



J N P G R O U P

CONSULTING ENGINEERS

Technical Note – Addendum to the Flood Risk Assessment and Drainage Strategy

Project: Ford Airfield Market
Arundel

Client: Ford Airfield Market Applicants

Reference: C85228-JNP-92-XX-RP-C-1001 P01

Date: 14 January 2021

Job name: Ford Airfield Market

Job No: C85228

Note No: C85228-JNP-92-XX-RP-C-1001

Date: 14/01/2021

Prepared by: Anthony McNevin

Subject: Technical Note – Addendum to the Flood Risk Assessment and Drainage Strategy Report

1. Introduction

- 1.1 In February 2020 JNP Group prepared a FRA and Drainage Strategy for the Market Site and Overspill Car Park located at Ford Airfield, Arundel, West Sussex.
- 1.2 A market is currently held at Ford Airfield, on the former runways, which provides onsite car parking for visitors. However, part of the airfield is an allocated strategic housing site (Reference SD8 in the Adoption Arun Local Plan 2011 – 2031 (July 2018)). It is proposed that part of the existing market site will be developed for housing.
- 1.3 The development was registered for planning on 25 February 2020. The planning application number is F/5/20/PL. The FRA and Drainage Strategy report by JNP Group is reference C85228/R002E dated 14 February 2020. This technical note should be read in conjunction with the FRA report.
- 1.4 The FRA was submitted whilst supplementary soakaway soil infiltration rate testing and groundwater level monitoring was carried out over the winter period of 2019/2020.
- 1.5 This technical note provides further information on the results of the winter 2019 / 2020 soakaway testing and groundwater monitoring. It confirms the strategy provided in the FRA and Drainage Strategy report is feasible and remains the proposed solution to serve the Ford Market Development.

2. Drainage Strategy

- 2.1 The access road to the market site and the former airfield runways are not affected by the proposed development. Therefore, the existing drainage systems which serve these areas will be retained and reused as discussed in the FRA and Drainage Strategy report.
- 2.2 The planning application includes providing a new overspill car park at the entrance to the market site located in part of an existing arable field.
- 2.3 The original site investigation for the market site overspill car park was carried out in August 2018.
- 2.4 Soakaway testing was carried out in trial hole S5 which was 2.65m below existing ground level. A soil infiltration rate of 4.76×10^{-6} m/s was recorded.
- 2.5 The trial pit log for excavation S5 advises that the ground conditions comprised of:

January 21

- 0m to 0.25m – TOPSOIL, brown slightly gravelly sandy CLAY.
 - 0.25m to 2.40m – Firm friable slightly gravelly sandy CLAY. (BRICKEARTH)
 - 2.40m to 2.80m – Stiff orangish brown gravelly fine to medium SAND. (RIVER TERRACE DEPOSITS)
 - 2.80m to 2.90m – Structureless CHALK recovered as sandy clayey GRAVEL. (WHITE CHALK SUBGROUP)
- 2.6 Soil infiltration rate testing shows that the gravelly SAND / sandy CLAY, approximately 2.60m below existing ground level, enables water to infiltrate into the ground with an infiltration rate of 4.76×10^{-6} m/s. The highest monitored groundwater level recorded in the vicinity of the overspill car park, at monitoring well BH5, in December 2019 was 3.90m below existing ground level.
- 2.7 The drainage strategy for the overspill car park discharges surface water runoff into a series of cellular storage soakaways which are constructed approximately 2.60m deep in the stratum underlying the site. The soil infiltration rate test proved that the ground is suitable for soakaways at this depth.
- 2.8 The overspill car park drainage strategy is shown on JNP drawing no. C85228 SK145 in Appendix A. Micro Drainage calculations for the soakaway design were provided in the FRA and Drainage Strategy Report.

3. Winter 2020 Soakaway Testing and Groundwater Monitoring

- 3.1 Between 17 February 2020 and 2 March 2020 RSK Environmental Limited carried out winter soakaway testing and groundwater level monitoring across the development site. Testing was carried out during a significantly wet period of heavy rainfall both before and during the site works.
- 3.2 The results of the site investigation and infiltration testing are provided in a letter report and attachments provided by RSK dated 16 April 2020.
- 3.3 For ease of reference the results are shown on the following drawings in Appendix B.
- C85228-D109 Groundwater Level Monitoring Plan
 - C85228-D122 Infiltration Rate Test Location Plan February 2020

The RSK information which is relevant to the design of the overspill car park is provided in Appendix C.

