0.018 | 0.018 |
| 1.012 | - | - | 100 | 0.024 | 0.024 | 0.024 |
| 1.013 | - | - | 100 | 0.024 | 0.024 | 0.024 |
| 1.014 | - | - | 100 | 0.024 | 0.024 | 0.024 |
| 7.000 | - | - | 100 | 0.027 | 0.027 | 0.027 |
| 7.001 | - | - | 100 | 0.044 | 0.044 | 0.044 |
| 8.000 | - | - | 100 | 0.032 | 0.032 | 0.032 |
| 9.000 | - | - | 100 | 0.041 | 0.041 | 0.041 |
| 9.001 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 8.001 | - | - | 100 | 0.066 | 0.066 | 0.066 |
| 7.002 | - | - | 100 | 0.031 | 0.031 | 0.031 |
| 7.003 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 7.004 | - | - | 100 | 0.101 | 0.101 | 0.101 |
| 7.005 | - | - | 100 | 0.076 | 0.076 | 0.076 |
| 7.006 | - | - | 100 | 0.080 | 0.080 | 0.080 |
| 1.015 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.016 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.017 | - | - | 100 | 0.030 | 0.030 | 0.030 |
| 1.018 | - | - | 100 | 0.020 | 0.020 | 0.020 |
| 10.000 | - | - | 100 | 0.111 | 0.111 | 0.111 |
| 10.001 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 10.002 | - | - | 100 | 0.064 | 0.064 | 0.064 |
| 11.000 | - | - | 100 | 0.059 | 0.059 | 0.059 |
| 11.001 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 12.000 | - | - | 100 | 0.044 | 0.044 | 0.044 |
| 12.001 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 11.002 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 11.003 | - | - | 100 | 0.026 | 0.026 | 0.026 |
| 10.003 | - | - | 100 | 0.033 | 0.033 | 0.033 |
| 10.004 | - | - | 100 | 0.032 | 0.032 | 0.032 |
| 1.019 | - | - | 100 | 0.029 | 0.029 | 0.029 |

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## Area Summary for Storm

| Pipe Number | PIMP Type | PIMP Name | PIMP (%) | Gross Area (ha) | Imp. Area (ha) | Pipe Total (ha) |
|---|---|---|---|---|---|---|
| 1.020 | - | - | 100 | 0.018 | 0.018 | 0.018 |
| 1.021 | - | - | 100 | 0.016 | 0.016 | 0.016 |
| 1.022 | - | - | 100 | 0.026 | 0.026 | 0.026 |
| 1.023 | - | - | 100 | 0.068 | 0.068 | 0.068 |
| 1.024 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| | | | | Total | Total | Total |
| | | | | 2.332 | 2.332 | 2.332 |

## 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) |
|---|---|---|---|---|---|---|
| S1.024 | S | 17.400 | 16.800 | 0.000 | 0 | 0 |

## 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 | 7 |
| Number of Online Controls | 7 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

## Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Profile Type | Summer |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 19.900 | Storm Duration (mins) | 30 |
| Ratio R | 0.350 | | |

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## Online Controls for Storm

### Hydro-Brake® Optimum Manhole: S7, DS/PN: S2.001, Volume (m³): 1.6

| | |
|---|---|
| Unit Reference | MD-SHE-0146-1050-1200-1050 |
| Design Head (m) | 1.200 |
| Design Flow (l/s) | 10.5 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 146 |
| Invert Level (m) | 24.850 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.200 | 10.5 |
| Flush-Flo™ | 0.359 | 10.5 |
| Kick-Flo® | 0.783 | 8.6 |
| Mean Flow over Head Range | - | 9.1 |

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 | 5.3 | 1.200 | 10.5 | 3.000 | 16.2 | 7.000 | 24.3 |
| 0.200 | 9.9 | 1.400 | 11.3 | 3.500 | 17.4 | 7.500 | 25.1 |
| 0.300 | 10.4 | 1.600 | 12.0 | 4.000 | 18.6 | 8.000 | 25.9 |
| 0.400 | 10.5 | 1.800 | 12.7 | 4.500 | 19.7 | 8.500 | 26.7 |
| 0.500 | 10.3 | 2.000 | 13.4 | 5.000 | 20.7 | 9.000 | 27.4 |
| 0.600 | 10.0 | 2.200 | 14.0 | 5.500 | 21.7 | 9.500 | 28.2 |
| 0.800 | 8.7 | 2.400 | 14.6 | 6.000 | 22.6 | | |
| 1.000 | 9.6 | 2.600 | 15.1 | 6.500 | 23.5 | | |

### Hydro-Brake® Optimum Manhole: S12, DS/PN: S5.001, Volume (m³): 1.7

| | |
|---|---|
| Unit Reference | MD-SHE-0099-4500-1100-4500 |
| Design Head (m) | 1.100 |
| Design Flow (l/s) | 4.5 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 99 |
| Invert Level (m) | 23.550 |
| Minimum Outlet Pipe Diameter (mm) | 150 |
| Suggested Manhole Diameter (mm) | 1200 |

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## Hydro-Brake® Optimum Manhole: S12, DS/PN: S5.001, Volume (m³): 1.7

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.100 | 4.5 |
| Flush-Flo™ | 0.329 | 4.5 |
| Kick-Flo® | 0.693 | 3.6 |
| Mean Flow over Head Range | - | 3.9 |

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 | 3.2 | 1.200 | 4.7 | 3.000 | 7.2 | 7.000 | 10.7 |
| 0.200 | 4.3 | 1.400 | 5.0 | 3.500 | 7.7 | 7.500 | 11.1 |
| 0.300 | 4.5 | 1.600 | 5.4 | 4.000 | 8.2 | 8.000 | 11.4 |
| 0.400 | 4.5 | 1.800 | 5.7 | 4.500 | 8.7 | 8.500 | 11.8 |
| 0.500 | 4.4 | 2.000 | 5.9 | 5.000 | 9.1 | 9.000 | 12.1 |
| 0.600 | 4.1 | 2.200 | 6.2 | 5.500 | 9.6 | 9.500 | 12.4 |
| 0.800 | 3.9 | 2.400 | 6.5 | 6.000 | 10.0 | | |
| 1.000 | 4.3 | 2.600 | 6.7 | 6.500 | 10.4 | | |

## Hydro-Brake® Optimum Manhole: S31, DS/PN: S9.001, Volume (m³): 1.6

| | |
|---|---|
| Unit Reference | MD-SHE-0093-4000-1100-4000 |
| Design Head (m) | 1.100 |
| Design Flow (l/s) | 4.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 93 |
| Invert Level (m) | 23.450 |
| Minimum Outlet Pipe Diameter (mm) | 150 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.100 | 4.0 |
| Flush-Flo™ | 0.326 | 4.0 |
| Kick-Flo® | 0.684 | 3.2 |
| Mean Flow over Head Range | - | 3.5 |

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

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 3.0 | 0.300 | 4.0 | 0.500 | 3.9 | 0.800 | 3.5 |
| 0.200 | 3.8 | 0.400 | 4.0 | 0.600 | 3.6 | 1.000 | 3.8 |

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Hydro-Brake® Optimum Manhole: S31, DS/PN: S9.001, Volume (m³): 1.6

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 1.200 | 4.2 | 2.400 | 5.7 | 5.000 | 8.1 | 8.000 | 10.2 |
| 1.400 | 4.5 | 2.600 | 6.0 | 5.500 | 8.5 | 8.500 | 10.5 |
| 1.600 | 4.8 | 3.000 | 6.4 | 6.000 | 8.9 | 9.000 | 10.7 |
| 1.800 | 5.0 | 3.500 | 6.9 | 6.500 | 9.2 | 9.500 | 11.0 |
| 2.000 | 5.3 | 4.000 | 7.3 | 7.000 | 9.5 | | |
| 2.200 | 5.5 | 4.500 | 7.7 | 7.500 | 9.8 | | |

Hydro-Brake® Optimum Manhole: S43, DS/PN: S10.001, Volume (m³): 1.7

| | |
|---|---|
| Unit Reference | MD-SHE-0079-3000-1200-3000 |
| Design Head (m) | 1.200 |
| Design Flow (l/s) | 3.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 79 |
| Invert Level (m) | 21.200 |
| Minimum Outlet Pipe Diameter (mm) | 100 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.200 | 3.0 |
| Flush-Flo™ | 0.348 | 2.9 |
| Kick-Flo® | 0.707 | 2.4 |
| Mean Flow over Head Range | - | 2.6 |

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 | 2.3 | 1.200 | 3.0 | 3.000 | 4.6 | 7.000 | 6.8 |
| 0.200 | 2.8 | 1.400 | 3.2 | 3.500 | 4.9 | 7.500 | 7.0 |
| 0.300 | 2.9 | 1.600 | 3.4 | 4.000 | 5.2 | 8.000 | 7.3 |
| 0.400 | 2.9 | 1.800 | 3.6 | 4.500 | 5.5 | 8.500 | 7.5 |
| 0.500 | 2.8 | 2.000 | 3.8 | 5.000 | 5.8 | 9.000 | 7.7 |
| 0.600 | 2.7 | 2.200 | 4.0 | 5.500 | 6.1 | 9.500 | 7.9 |
| 0.800 | 2.5 | 2.400 | 4.1 | 6.000 | 6.3 | | |
| 1.000 | 2.8 | 2.600 | 4.3 | 6.500 | 6.6 | | |

Hydro-Brake® Optimum Manhole: S46, DS/PN: S11.001, Volume (m³): 1.6

| | |
|---|---|
| Unit Reference | MD-SHE-0081-3000-1100-3000 |
| Design Head (m) | 1.100 |
| Design Flow (l/s) | 3.0 |
| Flush-Flo™ | Calculated |

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## Hydro-Brake® Optimum Manhole: S46, DS/PN: S11.001, Volume (m³): 1.6

| | |
|---|---|
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 81 |
| Invert Level (m) | 20.500 |
| Minimum Outlet Pipe Diameter (mm) | 100 |
| Suggested Manhole Diameter (mm) | 1200 |

| **Control Points** | **Head (m)** | **Flow (l/s)** |
|---|---|---|
| Design Point (Calculated) | 1.100 | 3.0 |
| Flush-Flo™ | 0.333 | 3.0 |
| Kick-Flo® | 0.682 | 2.4 |
| Mean Flow over Head Range | - | 2.6 |

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 | 2.4 | 1.200 | 3.1 | 3.000 | 4.8 | 7.000 | 7.1 |
| 0.200 | 2.9 | 1.400 | 3.4 | 3.500 | 5.1 | 7.500 | 7.3 |
| 0.300 | 3.0 | 1.600 | 3.6 | 4.000 | 5.5 | 8.000 | 7.6 |
| 0.400 | 3.0 | 1.800 | 3.8 | 4.500 | 5.8 | 8.500 | 7.8 |
| 0.500 | 2.9 | 2.000 | 4.0 | 5.000 | 6.1 | 9.000 | 8.0 |
| 0.600 | 2.7 | 2.200 | 4.1 | 5.500 | 6.3 | 9.500 | 8.2 |
| 0.800 | 2.6 | 2.400 | 4.3 | 6.000 | 6.6 | | |
| 1.000 | 2.9 | 2.600 | 4.5 | 6.500 | 6.9 | | |

## Hydro-Brake® Optimum Manhole: S48, DS/PN: S12.001, Volume (m³): 1.6

| | |
|---|---|
| Unit Reference | MD-SHE-0081-3000-1100-3000 |
| Design Head (m) | 1.100 |
| Design Flow (l/s) | 3.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 81 |
| Invert Level (m) | 20.500 |
| Minimum Outlet Pipe Diameter (mm) | 100 |
| Suggested Manhole Diameter (mm) | 1200 |

| **Control Points** | **Head (m)** | **Flow (l/s)** |
|---|---|---|
| Design Point (Calculated) | 1.100 | 3.0 |
| Flush-Flo™ | 0.333 | 3.0 |
| Kick-Flo® | 0.682 | 2.4 |
| Mean Flow over Head Range | - | 2.6 |

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

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## Hydro-Brake® Optimum Manhole: S48, DS/PN: S12.001, Volume (m³): 1.6

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 | 2.4 | 1.200 | 3.1 | 3.000 | 4.8 | 7.000 | 7.1 |
| 0.200 | 2.9 | 1.400 | 3.4 | 3.500 | 5.1 | 7.500 | 7.3 |
| 0.300 | 3.0 | 1.600 | 3.6 | 4.000 | 5.5 | 8.000 | 7.6 |
| 0.400 | 3.0 | 1.800 | 3.8 | 4.500 | 5.8 | 8.500 | 7.8 |
| 0.500 | 2.9 | 2.000 | 4.0 | 5.000 | 6.1 | 9.000 | 8.0 |
| 0.600 | 2.7 | 2.200 | 4.1 | 5.500 | 6.3 | 9.500 | 8.2 |
| 0.800 | 2.6 | 2.400 | 4.3 | 6.000 | 6.6 | | |
| 1.000 | 2.9 | 2.600 | 4.5 | 6.500 | 6.9 | | |

## Hydro-Brake® Optimum Manhole: S25, DS/PN: S1.024, Volume (m³): 35.1

| | |
|---|---|
| Unit Reference | MD-SHE-0268-3960-0900-3960 |
| Design Head (m) | 0.900 |
| Design Flow (l/s) | 39.6 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 268 |
| Invert Level (m) | 19.200 |
| Minimum Outlet Pipe Diameter (mm) | 300 |
| Suggested Manhole Diameter (mm) | 1800 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 0.900 | 39.6 |
| Flush-Flo™ | 0.405 | 39.6 |
| Kick-Flo® | 0.709 | 35.3 |
| Mean Flow over Head Range | - | 31.7 |

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 | 8.5 | 1.200 | 45.5 | 3.000 | 70.8 | 7.000 | 107.0 |
| 0.200 | 27.5 | 1.400 | 49.0 | 3.500 | 76.3 | 7.500 | 110.7 |
| 0.300 | 38.9 | 1.600 | 52.2 | 4.000 | 81.5 | 8.000 | 114.2 |
| 0.400 | 39.6 | 1.800 | 55.3 | 4.500 | 86.3 | 8.500 | 117.7 |
| 0.500 | 39.2 | 2.000 | 58.2 | 5.000 | 90.8 | 9.000 | 121.0 |
| 0.600 | 38.0 | 2.200 | 60.9 | 5.500 | 95.1 | 9.500 | 123.5 |
| 0.800 | 37.4 | 2.400 | 63.6 | 6.000 | 99.3 | | |
| 1.000 | 41.7 | 2.600 | 66.1 | 6.500 | 103.2 | | |

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## Storage Structures for Storm

### Porous Car Park Manhole: S6, DS/PN: S2.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 10.3 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 37.1 |
| Max Percolation (l/s) | 106.1 | Slope (1:X) | 40.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 25.450 | Membrane Depth (mm) | 0 |

### Porous Car Park Manhole: S11, DS/PN: S5.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 12.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 59.8 |
| Max Percolation (l/s) | 199.3 | Slope (1:X) | 50.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 24.150 | Membrane Depth (mm) | 0 |

### Porous Car Park Manhole: S30, DS/PN: S9.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 12.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 59.9 |
| Max Percolation (l/s) | 199.7 | Slope (1:X) | 50.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 24.050 | Membrane Depth (mm) | 0 |

### Porous Car Park Manhole: S42, DS/PN: S10.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 15.8 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 29.0 |
| Max Percolation (l/s) | 127.3 | Slope (1:X) | 80.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 21.900 | Membrane Depth (mm) | 0 |

### Porous Car Park Manhole: S45, DS/PN: S11.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 12.8 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 44.5 |
| Max Percolation (l/s) | 158.2 | Slope (1:X) | 50.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 21.100 | Membrane Depth (mm) | 0 |

### Porous Car Park Manhole: S47, DS/PN: S12.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Max Percolation (l/s) | 81.8 |
| Membrane Percolation (mm/hr) | 1000 | Safety Factor | 2.0 |

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## Porous Car Park Manhole: S47, DS/PN: S12.000

| | | | |
|---|---|---|---|
| Porosity | 0.30 | Slope (1:X) | 50.0 |
| Invert Level (m) | 21.100 | Depression Storage (mm) | 5 |
| Width (m) | 26.3 | Evaporation (mm/day) | 3 |
| Length (m) | 11.2 | Membrane Depth (mm) | 0 |

## Tank or Pond Manhole: S25, DS/PN: S1.024

Invert Level (m) 19.200

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 1788.0 | 0.900 | 3216.0 |

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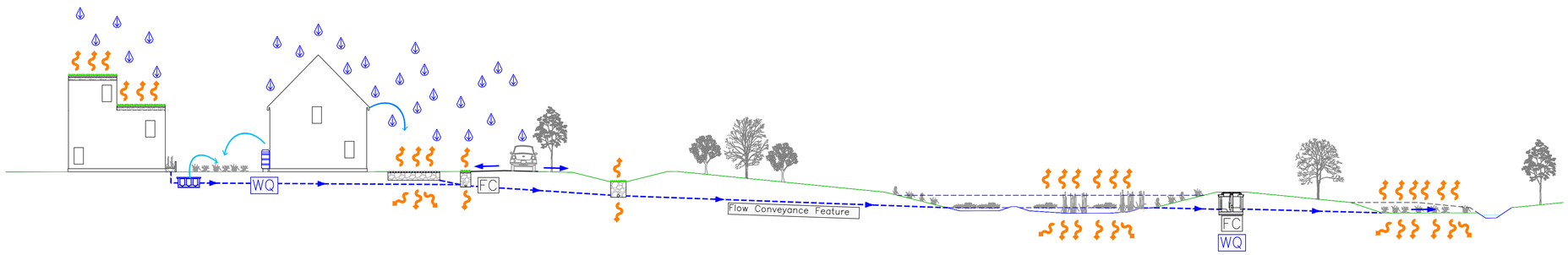
**APPENDIX H**

**Drawings Extracted from the Site-Wide Flood Risk Assessment:**

**(SuDS Management Train, Site-Wide Preliminary Water Management Strategy Plan (sheet 2 of 2), Typical Layout of Strategic SuDS Features to Inform Detailed Design)**

KEY

- Rainfall
- Interception Losses (Evapotranspiration / Infiltration)
- Water Reuse
- WQ Water Quality Device (Oil Separator / Vortex Separator)
- FC Flow Control Device (Orifice / Vortex Flow Control)
- Overland Flow
- Surface Water Sewer (connecting SuDS Features)




| DEVELOPMENT TYPE | Commercial / Public | Residential | Private / Shared Parking | Public Highway | Conveyance Features | | Green Infrastructure / Public Open Space | Watercourse Corridor |
|---|---|---|---|---|---|---|---|---|
| MANAGEMENT TRAIN | PREVENTION<br>SOURCE CONTROL | | | SITE / REGIONAL CONTROL | | | | |
| SuDS FEATURE | Rainwater Harvesting (Reuse for irrigation e.g Rainwater Butts)<br>Green Roofs<br>Bioretention Areas / Rain Gardens<br>Rills | Rainwater Harvesting (Reuse for irrigation e.g Rainwater Butts)<br>Porous Paving<br>Tanks<br>Flow Control Devices | | Swales<br>Bioretention Areas<br>Filter Strips<br>Filter Drains | | | Strategic SuDS incorporating sediment forbays, wetland areas, micropools at the outlet<br>Flow Control Devices<br>Water Quality Devices | Outfall Swale |
| MAINTENANCE RESPONSIBILITY | Commercial or Public Tenants | Homeowners | Homeowners / Management Company | Highway Authority | Southern Water / Management Company | | Southern Water / Management Company | Southern Water / Management Company |


PFA consulting

Stratton Park House, Wanborough Road
Swindon, SN3 4HG

**Telephone**
01793 828000

**Website**
www.pfaplc.com


For Planning
This drawing is produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

NOTES

1. Drawing to be read in conjunction with Flood Risk Assessment and Water Management Strategy produced by PFA Consulting (Document Ref: G277-DOC01 Dated November 2020) and Preliminary Water Management Strategy Plan (Drawing No. G277/21 & 22).
2. Future design of upstream Source Control & Site Control to take account of the principles established in in the Water Management Strategy and this drawing.

| Rev | Date | Description | Drawn | Check |
|---|---|---|---|---|
| # | 26.11.20 | First Issue. | BF | MWS |

Status
FOR PLANNING

Client
**Eastleigh Borough Council**

Project
**One Horton Heath Hampshire**

Drawing Title
**SuDS Management Train**

Drawing No. **G277/24**

Date: November 2020 | Scale: NTS @ A1


E-Mail: bfox@pfaplc.com

**Strategic SuDS Features Schedule**

| Strategic SuDS Feature | Contributing Catchment (ha) | % of impermeability | $Q_{MED}$ for Catchment (l/s) | 1 in 1 Year Storage Volume ($m^3$) | 1 in 1 Year Resulting Discharge (l/s) | 1 in 100+40%CC Storage Volume ($m^3$) | 1 in 100+40%CC Resulting Discharge (l/s) |
|---|---|---|---|---|---|---|---|
| A | 2.037 | 65 | 18.4 | 165 | 17.8 | 802 | 18.3 |
| | 0.260 | 100 | | | | | |
| B | 3.750 | 65 | 30.0 | 260 | 28.1 | 1224 | 29.9 |
| C | 6.808 | 65 | 54.5 | 405 | 50.1 | 2172 | 54.4 |
| D | 3.381 | 65 | 27.1 | 244 | 23.7 | 1112 | 27 |
| E | 3.650 | 65 | 32.3 | 337 | 24.8 | 1706 | 32.3 |
| | 0.382 | 100 | | | | | |
| F | 3.360 | 65 | 26.9 | 241 | 23.9 | 1103 | 26.9 |
| G | 2.762 | 65 | 41.5 | 267 | 34.7 | 1450 | 40.3 |
| | 2.415 | 50 | | | | | |
| H | 1.603 | 30 | 70.8 | 683 | 44.1 | 2694 | 70.8 |
| | 0.409 | 100 | | | | | |
| | 6.831 | 65 | | | | | |
| I | 1.556 | 65 | 29.6 | 314 | 26.7 | 1339 | 28.7 |
| J | 2.139 | 65 | | | | | |
| K | 1.696 | 65 | 13.6 | 127 | 11.0 | 560 | 13.5 |
| L | 3.894 | 65 | 39.6 | 433 | 32.5 | 1860 | 39.5 |
| | 1.046 | 100 | | | | | |
| M | 2.213 | 65 | 17.7 | 156 | 16.2 | 728 | 17.7 |
| N | 5.759 | 65 | 46.1 | 477 | 31.1 | 1924 | 46.0 |
| EM(Employment) | 2.029 | 85 | 16.3 | 150 | 15.5 | 878 | 16.3 |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For Planning
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NOTES

1. This drawing should be read in conjunction with PFA Consulting's Flood Risk Assessment (Doc ref G277-DOC01 FRA – Issue 1) dated Dec 2020.
2. This drawing is based on the Topographical Survey undertaken by Mayer Brown Limited, Drawing No:R.SAV.1.21.1, Rev E, dated 05 May 2014.
3. This site layout is based on Thrive's Concept Masterplan, Drawing number EAST200403 CMP 01 Rev P13, dated 04.12.20
4. Main River designation based on Flood Map for Planning.
5. All SuDS features shown on this drawing are subject to detailed design.
6. Typical Layout of Strategic SuDS Features to Inform Detailed Design shown on drawing number G277/23.
7. Detailed design of highway drainage features to provide attenuation and restrict flows to the downstream watercourse system. Sufficient attenuation should be provided to ensure discharge rates are restricted for all return periods up to the 100 year design event, including an appropriate allowance for climate change. Refer to PFA's Flood Risk Assessment (dated Dec 2020) document for guidance on flow rate restrictions.

Key

- Risk of Flooding from Surface Water Outline
- Basin Catchment Allocation
- Flood Zone 2
- Flood Zone 3
- Indicative Location of Foul Water Sewage Pumping Station with 15m odour offset
- 5m offset from Watercourse
- 8m offset from Main Rivers
- Opportunity for swale conveyance feature
- Direction of Exceedance Flows
- Outlet from SuDS Feature to be conveyance swale where feasible
- Indicative Proposed Foul Rising Main
- FS-> Indicative Proposed Strategic Foul Sewer
- Indicative Foul flow direction

Sheet Key

| Rev | Date | Description | Drawn | Check |
|---|---|---|---|---|
| # | 27/11/20 | First Issue. | DAB | MWS |
| A | 11/12/20 | Revised to latest Masterplan & link road design | DAB | SAM |

Status
FOR PLANNING

Client
Eastleigh Borough Council

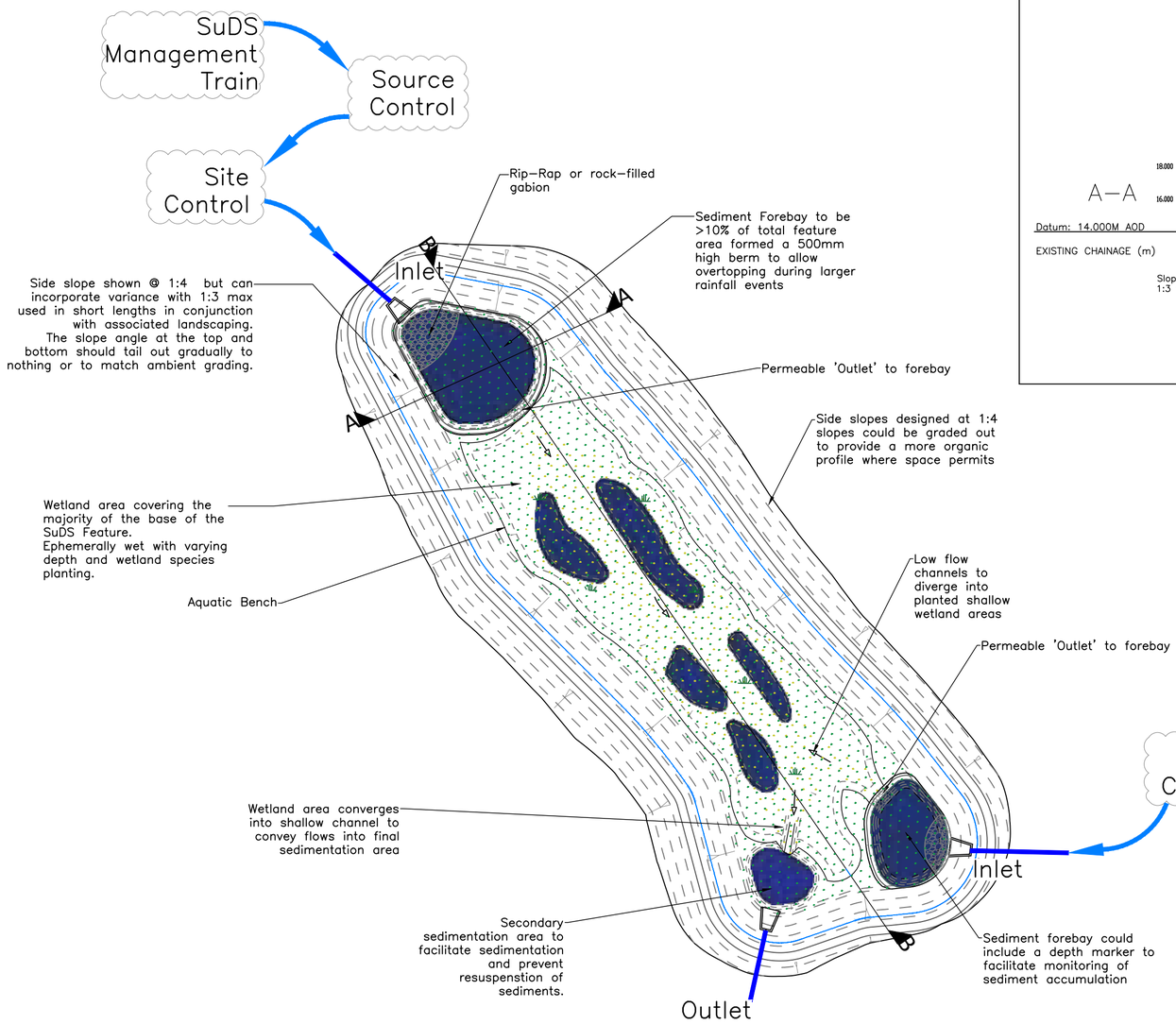
Project
One Horton Heath
Hampshire

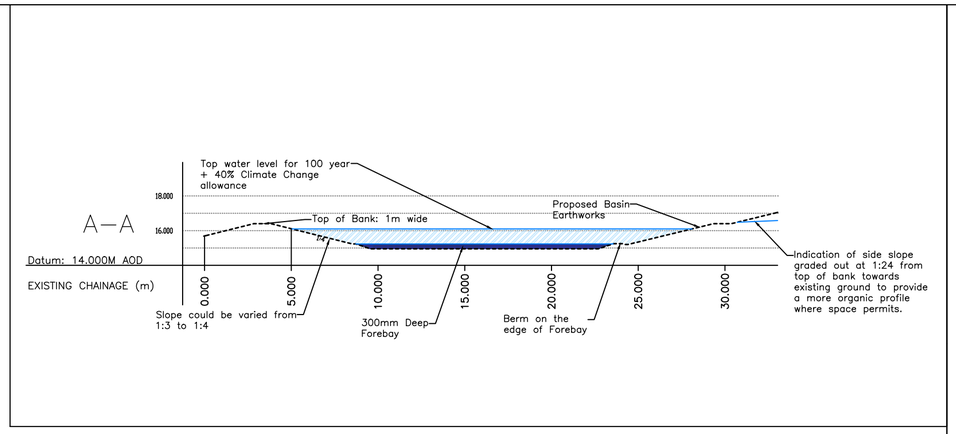
Drawing Title
Preliminary Water Management Strategy Plan (Sheet 2 of 2)

Drawing No. G277/22 Rev A

Date: November 2020 | Scale: 1:1250 @ A0


E-Mail: DBuciak@pfaplc.com



Stratton Park House, Wanborough Road
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**Website**
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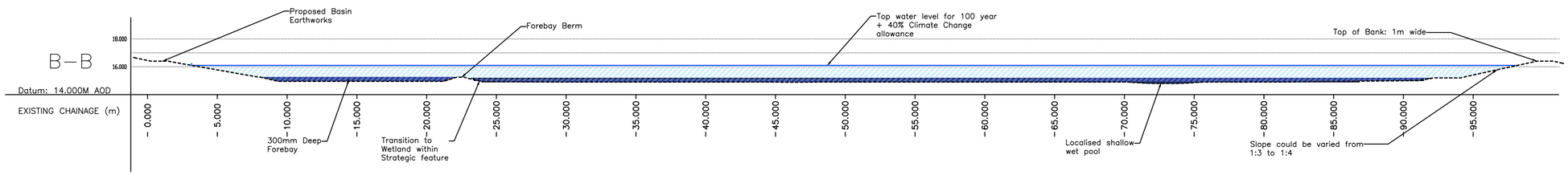
For Planning
This drawing is produced for the purposes of supporting a planning application and should not be relied upon for tender, pricing, or construction purposes.

