SURFACE WATER DRAINAGE DESIGN

ADDENDIUM TO 34109/R004/AJB

HOWE BARRACKS

April 2018
34109/R004/AJB

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Date 23/05/2018 16:58	Designed by AJB	
File PHASE 1 SW REV.MDX	Checked by	
Causeway	Network 2015.1	

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 Coefficient 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 8 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model   FSR   Ratio R 0.379
Region England and Wales Cv (Summer) 0.750
M5-60 (mm)   19.800 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm)   300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status   ON
DVD Status   ON
Inertia Status   ON

Profile(s)   Summer and Winter
Duration(s) (mins)   15, 30, 60, 120, 180, 240, 360, 480, 600, 720,
960, 1440, 2160, 2880, 4320, 5760, 7200, 8640,
10080
Return Period(s) (years)   100
Climate Change (%)   20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	ASV2	60 Winter	100	+20%	100/15 Winter				50.281
1.001	ASV1	60 Winter	100	+20%	100/15 Summer				50.277
1.002	AS1	60 Winter	100	+20%	100/15 Summer				50.266
2.000	AS13	60 Winter	100	+20%	100/60 Winter				50.300
2.001	AS14	60 Winter	100	+20%	100/60 Winter				50.295
2.002	AS15	60 Winter	100	+20%	100/15 Summer				50.273
2.003	AS16	60 Winter	100	+20%	100/15 Winter				50.262
1.003	AS2	60 Winter	100	+20%	100/15 Summer				50.244
3.000	AS17	60 Winter	100	+20%	100/30 Summer				50.271
3.001	AS18	60 Winter	100	+20%	100/15 Winter				50.263
3.002	AS19	60 Winter	100	+20%	100/15 Summer				50.249
1.004	AS3	60 Winter	100	+20%	100/15 Summer				50.242
1.005	AS4	60 Winter	100	+20%	100/15 Summer				50.239
1.006	AS5	60 Winter	100	+20%	100/15 Summer				50.236
4.000	AS20	180 Winter	100	+20%	100/60 Winter				49.348
4.001	AS21	180 Winter	100	+20%	100/60 Winter				49.348
4.002	AS22	180 Winter	100	+20%	100/60 Winter				49.348
4.003	AS23	180 Winter	100	+20%	100/60 Summer				49.323
5.000	AS24	15 Winter	100	+20%					49.557
6.000	AS26	15 Winter	100	+20%					49.832
5.001	AS25	180 Winter	100	+20%					49.300

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Causeway	Network 2015.1	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.007	AS6	180 Winter	100	+20%	100/30 Summer				49.300
7.000	AS27	180 Winter	100	+20%	100/120 Summer				48.952
1.008	AS7	180 Winter	100	+20%	100/15 Summer				48.952
1.009	AS8	180 Winter	100	+20%	100/15 Winter				48.593
1.010	AS9	180 Winter	100	+20%	100/30 Winter				48.212
8.000	AS28	360 Winter	100	+20%	100/60 Summer				47.827
9.000	AS30	360 Winter	100	+20%	100/60 Winter				47.827
8.001	AS29	360 Winter	100	+20%	100/60 Summer	100/180 Winter			47.827
1.011	AS10	360 Winter	100	+20%	100/30 Summer	100/120 Winter			47.828
1.012	AS11	240 Winter	100	+20%	100/15 Summer	100/120 Winter			47.850
1.013	AS12	360 Winter	100	+20%	100/15 Summer	100/120 Winter			47.862

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.007	AS6	1.225	0.000	0.01		27.6	SURCHARGED	
7.000	AS27	0.767	0.000	0.01		1.9	SURCHARGED	
1.008	AS7	2.092	0.000	0.01		16.5	SURCHARGED	
1.009	AS8	2.068	0.000	0.02		17.0	SURCHARGED	
1.010	AS9	1.927	0.000	0.01		17.3	SURCHARGED	
8.000	AS28	1.272	0.000	0.01		4.9	FLOOD RISK	
9.000	AS30	0.812	0.000	0.01		1.6	FLOOD RISK	
8.001	AS29	1.707	6.702	0.02		7.8	FLOOD	4
1.011	AS10	2.088	27.858	0.04		37.5	FLOOD	9
1.012	AS11	2.315	0.368	0.03		26.3	FLOOD	8
1.013	AS12	3.077	0.055	0.40		15.1	FLOOD	6

Site — Royal Parade
Job No. — 34109
Borehole — SS101

	Width	Length	Depth
Trial Pit Dimensions	0.45 m	1.1 m	0.65 m

Filled Water Level	0.269 m
75% effective depth	0.36425 m
50% effective depth	0.4595 m
25% effective depth	0.55475 m
Soil type at test depth	Made Ground

