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Maids Moreton
MK18 1QE

Our Ref: LA/19-12-10

A2Dominion Developments Ltd
The Point, 37 North Wharf Road,
London,
W2 1BD
For the attention of Steve Hornblow

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murraybateman@geo-integrity.co.uk
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11th February 2020

Dear Steve,

Geotechnical Ground Investigation – Elmsbrook Local Centre, Bicester, OX27 8BA

Following receipt of your acceptance form for our proposal, reference E00699 and dated the 11th December 2019, we have pleasure in providing you with our interpretative geotechnical letter report for the site at Elmsbrook Local Centre, Bicester OX27 8BA, centred at National Grid Reference SP 57891 24796.

1 Introduction

1.1 Sitework Information

From the 7th to the 8th of January 2020, we attended site and undertook four soakaway tests (SA301 – SA304) and two boreholes (WS201 – WS202) across two sites. The site consists of two areas one north and one south of Charlotte Avenue. Two soakaway tests and one borehole were undertaken in each area and a monitoring well was installed within WS201 on the northern site. Soakaway testing followed the guidelines set out in BRE 365 Digest. This consisted of machine excavated trial pits put down to depths ranging between 0.40m and 2.00m bgl. The pits were subsequently filled with water using a mobile 700 litre mobile bowser, and the infiltration of the water was then monitored over the course of the tests. The location of the exploratory holes can be seen on the Exploratory Hole Location Plan.

1.2 Development Proposals

It is proposed to construct a community centre at the northern site and a nursery at the southern site.

1.3 Published Geology

Reference to the British Geological Survey website and Sheet 219; Buckingham; 2002; indicates that the site is underlain by Middle Jurassic bedrock of the Cornbrash Formation overlying Forest Marble Formation.

The **Cornbrash Formation** is generally described as a medium to fine grained limestone, predominantly bioclastic wackestone and packestone and characteristically bioturbated and poorly bedded. Generally bluish grey when fresh but weathers to yellowish brown. Thin argillaceous partings or interbeds of calcareous mudstone may occur.

The **Forest Marble Formation** is generally described as a silicate mudstone, greenish grey, variably calcareous with lenticular typically cross-bedded limestone units that form banks and channel-fills. A variety of limestone types occur but generally grey weathering brown and flaggy.

2 Walkover Information

A walkover survey was undertaken at the time of the fieldwork and this indicated that the site is located at the centre of a newly developed residential estate. The site is split into two areas north and south of Charlotte Avenue. The site south of Charlotte Avenue consisted of a factory building and an electricity substation to the east and derelict land to the west. The derelict land to the west consisted of mainly tarmac ground with construction materials. The site north of Charlotte Avenue consisted of derelict land sloping westwards. The ground was mainly covered in aggregate. Both sites had a fenced perimeter with a padlock gated entrance. The surrounding area is mainly residential with a local business centre and factory to the immediate east. A stream is located to the west of the site.

3 Ground Conditions

Topsoil was encountered in one exploratory hole (SA303) from ground level down to 0.10m bgl. This material was generally encountered as soft light brown friable silty slightly sandy Topsoil.

Made Ground was encountered in five exploratory holes from ground level to depths ranging between 0.20m and 0.80m bgl. This material was variable consisting of loose to dense, light brown, silty, clayey, and very gravelly sand and soft friable brown silty sandy Topsoil. Gravel was encountered as brick, ceramic, tarpaulin, and aggregate.

Alluvium was encountered in one exploratory hole (SA304) from 0.10m bgl down to the base in excess of 0.65m bgl. This material was generally described as soft to firm, brown, silty, gravelly, slightly cobbly clay.

Forest Marble Formation was encountered in each of the exploratory holes, except for SA304, from depths ranging between 0.10m and 0.80m bgl down to the base of the exploratory holes in excess of 3.15m bgl. The material was generally described as firm light brown silty sandy gravelly cobbly and bouldery clay. Limestone cobbles and boulders are frequent.

No groundwater was encountered in any of the exploratory holes undertaken.