NOTES

1. This drawing shows the typical SuDS feature arrangements for the SuDS features shown on the Preliminary Water Management Strategy Plan, Drawing number G277/21 & G277/22.
2. Upstream SuDS management train principles are outlined in the PFA's Water Management Strategy and depicted on drawing G277/24 dated November 2020.




| Rev | Date | Description | Drawn | Check |
|---|---|---|---|---|
| # | 26/11/20 | First Issue. | DAB | SAM |

Status
FOR PLANNING

Client
**Eastleigh Borough Council**

Project
**One Horton Heath Hampshire**

Drawing Title
**Typical Layout of Strategic SuDS Features to Inform Detailed Design**

Drawing No. **G277/23**

Date: November 2020 | Scale: As shown

E-Mail: DBuciak@pfaplc.com

# APPENDIX I

## Maintenance Schedules

**TABLE 17.1 Operation and maintenance requirements for swales**

| Maintenance schedule | Required action | Typical frequency |
|---|---|---|
| Regular maintenance | Remove litter and debris | Monthly, or as required |
| | Cut grass – to retain grass height within specified design range | Monthly (during growing season), or as required |
| | Manage other vegetation and remove nuisance plants | Monthly at start, then as required |
| | Inspect inlets, outlets and overflows for blockages, and clear if required | Monthly |
| | Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours | Monthly, or when required |
| | Inspect vegetation coverage | Monthly for 6 months, quarterly for 2 years, then half yearly |
| | Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies | Half yearly |
| Occasional maintenance | Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required | As required or if bare soil is exposed over 10% or more of the swale treatment area |
| Remedial actions | Repair erosion or other damage by re-turfing or reseeding | As required |
| | Relevel uneven surfaces and reinstate design levels | As required |
| | Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface | As required |
| | Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip | As required |
| | Remove and dispose of oils or petrol residues using safe standard practices | As required |

**TABLE 20.15 Operation and maintenance requirements for pervious pavements**

| Maintenance schedule | Required action | Typical frequency |
|---|---|---|
| Regular maintenance | Brushing and vacuuming (standard cosmetic sweep over whole surface) | Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment |
| Occasional maintenance | Stabilise and mow contributing and adjacent areas | As required |
| | Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying | As required – once per year on less frequently used pavements |
| Remedial Actions | Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving | As required |
| | Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material | As required |
| | Rehabilitation of surface and upper substructure by remedial sweeping | Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging) |
| Monitoring | Initial inspection | Monthly for three months after installation |
| | Inspect for evidence of poor operation and/or weed growth – if required, take remedial action | Three-monthly, 48 h after large storms in first six months |
| | Inspect silt accumulation rates and establish appropriate brushing frequencies | Annually |
| | Monitor inspection chambers | Annually |

Many of the specific maintenance activities for pervious pavements can be undertaken as part of a general site cleaning contract (many car parks or roads are swept to remove litter and for visual reasons to keep them tidy) and therefore, if litter management is already required at site, this should have marginal cost implications.

Generally, pervious pavements require less frequent gritting in winter to prevent ice formation. There is also less risk of ice formation after snow melt, as the melt water drains directly into the underlying sub-base and does not have chance to refreeze. A slight frost may occur more frequently on the surface of pervious pavements compared to adjacent impermeable surfaces, but this is only likely to last for a few hours. It does not happen in all installations and, if necessary, this can be dealt with by application of salt. It is not likely to pose a hazard to vehicle movements.

▶ Generic health and safety guidance is presented in **Chapter 36**.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

**TABLE 22.1 Operation and maintenance requirements for detention basins**

| Maintenance schedule | Required action | Typical frequency |
|---|---|---|
| Regular maintenance | Remove litter and debris | Monthly |
| | Cut grass – for spillways and access routes | Monthly (during growing season), or as required |
| | Cut grass – meadow grass in and around basin | Half yearly (spring – before nesting season, and autumn) |
| | Manage other vegetation and remove nuisance plants | Monthly (at start, then as required) |
| | Inspect inlets, outlets and overflows for blockages, and clear if required. | Monthly |
| | Inspect banksides, structures, pipework etc for evidence of physical damage | Monthly |
| | Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies. | Monthly (for first year), then annually or as required |
| | Check any penstocks and other mechanical devices | Annually |
| | Tidy all dead growth before start of growing season | Annually |
| | Remove sediment from inlets, outlet and forebay | Annually (or as required) |
| | Manage wetland plants in outlet pool – where provided | Annually (as set out in Chapter 23) |
| Occasional maintenance | Reseed areas of poor vegetation growth | As required |
| | Prune and trim any trees and remove cuttings | Every 2 years, or as required |
| | Remove sediment from inlets, outlets, forebay and main basin when required | Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided) |
| Remedial actions | Repair erosion or other damage by reseeding or re-turfing | As required |
| | Realignment of rip-rap | As required |
| | Repair/rehabilitation of inlets, outlets and overflows | As required |
| | Relevel uneven surfaces and reinstate design levels | As required |

## 22.13 REFERENCE

KENNARD, M F, HOSKINS, C G and FLETCHER, M (1996) *Small embankment reservoirs*, R161, CIRIA, London, UK (ISBN: 978-0-86017-461-5). Go to: **www.ciria.org**

### Statutes

Reservoir Act 1975 (c.23)

Health and Safety at Work (etc) Act 1974 (c.37)

Building Act 1984 (c.55)

Flood and Water Management Act 2010 (c.29)

Construction (Design and Management) Regulations (CDM) 2015

**TABLE 14.2 An example of operation and maintenance requirements for a proprietary treatment system**

| Maintenance schedule | Required action | Typical frequency |
|---|---|---|
| Routine maintenance | Remove litter and debris and inspect for sediment, oil and grease accumulation | Six monthly |
| | Change the filter media | As recommended by manufacturer |
| | Remove sediment, oil, grease and floatables | As necessary – indicated by system inspections or immediately following significant spill |
| Remedial actions | Replace malfunctioning parts or structures | As required |
| Monitoring | Inspect for evidence of poor operation | Six monthly |
| | Inspect filter media and establish appropriate replacement frequencies | Six monthly |
| | Inspect sediment accumulation rates and establish appropriate removal frequencies | Monthly during first half year of operation, then every six months |

should be undertaken whenever access for maintenance is required. Removal of oil, silt and other pollutants must be in accordance with the appropriate waste management legislation.

Maintenance responsibility for all systems should be placed with an appropriate organisation, and Maintenance Plans and schedules should be developed during the design phase.

▶ Further detail on the preparation of maintenance specifications and schedules of work is given in **Chapter 32**.

Table 14.2 provides guidance on the type of operation and maintenance schedule that may be appropriate for a proprietary treatment system. The list of actions is not exhaustive and some actions may not always be required.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

▶ Generic health and safety guidance is presented in **Chapter 36**.

### 14.12.2 Oil water separators

Specific requirements for oil/water separators are provided in PPG3 (EA/SEPA/EHSNI, 2006). The following items should be undertaken every six months as a minimum:

- check volume of sludge
- check thickness of light liquid
- check function of automatic closure device
- empty the separator, if required
- check the coalescing material and clean or change if necessary (class 1 only)
- check the function of the warning device (if fitted)

General inspection of the integrity of oil/water separators should occur at a maximum frequency of five years, and should cover the following:

- watertightness of system

| | |
|---|---|
| Project Name | : Horton Heath, Eastleigh |
| Job No | : 19-367 |
| Note Title | : Flood Risk Assessment and Drainage Strategy - Addendum 1 |
| Author | : JW |
| Checked | : JH |
| Approved | : GG |
| Date | : May 2021 |

## 1.0 INTRODUCTION

### *1.1 Background*

1.1.1 Odyssey was commissioned by Eastleigh Borough Council (EBC) to undertake a Flood Risk Assessment (FRA) and Water Management Strategy to be submitted in association with a planning application in support of a proposed development for a site at Horton Heath, Eastleigh.

1.1.2 The wider One Horton Heath development has obtained planning permission via two separate applications. The new composite outline planning permission for the wider site would increase the number of proposed dwellings from circa 1,500 to 2,500. The FRA and Water Management Strategy relates to the First Residential Parcel (FRP) of the development for 393 of the 2,500 dwellings.

1.1.3 The FRA and Water Management Strategy were submitted to EBC as part of the full planning application (reference F/20/89500) for the proposed FRP development.

1.1.4 Following the submission of the application, comments were received from Hampshire County Council (HCC) in their capacity as the Lead Local Flood Authority (LLFA), in February 2021 (HCC reference: SWM/2021/0019). A copy of the LLFA consultation comments is provided in **Appendix A**.

1.1.5 This FRA Addendum, which should be read in conjunction with the submitted FRA and Water Management Strategy (reference 19-367-01B), provides additional information as requested by the LLFA.

## 2.0 RESPONSE TO HAMPSHIRE COUNTY COUNCIL COMMENTS

2.1.1 HCC provided the following comments (***in bold italics)*** in February 2021. Odyssey's response directly follows each comment.

**"*The drainage plan shows a series of outfalls into the existing ditch. However, the fall of the ditch is erratic with some sections backfalling and there being a relatively shallow depth throughout. No levels have been provided at the headwalls so it is not clear what the final outfall levels will be nor is there any information about the typical water level within the ditch. This should be provided to ensure that the outfalls will be functional and water will flow appropriately within the ditch*."**

2.1.2 It is proposed to discharge Basin I, Basin K and Basin L directly into the existing ditch.

2.1.3 The pipework from Basin I has been designed to outfall at an approximate invert level of 19.88 metres above ordinance datum (m AOD). The bed level of the ditch in the location of the proposed outfall is 19.58. The proposed pipe would outfall at 300mm above the invert level of the ditch.

2.1.4 The pipework from Basin K has been designed to outfall at an approximate invert level of 18.05m AOD. The bed level of the ditch in the location of the proposed outfall is 17.90m AOD. The proposed pipe would outfall 150mm above the invert of the ditch.

2.1.5 The pipework from Basin L has been designed to outfall at an approximate invert level of 17.00m AOD. The bed level of the ditch in the location of the proposed outfall is 16.60m AOD. The proposed pipe would outfall at 400mm above the invert of the ditch.

2.1.6 The typical water level within the ditch is currently unknown.

**"*If water levels in the ditch rise, it is not clear what the impact will be on the drainage system so if modelling is not available, the drainage should be modelled using a surcharged outfall to understand the potential flood risk.*"**

2.1.7 The drainage networks have been modelled using a submerged outfall for the 1 in 100 year storm with 40% allowance for climate change. The results are presented in **Appendix B**. The results show that even with a submerged outfall, none of the proposed drainage networks would flood.

**"*Permeable paving is proposed within the parking areas. Please confirm whether these are lined given that parts of the site could suffer with high groundwater.*"**

2.1.8 All proposed permeable paving would be lined.

**"*A series of what we believe to be swales are identified adjacent to the watercourse and in various locations around the development. These do not appear to be connected and there is a section that appears to go through basin I. There are also sections that appear to clash with the proposed access roads between the dwellings and the ponds. Please clarify these elements particularly as there appears to be an existing ditch in this location which would require ordinary watercourse consent if any alterations are proposed*."**

2.1.9 The proposed swales are shown in blue on the drainage strategy. The basin and access roads are shown over existing hedges, which would be removed. The updated drawing is presented in **Appendix C**.

2.1.10 The proposed swales to the south-west of the site would drain into the main drainage system. The two enhanced swales on the north side of the site would be incorporated into the pipework; directing water through the enhanced swales would provide additional treatment. The outfall into Basin K has also been moved to better accommodate the swales. The storage volume that would be provided by the proposed swales has not been included in the hydraulic model as a conservative approach.

**"*Detailed hydraulic calculations have been provided but these do not appear to include the results summary pages. Please can this be provided*."**

2.1.11 Updated hydraulic calculations including the results summary pages are presented in **Appendix B**.

**"*It is stated that a maintenance company will be responsible for the drainage assets. Please note that our response is separate from Highways and if the roads are to be adopted, maintenance responsibilities will need to be discussed with the Highways team*."**

2.1.12 All proposed adoptable highway drains and adoptable surface water sewers would be maintained by HCC Highways and Southern Water respectively. The remaining private drainage would be maintained by the appointed maintenance company.

**"Not with standing the above comments, we would request a condition to ensure clarity on who will be responsible for the drainage maintenance responsibility with a clear plan detailing this as well as confirmation that the relevant bodies will adopt the relevant features"**

2.1.13 A condition of this nature would be accepted.

# APPENDIX A

## LLFA Comments

Hampshire County Council

*Economy, Transport and Environment Department*
*Elizabeth II Court West, The Castle*
*Winchester, Hampshire SO23 8UD*

Tel: 0300 555 1375 (General Enquiries)
0300 555 1388 (Roads and Transport)
0300 555 1389 (Recycling Waste & Planning)
Textphone 0300 555 1390
Fax 01962 847055
www.hants.gov.uk

| | | | |
|---|---|---|---|
| *Enquiries to* | Sarah Reghif | *My reference* | SWM/2021/0019 |
| *Direct Line* | 0370 779 7497 | *Your reference* | F/20/89500 |
| *Date* | 5 February 2021 | *Email* | SWM.consultee@hants.gov.uk |

Dear Sir/Madam,

**Erection of 393 residential units with public open space, hard and soft landscape works, internal roads, footway/cycleways, associated parking spaces, substation, SuDS and associated infrastructure (This application is subject to Environmental Impact Assessment). at Land west of Burnetts Lane, Eastleigh, SO30 2HH**

Hampshire County Council as Lead Local Flood Authority has provided comments in relation to the above application in our role as statutory consultee on surface water drainage for major developments.

In order to assist applicants in providing the correct information to their Local Planning Authority for planning permission, Hampshire County Council has set out the information it requires to provide a substantive response at https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/planning

The County Council has reviewed the following documents relating to the above application:

- Flood Risk Assessment and Water Management Strategy rev B
- PFA Flood Risk Assessment Issue 1 dated December 2020
- Phase 1 – Ground Investigation Desk Study Assessment ref S2 P01
- Phase 2 – Ground Investigation Report ref: S2 P1

In order for us to provide a substantive response, the following information is required:

The drainage plan shows a series of outfalls into the existing ditch. However, the fall of the ditch is erratic with some sections backfalling and there being a relatively shallow depth throughout. No levels have been provided at the

headwalls so it is not clear what the final outfall levels will be nor is there any information about the typical water level within the ditch. This should be provided to ensure that the outfalls will be functional and water will flow appropriately within the ditch.

If water levels in the ditch rise, it is not clear what the impact will be on the drainage system so if modelling is not available, the drainage should be modelled using a surcharged outfall to understand the potential flood risk.

Permeable paving is proposed within the parking areas. Please confirm whether these are lined given that parts of the site could suffer with high groundwater.

A series of what we believe to be swales are identified adjacent to the watercourse and in various locations around the development. These do not appear to be connected and there is a section that appears to go through basin I. There are also sections that appear to clash with the proposed access roads between the dwellings and the ponds. Please clarify these elements particularly as there appears to be an existing ditch in this location which would require ordinary watercourse consent if any alterations are proposed.

Detailed hydraulic calculations have been provided but these do not appear to include the results summary pages. Please can this be provided.

It is stated that a maintenance company will be responsible for the drainage assets. Please note that our response is separate from Highways and if the roads are to be adopted, maintenance responsibilities will need to be discussed with the Highways team.

Notwithstanding the above points, we would request a condition to ensure clarity on who will be responsible for the drainage maintenance responsibilities with a clear plan detailing this as well as confirmation that the relevant bodies will adopt the relevant features.

As a statutory consultee, the County Council has a duty to respond to consultations within **21 days**. The 21 day period will not begin until we have received sufficient information to enable us to provide a meaningful response.

Please ensure all data is sent to us via the relevant Local Planning Authority.

For guidance on providing the correct information, we recommend you use our **Surface Water Management Pre-application service** which provides clear guidance on what is required for us to recommend that planning permission is granted and consider the works as best practise. For full details, please visit: https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/planning and click on pre-application advice request form.

This response has been provided using the best knowledge and information submitted as part of the planning application at the time of responding and is reliant on the accuracy of that information.

Yours faithfully,

Flood and Water Management Team
Economy, Transport & Environment Department,
Hampshire County Council, 1st Floor, EII Court West,
The Castle, Winchester, Hampshire SO23 8UD
Web:
https://www.hants.gov.uk/landplanningandenvironment/environment/flooding

**General guidance for the application**

*It is important to ensure that the long-term maintenance and responsibility for Sustainable Drainage Systems is agreed between the Local Planning Authority and the applicant before planning permission is granted. This should involve discussions with those adopting and/or maintaining the proposed systems, which could include the Highway Authority, Planning Authority, Parish Councils, Water Companies and private management companies.*

*For SuDS systems to be adopted by Hampshire Highways it is recommended that you visit the website at:*
*https://www.hants.gov.uk/transport/developers/constructionstandards for guidance on which drainage features would be suitable for adoption.*

*Where the proposals are connecting to an existing drainage system it is likely that the authorities responsible for maintaining those systems will have their own design requirements. These requirements will need to be reviewed and agreed as part of any surface water drainage scheme.*

***Works in relation to ordinary watercourses***

*PLEASE NOTE: If the proposals include works to an ordinary watercourse, under the Land Drainage Act 1991, as amended by the Flood and Water Management Act 2010, prior consent from the Lead Local Flood Authority is required.* ***This consent is required as a separate permission to planning.***

*Information on ordinary watercourse consenting can be found at the following link*

*https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/changewatercourse*

*It is strongly recommended that this information is reviewed before Land Drainage consent application is made.*

*For guidance on providing the correct information, we recommend you use our* ***Ordinary Watercourse Consents Pre-application service*** *and help avoid delays occurring at the formal application stage. A Pre-application service for Ordinary Watercourse Consents is available, allowing consents to go through in a smoother, often more timely manner. For full information please visit:*
*https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/changewatercourse*

# APPENDIX B

## MicroDrainage Calculations

## 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) | 100 | PIMP (%) | 100 |
| M5-60 (mm) | 19.900 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.350 | Minimum Backdrop Height (m) | 0.200 |
| Maximum Rainfall (mm/hr) | 50 | Maximum Backdrop Height (m) | 1.500 |
| 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 Soffits

### Time Area Diagram for Storm

| Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|---|---|---|---|
| 0-4 | 0.386 | 4-8 | 0.602 |

Total Area Contributing (ha) = 0.988

Total Pipe Volume (m³) = 41.916

### Network Design Table for Storm

« - Indicates pipe capacity < flow

| 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 | 4.862 | 0.161 | 30.2 | 0.023 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S1.001 | 33.610 | 0.862 | 39.0 | 0.071 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S1.002 | 23.881 | 0.353 | 67.7 | 0.036 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S1.003 | 9.044 | 0.270 | 33.5 | 0.050 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S1.004 | 33.270 | 0.746 | 44.6 | 0.005 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S1.000 | 50.00 | 4.04 | 26.241 | 0.023 | 0.0 | 0.0 | 0.0 | 1.84 | 32.5 | 3.1 |
| S1.001 | 50.00 | 4.31 | 26.005 | 0.094 | 0.0 | 0.0 | 0.0 | 2.10 | 83.6 | 12.7 |
| S1.002 | 50.00 | 4.56 | 25.143 | 0.130 | 0.0 | 0.0 | 0.0 | 1.59 | 63.3 | 17.6 |
| S1.003 | 50.00 | 4.63 | 24.790 | 0.180 | 0.0 | 0.0 | 0.0 | 2.27 | 90.2 | 24.4 |
| S1.004 | 50.00 | 4.91 | 24.520 | 0.185 | 0.0 | 0.0 | 0.0 | 1.96 | 78.1 | 25.1 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S2.000 | 8.269 | 0.055 | 150.0 | 0.046 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S2.001 | 26.172 | 0.157 | 167.0 | 0.066 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S2.002 | 4.867 | 0.029 | 167.0 | 0.053 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S2.003 | 21.279 | 0.127 | 167.0 | 0.003 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S1.005 | 14.376 | 0.398 | 36.1 | 0.052 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.006 | 13.212 | 0.363 | 36.4 | 0.022 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.007 | 12.906 | 0.344 | 37.5 | 0.018 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.008 | 15.865 | 0.473 | 33.5 | 0.018 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S3.000 | 25.344 | 0.300 | 84.5 | 0.102 | 4.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S3.001 | 22.383 | 0.137 | 162.9 | 0.054 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S1.009 | 19.700 | 0.496 | 39.7 | 0.036 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.010 | 11.941 | 0.187 | 63.9 | 0.029 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S1.011 | 17.760 | 0.371 | 47.9 | 0.020 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S4.000 | 26.867 | 1.033 | 26.0 | 0.071 | 4.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S4.001 | 17.677 | 0.654 | 27.0 | 0.040 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S5.000 | 6.576 | 0.395 | 16.6 | 0.030 | 4.00 | 0.0 | 0.600 | o | 150 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S2.000 | 50.00 | 4.17 | 24.217 | 0.046 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 6.2 |
| S2.001 | 50.00 | 4.60 | 24.087 | 0.112 | 0.0 | 0.0 | 0.0 | 1.01 | 40.1 | 15.2 |
| S2.002 | 50.00 | 4.68 | 23.930 | 0.165 | 0.0 | 0.0 | 0.0 | 1.01 | 40.1 | 22.3 |
| S2.003 | 50.00 | 5.03 | 23.901 | 0.168 | 0.0 | 0.0 | 0.0 | 1.01 | 40.1 | 22.7 |
| S1.005 | 50.00 | 5.12 | 23.699 | 0.405 | 0.0 | 0.0 | 0.0 | 2.62 | 185.5 | 54.8 |
| S1.006 | 50.00 | 5.21 | 23.301 | 0.427 | 0.0 | 0.0 | 0.0 | 2.61 | 184.8 | 57.8 |
| S1.007 | 50.00 | 5.29 | 22.938 | 0.445 | 0.0 | 0.0 | 0.0 | 2.57 | 182.0 | 60.3 |
| S1.008 | 50.00 | 5.39 | 22.594 | 0.463 | 0.0 | 0.0 | 0.0 | 2.72 | 192.6 | 62.7 |
| S3.000 | 50.00 | 4.30 | 22.633 | 0.102 | 0.0 | 0.0 | 0.0 | 1.42 | 56.6 | 13.8 |
| S3.001 | 50.00 | 4.66 | 22.333 | 0.156 | 0.0 | 0.0 | 0.0 | 1.02 | 40.6 | 21.1 |
| S1.009 | 50.00 | 5.52 | 22.121 | 0.655 | 0.0 | 0.0 | 0.0 | 2.50 | 176.9 | 88.7 |
| S1.010 | 50.00 | 5.62 | 21.625 | 0.684 | 0.0 | 0.0 | 0.0 | 1.97 | 139.3 | 92.6 |
| S1.011 | 50.00 | 5.75 | 21.438 | 0.704 | 0.0 | 0.0 | 0.0 | 2.28 | 161.0 | 95.3 |
| S4.000 | 50.00 | 4.17 | 23.112 | 0.071 | 0.0 | 0.0 | 0.0 | 2.58 | 102.4 | 9.6 |
| S4.001 | 50.00 | 4.29 | 22.079 | 0.111 | 0.0 | 0.0 | 0.0 | 2.53 | 100.5 | 15.0 |
| S5.000 | 50.00 | 4.04 | 21.895 | 0.030 | 0.0 | 0.0 | 0.0 | 2.48 | 43.8 | 4.1 |

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## 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 | 15.165 | 0.283 | 53.6 | 0.011 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S1.012 | 7.910 | 0.025 | 313.0 | 0.030 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S1.013 | 6.861 | 0.020 | 350.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.014 | 6.475 | 0.097 | 66.8 | 0.007 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.015 | 17.327 | 0.050 | 350.0 | 0.004 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.016 | 36.838 | 0.126 | 292.4 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S6.000 | 20.356 | 0.136 | 150.0 | 0.011 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S6.001 | 28.557 | 0.190 | 150.0 | 0.011 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S6.002 | 56.866 | 1.400 | 40.6 | 0.019 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S6.003 | 27.554 | 0.580 | 47.5 | 0.050 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S6.004 | 27.972 | 0.186 | 150.4 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S6.005 | 35.180 | 0.514 | 68.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S1.017 | 48.497 | 0.550 | 88.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S1.018 | 13.823 | 0.168 | 82.3 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S4.002 | 50.00 | 4.43 | 21.425 | 0.152 | 0.0 | 0.0 | 0.0 | 1.79 | 71.2 | 20.6 |
| S1.012 | 50.00 | 5.88 | 20.992 | 0.886 | 0.0 | 0.0 | 0.0 | 1.02 | 112.5« | 120.0 |
| S1.013 | 50.00 | 5.99 | 20.892 | 0.886 | 0.0 | 0.0 | 0.0 | 1.08 | 171.9 | 120.0 |
| S1.014 | 50.00 | 6.03 | 20.872 | 0.893 | 0.0 | 0.0 | 0.0 | 2.49 | 396.2 | 120.9 |
| S1.015 | 50.00 | 6.30 | 20.775 | 0.897 | 0.0 | 0.0 | 0.0 | 1.08 | 171.9 | 121.5 |
| S1.016 | 50.00 | 6.82 | 20.726 | 0.897 | 0.0 | 0.0 | 0.0 | 1.18 | 188.3 | 121.5 |
| S6.000 | 50.00 | 4.41 | 23.906 | 0.011 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 1.5 |
| S6.001 | 50.00 | 5.00 | 23.770 | 0.022 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 3.0 |
| S6.002 | 50.00 | 5.59 | 23.580 | 0.041 | 0.0 | 0.0 | 0.0 | 1.58 | 28.0 | 5.6 |
| S6.003 | 50.00 | 5.91 | 22.180 | 0.091 | 0.0 | 0.0 | 0.0 | 1.46 | 25.9 | 12.3 |
| S6.004 | 50.00 | 6.48 | 21.600 | 0.091 | 0.0 | 0.0 | 0.0 | 0.82 | 14.4 | 12.3 |
| S6.005 | 50.00 | 6.96 | 21.414 | 0.091 | 0.0 | 0.0 | 0.0 | 1.22 | 21.5 | 12.3 |
| S1.017 | 50.00 | 7.33 | 20.600 | 0.988 | 0.0 | 0.0 | 0.0 | 2.17 | 344.5 | 133.8 |
| S1.018 | 50.00 | 7.47 | 20.050 | 0.988 | 0.0 | 0.0 | 0.0 | 1.73 | 122.6« | 133.8 |

