

Time Area Diagram for Storm

| Time<br>(mins) | Area<br>(ha) | Time<br>(mins) | Area<br>(ha) |
|----------------|--------------|----------------|--------------|
| 0-4            | 0.013        | 4-8            | 0.003        |

Total Area Contributing (ha) = 0.016

Total Pipe Volume (m³) = 0.024

|                                                    |                  |                                                                                    |
|----------------------------------------------------|------------------|------------------------------------------------------------------------------------|
| CampbellReith                                      |                  | Page 2                                                                             |
| Raven House<br>29 Linkfield Lane<br>Surrey RH1 1SS | 12198 Sea Point  |  |
| Date 16/11/2017                                    | Designed by MB   |                                                                                    |
| File 12198 SW Soakaway Rev01.mdx                   | Checked by SB    |                                                                                    |
| XP Solutions                                       | Network 2016.1.1 |                                                                                    |

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

| 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 | 2.397         | 0.050       | 47.9           | 0.016          | 5.00           | 0.0                | 0.600     | o           | 100         | Pipe/Conduit |  |
| S1.001 | 0.662         | 0.011       | 60.2           | 0.000          | 0.00           | 0.0                | 0.600     | o           | 100         | Pipe/Conduit |  |

Network Results Table

| PN     | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ 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           | 5.04           | 49.395       | 0.016            | 0.0                  | 0.0           | 0.0               | 1.12         | 8.8          | 2.2           |
| S1.001 | 50.00           | 5.05           | 48.811       | 0.016            | 0.0                  | 0.0           | 0.0               | 0.99         | 7.8          | 2.2           |

Manhole Schedules for Storm

| 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      | 50.010    | 0.615        | Junction      |                    | S1.000 | 49.395                    | 100           |        |                           |               |               |
| S2      | 50.100    | 1.289        | Junction      | 0                  | S1.001 | 48.811                    | 100           | S1.000 | 49.345                    | 100           | 534           |
| S       | 50.100    | 1.300        | Open Manhole  | 0                  |        | OUTFALL                   |               | S1.001 | 48.800                    | 100           |               |

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        | 100       | S1      | 50.010      | 49.395      | 0.515       | Junction      |                    |
| S1.001 | o        | 100       | S2      | 50.100      | 48.811      | 1.189       | Junction      |                    |

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 | 2.397      | 47.9        | S2      | 50.100      | 49.345      | 0.655       | Junction      |                    |
| S1.001 | 0.662      | 60.2        | S       | 50.100      | 48.800      | 1.200       | Open Manhole  | 0                  |

Area Summary for Storm

| Pipe Number | PIMP Type | PIMP Name | PIMP (%) | Gross Area (ha) | Imp. Area (ha) | Pipe Total (ha) |
|-------------|-----------|-----------|----------|-----------------|----------------|-----------------|
| 1.000       | -         | -         | 100      | 0.016           | 0.016          | 0.016           |
| 1.001       | -         | -         | 100      | 0.000           | 0.000          | 0.000           |
|             |           |           |          | Total           | Total          | Total           |
|             |           |           |          | 0.016           | 0.016          | 0.016           |

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) |
|---------------------|--------------|--------------|--------------|------------------|-----------|--------|
| S1.001              | S            | 50.100       | 48.800       | 0.000            | 0         | 0      |

|                                                     |                                 |                                                                                    |
|-----------------------------------------------------|---------------------------------|------------------------------------------------------------------------------------|
| CampbellReith                                       |                                 | Page 6                                                                             |
| Raven House<br>29 Linkfield Lane<br>Surrey RH1 1SS  | 12198 Sea Point                 |  |
| Date 16/11/2017<br>File 12198 SW Soakaway Rev01.mdx | Designed by MB<br>Checked by SB |                                                                                    |
| XP Solutions                                        | Network 2016.1.1                |                                                                                    |