Groundwater monitoring was undertaken over a period of three weeks from 22/01/2020 to 06/02/2020 within CT1. Groundwater was recorded between 1.49m and 2.41m bgl.

4 Soil Infiltration Comments

The four soakaway pits were tested for their infiltration potential using the methods set out in BRE Digest 365. SA301 and SA304 were located at the northern site at depths of 0.94m and 0.64m bgl, respectively. SA302 and SA303 were located at the southern site at depths of 1.35m and 0.70m bgl, respectively.

SA303 successfully completed three tests as set out in BRE 365 providing an average infiltration rate of $3.99 \times 10^{-6} \text{m/s}$.

The rest of the soakaways failed to complete a single test.

The infiltration rates for each test are shown in the table below.

Trial Pit	Average Infiltration Rates (m/s)		
	Test 1	Test 2	Test 3
SA301	Unable To Calculate Infiltration Rate	-	-
SA302	Unable To Calculate Infiltration Rate	-	-
SA303	5.44×10^{-6}	1.77×10^{-6}	4.77×10^{-6}
SA304	Unable To Calculate Infiltration Rate	-	-

Therefore, in line with these comments it is considered that permeable paving type soakaways are a viable option at a depth of 0.70m bgl at the southern site only. It is considered that soakaways will not be viable at the northern site.

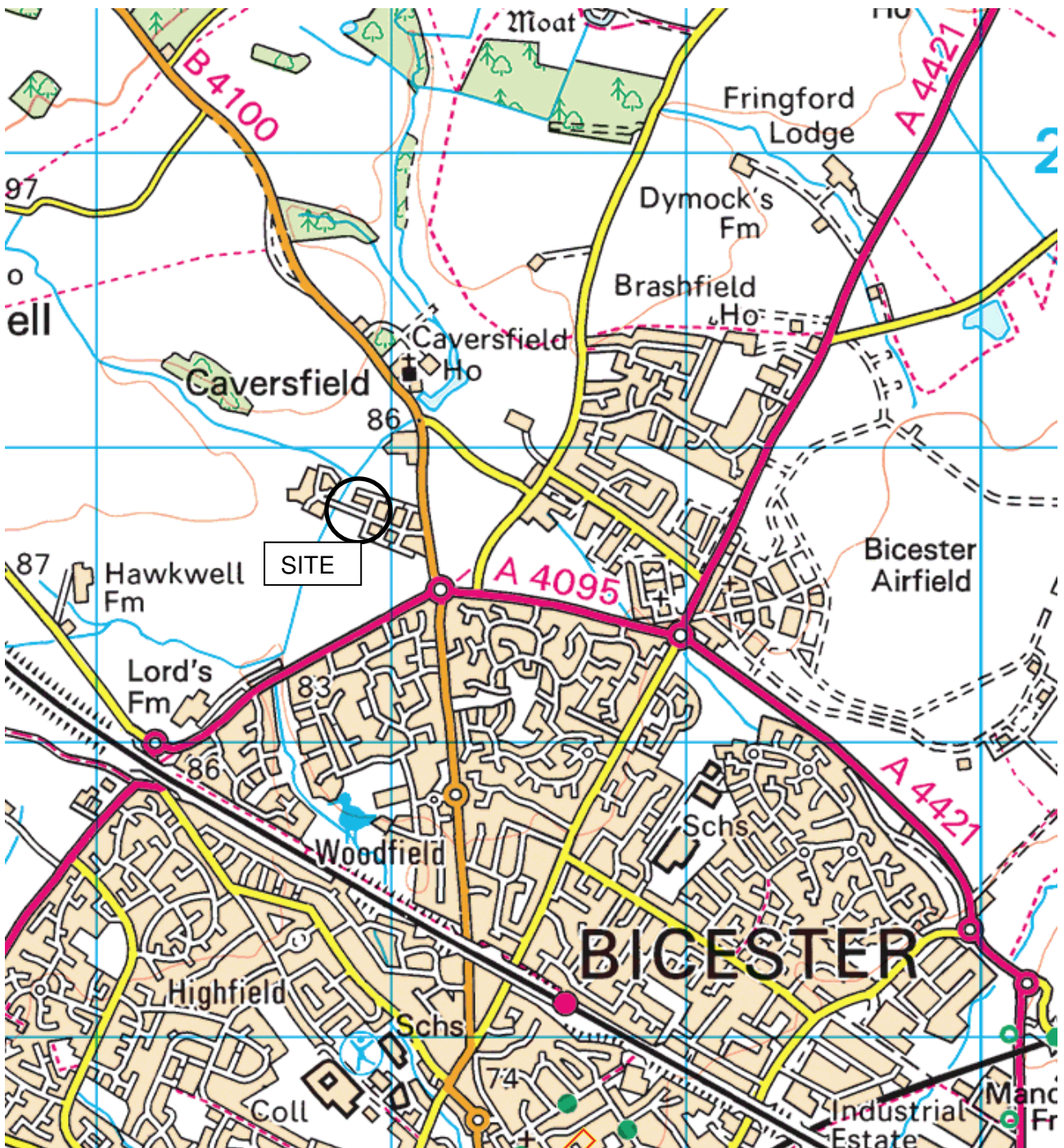
We trust this information is satisfactory to you. In the event of any queries please contact us.