The infiltration rate (f) is given by;

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

where:

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

a_{p50} = the internal surface area of the trial pit up to 50% effective depth and including the base area

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

Time (mins)	Depth m
0.1	0.269
0.5	0.29
1	0.297
1.5	0.301
2.5	0.307
3	0.311
3.5	0.318
4	0.327
5	0.329
7.5	0.352
10	0.363
15	0.389
20	0.402
30	0.435
92	0.573
123	0.62
174	0.692
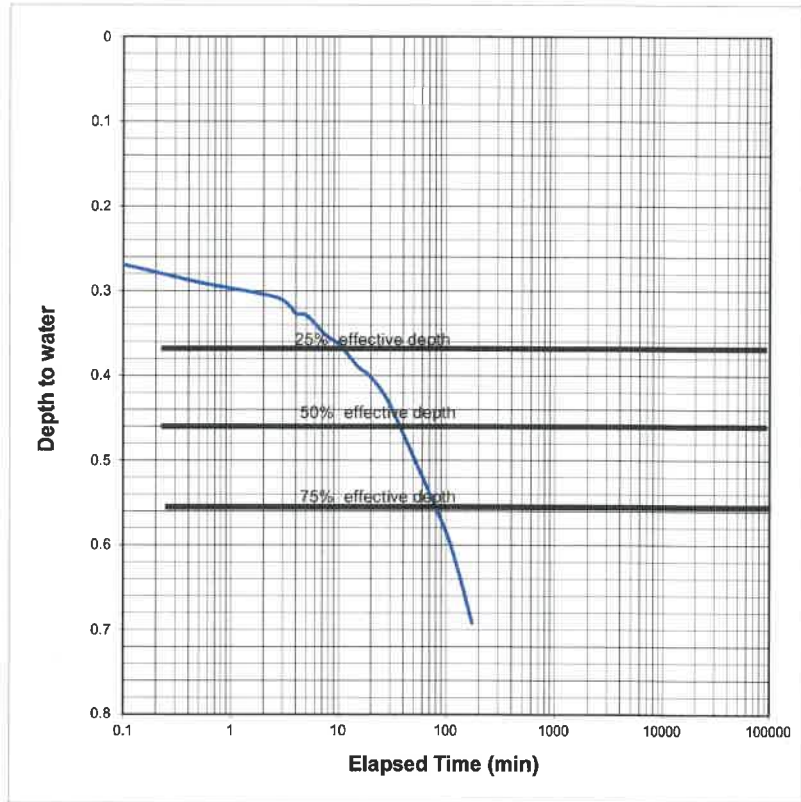
V_{p75-25} =	0.0942975 m3	m3
a_{p50} =	1.08555 m2	**Infiltration factor**
* t_{p75-25} =	4200 seconds	f = 2.06824E-05 ms^{-1}

Note;
* Indicates that the full drainage was not achieved within the duration of the test. Consequently, the infiltration valu has been calculated using the reduced depth test as outlined in BRE 365. Caution should be applied to the value obtained and where possible further long term testing carried out.

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Soakaway Test

Site Royal Parade
Job No. 34109
Borehole SS102

	Width	Length	Depth
Trial Pit Dimensions	0.45 m	1.2 m	0.7 m

Filled Water Level 0.269 m

75% effective depth 0.37675 m

50% effective depth 0.4845 m

25% effective depth 0.59225 m

Soil type at test depth Made Ground

The infiltration rate (f) is given by;

$$f = \frac{V_{p76-25}}{a_{p50} \times t_{p75-25}}$$

where:

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

a_{p50} = the internal surface area of the trial pit up to 50% effective depth and including the base area

