

Soakaway design for Acorn lodge

The soakaway has been designed following BRE365

Author: George Fletcher Ceng MICE

Date:17/04/2026

Site information

Description	Information
Details of premises	NGR: SK5004108875 Easting/ Northing: 450041 308875 Acorn Lodge (proposed), Leicester Road, Markfield, LE67 9RH Domestic property Impermeable surface area Garage area = 63m ² House area = 183m ² Total impermeable area = 249m ²

Results from the trial hole

A trial hole was excavated on the 30/03/2026. As per BRE365 this is at a suitable time for worst case scenario for the ground water levels.

Depth (meters) from ground level	Material
0 - 0.3	Topsoil – brown friable
0.3 - 0.5	Silt
0.5- 1.4	Clay – red
1.4-1.5	Grey – mudstone - water table encountered and noted seeping through the layer.
1.5-2.3	Clay – red

Design Rainfall

Rainfall Ratio figure 3 : Ratio of 60min to 2 day rainfall duration of a 5 year return period. from BRE365

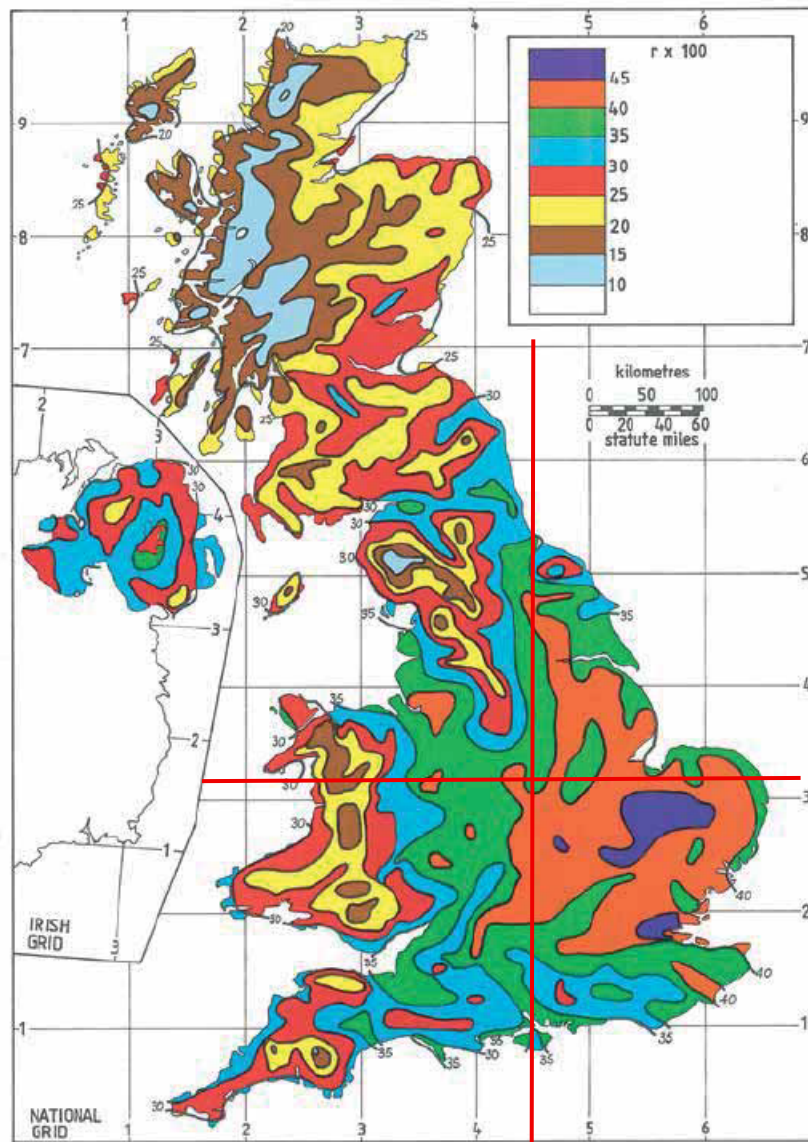


Figure 3: Ratio of 60-min to 2-day rainfall duration of a 5-year return period^[1] (image © Department for Environment, Food & Rural Affairs)

Using the site coordinates in figure 3 from BRE365 gives a ratio of 0.39

Using this value and tables 1+2 from BRE365 the following rainfall table was

developed.