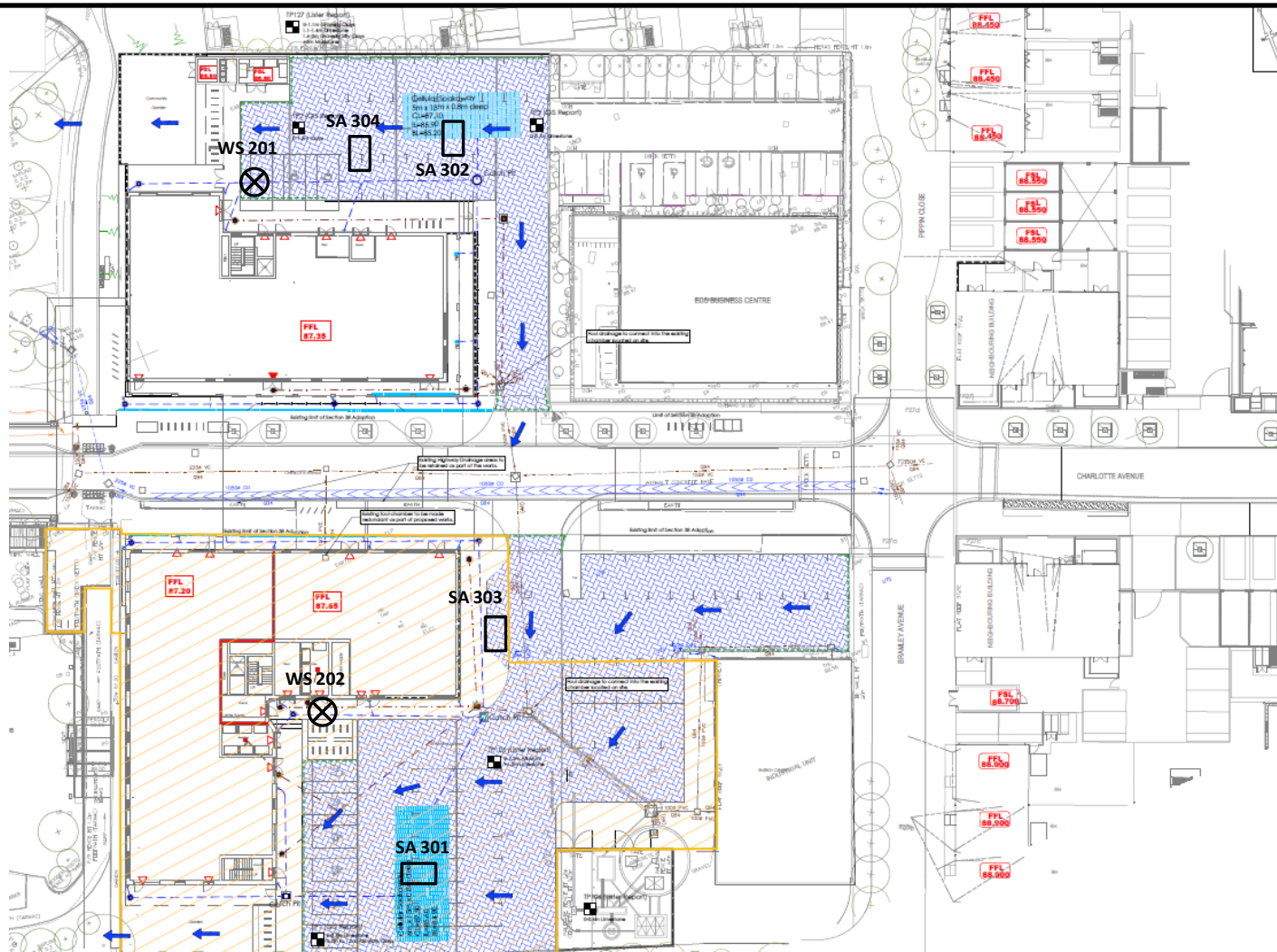
Yours sincerely



Lee Ashworth
Engineering Geologist

Geo-Integrity Ltd.





Key

⊗ Continuous Tube Borehole

□ Soakaway Pit

Exploratory Hole Location Plan

JOB NO.:-19-12-10

Tel:- 01280 816409
 Mob:- 07858 367 125
 www. geo-integrity.co.uk

SITE:- Eimbrook Local Centre, Bicester OX27 8BA

CLIENT:- A2 Dominion

4 Church Street
 Maids Moreton
 MK18 1QE

Drawn SB

Checked LA

Scale: Not To Scale, for indicative purposes only



INTEGRITY



Trial Pit Log

Project Name: Elmsbrook, Bicester		Client: A2 Dominion		Date: 07/01/2020	
Location: Elmsbrook Local Centre, Bicester OX27 8BA		Contractor: Geo-Integrity		Co-ords: E457886.00 N224803.00	
Project No. : 19-12-10		Crew Name: David Beecroft Ltd		Equipment: JCB 3CX	
Location Number SA 301	Location Type TP	Level	Logged By Lee Ashworth	Scale 1:10	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
[Pattern]					0.40		[Pattern]	MADE GROUND Loose light brown silty clayey very gravelly SAND. Gravel is brick, aggregate and limestone.
					0.94	[Pattern]	FOREST MARBLE FORMATION Soft to firm light brown silty sandy gravelly cobbly and bouldery CLAY. Gravel is limestone	
							End of Borehole at 0.940m	1
								2

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.00	0.70						

Remarks



Trial Pit Log

Project Name: Elmsbrook, Bicester		Client: A2 Dominion		Date: 07/01/2020	