- 3.4 With reference to drawing C85228-D122 the overspill car park is located in Parcel 26. Soakaway test T26 was carried out 3.0m below existing ground level at 4.050m AOD. The soakaway test trial hole was refilled with water 3 no. times and on each occasion the infiltration rate was calculated. The worst case infiltration rate was 7.86×10^{-6} m/s.
- 3.5 The winter soakaway test T26 was carried out 85m west from the original soakaway test S5, discussed in section 2.4 above. The infiltration rate is faster than that recorded during the original test, however, both results are within a similar range.

- 3.6 With reference to drawing C85228-D109 the groundwater level was recorded at monitoring well reference DS26Z which is located in Parcel 26. During Winter 2020 the worst case groundwater level was recorded in February 2020 as 4.060m below existing ground level which corresponds to 3.033m AOD.
- 3.7 The base of the soakaways to serve the overspill car park were specified at 4.000m AOD. Therefore, 1.0m clearance between the base of the soakaway and the worst case recorded winter groundwater level is provided.

4. Confirmation of the Original Soakaway Design Strategy

- 4.1 The base of excavation for the winter soakaway test was 4.050m AOD. The cellular storage soakaway units will be installed at a base level of 4.000m AOD. Therefore, the infiltration test rate is representative of the ground conditions where the soakaways will be constructed.
- 4.2 The worst case infiltration rate recorded during the soakaway testing was 7.860×10^{-6} m/s. The original soakaway design calculations provided in the FRA and Drainage Strategy Report, reference is C85228/ R002E dated 14 February, were based on a design infiltration rate of 4.720×10^{-6} m/s. Therefore, the calculations and the size of the cellular storage soakaway units shown on the drainage strategy drawing C85228 SK145 in Appendix A are satisfactory.
- 4.3 The base of the soakaways to serve the overspill car park were specified at 4.000m AOD. The worst case groundwater level was recorded in February 2020 was 3.033m AOD. This provides 1.0m clearance between the base of the soakaway and the worst case recorded winter groundwater level.

5. Conclusions

- 5.1 The Winter 2020 site investigation results confirm the original design strategy provided in the FRA and Drainage Strategy Report, reference is C85228/ R002E dated 14 February, is adequate.
- 5.2 The overspill car park will discharge surface water runoff to soakaways constructed using cellular storage units and provide attention for the 1 in 100 year + 40% climate change storm event.
- 5.3 The access road to the market site and the former airfield runways are not affected by the proposed development. Therefore, the existing drainage systems which serve these areas will be retained and reused.

Document Issue Record

Technical Note No	Rev	Date	Prepared	Reviewed	Approved
C85228-JNP-92-XX-RP-C-1001	P01	14.01.2021	AM	AB	AB

List of Appendices

Appendix A - Overspill Car Park Drainage Strategy Drawing

Appendix B - Winter 2020 Site Investigation Drawings

Appendix C – RSK Environmental Soakaway Test and Groundwater Monitoring Data

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Appendix A

Soakaway 1
Catchment Area = 4611m²
6.5m x 115m x 0.6m deep
Base of Soakaway = 4.0m AOD

Soakaway 2
Catchment Area = 4575 m²
6.5m x 115m x 0.6m deep
Base of Soakaway = 4.0m AOD

Soakaway 3
Catchment Area = 4717 m²
6.5m x 115m x 0.6m deep
Base of Soakaway = 4.0m AOD

Notes:-

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Legend

- Site Boundary
- Car park perimeter track. Compacted Type 1 granular material.
- Car park access route to parking areas. Permeable surface with tanked sub base construction. Surface will either be porous asphalt, permeable concrete block, grasscrete or Golpa /Cellweb Gravel Reinforcement. To be confirmed.
- Soft landscaped/aggregate car parking areas. Laid with a cross fall so that surface water runoff flows into the tanked permeable surfaced access route with a tanked sub base.
- Soakaway cellular storage system constructed in the gravelly SAND (Trial Hole S5 2.65m begl) / sandy CLAY (Borehole B5 1.5 to 2.6m begl).
- Drainage network, manholes and sewers which capture surface water runoff that have passed through the tanked permeable paving system and to discharge it into the cellular soakaway.

