Civil | Structural | Geo-Environmental | Transport Planning

Flood Risk Assessment and Drainage Strategy

Addendum Report

Prepared for
Keepmoat Homes

Proposed Residential Development of
Land at Eakring Road, Bilsthorpe

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-	09 July 2020	First Draft	Adrian Greenaway	Rob Travis

Contents

1.0 INTRODUCTION

1.1 Background

1.1.1 This Flood Risk Addendum report has been prepared by Travis Baker on behalf of Keepmoat to provide a response to Nottinghamshire County Council Lead Local Flood Authority objections to the scheme.

1.1.2 The site area is in excess of 1 hectare and a flood risk assessment is therefore required. It has been prepared under the guidance of the National Planning Policy Framework (NPPF) and associated technical guidance. The site is located within flood zone 1 and is not affected by fluvial flooding from nearby rivers, the report will therefore focus on other possible flood risk to or from the development and the sustainable disposal of surface water.

1.1.3 The potential effects of climate change on future rainfall intensity will also be taken into account.

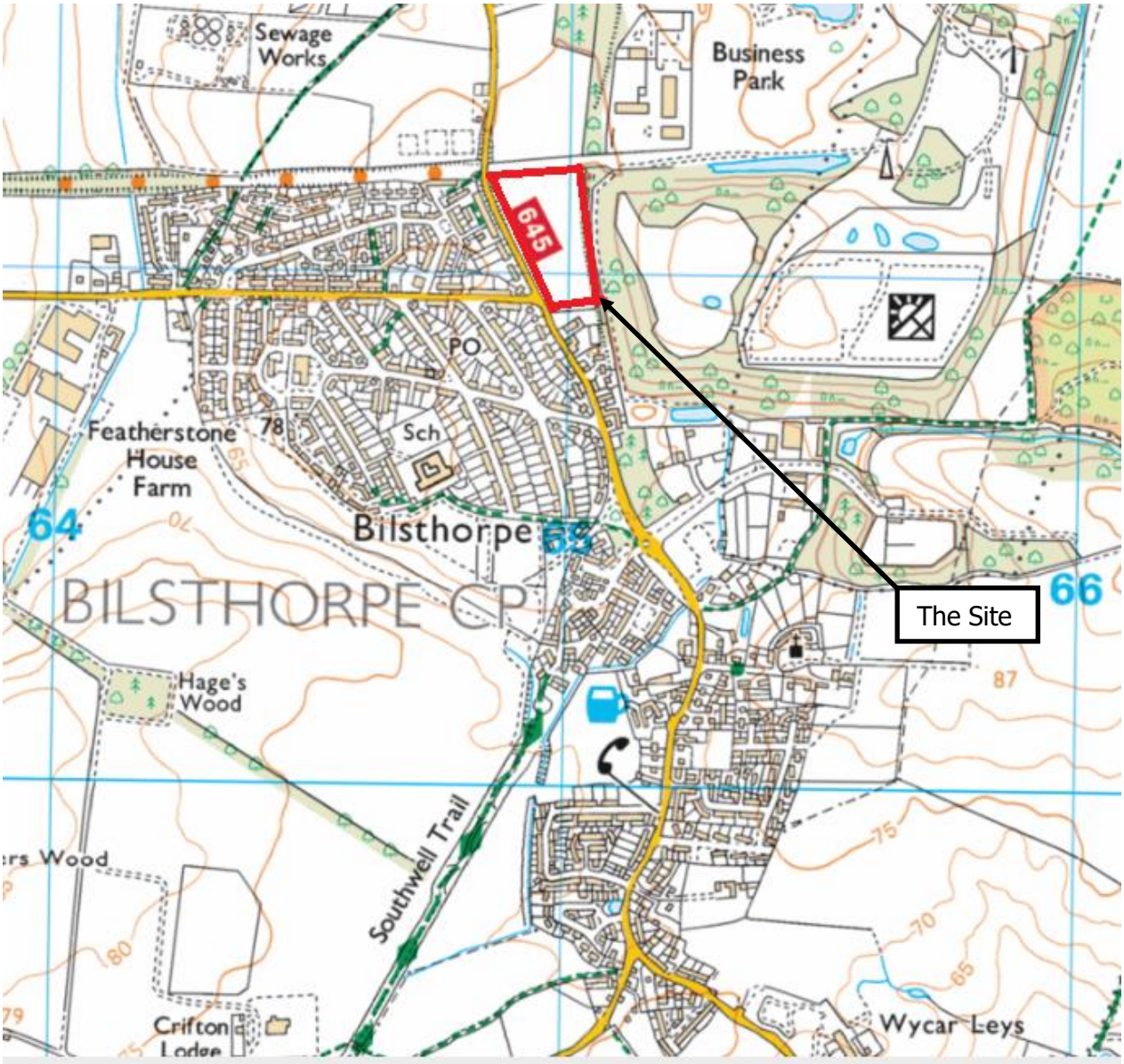
1.2 Site Location and Surroundings

1.2.1 The site is located to the northeast of Bilsthorpe Village, Nottinghamshire, approximately 12km to the east of Mansfield. The centre of the site is at approximate grid reference 464961, 361054 and extends over an area of approximately 3.8 hectares.