Online Controls for Storm

Orifice Manhole: S2, DS/PN: S1.001, Volume (m³): 0.0

Diameter (m) 0.001 Discharge Coefficient 0.600 Invert Level (m) 48.940

Storage Structures for Storm

Cellular Storage Manhole: S2, DS/PN: S1.001

Invert Level (m) 48.811 Safety Factor 2.5  
 Infiltration Coefficient Base (m/hr) 0.00214 Porosity 0.95  
 Infiltration Coefficient Side (m/hr) 0.00214

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|-----------|-----------|----------------|-----------|-----------|----------------|-----------|-----------|----------------|
| 0.000     | 3.2       | 3.2            | 0.660     | 3.2       | 3.2            | 0.661     | 0.0       | 3.2            |

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

| Simulation Criteria                |                                           |                                     |                   |
|------------------------------------|-------------------------------------------|-------------------------------------|-------------------|
| Areal Reduction Factor             | 1.000                                     | Additional Flow - % of Total Flow   | 0.000             |
| Hot Start (mins)                   | 0                                         | MADD Factor * 10m³/ha Storage       | 2.000             |
| Hot Start Level (mm)               | 0                                         | Inlet Coeffiecient                  | 0.800             |
| Manhole Headloss Coeff (Global)    | 0.500                                     | Flow per Person per Day (l/per/day) | 0.000             |
| Foul Sewage per hectare (l/s)      | 0.000                                     |                                     |                   |
| Number of Input Hydrographs        | 0                                         | Number of Offline Controls          | 0                 |
| Number of Online Controls          | 1                                         | Number of Storage Structures        | 1                 |
|                                    |                                           | Number of Time/Area Diagrams        | 0                 |
|                                    |                                           | Number of Real Time Controls        | 0                 |
| Synthetic Rainfall Details         |                                           |                                     |                   |
| Rainfall Model                     | FSR M5-60 (mm)                            | 19.000                              | Cv (Summer) 0.750 |
| Region                             | England and Wales                         | Ratio R                             | 0.350             |
|                                    |                                           | Cv (Winter)                         | 0.840             |
| Margin for Flood Risk Warning (mm) |                                           |                                     | 300.0             |
| Analysis Timestep                  | 2.5                                       | Second Increment (Extended)         |                   |
| DTS Status                         |                                           |                                     | OFF               |
| DVD Status                         |                                           |                                     | OFF               |
| Inertia Status                     |                                           |                                     | ON                |
| Profile(s)                         |                                           | Summer and Winter                   |                   |
| Duration(s) (mins)                 | 15, 30, 60, 120, 240, 360, 480, 960, 1440 |                                     |                   |
| Return Period(s) (years)           |                                           | 1, 30, 100                          |                   |
| Climate Change (%)                 |                                           | 0, 0, 30                            |                   |

| PN     | US/MH Name | Storm       | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) | Surcharged Depth (m) | Flooded Volume (m³) |
|--------|------------|-------------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|----------------------|---------------------|
| S1.000 | S1         | 1440 Winter | 1             | +0%            |                 |                 |                    |               | 49.495          | 0.000                | 0.000               |
| S1.001 | S2         | 1440 Winter | 1             | +0%            | 1/15 Summer     |                 |                    |               | 49.472          | 0.561                | 0.000               |

| PN     | US/MH Name | Flow / Cap. | Overflow (l/s) | Pipe Flow (l/s) | Status      | Level Exceeded |
|--------|------------|-------------|----------------|-----------------|-------------|----------------|
| S1.000 | S1         | 0.02        |                | 0.1             | SURCHARGED* |                |
| S1.001 | S2         | 0.00        |                | 0.0             | SURCHARGED* |                |

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

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor \* 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coeffiecient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of 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) 19.000