A	24.10.19	Market land use plan updated	IS	AM	
Rev.	Date	Amendment	By	Chk.	
Status					
Indicative					

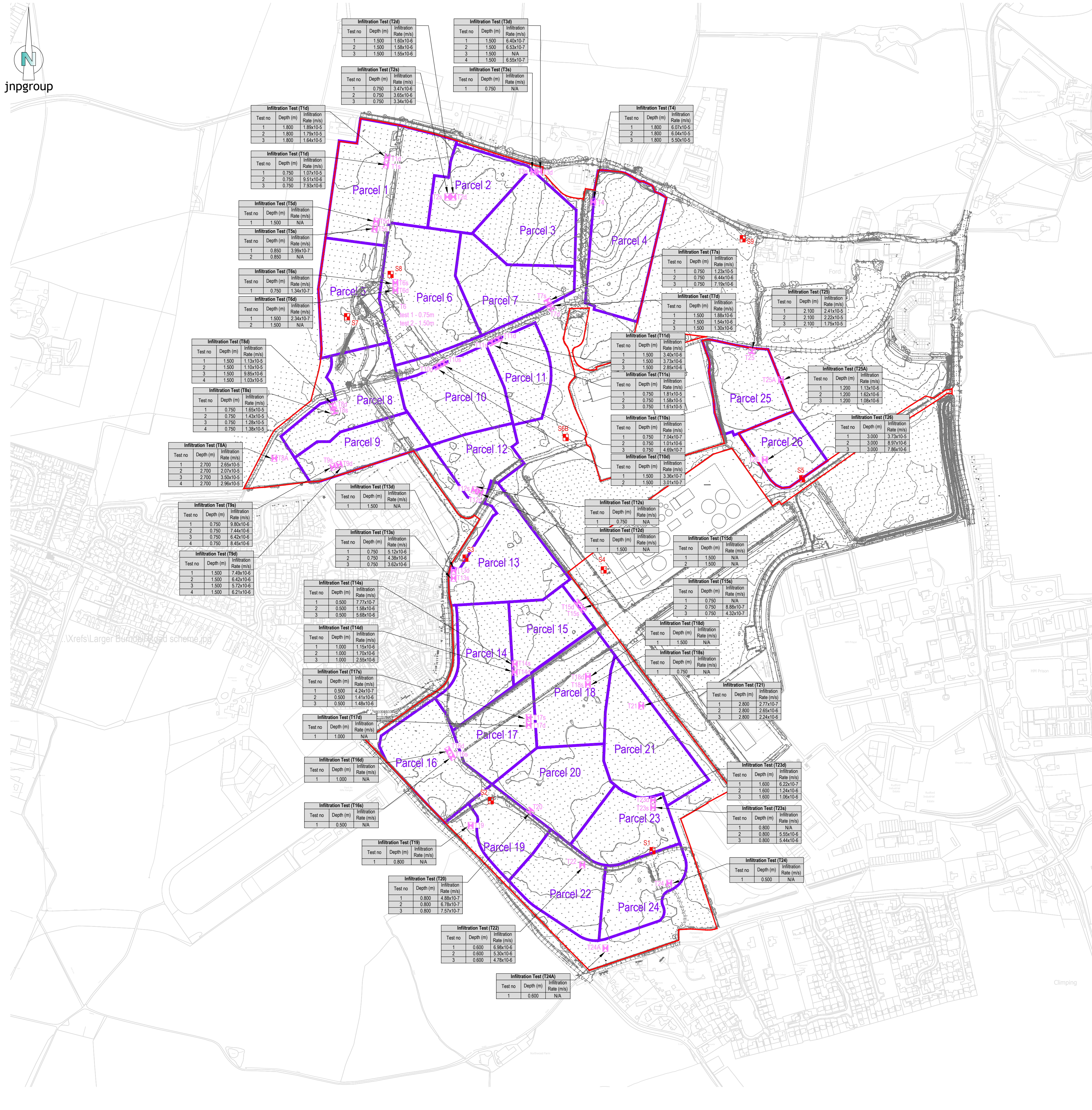


Client	Wates Redrow
Job	Ford Airfield Market
Title	Overspill Car Park Drainage Strategy

Scale 1:500	@ A1	Date April 2019
Drawn by AM	Checked by	Approved by
BMTTRA	UKAS	HAS
Accredited Contractor	Constructionline	Supplier No. 000029

Drawing No.	Rev.
C85228-SK145	A

Appendix B



- Notes:-
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Legend

Site Boundary

T4 Soakaway Test carried out by RSK dated February 2020

Rev.	Date	Amendment	By	Chk.
A		T2s, T20 and T22 infiltration rates revised, minor alterations	IS	AM
Status				
Indicative				

Wates REDROW HOMES

REDROW HOMES Wates

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Client	Wates Redrow
Job	Ford Airfield
Title	Infiltration Rate Test Location Plan February 2020