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

Time (mins)	Depth m
0.1	0.134
0.5	0.145
1	0.155
2	0.165
3	0.173
4	0.186
5	0.19
7.5	0.2
16.5	0.253
27	0.29
48	0.298
119	0.405
201	0.463
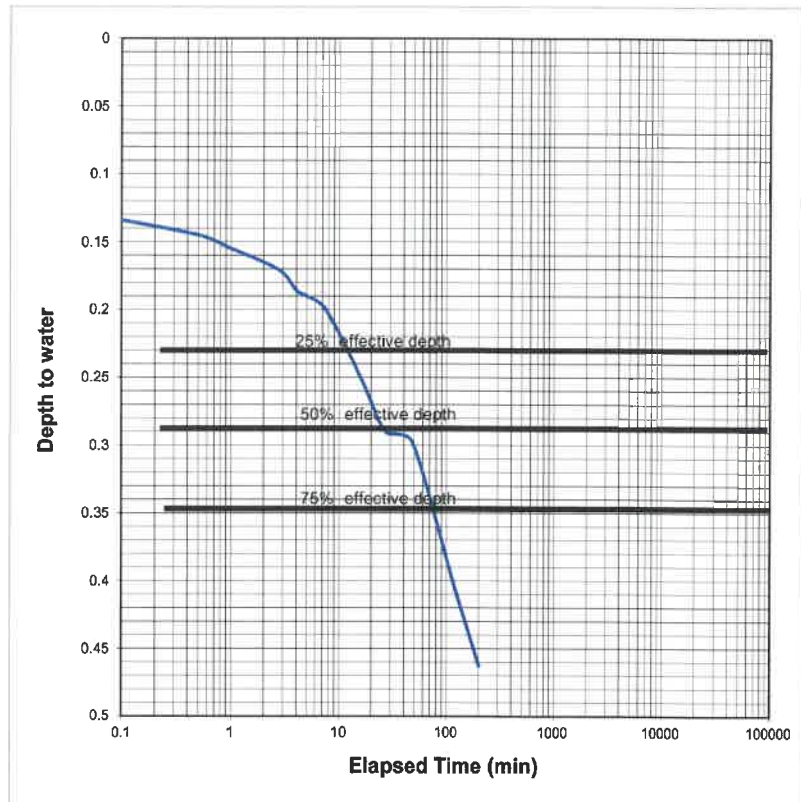
V_{p75-25} = 0.11637 m3 m3

a_{p50} = 1.25115 m2 **Infiltration factor**

* t_{p75-25} = 3900 seconds f = 2.38488E-05 ms^{-1}

Note;
* Indicates that the full drainage was not achieved within the duration of the test. Consequently, the infiltration valu has been calculated using the reduced depth test as outlined in BRE 365. Caution should be applied to the value obtained and where possible further long term testing carried out.

Site   Royal Parade
Job No.   34109
Borehole   SS103 Test 1

	Width	Length	Depth
Trial Pit Dimensions	0.45 m	1.0 m	0.62 m

Filled Water Level	0.193 m
75% effective depth	0.29975 m
50% effective depth	0.4065 m
25% effective depth	0.51325 m
Soil type at test depth	Made Ground

The infiltration rate (f) is given by;

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

where:

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

a_{p50} = the internal surface area of the trial pit up to 50% effective depth and including the base area

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

Time (mins)	Depth m
0.1	0.193
0.5	0.21
1	0.217
1.5	0.226
2	0.231
2.5	0.244
3	0.251
3.5	0.26
4	0.269
5	0.278
7.5	0.291
10	0.316
15	0.342
65	0.38
82.5	0.45
178	0.486
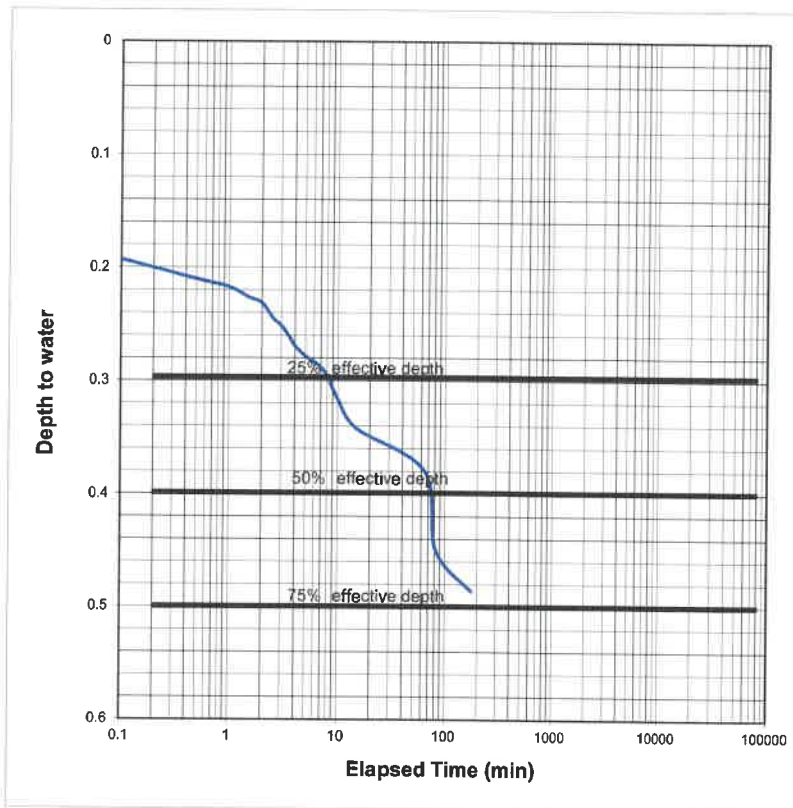
V_{p75-25} =	0.096075 m3	m3
a_{p50} =	1.06915 m2	Infiltration factor
* t_{p75-25} =	8520 seconds	f = 1.05471E-05 ms^{-1}