1.2.2 The site is rectangular with a footpath crossing the centre of the site, and comprised of open grassland with trees running along the boundary

1.2.3 There are fields to the north and east of the site, with residential developments to the west and factories to the south.

1.2.4 The site location is shown below.



1.3 Development Proposals

1.3.1 The proposed development will provide 103 new dwellings by Keepmoat Homes. The main access along with pedestrian access into the site will be from Eakring Road, on the western side of the site.

1.3.2 The proposed site layout, which also incorporates the proposed drainage strategy, is contained in the appendices.

2.0 NOTTINGHAMSHIRE COUNTY COUNCIL LLFA COMMENTS

2.1 Objections

2.1.1 Details of a proven outfall from site in accordance with the drainage hierarchy the following options should be considered, in order of preference: infiltration, discharge to watercourse, discharge to surface water sewer or discharge to combined sewer.

2.1.2 Evidence the maximum discharge is set to the QBar Greenfield run-off rate for the positively drained area of development.

2.1.3 Show the SUDS systems will be incorporated into the surface water management scheme for the site, preference should be given to above ground SUDS which provide multi-functional benefits.

2.1.4 Details of who will manage and maintain all drainage features for the lifetime of the development will be required prior to construction.

2.2 Travis Baker Response

2.2.1 Infiltration tests were carried out as part of the Geo-Environmental Assessment Report, and as stated in paragraph 6.9.7 most of the site exhibits poor soil infiltration rates and that materials are unlikely to be considered suitable for soakaway drainage. There are no watercourses within or near the site boundary. The surface water sewers are proposed to drain into a public combined water sewer drain at the south west corner of the site. The foul is split into two networks, one that drains to the combined sewer in the mid-western part of the site and the other half to the south western corner with the proposed storm drainage. There are no existing foul water sewers in the vicinity of the boundary.

2.2.2 The calculated Qbar value per hectare is 0.3l/s, however this is too small a value to be practical for a flow control device without risk of blockage. Severn trent has stated an acceptable discharge rate for the site of 5l/s/ha. The site has an impermeable area of approximately 1.6Ha resulting in an allowable discharge rate of 8l/s. However, we have approached this conservatively and limited the discharge rate to 5l/s.

2.2.3 A pond is used for the above ground SUDS systems of the site.

2.2.4 A management company for the pond will be selected nearer the build completion date.

3.0 APPENDICES

Appendix A: Drainage Strategy – drawing number 8B

Appendix B: Trial Pit Location Plan, Infiltration Test Results and Report Extract Travis Baker Geo-Environmental

Appendix C: Q Bar Calculation Per Hectare

Appendix D: Nottinghamshire County Council objection letter dated 6th July 2020

Appendix A

Drainage Strategy

Drawing number 8B

PROPOSED FOUL DRAINAGE HAS BEEN INDICATIVELY DESIGNED TO HAVE 1M COVER TO PROPOSED ROAD LEVELS TO REDUCE THE AMOUNT OF LEVEL LIFT REQUIRED. THIS RESULTS IN THE PROPOSED FOUL DRAINAGE REQUIRING CONCRETE SLAB PROTECTION TO ALLOW THE FOUL DRAINAGE TO DRAIN VIA GRAVITY TO THE EXISTING COMBINED WATER SEWER

1. DO NOT SCALE FROM THIS DRAWING. IF IN DOUBT CONTACT TRAVIS BAKER LIMITED.
2. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS RELATING TO THIS PROJECT.
4. ALL DIMENSIONS SHOULD BE CHECKED ON SITE PRIOR TO CONSTRUCTION. ANY DISCREPANCIES SHOULD BE IMMEDIATELY NOTIFIED IN WRITING TO TRAVIS BAKER LIMITED.
5. THE CONTRACTOR SHALL PRIOR TO CONSTRUCTION CHECK AND VERIFY THAT THE DETAILS SHOWN ON THIS DRAWING ARE FULLY COMPATIBLE WITH ANY AS CONSTRUCTED DIMENSIONS OR LEVELS. ANY DISCREPANCIES TO BE REPORTED IMMEDIATELY IN WRITING TO TRAVIS BAKER LIMITED.
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ALL INFORMATION IS INDICATIVE ONLY SUBJECT TO DETAILED DESIGN

KEY

- EXISTING COMBINED WATER SEWER
- EXISTING FOUL WATER SEWER
- EXISTING STORM WATER SEWER
- EXISTING HIGHWAY DRAIN
- 71.71 + EXISTING GROUND LEVEL
- 71.80+ PROPOSED LEVEL
- PROPOSED STORM SEWER
- PROPOSED FOUL SEWER
- BANKING
- RET 0.35m RETAINING FEATURE
- FFL 72.100 FINISHED FLOOR LEVEL
- HEADWALL
- EASEMENT
- +1050mm LEVEL DIFFERENCE BETWEEN PROPOSED AND EXISTING LEVELS