Scale	Not to Scale	@ A1	Date	March 2020
Drawn by	IS	Checked by		Approved by

BMTRADA UKAS Constructionline

Drawing No.	C85228-D122	Rev.	A
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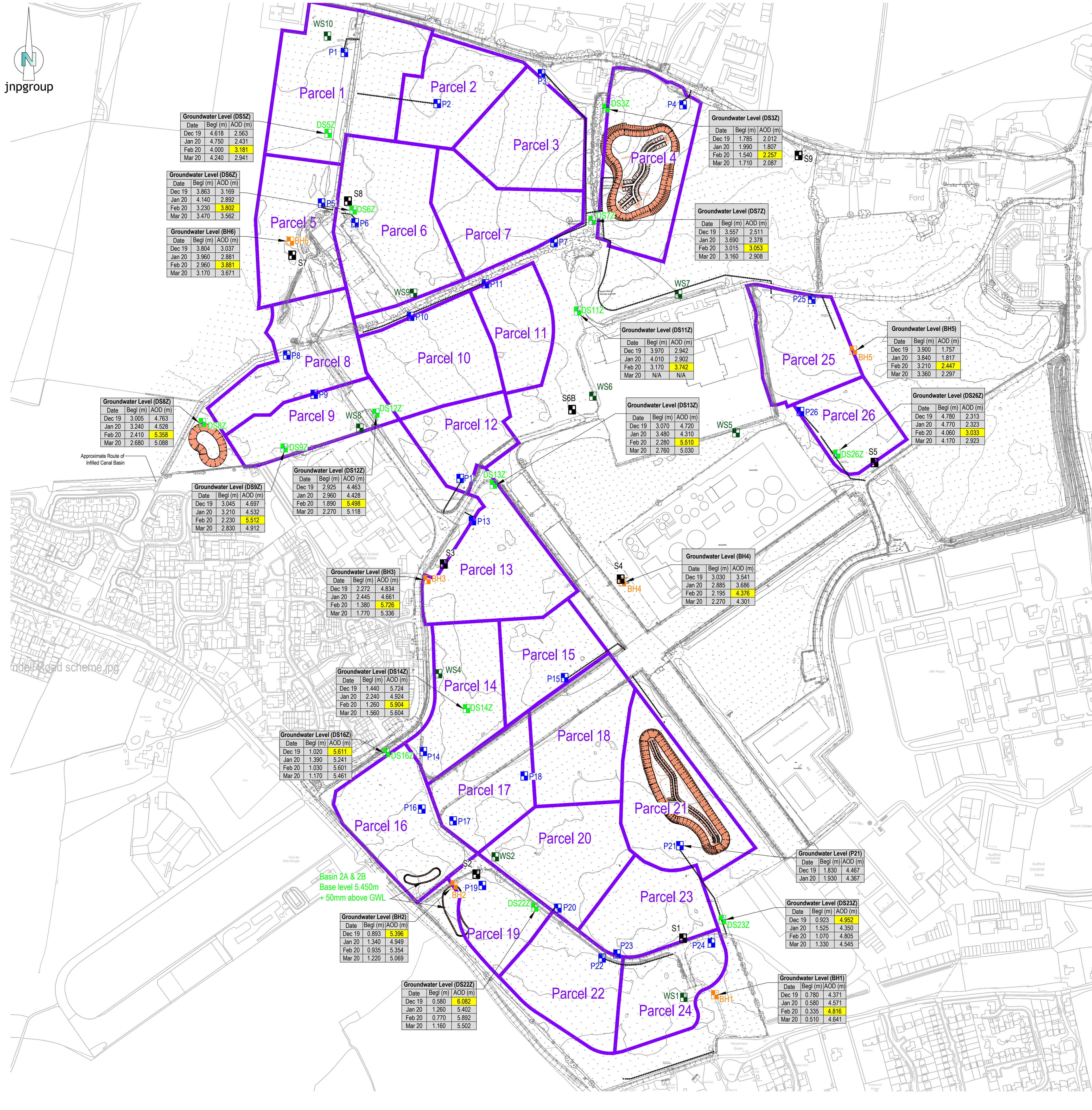


Table 1 - Original Soakaway Tests
Aug. 2018

Soakaway Test	Easting	Northing
S1	499453.200	102439.300
S2	499123.395	102541.425
S3	499071.463	103036.675
S4	499353.700	103012.500
S5	499758.800	103198.600
S6B	499276.200	103283.000
S7	498829.500	103529.600
S8	498918.500	103616.000
S9	499637.600	103688.900

Table 2 - Original Groundwater Monitoring Wells
Aug. 2019

Monitoring Well	Easting	Northing
WS1	499454.415	102344.690
WS2	499038.950	102737.530
WS4	499063.191	102861.480
WS5	499537.800	103246.000
WS6	499309.300	103304.600
WS7	499445.900	103467.400
WS8	499337.500	103253.800
WS9	499324.272	102407.410
WS10	498885.900	103879.500
BH1	499503.968	102349.080
BH2	499087.638	102524.180
BH3	499044.600	103011.720
BH4	499356.359	103008.100
BH5	499724.902	103377.820
BH6	498826.639	103552.020