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## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| SPP1 | 27.241 | 1.000 | Open Manhole | 1200 | S1.000 | 26.241 | 150 | | | |
| SHBRAKE PP1 | 27.430 | 1.425 | Open Manhole | 1200 | S1.001 | 26.005 | 225 | S1.000 | 26.080 | 150 |
| S3 | 26.568 | 1.425 | Open Manhole | 1200 | S1.002 | 25.143 | 225 | S1.001 | 25.143 | 225 |
| S4 | 26.215 | 1.425 | Open Manhole | 1200 | S1.003 | 24.790 | 225 | S1.002 | 24.790 | 225 |
| S5 | 25.945 | 1.425 | Open Manhole | 1200 | S1.004 | 24.520 | 225 | S1.003 | 24.520 | 225 |
| SPP2 | 25.217 | 1.000 | Open Manhole | 1200 | S2.000 | 24.217 | 150 | | | |
| SHBRAKE PP2 | 25.800 | 1.713 | Open Manhole | 1200 | S2.001 | 24.087 | 225 | S2.000 | 24.162 | 150 |
| S8 | 25.458 | 1.528 | Open Manhole | 1200 | S2.002 | 23.930 | 225 | S2.001 | 23.930 | 225 |
| S9 | 25.390 | 1.489 | Open Manhole | 1200 | S2.003 | 23.901 | 225 | S2.002 | 23.901 | 225 |
| S10 | 25.202 | 1.503 | Open Manhole | 1200 | S1.005 | 23.699 | 300 | S1.004 | 23.774 | 225 |
| | | | | | | | | S2.003 | 23.774 | 225 |
| S11 | 24.804 | 1.503 | Open Manhole | 1200 | S1.006 | 23.301 | 300 | S1.005 | 23.301 | 300 |
| S12 | 24.441 | 1.504 | Open Manhole | 1200 | S1.007 | 22.938 | 300 | S1.006 | 22.938 | 300 |
| S13 | 24.097 | 1.503 | Open Manhole | 1200 | S1.008 | 22.594 | 300 | S1.007 | 22.594 | 300 |
| S14 | 24.058 | 1.425 | Open Manhole | 1200 | S3.000 | 22.633 | 225 | | | |
| S15 | 23.758 | 1.425 | Open Manhole | 1200 | S3.001 | 22.333 | 225 | S3.000 | 22.333 | 225 |
| S16 | 23.662 | 1.541 | Open Manhole | 1200 | S1.009 | 22.121 | 300 | S1.008 | 22.121 | 300 |
| | | | | | | | | S3.001 | 22.196 | 225 |
| S17 | 23.127 | 1.503 | Open Manhole | 1200 | S1.010 | 21.625 | 300 | S1.009 | 21.625 | 300 |
| S18 | 22.841 | 1.403 | Open Manhole | 1200 | S1.011 | 21.438 | 300 | S1.010 | 21.438 | 300 |
| S19 | 24.537 | 1.425 | Open Manhole | 1200 | S4.000 | 23.112 | 225 | | | |
| S20 | 23.504 | 1.425 | Open Manhole | 1200 | S4.001 | 22.079 | 225 | S4.000 | 22.079 | 225 |
| SPP3 | 22.895 | 1.000 | Open Manhole | 1200 | S5.000 | 21.895 | 150 | | | |
| SHBRAKE PP3 | 22.850 | 1.425 | Open Manhole | 1200 | S4.002 | 21.425 | 225 | S4.001 | 21.425 | 225 |
| | | | | | | | | S5.000 | 21.500 | 150 |
| S23 | 22.467 | 1.475 | Open Manhole | 1350 | S1.012 | 20.992 | 375 | S1.011 | 21.067 | 300 |
| | | | | | | | | S4.002 | 21.142 | 225 |
| S24 | 22.335 | 1.444 | Open Manhole | 1350 | S1.013 | 20.892 | 450 | S1.012 | 20.967 | 375 |
| S25 | 22.229 | 1.357 | Open Manhole | 1350 | S1.014 | 20.872 | 450 | S1.013 | 20.872 | 450 |
| S26 | 22.132 | 1.357 | Open Manhole | 1350 | S1.015 | 20.775 | 450 | S1.014 | 20.775 | 450 |
| S27 | 22.602 | 1.876 | Open Manhole | 1350 | S1.016 | 20.726 | 450 | S1.015 | 20.726 | 450 |
| S28 | 25.256 | 1.350 | Open Manhole | 1200 | S6.000 | 23.906 | 150 | | | |
| S29 | 25.560 | 1.789 | Open Manhole | 1200 | S6.001 | 23.770 | 150 | S6.000 | 23.770 | 150 |
| S30 | 25.234 | 1.654 | Open Manhole | 1200 | S6.002 | 23.580 | 150 | S6.001 | 23.580 | 150 |
| S31 | 23.530 | 1.350 | Open Manhole | 1200 | S6.003 | 22.180 | 150 | S6.002 | 22.180 | 150 |
| SBASIN J | 22.500 | 0.900 | Open Manhole | 1200 | S6.004 | 21.600 | 150 | S6.003 | 21.600 | 150 |
| SHBRAKE BASIN J | 22.500 | 1.086 | Open Manhole | 1200 | S6.005 | 21.414 | 150 | S6.004 | 21.414 | 150 |
| SBASIN I | 21.600 | 1.000 | Open Manhole | 1350 | S1.017 | 20.600 | 450 | S1.016 | 20.600 | 450 |

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## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | S6.005 | 20.900 | 150 |
| SHBRAKE BASIN I | 21.100 | 1.050 | Open Manhole | 1350 | S1.018 | 20.050 | 300 | S1.017 | 20.050 | 450 |
| S | 20.300 | 0.418 | Open Manhole | 0 | | OUTFALL | | S1.018 | 19.882 | 300 |

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| SPP1 | 449017.276 | 116204.217 | 449017.276 | 116204.217 | Required | |
| SHBRAKE PP1 | 449017.901 | 116209.038 | 449017.901 | 116209.038 | Required | |
| S3 | 448988.776 | 116225.812 | 448988.776 | 116225.812 | Required | |
| S4 | 449000.622 | 116246.547 | 449000.622 | 116246.547 | Required | |
| S5 | 448992.771 | 116251.037 | 448992.771 | 116251.037 | Required | |
| SPP2 | 449059.454 | 116257.872 | 449059.454 | 116257.872 | Required | |
| SHBRAKE PP2 | 449054.217 | 116251.472 | 449054.217 | 116251.472 | Required | |
| S8 | 449031.533 | 116264.525 | 449031.533 | 116264.525 | Required | |
| S9 | 449029.275 | 116268.836 | 449029.275 | 116268.836 | Required | |
| S10 | 449010.637 | 116279.103 | 449010.637 | 116279.103 | Required | |
| S11 | 449017.601 | 116291.679 | 449017.601 | 116291.679 | Required | |
| S12 | 449021.778 | 116304.213 | 449021.778 | 116304.213 | Required | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S13 | 449028.405 | 116315.288 | 449028.405 | 116315.288 | Required | |
| S14 | 449077.743 | 116305.142 | 449077.743 | 116305.142 | Required | |
| S15 | 449056.035 | 116318.221 | 449056.035 | 116318.221 | Required | |
| S16 | 449036.410 | 116328.985 | 449036.410 | 116328.985 | Required | |
| S17 | 449045.466 | 116346.481 | 449045.466 | 116346.481 | Required | |
| S18 | 449052.354 | 116356.235 | 449052.354 | 116356.235 | Required | |
| S19 | 449110.976 | 116349.600 | 449110.976 | 116349.600 | Required | |
| S20 | 449086.876 | 116361.476 | 449086.876 | 116361.476 | Required | |
| SPP3 | 449075.530 | 116372.816 | 449075.530 | 116372.816 | Required | |
| SHBRAKE PP3 | 449070.626 | 116368.435 | 449070.626 | 116368.435 | Required | |
| S23 | 449056.346 | 116373.540 | 449056.346 | 116373.540 | Required | |
| S24 | 449059.135 | 116380.942 | 449059.135 | 116380.942 | Required | |
| S25 | 449061.639 | 116387.330 | 449061.639 | 116387.330 | Required | |
| S26 | 449060.142 | 116393.629 | 449060.142 | 116393.629 | Required | |
| S27 | 449066.588 | 116409.712 | 449066.588 | 116409.712 | Required | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S28 | 449131.816 | 116327.692 | 449131.816 | 116327.692 | Required | |
| S29 | 449141.616 | 116345.534 | 449141.616 | 116345.534 | Required | |
| S30 | 449151.873 | 116372.185 | 449151.873 | 116372.185 | Required | |
| S31 | 449099.208 | 116393.637 | 449099.208 | 116393.637 | Required | |
| SBASIN J | 449110.340 | 116418.843 | 449110.340 | 116418.843 | Required | |
| SHBRAKE BASIN J | 449085.669 | 116432.026 | 449085.669 | 116432.026 | Required | |
| SBASIN I | 449052.501 | 116443.750 | 449052.501 | 116443.750 | Required | |
| SHBRAKE BASIN I | 449007.623 | 116462.133 | 449007.623 | 116462.133 | Required | |
| S | 448995.517 | 116468.805 | | | No Entry | |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.000 | o | 150 | SPP1 | 27.241 | 26.241 | 0.850 | Open Manhole | 1200 |
| S1.001 | o | 225 | SHBRAKE PP1 | 27.430 | 26.005 | 1.200 | Open Manhole | 1200 |
| S1.002 | o | 225 | S3 | 26.568 | 25.143 | 1.200 | Open Manhole | 1200 |
| S1.003 | o | 225 | S4 | 26.215 | 24.790 | 1.200 | Open Manhole | 1200 |
| S1.004 | o | 225 | S5 | 25.945 | 24.520 | 1.200 | Open Manhole | 1200 |
| S2.000 | o | 150 | SPP2 | 25.217 | 24.217 | 0.850 | Open Manhole | 1200 |
| S2.001 | o | 225 | SHBRAKE PP2 | 25.800 | 24.087 | 1.488 | Open Manhole | 1200 |
| S2.002 | o | 225 | S8 | 25.458 | 23.930 | 1.303 | Open Manhole | 1200 |
| S2.003 | o | 225 | S9 | 25.390 | 23.901 | 1.264 | Open Manhole | 1200 |
| S1.005 | o | 300 | S10 | 25.202 | 23.699 | 1.203 | Open Manhole | 1200 |
| S1.006 | o | 300 | S11 | 24.804 | 23.301 | 1.203 | Open Manhole | 1200 |
| S1.007 | o | 300 | S12 | 24.441 | 22.938 | 1.204 | Open Manhole | 1200 |
| S1.008 | o | 300 | S13 | 24.097 | 22.594 | 1.203 | Open Manhole | 1200 |
| S3.000 | o | 225 | S14 | 24.058 | 22.633 | 1.200 | Open Manhole | 1200 |
| S3.001 | o | 225 | S15 | 23.758 | 22.333 | 1.200 | Open Manhole | 1200 |
| S1.009 | o | 300 | S16 | 23.662 | 22.121 | 1.241 | Open Manhole | 1200 |
| S1.010 | o | 300 | S17 | 23.127 | 21.625 | 1.203 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.000 | 4.862 | 30.2 | SHBRAKE PP1 | 27.430 | 26.080 | 1.200 | Open Manhole | 1200 |
| S1.001 | 33.610 | 39.0 | S3 | 26.568 | 25.143 | 1.200 | Open Manhole | 1200 |
| S1.002 | 23.881 | 67.7 | S4 | 26.215 | 24.790 | 1.200 | Open Manhole | 1200 |
| S1.003 | 9.044 | 33.5 | S5 | 25.945 | 24.520 | 1.200 | Open Manhole | 1200 |
| S1.004 | 33.270 | 44.6 | S10 | 25.202 | 23.774 | 1.203 | Open Manhole | 1200 |
| S2.000 | 8.269 | 150.0 | SHBRAKE PP2 | 25.800 | 24.162 | 1.488 | Open Manhole | 1200 |
| S2.001 | 26.172 | 167.0 | S8 | 25.458 | 23.930 | 1.303 | Open Manhole | 1200 |
| S2.002 | 4.867 | 167.0 | S9 | 25.390 | 23.901 | 1.264 | Open Manhole | 1200 |
| S2.003 | 21.279 | 167.0 | S10 | 25.202 | 23.774 | 1.203 | Open Manhole | 1200 |
| S1.005 | 14.376 | 36.1 | S11 | 24.804 | 23.301 | 1.203 | Open Manhole | 1200 |
| S1.006 | 13.212 | 36.4 | S12 | 24.441 | 22.938 | 1.204 | Open Manhole | 1200 |
| S1.007 | 12.906 | 37.5 | S13 | 24.097 | 22.594 | 1.203 | Open Manhole | 1200 |
| S1.008 | 15.865 | 33.5 | S16 | 23.662 | 22.121 | 1.241 | Open Manhole | 1200 |
| S3.000 | 25.344 | 84.5 | S15 | 23.758 | 22.333 | 1.200 | Open Manhole | 1200 |
| S3.001 | 22.383 | 162.9 | S16 | 23.662 | 22.196 | 1.241 | Open Manhole | 1200 |
| S1.009 | 19.700 | 39.7 | S17 | 23.127 | 21.625 | 1.203 | Open Manhole | 1200 |
| S1.010 | 11.941 | 63.9 | S18 | 22.841 | 21.438 | 1.103 | Open Manhole | 1200 |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.011 | o | 300 | S18 | 22.841 | 21.438 | 1.103 | Open Manhole | 1200 |
| S4.000 | o | 225 | S19 | 24.537 | 23.112 | 1.200 | Open Manhole | 1200 |
| S4.001 | o | 225 | S20 | 23.504 | 22.079 | 1.200 | Open Manhole | 1200 |
| S5.000 | o | 150 | SPP3 | 22.895 | 21.895 | 0.850 | Open Manhole | 1200 |
| S4.002 | o | 225 | SHBRAKE PP3 | 22.850 | 21.425 | 1.200 | Open Manhole | 1200 |
| S1.012 | o | 375 | S23 | 22.467 | 20.992 | 1.100 | Open Manhole | 1350 |
| S1.013 | o | 450 | S24 | 22.335 | 20.892 | 0.994 | Open Manhole | 1350 |
| S1.014 | o | 450 | S25 | 22.229 | 20.872 | 0.907 | Open Manhole | 1350 |
| S1.015 | o | 450 | S26 | 22.132 | 20.775 | 0.907 | Open Manhole | 1350 |
| S1.016 | o | 450 | S27 | 22.602 | 20.726 | 1.426 | Open Manhole | 1350 |
| S6.000 | o | 150 | S28 | 25.256 | 23.906 | 1.200 | Open Manhole | 1200 |
| S6.001 | o | 150 | S29 | 25.560 | 23.770 | 1.639 | Open Manhole | 1200 |
| S6.002 | o | 150 | S30 | 25.234 | 23.580 | 1.504 | Open Manhole | 1200 |
| S6.003 | o | 150 | S31 | 23.530 | 22.180 | 1.200 | Open Manhole | 1200 |
| S6.004 | o | 150 | SBASIN J | 22.500 | 21.600 | 0.750 | Open Manhole | 1200 |
| S6.005 | o | 150 | SHBRAKE BASIN J | 22.500 | 21.414 | 0.936 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.011 | 17.760 | 47.9 | S23 | 22.467 | 21.067 | 1.100 | Open Manhole | 1350 |
| S4.000 | 26.867 | 26.0 | S20 | 23.504 | 22.079 | 1.200 | Open Manhole | 1200 |
| S4.001 | 17.677 | 27.0 | SHBRAKE PP3 | 22.850 | 21.425 | 1.200 | Open Manhole | 1200 |
| S5.000 | 6.576 | 16.6 | SHBRAKE PP3 | 22.850 | 21.500 | 1.200 | Open Manhole | 1200 |
| S4.002 | 15.165 | 53.6 | S23 | 22.467 | 21.142 | 1.100 | Open Manhole | 1350 |
| S1.012 | 7.910 | 313.0 | S24 | 22.335 | 20.967 | 0.994 | Open Manhole | 1350 |
| S1.013 | 6.861 | 350.0 | S25 | 22.229 | 20.872 | 0.907 | Open Manhole | 1350 |
| S1.014 | 6.475 | 66.8 | S26 | 22.132 | 20.775 | 0.907 | Open Manhole | 1350 |
| S1.015 | 17.327 | 350.0 | S27 | 22.602 | 20.726 | 1.426 | Open Manhole | 1350 |
| S1.016 | 36.838 | 292.4 | SBASIN I | 21.600 | 20.600 | 0.550 | Open Manhole | 1350 |
| S6.000 | 20.356 | 150.0 | S29 | 25.560 | 23.770 | 1.639 | Open Manhole | 1200 |
| S6.001 | 28.557 | 150.0 | S30 | 25.234 | 23.580 | 1.504 | Open Manhole | 1200 |
| S6.002 | 56.866 | 40.6 | S31 | 23.530 | 22.180 | 1.200 | Open Manhole | 1200 |
| S6.003 | 27.554 | 47.5 | SBASIN J | 22.500 | 21.600 | 0.750 | Open Manhole | 1200 |
| S6.004 | 27.972 | 150.4 | SHBRAKE BASIN J | 22.500 | 21.414 | 0.936 | Open Manhole | 1200 |
| S6.005 | 35.180 | 68.5 | SBASIN I | 21.600 | 20.900 | 0.550 | Open Manhole | 1350 |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.017 | o | 450 | SBASIN I | 21.600 | 20.600 | 0.550 | Open Manhole | 1350 |
| S1.018 | o | 300 | SHBRAKE BASIN I | 21.100 | 20.050 | 0.750 | Open Manhole | 1350 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S1.017 | 48.497 | 88.2 | SHBRAKE BASIN I | 21.100 | 20.050 | 0.600 | Open Manhole | 1350 |
| S1.018 | 13.823 | 82.3 | S | 20.300 | 19.882 | 0.118 | Open Manhole | 0 |

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## Area Summary for Storm

| Pipe Number | PIMP Type | PIMP Name | PIMP (%) | Gross Area (ha) | Imp. Area (ha) | Pipe Total (ha) |
|---|---|---|---|---|---|---|
| 1.000 | - | - | 100 | 0.023 | 0.023 | 0.023 |
| 1.001 | - | - | 100 | 0.071 | 0.071 | 0.071 |
| 1.002 | - | - | 100 | 0.036 | 0.036 | 0.036 |
| 1.003 | - | - | 100 | 0.050 | 0.050 | 0.050 |
| 1.004 | - | - | 100 | 0.005 | 0.005 | 0.005 |
| 2.000 | - | - | 100 | 0.046 | 0.046 | 0.046 |
| 2.001 | - | - | 100 | 0.066 | 0.066 | 0.066 |
| 2.002 | - | - | 100 | 0.053 | 0.053 | 0.053 |
| 2.003 | - | - | 100 | 0.003 | 0.003 | 0.003 |
| 1.005 | - | - | 100 | 0.052 | 0.052 | 0.052 |
| 1.006 | - | - | 100 | 0.022 | 0.022 | 0.022 |
| 1.007 | - | - | 100 | 0.018 | 0.018 | 0.018 |
| 1.008 | - | - | 100 | 0.018 | 0.018 | 0.018 |
| 3.000 | - | - | 100 | 0.102 | 0.102 | 0.102 |
| 3.001 | - | - | 100 | 0.054 | 0.054 | 0.054 |
| 1.009 | - | - | 100 | 0.036 | 0.036 | 0.036 |
| 1.010 | - | - | 100 | 0.029 | 0.029 | 0.029 |
| 1.011 | - | - | 100 | 0.020 | 0.020 | 0.020 |
| 4.000 | - | - | 100 | 0.071 | 0.071 | 0.071 |
| 4.001 | - | - | 100 | 0.040 | 0.040 | 0.040 |
| 5.000 | - | - | 100 | 0.030 | 0.030 | 0.030 |
| 4.002 | - | - | 100 | 0.011 | 0.011 | 0.011 |
| 1.012 | - | - | 100 | 0.030 | 0.030 | 0.030 |
| 1.013 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.014 | - | - | 100 | 0.007 | 0.007 | 0.007 |
| 1.015 | - | - | 100 | 0.004 | 0.004 | 0.004 |
| 1.016 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 6.000 | - | - | 100 | 0.011 | 0.011 | 0.011 |
| 6.001 | - | - | 100 | 0.011 | 0.011 | 0.011 |
| 6.002 | - | - | 100 | 0.019 | 0.019 | 0.019 |
| 6.003 | - | - | 100 | 0.050 | 0.050 | 0.050 |
| 6.004 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 6.005 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.017 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 1.018 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| | | | | Total | Total | Total |
| | | | | 0.988 | 0.988 | 0.988 |

## 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) |
|---|---|---|---|---|---|---|
| S1.018 | S | 20.300 | 19.882 | 0.000 | 0 | 0 |

Datum (m) 0.000 Offset (mins) 0

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## 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) |
|---|---|---|---|---|---|---|---|---|---|
| 1440 | 20.300 | 5760 | 20.300 | 10080 | 20.300 | 14400 | 20.300 | 18720 | 20.300 |
| 2880 | 20.300 | 7200 | 20.300 | 11520 | 20.300 | 15840 | 20.300 | 20160 | 20.300 |
| 4320 | 20.300 | 8640 | 20.300 | 12960 | 20.300 | 17280 | 20.300 | | |

## 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 | 5 |
| Number of Online Controls | 5 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

## Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Profile Type | Summer |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 19.900 | Storm Duration (mins) | 30 |
| Ratio R | 0.350 | | |

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## Online Controls for Storm

### Hydro-Brake® Optimum Manhole: SHBRAKE PP1, DS/PN: S1.001, Volume (m³): 1.7

| | |
|---|---|
| Unit Reference | MD-SHE-0068-2000-0936-2000 |
| Design Head (m) | 0.936 |
| Design Flow (l/s) | 2.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 68 |
| Invert Level (m) | 26.005 |
| Minimum Outlet Pipe Diameter (mm) | 100 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 0.936 | 2.0 |
| Flush-Flo™ | 0.287 | 2.0 |
| Kick-Flo® | 0.586 | 1.6 |
| Mean Flow over Head Range | - | 1.8 |

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

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 1.7 | 1.200 | 2.2 | 3.000 | 3.4 | 7.000 | 5.1 |
| 0.200 | 2.0 | 1.400 | 2.4 | 3.500 | 3.7 | 7.500 | 5.2 |
| 0.300 | 2.0 | 1.600 | 2.6 | 4.000 | 3.9 | 8.000 | 5.4 |
| 0.400 | 2.0 | 1.800 | 2.7 | 4.500 | 4.1 | 8.500 | 5.6 |
| 0.500 | 1.8 | 2.000 | 2.8 | 5.000 | 4.3 | 9.000 | 5.7 |
| 0.600 | 1.6 | 2.200 | 3.0 | 5.500 | 4.5 | 9.500 | 5.9 |
| 0.800 | 1.9 | 2.400 | 3.1 | 6.000 | 4.7 | | |
| 1.000 | 2.1 | 2.600 | 3.2 | 6.500 | 4.9 | | |

### Orifice Manhole: SHBRAKE PP2, DS/PN: S2.001, Volume (m³): 2.1

Diameter (m) 0.045 Discharge Coefficient 0.600 Invert Level (m) 24.087

### Hydro-Brake® Optimum Manhole: SHBRAKE PP3, DS/PN: S4.002, Volume (m³): 2.4

| | |
|---|---|
| Unit Reference | MD-SHE-0143-1000-1170-1000 |
| Design Head (m) | 1.170 |
| Design Flow (l/s) | 10.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 143 |

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## Hydro-Brake® Optimum Manhole: SHBRAKE PP3, DS/PN: S4.002, Volume (m³): 2.4

| | |
|---|---|
| Invert Level (m) | 21.425 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.170 | 10.0 |
| Flush-Flo™ | 0.348 | 10.0 |
| Kick-Flo® | 0.763 | 8.2 |
| Mean Flow over Head Range | - | 8.6 |

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 | 5.2 | 1.200 | 10.1 | 3.000 | 15.6 | 7.000 | 23.4 |
| 0.200 | 9.5 | 1.400 | 10.9 | 3.500 | 16.8 | 7.500 | 24.2 |
| 0.300 | 10.0 | 1.600 | 11.6 | 4.000 | 17.9 | 8.000 | 25.0 |
| 0.400 | 10.0 | 1.800 | 12.2 | 4.500 | 18.9 | 8.500 | 25.7 |
| 0.500 | 9.8 | 2.000 | 12.9 | 5.000 | 19.9 | 9.000 | 26.4 |
| 0.600 | 9.5 | 2.200 | 13.5 | 5.500 | 20.9 | 9.500 | 27.1 |
| 0.800 | 8.4 | 2.400 | 14.0 | 6.000 | 21.7 | | |
| 1.000 | 9.3 | 2.600 | 14.6 | 6.500 | 22.6 | | |

## Hydro-Brake® Optimum Manhole: SHBRAKE BASIN J, DS/PN: S6.005, Volume (m³): 1.7

| | |
|---|---|
| Unit Reference | MD-SHE-0046-1000-1086-1000 |
| Design Head (m) | 1.086 |
| Design Flow (l/s) | 1.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 46 |
| Invert Level (m) | 21.414 |
| Minimum Outlet Pipe Diameter (mm) | 75 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.086 | 1.0 |
| Flush-Flo™ | 0.202 | 0.8 |
| Kick-Flo® | 0.407 | 0.6 |
| Mean Flow over Head Range | - | 0.8 |

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

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Hydro-Brake® Optimum Manhole: SHBRAKE BASIN J, DS/PN: S6.005, Volume (m³): 1.7

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 0.7 | 1.200 | 1.0 | 3.000 | 1.6 | 7.000 | 2.3 |
| 0.200 | 0.8 | 1.400 | 1.1 | 3.500 | 1.7 | 7.500 | 2.4 |
| 0.300 | 0.8 | 1.600 | 1.2 | 4.000 | 1.8 | 8.000 | 2.5 |
| 0.400 | 0.7 | 1.800 | 1.3 | 4.500 | 1.9 | 8.500 | 2.6 |
| 0.500 | 0.7 | 2.000 | 1.3 | 5.000 | 2.0 | 9.000 | 2.6 |
| 0.600 | 0.8 | 2.200 | 1.4 | 5.500 | 2.1 | 9.500 | 2.7 |
| 0.800 | 0.9 | 2.400 | 1.4 | 6.000 | 2.2 | | |
| 1.000 | 1.0 | 2.600 | 1.5 | 6.500 | 2.3 | | |

Hydro-Brake® Optimum Manhole: SHBRAKE BASIN I, DS/PN: S1.018, Volume (m³): 9.0

| | |
|---|---|
| Unit Reference | MD-SHE-0228-2960-1550-2960 |
| Design Head (m) | 1.550 |
| Design Flow (l/s) | 29.6 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 228 |
| Invert Level (m) | 20.050 |
| Minimum Outlet Pipe Diameter (mm) | 300 |
| Suggested Manhole Diameter (mm) | 1800 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.550 | 29.6 |
| Flush-Flo™ | 0.472 | 29.6 |
| Kick-Flo® | 1.039 | 24.4 |
| Mean Flow over Head Range | - | 25.4 |

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 | 7.6 | 1.200 | 26.2 | 3.000 | 40.6 | 7.000 | 61.2 |
| 0.200 | 22.8 | 1.400 | 28.2 | 3.500 | 43.8 | 7.500 | 63.3 |
| 0.300 | 28.5 | 1.600 | 30.0 | 4.000 | 46.7 | 8.000 | 65.3 |
| 0.400 | 29.4 | 1.800 | 31.8 | 4.500 | 49.4 | 8.500 | 67.3 |
| 0.500 | 29.5 | 2.000 | 33.4 | 5.000 | 52.0 | 9.000 | 69.2 |
| 0.600 | 29.3 | 2.200 | 35.0 | 5.500 | 54.5 | 9.500 | 71.0 |
| 0.800 | 28.3 | 2.400 | 36.5 | 6.000 | 56.8 | | |
| 1.000 | 25.5 | 2.600 | 37.9 | 6.500 | 59.1 | | |

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## Storage Structures for Storm

### Porous Car Park Manhole: SPP1, DS/PN: S1.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 13.6 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 16.6 |
| Max Percolation (l/s) | 62.7 | Slope (1:X) | 70.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 26.241 | Membrane Depth (mm) | 0 |

### Porous Car Park Manhole: SPP2, DS/PN: S2.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 20.4 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 11.0 |
| Max Percolation (l/s) | 62.3 | Slope (1:X) | 300.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 24.217 | Membrane Depth (mm) | 0 |

### Porous Car Park Manhole: SPP3, DS/PN: S5.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 10.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 31.1 |
| Max Percolation (l/s) | 86.4 | Slope (1:X) | 50.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 21.895 | Membrane Depth (mm) | 0 |

### Tank or Pond Manhole: SBASIN J, DS/PN: S6.004

Invert Level (m) 21.600

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 280.0 | 0.900 | 592.0 |

### Tank or Pond Manhole: SBASIN I, DS/PN: S1.017

Invert Level (m) 20.600

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 919.0 | 1.000 | 1624.0 |

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## 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 5
Number of Online Controls 5 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

### Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.900 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
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 |
|---|---|---|---|---|---|---|---|
| S1.000 | SPP1 | 180 Winter | 100 | +40% | 100/15 Summer | | |
| S1.001 | SHBRAKE PP1 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S1.002 | S3 | 15 Winter | 100 | +40% | | | |
| S1.003 | S4 | 15 Winter | 100 | +40% | | | |
| S1.004 | S5 | 15 Winter | 100 | +40% | 100/15 Winter | | |
| S2.000 | SPP2 | 120 Winter | 100 | +40% | 100/15 Summer | | |
| S2.001 | SHBRAKE PP2 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S2.002 | S8 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S2.003 | S9 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S1.005 | S10 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S1.006 | S11 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S1.007 | S12 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S1.008 | S13 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S3.000 | S14 | 15 Winter | 100 | +40% | 100/15 Summer | 100/15 Summer | |
| S3.001 | S15 | 15 Winter | 100 | +40% | 100/15 Summer | 100/15 Summer | |
| S1.009 | S16 | 15 Winter | 100 | +40% | 100/15 Summer | 100/15 Winter | |
| S1.010 | S17 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S1.011 | S18 | 15 Winter | 100 | +40% | 100/15 Summer | | |

