

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm building

| PN     | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Section Type | Auto<br>Design                                                                        |
|--------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|--------------|---------------------------------------------------------------------------------------|
| S1.000 | 7.083         | 0.215       | 32.9           | 0.023          | 5.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |    |
| S1.001 | 7.839         | 0.052       | 150.0          | 0.012          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |    |
| S1.002 | 4.372         | 0.116       | 37.7           | 0.000          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |    |
| S2.000 | 11.278        | 0.470       | 24.0           | 0.012          | 5.00           | 0.0                | 0.600     | o           | 100         | Pipe/Conduit |    |
| S2.001 | 4.545         | 0.189       | 24.0           | 0.000          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |    |
| S2.002 | 2.160         | 0.059       | 36.6           | 0.011          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |    |
| S2.003 | 2.160         | 0.059       | 36.6           | 0.012          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |    |
| S2.004 | 4.321         | 0.117       | 36.9           | 0.012          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |    |
| S1.003 | 7.167         | 0.410       | 17.5           | 0.000          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |    |
| S1.004 | 6.813         | 0.023       | 300.0          | 0.012          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |    |
| S1.005 | 6.876         | 0.023       | 299.0          | 0.018          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |    |
| S1.006 | 7.892         | 0.026       | 300.0          | 0.005          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |   |
| S3.000 | 2.205         | 0.354       | 6.2            | 0.017          | 5.00           | 0.0                | 0.600     | o           | 100         | Pipe/Conduit |  |
| S4.000 | 12.634        | 0.149       | 85.0           | 0.003          | 5.00           | 0.0                | 0.600     | o           | 100         | Pipe/Conduit |  |
| S4.001 | 2.369         | 0.068       | 35.0           | 0.003          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |  |
| S3.001 | 10.759        | 0.108       | 99.6           | 0.000          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |  |
| S1.007 | 7.588         | 0.025       | 300.0          | 0.003          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |  |
| S5.000 | 2.687         | 0.067       | 40.1           | 0.014          | 5.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |  |
| S5.001 | 2.687         | 0.448       | 6.0            | 0.020          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |  |
| S1.008 | 13.746        | 0.625       | 22.0           | 0.023          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |  |
| S1.009 | 4.724         | 0.143       | 33.0           | 0.000          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |  |
| S1.010 | 1.290         | 0.143       | 9.0            | 0.000          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |  |
| S1.011 | 1.848         | 0.056       | 33.0           | 0.000          | 0.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |  |

Network Results Table

| PN     | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | E I.Area<br>(ha) | E Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|--------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| S1.000 | 50.00           | 5.07           | 48.390       | 0.023            | 0.0                  | 0.0           | 0.0               | 1.76         | 31.1         | 3.1           |
| S1.001 | 50.00           | 5.23           | 48.175       | 0.035            | 0.0                  | 0.0           | 0.0               | 0.82         | 14.5         | 4.7           |
| S1.002 | 50.00           | 5.27           | 48.123       | 0.035            | 0.0                  | 0.0           | 0.0               | 1.64         | 29.1         | 4.7           |
| S2.000 | 50.00           | 5.12           | 48.950       | 0.012            | 0.0                  | 0.0           | 0.0               | 1.58         | 12.4         | 1.6           |
| S2.001 | 50.00           | 5.16           | 48.430       | 0.012            | 0.0                  | 0.0           | 0.0               | 2.06         | 36.4         | 1.6           |
| S2.002 | 50.00           | 5.18           | 48.241       | 0.023            | 0.0                  | 0.0           | 0.0               | 1.67         | 29.5         | 3.1           |
| S2.003 | 50.00           | 5.20           | 48.182       | 0.035            | 0.0                  | 0.0           | 0.0               | 1.67         | 29.5         | 4.7           |
| S2.004 | 50.00           | 5.24           | 48.123       | 0.047            | 0.0                  | 0.0           | 0.0               | 1.66         | 29.4         | 6.4           |
| S1.003 | 50.00           | 5.32           | 48.007       | 0.082            | 0.0                  | 0.0           | 0.0               | 2.42         | 42.8         | 11.1          |
| S1.004 | 50.00           | 5.45           | 47.000       | 0.094            | 0.0                  | 0.0           | 0.0               | 0.90         | 63.8         | 12.7          |
| S1.005 | 50.00           | 5.57           | 46.977       | 0.112            | 0.0                  | 0.0           | 0.0               | 0.90         | 63.9         | 15.2          |
| S1.006 | 50.00           | 5.72           | 46.954       | 0.117            | 0.0                  | 0.0           | 0.0               | 0.90         | 63.8         | 15.8          |
| S3.000 | 50.00           | 5.01           | 49.780       | 0.017            | 0.0                  | 0.0           | 0.0               | 3.12         | 24.5         | 2.3           |
| S4.000 | 50.00           | 5.25           | 48.750       | 0.003            | 0.0                  | 0.0           | 0.0               | 0.83         | 6.6          | 0.4           |
| S4.001 | 50.00           | 5.28           | 48.551       | 0.006            | 0.0                  | 0.0           | 0.0               | 1.71         | 30.2         | 0.8           |
| S3.001 | 50.00           | 5.45           | 48.484       | 0.023            | 0.0                  | 0.0           | 0.0               | 1.01         | 17.8         | 3.1           |
| S1.007 | 50.00           | 5.86           | 46.928       | 0.143            | 0.0                  | 0.0           | 0.0               | 0.90         | 63.8         | 19.4          |
| S5.000 | 50.00           | 5.03           | 49.530       | 0.014            | 0.0                  | 0.0           | 0.0               | 1.59         | 28.2         | 1.9           |
| S5.001 | 50.00           | 5.04           | 49.463       | 0.034            | 0.0                  | 0.0           | 0.0               | 4.14         | 73.2         | 4.6           |
| S1.008 | 50.00           | 5.97           | 46.902       | 0.200            | 0.0                  | 0.0           | 0.0               | 2.16         | 38.1         | 27.1          |
| S1.009 | 50.00           | 6.01           | 46.250       | 0.200            | 0.0                  | 0.0           | 0.0               | 1.76         | 31.1         | 27.1          |
| S1.010 | 50.00           | 6.02           | 46.107       | 0.200            | 0.0                  | 0.0           | 0.0               | 3.38         | 59.6         | 27.1          |
| S1.011 | 50.00           | 6.03           | 45.889       | 0.200            | 0.0                  | 0.0           | 0.0               | 1.76         | 31.1         | 27.1          |