Table 3 - Shallow Groundwater Monitoring Wells
September 2019
Note: The wells were installed 2.0m below ex ground level

Monitoring Well	Easting	Northing
P1	498912.858	103853.290
P2	499060.969	103771.730
P3	499227.455	103819.480
P4	499453.265	103769.770
P5	498876.406	103613.000
P6	498929.842	103681.360
P7	499247.323	103549.600
P8	498820.979	103370.250
P9	498864.704	103307.610
P10	499016.532	103431.980
P11	499137.820	103484.110
P12	499097.564	103173.220
P13	499117.293	103105.760
P14	499038.738	102737.450
P15	499264.234	102855.180
P16	499036.327	102645.410
P17	499086.328	102626.700
P18	499199.790	102698.270
P19	499132.992	102523.490
P20	499253.393	102487.270
P21	499448.215	102587.010
P22	499324.093	102407.600
P23	499347.870	102414.170
P24	499498.503	102431.670
P25	499658.630	103459.150
P26	499640.629	103280.070

Table 4 - Additional Monitoring Wells
Dec. 2019
Note: wells installed approx 5m below ex ground level

Soakaway Test	Easting	Northing
DS3Z	499330.21	103764.436
DS11Z	499285.03	103440.599
DS5Z	498886.555	103724.244
DS6Z	499026.701	103801.706
DS7Z	499308.109	103585.387
DS8Z	498686.191	103262.496
DS9Z	498816.624	103221.936
DS12Z	498962.937	103277.462
DS13Z	499150.724	103163.813
DS14Z	499107.709	102805.781
DS16Z	498979.871	102735.714
DS22Z	499216.557	102488.889
DS23Z	499516.034	102468.851
DS26Z	499698.477	103212.071

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Legend
Site Boundary

Rev.	Date	Amendment	By	Chk.
E	07.04.20	Groundwater levels for February and March added	IS	AM
D	23.01.20	Updated with latest groundwater levels and proposed soakaway test locations added	IS	AM
C	12.12.19	Table 5 added & wells shown on plan	AM	AM
B	18.11.19	Original Soakaway tests provided for reference. Deep Soakaway test added.	MF	AM
A	11.07.19	Parcels revised to suit revised site layout	IS	AM
Status		Indicative		

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Client	Wates Redrow
Job	Ford Airfield
Title	Groundwater Level Monitoring Plan
Scale	Not to Scale @ A1 Date March 2019
Drawn by	MF
Checked by	
Approved by	

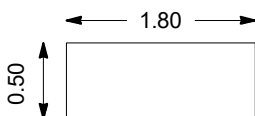
Drawing No.	C85228-D109
Rev.	E

Appendix C

Contract: Ford Airfield		Client: Wates / Redrow		Trial Pit: T26
Contract Ref: 29228	Start: 19.02.20 End: 19.02.20	Ground Level (m AOD): 7.05	National Grid Co-ordinate: E:499682.7 N:103237.2	Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Reduced Level	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results						
						Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of flint. (TOPSOIL)	6.85	0.20	
						Firm light brown slightly sandy slightly gravelly CLAY Sand is fine to coarse. Gravel is angular to subrounded fine to medium of flint. Occasional angular coarse gravel of flint. (BRICKEARTH) ... Sand content increasing with depth.		(2.10)	
						Light brown clayey gravelly fine to coarse SAND. Gravel is angular fine to coarse of flint. (RIVER TERRACE DEPOSITS)	4.75	2.30	
							4.05	3.00	
						Trial pit terminated at 3.00mbgl.			

Plan (Not to Scale)



General Remarks

- Checks for buried ferrous objects carried out during excavation by specialist unexploded ordnance (UXO) officer using magnetometer.
- Trial pit remained dry and stable during excavation.
- No visual or olfactory evidence of contamination.
- No groundwater encountered.
- No samples or well installation required.
- Trial pit backfilled with gravel to ground level in preparation for soakage testing.
- On completion, gravel was removed and trial pit backfilled with arisings.