Note;
* Indicates that the full drainage was not achieved within the duration of the test. Consequently, the infiltration valu has been calculated using the reduced depth test as outlined in BRE 365. Caution should be applied to the value obtained and where possible further long term testing carried out.

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Soakaway Test

Site	Royal Parade		
Job No.	34109		
Borehole	SS103 Test 2		

	Width	Length	Depth
Trial Pit Dimensions	0.45 m	1.0 m	0.62 m

Filled Water Level	0.146 m
75% effective depth	0.2645 m
50% effective depth	0.383 m
25% effective depth	0.5015 m
Soil type at test depth	Made Ground

The infiltration rate (f) is given by;

$$f = \frac{V_{p75\text{-}25}}{a_{p50} \times t_{p75\text{-}25}}$$

where:

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

a_{p50} = the internal surface area of the trial pit up to 50% effective depth and including the base area

$t_{p75\text{-}25}$ = the time for the water level to fall from 75% to 25% effective depth

Time (mins)	Depth m
0.1	0.146
0.5	0.149
1	0.155
1.5	0.156
2	0.161
2.5	0.168
5	0.18
8	0.199
12	0.219
16	0.238
100	0.328
150	0.486
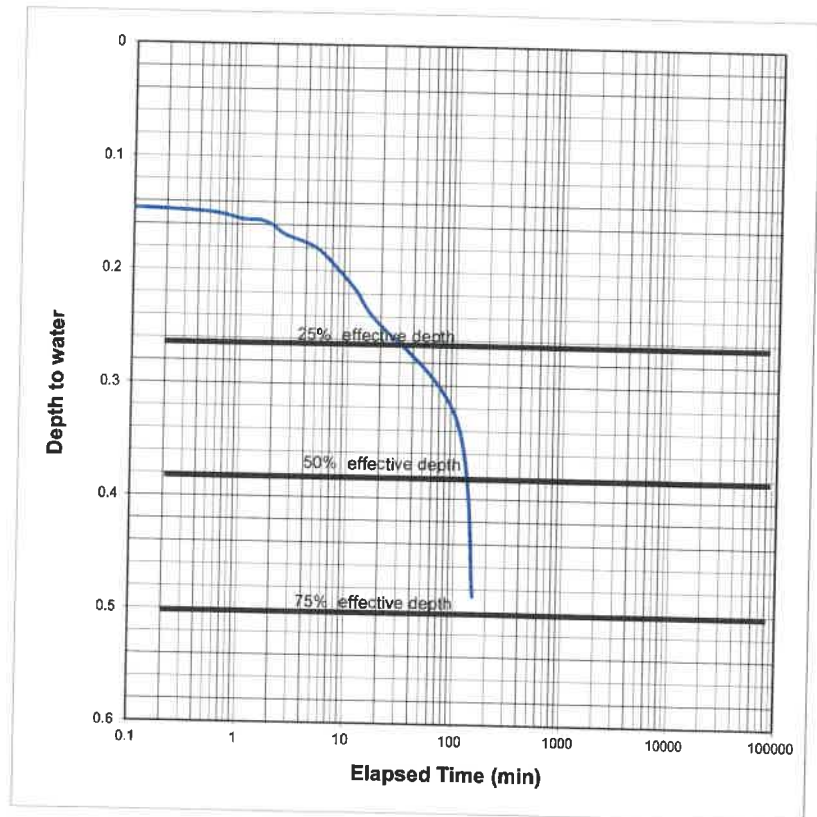
$V_{p75\text{-}25}$ =	0.10665 m3	m3	
a_{p50} =	1.1373 m2	Infiltration factor	
* $t_{p75\text{-}25}$ =	8520 seconds	f =	1.10064E-05 ms⁻¹

Note;
* Indicates that the full drainage was not achieved within the duration of the test. Consequently, the infiltration valu has been calculated using the reduced depth test as outlined in BRE 365. Caution should be applied to the value obtained and where possible further long term testing carried out.