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

| PN | US/MH Name | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|
| S1.000 | SPP1 | | 26.915 | 0.524 | 0.000 | 0.09 | | | 2.2 |
| S1.001 | SHBRAKE PP1 | | 26.961 | 0.731 | 0.000 | 0.03 | | | 2.0 |
| S1.002 | S3 | | 25.245 | -0.123 | 0.000 | 0.42 | | | 24.6 |
| S1.003 | S4 | | 24.938 | -0.077 | 0.000 | 0.77 | | | 56.2 |
| S1.004 | S5 | | 24.746 | 0.001 | 0.000 | 0.80 | | | 58.8 |
| S2.000 | SPP2 | | 24.861 | 0.494 | 0.000 | 0.28 | | 124 | 3.5 |
| S2.001 | SHBRAKE PP2 | | 24.913 | 0.601 | 0.000 | 0.09 | | | 3.4 |
| S2.002 | S8 | | 24.504 | 0.349 | 0.000 | 1.08 | | | 31.3 |
| S2.003 | S9 | | 24.479 | 0.353 | 0.000 | 0.88 | | | 32.0 |
| S1.005 | S10 | | 24.420 | 0.421 | 0.000 | 0.72 | | | 111.3 |
| S1.006 | S11 | | 24.272 | 0.672 | 0.000 | 0.75 | | | 112.6 |
| S1.007 | S12 | | 24.104 | 0.866 | 0.000 | 0.75 | | | 109.7 |
| S1.008 | S13 | | 23.911 | 1.018 | 0.000 | 0.72 | | | 117.1 |
| S3.000 | S14 | | 24.059 | 1.201 | 0.312 | 0.98 | | | 51.1 |
| S3.001 | S15 | | 23.765 | 1.207 | 6.835 | 1.74 | | | 64.8 |
| S1.009 | S16 | | 23.662 | 1.241 | 0.086 | 1.08 | | | 165.3 |
| S1.010 | S17 | | 23.114 | 1.190 | 0.000 | 1.65 | | | 178.2 |
| S1.011 | S18 | | 22.611 | 0.874 | 0.000 | 1.35 | | | 185.8 |

| PN | US/MH Name | Status | Level Exceeded |
|---|---|---|---|
| S1.000 | SPP1 | SURCHARGED | |
| S1.001 | SHBRAKE PP1 | SURCHARGED | |
| S1.002 | S3 | OK | |
| S1.003 | S4 | OK | |
| S1.004 | S5 | SURCHARGED | |
| S2.000 | SPP2 | SURCHARGED | |
| S2.001 | SHBRAKE PP2 | SURCHARGED | |
| S2.002 | S8 | SURCHARGED | |
| S2.003 | S9 | SURCHARGED | |
| S1.005 | S10 | SURCHARGED | |
| S1.006 | S11 | SURCHARGED | |
| S1.007 | S12 | SURCHARGED | |
| S1.008 | S13 | FLOOD RISK | |
| S3.000 | S14 | FLOOD | 2 |
| S3.001 | S15 | FLOOD | 4 |
| S1.009 | S16 | FLOOD | 1 |
| S1.010 | S17 | FLOOD RISK | |
| S1.011 | S18 | FLOOD RISK | |

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## 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 |
|---|---|---|---|---|---|---|---|
| S4.000 | S19 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S4.001 | S20 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S5.000 | SPP3 | 60 Winter | 100 | +40% | 100/15 Summer | | |
| S4.002 | SHBRAKE PP3 | 15 Winter | 100 | +40% | 100/15 Summer | 100/15 Summer | |
| S1.012 | S23 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S1.013 | S24 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S1.014 | S25 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S1.015 | S26 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S1.016 | S27 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S6.000 | S28 | 15 Winter | 100 | +40% | | | |
| S6.001 | S29 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S6.002 | S30 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S6.003 | S31 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S6.004 | SBASIN J | 480 Winter | 100 | +40% | 100/120 Winter | | |
| S6.005 | SHBRAKE BASIN J | 720 Winter | 100 | +40% | 100/15 Summer | | |
| S1.017 | SBASIN I | 180 Winter | 100 | +40% | | | |
| S1.018 | SHBRAKE BASIN I | 180 Winter | 100 | +40% | 100/15 Summer | | |

| PN | US/MH Name | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) |
|---|---|---|---|---|---|---|---|---|
| S4.000 | S19 | | 23.396 | 0.059 | 0.000 | 0.45 | | |
| S4.001 | S20 | | 23.191 | 0.887 | 0.000 | 0.71 | | |
| S5.000 | SPP3 | | 22.588 | 0.543 | 0.000 | 0.25 | | 44 |
| S4.002 | SHBRAKE PP3 | | 22.852 | 1.202 | 2.481 | 0.16 | | |
| S1.012 | S23 | | 21.931 | 0.564 | 0.000 | 2.71 | | |
| S1.013 | S24 | | 21.645 | 0.303 | 0.000 | 2.05 | | |
| S1.014 | S25 | | 21.511 | 0.189 | 0.000 | 1.20 | | |
| S1.015 | S26 | | 21.374 | 0.148 | 0.000 | 1.56 | | |
| S1.016 | S27 | | 21.233 | 0.057 | 0.000 | 1.27 | | |
| S6.000 | S28 | | 24.005 | -0.051 | 0.000 | 0.51 | | |
| S6.001 | S29 | | 23.983 | 0.063 | 0.000 | 0.88 | | |
| S6.002 | S30 | | 23.916 | 0.186 | 0.000 | 0.71 | | |
| S6.003 | S31 | | 23.367 | 1.037 | 0.000 | 1.66 | | |
| S6.004 | SBASIN J | | 21.785 | 0.035 | 0.000 | 0.10 | | |
| S6.005 | SHBRAKE BASIN J | | 21.797 | 0.233 | 0.000 | 0.04 | | |
| S1.017 | SBASIN I | | 20.859 | -0.191 | 0.000 | 0.14 | | |
| S1.018 | SHBRAKE BASIN I | | 20.845 | 0.495 | 0.000 | 0.29 | | |

| PN | US/MH Name | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|
| S4.000 | S19 | 42.7 | SURCHARGED | |
| S4.001 | S20 | 63.7 | SURCHARGED | |
| S5.000 | SPP3 | 9.3 | SURCHARGED | |

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

| PN | US/MH Name | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|
| S4.002 | SHBRAKE PP3 | 10.0 | FLOOD | 4 |
| S1.012 | S23 | 207.9 | SURCHARGED | |
| S1.013 | S24 | 208.1 | SURCHARGED | |
| S1.014 | S25 | 210.7 | SURCHARGED | |
| S1.015 | S26 | 210.7 | SURCHARGED | |
| S1.016 | S27 | 210.3 | SURCHARGED | |
| S6.000 | S28 | 6.9 | OK | |
| S6.001 | S29 | 12.2 | SURCHARGED | |
| S6.002 | S30 | 19.3 | SURCHARGED | |
| S6.003 | S31 | 41.0 | FLOOD RISK | |
| S6.004 | SBASIN J | 1.4 | SURCHARGED | |
| S6.005 | SHBRAKE BASIN J | 0.8 | SURCHARGED | |
| S1.017 | SBASIN I | 43.6 | OK | |
| S1.018 | SHBRAKE BASIN I | 29.5 | FLOOD RISK | |

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## 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) | 100 | PIMP (%) | 100 |
| M5-60 (mm) | 19.900 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.350 | Minimum Backdrop Height (m) | 0.200 |
| Maximum Rainfall (mm/hr) | 50 | Maximum Backdrop Height (m) | 1.500 |
| 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 Soffits

### Time Area Diagram for Storm

| Time (mins) | Area (ha) | Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|---|---|---|---|---|---|
| 0-4 | 0.088 | 4-8 | 1.045 | 8-12 | 0.218 |

Total Area Contributing (ha) = 1.351

Total Pipe Volume (m³) = 76.603

### Network Design Table for Storm

« - Indicates pipe capacity < flow

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S7.000 | 18.040 | 0.120 | 150.0 | 0.028 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S7.001 | 10.579 | 0.071 | 150.0 | 0.004 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S7.002 | 22.892 | 0.153 | 150.0 | 0.029 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S7.003 | 22.797 | 0.137 | 167.0 | 0.044 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S7.004 | 22.670 | 0.136 | 166.7 | 0.018 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S7.000 | 50.00 | 4.37 | 22.118 | 0.028 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 3.8 |
| S7.001 | 50.00 | 4.58 | 21.998 | 0.032 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 4.3 |
| S7.002 | 50.00 | 5.05 | 21.927 | 0.061 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 8.3 |
| S7.003 | 50.00 | 5.43 | 21.700 | 0.105 | 0.0 | 0.0 | 0.0 | 1.01 | 40.1 | 14.2 |
| S7.004 | 50.00 | 5.80 | 21.563 | 0.123 | 0.0 | 0.0 | 0.0 | 1.01 | 40.2 | 16.7 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S8.000 | 23.196 | 0.451 | 51.4 | 0.054 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S7.005 | 28.209 | 0.171 | 165.0 | 0.028 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S7.006 | 18.438 | 0.332 | 55.5 | 0.031 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S7.007 | 25.983 | 0.800 | 32.5 | 0.017 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S9.000 | 26.645 | 0.178 | 149.7 | 0.082 | 4.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S7.008 | 16.836 | 0.071 | 238.0 | 0.009 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S7.009 | 35.362 | 0.149 | 238.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S7.010 | 36.316 | 0.274 | 132.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S10.000 | 26.182 | 1.260 | 20.8 | 0.008 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S11.000 | 16.142 | 0.115 | 140.0 | 0.019 | 4.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S11.001 | 25.067 | 0.167 | 150.0 | 0.045 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S11.002 | 12.530 | 0.077 | 163.6 | 0.004 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S10.001 | 18.405 | 0.110 | 167.3 | 0.061 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S10.002 | 13.873 | 0.083 | 167.1 | 0.051 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S10.003 | 27.145 | 0.366 | 74.2 | 0.074 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S8.000 | 50.00 | 4.27 | 21.953 | 0.054 | 0.0 | 0.0 | 0.0 | 1.41 | 24.8 | 7.3 |
| S7.005 | 50.00 | 6.26 | 21.427 | 0.205 | 0.0 | 0.0 | 0.0 | 1.02 | 40.4 | 27.8 |
| S7.006 | 50.00 | 6.44 | 21.256 | 0.236 | 0.0 | 0.0 | 0.0 | 1.76 | 69.9 | 32.0 |
| S7.007 | 50.00 | 6.59 | 20.849 | 0.253 | 0.0 | 0.0 | 0.0 | 2.77 | 195.7 | 34.3 |
| S9.000 | 50.00 | 4.35 | 20.227 | 0.082 | 0.0 | 0.0 | 0.0 | 1.28 | 90.7 | 11.1 |
| S7.008 | 50.00 | 6.87 | 20.049 | 0.344 | 0.0 | 0.0 | 0.0 | 1.01 | 71.7 | 46.6 |
| S7.009 | 50.00 | 7.45 | 19.978 | 0.344 | 0.0 | 0.0 | 0.0 | 1.01 | 71.7 | 46.6 |
| S7.010 | 50.00 | 7.90 | 19.830 | 0.344 | 0.0 | 0.0 | 0.0 | 1.36 | 96.4 | 46.6 |
| S10.000 | 50.00 | 4.20 | 21.525 | 0.008 | 0.0 | 0.0 | 0.0 | 2.22 | 39.2 | 1.1 |
| S11.000 | 50.00 | 4.24 | 20.549 | 0.019 | 0.0 | 0.0 | 0.0 | 1.10 | 43.9 | 2.6 |
| S11.001 | 50.00 | 4.64 | 20.434 | 0.064 | 0.0 | 0.0 | 0.0 | 1.07 | 42.4 | 8.7 |
| S11.002 | 50.00 | 4.84 | 20.267 | 0.068 | 0.0 | 0.0 | 0.0 | 1.02 | 40.5 | 9.2 |
| S10.001 | 50.00 | 5.15 | 20.190 | 0.137 | 0.0 | 0.0 | 0.0 | 1.01 | 40.1 | 18.6 |
| S10.002 | 50.00 | 5.37 | 20.080 | 0.188 | 0.0 | 0.0 | 0.0 | 1.01 | 40.1 | 25.5 |
| S10.003 | 50.00 | 5.62 | 19.922 | 0.262 | 0.0 | 0.0 | 0.0 | 1.83 | 129.2 | 35.5 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S7.011 | 34.212 | 0.109 | 313.0 | 0.043 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S7.012 | 46.154 | 0.234 | 197.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S12.000 | 16.586 | 0.111 | 149.4 | 0.037 | 4.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S12.001 | 38.679 | 1.308 | 29.6 | 0.038 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S13.000 | 19.980 | 1.113 | 18.0 | 0.047 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S14.000 | 33.369 | 0.334 | 99.9 | 0.070 | 4.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S12.002 | 5.834 | 0.035 | 167.0 | 0.060 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S12.003 | 40.197 | 0.241 | 167.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S12.004 | 23.880 | 0.239 | 100.0 | 0.071 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S12.005 | 7.963 | 0.053 | 150.0 | 0.017 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S12.006 | 24.831 | 0.104 | 238.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S12.007 | 5.947 | 0.025 | 238.0 | 0.060 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S12.008 | 6.270 | 0.117 | 53.6 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S15.000 | 4.196 | 0.250 | 16.8 | 0.041 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S15.001 | 15.978 | 0.107 | 150.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S15.002 | 36.799 | 0.220 | 167.0 | 0.045 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S7.011 | 50.00 | 8.46 | 19.481 | 0.649 | 0.0 | 0.0 | 0.0 | 1.02 | 112.5 | 87.9 |
| S7.012 | 50.00 | 9.05 | 19.371 | 0.649 | 0.0 | 0.0 | 0.0 | 1.29 | 142.1 | 87.9 |
| S12.000 | 50.00 | 4.26 | 21.708 | 0.037 | 0.0 | 0.0 | 0.0 | 1.07 | 42.4 | 5.0 |
| S12.001 | 50.00 | 4.53 | 21.597 | 0.075 | 0.0 | 0.0 | 0.0 | 2.41 | 96.0 | 10.2 |
| S13.000 | 50.00 | 4.14 | 21.477 | 0.047 | 0.0 | 0.0 | 0.0 | 2.39 | 42.2 | 6.4 |
| S14.000 | 50.00 | 4.35 | 20.548 | 0.070 | 0.0 | 0.0 | 0.0 | 1.57 | 111.2 | 9.5 |
| S12.002 | 50.00 | 4.61 | 20.214 | 0.252 | 0.0 | 0.0 | 0.0 | 1.21 | 85.8 | 34.1 |
| S12.003 | 50.00 | 5.16 | 20.179 | 0.252 | 0.0 | 0.0 | 0.0 | 1.21 | 85.8 | 34.1 |
| S12.004 | 50.00 | 5.41 | 19.938 | 0.323 | 0.0 | 0.0 | 0.0 | 1.57 | 111.1 | 43.7 |
| S12.005 | 50.00 | 5.51 | 19.700 | 0.340 | 0.0 | 0.0 | 0.0 | 1.28 | 90.6 | 46.0 |
| S12.006 | 50.00 | 5.92 | 19.646 | 0.340 | 0.0 | 0.0 | 0.0 | 1.01 | 71.7 | 46.0 |
| S12.007 | 50.00 | 6.02 | 19.542 | 0.400 | 0.0 | 0.0 | 0.0 | 1.01 | 71.7 | 54.2 |
| S12.008 | 50.00 | 6.07 | 19.517 | 0.400 | 0.0 | 0.0 | 0.0 | 2.15 | 152.1 | 54.2 |
| S15.000 | 50.00 | 4.03 | 20.500 | 0.041 | 0.0 | 0.0 | 0.0 | 2.47 | 43.7 | 5.6 |
| S15.001 | 50.00 | 4.35 | 20.250 | 0.041 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 5.6 |
| S15.002 | 50.00 | 4.96 | 20.068 | 0.086 | 0.0 | 0.0 | 0.0 | 1.01 | 40.1 | 11.6 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S15.003 | 8.289 | 0.050 | 167.0 | 0.064 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S15.004 | 18.278 | 0.109 | 167.0 | 0.023 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S15.005 | 32.665 | 0.137 | 238.0 | 0.046 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S15.006 | 10.628 | 0.045 | 238.0 | 0.033 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S15.007 | 7.549 | 0.032 | 235.9 | 0.000 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S12.009 | 10.317 | 0.033 | 313.0 | 0.033 | 0.00 | 0.0 | 0.600 | o | 375 | Pipe/Conduit | |
| S7.013 | 51.249 | 0.133 | 385.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S7.014 | 61.637 | 0.160 | 385.2 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S7.015 | 30.067 | 0.099 | 303.7 | 0.017 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S7.016 | 16.505 | 0.236 | 69.9 | 0.000 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S7.017 | 6.058 | 0.614 | 9.9 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S15.003 | 50.00 | 5.10 | 19.848 | 0.150 | 0.0 | 0.0 | 0.0 | 1.01 | 40.1 | 20.3 |
| S15.004 | 50.00 | 5.40 | 19.798 | 0.173 | 0.0 | 0.0 | 0.0 | 1.01 | 40.1 | 23.4 |
| S15.005 | 50.00 | 5.94 | 19.614 | 0.219 | 0.0 | 0.0 | 0.0 | 1.01 | 71.7 | 29.7 |
| S15.006 | 50.00 | 6.11 | 19.477 | 0.252 | 0.0 | 0.0 | 0.0 | 1.01 | 71.7 | 34.1 |
| S15.007 | 50.00 | 6.24 | 19.432 | 0.252 | 0.0 | 0.0 | 0.0 | 1.02 | 72.1 | 34.1 |
| S12.009 | 50.00 | 6.40 | 19.325 | 0.685 | 0.0 | 0.0 | 0.0 | 1.02 | 112.5 | 92.8 |
| S7.013 | 50.00 | 9.88 | 19.292 | 1.334 | 0.0 | 0.0 | 0.0 | 1.03 | 163.8« | 180.6 |
| S7.014 | 50.00 | 10.88 | 19.159 | 1.334 | 0.0 | 0.0 | 0.0 | 1.03 | 163.8« | 180.6 |
| S7.015 | 50.00 | 11.31 | 18.999 | 1.351 | 0.0 | 0.0 | 0.0 | 1.16 | 184.7 | 182.9 |
| S7.016 | 50.00 | 11.42 | 18.900 | 1.351 | 0.0 | 0.0 | 0.0 | 2.43 | 387.1 | 182.9 |
| S7.017 | 50.00 | 11.44 | 18.664 | 1.351 | 0.0 | 0.0 | 0.0 | 6.50 | 1034.0 | 182.9 |

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## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) | Backdrop (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S36 | 23.468 | 1.350 | Open Manhole | 1200 | S7.000 | 22.118 | 150 | | | | |
| S37 | 23.943 | 1.946 | Open Manhole | 1200 | S7.001 | 21.998 | 150 | S7.000 | 21.998 | 150 | |
| S38 | 24.213 | 2.286 | Open Manhole | 1200 | S7.002 | 21.927 | 150 | S7.001 | 21.927 | 150 | |
| S39 | 24.833 | 3.133 | Open Manhole | 1200 | S7.003 | 21.700 | 225 | S7.002 | 21.775 | 150 | |
| S40 | 23.947 | 2.384 | Open Manhole | 1200 | S7.004 | 21.563 | 225 | S7.003 | 21.563 | 225 | |
| S41 | 23.303 | 1.350 | Open Manhole | 1200 | S8.000 | 21.953 | 150 | | | | |
| S42 | 23.580 | 2.153 | Open Manhole | 1200 | S7.005 | 21.427 | 225 | S7.004 | 21.427 | 225 | |
| | | | | | | | | S8.000 | 21.502 | 150 | |
| S43 | 22.681 | 1.425 | Open Manhole | 1200 | S7.006 | 21.256 | 225 | S7.005 | 21.256 | 225 | |
| S44 | 22.349 | 1.500 | Open Manhole | 1200 | S7.007 | 20.849 | 300 | S7.006 | 20.924 | 225 | |
| S45 | 21.727 | 1.500 | Open Manhole | 1200 | S9.000 | 20.227 | 300 | | | | |
| S46 | 22.073 | 2.024 | Open Manhole | 1200 | S7.008 | 20.049 | 300 | S7.007 | 20.049 | 300 | |
| | | | | | | | | S9.000 | 20.049 | 300 | |
| S47 | 22.299 | 2.320 | Open Manhole | 1200 | S7.009 | 19.978 | 300 | S7.008 | 19.978 | 300 | |
| S48 | 21.841 | 2.011 | Open Manhole | 1200 | S7.010 | 19.830 | 300 | S7.009 | 19.830 | 300 | |
| S49 | 22.875 | 1.350 | Open Manhole | 1200 | S10.000 | 21.525 | 150 | | | | |
| S50 | 21.974 | 1.425 | Open Manhole | 1200 | S11.000 | 20.549 | 225 | | | | |
| S51 | 22.360 | 1.926 | Open Manhole | 1200 | S11.001 | 20.434 | 225 | S11.000 | 20.434 | 225 | |
| S52 | 22.450 | 2.184 | Open Manhole | 1200 | S11.002 | 20.267 | 225 | S11.001 | 20.267 | 225 | |
| S53 | 22.420 | 2.230 | Open Manhole | 1200 | S10.001 | 20.190 | 225 | S10.000 | 20.265 | 150 | |
| | | | | | | | | S11.002 | 20.190 | 225 | |
| S54 | 22.000 | 1.920 | Open Manhole | 1200 | S10.002 | 20.080 | 225 | S10.001 | 20.080 | 225 | |
| S55 | 21.700 | 1.778 | Open Manhole | 1200 | S10.003 | 19.922 | 300 | S10.002 | 19.997 | 225 | |
| S56 | 21.414 | 1.933 | Open Manhole | 1350 | S7.011 | 19.481 | 375 | S7.010 | 19.556 | 300 | |
| | | | | | | | | S10.003 | 19.556 | 300 | |
| S57 | 21.232 | 1.861 | Open Manhole | 1350 | S7.012 | 19.371 | 375 | S7.011 | 19.371 | 375 | |
| S58 | 23.500 | 1.792 | Open Manhole | 1200 | S12.000 | 21.708 | 225 | | | | |
| S59 | 23.150 | 1.553 | Open Manhole | 1200 | S12.001 | 21.597 | 225 | S12.000 | 21.597 | 225 | |
| S60 | 22.827 | 1.350 | Open Manhole | 1200 | S13.000 | 21.477 | 150 | | | | |
| S61 | 22.048 | 1.500 | Open Manhole | 1200 | S14.000 | 20.548 | 300 | | | | |
| S62 | 22.556 | 2.342 | Open Manhole | 1200 | S12.002 | 20.214 | 300 | S12.001 | 20.289 | 225 | |
| | | | | | | | | S13.000 | 20.364 | 150 | |
| | | | | | | | | S14.000 | 20.214 | 300 | |
| S63 | 22.335 | 2.156 | Open Manhole | 1200 | S12.003 | 20.179 | 300 | S12.002 | 20.179 | 300 | |
| S64 | 21.617 | 1.679 | Open Manhole | 1200 | S12.004 | 19.938 | 300 | S12.003 | 19.938 | 300 | |
| S65 | 21.180 | 1.480 | Open Manhole | 1200 | S12.005 | 19.700 | 300 | S12.004 | 19.700 | 300 | |
| S66 | 21.059 | 1.413 | Open Manhole | 1200 | S12.006 | 19.646 | 300 | S12.005 | 19.646 | 300 | |
| S67 | 20.921 | 1.379 | Open Manhole | 1200 | S12.007 | 19.542 | 300 | S12.006 | 19.542 | 300 | |

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## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diamete (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| S68 | 20.978 | 1.461 | Open Manhole | 1200 | S12.008 | 19.517 | 300 | S12.007 | 19.517 | 30 |
| SPP4 | 21.300 | 0.800 | Open Manhole | 1200 | S15.000 | 20.500 | 150 | | | |
| SHBRAKE PP4 | 21.300 | 1.050 | Open Manhole | 1200 | S15.001 | 20.250 | 150 | S15.000 | 20.250 | 15 |
| S71 | 21.220 | 1.152 | Open Manhole | 1200 | S15.002 | 20.068 | 225 | S15.001 | 20.143 | 15 |
| S72 | 20.976 | 1.128 | Open Manhole | 1200 | S15.003 | 19.848 | 225 | S15.002 | 19.848 | 22 |
| S73 | 20.965 | 1.167 | Open Manhole | 1200 | S15.004 | 19.798 | 225 | S15.003 | 19.798 | 22 |
| S74 | 21.132 | 1.518 | Open Manhole | 1200 | S15.005 | 19.614 | 300 | S15.004 | 19.689 | 22 |
| S75 | 21.207 | 1.730 | Open Manhole | 1200 | S15.006 | 19.477 | 300 | S15.005 | 19.477 | 30 |
| S76 | 21.121 | 1.689 | Open Manhole | 1200 | S15.007 | 19.432 | 300 | S15.006 | 19.432 | 30 |
| S77 | 21.033 | 1.707 | Open Manhole | 1350 | S12.009 | 19.325 | 375 | S12.008 | 19.400 | 30 |
| | | | | | | | | S15.007 | 19.400 | 30 |
| S78 | 21.104 | 1.967 | Open Manhole | 1350 | S7.013 | 19.292 | 450 | S7.012 | 19.137 | 37 |
| | | | | | | | | S12.009 | 19.292 | 37 |
| S79 | 21.080 | 1.921 | Open Manhole | 1350 | S7.014 | 19.159 | 450 | S7.013 | 19.159 | 45 |
| S80 | 21.111 | 2.112 | Open Manhole | 1350 | S7.015 | 18.999 | 450 | S7.014 | 18.999 | 45 |
| SBASIN K | 20.100 | 1.200 | Open Manhole | 1350 | S7.016 | 18.900 | 450 | S7.015 | 18.900 | 45 |
| SHBRAKE BASIN K | 19.600 | 0.936 | Open Manhole | 1350 | S7.017 | 18.664 | 450 | S7.016 | 18.664 | 45 |
| S | 18.600 | 0.550 | Open Manhole | 0 | | OUTFALL | | S7.017 | 18.050 | 45 |