Location: Elmsbrook Local Centre, Bicester OX27 8BA		Contractor: Geo-Integrity		Co-ords: E457860.00 N224739.00	
Project No. : 19-12-10		Crew Name: David Beecroft Ltd		Equipment: JCB 3CX	
Location Number SA 302	Location Type TP	Level	Logged By Lee Ashworth	Scale 1:10	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
[Pattern]					0.20		MADE GROUND Aggregate over soft friable brown silty sandy gravelly TOPSOIL. Gravel is limestone and tarpaulin.		
					0.90		FOREST MARBLE FORMATION Blue grey LIMESTONE.		
					1.30		FOREST MARBLE FORMATION Light brown grey silty sandy very cobbly very gravelly CLAY. Gravel and cobbles are limestone	1	
							End of Borehole at 1.300m	2	

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.00	0.70						

Remarks



Trial Pit Log

Project Name: Elmsbrook, Bicester		Client: A2 Dominion		Date: 07/01/2020	
Location: Elmsbrook Local Centre, Bicester OX27 8BA		Contractor: Geo-Integrity		Co-ords: E457865.00 N224761.00	
Project No. : 19-12-10		Crew Name: David Beecroft Ltd		Equipment: JCB 3CX	
Location Number SA 303	Location Type TP	Level	Logged By Lee Ashworth	Scale 1:10	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
[Pattern]					0.10		[Pattern]	TOPSOIL Soft light brown friable silty slightly sandy TOPSOIL.
					0.70		[Pattern]	FOREST MARBLE FORMATION Soft light brown grey silty sandy gravelly cobbly bouldery CLAY. Gravel is limestone.
								End of Borehole at 0.700m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.00	0.70						