Storm Duration D(min)	Z1	M5-D min = 20mm x Z1	Z2 for 10 year return period	M10-D min = R(mm)	Z2 for 100 year return period	M100-D min = R(mm)
10	0.52	10.4	1.22	12.69	1.91	19.86
15	0.63	12.6	1.23	15.50	1.95	24.57
30	0.8	16	1.24	19.84	2.00	32.00
60	1	20	1.24	24.80	2.03	40.60
120	1.21	24.2	1.24	30.01	2.01	48.64
240	1.46	29.2	1.22	35.62	1.97	57.52
360	1.62	32.4	1.21	39.20	1.94	62.86
600	1.82	36.4	1.19	43.32	1.90	69.16
1440	2.28	45.6	1.17	53.35	1.81	82.54

Soil infiltration rate

Following BRE365 a Trial hole was excavated by the land owner and trial test results supplied for the calculations.

The trial hole was 0.9m wide, 2m long and 1m deep.

The time taken to reduce the water level to reduce from 75% (0.75m) and 25%(0.25m). The test was repeated 3 times with the longest duration to reduce from 75% to 25% was 236minute. This was used in the calculations as per BRE365 and is the conservative approach.

Using the information gathered from the trial test the following infiltration rate was calculated.

Soil infiltration rate (f) = $V_{p75-25}/a_{s50} \times t_{p75-25}$

V_{p75-25} = effective storage volume of water in the soakage trial pit between 75% and 25%

a_{s50} = the internal surface area of the soakage trial pit up to 50% effective storage depth and including the base area

t_{p75-25} = the time for the water level to fall from 75% to 25% effective storage depth.

Soil infiltration rate (f) = 1.35×10^{-5} m/s

Outflow from the soakaway

Outflow from the soakaway (O) - the design calculation allowed dimension of the width and length of the soakaway to change to determine the size needed to control the inflows. The is tabulated in the below table.

$$O = as_{50} \times f \times D$$

as_{50} = internal surface area of pit to 50% storage depth (excluding base area)

f = Soil percolation rate

D = storm duration

Inflow

The inflow (I) was calculated using the rainfall for a 10 year return period and impermeable area for the site and altered depending on the duration of the event – M10-Dmin.

Soakaway storage volume

This was set up the calculations and altered to ensure that the inflows were equalised. The calculations used a 30% free volume rate for the storage volume.

Table of results

The depth of the soakaway was fixed at 1m to target permeable layer for infiltration while the width and length of the soakaway were altered to ensure that the outflow and storage was greater than the inflow. The below table uses the 10 year return period rainfall.

Soakaway dimensions

Width = 1.8m

Length = 12m

Depth = 1m

Storm Duration D(min)	I=Inflow m3 M10- Dmin	S=Soakaway storage volume (m3)	O=Outflow(m3)	S+O	(S+O)- I
10	3.17	6.48	0.11	6.59	3.42
15	3.87	6.48	0.17	6.65	2.77
30	4.96	6.48	0.33	6.81	1.85
60	6.20	6.48	0.67	7.15	0.95
120	7.50	6.48	1.34	7.82	0.32
240	8.91	6.48	2.68	9.16	0.25
360	9.80	6.48	4.02	10.50	0.70

600	10.83	6.48	6.70	13.18	2.35
1440	13.34	6.48	16.08	22.56	9.22

Note all values for (S+O-I) are greater than zero showing that the dimensions are suitable.

The results show that the controlling design event is the M10 – 4hour.

Plan of soakaway location