DRIVES TO ADOPTABLE CONSTRUCTION FOR FIRE REGULATIONS

POS 1854 SQ.M

RETAIL

POND

EX STW CWS MH CL71.89 IL 70.19

EX STW CWS MH REF. 9901 CL70.99 (Topo Survey) IL 69.315 (Topo Survey)

Ex Highway Drain REF 9902 CL70.890 (Topo Survey) IL 69.740 (Topo Survey)

EX STW CWS MH REF 9801 CL70.49 (Topo Survey) IL 69.095 (Topo Survey)

Ex STW SWS MH REF. 9802 CL70.48 (Topo Survey) IL 69.44 (Topo Survey)

REV	DESCRIPTION	DATE	BY	AUTH
B	INSERTED NEW LAYOUT, AMENDMENTS TO SUIT	26.05.20	AG	GE
A	INSERTED NEW LAYOUT, AMENDMENTS TO FOUL NEAR PLOT 68	19.05.20	AG	GE

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CLIENT: KEEPMOAT HOMES

PROJECT: EAKRING ROAD, BILSTHORPE

TITLE: DRAINAGE STRATEGY - OPTION 5 (WITH ADDITIONAL PLOTS)

DRAWN	AUTHORISED	SCALE	DATE
GE	RWT	1:500@A0	21.02.20

PROJECT NO.	DRAWING NO.	REV
19017	8	B

STATUS: INDICATIVE

Appendix B

Trial Pit Location Plan, Infiltration Test Results

And Report Extract Travis Baker Geo-Environmental

DRIVES TO ADOPTABLE CONSTRUCTION FOR FIRE REGULATIONS

KEY:

- TP8 — TRIAL PIT LOCATION
- SA6 — SOAKAWAY LOCATION
- TRLDCP6 — DYNAMIC CONE PENETROMETER LOCATION
- DS4 — DYNAMIC SAMPLE LOCATION
- DS6 — BOREHOLE WITH GAS MONITORING STANDPIPE
- SITE BOUNDARY
- RECORDED WATER MAIN
- UNDERGROUND ELECTRICITY CABLE

APPROXIMATE LINE OF FENCE

HAY BALES ACROSS OPENING

2.0m HIGH CHAIN LINK SECURITY FENCE

2m Footpath to be constructed. Existing Hedge to be trimmed back as necessary.

2m Footpath to be constructed - link to existing. Existing Hedge to be trimmed back as necessary.

EAKRING ROAD

POS

RETAIL

ATTENUATION POND

Sport

REV	DESCRIPTION	DATE	BY	AUTH
A	SOAKAWAY LOCATIONS AMENDED.	06.08.19	TD	LG

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CLIENT
KEEPMOAT HOMES

PROJECT
EAKRING ROAD, BILSTHORPE

TITLE
EXPLORATORY HOLE LOCATION PLAN

DRAWN	AUTHORISED	SCALE	DATE
TD	LG	1:500-@A1	06.06.19

PROJECT NO.	DRAWING NO.	REV
19017	GE01	A

STATUS.
DRAFT

6.9.7 Based on the results of soakaway testing and associated assessments it is considered that the granular materials of the weathered Chester Formation underlying most of the site exhibit poor soil infiltration rates in respect of potential soakaway drainage. These materials are unlikely to be considered suitable for soakaway drainage.

6.10 Hard Strata

6.10.1 Hard strata (i.e. bedrock) was encountered within several of the exploratory hole locations between 1.5m and 2.85m below ground level.

6.10.2 TP05, TP07, DS03 and DS05 encountered extremely weak grey-green siltstone at the base of the trial pits and boreholes. Hard digging was recorded within the aforementioned trial pits and drilling progress refused within siltstone. These materials are considered to be representative of Retford Member strata.

6.10.3 TP01, TP02 and TP06 recorded hard digging at the base of the excavations. The material encountered was extremely weak pale grey brown sandstone representative of the Chester Formation.

6.10.4 The locations and depth to hard strata encountered during the recent site investigation works is illustrated on Drawing 19017-GE02.

6.11 Founding Horizon

6.11.1 The in-situ SPTs and laboratory geotechnical test results indicate that material of the weathered Retford Member and weathered Chester Formation would generally provide suitable founding strata for the proposed 2 to 3 storey residential housing. These materials are generally considered suitable for the construction of traditional strip and trench fill foundations at a minimum depth of 0.75m below existing ground level within the Chester Formation (low volume change potential) and 0.9m below existing ground level within the Retford Member (medium volume change potential). For preliminary design purposes it is recommended that a net allowable bearing pressure of 100kN/m^2 will be appropriate for the uppermost weathered component of the Chester Formation and 125kN/m^2 for the weathered Retford Member materials. The proposed net allowable bearing pressures would be suitable for a traditional strip or trench fill foundation up to 1m wide; settlements would be restricted to less than 25mm for such a foundation. If greater bearing pressures are required foundations could be deepened, a net allowable bearing pressure of 150kN/m^2 would be applicable for foundations in the order of 2.0m below existing ground level.