Remarks



Trial Pit Log

Project Name: Elmsbrook, Bicester		Client: A2 Dominion		Date: 07/01/2020	
Location: Elmsbrook Local Centre, Bicester OX27 8BA		Contractor: Geo-Integrity		Co-ords: E457877.00 N224808.00	
Project No. : 19-12-10		Crew Name: David Beecroft Ltd		Equipment: JCB 3CX	
Location Number SA 304	Location Type TP	Level	Logged By Lee Ashworth	Scale 1:10	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
[Pattern]					0.30		[Pattern]	MADE GROUND Loose light brown silty clayey very gravelly SAND. Gravel is brick aggregate, ceramic and tarpaulin
					0.65		[Pattern]	ALLUVIUM Soft to firm light brown silty sandy gravelly slightly cobbly CLAY. Gravel and cobbles are limestone.
								End of Borehole at 0.650m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.00	0.70						

Remarks



Percussion Drilling Log

Project Name: Elmsbrook, Bicester		Client: A2 Dominion		Date: 07/01/2020	
Location: Elmsbrook Local Centre, Bicester OX27 8BA		Contractor: Geo-Integrity		Co-ords: E457804.00 N21810.00	
Project No. : 19-12-10		Crew Name: AA Drilling		Drilling Equipment: Window Sample Rig	
Borehole Number WS201	Hole Type WS	Level	Logged By Lee Ashworth	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.20		MADE GROUND Dense greyish brown very sandy fine to coarse angular GRAVEL		
		0.60	D		0.60		MADE GROUND Dense brown very sandy fine to coarse angular GRAVEL AND COBBLES of limestone with some brick		
		0.80	D		0.80		MADE GROUND Stiff dark brown silty sandy gravelly CLAY. Gravel is fine to medium angular		
		1.00	D				FOREST MARBLE FORMATION Stiff becoming firm brown and light brown silty sandy gravelly CLAY with occasional shell fragments and limestone cobbles. Gravel is fine to coarse angular of limestone		
		1.00	PP	112.50					
		1.25	PP	100.00					
		1.50	PP	50.00					
		1.75	PP	50.00					
		1.80	D		1.80		FOREST MARBLE FORMATION Stiff becoming firm brown and light brown silty sandy gravelly CLAY with occasional shell fragments and cobbles. Gravel is fine to coarse angular of limestone.		
		2.00	D						
		2.00	PP	250.00					
		2.25	PP	250.00					
		2.50	D						
		2.50	PP	250.00			No penetration on tip of sampler		
		2.75	PP	250.00					
	3.00	D							
	3.00	PP	250.00			End of Borehole at 3.150m			
	3.15	D		3.15					

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
		1.00	87								
		2.00	77								
		3.00	67								
		3.15	57								

Remarks





Percussion Drilling Log

Project Name: Elmsbrook, Bicester		Client: A2 Dominion		Date: 07/01/2020	
Location: Elmsbrook Local Centre, Bicester OX27 8BA		Contractor: Geo-Integrity		Co-ords: E457845.00 N224756.00	
Project No. : 19-12-10		Crew Name: AA Drilling		Drilling Equipment: Window Sample Rig	
Borehole Number WS202	Hole Type WS	Level	Logged By Lee Ashworth	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
Water Strikes		0.10	D		0.30	MADE GROUND Medium dense dark brown very sandy fine to coarse angular GRAVEL AND COBBLES of limestone with some brick		1	
		0.50	D						FOREST MARBLE FORMATION Dense light brown sandy clay bound fine to coarse angular GRAVEL AND COBBLES of limestone
		1.00	D		1.00	FOREST MARBLE FORMATION Stiff brown orange brown and light brown silty sandy gravelly CLAY with occasional shell fragments. Gravel is fine to coarse angular of limestone		1	
		1.00	PP	100.00					
		1.25	PP	100.00					
		1.50	D		1.50	FOREST MARBLE FORMATION Weak light brown weathered LIMESTONE.		2	
		1.50	PP	150.00					
	1.70	D		1.70			2		
	1.80	D		1.80		No penetration past this point. End of Borehole at 1.800m			