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S36 | 448992.587 | 116327.978 | 448992.587 | 116327.978 | Required | |
| S37 | 448985.857 | 116311.241 | 448985.857 | 116311.241 | Required | |
| S38 | 448989.434 | 116301.285 | 448989.434 | 116301.285 | Required | |
| S39 | 449008.038 | 116287.947 | 449008.038 | 116287.947 | Required | |
| S40 | 449019.154 | 116307.850 | 449019.154 | 116307.850 | Required | |
| S41 | 449007.530 | 116337.460 | 449007.530 | 116337.460 | Required | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S42 | 449028.858 | 116328.338 | 449028.858 | 116328.338 | Required | |
| S43 | 449039.874 | 116354.307 | 449039.874 | 116354.307 | Required | |
| S44 | 449047.201 | 116371.227 | 449047.201 | 116371.227 | Required | |
| S45 | 449031.926 | 116405.480 | 449031.926 | 116405.480 | Required | |
| S46 | 449056.610 | 116395.447 | 449056.610 | 116395.447 | Required | |
| S47 | 449062.783 | 116411.110 | 449062.783 | 116411.110 | Required | |
| S48 | 449029.884 | 116424.076 | 449029.884 | 116424.076 | Required | |
| S49 | 448967.246 | 116358.983 | 448967.246 | 116358.983 | Required | |
| S50 | 449018.595 | 116384.260 | 449018.595 | 116384.260 | Required | |
| S51 | 449012.058 | 116369.500 | 449012.058 | 116369.500 | Required | |
| S52 | 448988.966 | 116379.255 | 448988.966 | 116379.255 | Required | |
| S53 | 448977.088 | 116383.244 | 448977.088 | 116383.244 | Required | |
| S54 | 448981.472 | 116401.120 | 448981.472 | 116401.120 | Required | |
| S55 | 448985.596 | 116414.365 | 448985.596 | 116414.365 | Required | |
| S56 | 448996.814 | 116439.084 | 448996.814 | 116439.084 | Required | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S57 | 448964.113 | 116449.142 | 448964.113 | 116449.142 | Required | |
| S58 | 448957.772 | 116337.963 | 448957.772 | 116337.963 | Required | |
| S59 | 448964.500 | 116353.123 | 448964.500 | 116353.123 | Required | |
| S60 | 448921.130 | 116349.964 | 448921.130 | 116349.964 | Required | |
| S61 | 448898.273 | 116381.495 | 448898.273 | 116381.495 | Required | |
| S62 | 448928.945 | 116368.352 | 448928.945 | 116368.352 | Required | |
| S63 | 448927.859 | 116374.084 | 448927.859 | 116374.084 | Required | |
| S64 | 448943.265 | 116411.211 | 448943.265 | 116411.211 | Required | |
| S65 | 448952.835 | 116433.089 | 448952.835 | 116433.089 | Required | |
| S66 | 448950.611 | 116440.735 | 448950.611 | 116440.735 | Required | |
| S67 | 448927.991 | 116450.978 | 448927.991 | 116450.978 | Required | |
| S68 | 448922.146 | 116452.077 | 448922.146 | 116452.077 | Required | |
| SPP4 | 448823.671 | 116465.983 | 448823.671 | 116465.983 | Required | |
| SHBRAKE PP4 | 448824.565 | 116461.883 | 448824.565 | 116461.883 | Required | |
| S71 | 448830.315 | 116446.975 | 448830.315 | 116446.975 | Required | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S72 | 448845.533 | 116480.480 | 448845.533 | 116480.480 | Required | |
| S73 | 448853.466 | 116482.884 | 448853.466 | 116482.884 | Required | |
| S74 | 448870.356 | 116475.897 | 448870.356 | 116475.897 | Required | |
| S75 | 448900.346 | 116462.951 | 448900.346 | 116462.951 | Required | |
| S76 | 448909.422 | 116457.420 | 448909.422 | 116457.420 | Required | |
| S77 | 448916.514 | 116454.834 | 448916.514 | 116454.834 | Required | |
| S78 | 448920.532 | 116464.336 | 448920.532 | 116464.336 | Required | |
| S79 | 448873.150 | 116483.867 | 448873.150 | 116483.867 | Required | |
| S80 | 448815.996 | 116506.943 | 448815.996 | 116506.943 | Required | |
| SBASIN K | 448823.779 | 116535.986 | 448823.779 | 116535.986 | Required | |
| SHBRAKE BASIN K | 448825.024 | 116552.444 | 448825.024 | 116552.444 | Required | |
| S | 448828.056 | 116557.689 | | | No Entry | |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S7.000 | o | 150 | S36 | 23.468 | 22.118 | 1.200 | Open Manhole | 1200 |
| S7.001 | o | 150 | S37 | 23.943 | 21.998 | 1.796 | Open Manhole | 1200 |
| S7.002 | o | 150 | S38 | 24.213 | 21.927 | 2.136 | Open Manhole | 1200 |
| S7.003 | o | 225 | S39 | 24.833 | 21.700 | 2.908 | Open Manhole | 1200 |
| S7.004 | o | 225 | S40 | 23.947 | 21.563 | 2.159 | Open Manhole | 1200 |
| S8.000 | o | 150 | S41 | 23.303 | 21.953 | 1.200 | Open Manhole | 1200 |
| S7.005 | o | 225 | S42 | 23.580 | 21.427 | 1.928 | Open Manhole | 1200 |
| S7.006 | o | 225 | S43 | 22.681 | 21.256 | 1.200 | Open Manhole | 1200 |
| S7.007 | o | 300 | S44 | 22.349 | 20.849 | 1.200 | Open Manhole | 1200 |
| S9.000 | o | 300 | S45 | 21.727 | 20.227 | 1.200 | Open Manhole | 1200 |
| S7.008 | o | 300 | S46 | 22.073 | 20.049 | 1.724 | Open Manhole | 1200 |
| S7.009 | o | 300 | S47 | 22.299 | 19.978 | 2.020 | Open Manhole | 1200 |
| S7.010 | o | 300 | S48 | 21.841 | 19.830 | 1.711 | Open Manhole | 1200 |
| S10.000 | o | 150 | S49 | 22.875 | 21.525 | 1.200 | Open Manhole | 1200 |
| S11.000 | o | 225 | S50 | 21.974 | 20.549 | 1.200 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S7.000 | 18.040 | 150.0 | S37 | 23.943 | 21.998 | 1.796 | Open Manhole | 1200 |
| S7.001 | 10.579 | 150.0 | S38 | 24.213 | 21.927 | 2.136 | Open Manhole | 1200 |
| S7.002 | 22.892 | 150.0 | S39 | 24.833 | 21.775 | 2.908 | Open Manhole | 1200 |
| S7.003 | 22.797 | 167.0 | S40 | 23.947 | 21.563 | 2.159 | Open Manhole | 1200 |
| S7.004 | 22.670 | 166.7 | S42 | 23.580 | 21.427 | 1.928 | Open Manhole | 1200 |
| S8.000 | 23.196 | 51.4 | S42 | 23.580 | 21.502 | 1.928 | Open Manhole | 1200 |
| S7.005 | 28.209 | 165.0 | S43 | 22.681 | 21.256 | 1.200 | Open Manhole | 1200 |
| S7.006 | 18.438 | 55.5 | S44 | 22.349 | 20.924 | 1.200 | Open Manhole | 1200 |
| S7.007 | 25.983 | 32.5 | S46 | 22.073 | 20.049 | 1.724 | Open Manhole | 1200 |
| S9.000 | 26.645 | 149.7 | S46 | 22.073 | 20.049 | 1.724 | Open Manhole | 1200 |
| S7.008 | 16.836 | 238.0 | S47 | 22.299 | 19.978 | 2.020 | Open Manhole | 1200 |
| S7.009 | 35.362 | 238.0 | S48 | 21.841 | 19.830 | 1.711 | Open Manhole | 1200 |
| S7.010 | 36.316 | 132.6 | S56 | 21.414 | 19.556 | 1.558 | Open Manhole | 1350 |
| S10.000 | 26.182 | 20.8 | S53 | 22.420 | 20.265 | 2.005 | Open Manhole | 1200 |
| S11.000 | 16.142 | 140.0 | S51 | 22.360 | 20.434 | 1.701 | Open Manhole | 1200 |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S11.001 | o | 225 | S51 | 22.360 | 20.434 | 1.701 | Open Manhole | 1200 |
| S11.002 | o | 225 | S52 | 22.450 | 20.267 | 1.959 | Open Manhole | 1200 |
| S10.001 | o | 225 | S53 | 22.420 | 20.190 | 2.005 | Open Manhole | 1200 |
| S10.002 | o | 225 | S54 | 22.000 | 20.080 | 1.695 | Open Manhole | 1200 |
| S10.003 | o | 300 | S55 | 21.700 | 19.922 | 1.478 | Open Manhole | 1200 |
| S7.011 | o | 375 | S56 | 21.414 | 19.481 | 1.558 | Open Manhole | 1350 |
| S7.012 | o | 375 | S57 | 21.232 | 19.371 | 1.486 | Open Manhole | 1350 |
| S12.000 | o | 225 | S58 | 23.500 | 21.708 | 1.567 | Open Manhole | 1200 |
| S12.001 | o | 225 | S59 | 23.150 | 21.597 | 1.328 | Open Manhole | 1200 |
| S13.000 | o | 150 | S60 | 22.827 | 21.477 | 1.200 | Open Manhole | 1200 |
| S14.000 | o | 300 | S61 | 22.048 | 20.548 | 1.200 | Open Manhole | 1200 |
| S12.002 | o | 300 | S62 | 22.556 | 20.214 | 2.042 | Open Manhole | 1200 |
| S12.003 | o | 300 | S63 | 22.335 | 20.179 | 1.856 | Open Manhole | 1200 |
| S12.004 | o | 300 | S64 | 21.617 | 19.938 | 1.379 | Open Manhole | 1200 |
| S12.005 | o | 300 | S65 | 21.180 | 19.700 | 1.180 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S11.001 | 25.067 | 150.0 | S52 | 22.450 | 20.267 | 1.959 | Open Manhole | 1200 |
| S11.002 | 12.530 | 163.6 | S53 | 22.420 | 20.190 | 2.005 | Open Manhole | 1200 |
| S10.001 | 18.405 | 167.3 | S54 | 22.000 | 20.080 | 1.695 | Open Manhole | 1200 |
| S10.002 | 13.873 | 167.1 | S55 | 21.700 | 19.997 | 1.478 | Open Manhole | 1200 |
| S10.003 | 27.145 | 74.2 | S56 | 21.414 | 19.556 | 1.558 | Open Manhole | 1350 |
| S7.011 | 34.212 | 313.0 | S57 | 21.232 | 19.371 | 1.486 | Open Manhole | 1350 |
| S7.012 | 46.154 | 197.2 | S78 | 21.104 | 19.137 | 1.592 | Open Manhole | 1350 |
| S12.000 | 16.586 | 149.4 | S59 | 23.150 | 21.597 | 1.328 | Open Manhole | 1200 |
| S12.001 | 38.679 | 29.6 | S62 | 22.556 | 20.289 | 2.042 | Open Manhole | 1200 |
| S13.000 | 19.980 | 18.0 | S62 | 22.556 | 20.364 | 2.042 | Open Manhole | 1200 |
| S14.000 | 33.369 | 99.9 | S62 | 22.556 | 20.214 | 2.042 | Open Manhole | 1200 |
| S12.002 | 5.834 | 167.0 | S63 | 22.335 | 20.179 | 1.856 | Open Manhole | 1200 |
| S12.003 | 40.197 | 167.0 | S64 | 21.617 | 19.938 | 1.379 | Open Manhole | 1200 |
| S12.004 | 23.880 | 100.0 | S65 | 21.180 | 19.700 | 1.180 | Open Manhole | 1200 |
| S12.005 | 7.963 | 150.0 | S66 | 21.059 | 19.646 | 1.113 | Open Manhole | 1200 |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S12.006 | o | 300 | S66 | 21.059 | 19.646 | 1.113 | Open Manhole | 1200 |
| S12.007 | o | 300 | S67 | 20.921 | 19.542 | 1.079 | Open Manhole | 1200 |
| S12.008 | o | 300 | S68 | 20.978 | 19.517 | 1.161 | Open Manhole | 1200 |
| S15.000 | o | 150 | SPP4 | 21.300 | 20.500 | 0.650 | Open Manhole | 1200 |
| S15.001 | o | 150 | SHBRAKE PP4 | 21.300 | 20.250 | 0.900 | Open Manhole | 1200 |
| S15.002 | o | 225 | S71 | 21.220 | 20.068 | 0.927 | Open Manhole | 1200 |
| S15.003 | o | 225 | S72 | 20.976 | 19.848 | 0.903 | Open Manhole | 1200 |
| S15.004 | o | 225 | S73 | 20.965 | 19.798 | 0.942 | Open Manhole | 1200 |
| S15.005 | o | 300 | S74 | 21.132 | 19.614 | 1.218 | Open Manhole | 1200 |
| S15.006 | o | 300 | S75 | 21.207 | 19.477 | 1.430 | Open Manhole | 1200 |
| S15.007 | o | 300 | S76 | 21.121 | 19.432 | 1.389 | Open Manhole | 1200 |
| S12.009 | o | 375 | S77 | 21.033 | 19.325 | 1.332 | Open Manhole | 1350 |
| S7.013 | o | 450 | S78 | 21.104 | 19.292 | 1.362 | Open Manhole | 1350 |
| S7.014 | o | 450 | S79 | 21.080 | 19.159 | 1.471 | Open Manhole | 1350 |
| S7.015 | o | 450 | S80 | 21.111 | 18.999 | 1.662 | Open Manhole | 1350 |
| S7.016 | o | 450 | SBASIN K | 20.100 | 18.900 | 0.750 | Open Manhole | 1350 |
| S7.017 | o | 450 | SHBRAKE BASIN K | 19.600 | 18.664 | 0.486 | Open Manhole | 1350 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S12.006 | 24.831 | 238.0 | S67 | 20.921 | 19.542 | 1.079 | Open Manhole | 1200 |
| S12.007 | 5.947 | 238.0 | S68 | 20.978 | 19.517 | 1.161 | Open Manhole | 1200 |
| S12.008 | 6.270 | 53.6 | S77 | 21.033 | 19.400 | 1.332 | Open Manhole | 1350 |
| S15.000 | 4.196 | 16.8 | SHBRAKE PP4 | 21.300 | 20.250 | 0.900 | Open Manhole | 1200 |
| S15.001 | 15.978 | 150.0 | S71 | 21.220 | 20.143 | 0.927 | Open Manhole | 1200 |
| S15.002 | 36.799 | 167.0 | S72 | 20.976 | 19.848 | 0.903 | Open Manhole | 1200 |
| S15.003 | 8.289 | 167.0 | S73 | 20.965 | 19.798 | 0.942 | Open Manhole | 1200 |
| S15.004 | 18.278 | 167.0 | S74 | 21.132 | 19.689 | 1.218 | Open Manhole | 1200 |
| S15.005 | 32.665 | 238.0 | S75 | 21.207 | 19.477 | 1.430 | Open Manhole | 1200 |
| S15.006 | 10.628 | 238.0 | S76 | 21.121 | 19.432 | 1.389 | Open Manhole | 1200 |
| S15.007 | 7.549 | 235.9 | S77 | 21.033 | 19.400 | 1.332 | Open Manhole | 1350 |
| S12.009 | 10.317 | 313.0 | S78 | 21.104 | 19.292 | 1.437 | Open Manhole | 1350 |
| S7.013 | 51.249 | 385.3 | S79 | 21.080 | 19.159 | 1.471 | Open Manhole | 1350 |
| S7.014 | 61.637 | 385.2 | S80 | 21.111 | 18.999 | 1.662 | Open Manhole | 1350 |
| S7.015 | 30.067 | 303.7 | SBASIN K | 20.100 | 18.900 | 0.750 | Open Manhole | 1350 |
| S7.016 | 16.505 | 69.9 | SHBRAKE BASIN K | 19.600 | 18.664 | 0.486 | Open Manhole | 1350 |
| S7.017 | 6.058 | 9.9 | S | 18.600 | 18.050 | 0.100 | Open Manhole | 0 |

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## Area Summary for Storm

| Pipe Number | PIMP Type | PIMP Name | PIMP (%) | Gross Area (ha) | Imp. Area (ha) | Pipe Total (ha) |
|---|---|---|---|---|---|---|
| 7.000 | - | - | 100 | 0.028 | 0.028 | 0.028 |
| 7.001 | - | - | 100 | 0.004 | 0.004 | 0.004 |
| 7.002 | - | - | 100 | 0.029 | 0.029 | 0.029 |
| 7.003 | - | - | 100 | 0.044 | 0.044 | 0.044 |
| 7.004 | - | - | 100 | 0.018 | 0.018 | 0.018 |
| 8.000 | - | - | 100 | 0.054 | 0.054 | 0.054 |
| 7.005 | - | - | 100 | 0.028 | 0.028 | 0.028 |
| 7.006 | - | - | 100 | 0.031 | 0.031 | 0.031 |
| 7.007 | - | - | 100 | 0.017 | 0.017 | 0.017 |
| 9.000 | - | - | 100 | 0.082 | 0.082 | 0.082 |
| 7.008 | - | - | 100 | 0.009 | 0.009 | 0.009 |
| 7.009 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 7.010 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 10.000 | - | - | 100 | 0.008 | 0.008 | 0.008 |
| 11.000 | - | - | 100 | 0.019 | 0.019 | 0.019 |
| 11.001 | - | - | 100 | 0.045 | 0.045 | 0.045 |
| 11.002 | - | - | 100 | 0.004 | 0.004 | 0.004 |
| 10.001 | - | - | 100 | 0.061 | 0.061 | 0.061 |
| 10.002 | - | - | 100 | 0.051 | 0.051 | 0.051 |
| 10.003 | - | - | 100 | 0.074 | 0.074 | 0.074 |
| 7.011 | - | - | 100 | 0.043 | 0.043 | 0.043 |
| 7.012 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 12.000 | - | - | 100 | 0.037 | 0.037 | 0.037 |
| 12.001 | - | - | 100 | 0.038 | 0.038 | 0.038 |
| 13.000 | - | - | 100 | 0.047 | 0.047 | 0.047 |
| 14.000 | - | - | 100 | 0.070 | 0.070 | 0.070 |
| 12.002 | - | - | 100 | 0.060 | 0.060 | 0.060 |
| 12.003 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 12.004 | - | - | 100 | 0.071 | 0.071 | 0.071 |
| 12.005 | - | - | 100 | 0.017 | 0.017 | 0.017 |
| 12.006 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 12.007 | - | - | 100 | 0.060 | 0.060 | 0.060 |
| 12.008 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 15.000 | - | - | 100 | 0.041 | 0.041 | 0.041 |
| 15.001 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 15.002 | - | - | 100 | 0.045 | 0.045 | 0.045 |
| 15.003 | - | - | 100 | 0.064 | 0.064 | 0.064 |
| 15.004 | - | - | 100 | 0.023 | 0.023 | 0.023 |
| 15.005 | - | - | 100 | 0.046 | 0.046 | 0.046 |
| 15.006 | - | - | 100 | 0.033 | 0.033 | 0.033 |
| 15.007 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 12.009 | - | - | 100 | 0.033 | 0.033 | 0.033 |
| 7.013 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 7.014 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 7.015 | - | - | 100 | 0.017 | 0.017 | 0.017 |
| 7.016 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 7.017 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| | | | | Total | Total | Total |
| | | | | 1.351 | 1.351 | 1.351 |

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## 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) |
|---|---|---|---|---|---|---|
| S7.017 | S | 18.600 | 18.050 | 18.050 | 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) |
|---|---|---|---|---|---|---|---|---|---|
| 1440 | 18.400 | 5760 | 18.400 | 10080 | 18.400 | 14400 | 18.400 | 18720 | 18.400 |
| 2880 | 18.400 | 7200 | 18.400 | 11520 | 18.400 | 15840 | 18.400 | 20160 | 18.400 |
| 4320 | 18.400 | 8640 | 18.400 | 12960 | 18.400 | 17280 | 18.400 | | |

## 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 | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

## Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Profile Type | Summer |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 19.900 | Storm Duration (mins) | 30 |
| Ratio R | 0.350 | | |

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## Online Controls for Storm

### Hydro-Brake® Optimum Manhole: SHBRAKE PP4, DS/PN: S15.001, Volume (m³): 1.2

| | |
|---|---|
| Unit Reference | MD-SHE-0061-1500-0750-1500 |
| Design Head (m) | 0.750 |
| Design Flow (l/s) | 1.5 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 61 |
| Invert Level (m) | 20.250 |
| Minimum Outlet Pipe Diameter (mm) | 75 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 0.750 | 1.5 |
| Flush-Flo™ | 0.231 | 1.5 |
| Kick-Flo® | 0.479 | 1.2 |
| Mean Flow over Head Range | - | 1.3 |

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 | 1.3 | 1.200 | 1.9 | 3.000 | 2.8 | 7.000 | 4.2 |
| 0.200 | 1.5 | 1.400 | 2.0 | 3.500 | 3.0 | 7.500 | 4.3 |
| 0.300 | 1.5 | 1.600 | 2.1 | 4.000 | 3.2 | 8.000 | 4.5 |
| 0.400 | 1.4 | 1.800 | 2.2 | 4.500 | 3.4 | 8.500 | 4.6 |
| 0.500 | 1.3 | 2.000 | 2.3 | 5.000 | 3.6 | 9.000 | 4.7 |
| 0.600 | 1.4 | 2.200 | 2.4 | 5.500 | 3.7 | 9.500 | 4.9 |
| 0.800 | 1.5 | 2.400 | 2.5 | 6.000 | 3.9 | | |
| 1.000 | 1.7 | 2.600 | 2.6 | 6.500 | 4.0 | | |

### Hydro-Brake® Optimum Manhole: SBASIN K, DS/PN: S7.016, Volume (m³): 6.3

| | |
|---|---|
| Unit Reference | MD-SHE-0165-1360-1200-1360 |
| Design Head (m) | 1.200 |
| Design Flow (l/s) | 13.6 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 165 |
| Invert Level (m) | 18.900 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1500 |

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Hydro-Brake® Optimum Manhole: SBASIN K, DS/PN: S7.016, Volume (m³): 6.3

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.200 | 13.6 |
| Flush-Flo™ | 0.364 | 13.6 |
| Kick-Flo® | 0.801 | 11.2 |
| Mean Flow over Head Range | - | 11.7 |

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 | 5.9 | 1.200 | 13.6 | 3.000 | 21.0 | 7.000 | 31.6 |
| 0.200 | 12.8 | 1.400 | 14.6 | 3.500 | 22.6 | 7.500 | 32.7 |
| 0.300 | 13.5 | 1.600 | 15.6 | 4.000 | 24.1 | 8.000 | 33.7 |
| 0.400 | 13.6 | 1.800 | 16.5 | 4.500 | 25.5 | 8.500 | 34.7 |
| 0.500 | 13.4 | 2.000 | 17.3 | 5.000 | 26.9 | 9.000 | 35.7 |
| 0.600 | 13.1 | 2.200 | 18.1 | 5.500 | 28.1 | 9.500 | 36.6 |
| 0.800 | 11.3 | 2.400 | 18.9 | 6.000 | 29.3 | | |
| 1.000 | 12.5 | 2.600 | 19.6 | 6.500 | 30.5 | | |

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## Storage Structures for Storm

### Porous Car Park Manhole: SPP4, DS/PN: S15.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 10.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 31.0 |
| Max Percolation (l/s) | 86.1 | Slope (1:X) | 100.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 20.500 | Membrane Depth (mm) | 0 |

### Tank or Pond Manhole: SBASIN K, DS/PN: S7.016

Invert Level (m) 18.900

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 807.0 | 1.200 | 1502.0 |

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## 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 | 0 |
| 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) | 19.900 | Cv (Winter) | 0.840 |

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

| | |
|---|---|
| Profile(s) | Summer and Winter |
| Duration(s) (mins) | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 |
| Return Period(s) (years) | 100 |
| Climate Change (%) | 40 |

WARNING: Half Drain Time has not been calculated as the structure is too full.

| PN | US/MH Name | Storm | Return Period | Climate Change | First (X) Surcharge | First (Y) Flood | First (Z) Overflow | Overflow Act. |
|---|---|---|---|---|---|---|---|---|
| S7.000 | S36 | 15 Winter | 100 | +40% | 100/15 Summer | 100/15 Winter | | |
| S7.001 | S37 | 15 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.002 | S38 | 15 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.003 | S39 | 15 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.004 | S40 | 15 Winter | 100 | +40% | 100/15 Summer | | | |
| S8.000 | S41 | 15 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.005 | S42 | 15 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.006 | S43 | 15 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.007 | S44 | 15 Winter | 100 | +40% | 100/15 Summer | | | |
| S9.000 | S45 | 30 Winter | 100 | +40% | 100/15 Summer | 100/15 Summer | | |
| S7.008 | S46 | 15 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.009 | S47 | 15 Winter | 100 | +40% | 100/15 Summer | | | |
| S7.010 | S48 | 15 Winter | 100 | +40% | 100/15 Summer | | | |
| S10.000 | S49 | 15 Winter | 100 | +40% | 100/15 Summer | | | |
| S11.000 | S50 | 15 Winter | 100 | +40% | 100/15 Summer | 100/15 Winter | | |

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

| PN | US/MH Name | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) | Status |
|---|---|---|---|---|---|---|---|---|---|
| S7.000 | S36 | 23.468 | 1.200 | 0.049 | 0.74 | | | 10.0 | FLOOD |
| S7.001 | S37 | 23.438 | 1.290 | 0.000 | 0.94 | | | 12.2 | SURCHARGED |
| S7.002 | S38 | 23.412 | 1.335 | 0.000 | 1.42 | | | 19.5 | SURCHARGED |
| S7.003 | S39 | 23.209 | 1.284 | 0.000 | 0.95 | | | 34.7 | SURCHARGED |
| S7.004 | S40 | 23.113 | 1.325 | 0.000 | 1.04 | | | 38.1 | SURCHARGED |
| S8.000 | S41 | 23.290 | 1.187 | 0.000 | 0.95 | | | 22.3 | FLOOD RISK |
| S7.005 | S42 | 22.979 | 1.327 | 0.000 | 1.81 | | | 67.9 | SURCHARGED |
| S7.006 | S43 | 22.458 | 0.977 | 0.000 | 1.20 | | | 75.6 | FLOOD RISK |
| S7.007 | S44 | 21.975 | 0.826 | 0.000 | 0.47 | | | 82.1 | SURCHARGED |
| S9.000 | S45 | 21.738 | 1.211 | 11.193 | 0.58 | | | 47.4 | FLOOD |
| S7.008 | S46 | 21.796 | 1.447 | 0.000 | 1.53 | | | 93.8 | FLOOD RISK |
| S7.009 | S47 | 21.712 | 1.433 | 0.000 | 1.42 | | | 93.8 | SURCHARGED |
| S7.010 | S48 | 21.577 | 1.447 | 0.000 | 1.06 | | | 94.2 | FLOOD RISK |
| S10.000 | S49 | 21.957 | 0.282 | 0.000 | 0.13 | | | 5.0 | SURCHARGED |
| S11.000 | S50 | 21.974 | 1.200 | 0.547 | 0.33 | | | 12.8 | FLOOD |

| PN | US/MH Name | Level Exceeded |
|---|---|---|
| S7.000 | S36 | 1 |
| S7.001 | S37 | |
| S7.002 | S38 | |
| S7.003 | S39 | |
| S7.004 | S40 | |
| S8.000 | S41 | |
| S7.005 | S42 | |
| S7.006 | S43 | |
| S7.007 | S44 | |
| S9.000 | S45 | 6 |
| S7.008 | S46 | |
| S7.009 | S47 | |
| S7.010 | S48 | |
| S10.000 | S49 | |
| S11.000 | S50 | 2 |

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## 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 |
|---|---|---|---|---|---|---|---|
| S11.001 | S51 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S11.002 | S52 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S10.001 | S53 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S10.002 | S54 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S10.003 | S55 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S7.011 | S56 | 15 Winter | 100 | +40% | 100/15 Summer | 100/15 Winter | |
| S7.012 | S57 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S12.000 | S58 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S12.001 | S59 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S13.000 | S60 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S14.000 | S61 | 15 Winter | 100 | +40% | 100/15 Summer | 100/15 Summer | |
| S12.002 | S62 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S12.003 | S63 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S12.004 | S64 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S12.005 | S65 | 30 Winter | 100 | +40% | 100/15 Summer | 100/15 Summer | |
| S12.006 | S66 | 30 Winter | 100 | +40% | 100/15 Summer | 100/15 Summer | |
| S12.007 | S67 | 30 Winter | 100 | +40% | 100/15 Summer | 100/15 Summer | |
| S12.008 | S68 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S15.000 | SPP4 | 60 Winter | 100 | +40% | 100/15 Summer | | |
| S15.001 | SHBRAKE PP4 | 120 Winter | 100 | +40% | 100/15 Summer | | |
| S15.002 | S71 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S15.003 | S72 | 30 Winter | 100 | +40% | 100/15 Summer | 100/15 Summer | |
| S15.004 | S73 | 15 Winter | 100 | +40% | 100/15 Summer | 100/15 Summer | |
| S15.005 | S74 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S15.006 | S75 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S15.007 | S76 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S12.009 | S77 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S7.013 | S78 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S7.014 | S79 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S7.015 | S80 | 480 Winter | 100 | +40% | 100/15 Summer | | |
| S7.016 | SBASIN K | 480 Winter | 100 | +40% | 100/30 Winter | | |
| S7.017 | SHBRAKE BASIN K | 960 Winter | 100 | +40% | | | |

| PN | US/MH Name | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) |
|---|---|---|---|---|---|---|---|---|
| S11.001 | S51 | | 22.008 | 1.349 | 0.000 | 0.57 | | |
| S11.002 | S52 | | 21.980 | 1.488 | 0.000 | 0.70 | | |
| S10.001 | S53 | | 21.953 | 1.538 | 0.000 | 1.18 | | |
| S10.002 | S54 | | 21.823 | 1.518 | 0.000 | 1.76 | | |
| S10.003 | S55 | | 21.603 | 1.381 | 0.000 | 0.78 | | |
| S7.011 | S56 | | 21.414 | 1.558 | 0.067 | 1.68 | | |
| S7.012 | S57 | | 21.120 | 1.373 | 0.000 | 1.27 | | |
| S12.000 | S58 | | 22.275 | 0.342 | 0.000 | 0.58 | | |
| S12.001 | S59 | | 22.241 | 0.419 | 0.000 | 0.47 | | |
| S13.000 | S60 | | 22.376 | 0.749 | 0.000 | 0.62 | | |
| S14.000 | S61 | | 22.050 | 1.202 | 2.134 | 0.38 | | |

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

| PN | US/MH Name | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) |
|---|---|---|---|---|---|---|---|---|
| S12.002 | S62 | | 22.047 | 1.533 | 0.000 | 1.60 | | |
| S12.003 | S63 | | 21.910 | 1.431 | 0.000 | 1.19 | | |
| S12.004 | S64 | | 21.588 | 1.350 | 0.000 | 1.25 | | |
| S12.005 | S65 | | 21.190 | 1.191 | 10.551 | 1.45 | | |
| S12.006 | S66 | | 21.070 | 1.123 | 10.687 | 1.25 | | |
| S12.007 | S67 | | 20.932 | 1.089 | 10.230 | 2.27 | | |
| S12.008 | S68 | | 20.878 | 1.060 | 0.000 | 1.30 | | |
| S15.000 | SPP4 | | 20.814 | 0.164 | 0.000 | 0.11 | | |
| S15.001 | SHBRAKE PP4 | | 20.831 | 0.431 | 0.000 | 0.11 | | |
| S15.002 | S71 | | 21.058 | 0.764 | 0.000 | 0.52 | | |
| S15.003 | S72 | | 20.983 | 0.910 | 6.691 | 1.10 | | |
| S15.004 | S73 | | 20.966 | 0.943 | 0.799 | 1.21 | | |
| S15.005 | S74 | | 20.953 | 1.039 | 0.000 | 0.90 | | |
| S15.006 | S75 | | 20.909 | 1.132 | 0.000 | 1.22 | | |
| S15.007 | S76 | | 20.856 | 1.123 | 0.000 | 1.20 | | |
| S12.009 | S77 | | 20.829 | 1.128 | 0.000 | 2.05 | | |
| S7.013 | S78 | | 20.732 | 0.990 | 0.000 | 2.00 | | |
| S7.014 | S79 | | 20.237 | 0.628 | 0.000 | 1.89 | | |
| S7.015 | S80 | | 19.694 | 0.245 | 0.000 | 0.58 | | |
| S7.016 | SBASIN K | | 19.688 | 0.338 | 0.000 | 0.05 | | |
| S7.017 | SHBRAKE BASIN K | | 18.715 | -0.399 | 0.000 | 0.03 | | |

| PN | US/MH Name | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|
| S11.001 | S51 | 22.4 | SURCHARGED | |
| S11.002 | S52 | 24.4 | SURCHARGED | |
| S10.001 | S53 | 42.5 | SURCHARGED | |
| S10.002 | S54 | 61.5 | FLOOD RISK | |
| S10.003 | S55 | 90.3 | FLOOD RISK | |
| S7.011 | S56 | 169.5 | FLOOD | 1 |
| S7.012 | S57 | 166.1 | FLOOD RISK | |
| S12.000 | S58 | 22.1 | SURCHARGED | |
| S12.001 | S59 | 43.0 | SURCHARGED | |
| S13.000 | S60 | 24.5 | SURCHARGED | |
| S14.000 | S61 | 38.9 | FLOOD | 2 |
| S12.002 | S62 | 94.9 | SURCHARGED | |
| S12.003 | S63 | 95.2 | SURCHARGED | |
| S12.004 | S64 | 123.8 | FLOOD RISK | |
| S12.005 | S65 | 88.9 | FLOOD | 6 |
| S12.006 | S66 | 80.1 | FLOOD | 6 |
| S12.007 | S67 | 113.1 | FLOOD | 6 |
| S12.008 | S68 | 111.5 | FLOOD RISK | |
| S15.000 | SPP4 | 3.3 | SURCHARGED | |
| S15.001 | SHBRAKE PP4 | 1.5 | SURCHARGED | |
| S15.002 | S71 | 19.8 | FLOOD RISK | |
| S15.003 | S72 | 34.4 | FLOOD | 6 |