6.11.2 The cohesive materials of the Retford Member have been classified as having medium volume change potential; the localised cohesive materials of the Chester Formation have been classified as having a low volume change potential and are therefore susceptible to shrinkage / heave within influencing distance of trees. Foundations are required to be deepened for plots located within the influencing distance of trees. Heave protection measures may also be required to be installed within localised plots located within close proximity to existing trees or hedgerows.

6.11.3 Given the general absence of cohesive (clay based) materials and made ground across most of the site, plus low concentrations of ground gas, ground bearing floor slabs may be acceptable across majority of the proposed development area. However suspended / beam and block floor slabs will be required in areas of identified tree influence.

6.11.4 Foundation considerations are discussed in further detail within Section 8 of this report.

Soakaway SA1A Test 1

Width (m):	0.70
Length (m):	2.50
Depth (m):	2.60
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.80
Effective depth (m)	0.80
Vp25 (m)	0.200
Depth (mbgl) at Vp25	2.400
Vp75 (m)	0.600
Depth (mbgl) at Vp75	2.000
Vp50 (m)	0.40
Vp75/Vp25 (m^3)	0.700
Effective volume * 0.3	0.210
a50 (m^2)	4.31
t between vp75 to vp25(secs)	26500
Soil Infiltration (m/s)	6.13E-06

Trial 1

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.8
2	120	1.82
3	180	1.83
4	240	1.83
5	300	1.84
6	360	1.85
7	420	1.855
8	480	1.86
9	540	1.86
10	600	1.87
11	660	1.88
12	720	1.885
13	780	1.89
15	900	1.91
17	1020	1.92
19	1140	1.92
21	1260	1.92
31	1860	1.94
36	2160	1.96
38	2280	1.96
67	4020	2.01
86	5160	2.06
123	7380	2.07
148	8880	2.09
170	10200	2.11
218	13080	2.15
264	15840	2.19
305	18300	2.22
329	19740	2.25

Soakaway SA1A Test 2

Width (m):	0.70
Length (m):	2.50
Depth (m):	2.60
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.60
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	2.350
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.850
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.875
Effective volume * 0.3	0.263
a50 (m^2)	4.95
t between vp75 to vp25(secs)	35500
Soil Infiltration (m/s)	4.98E-06

Trial 2

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.61
2	120	1.62
3	180	1.62
4	240	1.63
5	300	1.62
6	360	1.63
7	420	1.63
8	480	1.63
9	540	1.63
10	600	1.64
15	900	1.65
27	1620	1.63
34	2040	1.64
40	2400	1.64
62	3720	1.68
82	4920	1.71
106	6360	1.75
124	7440	1.77
152	9120	1.81
187	11220	1.84
211	12660	1.86
251	15060	1.9
291	17460	1.93
329	19740	1.96

Soakaway SA1A Test 3

Width (m):	0.00
Length (m):	0.00
Depth (m):	0.00
Natural depth (m):	0.00
Depth (m) of Water at T = 0	0.00
Effective depth (m)	0.00
Vp25 (m)	0.000
Depth (mbgl) at Vp25	0.000
Vp75 (m)	0.000
Depth (mbgl) at Vp75	0.000
Vp50 (m)	0.00
Vp75/Vp25 (m^3)	0.000
Effective volume * 0.3	0.000
a50 (m^2)	0.00
t between vp75 to vp25(secs)	0
Soil Infiltration (m/s)	#DIV/0!

Trial 3

Time (mins)	Time (secs)	Depth (mbgl)

Soakaway SA2 Test 1

Width (m):	0.70
Length (m):	2.40
Depth (m):	2.30
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.48
Effective depth (m)	0.82
Vp25 (m)	0.205
Depth (mbgl) at Vp25	2.095
Vp75 (m)	0.615
Depth (mbgl) at Vp75	1.685
Vp50 (m)	0.41
Vp75/Vp25 (m^3)	0.689
Effective volume * 0.3	0.000
a50 (m^2)	4.22
t between vp75 to vp25(secs)	44183
Soil Infiltration (m/s)	3.69E-06

Trial 1

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.485
2	120	1.49
3	180	1.5
4	240	1.5
5	300	1.5
6	360	1.5
7	420	1.505
8	480	1.505
9	540	1.51
10	600	1.51
11	660	1.51
12	720	1.52
13	780	1.52
14	840	1.52
15	900	1.52
16	960	1.52
17	1020	1.52
18	1080	1.525
19	1140	1.525
20	1200	1.53
22	1320	1.54
24	1440	1.54
26	1560	1.545
28	1680	1.55
30	1800	1.56
35	2100	1.56
40	2400	1.565
54	3240	1.59
59	3540	1.6
73	4380	1.61
85	5100	1.62
115	6900	1.66
132	7920	1.66
153	9180	1.68
190	11400	1.7
238	14280	1.74
248	14880	1.74
287	17220	1.77
311	18660	1.77

