

3136 – Proposed Alterations & Extensions at Midlake House – October 2021

Based on the intrusive site investigation and testing to BRE365 it is considered that the use of soakaways are suitable to serve the development. The testing recorded worst case rate of 6.6×10^{-5} m/s.

The proposed extension comprises impermeable area including:

Proposed Extension	290 m ²
Total Impermeable Area	290 m²

It is proposed to utilise a soakaway to manage surface water runoff from the proposed extension. The soakaway has been designed to accommodate rainfall events up to the 1 in 100 year with 30% allowance for climate. $f = 6.6 \times 10^{-5}$ m/s, Area = 290m²- Soakaway 10m x 1m x 1.2m deep. A copy of the proposed surface water drainage layout and construction details is contained within Appendix E. It is proposed to use Aquacell Eco crates which provide 95% void ratio.

The proposed surface drainage solution should be approved by the local authority prior to commencing any drainage works on site.

Project Midlake House				Job no. 3136	
Calcs for Soakaway				Start page no./Revision 1	
Calcs by SS	Calcs date 06/10/2021	Checked by	Checked date	Approved by	Approved date

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.04

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = 290.0 m ²
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.400
5-year return period rainfall of 60 minutes duration	M5_60min = 19.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 30 %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = 1200 mm
Width of pit	w = 1000 mm
Length of pit	l = 9975 mm
Percentage free volume	V _{free} = 95 %
Soil infiltration rate	f = 64.0 × 10 ⁻⁶ m/s
Wetted area of pit 50% full	a _{s50} = l × d + w × d = 13170303 mm ²

Table equations

Inflow (cl.3.3.1)	I = M100 × A
Outflow (cl.3.3.2)	O = a _{s50} × f × D
Storage (cl.3.3.3)	S = I - O

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m ³)	Outflow (m ³)	Storage required (m ³)
5	0.37;	9.2;	1.89;	17.4;	5.06;	0.25;	4.80
10	0.52;	12.9;	1.96;	25.3;	7.34;	0.51;	6.83
15	0.63;	15.6;	2.00;	31.2;	9.05;	0.76;	8.29
30	0.80;	19.8;	2.03;	40.3;	11.67;	1.52;	10.16
60	1.00;	24.7;	2.01;	49.7;	14.41;	3.03;	11.37
120	1.21;	29.8;	1.97;	58.8;	17.04;	6.07;	10.97
240	1.45;	35.7;	1.92;	68.8;	19.94;	12.14;	7.80
360	1.60;	39.6;	1.89;	75.0;	21.74;	18.21;	3.54
600	1.79;	44.3;	1.86;	82.2;	23.84;	30.34;	0.00
1440	2.24;	55.3;	1.77;	98.1;	28.46;	72.83;	0.00

Required storage volume S_{req} = **11.37** m³

Soakaway storage volume S_{act} = l × d × w × V_{free} = **11.37** m³

PASS - Soakaway storage volume

Time for emptying soakaway to half volume t_{s50} = S_{req} × 0.5 / (a_{s50} × f) = 1hr 52min 25s

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

Project Midlake House				Job no. 3136	
Calcs for Soakway 1 in 30 years				Start page no./Revision 1	
Calcs by SS	Calcs date 18/10/2021	Checked by	Checked date	Approved by	Approved date

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.04

Design rainfall intensity

Location of catchment area Other
Impermeable area drained to the system $A = 290.0 \text{ m}^2$
Return period Period = 30 yr
Ratio 60 min to 2 day rainfall of 5 yr return period $r = 0.400$
5-year return period rainfall of 60 minutes duration $M5_{60\text{min}} = 19.0 \text{ mm}$
Increase of rainfall intensity due to global warming $p_{\text{climate}} = 30 \%$

Soakaway / infiltration trench details

Soakaway type Rectangular
Minimum depth of pit (below incoming invert) $d = 1200 \text{ mm}$
Width of pit $w = 1000 \text{ mm}$
Length of pit $l = 7510 \text{ mm}$
Percentage free volume $V_{\text{free}} = 95 \%$
Soil infiltration rate $f = 66.0 \times 10^{-6} \text{ m/s}$
Wetted area of pit 50% full $a_{s50} = l \times d + w \times d = 10211826 \text{ mm}^2$

Table equations

Inflow (cl.3.3.1) $I = M30 \times A$
Outflow (cl.3.3.2) $O = a_{s50} \times f \times D$
Storage (cl.3.3.3) $S = I - O$

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	30 year rainfall, M30 (mm)	Inflow (m³)	Outflow (m³)	Storage required (m³)
5	0.37;	9.2;	1.48;	13.6;	3.96;	0.20;	3.76
10	0.52;	12.9;	1.51;	19.5;	5.67;	0.40;	5.26
15	0.63;	15.6;	1.53;	23.9;	6.94;	0.61;	6.33
30	0.80;	19.8;	1.54;	30.6;	8.88;	1.21;	7.66
60	1.00;	24.7;	1.53;	37.9;	10.99;	2.43;	8.56
120	1.21;	29.8;	1.51;	45.1;	13.09;	4.85;	8.23
240	1.45;	35.7;	1.49;	53.1;	15.40;	9.71;	5.70
360	1.60;	39.6;	1.47;	58.2;	16.87;	14.56;	2.31
600	1.79;	44.3;	1.45;	64.1;	18.58;	24.26;	0.00
1440	2.24;	55.3;	1.40;	77.7;	22.52;	58.23;	0.00

Required storage volume $S_{\text{req}} = 8.56 \text{ m}^3$

Soakaway storage volume $S_{\text{act}} = l \times d \times w \times V_{\text{free}} = 8.56 \text{ m}^3$

PASS - Soakaway storage volume

Time for emptying soakaway to half volume $t_{s50} = S_{\text{req}} \times 0.5 / (a_{s50} \times f) = 1 \text{ hr } 45 \text{ min } 51 \text{ s}$

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