Manhole Schedules for Storm building

| MH Name   | MH CL (m) | MH Depth (m) | MH Connection  | MH Diam.,L*W (mm) | PN     | Pipe Out Invert Level (m) | Diameter (mm) | PN     | Pipes In Invert Level (m) | Diameter (mm) | Backdrop (mm) |
|-----------|-----------|--------------|----------------|-------------------|--------|---------------------------|---------------|--------|---------------------------|---------------|---------------|
| S1        | 49.540    | 1.150        | Sealed Manhole | 450               | S1.000 | 48.390                    | 150           |        |                           |               |               |
| Sjunction | 50.100    | 1.925        | Junction       |                   | S1.001 | 48.175                    | 150           | S1.000 | 48.175                    | 150           |               |
| S2        | 50.100    | 1.977        | Sealed Manhole | 450               | S1.002 | 48.123                    | 150           | S1.001 | 48.123                    | 150           |               |
| Srwp      | 49.480    | 0.530        | Sealed Manhole | 100               | S2.000 | 48.950                    | 100           |        |                           |               |               |
| Sjunction | 49.480    | 1.050        | Junction       |                   | S2.001 | 48.430                    | 150           | S2.000 | 48.480                    | 100           |               |
| S3a       | 50.100    | 1.859        | Sealed Manhole | 450               | S2.002 | 48.241                    | 150           | S2.001 | 48.241                    | 150           |               |
| Sjunction | 50.100    | 1.918        | Junction       |                   | S2.003 | 48.182                    | 150           | S2.002 | 48.182                    | 150           |               |
| Sjunction | 50.100    | 1.977        | Junction       |                   | S2.004 | 48.123                    | 150           | S2.003 | 48.123                    | 150           |               |
| S3        | 50.100    | 2.094        | Sealed Manhole | 450               | S1.003 | 48.007                    | 150           | S1.002 | 48.007                    | 150           |               |
|           |           |              |                |                   |        |                           |               | S2.004 | 48.006                    | 150           |               |
| S4        | 50.210    | 3.210        | Open Manhole   | 1200              | S1.004 | 47.000                    | 300           | S1.003 | 47.597                    | 150           | 447           |
| Stank     | 50.210    | 3.233        | Open Manhole   | 100               | S1.005 | 46.977                    | 300           | S1.004 | 46.977                    | 300           |               |
| Sjunction | 50.210    | 3.256        | Junction       |                   | S1.006 | 46.954                    | 300           | S1.005 | 46.954                    | 300           |               |
| SRWP      | 50.230    | 0.450        | Open Manhole   | 100               | S3.000 | 49.780                    | 100           |        |                           |               |               |
| Srwp      | 50.210    | 1.460        | Open Manhole   | 100               | S4.000 | 48.750                    | 100           |        |                           |               |               |
| SJUNCTION | 50.205    | 1.654        | Junction       |                   | S4.001 | 48.551                    | 150           | S4.000 | 48.601                    | 100           |               |
| S6a       | 50.205    | 1.721        | Open Manhole   | 450               | S3.001 | 48.484                    | 150           | S3.000 | 49.426                    | 100           | 892           |
|           |           |              |                |                   |        |                           |               | S4.001 | 48.484                    | 150           |               |
| S5        | 50.210    | 3.282        | Open Manhole   | 1200              | S1.007 | 46.928                    | 300           | S1.006 | 46.928                    | 300           |               |
|           |           |              |                |                   |        |                           |               | S3.001 | 48.376                    | 150           | 1298          |
| S6        | 50.210    | 0.680        | Open Manhole   | 1200              | S5.000 | 49.530                    | 150           |        |                           |               |               |
| Sjunction | 50.210    | 0.747        | Junction       |                   | S5.001 | 49.463                    | 150           | S5.000 | 49.463                    | 150           |               |
| S7        | 50.210    | 3.308        | Sealed Manhole | 1200              | S1.008 | 46.902                    | 150           | S1.007 | 46.902                    | 300           |               |
|           |           |              |                |                   |        |                           |               | S5.001 | 49.015                    | 150           | 2113          |
| Scw2      | 50.210    | 3.960        | Open Manhole   | 1200              | S1.009 | 46.250                    | 150           | S1.008 | 46.277                    | 150           | 27            |
| Sex4      | 50.410    | 4.303        | Open Manhole   | 940 x 1330        | S1.010 | 46.107                    | 150           | S1.009 | 46.107                    | 150           |               |
| Sex5      | 50.420    | 4.531        | Open Manhole   | 1000 x 1270       | S1.011 | 45.889                    | 150           | S1.010 | 45.964                    | 150           | 75            |
| S         | 50.630    | 4.797        | Open Manhole   | 0                 |        | OUTFALL                   |               | S1.011 | 45.833                    | 150           |               |

|                                                                       |                          |                                                                                     |
|-----------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------|
| Curtins Consulting                                                    |                          | Page 3                                                                              |
| Merchant Exchange<br>17-19 Whitworth Street West<br>Manchester M1 5WG | Swan House<br>Manchester |  |
| Date 17/05/2022 12:22                                                 | Designed by CG           |                                                                                     |
| File surface 4ls and foul network 30.03.22.MDX                        | Checked by               |                                                                                     |
| Micro Drainage                                                        | Network 2018.1.1         |                                                                                     |