Soakaway SA2 Test 2

Width (m):	0.70
Length (m):	2.40
Depth (m):	2.14
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.10
Effective depth (m)	1.04
Vp25 (m)	0.260
Depth (mbgl) at Vp25	1.880
Vp75 (m)	0.780
Depth (mbgl) at Vp75	1.360
Vp50 (m)	0.52
Vp75/Vp25 (m^3)	0.874
Effective volume * 0.3	
a50 (m^2)	4.90
t between vp75 to vp25(secs)	44500
Soil Infiltration (m/s)	4.00E-06

Trial 2

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.1
2	120	1.13
3	180	1.13
4	240	1.14
5	300	1.15
6	360	1.15
7	420	1.155
8	480	1.16
9	540	1.17
10	600	1.17
16	960	1.18
20	1200	1.2
24	1440	1.21
28	1680	1.21
30	1800	1.21
32	1920	1.21
34	2040	1.21
36	2160	1.21
38	2280	1.21
40	2400	1.22
59	3540	1.3
99	5940	1.35
124	7440	1.4
145	8700	1.43
170	10200	1.46
188	11280	1.46
213	12780	1.48
227	13620	1.54
250	15000	1.55
272	16320	1.53
320	19200	1.55
366	21960	1.6
408	24480	1.62
437	26220	1.63
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Soakaway SA2 Test 3

Width (m):	0.70
Length (m):	2.40
Depth (m):	2.14
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.14
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	1.890
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.390
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.840
Effective volume * 0.3	
a50 (m^2)	4.78
t between vp75 to vp25(secs)	54166
Soil Infiltration (m/s)	3.24E-06

Trial 3

Time (mins)	Time (secs)	Depth (mbgl)
0	0	1.14
1	60	1.14
2	120	1.16
3	180	1.17
4	240	1.17
5	300	1.17
6	360	1.17
7	420	1.17
8	480	1.17
9	540	1.18
10	600	1.18
16	960	1.18
22	1320	1.19
44	2640	1.23
64	3840	1.25
88	5280	1.29
106	6360	1.31
134	8040	1.33
168	10080	1.38
206	12360	1.4
246	14760	1.44
283	16980	1.45
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Soakaway SA3 Test 1

Width (m):	0.70
Length (m):	2.70
Depth (m):	2.40
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.50
Effective depth (m)	0.90
Vp25 (m)	0.225
Depth (mbgl) at Vp25	2.175
Vp75 (m)	0.675
Depth (mbgl) at Vp75	1.725
Vp50 (m)	0.45
Vp75/Vp25 (m^3)	0.851
Effective volume * 0.3	0.255
a50 (m^2)	4.95
t between vp75 to vp25(secs)	20500
Soil Infiltration (m/s)	8.38E-06

Trial 1

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.5
2	120	1.53
3	180	1.55
4	240	1.56
5	300	1.575
6	360	1.59
7	420	1.6
8	480	1.6
9	540	1.605
10	600	1.62
11	660	1.625
12	720	1.64
13	780	1.65
14	840	1.655
15	900	1.67
16	960	1.67
17	1020	1.67
18	1080	1.675
19	1140	1.68
20	1200	1.68
22	1320	1.69
24	1440	1.7
26	1560	1.7
28	1680	1.71
30	1800	1.72
35	2100	1.735
40	2400	1.745
54	3240	1.78
76	4560	1.83
92	5520	1.85
123	7380	1.9
156	9360	1.94
167	10020	1.96
174	10440	1.98
201	12060	2.01
211	12660	2.01
222	13320	2.03
268	16080	2.07
306	18360	2.1

Soakaway SA3 Test 2

Width (m):	0.70
Length (m):	2.70
Depth (m):	2.40
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.40
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	2.150
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.650
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.945
Effective volume * 0.3	0.284
a50 (m^2)	5.29
t between vp75 to vp25(secs)	38750
Soil Infiltration (m/s)	4.61E-06

Trial 2

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.43
2	120	1.44
3	180	1.46
4	240	1.46
5	300	1.47
6	360	1.47
7	420	1.48
8	480	1.49
9	540	1.49
10	600	1.49
12	720	1.49
14	840	1.5
18	1080	1.51
20	1200	1.52
22	1320	1.53
24	1440	1.54
26	1560	1.55
30	1800	1.55
34	2040	1.56
38	2280	1.57
42	2520	1.58
63	3780	1.63
72	4320	1.65
116	6960	1.72
144	8640	1.77
167	10020	1.79
189	11340	1.82
208	12480	1.83
228	13680	1.87
250	15000	1.89
272	16320	1.93
320	19200	1.98
366	21960	2
397	23820	2.02
410	24600	2.03
436	26160	2.04
0	0	0
0	0	0
0	0	0