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

| PN | US/MH Name | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|
| S15.004 | S73 | 43.7 | FLOOD | 4 |
| S15.005 | S74 | 59.0 | FLOOD RISK | |
| S15.006 | S75 | 69.3 | FLOOD RISK | |
| S15.007 | S76 | 63.9 | FLOOD RISK | |
| S12.009 | S77 | 167.6 | FLOOD RISK | |
| S7.013 | S78 | 297.6 | SURCHARGED | |
| S7.014 | S79 | 285.4 | SURCHARGED | |
| S7.015 | S80 | 92.6 | SURCHARGED | |
| S7.016 | SBASIN K | 13.6 | SURCHARGED | |
| S7.017 | SHBRAKE BASIN K | 13.6 | OK | |

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## 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) | 100 | PIMP (%) | 100 |
| M5-60 (mm) | 19.900 | Add Flow / Climate Change (%) | 0 |
| Ratio R | 0.350 | Minimum Backdrop Height (m) | 0.200 |
| Maximum Rainfall (mm/hr) | 50 | Maximum Backdrop Height (m) | 1.500 |
| 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 Soffits

### Time Area Diagram for Storm

| Time (mins) | Area (ha) | Time (mins) | Area (ha) | Time (mins) | Area (ha) | Time (mins) | Area (ha) |
|---|---|---|---|---|---|---|---|
| 0-4 | 0.018 | 4-8 | 0.713 | 8-12 | 1.714 | 12-16 | 0.248 |

Total Area Contributing (ha) = 2.694

Total Pipe Volume (m³) = 274.840

### 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S16.000 | 22.220 | 0.333 | 66.7 | 0.024 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S17.000 | 21.574 | 0.809 | 26.7 | 0.041 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S17.001 | 26.648 | 0.919 | 29.0 | 0.053 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S16.001 | 26.563 | 0.395 | 67.2 | 0.049 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S16.002 | 29.160 | 0.384 | 75.9 | 0.047 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S16.000 | 50.00 | 4.30 | 25.130 | 0.024 | 0.0 | 0.0 | 0.0 | 1.23 | 21.8 | 3.2 |
| S17.000 | 50.00 | 4.18 | 26.525 | 0.041 | 0.0 | 0.0 | 0.0 | 1.96 | 34.6 | 5.6 |
| S17.001 | 50.00 | 4.37 | 25.641 | 0.094 | 0.0 | 0.0 | 0.0 | 2.44 | 97.0 | 12.7 |
| S16.001 | 50.00 | 4.60 | 24.647 | 0.167 | 0.0 | 0.0 | 0.0 | 1.92 | 135.7 | 22.6 |
| S16.002 | 50.00 | 4.87 | 24.252 | 0.214 | 0.0 | 0.0 | 0.0 | 1.81 | 127.7 | 29.0 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S18.000 | 22.692 | 0.795 | 28.5 | 0.045 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S18.001 | 22.747 | 0.820 | 27.7 | 0.077 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S19.000 | 17.312 | 0.345 | 50.2 | 0.011 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S19.001 | 10.325 | 0.195 | 52.9 | 0.028 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S19.002 | 13.321 | 0.253 | 52.7 | 0.113 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S19.003 | 20.903 | 0.379 | 55.2 | 0.008 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S16.003 | 23.198 | 0.841 | 27.6 | 0.104 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S16.004 | 6.114 | 0.196 | 31.2 | 0.012 | 0.00 | 0.0 | 0.600 | o | 525 | Pipe/Conduit | |
| S20.000 | 36.476 | 0.510 | 71.5 | 0.014 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S20.001 | 14.010 | 0.093 | 150.6 | 0.034 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S16.005 | 6.437 | 0.118 | 54.6 | 0.011 | 0.00 | 0.0 | 0.600 | o | 525 | Pipe/Conduit | |
| S16.006 | 10.922 | 0.128 | 85.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 525 | Pipe/Conduit | |
| S16.007 | 8.616 | 0.082 | 105.1 | 0.030 | 0.00 | 0.0 | 0.600 | o | 525 | Pipe/Conduit | |
| S16.008 | 24.413 | 0.251 | 97.3 | 0.000 | 0.00 | 0.0 | 0.600 | o | 525 | Pipe/Conduit | |
| S16.009 | 25.396 | 0.250 | 101.6 | 0.127 | 0.00 | 0.0 | 0.600 | o | 525 | Pipe/Conduit | |
| S16.010 | 13.755 | 0.103 | 133.5 | 0.055 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S16.011 | 18.458 | 0.100 | 184.6 | 0.078 | 0.00 | 0.0 | 0.600 | o | 600 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S18.000 | 50.00 | 4.20 | 25.633 | 0.045 | 0.0 | 0.0 | 0.0 | 1.89 | 33.4 | 6.1 |
| S18.001 | 50.00 | 4.35 | 24.763 | 0.122 | 0.0 | 0.0 | 0.0 | 2.49 | 99.2 | 16.5 |
| S19.000 | 50.00 | 4.20 | 25.190 | 0.011 | 0.0 | 0.0 | 0.0 | 1.42 | 25.2 | 1.5 |
| S19.001 | 50.00 | 4.30 | 24.770 | 0.039 | 0.0 | 0.0 | 0.0 | 1.80 | 71.6 | 5.3 |
| S19.002 | 50.00 | 4.40 | 24.500 | 0.152 | 0.0 | 0.0 | 0.0 | 2.17 | 153.5 | 20.6 |
| S19.003 | 50.00 | 4.56 | 24.247 | 0.160 | 0.0 | 0.0 | 0.0 | 2.12 | 150.0 | 21.7 |
| S16.003 | 50.00 | 4.97 | 23.718 | 0.600 | 0.0 | 0.0 | 0.0 | 3.88 | 617.5 | 81.2 |
| S16.004 | 50.00 | 4.99 | 22.802 | 0.612 | 0.0 | 0.0 | 0.0 | 4.02 | 870.4 | 82.9 |
| S20.000 | 50.00 | 4.51 | 23.584 | 0.014 | 0.0 | 0.0 | 0.0 | 1.19 | 21.0 | 1.9 |
| S20.001 | 50.00 | 4.80 | 23.074 | 0.048 | 0.0 | 0.0 | 0.0 | 0.82 | 14.4 | 6.5 |
| S16.005 | 50.00 | 5.03 | 22.606 | 0.671 | 0.0 | 0.0 | 0.0 | 3.04 | 657.5 | 90.9 |
| S16.006 | 50.00 | 5.10 | 22.488 | 0.671 | 0.0 | 0.0 | 0.0 | 2.43 | 525.2 | 90.9 |
| S16.007 | 50.00 | 5.17 | 22.360 | 0.701 | 0.0 | 0.0 | 0.0 | 2.18 | 473.0 | 94.9 |
| S16.008 | 50.00 | 5.35 | 22.278 | 0.701 | 0.0 | 0.0 | 0.0 | 2.27 | 491.7 | 94.9 |
| S16.009 | 50.00 | 5.54 | 22.027 | 0.828 | 0.0 | 0.0 | 0.0 | 2.22 | 481.1 | 112.1 |
| S16.010 | 50.00 | 5.64 | 21.702 | 0.883 | 0.0 | 0.0 | 0.0 | 2.11 | 595.4 | 119.6 |
| S16.011 | 50.00 | 5.82 | 21.599 | 0.961 | 0.0 | 0.0 | 0.0 | 1.79 | 505.9 | 130.1 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S16.012 | 28.539 | 0.357 | 79.9 | 0.091 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S16.013 | 29.655 | 0.053 | 556.0 | 0.045 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S16.014 | 24.556 | 0.044 | 556.0 | 0.045 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S16.015 | 23.901 | 0.043 | 556.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S16.016 | 26.254 | 0.089 | 295.0 | 0.051 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S21.000 | 4.798 | 0.604 | 7.9 | 0.016 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S21.001 | 6.858 | 0.125 | 54.9 | 0.058 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S21.002 | 19.437 | 0.268 | 72.5 | 0.024 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S21.003 | 28.496 | 0.300 | 95.0 | 0.082 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S21.004 | 17.799 | 0.200 | 89.0 | 0.032 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S21.005 | 15.802 | 0.066 | 238.0 | 0.038 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S21.006 | 14.733 | 0.062 | 238.0 | 0.041 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S21.007 | 15.080 | 0.063 | 238.0 | 0.034 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S21.008 | 26.887 | 0.113 | 237.9 | 0.024 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S22.000 | 7.673 | 0.676 | 11.4 | 0.019 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S22.001 | 7.875 | 0.971 | 8.1 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S21.009 | 21.412 | 0.090 | 237.9 | 0.061 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S23.000 | 31.295 | 0.209 | 150.0 | 0.022 | 4.00 | 0.0 | 0.600 | o | 150 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S16.012 | 50.00 | 5.99 | 21.499 | 1.052 | 0.0 | 0.0 | 0.0 | 2.73 | 770.6 | 142.5 |
| S16.013 | 50.00 | 6.47 | 21.142 | 1.097 | 0.0 | 0.0 | 0.0 | 1.03 | 290.0 | 148.5 |
| S16.014 | 50.00 | 6.87 | 21.089 | 1.142 | 0.0 | 0.0 | 0.0 | 1.03 | 290.0 | 154.6 |
| S16.015 | 50.00 | 7.26 | 21.044 | 1.142 | 0.0 | 0.0 | 0.0 | 1.03 | 290.0 | 154.6 |
| S16.016 | 50.00 | 7.57 | 21.002 | 1.193 | 0.0 | 0.0 | 0.0 | 1.41 | 399.4 | 161.5 |
| S21.000 | 50.00 | 4.02 | 23.754 | 0.016 | 0.0 | 0.0 | 0.0 | 3.60 | 63.6 | 2.2 |
| S21.001 | 50.00 | 4.11 | 23.150 | 0.074 | 0.0 | 0.0 | 0.0 | 1.36 | 24.0 | 10.0 |
| S21.002 | 50.00 | 4.32 | 22.950 | 0.098 | 0.0 | 0.0 | 0.0 | 1.54 | 61.1 | 13.3 |
| S21.003 | 50.00 | 4.67 | 22.682 | 0.180 | 0.0 | 0.0 | 0.0 | 1.34 | 53.4 | 24.4 |
| S21.004 | 50.00 | 4.88 | 22.382 | 0.212 | 0.0 | 0.0 | 0.0 | 1.39 | 55.1 | 28.7 |
| S21.005 | 50.00 | 5.14 | 22.107 | 0.250 | 0.0 | 0.0 | 0.0 | 1.01 | 71.7 | 33.9 |
| S21.006 | 50.00 | 5.39 | 22.041 | 0.291 | 0.0 | 0.0 | 0.0 | 1.01 | 71.7 | 39.4 |
| S21.007 | 50.00 | 5.63 | 21.979 | 0.325 | 0.0 | 0.0 | 0.0 | 1.01 | 71.7 | 44.0 |
| S21.008 | 50.00 | 6.08 | 21.915 | 0.349 | 0.0 | 0.0 | 0.0 | 1.01 | 71.7 | 47.3 |
| S22.000 | 50.00 | 4.04 | 23.599 | 0.019 | 0.0 | 0.0 | 0.0 | 3.01 | 53.1 | 2.6 |
| S22.001 | 50.00 | 4.08 | 22.923 | 0.019 | 0.0 | 0.0 | 0.0 | 3.56 | 62.9 | 2.6 |
| S21.009 | 50.00 | 6.43 | 21.802 | 0.429 | 0.0 | 0.0 | 0.0 | 1.01 | 71.7 | 58.1 |
| S23.000 | 50.00 | 4.64 | 23.661 | 0.022 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 3.0 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S23.001 | 6.332 | 0.042 | 150.0 | 0.044 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S23.002 | 12.179 | 1.548 | 7.9 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S21.010 | 38.483 | 0.100 | 384.8 | 0.017 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S21.011 | 23.055 | 0.060 | 384.2 | 0.054 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S21.012 | 38.011 | 0.084 | 452.5 | 0.061 | 0.00 | 0.0 | 0.600 | o | 525 | Pipe/Conduit | |
| S21.013 | 31.029 | 0.068 | 456.3 | 0.115 | 0.00 | 0.0 | 0.600 | o | 525 | Pipe/Conduit | |
| S21.014 | 12.375 | 0.187 | 66.2 | 0.030 | 0.00 | 0.0 | 0.600 | o | 525 | Pipe/Conduit | |
| S16.017 | 32.829 | 0.059 | 556.0 | 0.068 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S16.018 | 35.912 | 0.214 | 167.8 | 0.083 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S16.019 | 32.324 | 0.500 | 64.6 | 0.051 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S16.020 | 24.523 | 0.498 | 49.2 | 0.056 | 0.00 | 0.0 | 0.600 | o | 600 | Pipe/Conduit | |
| S24.000 | 6.160 | 0.297 | 20.7 | 0.035 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S24.001 | 7.988 | 0.122 | 65.5 | 0.043 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S24.002 | 28.632 | 0.451 | 63.5 | 0.000 | 0.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S24.003 | 30.090 | 0.501 | 60.1 | 0.044 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S24.004 | 12.984 | 0.139 | 93.4 | 0.042 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S25.000 | 6.940 | 0.179 | 38.8 | 0.020 | 4.00 | 0.0 | 0.600 | o | 150 | Pipe/Conduit | |
| S25.001 | 24.162 | 0.161 | 150.1 | 0.021 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S23.001 | 50.00 | 4.77 | 23.452 | 0.066 | 0.0 | 0.0 | 0.0 | 0.82 | 14.5 | 8.9 |
| S23.002 | 50.00 | 4.82 | 23.410 | 0.066 | 0.0 | 0.0 | 0.0 | 3.61 | 63.9 | 8.9 |
| S21.010 | 50.00 | 7.05 | 21.562 | 0.512 | 0.0 | 0.0 | 0.0 | 1.03 | 163.9 | 69.3 |
| S21.011 | 50.00 | 7.42 | 21.462 | 0.566 | 0.0 | 0.0 | 0.0 | 1.03 | 164.0 | 76.6 |
| S21.012 | 50.00 | 8.03 | 21.327 | 0.627 | 0.0 | 0.0 | 0.0 | 1.05 | 226.5 | 84.9 |
| S21.013 | 50.00 | 8.52 | 21.243 | 0.742 | 0.0 | 0.0 | 0.0 | 1.04 | 225.6 | 100.5 |
| S21.014 | 50.00 | 8.60 | 21.175 | 0.772 | 0.0 | 0.0 | 0.0 | 2.76 | 596.7 | 104.5 |
| S16.017 | 50.00 | 9.13 | 20.913 | 2.033 | 0.0 | 0.0 | 0.0 | 1.03 | 290.0 | 275.3 |
| S16.018 | 50.00 | 9.45 | 20.853 | 2.116 | 0.0 | 0.0 | 0.0 | 1.88 | 530.7 | 286.5 |
| S16.019 | 50.00 | 9.63 | 20.639 | 2.167 | 0.0 | 0.0 | 0.0 | 3.03 | 857.3 | 293.4 |
| S16.020 | 50.00 | 9.75 | 20.139 | 2.223 | 0.0 | 0.0 | 0.0 | 3.48 | 982.8 | 301.0 |
| S24.000 | 50.00 | 4.05 | 21.825 | 0.035 | 0.0 | 0.0 | 0.0 | 2.22 | 39.3 | 4.7 |
| S24.001 | 50.00 | 4.15 | 21.528 | 0.078 | 0.0 | 0.0 | 0.0 | 1.24 | 22.0 | 10.6 |
| S24.002 | 50.00 | 4.53 | 21.406 | 0.078 | 0.0 | 0.0 | 0.0 | 1.26 | 22.3 | 10.6 |
| S24.003 | 50.00 | 4.83 | 20.880 | 0.122 | 0.0 | 0.0 | 0.0 | 1.69 | 67.2 | 16.5 |
| S24.004 | 50.00 | 4.99 | 20.379 | 0.164 | 0.0 | 0.0 | 0.0 | 1.35 | 53.8 | 22.2 |
| S25.000 | 50.00 | 4.07 | 20.736 | 0.020 | 0.0 | 0.0 | 0.0 | 1.62 | 28.7 | 2.7 |
| S25.001 | 50.00 | 4.45 | 20.482 | 0.041 | 0.0 | 0.0 | 0.0 | 1.06 | 42.3 | 5.6 |

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## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S25.002 | 12.137 | 0.081 | 149.8 | 0.042 | 0.00 | 0.0 | 0.600 | o | 225 | Pipe/Conduit | |
| S24.005 | 21.790 | 0.092 | 238.0 | 0.019 | 0.00 | 0.0 | 0.600 | o | 300 | Pipe/Conduit | |
| S24.006 | 18.221 | 0.047 | 385.0 | 0.006 | 0.00 | 0.0 | 0.600 | o | 450 | Pipe/Conduit | |
| S16.021 | 34.545 | 0.062 | 556.0 | 0.089 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S16.022 | 18.175 | 0.033 | 556.0 | 0.032 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S16.023 | 19.666 | 0.035 | 556.0 | 0.016 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S16.024 | 24.490 | 0.044 | 556.0 | 0.005 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S16.025 | 20.152 | 0.036 | 556.0 | 0.043 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S16.026 | 92.652 | 0.156 | 593.9 | 0.014 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S16.027 | 90.121 | 0.251 | 359.0 | 0.000 | 0.00 | 0.0 | 0.600 | o | 675 | Pipe/Conduit | |
| S16.028 | 39.872 | 1.950 | 20.4 | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| S25.002 | 50.00 | 4.64 | 20.321 | 0.083 | 0.0 | 0.0 | 0.0 | 1.07 | 42.4 | 11.2 |
| S24.005 | 50.00 | 5.35 | 20.165 | 0.266 | 0.0 | 0.0 | 0.0 | 1.01 | 71.7 | 36.0 |
| S24.006 | 50.00 | 5.64 | 19.923 | 0.272 | 0.0 | 0.0 | 0.0 | 1.03 | 163.8 | 36.8 |
| S16.021 | 50.00 | 10.27 | 19.566 | 2.584 | 0.0 | 0.0 | 0.0 | 1.10 | 395.2 | 349.9 |
| S16.022 | 50.00 | 10.54 | 19.504 | 2.616 | 0.0 | 0.0 | 0.0 | 1.10 | 395.2 | 354.2 |
| S16.023 | 50.00 | 10.84 | 19.472 | 2.632 | 0.0 | 0.0 | 0.0 | 1.10 | 395.2 | 356.4 |
| S16.024 | 50.00 | 11.21 | 19.436 | 2.637 | 0.0 | 0.0 | 0.0 | 1.10 | 395.2 | 357.1 |
| S16.025 | 50.00 | 11.51 | 19.392 | 2.680 | 0.0 | 0.0 | 0.0 | 1.10 | 395.2 | 362.9 |
| S16.026 | 50.00 | 12.96 | 19.356 | 2.694 | 0.0 | 0.0 | 0.0 | 1.07 | 382.2 | 364.8 |
| S16.027 | 50.00 | 14.05 | 19.200 | 2.694 | 0.0 | 0.0 | 0.0 | 1.38 | 492.9 | 364.8 |
| S16.028 | 50.00 | 14.20 | 18.949 | 2.694 | 0.0 | 0.0 | 0.0 | 4.51 | 717.6 | 364.8 |

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## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S83 | 26.480 | 1.350 | Open Manhole | 1200 | S16.000 | 25.130 | 150 | | | | |
| S84 | 27.875 | 1.350 | Open Manhole | 1200 | S17.000 | 26.525 | 150 | | | | |
| S85 | 27.066 | 1.425 | Open Manhole | 1200 | S17.001 | 25.641 | 225 | S17.000 | 25.716 | 150 | |
| S86 | 26.147 | 1.500 | Open Manhole | 1200 | S16.001 | 24.647 | 300 | S16.000 | 24.797 | 150 | |
| | | | | | | | | S17.001 | 24.722 | 225 | |
| S87 | 25.752 | 1.500 | Open Manhole | 1200 | S16.002 | 24.252 | 300 | S16.001 | 24.252 | 300 | |
| S88 | 26.983 | 1.350 | Open Manhole | 1200 | S18.000 | 25.633 | 150 | | | | |
| S89 | 26.188 | 1.425 | Open Manhole | 1200 | S18.001 | 24.763 | 225 | S18.000 | 24.838 | 150 | |
| S90 | 26.540 | 1.350 | Open Manhole | 1200 | S19.000 | 25.190 | 150 | | | | |
| S91 | 26.195 | 1.425 | Open Manhole | 1200 | S19.001 | 24.770 | 225 | S19.000 | 24.845 | 150 | |
| S92 | 26.000 | 1.500 | Open Manhole | 1200 | S19.002 | 24.500 | 300 | S19.001 | 24.575 | 225 | |
| S93 | 25.747 | 1.500 | Open Manhole | 1200 | S19.003 | 24.247 | 300 | S19.002 | 24.247 | 300 | |
| S94 | 25.368 | 1.650 | Open Manhole | 1350 | S16.003 | 23.718 | 450 | S16.002 | 23.868 | 300 | |
| | | | | | | | | S18.001 | 23.943 | 225 | |
| | | | | | | | | S19.003 | 23.868 | 300 | |
| S95 | 24.527 | 1.725 | Open Manhole | 1500 | S16.004 | 22.802 | 525 | S16.003 | 22.877 | 450 | |
| S96 | 24.934 | 1.350 | Open Manhole | 1200 | S20.000 | 23.584 | 150 | | | | |
| S97 | 24.424 | 1.350 | Open Manhole | 1200 | S20.001 | 23.074 | 150 | S20.000 | 23.074 | 150 | |
| S98 | 24.346 | 1.740 | Open Manhole | 1500 | S16.005 | 22.606 | 525 | S16.004 | 22.606 | 525 | |
| | | | | | | | | S20.001 | 22.981 | 150 | |
| S99 | 24.213 | 1.725 | Open Manhole | 1500 | S16.006 | 22.488 | 525 | S16.005 | 22.488 | 525 | |
| S100 | 24.085 | 1.725 | Open Manhole | 1500 | S16.007 | 22.360 | 525 | S16.006 | 22.360 | 525 | |
| S101 | 24.003 | 1.725 | Open Manhole | 1500 | S16.008 | 22.278 | 525 | S16.007 | 22.278 | 525 | |
| S102 | 23.752 | 1.725 | Open Manhole | 1500 | S16.009 | 22.027 | 525 | S16.008 | 22.027 | 525 | |
| S103 | 23.502 | 1.800 | Open Manhole | 1500 | S16.010 | 21.702 | 600 | S16.009 | 21.777 | 525 | |
| S104 | 23.400 | 1.801 | Open Manhole | 1500 | S16.011 | 21.599 | 600 | S16.010 | 21.599 | 600 | |
| S105 | 23.300 | 1.801 | Open Manhole | 1500 | S16.012 | 21.499 | 600 | S16.011 | 21.499 | 600 | |
| S106 | 23.540 | 2.398 | Open Manhole | 1500 | S16.013 | 21.142 | 600 | S16.012 | 21.142 | 600 | |
| S107 | 23.900 | 2.811 | Open Manhole | 1500 | S16.014 | 21.089 | 600 | S16.013 | 21.089 | 600 | |
| S108 | 24.100 | 3.056 | Open Manhole | 1500 | S16.015 | 21.044 | 600 | S16.014 | 21.044 | 600 | |
| S109 | 23.960 | 2.958 | Open Manhole | 1500 | S16.016 | 21.002 | 600 | S16.015 | 21.002 | 600 | |
| SPP5 | 24.554 | 0.800 | Open Manhole | 1200 | S21.000 | 23.754 | 150 | | | | |
| SHBRAKE PP5 | 24.500 | 1.350 | Open Manhole | 1200 | S21.001 | 23.150 | 150 | S21.000 | 23.150 | 150 | |
| S112 | 24.375 | 1.425 | Open Manhole | 1200 | S21.002 | 22.950 | 225 | S21.001 | 23.025 | 150 | |
| S113 | 24.107 | 1.425 | Open Manhole | 1200 | S21.003 | 22.682 | 225 | S21.002 | 22.682 | 225 | |
| S114 | 23.807 | 1.425 | Open Manhole | 1200 | S21.004 | 22.382 | 225 | S21.003 | 22.382 | 225 | |
| S115 | 23.607 | 1.500 | Open Manhole | 1200 | S21.005 | 22.107 | 300 | S21.004 | 22.182 | 225 | |
| S116 | 23.593 | 1.553 | Open Manhole | 1200 | S21.006 | 22.041 | 300 | S21.005 | 22.041 | 300 | |

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## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diameter (mm) | Ba |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S117 | 23.716 | 1.737 | Open Manhole | 1200 | S21.007 | 21.979 | 300 | S21.006 | 21.979 | 300 | |
| S118 | 23.862 | 1.947 | Open Manhole | 1200 | S21.008 | 21.915 | 300 | S21.007 | 21.915 | 300 | |
| SPP6 | 24.399 | 0.800 | Open Manhole | 1200 | S22.000 | 23.599 | 150 | | | | |
| SHBRAKE PP6 | 24.273 | 1.350 | Open Manhole | 1200 | S22.001 | 22.923 | 150 | S22.000 | 22.923 | 150 | |
| S121 | 24.134 | 2.332 | Open Manhole | 1200 | S21.009 | 21.802 | 300 | S21.008 | 21.802 | 300 | |
| | | | | | | | | S22.001 | 21.952 | 150 | |
| S122 | 25.011 | 1.350 | Open Manhole | 1200 | S23.000 | 23.661 | 150 | | | | |
| S123 | 25.196 | 1.744 | Open Manhole | 1200 | S23.001 | 23.452 | 150 | S23.000 | 23.452 | 150 | |
| S124 | 25.035 | 1.625 | Open Manhole | 1200 | S23.002 | 23.410 | 150 | S23.001 | 23.410 | 150 | |
| S125 | 24.700 | 3.138 | Open Manhole | 1350 | S21.010 | 21.562 | 450 | S21.009 | 21.712 | 300 | |
| | | | | | | | | S23.002 | 21.862 | 150 | |
| S126 | 23.700 | 2.238 | Open Manhole | 1350 | S21.011 | 21.462 | 450 | S21.010 | 21.462 | 450 | |
| S127 | 23.470 | 2.143 | Open Manhole | 1500 | S21.012 | 21.327 | 525 | S21.011 | 21.402 | 450 | |
| S128 | 23.250 | 2.007 | Open Manhole | 1500 | S21.013 | 21.243 | 525 | S21.012 | 21.243 | 525 | |
| S129 | 23.500 | 2.325 | Open Manhole | 1500 | S21.014 | 21.175 | 525 | S21.013 | 21.175 | 525 | |
| S130 | 23.600 | 2.687 | Open Manhole | 1500 | S16.017 | 20.913 | 600 | S16.016 | 20.913 | 600 | |
| | | | | | | | | S21.014 | 20.988 | 525 | |
| S131 | 23.200 | 2.347 | Open Manhole | 1500 | S16.018 | 20.853 | 600 | S16.017 | 20.853 | 600 | |
| S132 | 22.600 | 1.961 | Open Manhole | 1500 | S16.019 | 20.639 | 600 | S16.018 | 20.639 | 600 | |
| S133 | 22.100 | 1.961 | Open Manhole | 1500 | S16.020 | 20.139 | 600 | S16.019 | 20.139 | 600 | |
| SPP7 | 22.625 | 0.800 | Open Manhole | 1200 | S24.000 | 21.825 | 150 | | | | |
| SHBRAKE PP7 | 22.878 | 1.350 | Open Manhole | 1200 | S24.001 | 21.528 | 150 | S24.000 | 21.528 | 150 | |
| S136 | 22.756 | 1.350 | Open Manhole | 1200 | S24.002 | 21.406 | 150 | S24.001 | 21.406 | 150 | |
| S137 | 22.305 | 1.425 | Open Manhole | 1200 | S24.003 | 20.880 | 225 | S24.002 | 20.955 | 150 | |
| S138 | 21.804 | 1.425 | Open Manhole | 1200 | S24.004 | 20.379 | 225 | S24.003 | 20.379 | 225 | |
| SPP8 | 21.536 | 0.800 | Open Manhole | 1200 | S25.000 | 20.736 | 150 | | | | |
| SHBRAKE PP8 | 21.790 | 1.308 | Open Manhole | 1200 | S25.001 | 20.482 | 225 | S25.000 | 20.557 | 150 | |
| S141 | 21.518 | 1.197 | Open Manhole | 1200 | S25.002 | 20.321 | 225 | S25.001 | 20.321 | 225 | |
| S142 | 21.537 | 1.372 | Open Manhole | 1200 | S24.005 | 20.165 | 300 | S24.004 | 20.240 | 225 | |
| | | | | | | | | S25.002 | 20.240 | 225 | |
| S143 | 21.713 | 1.790 | Open Manhole | 1350 | S24.006 | 19.923 | 450 | S24.005 | 20.073 | 300 | |
| S144 | 21.900 | 2.334 | Open Manhole | 1500 | S16.021 | 19.566 | 675 | S16.020 | 19.641 | 600 | |
| | | | | | | | | S24.006 | 19.876 | 450 | |
| S145 | 22.040 | 2.536 | Open Manhole | 1500 | S16.022 | 19.504 | 675 | S16.021 | 19.504 | 675 | |
| S146 | 22.230 | 2.758 | Open Manhole | 1500 | S16.023 | 19.472 | 675 | S16.022 | 19.472 | 675 | |
| S147 | 22.300 | 2.864 | Open Manhole | 1500 | S16.024 | 19.436 | 675 | S16.023 | 19.436 | 675 | |
| S148 | 22.150 | 2.758 | Open Manhole | 1500 | S16.025 | 19.392 | 675 | S16.024 | 19.392 | 675 | |
| S149 | 21.900 | 2.544 | Open Manhole | 1500 | S16.026 | 19.356 | 675 | S16.025 | 19.356 | 675 | |