PIPELINE SCHEDULES for Storm building

Upstream Manhole

| PN     | Hyd<br>Sect | Diam<br>(mm) | MH<br>Name | C.Level<br>(m) | I.Level<br>(m) | D.Depth<br>(m) | MH<br>Connection | MH DIAM., L*W<br>(mm) |
|--------|-------------|--------------|------------|----------------|----------------|----------------|------------------|-----------------------|
| S1.000 | o           | 150          | S1         | 49.540         | 48.390         | 1.000          | Sealed Manhole   | 450                   |
| S1.001 | o           | 150          | Sjunction  | 50.100         | 48.175         | 1.775          | Junction         |                       |
| S1.002 | o           | 150          | S2         | 50.100         | 48.123         | 1.827          | Sealed Manhole   | 450                   |
| S2.000 | o           | 100          | Srwp       | 49.480         | 48.950         | 0.430          | Sealed Manhole   | 100                   |
| S2.001 | o           | 150          | Sjunction  | 49.480         | 48.430         | 0.900          | Junction         |                       |
| S2.002 | o           | 150          | S3a        | 50.100         | 48.241         | 1.709          | Sealed Manhole   | 450                   |
| S2.003 | o           | 150          | Sjunction  | 50.100         | 48.182         | 1.768          | Junction         |                       |
| S2.004 | o           | 150          | Sjunction  | 50.100         | 48.123         | 1.827          | Junction         |                       |
| S1.003 | o           | 150          | S3         | 50.100         | 48.007         | 1.943          | Sealed Manhole   | 450                   |
| S1.004 | o           | 300          | S4         | 50.210         | 47.000         | 2.910          | Open Manhole     | 1200                  |
| S1.005 | o           | 300          | Stank      | 50.210         | 46.977         | 2.933          | Open Manhole     | 100                   |
| S1.006 | o           | 300          | Sjunction  | 50.210         | 46.954         | 2.956          | Junction         |                       |
| S3.000 | o           | 100          | SRWP       | 50.230         | 49.780         | 0.350          | Open Manhole     | 100                   |
| S4.000 | o           | 100          | Srwp       | 50.210         | 48.750         | 1.360          | Open Manhole     | 100                   |
| S4.001 | o           | 150          | SJUNCTION  | 50.205         | 48.551         | 1.504          | Junction         |                       |
| S3.001 | o           | 150          | S6a        | 50.205         | 48.484         | 1.571          | Open Manhole     | 450                   |
| S1.007 | o           | 300          | S5         | 50.210         | 46.928         | 2.982          | Open Manhole     | 1200                  |
| S5.000 | o           | 150          | S6         | 50.210         | 49.530         | 0.530          | Open Manhole     | 1200                  |
| S5.001 | o           | 150          | Sjunction  | 50.210         | 49.463         | 0.597          | Junction         |                       |
| S1.008 | o           | 150          | S7         | 50.210         | 46.902         | 3.158          | Sealed Manhole   | 1200                  |
| S1.009 | o           | 150          | Scw2       | 50.210         | 46.250         | 3.810          | Open Manhole     | 1200                  |
| S1.010 | o           | 150          | Sex4       | 50.410         | 46.107         | 4.153          | Open Manhole     | 940 x 1330            |
| S1.011 | o           | 150          | Sex5       | 50.420         | 45.889         | 4.381          | Open Manhole     | 1000 x 1270           |