Soakaway SA3 Test 3

Width (m):	0.70
Length (m):	2.70
Depth (m):	2.40
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.40
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	2.150
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.650
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.945
Effective volume * 0.3	0.284
a50 (m^2)	5.29
t between vp75 to vp25(secs)	33000
Soil Infiltration (m/s)	5.41E-06

Trial 3

Time (mins)	Time (secs)	Depth (mbgl)
0	0	1.4
1	60	1.41
2	120	1.42
3	180	1.43
4	240	1.43
5	300	1.43
6	360	1.44
7	420	1.44
8	480	1.45
9	540	1.45
10	600	1.46
13	780	1.47
16	960	1.47
40	2400	1.55
58	3480	1.58
64	3840	1.59
71	4260	1.6
112	6720	1.67
138	8280	1.73
160	9600	1.73
182	10920	1.75
217	13020	1.8
255	15300	1.82
293	17580	1.86
333	19980	1.92
378	22680	1.95
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Soakaway SA4 Test 1

Width (m):	0.70
Length (m):	2.30
Depth (m):	2.60
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.50
Effective depth (m)	1.10
Vp25 (m)	0.275
Depth (mbgl) at Vp25	2.325
Vp75 (m)	0.825
Depth (mbgl) at Vp75	1.775
Vp50 (m)	0.55
Vp75/Vp25 (m^3)	0.886
Effective volume * 0.3	0.266
a50 (m^2)	4.91
t between vp75 to vp25(secs)	30500
Soil Infiltration (m/s)	5.91E-06

Trial 1

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.53
2	120	1.54
3	180	1.54
4	240	1.55
5	300	1.55
6	360	1.56
7	420	1.57
8	480	1.57
9	540	1.57
10	600	1.58
12	720	1.59
14	840	1.6
16	960	1.6
18	1080	1.62
20	1200	1.65
25	1500	1.67
30	1800	1.67
35	2100	1.7
38	2280	1.71
53	3180	1.75
58	3480	1.75
67	4020	1.76
72	4320	1.77
92	5520	1.8
98	5880	1.81
121	7260	1.85
131	7860	1.87
140	8400	1.88
	0	
	0	
	0	
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	

Soakaway SA4 Test 2

Width (m):	0.70
Length (m):	2.30
Depth (m):	2.50
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.50
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	2.250
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.750
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.805
Effective volume * 0.3	0.242
a50 (m^2)	4.61
t between vp75 to vp25(secs)	44500
Soil Infiltration (m/s)	3.92E-06

Trial 2

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.51
2	120	1.52
3	180	1.53
4	240	1.53
5	300	1.54
6	360	1.54
7	420	1.55
8	480	1.55
9	540	1.55
10	600	1.555
11	660	1.56
12	720	1.56
14	840	1.57
16	960	1.59
18	1080	1.6
20	1200	1.6
22	1320	1.6
24	1440	1.6
26	1560	1.6
28	1680	1.6
30	1800	1.6
32	1920	1.61
34	2040	1.61
36	2160	1.61
38	2280	1.62
40	2400	1.62
42	2520	1.63
83	4980	1.7
107	6420	1.75
128	7680	1.77
153	9180	1.79
172	10320	1.8
196	11760	1.82
212	12720	1.83
233	13980	1.85
255	15300	1.88
303	18180	1.91
349	20940	1.93
392	23520	1.94
417	25020	1.96

Soakaway SA4 Test 3

Width (m):	0.70
Length (m):	2.30
Depth (m):	2.50
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.50
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	2.250
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.750
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.805
Effective volume * 0.3	0.242
a50 (m^2)	4.61
t between vp75 to vp25(secs)	49500
Soil Infiltration (m/s)	3.53E-06

Trial 3

Time (mins)	Time (secs)	Depth (mbgl)
0	0	1.5
1	60	1.5
2	120	1.5
3	180	1.5
4	240	1.5
5	300	1.5
6	360	1.51
7	420	1.5
8	480	1.51
9	540	1.52
10	600	1.52
38	2280	1.57
63	3780	1.63
87	5220	1.65
107	6420	1.68
142	8520	1.72
167	10020	1.75
205	12300	1.8
245	14700	1.81
291	17460	1.85
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Soakaway SA5 Test 1

Width (m):	0.70
Length (m):	2.60
Depth (m):	2.04
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.00
Effective depth (m)	1.04
Vp25 (m)	0.260
Depth (mbgl) at Vp25	1.780
Vp75 (m)	0.780
Depth (mbgl) at Vp75	1.260
Vp50 (m)	0.52
Vp75/Vp25 (m^3)	0.946
Effective volume * 0.3	0.284
a50 (m^2)	5.25
t between vp75 to vp25(secs)	47500
Soil Infiltration (m/s)	3.79E-06