All dimensions in metres

Scale: **1:25**

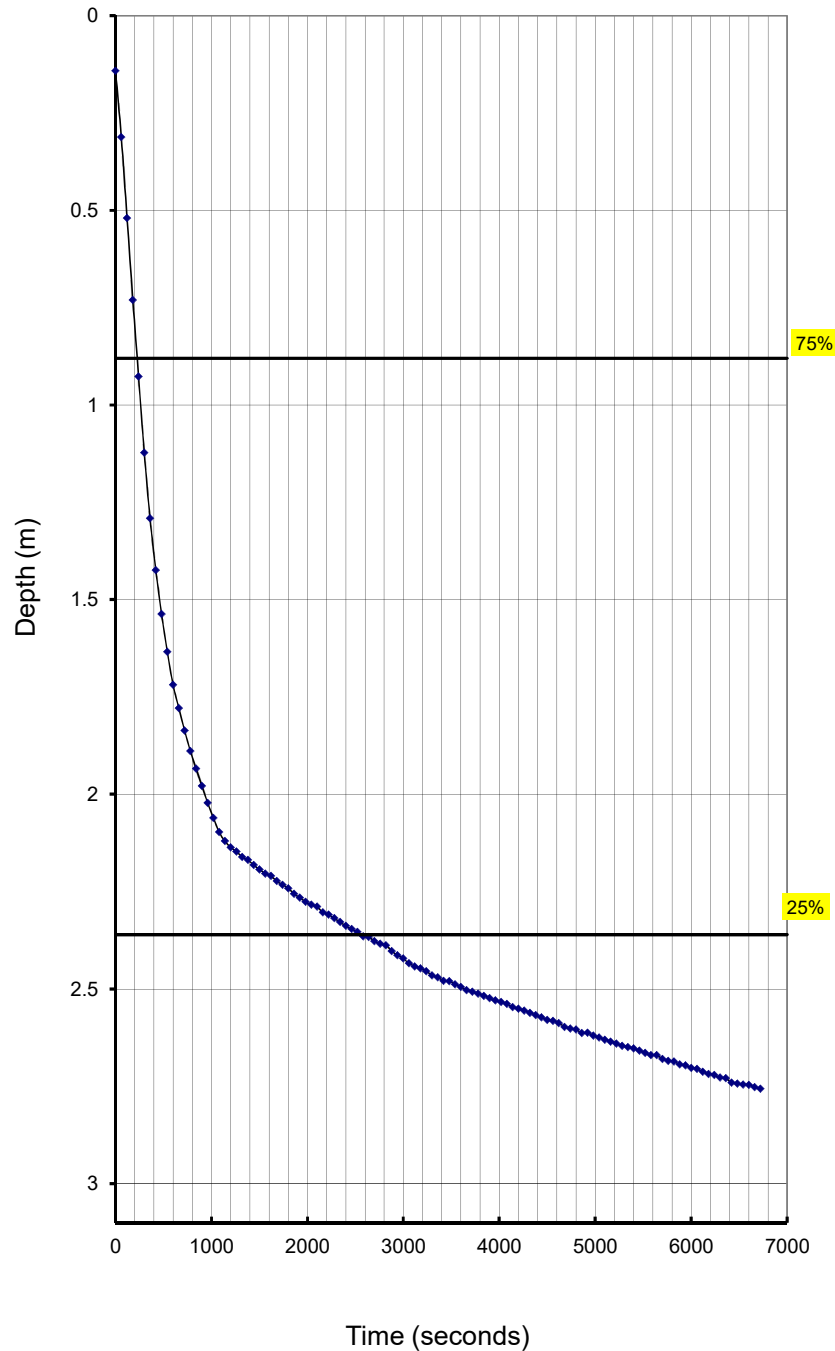
Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: VRussell	Checked By:	
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TRIAL PIT SOAKAWAY TEST TO BRE 365 (BACKFILLED PIT)

Location	T26	Test No	1.00
Client	Redrow / Wates	Length of Trial Pit (m)	2.20
Job Number	29228	Width of Trial Pit (m)	0.50
Date	26th Feb 2020	Water level at start (mbgl)	0.14
Operator	SM	Depth to Base of Trial Pit (m)	3.10
		Porosity of Backfill (%)	30

Time (Secs)	Water level (mbgl)
0	0.14191
600	1.71887
1020	2.06076
2040	2.28354
3000	2.42189
5040	2.62417
6720	2.75653

Trial Pit Soakaway Test Results



Results

Vp 75-25 (m3)	0.49
ap 50 (m2)	9.09
tp 75-25 (s)	1440.00
Infiltration Rate (m/s)	3.73E-05