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## Manhole Schedules for Storm

| MH Name | MH CL (m) | MH Depth (m) | MH Connection | MH Diam.,L*W (mm) | Pipe Out PN | Pipe Out Invert Level (m) | Pipe Out Diameter (mm) | Pipes In PN | Pipes In Invert Level (m) | Pipes In Diamete (mm) |
|---|---|---|---|---|---|---|---|---|---|---|
| SBASIN L | 20.100 | 0.900 | Open Manhole | 1500 | S16.027 | 19.200 | 675 | S16.026 | 19.200 | 67 |
| SHBRAKE BASIN L | 20.000 | 1.051 | Open Manhole | 1500 | S16.028 | 18.949 | 450 | S16.027 | 18.949 | 67 |
| S | 17.500 | 0.501 | Open Manhole | 0 | | OUTFALL | | S16.028 | 16.999 | 45 |

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S83 | 448979.295 | 116209.306 | 448979.295 | 116209.306 | Required | |
| S84 | 449009.983 | 116166.014 | 449009.983 | 116166.014 | Required | |
| S85 | 448991.251 | 116176.718 | 448991.251 | 116176.718 | Required | |
| S86 | 448968.185 | 116190.062 | 448968.185 | 116190.062 | Required | |
| S87 | 448955.061 | 116166.967 | 448955.061 | 116166.967 | Required | |
| S88 | 448980.318 | 116119.221 | 448980.318 | 116119.221 | Required | |
| S89 | 448960.569 | 116130.397 | 448960.569 | 116130.397 | Required | |
| S90 | 448932.767 | 116083.487 | 448932.767 | 116083.487 | Required | |
| S91 | 448928.164 | 116100.175 | 448928.164 | 116100.175 | Required | |
| S92 | 448927.524 | 116110.481 | 448927.524 | 116110.481 | Required | |
| S93 | 448930.161 | 116123.538 | 448930.161 | 116123.538 | Required | |
| S94 | 448940.750 | 116141.561 | 448940.750 | 116141.561 | Required | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S95 | 448920.712 | 116153.250 | 448920.712 | 116153.250 | Required | |
| S96 | 448932.005 | 116199.217 | 448932.005 | 116199.217 | Required | |
| S97 | 448913.416 | 116167.833 | 448913.416 | 116167.833 | Required | |
| S98 | 448914.630 | 116153.876 | 448914.630 | 116153.876 | Required | |
| S99 | 448908.940 | 116150.866 | 448908.940 | 116150.866 | Required | |
| S100 | 448903.265 | 116141.534 | 448903.265 | 116141.534 | Required | |
| S101 | 448895.106 | 116138.765 | 448895.106 | 116138.765 | Required | |
| S102 | 448870.692 | 116138.765 | 448870.692 | 116138.765 | Required | |
| S103 | 448845.297 | 116138.610 | 448845.297 | 116138.610 | Required | |
| S104 | 448831.542 | 116138.594 | 448831.542 | 116138.594 | Required | |
| S105 | 448832.691 | 116157.017 | 448832.691 | 116157.017 | Required | |
| S106 | 448833.700 | 116185.538 | 448833.700 | 116185.538 | Required | |
| S107 | 448834.209 | 116215.189 | 448834.209 | 116215.189 | Required | |
| S108 | 448838.209 | 116239.416 | 448838.209 | 116239.416 | Required | |
| S109 | 448845.006 | 116262.330 | 448845.006 | 116262.330 | Required | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| SPP5 | 448895.542 | 116193.301 | 448895.542 | 116193.301 | Required | |
| SHBRAKE PP5 | 448893.095 | 116189.174 | 448893.095 | 116189.174 | Required | |
| S112 | 448889.814 | 116183.151 | 448889.814 | 116183.151 | Required | |
| S113 | 448872.850 | 116192.640 | 448872.850 | 116192.640 | Required | |
| S114 | 448877.692 | 116220.722 | 448877.692 | 116220.722 | Required | |
| S115 | 448882.613 | 116237.828 | 448882.613 | 116237.828 | Required | |
| S116 | 448891.179 | 116251.106 | 448891.179 | 116251.106 | Required | |
| S117 | 448902.143 | 116260.947 | 448902.143 | 116260.947 | Required | |
| S118 | 448915.514 | 116267.921 | 448915.514 | 116267.921 | Required | |
| SPP6 | 448936.044 | 116260.653 | 448936.044 | 116260.653 | Required | |
| SHBRAKE PP6 | 448939.116 | 116267.684 | 448939.116 | 116267.684 | Required | |
| S121 | 448941.390 | 116275.224 | 448941.390 | 116275.224 | Required | |
| S122 | 448953.713 | 116237.146 | 448953.713 | 116237.146 | Required | |
| S123 | 448969.021 | 116264.441 | 448969.021 | 116264.441 | Required | |
| S124 | 448965.940 | 116269.974 | 448965.940 | 116269.974 | Required | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| S125 | 448961.875 | 116281.454 | 448961.875 | 116281.454 | Required | |
| S126 | 448947.787 | 116317.266 | 448947.787 | 116317.266 | Required | |
| S127 | 448926.252 | 116309.033 | 448926.252 | 116309.033 | Required | |
| S128 | 448889.581 | 116299.030 | 448889.581 | 116299.030 | Required | |
| S129 | 448859.761 | 116290.455 | 448859.761 | 116290.455 | Required | |
| S130 | 448847.547 | 116288.461 | 448847.547 | 116288.461 | Required | |
| S131 | 448837.027 | 116319.559 | 448837.027 | 116319.559 | Required | |
| S132 | 448824.202 | 116353.103 | 448824.202 | 116353.103 | Required | |
| S133 | 448809.278 | 116381.775 | 448809.278 | 116381.775 | Required | |
| SPP7 | 448867.145 | 116340.867 | 448867.145 | 116340.867 | Required | |
| SHBRAKE PP7 | 448869.260 | 116346.652 | 448869.260 | 116346.652 | Required | |
| S136 | 448862.547 | 116350.981 | 448862.547 | 116350.981 | Required | |
| S137 | 448851.783 | 116377.512 | 448851.783 | 116377.512 | Required | |
| S138 | 448841.757 | 116405.882 | 448841.757 | 116405.882 | Required | |
| SPP8 | 448874.308 | 116418.947 | 448874.308 | 116418.947 | Required | |

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## Manhole Schedules for Storm

| MH Name | Manhole Easting (m) | Manhole Northing (m) | Intersection Easting (m) | Intersection Northing (m) | Manhole Access | Layout (North) |
|---|---|---|---|---|---|---|
| SHBRAKE PP8 | 448871.111 | 116412.787 | 448871.111 | 116412.787 | Required | |
| S141 | 448848.765 | 116421.977 | 448848.765 | 116421.977 | Required | |
| S142 | 448837.275 | 116418.068 | 448837.275 | 116418.068 | Required | |
| S143 | 448816.824 | 116410.547 | 448816.824 | 116410.547 | Required | |
| S144 | 448799.690 | 116404.345 | 448799.690 | 116404.345 | Required | |
| S145 | 448791.513 | 116437.908 | 448791.513 | 116437.908 | Required | |
| S146 | 448785.082 | 116454.907 | 448785.082 | 116454.907 | Required | |
| S147 | 448776.845 | 116472.765 | 448776.845 | 116472.765 | Required | |
| S148 | 448775.997 | 116497.240 | 448775.997 | 116497.240 | Required | |
| S149 | 448777.019 | 116517.366 | 448777.019 | 116517.366 | Required | |
| SBASIN L | 448721.521 | 116591.558 | 448721.521 | 116591.558 | Required | |
| SHBRAKE BASIN L | 448668.896 | 116664.718 | 448668.896 | 116664.718 | Required | |
| S | 448693.220 | 116696.311 | | | No Entry | |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S16.000 | o | 150 | S83 | 26.480 | 25.130 | 1.200 | Open Manhole | 1200 |
| S17.000 | o | 150 | S84 | 27.875 | 26.525 | 1.200 | Open Manhole | 1200 |
| S17.001 | o | 225 | S85 | 27.066 | 25.641 | 1.200 | Open Manhole | 1200 |
| S16.001 | o | 300 | S86 | 26.147 | 24.647 | 1.200 | Open Manhole | 1200 |
| S16.002 | o | 300 | S87 | 25.752 | 24.252 | 1.200 | Open Manhole | 1200 |
| S18.000 | o | 150 | S88 | 26.983 | 25.633 | 1.200 | Open Manhole | 1200 |
| S18.001 | o | 225 | S89 | 26.188 | 24.763 | 1.200 | Open Manhole | 1200 |
| S19.000 | o | 150 | S90 | 26.540 | 25.190 | 1.200 | Open Manhole | 1200 |
| S19.001 | o | 225 | S91 | 26.195 | 24.770 | 1.200 | Open Manhole | 1200 |
| S19.002 | o | 300 | S92 | 26.000 | 24.500 | 1.200 | Open Manhole | 1200 |
| S19.003 | o | 300 | S93 | 25.747 | 24.247 | 1.200 | Open Manhole | 1200 |
| S16.003 | o | 450 | S94 | 25.368 | 23.718 | 1.200 | Open Manhole | 1350 |
| S16.004 | o | 525 | S95 | 24.527 | 22.802 | 1.200 | Open Manhole | 1500 |
| S20.000 | o | 150 | S96 | 24.934 | 23.584 | 1.200 | Open Manhole | 1200 |
| S20.001 | o | 150 | S97 | 24.424 | 23.074 | 1.200 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S16.000 | 22.220 | 66.7 | S86 | 26.147 | 24.797 | 1.200 | Open Manhole | 1200 |
| S17.000 | 21.574 | 26.7 | S85 | 27.066 | 25.716 | 1.200 | Open Manhole | 1200 |
| S17.001 | 26.648 | 29.0 | S86 | 26.147 | 24.722 | 1.200 | Open Manhole | 1200 |
| S16.001 | 26.563 | 67.2 | S87 | 25.752 | 24.252 | 1.200 | Open Manhole | 1200 |
| S16.002 | 29.160 | 75.9 | S94 | 25.368 | 23.868 | 1.200 | Open Manhole | 1350 |
| S18.000 | 22.692 | 28.5 | S89 | 26.188 | 24.838 | 1.200 | Open Manhole | 1200 |
| S18.001 | 22.747 | 27.7 | S94 | 25.368 | 23.943 | 1.200 | Open Manhole | 1350 |
| S19.000 | 17.312 | 50.2 | S91 | 26.195 | 24.845 | 1.200 | Open Manhole | 1200 |
| S19.001 | 10.325 | 52.9 | S92 | 26.000 | 24.575 | 1.200 | Open Manhole | 1200 |
| S19.002 | 13.321 | 52.7 | S93 | 25.747 | 24.247 | 1.200 | Open Manhole | 1200 |
| S19.003 | 20.903 | 55.2 | S94 | 25.368 | 23.868 | 1.200 | Open Manhole | 1350 |
| S16.003 | 23.198 | 27.6 | S95 | 24.527 | 22.877 | 1.200 | Open Manhole | 1500 |
| S16.004 | 6.114 | 31.2 | S98 | 24.346 | 22.606 | 1.215 | Open Manhole | 1500 |
| S20.000 | 36.476 | 71.5 | S97 | 24.424 | 23.074 | 1.200 | Open Manhole | 1200 |
| S20.001 | 14.010 | 150.6 | S98 | 24.346 | 22.981 | 1.215 | Open Manhole | 1500 |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S16.005 | o | 525 | S98 | 24.346 | 22.606 | 1.215 | Open Manhole | 1500 |
| S16.006 | o | 525 | S99 | 24.213 | 22.488 | 1.200 | Open Manhole | 1500 |
| S16.007 | o | 525 | S100 | 24.085 | 22.360 | 1.200 | Open Manhole | 1500 |
| S16.008 | o | 525 | S101 | 24.003 | 22.278 | 1.200 | Open Manhole | 1500 |
| S16.009 | o | 525 | S102 | 23.752 | 22.027 | 1.200 | Open Manhole | 1500 |
| S16.010 | o | 600 | S103 | 23.502 | 21.702 | 1.200 | Open Manhole | 1500 |
| S16.011 | o | 600 | S104 | 23.400 | 21.599 | 1.201 | Open Manhole | 1500 |
| S16.012 | o | 600 | S105 | 23.300 | 21.499 | 1.201 | Open Manhole | 1500 |
| S16.013 | o | 600 | S106 | 23.540 | 21.142 | 1.798 | Open Manhole | 1500 |
| S16.014 | o | 600 | S107 | 23.900 | 21.089 | 2.211 | Open Manhole | 1500 |
| S16.015 | o | 600 | S108 | 24.100 | 21.044 | 2.456 | Open Manhole | 1500 |
| S16.016 | o | 600 | S109 | 23.960 | 21.002 | 2.358 | Open Manhole | 1500 |
| S21.000 | o | 150 | SPP5 | 24.554 | 23.754 | 0.650 | Open Manhole | 1200 |
| S21.001 | o | 150 | SHBRAKE PP5 | 24.500 | 23.150 | 1.200 | Open Manhole | 1200 |
| S21.002 | o | 225 | S112 | 24.375 | 22.950 | 1.200 | Open Manhole | 1200 |
| S21.003 | o | 225 | S113 | 24.107 | 22.682 | 1.200 | Open Manhole | 1200 |
| S21.004 | o | 225 | S114 | 23.807 | 22.382 | 1.200 | Open Manhole | 1200 |
| S21.005 | o | 300 | S115 | 23.607 | 22.107 | 1.200 | Open Manhole | 1200 |
| S21.006 | o | 300 | S116 | 23.593 | 22.041 | 1.253 | Open Manhole | 1200 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S16.005 | 6.437 | 54.6 | S99 | 24.213 | 22.488 | 1.200 | Open Manhole | 1500 |
| S16.006 | 10.922 | 85.3 | S100 | 24.085 | 22.360 | 1.200 | Open Manhole | 1500 |
| S16.007 | 8.616 | 105.1 | S101 | 24.003 | 22.278 | 1.200 | Open Manhole | 1500 |
| S16.008 | 24.413 | 97.3 | S102 | 23.752 | 22.027 | 1.200 | Open Manhole | 1500 |
| S16.009 | 25.396 | 101.6 | S103 | 23.502 | 21.777 | 1.200 | Open Manhole | 1500 |
| S16.010 | 13.755 | 133.5 | S104 | 23.400 | 21.599 | 1.201 | Open Manhole | 1500 |
| S16.011 | 18.458 | 184.6 | S105 | 23.300 | 21.499 | 1.201 | Open Manhole | 1500 |
| S16.012 | 28.539 | 79.9 | S106 | 23.540 | 21.142 | 1.798 | Open Manhole | 1500 |
| S16.013 | 29.655 | 556.0 | S107 | 23.900 | 21.089 | 2.211 | Open Manhole | 1500 |
| S16.014 | 24.556 | 556.0 | S108 | 24.100 | 21.044 | 2.456 | Open Manhole | 1500 |
| S16.015 | 23.901 | 556.0 | S109 | 23.960 | 21.002 | 2.358 | Open Manhole | 1500 |
| S16.016 | 26.254 | 295.0 | S130 | 23.600 | 20.913 | 2.087 | Open Manhole | 1500 |
| S21.000 | 4.798 | 7.9 | SHBRAKE PP5 | 24.500 | 23.150 | 1.200 | Open Manhole | 1200 |
| S21.001 | 6.858 | 54.9 | S112 | 24.375 | 23.025 | 1.200 | Open Manhole | 1200 |
| S21.002 | 19.437 | 72.5 | S113 | 24.107 | 22.682 | 1.200 | Open Manhole | 1200 |
| S21.003 | 28.496 | 95.0 | S114 | 23.807 | 22.382 | 1.200 | Open Manhole | 1200 |
| S21.004 | 17.799 | 89.0 | S115 | 23.607 | 22.182 | 1.200 | Open Manhole | 1200 |
| S21.005 | 15.802 | 238.0 | S116 | 23.593 | 22.041 | 1.253 | Open Manhole | 1200 |
| S21.006 | 14.733 | 238.0 | S117 | 23.716 | 21.979 | 1.437 | Open Manhole | 1200 |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S21.007 | o | 300 | S117 | 23.716 | 21.979 | 1.437 | Open Manhole | 1200 |
| S21.008 | o | 300 | S118 | 23.862 | 21.915 | 1.647 | Open Manhole | 1200 |
| S22.000 | o | 150 | SPP6 | 24.399 | 23.599 | 0.650 | Open Manhole | 1200 |
| S22.001 | o | 150 | SHBRAKE PP6 | 24.273 | 22.923 | 1.200 | Open Manhole | 1200 |
| S21.009 | o | 300 | S121 | 24.134 | 21.802 | 2.032 | Open Manhole | 1200 |
| S23.000 | o | 150 | S122 | 25.011 | 23.661 | 1.200 | Open Manhole | 1200 |
| S23.001 | o | 150 | S123 | 25.196 | 23.452 | 1.594 | Open Manhole | 1200 |
| S23.002 | o | 150 | S124 | 25.035 | 23.410 | 1.475 | Open Manhole | 1200 |
| S21.010 | o | 450 | S125 | 24.700 | 21.562 | 2.688 | Open Manhole | 1350 |
| S21.011 | o | 450 | S126 | 23.700 | 21.462 | 1.788 | Open Manhole | 1350 |
| S21.012 | o | 525 | S127 | 23.470 | 21.327 | 1.618 | Open Manhole | 1500 |
| S21.013 | o | 525 | S128 | 23.250 | 21.243 | 1.482 | Open Manhole | 1500 |
| S21.014 | o | 525 | S129 | 23.500 | 21.175 | 1.800 | Open Manhole | 1500 |
| S16.017 | o | 600 | S130 | 23.600 | 20.913 | 2.087 | Open Manhole | 1500 |
| S16.018 | o | 600 | S131 | 23.200 | 20.853 | 1.747 | Open Manhole | 1500 |
| S16.019 | o | 600 | S132 | 22.600 | 20.639 | 1.361 | Open Manhole | 1500 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S21.007 | 15.080 | 238.0 | S118 | 23.862 | 21.915 | 1.647 | Open Manhole | 1200 |
| S21.008 | 26.887 | 237.9 | S121 | 24.134 | 21.802 | 2.031 | Open Manhole | 1200 |
| S22.000 | 7.673 | 11.4 | SHBRAKE PP6 | 24.273 | 22.923 | 1.200 | Open Manhole | 1200 |
| S22.001 | 7.875 | 8.1 | S121 | 24.134 | 21.952 | 2.032 | Open Manhole | 1200 |
| S21.009 | 21.412 | 237.9 | S125 | 24.700 | 21.712 | 2.688 | Open Manhole | 1350 |
| S23.000 | 31.295 | 150.0 | S123 | 25.196 | 23.452 | 1.594 | Open Manhole | 1200 |
| S23.001 | 6.332 | 150.0 | S124 | 25.035 | 23.410 | 1.475 | Open Manhole | 1200 |
| S23.002 | 12.179 | 7.9 | S125 | 24.700 | 21.862 | 2.688 | Open Manhole | 1350 |
| S21.010 | 38.483 | 384.8 | S126 | 23.700 | 21.462 | 1.788 | Open Manhole | 1350 |
| S21.011 | 23.055 | 384.2 | S127 | 23.470 | 21.402 | 1.618 | Open Manhole | 1500 |
| S21.012 | 38.011 | 452.5 | S128 | 23.250 | 21.243 | 1.482 | Open Manhole | 1500 |
| S21.013 | 31.029 | 456.3 | S129 | 23.500 | 21.175 | 1.800 | Open Manhole | 1500 |
| S21.014 | 12.375 | 66.2 | S130 | 23.600 | 20.988 | 2.087 | Open Manhole | 1500 |
| S16.017 | 32.829 | 556.0 | S131 | 23.200 | 20.853 | 1.747 | Open Manhole | 1500 |
| S16.018 | 35.912 | 167.8 | S132 | 22.600 | 20.639 | 1.361 | Open Manhole | 1500 |
| S16.019 | 32.324 | 64.6 | S133 | 22.100 | 20.139 | 1.361 | Open Manhole | 1500 |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S16.020 | o | 600 | S133 | 22.100 | 20.139 | 1.361 | Open Manhole | 1500 |
| S24.000 | o | 150 | SPP7 | 22.625 | 21.825 | 0.650 | Open Manhole | 1200 |
| S24.001 | o | 150 | SHBRAKE PP7 | 22.878 | 21.528 | 1.200 | Open Manhole | 1200 |
| S24.002 | o | 150 | S136 | 22.756 | 21.406 | 1.200 | Open Manhole | 1200 |
| S24.003 | o | 225 | S137 | 22.305 | 20.880 | 1.200 | Open Manhole | 1200 |
| S24.004 | o | 225 | S138 | 21.804 | 20.379 | 1.200 | Open Manhole | 1200 |
| S25.000 | o | 150 | SPP8 | 21.536 | 20.736 | 0.650 | Open Manhole | 1200 |
| S25.001 | o | 225 | SHBRAKE PP8 | 21.790 | 20.482 | 1.083 | Open Manhole | 1200 |
| S25.002 | o | 225 | S141 | 21.518 | 20.321 | 0.972 | Open Manhole | 1200 |
| S24.005 | o | 300 | S142 | 21.537 | 20.165 | 1.072 | Open Manhole | 1200 |
| S24.006 | o | 450 | S143 | 21.713 | 19.923 | 1.340 | Open Manhole | 1350 |
| S16.021 | o | 675 | S144 | 21.900 | 19.566 | 1.659 | Open Manhole | 1500 |
| S16.022 | o | 675 | S145 | 22.040 | 19.504 | 1.861 | Open Manhole | 1500 |
| S16.023 | o | 675 | S146 | 22.230 | 19.472 | 2.083 | Open Manhole | 1500 |
| S16.024 | o | 675 | S147 | 22.300 | 19.436 | 2.189 | Open Manhole | 1500 |
| S16.025 | o | 675 | S148 | 22.150 | 19.392 | 2.083 | Open Manhole | 1500 |
| S16.026 | o | 675 | S149 | 21.900 | 19.356 | 1.869 | Open Manhole | 1500 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S16.020 | 24.523 | 49.2 | S144 | 21.900 | 19.641 | 1.659 | Open Manhole | 1500 |
| S24.000 | 6.160 | 20.7 | SHBRAKE PP7 | 22.878 | 21.528 | 1.200 | Open Manhole | 1200 |
| S24.001 | 7.988 | 65.5 | S136 | 22.756 | 21.406 | 1.200 | Open Manhole | 1200 |
| S24.002 | 28.632 | 63.5 | S137 | 22.305 | 20.955 | 1.200 | Open Manhole | 1200 |
| S24.003 | 30.090 | 60.1 | S138 | 21.804 | 20.379 | 1.200 | Open Manhole | 1200 |
| S24.004 | 12.984 | 93.4 | S142 | 21.537 | 20.240 | 1.072 | Open Manhole | 1200 |
| S25.000 | 6.940 | 38.8 | SHBRAKE PP8 | 21.790 | 20.557 | 1.083 | Open Manhole | 1200 |
| S25.001 | 24.162 | 150.1 | S141 | 21.518 | 20.321 | 0.972 | Open Manhole | 1200 |
| S25.002 | 12.137 | 149.8 | S142 | 21.537 | 20.240 | 1.072 | Open Manhole | 1200 |
| S24.005 | 21.790 | 238.0 | S143 | 21.713 | 20.073 | 1.340 | Open Manhole | 1350 |
| S24.006 | 18.221 | 385.0 | S144 | 21.900 | 19.876 | 1.574 | Open Manhole | 1500 |
| S16.021 | 34.545 | 556.0 | S145 | 22.040 | 19.504 | 1.861 | Open Manhole | 1500 |
| S16.022 | 18.175 | 556.0 | S146 | 22.230 | 19.472 | 2.083 | Open Manhole | 1500 |
| S16.023 | 19.666 | 556.0 | S147 | 22.300 | 19.436 | 2.189 | Open Manhole | 1500 |
| S16.024 | 24.490 | 556.0 | S148 | 22.150 | 19.392 | 2.083 | Open Manhole | 1500 |
| S16.025 | 20.152 | 556.0 | S149 | 21.900 | 19.356 | 1.869 | Open Manhole | 1500 |
| S16.026 | 92.652 | 593.9 | SBASIN L | 20.100 | 19.200 | 0.225 | Open Manhole | 1500 |

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## PIPELINE SCHEDULES for Storm

### Upstream Manhole

| PN | Hyd Sect | Diam (mm) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S16.027 | o | 675 | SBASIN L | 20.100 | 19.200 | 0.225 | Open Manhole | 1500 |
| S16.028 | o | 450 | SHBRAKE BASIN L | 20.000 | 18.949 | 0.601 | Open Manhole | 1500 |

### Downstream Manhole

| PN | Length (m) | Slope (1:X) | MH Name | C.Level (m) | I.Level (m) | D.Depth (m) | MH Connection | MH DIAM., L*W (mm) |
|---|---|---|---|---|---|---|---|---|
| S16.027 | 90.121 | 359.0 | SHBRAKE BASIN L | 20.000 | 18.949 | 0.376 | Open Manhole | 1500 |
| S16.028 | 39.872 | 20.4 | S | 17.500 | 16.999 | 0.051 | Open Manhole | 0 |

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## Area Summary for Storm

| Pipe Number | PIMP Type | PIMP Name | PIMP (%) | Gross Area (ha) | Imp. Area (ha) | Pipe Total (ha) |
|---|---|---|---|---|---|---|
| 16.000 | - | - | 100 | 0.024 | 0.024 | 0.024 |
| 17.000 | - | - | 100 | 0.041 | 0.041 | 0.041 |
| 17.001 | - | - | 100 | 0.053 | 0.053 | 0.053 |
| 16.001 | - | - | 100 | 0.049 | 0.049 | 0.049 |
| 16.002 | - | - | 100 | 0.047 | 0.047 | 0.047 |
| 18.000 | - | - | 100 | 0.045 | 0.045 | 0.045 |
| 18.001 | - | - | 100 | 0.077 | 0.077 | 0.077 |
| 19.000 | - | - | 100 | 0.011 | 0.011 | 0.011 |
| 19.001 | - | - | 100 | 0.028 | 0.028 | 0.028 |
| 19.002 | - | - | 100 | 0.113 | 0.113 | 0.113 |
| 19.003 | - | - | 100 | 0.008 | 0.008 | 0.008 |
| 16.003 | - | - | 100 | 0.104 | 0.104 | 0.104 |
| 16.004 | - | - | 100 | 0.012 | 0.012 | 0.012 |
| 20.000 | - | - | 100 | 0.014 | 0.014 | 0.014 |
| 20.001 | - | - | 100 | 0.034 | 0.034 | 0.034 |
| 16.005 | - | - | 100 | 0.011 | 0.011 | 0.011 |
| 16.006 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 16.007 | - | - | 100 | 0.030 | 0.030 | 0.030 |
| 16.008 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 16.009 | - | - | 100 | 0.127 | 0.127 | 0.127 |
| 16.010 | - | - | 100 | 0.055 | 0.055 | 0.055 |
| 16.011 | - | - | 100 | 0.078 | 0.078 | 0.078 |
| 16.012 | - | - | 100 | 0.091 | 0.091 | 0.091 |
| 16.013 | - | - | 100 | 0.045 | 0.045 | 0.045 |
| 16.014 | - | - | 100 | 0.045 | 0.045 | 0.045 |
| 16.015 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 16.016 | - | - | 100 | 0.051 | 0.051 | 0.051 |
| 21.000 | - | - | 100 | 0.016 | 0.016 | 0.016 |
| 21.001 | - | - | 100 | 0.058 | 0.058 | 0.058 |
| 21.002 | - | - | 100 | 0.024 | 0.024 | 0.024 |
| 21.003 | - | - | 100 | 0.082 | 0.082 | 0.082 |
| 21.004 | - | - | 100 | 0.032 | 0.032 | 0.032 |
| 21.005 | - | - | 100 | 0.038 | 0.038 | 0.038 |
| 21.006 | - | - | 100 | 0.041 | 0.041 | 0.041 |
| 21.007 | - | - | 100 | 0.034 | 0.034 | 0.034 |
| 21.008 | - | - | 100 | 0.024 | 0.024 | 0.024 |
| 22.000 | - | - | 100 | 0.019 | 0.019 | 0.019 |
| 22.001 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 21.009 | - | - | 100 | 0.061 | 0.061 | 0.061 |
| 23.000 | - | - | 100 | 0.022 | 0.022 | 0.022 |
| 23.001 | - | - | 100 | 0.044 | 0.044 | 0.044 |
| 23.002 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 21.010 | - | - | 100 | 0.017 | 0.017 | 0.017 |
| 21.011 | - | - | 100 | 0.054 | 0.054 | 0.054 |
| 21.012 | - | - | 100 | 0.061 | 0.061 | 0.061 |
| 21.013 | - | - | 100 | 0.115 | 0.115 | 0.115 |
| 21.014 | - | - | 100 | 0.030 | 0.030 | 0.030 |
| 16.017 | - | - | 100 | 0.068 | 0.068 | 0.068 |
| 16.018 | - | - | 100 | 0.083 | 0.083 | 0.083 |
| 16.019 | - | - | 100 | 0.051 | 0.051 | 0.051 |
| 16.020 | - | - | 100 | 0.056 | 0.056 | 0.056 |