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation
		1.00	77								
		1.80	67								

Remarks





Date	Job No.	BH	CH4(%)	LEL(%)	CO2(%)	O2(%)	H2S (ppm)	CO (ppm)	Hex(%)	PIDCf()	PkFlw (lh)	AP (mbar)	GW (m bgl)	Pmp (s)	Bal(%)
22/01/20	19-12-10	CT 1	0	0	1.7	0.1	0	0	0.002	1	0	0	2.21	61	98.2
27/01/20	19-12-10	CT 1	0	0	0.5	6.1	0	0	0	1	-0.2	-0.4	1.49	60	93.4
06/02/20	19-12-10	CT 1	0	0	2.2	0.4	0	0	0	1	-0.5	-0.4	2.41	72	97.4



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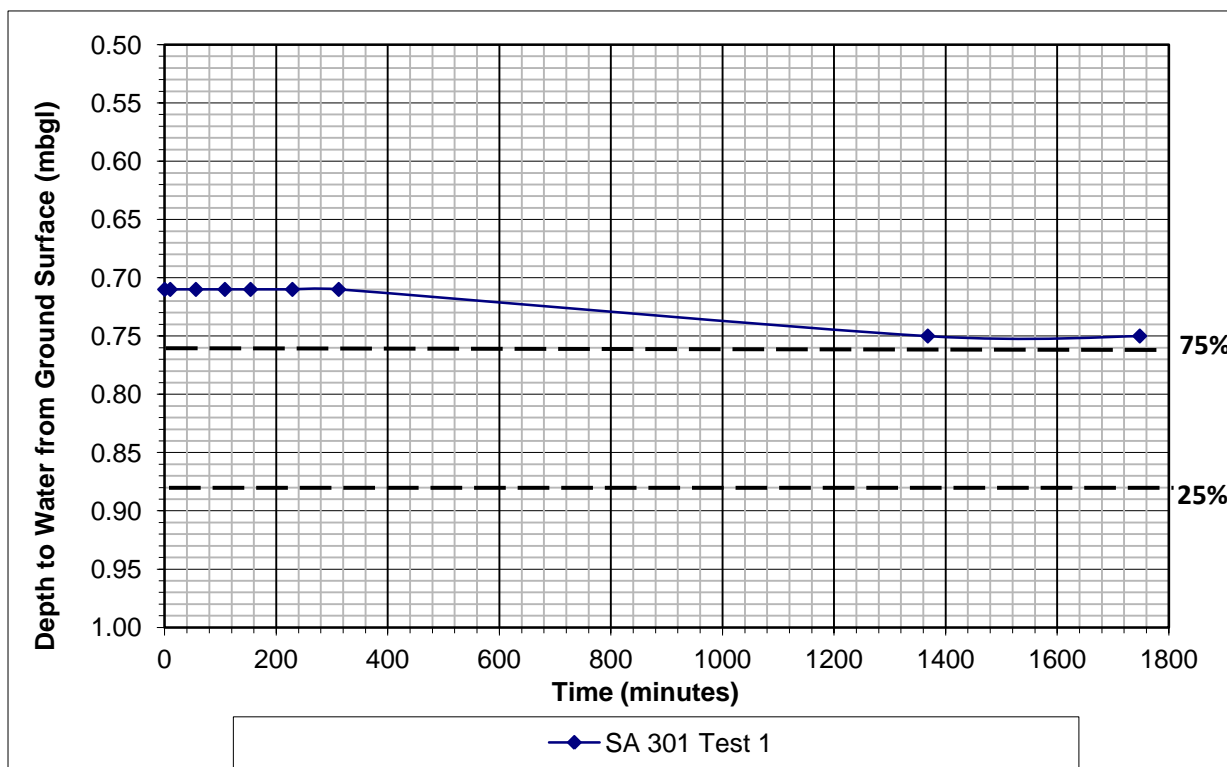
Trial Pit Infiltration Testing to BRE Digest 365