Downstream Manhole

| PN     | Length<br>(m) | Slope<br>(1:X) | MH<br>Name | C.Level<br>(m) | I.Level<br>(m) | D.Depth<br>(m) | MH<br>Connection | MH DIAM., L*W<br>(mm) |
|--------|---------------|----------------|------------|----------------|----------------|----------------|------------------|-----------------------|
| S1.000 | 7.083         | 32.9           | Sjunction  | 50.100         | 48.175         | 1.775          | Junction         |                       |
| S1.001 | 7.839         | 150.0          | S2         | 50.100         | 48.123         | 1.827          | Sealed Manhole   | 450                   |
| S1.002 | 4.372         | 37.7           | S3         | 50.100         | 48.007         | 1.943          | Sealed Manhole   | 450                   |
| S2.000 | 11.278        | 24.0           | Sjunction  | 49.480         | 48.480         | 0.900          | Junction         |                       |
| S2.001 | 4.545         | 24.0           | S3a        | 50.100         | 48.241         | 1.709          | Sealed Manhole   | 450                   |
| S2.002 | 2.160         | 36.6           | Sjunction  | 50.100         | 48.182         | 1.768          | Junction         |                       |
| S2.003 | 2.160         | 36.6           | Sjunction  | 50.100         | 48.123         | 1.827          | Junction         |                       |
| S2.004 | 4.321         | 36.9           | S3         | 50.100         | 48.006         | 1.944          | Sealed Manhole   | 450                   |
| S1.003 | 7.167         | 17.5           | S4         | 50.210         | 47.597         | 2.463          | Open Manhole     | 1200                  |
| S1.004 | 6.813         | 300.0          | Stank      | 50.210         | 46.977         | 2.933          | Open Manhole     | 100                   |
| S1.005 | 6.876         | 299.0          | Sjunction  | 50.210         | 46.954         | 2.956          | Junction         |                       |
| S1.006 | 7.892         | 300.0          | S5         | 50.210         | 46.928         | 2.982          | Open Manhole     | 1200                  |
| S3.000 | 2.205         | 6.2            | S6a        | 50.205         | 49.426         | 0.679          | Open Manhole     | 450                   |
| S4.000 | 12.634        | 85.0           | SJUNCTION  | 50.205         | 48.601         | 1.504          | Junction         |                       |
| S4.001 | 2.369         | 35.0           | S6a        | 50.205         | 48.484         | 1.571          | Open Manhole     | 450                   |
| S3.001 | 10.759        | 99.6           | S5         | 50.210         | 48.376         | 1.684          | Open Manhole     | 1200                  |
| S1.007 | 7.588         | 300.0          | S7         | 50.210         | 46.902         | 3.008          | Sealed Manhole   | 1200                  |
| S5.000 | 2.687         | 40.1           | Sjunction  | 50.210         | 49.463         | 0.597          | Junction         |                       |
| S5.001 | 2.687         | 6.0            | S7         | 50.210         | 49.015         | 1.045          | Sealed Manhole   | 1200                  |
| S1.008 | 13.746        | 22.0           | Scw2       | 50.210         | 46.277         | 3.783          | Open Manhole     | 1200                  |
| S1.009 | 4.724         | 33.0           | Sex4       | 50.410         | 46.107         | 4.153          | Open Manhole     | 940 x 1330            |
| S1.010 | 1.290         | 9.0            | Sex5       | 50.420         | 45.964         | 4.306          | Open Manhole     | 1000 x 1270           |
| S1.011 | 1.848         | 33.0           | S          | 50.630         | 45.833         | 4.647          | Open Manhole     | 0                     |

Area Summary for Storm building

| 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      | 0.012           | 0.012          | 0.012           |
| 1.002       | -         | -         | 100      | 0.000           | 0.000          | 0.000           |
| 2.000       | -         | -         | 100      | 0.012           | 0.012          | 0.012           |
| 2.001       | -         | -         | 100      | 0.000           | 0.000          | 0.000           |
| 2.002       | -         | -         | 100      | 0.011           | 0.011          | 0.011           |
| 2.003       | -         | -         | 100      | 0.012           | 0.012          | 0.012           |
| 2.004       | -         | -         | 100      | 0.012           | 0.012          | 0.012           |
| 1.003       | -         | -         | 100      | 0.000           | 0.000          | 0.000           |
| 1.004       | -         | -         | 100      | 0.012           | 0.012          | 0.012           |
| 1.005       | -         | -         | 100      | 0.018           | 0.018          | 0.018           |
| 1.006       | -         | -         | 100      | 0.005           | 0.005          | 0.005           |
| 3.000       | -         | -         | 100      | 0.017           | 0.017          | 0.017           |
| 4.000       | -         | -         | 100      | 0.003           | 0.003          | 0.003           |
| 4.001       | -         | -         | 100      | 0.003           | 0.003          | 0.003           |
| 3.001       | -         | -         | 100      | 0.000           | 0.000          | 0.000           |
| 1.007       | -         | -         | 100      | 0.003           | 0.003          | 0.003           |
| 5.000       | -         | -         | 100      | 0.014           | 0.014          | 0.014           |
| 5.001       | -         | -         | 100      | 0.020           | 0.020          | 0.020           |
| 1.008       | -         | -         | 100      | 0.023           | 0.023          | 0.023           |
| 1.009       | -         | -         | 100      | 0.000           | 0.000          | 0.000           |
| 1.010       | -         | -         | 100      | 0.000           | 0.000          | 0.000           |
| 1.011       | -         | -         | 100      | 0.000           | 0.000          | 0.000           |
|             |           |           |          | Total           | Total          | Total           |
|             |           |           |          | 0.200           | 0.200          | 0.200           |

Surcharged Outfall Details for Storm building

| Outfall Pipe Number | Outfall Name | C. Level (m) | I. Level (m) | Min I. Level (m) | D,L (mm) | W (mm) |
|---------------------|--------------|--------------|--------------|------------------|----------|--------|
|---------------------|--------------|--------------|--------------|------------------|----------|--------|

S1.011 S 50.630 45.833 0.000 0 0

Datum (m) 45.810 Offset (mins) 0

| Time (mins) | Depth (m) | Time (mins) | Depth (m) | Time (mins) | Depth (m) | Time (mins) | Depth (m) | Time (mins) | Depth (m) | Time (mins) | Depth (m) |
|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|-----------|
| 60          | 1.000     | 120         | 1.000     | 180         | 1.000     | 240         | 1.000     | 300         | 1.000     | 360         | 1.000     |