Value to be determined from graph

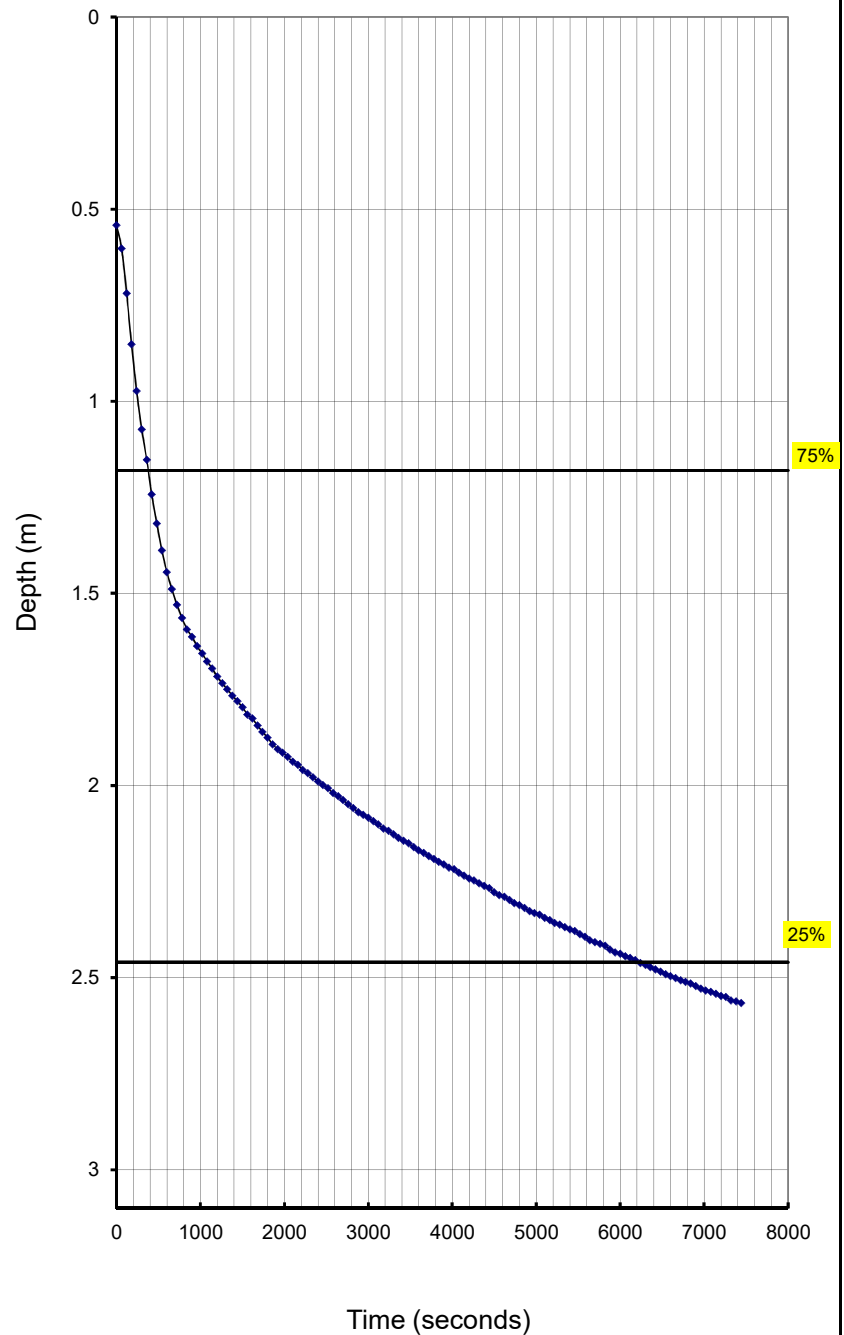


TRIAL PIT SOAKAWAY TEST TO BRE 365 (BACKFILLED PIT)

Location	T26	Test No	2.00
Client	Redrow / Wates	Length of Trial Pit (m)	2.20
Job Number	29228	Width of Trial Pit (m)	0.50
Date	27th Feb 2020	Water level at start (mbgl)	0.54
Operator	SM	Depth to Base of Trial Pit (m)	3.10
		Porosity of Backfill (%)	30

Time (Secs)	Water level (mbgl)
0	0.54217
540	1.38845
1080	1.67709
2040	1.92531
3000	2.08352
4020	2.21796
5040	2.33582
6300	2.4666
7440	2.56596
8700	2.64898
9780	2.70241
13260	3.00206
13980	3.05374

Trial Pit Soakaway Test Results



Results

Vp 75-25 (m3)	0.42
ap 50 (m2)	8.01
tp 75-25 (s)	5880.00
Infiltration Rate (m/s)	8.97E-06