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## Area Summary for Storm

| Pipe Number | PIMP Type | PIMP Name | PIMP (%) | Gross Area (ha) | Imp. Area (ha) | Pipe Total (ha) |
|---|---|---|---|---|---|---|
| 24.000 | - | - | 100 | 0.035 | 0.035 | 0.035 |
| 24.001 | - | - | 100 | 0.043 | 0.043 | 0.043 |
| 24.002 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 24.003 | - | - | 100 | 0.044 | 0.044 | 0.044 |
| 24.004 | - | - | 100 | 0.042 | 0.042 | 0.042 |
| 25.000 | - | - | 100 | 0.020 | 0.020 | 0.020 |
| 25.001 | - | - | 100 | 0.021 | 0.021 | 0.021 |
| 25.002 | - | - | 100 | 0.042 | 0.042 | 0.042 |
| 24.005 | - | - | 100 | 0.019 | 0.019 | 0.019 |
| 24.006 | - | - | 100 | 0.006 | 0.006 | 0.006 |
| 16.021 | - | - | 100 | 0.089 | 0.089 | 0.089 |
| 16.022 | - | - | 100 | 0.032 | 0.032 | 0.032 |
| 16.023 | - | - | 100 | 0.016 | 0.016 | 0.016 |
| 16.024 | - | - | 100 | 0.005 | 0.005 | 0.005 |
| 16.025 | - | - | 100 | 0.043 | 0.043 | 0.043 |
| 16.026 | - | - | 100 | 0.014 | 0.014 | 0.014 |
| 16.027 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| 16.028 | - | - | 100 | 0.000 | 0.000 | 0.000 |
| | | | | Total | Total | Total |
| | | | | 2.694 | 2.694 | 2.694 |

## 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) |
|---|---|---|---|---|---|---|
| S16.028 | S | 17.500 | 16.999 | 17.000 | 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) |
|---|---|---|---|---|---|---|---|---|---|
| 1440 | 17.500 | 5760 | 17.500 | 10080 | 17.500 | 14400 | 17.500 | 18720 | 17.500 |
| 2880 | 17.500 | 7200 | 17.500 | 11520 | 17.500 | 15840 | 17.500 | 20160 | 17.500 |
| 4320 | 17.500 | 8640 | 17.500 | 12960 | 17.500 | 17280 | 17.500 | | |

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## 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 | 5 |
| Number of Online Controls | 5 | Number of Time/Area Diagrams | 0 |
| Number of Offline Controls | 0 | Number of Real Time Controls | 0 |

## Synthetic Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Profile Type | Summer |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 19.900 | Storm Duration (mins) | 30 |
| Ratio R | 0.350 | | |

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## Online Controls for Storm

### Hydro-Brake® Optimum Manhole: SHBRAKE PP5, DS/PN: S21.001, Volume (m³): 1.6

| | |
|---|---|
| Unit Reference | MD-SHE-0087-3500-1104-3500 |
| Design Head (m) | 1.104 |
| Design Flow (l/s) | 3.5 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 87 |
| Invert Level (m) | 23.150 |
| Minimum Outlet Pipe Diameter (mm) | 100 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.104 | 3.5 |
| Flush-Flo™ | 0.334 | 3.5 |
| Kick-Flo® | 0.689 | 2.8 |
| Mean Flow over Head Range | - | 3.1 |

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 | 2.7 | 1.200 | 3.6 | 3.000 | 5.6 | 7.000 | 8.3 |
| 0.200 | 3.3 | 1.400 | 3.9 | 3.500 | 6.0 | 7.500 | 8.6 |
| 0.300 | 3.5 | 1.600 | 4.2 | 4.000 | 6.4 | 8.000 | 8.9 |
| 0.400 | 3.5 | 1.800 | 4.4 | 4.500 | 6.7 | 8.500 | 9.1 |
| 0.500 | 3.4 | 2.000 | 4.6 | 5.000 | 7.1 | 9.000 | 9.4 |
| 0.600 | 3.2 | 2.200 | 4.8 | 5.500 | 7.4 | 9.500 | 9.6 |
| 0.800 | 3.0 | 2.400 | 5.0 | 6.000 | 7.7 | | |
| 1.000 | 3.3 | 2.600 | 5.2 | 6.500 | 8.0 | | |

### Hydro-Brake® Optimum Manhole: SHBRAKE PP6, DS/PN: S22.001, Volume (m³): 1.6

| | |
|---|---|
| Unit Reference | MD-SHE-0055-1500-1176-1500 |
| Design Head (m) | 1.176 |
| Design Flow (l/s) | 1.5 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 55 |
| Invert Level (m) | 22.923 |
| Minimum Outlet Pipe Diameter (mm) | 75 |
| Suggested Manhole Diameter (mm) | 1200 |

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## Hydro-Brake® Optimum Manhole: SHBRAKE PP6, DS/PN: S22.001, Volume (m³): 1.6

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.176 | 1.5 |
| Flush-Flo™ | 0.245 | 1.2 |
| Kick-Flo® | 0.496 | 1.0 |
| Mean Flow over Head Range | - | 1.2 |

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

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 1.1 | 1.200 | 1.5 | 3.000 | 2.3 | 7.000 | 3.4 |
| 0.200 | 1.2 | 1.400 | 1.6 | 3.500 | 2.5 | 7.500 | 3.5 |
| 0.300 | 1.2 | 1.600 | 1.7 | 4.000 | 2.6 | 8.000 | 3.6 |
| 0.400 | 1.2 | 1.800 | 1.8 | 4.500 | 2.8 | 8.500 | 3.7 |
| 0.500 | 1.0 | 2.000 | 1.9 | 5.000 | 2.9 | 9.000 | 3.8 |
| 0.600 | 1.1 | 2.200 | 2.0 | 5.500 | 3.0 | 9.500 | 3.9 |
| 0.800 | 1.3 | 2.400 | 2.1 | 6.000 | 3.2 | | |
| 1.000 | 1.4 | 2.600 | 2.1 | 6.500 | 3.3 | | |

## Hydro-Brake® Optimum Manhole: SHBRAKE PP7, DS/PN: S24.001, Volume (m³): 1.6

| | |
|---|---|
| Unit Reference | MD-SHE-0061-1500-0797-1500 |
| Design Head (m) | 0.797 |
| Design Flow (l/s) | 1.5 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 61 |
| Invert Level (m) | 21.528 |
| Minimum Outlet Pipe Diameter (mm) | 75 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 0.797 | 1.5 |
| Flush-Flo™ | 0.247 | 1.5 |
| Kick-Flo® | 0.506 | 1.2 |
| Mean Flow over Head Range | - | 1.3 |

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 | 1.3 | 0.300 | 1.5 | 0.500 | 1.2 | 0.800 | 1.5 |
| 0.200 | 1.5 | 0.400 | 1.4 | 0.600 | 1.3 | 1.000 | 1.7 |

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Hydro-Brake® Optimum Manhole: SHBRAKE PP7, DS/PN: S24.001, Volume (m³): 1.6

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 1.200 | 1.8 | 2.400 | 2.5 | 5.000 | 3.5 | 8.000 | 4.3 |
| 1.400 | 1.9 | 2.600 | 2.6 | 5.500 | 3.6 | 8.500 | 4.5 |
| 1.600 | 2.1 | 3.000 | 2.7 | 6.000 | 3.8 | 9.000 | 4.6 |
| 1.800 | 2.2 | 3.500 | 2.9 | 6.500 | 3.9 | 9.500 | 4.7 |
| 2.000 | 2.3 | 4.000 | 3.1 | 7.000 | 4.1 | | |
| 2.200 | 2.4 | 4.500 | 3.3 | 7.500 | 4.2 | | |

Hydro-Brake® Optimum Manhole: SHBRAKE PP8, DS/PN: S25.001, Volume (m³): 1.6

| | |
|---|---|
| Unit Reference | MD-SHE-0051-1000-0679-1000 |
| Design Head (m) | 0.679 |
| Design Flow (l/s) | 1.0 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 51 |
| Invert Level (m) | 20.557 |
| Minimum Outlet Pipe Diameter (mm) | 75 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 0.679 | 1.0 |
| Flush-Flo™ | 0.213 | 1.0 |
| Kick-Flo® | 0.435 | 0.8 |
| Mean Flow over Head Range | - | 0.9 |

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 | 0.9 | 1.200 | 1.3 | 3.000 | 2.0 | 7.000 | 2.9 |
| 0.200 | 1.0 | 1.400 | 1.4 | 3.500 | 2.1 | 7.500 | 3.0 |
| 0.300 | 1.0 | 1.600 | 1.5 | 4.000 | 2.2 | 8.000 | 3.1 |
| 0.400 | 0.9 | 1.800 | 1.5 | 4.500 | 2.4 | 8.500 | 3.2 |
| 0.500 | 0.9 | 2.000 | 1.6 | 5.000 | 2.5 | 9.000 | 3.3 |
| 0.600 | 0.9 | 2.200 | 1.7 | 5.500 | 2.6 | 9.500 | 3.4 |
| 0.800 | 1.1 | 2.400 | 1.8 | 6.000 | 2.7 | | |
| 1.000 | 1.2 | 2.600 | 1.8 | 6.500 | 2.8 | | |

Hydro-Brake® Optimum Manhole: SHBRAKE BASIN L, DS/PN: S16.028, Volume (m³): 33.6

| | |
|---|---|
| Unit Reference | MD-SHE-0265-3960-1150-3960 |
| Design Head (m) | 1.150 |
| Design Flow (l/s) | 39.6 |

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## Hydro-Brake® Optimum Manhole: SHBRAKE BASIN L, DS/PN: S16.028, Volume (m³): 33.6

| | |
|---|---|
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 265 |
| Invert Level (m) | 18.949 |
| Minimum Outlet Pipe Diameter (mm) | 300 |
| Suggested Manhole Diameter (mm) | 1800 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 1.150 | 39.6 |
| Flush-Flo™ | 0.428 | 39.6 |
| Kick-Flo® | 0.852 | 34.3 |
| Mean Flow over Head Range | - | 32.8 |

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 | 8.4 | 1.200 | 40.4 | 3.000 | 62.9 | 7.000 | 95.0 |
| 0.200 | 27.2 | 1.400 | 43.5 | 3.500 | 67.8 | 7.500 | 98.2 |
| 0.300 | 38.7 | 1.600 | 46.4 | 4.000 | 72.3 | 8.000 | 101.4 |
| 0.400 | 39.6 | 1.800 | 49.1 | 4.500 | 76.6 | 8.500 | 104.4 |
| 0.500 | 39.4 | 2.000 | 51.7 | 5.000 | 80.6 | 9.000 | 107.4 |
| 0.600 | 38.8 | 2.200 | 54.1 | 5.500 | 84.4 | 9.500 | 110.2 |
| 0.800 | 36.0 | 2.400 | 56.5 | 6.000 | 88.1 | | |
| 1.000 | 37.0 | 2.600 | 58.7 | 6.500 | 91.6 | | |

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## Storage Structures for Storm

### Porous Car Park Manhole: SPP5, DS/PN: S21.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 10.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 16.2 |
| Max Percolation (l/s) | 45.0 | Slope (1:X) | 100.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 23.754 | Membrane Depth (mm) | 0 |

### Porous Car Park Manhole: SPP6, DS/PN: S22.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 10.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 18.7 |
| Max Percolation (l/s) | 51.9 | Slope (1:X) | 60.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 23.599 | Membrane Depth (mm) | 0 |

### Porous Car Park Manhole: SPP7, DS/PN: S24.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 11.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 31.9 |
| Max Percolation (l/s) | 97.5 | Slope (1:X) | 100.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 21.825 | Membrane Depth (mm) | 0 |

### Porous Car Park Manhole: SPP8, DS/PN: S25.000

| | | | |
|---|---|---|---|
| Infiltration Coefficient Base (m/hr) | 0.00000 | Width (m) | 11.0 |
| Membrane Percolation (mm/hr) | 1000 | Length (m) | 17.7 |
| Max Percolation (l/s) | 54.1 | Slope (1:X) | 100.0 |
| Safety Factor | 2.0 | Depression Storage (mm) | 5 |
| Porosity | 0.30 | Evaporation (mm/day) | 3 |
| Invert Level (m) | 20.736 | Membrane Depth (mm) | 0 |

### Tank or Pond Manhole: SBASIN L, DS/PN: S16.027

Invert Level (m) 19.200

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 1788.0 | 0.900 | 3216.0 |

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## 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 5
Number of Online Controls 5 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

### Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.900 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
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. | Water Level (m) |
|---|---|---|---|---|---|---|---|---|---|
| S16.000 | S83 | 15 Winter | 100 | +40% | | | | | 25.226 |
| S17.000 | S84 | 15 Winter | 100 | +40% | | | | | 26.626 |
| S17.001 | S85 | 15 Summer | 100 | +40% | | | | | 25.775 |
| S16.001 | S86 | 15 Winter | 100 | +40% | | | | | 24.921 |
| S16.002 | S87 | 15 Winter | 100 | +40% | 100/15 Summer | | | | 24.681 |
| S18.000 | S88 | 15 Winter | 100 | +40% | | | | | 25.744 |
| S18.001 | S89 | 15 Summer | 100 | +40% | | | | | 24.923 |
| S19.000 | S90 | 15 Winter | 100 | +40% | | | | | 25.246 |
| S19.001 | S91 | 15 Summer | 100 | +40% | | | | | 24.870 |
| S19.002 | S92 | 15 Summer | 100 | +40% | | | | | 24.697 |
| S19.003 | S93 | 15 Winter | 100 | +40% | | | | | 24.462 |
| S16.003 | S94 | 15 Winter | 100 | +40% | 100/15 Summer | | | | 24.361 |
| S16.004 | S95 | 15 Winter | 100 | +40% | 100/15 Summer | | | | 24.158 |
| S20.000 | S96 | 15 Winter | 100 | +40% | 100/15 Summer | | | | 24.166 |
| S20.001 | S97 | 15 Winter | 100 | +40% | 100/15 Summer | | | | 24.144 |
| S16.005 | S98 | 15 Winter | 100 | +40% | 100/15 Summer | | | | 24.044 |
| S16.006 | S99 | 15 Winter | 100 | +40% | 100/15 Summer | | | | 23.917 |
| S16.007 | S100 | 15 Winter | 100 | +40% | 100/15 Summer | | | | 23.807 |

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## 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) | Half Drain Time (mins) | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|---|---|---|---|---|
| S16.000 | S83 | -0.054 | 0.000 | 0.73 | | | 15.1 | OK | |
| S17.000 | S84 | -0.049 | 0.000 | 0.79 | | | 25.9 | OK | |
| S17.001 | S85 | -0.091 | 0.000 | 0.66 | | | 59.3 | OK | |
| S16.001 | S86 | -0.026 | 0.000 | 0.84 | | | 102.4 | OK | |
| S16.002 | S87 | 0.129 | 0.000 | 1.08 | | | 125.0 | SURCHARGED | |
| S18.000 | S88 | -0.039 | 0.000 | 0.90 | | | 28.4 | OK | |
| S18.001 | S89 | -0.065 | 0.000 | 0.85 | | | 77.0 | OK | |
| S19.000 | S90 | -0.094 | 0.000 | 0.30 | | | 6.9 | OK | |
| S19.001 | S91 | -0.125 | 0.000 | 0.41 | | | 24.6 | OK | |
| S19.002 | S92 | -0.103 | 0.000 | 0.76 | | | 96.0 | OK | |
| S19.003 | S93 | -0.085 | 0.000 | 0.77 | | | 101.1 | OK | |
| S16.003 | S94 | 0.193 | 0.000 | 0.68 | | | 347.4 | SURCHARGED | |
| S16.004 | S95 | 0.831 | 0.000 | 0.99 | | | 337.7 | SURCHARGED | |
| S20.000 | S96 | 0.432 | 0.000 | 0.39 | | | 8.0 | SURCHARGED | |
| S20.001 | S97 | 0.920 | 0.000 | 1.49 | | | 19.8 | FLOOD RISK | |
| S16.005 | S98 | 0.913 | 0.000 | 1.35 | | | 356.6 | SURCHARGED | |
| S16.006 | S99 | 0.904 | 0.000 | 1.27 | | | 347.6 | FLOOD RISK | |
| S16.007 | S100 | 0.922 | 0.000 | 1.42 | | | 353.9 | FLOOD RISK | |

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## 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 |
|---|---|---|---|---|---|---|---|
| S16.008 | S101 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S16.009 | S102 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.010 | S103 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.011 | S104 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.012 | S105 | 30 Winter | 100 | +40% | 100/15 Summer | 100/15 Winter | |
| S16.013 | S106 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.014 | S107 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.015 | S108 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.016 | S109 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S21.000 | SPP5 | 60 Winter | 100 | +40% | 100/15 Summer | | |
| S21.001 | SHBRAKE PP5 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S21.002 | S112 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S21.003 | S113 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S21.004 | S114 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S21.005 | S115 | 30 Winter | 100 | +40% | 100/15 Summer | 100/30 Winter | |
| S21.006 | S116 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S21.007 | S117 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S21.008 | S118 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S22.000 | SPP6 | 60 Winter | 100 | +40% | 100/15 Winter | | |
| S22.001 | SHBRAKE PP6 | 60 Winter | 100 | +40% | 100/15 Summer | | |
| S21.009 | S121 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S23.000 | S122 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S23.001 | S123 | 15 Winter | 100 | +40% | 100/15 Summer | | |
| S23.002 | S124 | 15 Winter | 100 | +40% | | | |
| S21.010 | S125 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S21.011 | S126 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S21.012 | S127 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S21.013 | S128 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S21.014 | S129 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.017 | S130 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.018 | S131 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.019 | S132 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.020 | S133 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S24.000 | SPP7 | 180 Winter | 100 | +40% | 100/15 Summer | | |
| S24.001 | SHBRAKE PP7 | 180 Winter | 100 | +40% | 100/15 Summer | | |
| S24.002 | S136 | 30 Winter | 100 | +40% | 100/30 Winter | | |
| S24.003 | S137 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S24.004 | S138 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S25.000 | SPP8 | 180 Winter | 100 | +40% | 100/15 Summer | | |
| S25.001 | SHBRAKE PP8 | 180 Winter | 100 | +40% | 100/15 Summer | | |
| S25.002 | S141 | 30 Winter | 100 | +40% | 100/15 Summer | 100/30 Winter | |
| S24.005 | S142 | 30 Winter | 100 | +40% | 100/15 Summer | 100/30 Winter | |
| S24.006 | S143 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.021 | S144 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.022 | S145 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.023 | S146 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.024 | S147 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.025 | S148 | 30 Winter | 100 | +40% | 100/15 Summer | | |
| S16.026 | S149 | 30 Winter | 100 | +40% | 100/15 Summer | | |

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

| PN | US/MH Name | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|
| S16.008 | S101 | | 23.691 | 0.888 | 0.000 | 0.86 | | | 329.7 |
| S16.009 | S102 | | 23.578 | 1.026 | 0.000 | 0.82 | | | 314.6 |
| S16.010 | S103 | | 23.438 | 1.136 | 0.000 | 0.95 | | | 328.9 |
| S16.011 | S104 | | 23.381 | 1.182 | 0.000 | 1.01 | | | 350.3 |
| S16.012 | S105 | | 23.310 | 1.211 | 10.449 | 0.62 | | | 373.5 |
| S16.013 | S106 | | 23.256 | 1.514 | 0.000 | 1.59 | | | 374.2 |
| S16.014 | S107 | | 23.190 | 1.501 | 0.000 | 1.75 | | | 374.2 |
| S16.015 | S108 | | 23.108 | 1.464 | 0.000 | 1.71 | | | 359.5 |
| S16.016 | S109 | | 23.035 | 1.433 | 0.000 | 1.15 | | | 365.5 |
| S21.000 | SPP5 | | 24.245 | 0.341 | 0.000 | 0.07 | | 58 | 3.3 |
| S21.001 | SHBRAKE PP5 | | 24.251 | 0.951 | 0.000 | 0.17 | | | 3.5 |
| S21.002 | S112 | | 24.037 | 0.862 | 0.000 | 0.28 | | | 15.2 |
| S21.003 | S113 | | 24.014 | 1.107 | 0.000 | 0.93 | | | 45.9 |
| S21.004 | S114 | | 23.796 | 1.189 | 0.000 | 1.16 | | | 57.4 |
| S21.005 | S115 | | 23.609 | 1.202 | 1.271 | 1.04 | | | 62.8 |
| S21.006 | S116 | | 23.589 | 1.248 | 0.000 | 1.28 | | | 76.8 |
| S21.007 | S117 | | 23.548 | 1.269 | 0.000 | 1.46 | | | 88.2 |
| S21.008 | S118 | | 23.479 | 1.264 | 0.000 | 1.47 | | | 95.0 |
| S22.000 | SPP6 | | 23.799 | 0.050 | 0.000 | 0.08 | | 37 | 3.9 |
| S22.001 | SHBRAKE PP6 | | 23.795 | 0.722 | 0.000 | 0.02 | | | 1.3 |
| S21.009 | S121 | | 23.354 | 1.252 | 0.000 | 1.88 | | | 118.6 |
| S23.000 | S122 | | 24.136 | 0.325 | 0.000 | 0.91 | | | 12.6 |
| S23.001 | S123 | | 23.971 | 0.368 | 0.000 | 3.06 | | | 37.3 |
| S23.002 | S124 | | 23.499 | -0.061 | 0.000 | 0.65 | | | 37.5 |
| S21.010 | S125 | | 23.202 | 1.190 | 0.000 | 1.01 | | | 147.2 |
| S21.011 | S126 | | 23.144 | 1.232 | 0.000 | 1.19 | | | 161.0 |
| S21.012 | S127 | | 23.089 | 1.237 | 0.000 | 0.87 | | | 170.8 |
| S21.013 | S128 | | 23.041 | 1.273 | 0.000 | 1.05 | | | 199.7 |
| S21.014 | S129 | | 22.982 | 1.282 | 0.000 | 0.60 | | | 198.9 |
| S16.017 | S130 | | 22.943 | 1.430 | 0.000 | 2.37 | | | 569.0 |
| S16.018 | S131 | | 22.645 | 1.191 | 0.000 | 1.32 | | | 585.3 |
| S16.019 | S132 | | 22.290 | 1.051 | 0.000 | 0.84 | | | 592.4 |
| S16.020 | S133 | | 21.944 | 1.205 | 0.000 | 0.85 | | | 601.7 |
| S24.000 | SPP7 | | 22.295 | 0.320 | 0.000 | 0.04 | | | 1.4 |
| S24.001 | SHBRAKE PP7 | | 22.294 | 0.616 | 0.000 | 0.08 | | | 1.5 |
| S24.002 | S136 | | 21.600 | 0.044 | 0.000 | 0.13 | | | 2.7 |
| S24.003 | S137 | | 21.593 | 0.488 | 0.000 | 0.36 | | | 22.6 |
| S24.004 | S138 | | 21.569 | 0.965 | 0.000 | 0.86 | | | 39.9 |
| S25.000 | SPP8 | | 21.094 | 0.208 | 0.000 | 0.05 | | 168 | 1.3 |
| S25.001 | SHBRAKE PP8 | | 21.093 | 0.386 | 0.000 | 0.02 | | | 1.0 |
| S25.002 | S141 | | 21.521 | 0.975 | 3.211 | 0.80 | | | 29.1 |
| S24.005 | S142 | | 21.540 | 1.075 | 3.588 | 0.97 | | | 61.5 |
| S24.006 | S143 | | 21.579 | 1.206 | 0.000 | 0.44 | | | 56.2 |
| S16.021 | S144 | | 21.585 | 1.344 | 0.000 | 1.97 | | | 635.0 |
| S16.022 | S145 | | 21.354 | 1.174 | 0.000 | 2.80 | | | 636.9 |
| S16.023 | S146 | | 21.118 | 0.971 | 0.000 | 2.64 | | | 637.2 |
| S16.024 | S147 | | 20.873 | 0.762 | 0.000 | 2.24 | | | 633.3 |
| S16.025 | S148 | | 20.623 | 0.556 | 0.000 | 2.60 | | | 640.3 |

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

| PN | US/MH Name | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) | Pipe Flow (l/s) |
|---|---|---|---|---|---|---|---|---|---|
| S16.026 | S149 | | 20.365 | 0.334 | 0.000 | 1.78 | | | 623.7 |

| PN | US/MH Name | Status | Level Exceeded |
|---|---|---|---|
| S16.008 | S101 | SURCHARGED | |
| S16.009 | S102 | FLOOD RISK | |
| S16.010 | S103 | FLOOD RISK | |
| S16.011 | S104 | FLOOD RISK | |
| S16.012 | S105 | FLOOD | 2 |
| S16.013 | S106 | FLOOD RISK | |
| S16.014 | S107 | SURCHARGED | |
| S16.015 | S108 | SURCHARGED | |
| S16.016 | S109 | SURCHARGED | |
| S21.000 | SPP5 | SURCHARGED | |
| S21.001 | SHBRAKE PP5 | FLOOD RISK | |
| S21.002 | S112 | SURCHARGED | |
| S21.003 | S113 | FLOOD RISK | |
| S21.004 | S114 | FLOOD RISK | |
| S21.005 | S115 | FLOOD | 1 |
| S21.006 | S116 | FLOOD RISK | |
| S21.007 | S117 | FLOOD RISK | |
| S21.008 | S118 | SURCHARGED | |
| S22.000 | SPP6 | SURCHARGED | |
| S22.001 | SHBRAKE PP6 | SURCHARGED | |
| S21.009 | S121 | SURCHARGED | |
| S23.000 | S122 | SURCHARGED | |
| S23.001 | S123 | SURCHARGED | |
| S23.002 | S124 | OK | |
| S21.010 | S125 | SURCHARGED | |
| S21.011 | S126 | SURCHARGED | |
| S21.012 | S127 | SURCHARGED | |
| S21.013 | S128 | FLOOD RISK | |
| S21.014 | S129 | SURCHARGED | |
| S16.017 | S130 | SURCHARGED | |
| S16.018 | S131 | SURCHARGED | |
| S16.019 | S132 | SURCHARGED | |
| S16.020 | S133 | FLOOD RISK | |
| S24.000 | SPP7 | SURCHARGED | |
| S24.001 | SHBRAKE PP7 | SURCHARGED | |
| S24.002 | S136 | SURCHARGED | |
| S24.003 | S137 | SURCHARGED | |
| S24.004 | S138 | FLOOD RISK | |
| S25.000 | SPP8 | SURCHARGED | |
| S25.001 | SHBRAKE PP8 | SURCHARGED | |
| S25.002 | S141 | FLOOD | 1 |
| S24.005 | S142 | FLOOD | 1 |

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

| PN | US/MH Name | Status | Level Exceeded |
|---|---|---|---|
| S24.006 | S143 | FLOOD RISK | |
| S16.021 | S144 | SURCHARGED | |
| S16.022 | S145 | SURCHARGED | |
| S16.023 | S146 | SURCHARGED | |
| S16.024 | S147 | SURCHARGED | |
| S16.025 | S148 | SURCHARGED | |
| S16.026 | S149 | SURCHARGED | |

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## 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 |
|---|---|---|---|---|---|---|---|
| S16.027 | SBASIN L | 360 Winter | 100 | +40% | | | |
| S16.028 | SHBRAKE BASIN L | 240 Winter | 100 | +40% | 100/15 Summer | | |

| PN | US/MH Name | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) | Flow / Cap. | Overflow (l/s) | Half Drain Time (mins) |
|---|---|---|---|---|---|---|---|---|
| S16.027 | SBASIN L | | 19.805 | -0.070 | 0.000 | 0.11 | | |
| S16.028 | SHBRAKE BASIN L | | 19.832 | 0.433 | 0.000 | 0.06 | | |

| PN | US/MH Name | Pipe Flow (l/s) | Status | Level Exceeded |
|---|---|---|---|---|
| S16.027 | SBASIN L | 47.9 | FLOOD RISK | |
| S16.028 | SHBRAKE BASIN L | 39.6 | FLOOD RISK | |

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# APPENDIX C

## Water Management Strategy