Online Controls for Storm building

Hydro-Brake® Optimum Manhole: S7, DS/PN: S1.008, Volume (m³): 4.2

|                   |                            |                                   |        |
|-------------------|----------------------------|-----------------------------------|--------|
| Unit Reference    | MD-SHE-0077-4000-2500-4000 | Sump Available                    | Yes    |
| Design Head (m)   | 2.500                      | Diameter (mm)                     | 77     |
| Design Flow (l/s) | 4.0                        | Invert Level (m)                  | 46.902 |
| Flush-Flo™        | Calculated                 | Minimum Outlet Pipe Diameter (mm) | 100    |
| Objective         | Minimise upstream storage  | Suggested Manhole Diameter (mm)   | 1200   |
| Application       | Surface                    |                                   |        |

| Control Points            | Head (m) | Flow (l/s) | Control Points            | Head (m) | Flow (l/s) |
|---------------------------|----------|------------|---------------------------|----------|------------|
| Design Point (Calculated) | 2.500    | 4.0        | Kick-Flo®                 | 0.689    | 2.2        |
| Flush-Flo™                | 0.334    | 2.8        | Mean Flow over Head Range | -        | 3.0        |

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) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 0.100     | 2.2        | 0.600     | 2.5        | 1.600     | 3.2        | 2.600     | 4.1        | 5.000     | 5.5        | 7.500     | 6.7        |
| 0.200     | 2.6        | 0.800     | 2.4        | 1.800     | 3.4        | 3.000     | 4.3        | 5.500     | 5.8        | 8.000     | 6.9        |
| 0.300     | 2.7        | 1.000     | 2.6        | 2.000     | 3.6        | 3.500     | 4.7        | 6.000     | 6.0        | 8.500     | 7.1        |
| 0.400     | 2.7        | 1.200     | 2.8        | 2.200     | 3.8        | 4.000     | 5.0        | 6.500     | 6.2        | 9.000     | 7.3        |
| 0.500     | 2.7        | 1.400     | 3.1        | 2.400     | 3.9        | 4.500     | 5.3        | 7.000     | 6.5        | 9.500     | 7.5        |

Storage Structures for Storm building

Cellular Storage Manhole: Stank, DS/PN: S1.005

Invert Level (m) 46.977 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95  
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|-----------|-----------|----------------|-----------|-----------|----------------|-----------|-----------|----------------|
| 0.000     | 34.0      | 0.0            | 2.250     | 34.0      | 0.0            | 2.251     | 0.0       | 0.0            |