Trial 1

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.02
2	120	1.025
3	180	1.03
4	240	1.035
5	300	1.04
6	360	1.045
7	420	1.05
11	660	1.06
12	720	1.065
13	780	1.07
14	840	1.075
32	1920	1.12
48	2880	1.15
59	3540	1.15
74	4440	1.17
84	5040	1.195
103	6180	1.22
122	7320	1.25
160	9600	1.27
189	11340	1.3
	0	
	0	
	0	
	0	
	0	
	0	
	0	
	0	
	0	
	0	
	0	
0	0	0

Soakaway SA5 Test 2

Width (m):	0.70
Length (m):	2.60
Depth (m):	1.96
Natural depth (m):	0.00
Depth (m) of Water at T = 0	0.93
Effective depth (m)	1.03
Vp25 (m)	0.258
Depth (mbgl) at Vp25	1.703
Vp75 (m)	0.773
Depth (mbgl) at Vp75	1.188
Vp50 (m)	0.52
Vp75/Vp25 (m^3)	0.937
Effective volume * 0.3	0.281
a50 (m^2)	5.22
t between vp75 to vp25(secs)	54500
Soil Infiltration (m/s)	3.30E-06

Trial 2

Time (mins)	Time (secs)	Depth (mbgl)
1	60	0.93
2	120	0.94
3	180	0.945
4	240	0.96
5	300	0.96
6	360	0.965
7	420	0.97
8	480	0.98
10	600	0.98
12	720	0.99
14	840	0.99
16	960	0.99
18	1080	1
21	1260	1.08
24	1440	1.12
26	1560	1.1
28	1680	1.03
30	1800	1.05
32	1920	1.06
34	2040	1.08
48	2880	1.07
65	3900	1.11
101	6060	1.15
122	7320	1.12
143	8580	1.13
162	9720	1.18
178	10680	1.2
229	13740	1.23
273	16380	1.25
316	18960	1.31
362	21720	1.33
388	23280	1.35

Soakaway SA5 Test 3

Width (m):	0.70
Length (m):	2.60
Depth (m):	1.96
Natural depth (m):	0.00
Depth (m) of Water at T = 0	0.96
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	1.710
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.210
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.910
Effective volume * 0.3	0.273
a50 (m^2)	5.12
t between vp75 to vp25(secs)	60000
Soil Infiltration (m/s)	2.96E-06

Trial 3

Time (mins)	Time (secs)	Depth (mbgl)
0	0	0.96
1	60	0.96
2	120	0.96
3	180	0.97
4	240	0.98
5	300	0.98
6	360	0.98
7	420	0.99
8	480	1
9	540	1
10	600	0.99
27	1620	1.02
50	3000	1.04
83	4980	1.07
111	6660	1.16
130	7800	1.14
167	10020	1.17
208	12480	1.2
253	15180	1.26
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Soakaway SA6 Test 1

Width (m):	0.70
Length (m):	2.30
Depth (m):	2.60
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.26
Effective depth (m)	1.34
Vp25 (m)	0.335
Depth (mbgl) at Vp25	2.265
Vp75 (m)	1.005
Depth (mbgl) at Vp75	1.595
Vp50 (m)	0.67
Vp75/Vp25 (m^3)	1.079
Effective volume * 0.3	0.324
a50 (m^2)	5.63
t between vp75 to vp25(secs)	35500
Soil Infiltration (m/s)	5.40E-06

Trial 1

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.29
2	120	1.3
3	180	1.315
4	240	1.325
5	300	1.33
6	360	1.34
7	420	1.35
8	480	1.355
11	660	1.375
18	1080	1.425
21	1260	1.44
33	1980	1.49
48	2880	1.53
62	3720	1.57
81	4860	1.61
116	6960	1.67
145	8700	1.72
154	9240	1.74

Soakaway SA6 Test 2

Width (m):	0.70
Length (m):	2.30
Depth (m):	2.40
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.40
Effective depth (m)	1.00
Vp25 (m)	0.250
Depth (mbgl) at Vp25	2.150
Vp75 (m)	0.750
Depth (mbgl) at Vp75	1.650
Vp50 (m)	0.50
Vp75/Vp25 (m^3)	0.805
Effective volume * 0.3	0.242
a50 (m^2)	4.61
t between vp75 to vp25(secs)	22000
Soil Infiltration (m/s)	7.94E-06

Trial 2

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.41
2	120	1.42
3	180	1.43
4	240	1.44
5	300	1.45
6	360	1.455
7	420	1.46
8	480	1.47
10	600	1.48
12	720	1.49
14	840	1.5
16	960	1.51
18	1080	1.52
20	1200	1.53
22	1320	1.55
24	1440	1.55
26	1560	1.56
28	1680	1.57
30	1800	1.58
32	1920	1.58
34	2040	1.59
36	2160	1.6
38	2280	1.6
40	2400	1.61
42	2520	1.62
44	2640	1.64
62	3720	1.67
80	4800	1.71
115	6900	1.79
136	8160	1.83
154	9240	1.87
175	10500	1.9
193	11580	1.91
216	12960	1.95
242	14520	2.01
286	17160	2.01
330	19800	2.06
375	22500	2.09
399	23940	2.12

