Your ref
Our ref 230276-00
File ref

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22 September 2014

Dear Simon

RBKC Planning Policy (basements)

You have asked for an example or illustrative calculation of the residual garden area that would be required as a proportion of the original area to be drained, for a garden in the southern part of the RBKC, which is underlain by sand and gravel of the River Terrace Deposits (RTD).

On the basis of the particle size distribution (PSD) from the geotechnical investigation at Evelyn Gardens which you have provided to me I estimate the permeability as being about 4×10^{-4} m/s. This is quite high.

Table 4.4 in CIRIA report 156 "Infiltration Drainage – Manual of Good Practice" gives ranges of infiltration coefficient for sand and for gravel as from 0.1 – 100 mm/hr and 10 – 1000 mm/hr respectively. The material described in the geotechnical report for the Evelyn Gardens site would probably fit within this range; an infiltration value of 100 mm/hr would be quite a conservative estimate but the figure could well be much higher.

A garden underlain by material with an infiltration coefficient greater than 100 mm/hr would be very well drained. I would not expect waterlogging to occur even during a severe rainfall event. Such an event might have an intensity of 50 mm/hr (see Table 4.5 in the CIRIA report). The infiltration capacity of this particular garden is more than adequate to drain a storm of double the likely maximum event.

Another way of looking at this would be to say that all the rain falling upon such a garden could be drained from only a minor part of the garden, if the remainder were to be made impermeable.

I think it quite possible that the proportion could be 1:4 given the figures I have quoted above. However, given the range of possible coefficients for the ground as noted above, I must emphasize that a proper hydrogeological investigation should be carried out at any site where such a scheme is proposed, and this should include measurements of infiltration

as well as permeability testing. Furthermore, the design of the eventual scheme should fully take into account the results of such an investigation.

Yours sincerely

David Whitaker
Associate Hydrogeologist

Attached: Tables 4.4 and 4.5 from CIRIA 156

CIRIA tables 4.4 and 4.5

To be attached to Arup 230276-00 dated 22 September 2014

Table 4.4 Typical infiltration coefficients based on soil texture (Watkins, 1995)

Soil type	Infiltration coefficient (mm/h)
gravel	10 – 1000
sand	0.1 – 100
loamy sand	0.01 – 1
sandy loam	0.05 – 0.5
loam	0.001 – 0.1
silt loam	0.0005 – 0.05
chalk	0.001 – 100
cut off point for most infiltration drainage systems	0.001
sandy clay loam	0.001 – 0.01
silty clay loam	0.00005 – 0.005
clay	< 0.0001
till	0.00001 – 0.01
rock	0.00001 – 0.1

Table 4.5 *M*10 rainfall intensity (mm/h) for duration *D* and ratio *r*

England & Wales

Rainfall duration (*D*)										
	Minutes				Hours					
r	5	10	15	30	1	2	4	6	10	24
0.12	62.9	49.0	43.16	33.0	24.80	18.1	12.8	10.6	8.44	5.65
0.15	71.4	55.2	46.8	39.2	24.80	17.5	12.0	9.59	7.43	4.61
0.18	77.2	59.5	49.8	35.2	24.80	16.7	11.2	8.85	6.63	4.08
0.21	82.8	62.5	52.7	36.2	24.80	16.4	10.6	8.41	6.13	3.42
0.24	89.3	67.3	54.6	37.2	24.80	16.1	10.3	7.93	5.62	3.21
0.27	95.0	70.3	57.1	37.7	24.80	15.7	9.92	7.52	5.29	2.97
0.30	97.9	71.8	58.0	38.2	24.80	15.5	9.58	7.12	5.05	2.75
0.33	100.0	73.2	60.0	38.7	24.80	15.2	9.33	6.98	4.85	2.53
0.36	104.0	74.6	61.0	39.2	24.80	15.1	9.03	6.73	4.56	2.36
0.39	107.0	76.1	62.0	39.7	24.80	15.0	8.90	6.53	4.37	2.24
0.42	111.0	77.6	63.0	40.2	24.80	14.9	8.73	6.38	4.21	2.12
0.45	114.0	79.1	64.0	40.7	24.80	14.8	8.49	6.14	4.07	2.01

Scotland & N. Ireland

Rainfall duration (*D*)										
	Minutes				Hours					
r	5	10	15	30	1	2	4	6	10	24
0.12	89.8	48.1	42.8	32.2	23.80	17.5	12.7	10.6	8.44	5.65
0.15	102.0	53.8	45.7	33.1	23.80	16.8	11.8	9.51	7.43	4.61
0.18	110.0	58.1	48.6	34.1	23.80	16.0	10.9	8.70	6.58	4.08
0.21	118.0	60.9	51.9	35.0	23.80	15.7	10.4	8.27	6.08	3.42
0.24	126.0	65.7	53.3	36.0	23.80	15.3	10.1	7.80	5.57	3.18
0.27	143.0	68.5	55.2	36.5	23.80	15.0	9.67	7.33	5.24	2.97
0.30	147.0	70.0	56.2	37.0	23.80	14.7	9.26	6.94	4.96	2.72
0.33	151.0	71.4	58.1	37.4	23.80	14.5	9.03	6.80	4.77	2.51
0.36	156.0	72.8	59.0	37.9	23.80	14.4	8.73	6.57	4.45	2.34
0.39	160.0	74.3	60.5	38.4	23.80	14.3	8.61	6.37	4.26	2.20
0.42	164.0	75.7	61.4	38.9	23.80	14.2	8.38	6.17	4.11	2.11
0.45	168.0	77.1	62.4	39.4	23.80	14.0	8.14	5.94	3.96	1.98