|                                                                                               |            |           |               |                |                                                          |                 |                    |               |           |                                           |             |             |                |                 |
|-----------------------------------------------------------------------------------------------|------------|-----------|---------------|----------------|----------------------------------------------------------|-----------------|--------------------|---------------|-----------|-------------------------------------------|-------------|-------------|----------------|-----------------|
| Curtins Consulting                                                                            |            |           |               |                |                                                          |                 |                    |               |           | Page 7                                    |             |             |                |                 |
| Merchant Exchange<br>17-19 Whitworth Street West<br>Manchester M1 5WG                         |            |           |               |                |                                                          |                 |                    |               |           | Swan House<br>Manchester                  |             |             |                |                 |
| Date 17/05/2022 12:22<br>File surface 4ls and foul network 30.03.22.MDX                       |            |           |               |                |                                                          |                 |                    |               |           | Designed by CG<br>Checked by              |             |             |                |                 |
| Micro Drainage                                                                                |            |           |               |                |                                                          |                 |                    |               |           | Network 2018.1.1                          |             |             |                |                 |
| 1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm building |            |           |               |                |                                                          |                 |                    |               |           |                                           |             |             |                |                 |
| Simulation Criteria                                                                           |            |           |               |                |                                                          |                 |                    |               |           |                                           |             |             |                |                 |
| Areal Reduction Factor 1.000                                                                  |            |           |               |                | Manhole Headloss Coeff (Global) 0.500                    |                 |                    |               |           | MADD Factor * 10m³/ha Storage 2.000       |             |             |                |                 |
| Hot Start (mins) 0                                                                            |            |           |               |                | Foul Sewage per hectare (l/s) 0.000                      |                 |                    |               |           | Inlet Coeffiecient 0.800                  |             |             |                |                 |
| Hot Start Level (mm) 0                                                                        |            |           |               |                | Additional Flow - % of Total Flow 0.000                  |                 |                    |               |           | Flow per Person per Day (l/per/day) 0.000 |             |             |                |                 |
| Number of Input Hydrographs 0                                                                 |            |           |               |                | Number of Offline Controls 0                             |                 |                    |               |           | Number of Time/Area Diagrams 0            |             |             |                |                 |
| Number of Online Controls 1                                                                   |            |           |               |                | Number of Storage Structures 1                           |                 |                    |               |           | Number of Real Time Controls 0            |             |             |                |                 |
| Synthetic Rainfall Details                                                                    |            |           |               |                |                                                          |                 |                    |               |           |                                           |             |             |                |                 |
| Rainfall Model                                                                                |            |           |               |                | FSR M5-60 (mm) 18.000                                    |                 |                    |               |           | Cv (Summer) 0.740                         |             |             |                |                 |
| Region England and Wales                                                                      |            |           |               |                | Ratio R 0.361                                            |                 |                    |               |           | Cv (Winter) 0.850                         |             |             |                |                 |
| Margin for Flood Risk Warning (mm)                                                            |            |           |               |                | 300.0                                                    |                 |                    |               |           | DVD Status ON                             |             |             |                |                 |
| Analysis Timestep 2.5                                                                         |            |           |               |                | Second Increment (Extended)                              |                 |                    |               |           | Inertia Status ON                         |             |             |                |                 |
| DTS Status                                                                                    |            |           |               |                |                                                          |                 |                    |               |           | OFF                                       |             |             |                |                 |
| Profile(s)                                                                                    |            |           |               |                |                                                          |                 |                    |               |           | Summer and Winter                         |             |             |                |                 |
| Duration(s) (mins)                                                                            |            |           |               |                | 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440 |                 |                    |               |           |                                           |             |             |                |                 |
| Return Period(s) (years)                                                                      |            |           |               |                |                                                          |                 |                    |               |           | 1, 30, 100                                |             |             |                |                 |
| Climate Change (%)                                                                            |            |           |               |                |                                                          |                 |                    |               |           | 0, 0, 40                                  |             |             |                |                 |
| Water Surcharged Flooded                                                                      |            |           |               |                |                                                          |                 |                    |               |           |                                           |             |             |                |                 |
| PN                                                                                            | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surcharge                                      | First (Y) Flood | First (Z) Overflow | Overflow Act. | Level (m) | Depth (m)                                 | Volume (m³) | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) |
| S1.000                                                                                        | S1         | 15 Winter | 1             | +0%            | 100/30 Winter                                            |                 |                    |               | 48.423    | -0.117                                    | 0.000       | 0.11        |                | 2.8             |
| S1.001                                                                                        | Sjunction  | 15 Winter | 1             | +0%            |                                                          |                 |                    |               | 48.230    | -0.095                                    | 0.000       | 0.28        |                | 4.0             |
| S1.002                                                                                        | S2         | 15 Winter | 1             | +0%            | 100/15 Summer                                            |                 |                    |               | 48.168    | -0.105                                    | 0.000       | 0.19        |                | 4.0             |
| S2.000                                                                                        | Srwp       | 15 Winter | 1             | +0%            | 100/120 Winter                                           |                 |                    |               | 48.974    | -0.076                                    | 0.000       | 0.13        |                | 1.5             |
| S2.001                                                                                        | Sjunction  | 15 Winter | 1             | +0%            |                                                          |                 |                    |               | 48.452    | -0.128                                    | 0.000       | 0.05        |                | 1.4             |
| S2.002                                                                                        | S3a        | 15 Winter | 1             | +0%            | 100/15 Summer                                            |                 |                    |               | 48.283    | -0.108                                    | 0.000       | 0.17        |                | 2.6             |
| S2.003                                                                                        | Sjunction  | 15 Winter | 1             | +0%            |                                                          |                 |                    |               | 48.233    | -0.099                                    | 0.000       | 0.25        |                | 3.8             |
| S2.004                                                                                        | Sjunction  | 15 Winter | 1             | +0%            |                                                          |                 |                    |               | 48.173    | -0.100                                    | 0.000       | 0.24        |                | 5.1             |
| S1.003                                                                                        | S3         | 15 Winter | 1             | +0%            | 100/15 Summer                                            |                 |                    |               | 48.058    | -0.099                                    | 0.000       | 0.25        |                | 9.1             |
| S1.004                                                                                        | S4         | 60 Winter | 1             | +0%            | 30/15 Summer                                             |                 |                    |               | 47.258    | -0.042                                    | 0.000       | 0.13        |                | 5.8             |
| S1.005                                                                                        | Stank      | 60 Winter | 1             | +0%            | 30/15 Summer                                             |                 |                    |               | 47.257    | -0.020                                    | 0.000       | 0.05        |                | 2.4             |
| S1.006                                                                                        | Sjunction  | 60 Winter | 1             | +0%            |                                                          |                 |                    |               | 47.254    | 0.000                                     | 0.000       | 0.04        |                | 2.6             |