Soakaway SA6 Test 3

Width (m):	0.70
Length (m):	2.30
Depth (m):	2.40
Natural depth (m):	0.00
Depth (m) of Water at T = 0	1.33
Effective depth (m)	1.07
Vp25 (m)	0.268
Depth (mbgl) at Vp25	2.133
Vp75 (m)	0.803
Depth (mbgl) at Vp75	1.598
Vp50 (m)	0.54
Vp75/Vp25 (m^3)	0.861
Effective volume * 0.3	0.258
a50 (m^2)	4.82
t between vp75 to vp25(secs)	31750
Soil Infiltration (m/s)	5.63E-06

Trial 3

Time (mins)	Time (secs)	Depth (mbgl)
1	60	1.34
2	120	1.35
3	180	1.36
4	240	1.37
5	300	1.38
6	360	1.39
7	420	1.39
8	480	1.4
9	540	1.41
10	600	1.41
20	1200	1.48
46	2760	1.55
71	4260	1.62
103	6180	1.67
132	7920	1.74
151	9060	1.75
187	11220	1.82
218	13080	1.86
264	15840	1.9

Appendix C

QBar Calculation Per Hectare

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.150
Area (ha)	1.000	Urban	0.000
SAAR (mm)	700	Region Number	Region 4

Results l/s

QBAR Rural	0.4
QBAR Urban	0.4
Q1 year	0.3
Q1 year	0.3
Q30 years	0.8
Q100 years	1.0

Appendix D

Nottinghamshire County Council objection letter

dated 6th July 2020

This matter is being dealt with by:
Ross Marshall
Tel: 0115 977 4473
E-mail: Ross.marshall@nottscc.gov.uk

Nottinghamshire County Council

Planning ref: 20/00873/FULM
Our ref: 19/20-109
Consultation received: 11/06/20

Matt Lamb
Director of Growth and Regeneration
Newark and Sherwood District Council
Castle House
Great North Road
Newark
NG24 1BY

FAO Application Case Officer

Wednesday, 08 July 2020

Dear Matt Lamb

PROPOSAL: Residential development of 103 dwellings and associated access and infrastructure

LOCATION: Eakring Road, Bilsthorpe,

Nottinghamshire County Council as the Lead Local Flood Authority (LLFA) has reviewed the application which was received on the 11 Jun 2020. Due to insufficient surface water drainage information being submitted, we **object** to this application and recommend refusal of planning permission until the information outlined below has been submitted and approved.

Reason

Given the proposed scale of the development to satisfy the National Planning Policy Framework (NPPF) details should be provided to asses the application in accordance with the NPPF. Paragraph 165 of the NPPF states that all major applications should incorporate sustainable drainage systems which have appropriate operational standards; maintenance arrangements in place to ensure operation for the lifetime of the development and where possible, provide multifunctional benefits.

The current submission appears to fail to consider alternative methods of surface water disposal including discharge to adjacent watercourses or to a nearby surface water sewer.

Overcoming our objection

You can overcome our objection by submitting the information outlined below which demonstrates that the development will not increase risk elsewhere and where possible reduces flood risk overall. If this cannot be achieved, we will consider whether there is a need to maintain our objection to the application.

Further to the submitted details any further details should be in accordance with CIRIA C753 and current best practice guidance. We look to see the following information included in any resubmission:

- Details of a proven outfall from site in accordance with the drainage hierarchy the follows options should be considered, in order of preference; infiltration, discharge to watercourse, discharge to surface water sewer or discharge to combined sewer.
- Evidence the maximum discharge is set to the QBar Greenfield run-off rate for the positively drained area of development.

- Show that SuDS systems will be incorporated into the surface water management scheme for the site, preference should be given to above ground SuDS which provide multi-functional benefits.
- Details of who will manage and maintain all drainage features for the lifetime of the development will be required prior to construction.

We ask to be re-consulted with the results of any further information. We will provide you with bespoke comments within 21 days of receiving formal re-consultation. Our objection will be maintained until adequate details has been submitted.

Informative

1. SuDS involve a range of techniques and SuDS methods can be implements on all sites. SuDS are a requirement for all major development as set out within paragraph 165 and 163 of the NPPF.

2. The LLFA does not consider oversized pipes or box culverts as sustainable drainage. Should infiltration not be feasible at the site, alternative sustainable drainage should be used, with a preference for above ground solutions.

3. Surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management. Sustainable Drainage Systems (SuDS) are an approach to managing surface water run-off which seeks to mimic natural drainage systems and retain water on-site as opposed to traditional drainage approaches which involve piping water off-site as quickly as possible.

Yours sincerely

Ross Marshall

Ross Marshall
Principal Flood Risk Management Officer

Please ensure any consultations are sent to flood.team@nottscc.gov.uk