Value to be determined from graph

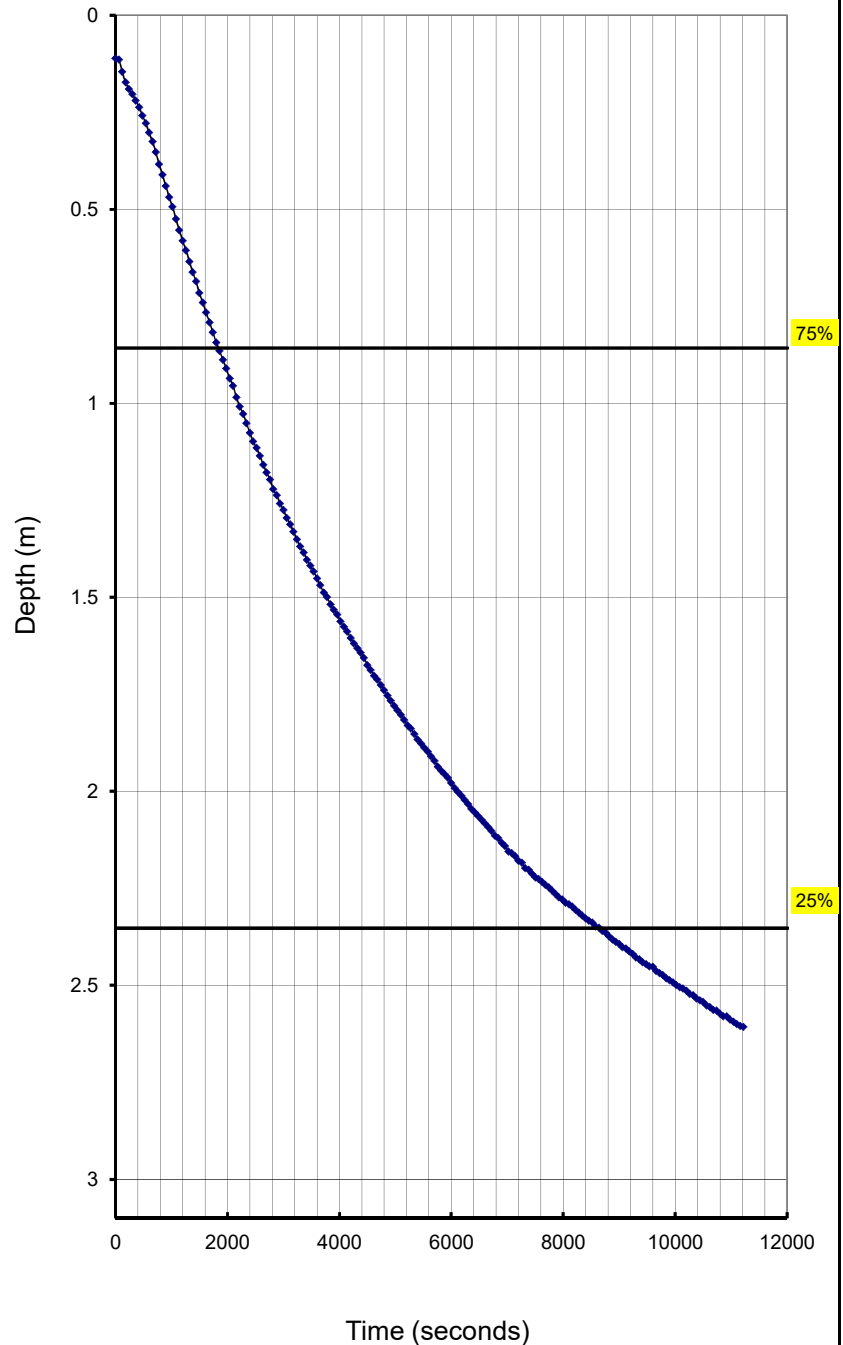


TRIAL PIT SOAKAWAY TEST TO BRE 365 (BACKFILLED PIT)

Location	T26	Test No	3.00
Client	Redrow / Wates	Length of Trial Pit (m)	2.20
Job Number	29228	Width of Trial Pit (m)	0.50
Date	27th Feb2020	Water level at start (mbgl)	0.11
Operator	SM	Depth to Base of Trial Pit (m)	3.10
		Porosity of Backfill (%)	30

Time (Secs)	Water level (mbgl)
0	0.11098
1020	0.49405
2100	0.95441
3780	1.49912
5220	1.8302
8160	2.29656
10140	2.50836
12300	2.70366
14940	2.90145

Trial Pit Soakaway Test Results



Results

Vp 75-25 (m3)	0.49
ap 50 (m2)	9.17
tp 75-25 (s)	6840.00
Infiltration Rate (m/s)	7.86E-06

Value to be determined from graph