| S3.000                                                                                        | SRWP       | 15 Winter | 1             | +0%            |                                                          |                 |                    |               | 49.804    | -0.076                                    | 0.000       | 0.13        |                | 2.1             |
| S4.000                                                                                        | Srwp       | 15 Winter | 1             | +0%            | 100/60 Winter                                            |                 |                    |               | 48.766    | -0.084                                    | 0.000       | 0.06        |                | 0.4             |
| S4.001                                                                                        | SJUNCTION  | 15 Winter | 1             | +0%            |                                                          |                 |                    |               | 48.571    | -0.130                                    | 0.000       | 0.04        |                | 0.7             |
| S3.001                                                                                        | S6a        | 15 Winter | 1             | +0%            | 100/60 Winter                                            |                 |                    |               | 48.526    | -0.108                                    | 0.000       | 0.17        |                | 2.7             |
| S1.007                                                                                        | S5         | 60 Winter | 1             | +0%            | 1/60 Winter                                              |                 |                    |               | 47.257    | 0.030                                     | 0.000       | 0.06        |                | 2.7             |
| S5.000                                                                                        | S6         | 15 Winter | 1             | +0%            |                                                          |                 |                    |               | 49.563    | -0.117                                    | 0.000       | 0.10        |                | 1.7             |
| S5.001                                                                                        | Sjunction  | 15 Winter | 1             | +0%            |                                                          |                 |                    |               | 49.493    | -0.120                                    | 0.000       | 0.09        |                | 3.7             |
| S1.008                                                                                        | S7         | 60 Winter | 1             | +0%            | 1/15 Summer                                              |                 |                    |               | 47.257    | 0.205                                     | 0.000       | 0.08        |                | 2.7             |
| S1.009                                                                                        | Scw2       | 60 Summer | 1             | +0%            | 1/15 Summer                                              |                 |                    |               | 46.822    | 0.422                                     | 0.000       | 0.12        |                | 2.8             |
| S1.010                                                                                        | Sex4       | 60 Summer | 1             | +0%            | 1/15 Summer                                              |                 |                    |               | 46.816    | 0.559                                     | 0.000       | 0.12        |                | 2.8             |
| S1.011                                                                                        | Sex5       | 60 Summer | 1             | +0%            | 1/15 Summer                                              |                 |                    |               | 46.814    | 0.775                                     | 0.000       | 0.19        |                | 2.8             |
| Level Exceeded                                                                                |            |           |               |                |                                                          |                 |                    |               |           |                                           |             |             |                |                 |
| PN                                                                                            | US/MH Name |           |               |                |                                                          |                 |                    | Status        |           |                                           |             |             |                |                 |
| S1.000                                                                                        | S1         |           |               |                |                                                          |                 |                    | OK            |           |                                           |             |             |                |                 |
| S1.001                                                                                        | Sjunction  |           |               |                |                                                          |                 |                    | OK*           |           |                                           |             |             |                |                 |
| S1.002                                                                                        | S2         |           |               |                |                                                          |                 |                    | OK            |           |                                           |             |             |                |                 |
| S2.000                                                                                        | Srwp       |           |               |                |                                                          |                 |                    | OK            |           |                                           |             |             |                |                 |
| S2.001                                                                                        | Sjunction  |           |               |                |                                                          |                 |                    | OK*           |           |                                           |             |             |                |                 |
| S2.002                                                                                        | S3a        |           |               |                |                                                          |                 |                    | OK            |           |                                           |             |             |                |                 |
| S2.003                                                                                        | Sjunction  |           |               |                |                                                          |                 |                    | OK*           |           |                                           |             |             |                |                 |
| S2.004                                                                                        | Sjunction  |           |               |                |                                                          |                 |                    | OK*           |           |                                           |             |             |                |                 |
| S1.003                                                                                        | S3         |           |               |                |                                                          |                 |                    | OK            |           |                                           |             |             |                |                 |
| S1.004                                                                                        | S4         |           |               |                |                                                          |                 |                    | OK            |           |                                           |             |             |                |                 |
| S1.005                                                                                        | Stank      |           |               |                |                                                          |                 |                    | OK            |           |                                           |             |             |                |                 |
| S1.006                                                                                        | Sjunction  |           |               |                |                                                          |                 |                    | SURCHARGED*   |           |                                           |             |             |                |                 |
| S3.000                                                                                        | SRWP       |           |               |                |                                                          |                 |                    | OK            |           |                                           |             |             |                |                 |
| S4.000                                                                                        | Srwp       |           |               |                |                                                          |                 |                    | OK            |           |                                           |             |             |                |                 |
| S4.001                                                                                        | SJUNCTION  |           |               |                |                                                          |                 |                    | OK*           |           |                                           |             |             |                |                 |
| S3.001                                                                                        | S6a        |           |               |                |                                                          |                 |                    | OK            |           |                                           |             |             |                |                 |
| S1.007                                                                                        | S5         |           |               |                |                                                          |                 |                    | SURCHARGED    |           |                                           |             |             |                |                 |
| S5.000                                                                                        | S6         |           |               |                |                                                          |                 |                    | OK            |           |                                           |             |             |                |                 |
| S5.001                                                                                        | Sjunction  |           |               |                |                                                          |                 |                    | OK*           |           |                                           |             |             |                |                 |
| S1.008                                                                                        | S7         |           |               |                |                                                          |                 |                    | SURCHARGED*   |           |                                           |             |             |                |                 |
| S1.009                                                                                        | Scw2       |           |               |                |                                                          |                 |                    | SURCHARGED    |           |                                           |             |             |                |                 |
| S1.010                                                                                        | Sex4       |           |               |                |                                                          |                 |                    | SURCHARGED    |           |                                           |             |             |                |                 |
| S1.011                                                                                        | Sex5       |           |               |                |                                                          |                 |                    | SURCHARGED    |           |                                           |             |             |                |                 |