Cv (Summer) 0.750

Region England and Wales

Ratio R 0.350

Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status OFF

DVD Status OFF

Inertia Status ON

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 30

| PN     | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level | Surcharged Depth | Flooded Volume | Flow / Cap. |
|--------|------------|-----------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-------------|------------------|----------------|-------------|
|        |            |           |               |                |                 |                 |                    |               | (m)         | (m)              | (m³)           |             |
| S1.000 | S1         | 60 Winter | 30            | +0%            |                 |                 |                    |               | 49.495      | 0.000            | 0.000          | 0.43        |
| S1.001 | S2         | 60 Winter | 30            | +0%            | 1/15 Summer     |                 |                    |               | 49.472      | 0.561            | 0.000          | 0.00        |

| PN     | US/MH Name | Overflow (l/s) | Pipe       | Status      | Level Exceeded |
|--------|------------|----------------|------------|-------------|----------------|
|        |            |                | Flow (l/s) |             |                |
| S1.000 | S1         |                | 2.7        | SURCHARGED* |                |
| S1.001 | S2         |                | 0.0        | SURCHARGED* |                |

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

| Simulation Criteria                |                                           |                                     |                   |
|------------------------------------|-------------------------------------------|-------------------------------------|-------------------|
| Areal Reduction Factor             | 1.000                                     | Additional Flow - % of Total Flow   | 0.000             |
| Hot Start (mins)                   | 0                                         | MADD Factor * 10m³/ha Storage       | 2.000             |
| Hot Start Level (mm)               | 0                                         | Inlet Coeffiecient                  | 0.800             |
| Manhole Headloss Coeff (Global)    | 0.500                                     | Flow per Person per Day (l/per/day) | 0.000             |
| Foul Sewage per hectare (l/s)      | 0.000                                     |                                     |                   |
| Number of Input Hydrographs        | 0                                         | Number of Offline Controls          | 0                 |
| Number of Online Controls          | 1                                         | Number of Storage Structures        | 1                 |
|                                    |                                           | Number of Time/Area Diagrams        | 0                 |
|                                    |                                           | Number of Real Time Controls        | 0                 |
| Synthetic Rainfall Details         |                                           |                                     |                   |
| Rainfall Model                     | FSR M5-60 (mm)                            | 19.000                              | Cv (Summer) 0.750 |
| Region                             | England and Wales                         | Ratio R                             | 0.350             |
|                                    |                                           | Cv (Winter)                         | 0.840             |
| Margin for Flood Risk Warning (mm) |                                           |                                     | 300.0             |
| Analysis Timestep                  | 2.5 Second Increment (Extended)           |                                     |                   |
| DTS Status                         |                                           |                                     | OFF               |
| DVD Status                         |                                           |                                     | OFF               |
| Inertia Status                     |                                           |                                     | ON                |
| Profile(s)                         |                                           | Summer and Winter                   |                   |
| Duration(s) (mins)                 | 15, 30, 60, 120, 240, 360, 480, 960, 1440 |                                     |                   |
| Return Period(s) (years)           |                                           | 1, 30, 100                          |                   |
| Climate Change (%)                 |                                           | 0, 0, 30                            |                   |

| PN     | US/MH Name | Storm     | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level | Surcharged Depth | Flooded Volume | Flow / Cap. |
|--------|------------|-----------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-------------|------------------|----------------|-------------|
|        |            |           |               |                |                 |                 |                    |               | (m)         | (m)              | (m³)           |             |
| S1.000 | S1         | 60 Winter | 100           | +30%           |                 |                 |                    |               | 49.495      | 0.000            | 0.000          | 0.64        |
| S1.001 | S2         | 60 Winter | 100           | +30%           | 1/15 Summer     |                 |                    |               | 49.472      | 0.561            | 0.000          | 0.00        |

| PN     | US/MH Name | Overflow (l/s) | Pipe Flow (l/s) | Status      | Level Exceeded |
|--------|------------|----------------|-----------------|-------------|----------------|
|        |            |                |                 |             |                |
| S1.000 | S1         |                | 4.0             | SURCHARGED* |                |
| S1.001 | S2         |                | 0.0             | SURCHARGED* |                |