

|                                |                          |            |              |                              |               |
|--------------------------------|--------------------------|------------|--------------|------------------------------|---------------|
| Project<br>Land of Talbot Road |                          |            |              | Job no.                      |               |
| Calcs for<br>Soakaway          |                          |            |              | Start page no./Revision<br>1 |               |
| Calcs by<br>JB                 | Calcs date<br>23/04/2020 | Checked by | Checked date | Approved by                  | Approved date |

## SOAKAWAY DESIGN

### In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.02

#### Design rainfall intensity

|                                                      |                                   |
|------------------------------------------------------|-----------------------------------|
| Location of catchment area                           | Sheffield                         |
| Impermeable area drained to the system               | A = <b>94.0</b> m <sup>2</sup>    |
| Return period                                        | Period = <b>10</b> yr             |
| Ratio 60 min to 2 day rainfall of 5 yr return period | r = <b>0.360</b>                  |
| 5-year return period rainfall of 60 minutes duration | M5_60min = <b>18.9</b> mm         |
| Increase of rainfall intensity due to global warming | p <sub>climate</sub> = <b>0</b> % |

#### Soakaway / infiltration trench details

|                                              |                                 |
|----------------------------------------------|---------------------------------|
| Soakaway type                                | Rectangular                     |
| Minimum depth of pit (below incoming invert) | d = <b>1357</b> mm              |
| Width of pit                                 | w = <b>1000</b> mm              |
| Length of pit                                | l = <b>5000</b> mm              |
| Percentage free volume                       | V <sub>free</sub> = <b>30</b> % |

#### Soil infiltration rate (BRE digest 365)

|                                                   |                                                                                                                                                                  |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Length of trial pit                               | l <sub>trial</sub> = <b>500</b> mm                                                                                                                               |
| Width of trial pit                                | b <sub>trial</sub> = <b>500</b> mm                                                                                                                               |
| Depth of trial pit (below invert)                 | d <sub>trial</sub> = <b>500</b> mm                                                                                                                               |
| Free volume (if fill used)                        | V <sub>trial</sub> = <b>100</b> %                                                                                                                                |
| 75% depth of pit                                  | d <sub>75</sub> = (d <sub>trial</sub> × 0.75) = <b>375.00</b> mm                                                                                                 |
| 50% depth of pit                                  | d <sub>50</sub> = (d <sub>trial</sub> × 0.50) = <b>250.00</b> mm                                                                                                 |
| 25% depth of pit                                  | d <sub>25</sub> = (d <sub>trial</sub> × 0.25) = <b>125.00</b> mm                                                                                                 |
| Test 1 - time to fall from 75% depth to 25% depth | T1 = <b>120</b> min                                                                                                                                              |
| Test 2 - time to fall from 75% depth to 25% depth | T2 = <b>125</b> min                                                                                                                                              |
| Test 3 - time to fall from 75% depth to 25% depth | T3 = <b>123</b> min                                                                                                                                              |
| Longest time to fall from 75% depth to 25% depth  | t <sub>lg</sub> = max(T1, T2, T3) = <b>125</b> min                                                                                                               |
| Storage volume from 75% to 25% depth              | V <sub>p75_25</sub> = (l <sub>trial</sub> × b <sub>trial</sub> × (d <sub>75</sub> - d <sub>25</sub> )) × V <sub>trial</sub> = <b>0.06</b> m <sup>3</sup>         |
| Internal surface area to 50% depth                | a <sub>p50</sub> = ((l <sub>trial</sub> × b <sub>trial</sub> ) + (l <sub>trial</sub> + b <sub>trial</sub> ) × 2 × d <sub>50</sub> ) = <b>0.75</b> m <sup>2</sup> |
| Surface area of soakaway to 50% storage depth     | A <sub>s50</sub> = 2 × (l <sub>trial</sub> + b <sub>trial</sub> ) × d <sub>trial</sub> / 2 = <b>0.500</b> m <sup>2</sup>                                         |
| Soil infiltration rate                            | f = V <sub>p75_25</sub> / (a <sub>p50</sub> × t <sub>lg</sub> ) = <b>11.1×10<sup>-6</sup></b> m/s                                                                |
| Wetted area of pit 50% full                       | a <sub>s50</sub> = l × d + w × d = <b>8144365</b> mm <sup>2</sup>                                                                                                |

#### Table equations

|         |                              |
|---------|------------------------------|
| Inflow  | I = M10 × A                  |
| Outflow | O = a <sub>s50</sub> × f × D |
| Storage | S = I - O                    |

| Duration, D (min) | Growth factor Z1 | M5 rainfalls (mm) | Growth factor Z2 | 10 year rainfall, M10 (mm) | Inflow (m <sup>3</sup> ) | Outflow (m <sup>3</sup> ) | Storage required (m <sup>3</sup> ) |
|-------------------|------------------|-------------------|------------------|----------------------------|--------------------------|---------------------------|------------------------------------|
| 5                 | 0.36             | 6.8               | 1.20             | 8.2                        | 0.77                     | 0.03                      | 0.74                               |
| 10                | 0.51             | 9.6               | 1.22             | 11.7                       | 1.10                     | 0.05                      | 1.05                               |
| 15                | 0.62             | 11.7              | 1.23             | 14.4                       | 1.35                     | 0.08                      | 1.27                               |

|                                |                          |            |              |                              |               |
|--------------------------------|--------------------------|------------|--------------|------------------------------|---------------|
| Project<br>Land of Talbot Road |                          |            |              | Job no.                      |               |
| Calcs for<br>Soakaway          |                          |            |              | Start page no./Revision<br>2 |               |
| Calcs by<br>JB                 | Calcs date<br>23/04/2020 | Checked by | Checked date | Approved by                  | Approved date |

| Duration,<br>D (min) | Growth<br>factor Z1 | M5<br>rainfalls<br>(mm) | Growth<br>factor Z2 | 10 year<br>rainfall,<br>M10<br>(mm) | Inflow<br>(m³) | Outflow<br>(m³) | Storage<br>required<br>(m³) |
|----------------------|---------------------|-------------------------|---------------------|-------------------------------------|----------------|-----------------|-----------------------------|
| 30                   | 0.79                | 14.9                    | 1.24                | 18.5                                | 1.74           | 0.16            | 1.58                        |
| 60                   | 1.00                | 18.9                    | 1.24                | 23.4                                | 2.20           | 0.33            | 1.88                        |
| 120                  | 1.22                | 23.1                    | 1.24                | 28.6                                | 2.69           | 0.65            | 2.04                        |
| 240                  | 1.48                | 28.0                    | 1.23                | 34.4                                | 3.23           | 1.30            | 1.93                        |
| 360                  | 1.67                | 31.6                    | 1.22                | 38.4                                | 3.61           | 1.95            | 1.65                        |
| 600                  | 1.90                | 35.9                    | 1.20                | 43.2                                | 4.06           | 3.26            | 0.80                        |
| 1440                 | 2.42                | 45.7                    | 1.18                | 53.9                                | 5.07           | 7.82            | 0.00                        |

Required storage volume

$$S_{\text{req}} = 2.04 \text{ m}^3$$

Soakaway storage volume

$$S_{\text{act}} = l \times d \times w \times V_{\text{free}} = 2.04 \text{ m}^3$$

**PASS - Soakaway storage volume**

Time for emptying soakaway to half volume

$$t_{s50} = S_{\text{req}} \times 0.5 / (a_{s50} \times f) = 3\text{hr } 7\text{min } 52\text{s}$$

**PASS - Soakaway discharge time less than or equal to 24 hours**