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

Simulation Criteria

Areal Reduction Factor 1.000    Manhole Headloss Coeff (Global) 0.500    MADD Factor \* 10m³/ha Storage 2.000  
Hot Start (mins) 0    Foul Sewage per hectare (l/s) 0.000    Inlet Coeffiecient 0.800  
Hot Start Level (mm) 0    Additional Flow - % of Total Flow 0.000    Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0    Number of Offline Controls 0    Number of Time/Area Diagrams 0  
Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model    FSR M5-60 (mm) 18.000    Cv (Summer) 0.740  
Region England and Wales    Ratio R 0.361    Cv (Winter) 0.850

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

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

|        |               |            |                  |                   |                        |                    |                       |                  | Water        | Surcharged   | Flooded        |                |                   | Pipe          |
|--------|---------------|------------|------------------|-------------------|------------------------|--------------------|-----------------------|------------------|--------------|--------------|----------------|----------------|-------------------|---------------|
| PN     | US/MH<br>Name | Storm      | Return<br>Period | Climate<br>Change | First (X)<br>Surcharge | First (Y)<br>Flood | First (Z)<br>Overflow | Overflow<br>Act. | Level<br>(m) | Depth<br>(m) | Volume<br>(m³) | Flow /<br>Cap. | Overflow<br>(l/s) | Flow<br>(l/s) |
| S1.000 | S1            | 15 Winter  | 30               | +0%               | 100/30 Winter          |                    |                       |                  | 48.442       | -0.098       | 0.000          | 0.26           |                   | 6.9           |
| S1.001 | Sjunction     | 15 Winter  | 30               | +0%               |                        |                    |                       |                  | 48.273       | -0.052       | 0.000          | 0.74           |                   | 10.6          |
| S1.002 | S2            | 15 Winter  | 30               | +0%               | 100/15 Summer          |                    |                       |                  | 48.199       | -0.074       | 0.000          | 0.49           |                   | 10.5          |
| S2.000 | Srwp          | 15 Winter  | 30               | +0%               | 100/120 Winter         |                    |                       |                  | 48.988       | -0.062       | 0.000          | 0.31           |                   | 3.6           |
| S2.001 | Sjunction     | 15 Winter  | 30               | +0%               |                        |                    |                       |                  | 48.466       | -0.114       | 0.000          | 0.13           |                   | 3.5           |
| S2.002 | S3a           | 15 Winter  | 30               | +0%               | 100/15 Summer          |                    |                       |                  | 48.313       | -0.078       | 0.000          | 0.46           |                   | 7.0           |
| S2.003 | Sjunction     | 15 Winter  | 30               | +0%               |                        |                    |                       |                  | 48.277       | -0.055       | 0.000          | 0.71           |                   | 10.8          |
| S2.004 | Sjunction     | 15 Winter  | 30               | +0%               |                        |                    |                       |                  | 48.215       | -0.058       | 0.000          | 0.68           |                   | 14.5          |
| S1.003 | S3            | 15 Winter  | 30               | +0%               | 100/15 Summer          |                    |                       |                  | 48.099       | -0.058       | 0.000          | 0.68           |                   | 24.9          |
| S1.004 | S4            | 120 Winter | 30               | +0%               | 30/15 Summer           |                    |                       |                  | 48.037       | 0.737        | 0.000          | 0.19           |                   | 8.9           |
| S1.005 | Stank         | 120 Winter | 30               | +0%               | 30/15 Summer           |                    |                       |                  | 48.036       | 0.759        | 0.000          | 0.17           |                   | 7.6           |
| S1.006 | Sjunction     | 60 Winter  | 30               | +0%               |                        |                    |                       |                  | 47.254       | 0.000        | 0.000          | 0.10           |                   | 6.4           |
| S3.000 | SRWP          | 15 Winter  | 30               | +0%               |                        |                    |                       |                  | 49.818       | -0.062       | 0.000          | 0.31           |                   | 5.1           |
| S4.000 | Srwp          | 15 Winter  | 30               | +0%               | 100/60 Winter          |                    |                       |                  | 48.775       | -0.075       | 0.000          | 0.15           |                   | 0.9           |
| S4.001 | SJUNCTION     | 15 Winter  | 30               | +0%               |                        |                    |                       |                  | 48.585       | -0.116       | 0.000          | 0.11           |                   | 1.8           |
| S3.001 | S6a           | 15 Winter  | 30               | +0%               | 100/60 Winter          |                    |                       |                  | 48.553       | -0.081       | 0.000          | 0.43           |                   | 6.9           |
| S1.007 | S5            | 120 Winter | 30               | +0%               | 1/60 Winter            |                    |                       |                  | 48.084       | 0.856        | 0.000          | 0.10           |                   | 4.9           |
| S5.000 | S6            | 15 Winter  | 30               | +0%               |                        |                    |                       |                  | 49.582       | -0.098       | 0.000          | 0.26           |                   | 4.2           |
| S5.001 | Sjunction     | 15 Winter  | 30               | +0%               |                        |                    |                       |                  | 49.514       | -0.099       | 0.000          | 0.25           |                   | 10.5          |
| S1.008 | S7            | 120 Winter | 30               | +0%               | 1/15 Summer            |                    |                       |                  | 48.088       | 1.036        | 0.000          | 0.08           |                   | 2.8           |
| S1.009 | Scw2          | 60 Winter  | 30               | +0%               | 1/15 Summer            |                    |                       |                  | 46.822       | 0.422        | 0.000          | 0.12           |                   | 2.7           |
| S1.010 | Sex4          | 60 Winter  | 30               | +0%               | 1/15 Summer            |                    |                       |                  | 46.816       | 0.559        | 0.000          | 0.12           |                   | 2.8           |
| S1.011 | Sex5          | 60 Winter  | 30               | +0%               | 1/15 Summer            |                    |                       |                  | 46.814       | 0.775        | 0.000          | 0.19           |                   | 2.7           |

| PN     | US/MH<br>Name | Status      | Level<br>Exceeded |
|--------|---------------|-------------|-------------------|
| S1.000 | S1            | OK          |                   |
| S1.001 | Sjunction     | OK*         |                   |
| S1.002 | S2            | OK          |                   |
| S2.000 | Srwp          | OK          |                   |
| S2.001 | Sjunction     | OK*         |                   |
| S2.002 | S3a           | OK          |                   |
| S2.003 | Sjunction     | OK*         |                   |
| S2.004 | Sjunction     | OK*         |                   |
| S1.003 | S3            | OK          |                   |
| S1.004 | S4            | SURCHARGED  |                   |
| S1.005 | Stank         | SURCHARGED  |                   |
| S1.006 | Sjunction     | SURCHARGED* |                   |
| S3.000 | SRWP          | OK          |                   |
| S4.000 | Srwp          | OK          |                   |
| S4.001 | SJUNCTION     | OK*         |                   |
| S3.001 | S6a           | OK          |                   |
| S1.007 | S5            | SURCHARGED  |                   |
| S5.000 | S6            | OK          |                   |
| S5.001 | Sjunction     | OK*         |                   |
| S1.008 | S7            | SURCHARGED* |                   |
| S1.009 | Scw2          | SURCHARGED  |                   |
| S1.010 | Sex4          | SURCHARGED  |                   |
| S1.011 | Sex5          | SURCHARGED  |                   |