Client: A2 Dominion **Report No:** 19-12-10
Site: Elmsbrook Local Centre, OX27 8BA **Date Tested:** 07/01/20
Dimensions: 0.70m x 1.0m x 0.94m **Test Location:** SA 301
(width x length x depth)

Test Response Zone Description - : Forest Marble Formation

Time	Depth BGL	Time	Depth BGL	Time	Depth BGL
0	0.71	1368	0.75		
10	0.71	1748	0.75		
56	0.71				
108	0.71				
154	0.71				
229	0.71				
312	0.71				

Unable to Calculate Average Soil Infiltration Rate





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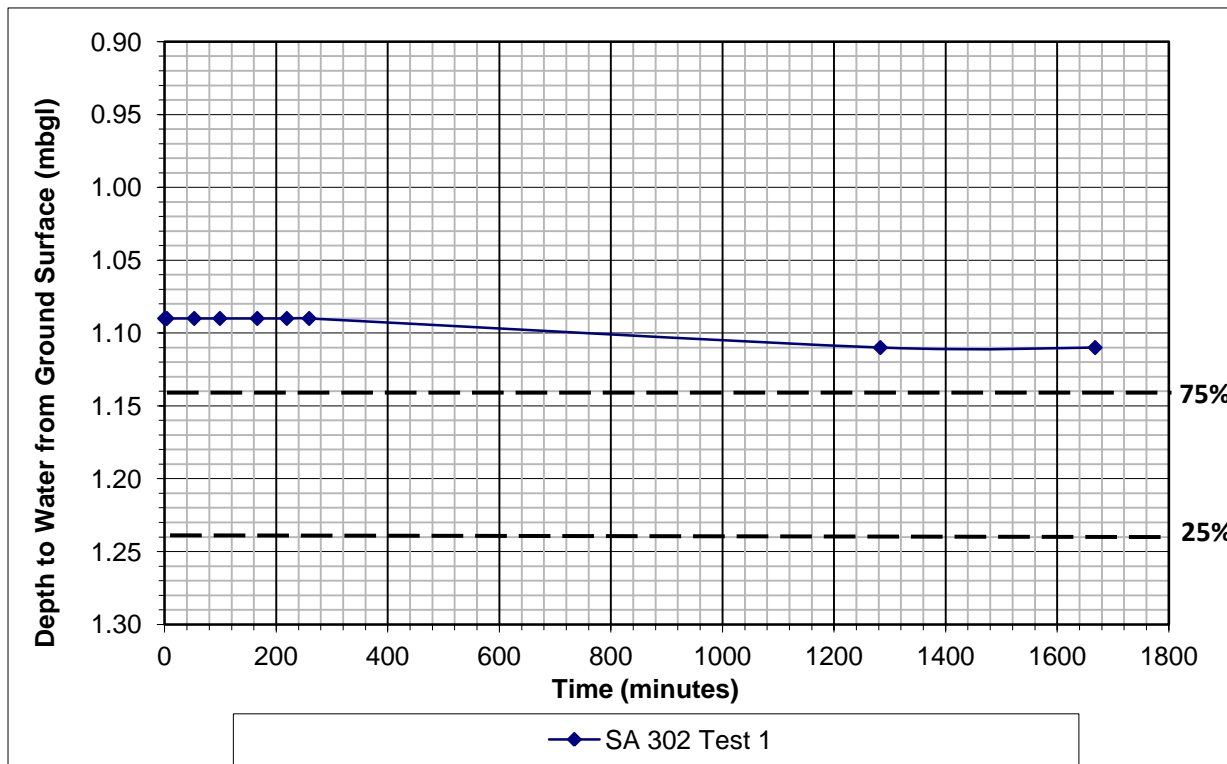
Trial Pit Infiltration Testing to BRE Digest 365

Client: A2 Dominion **Report No:** 19-12-10
Site: Elmsbrook Local Centre, OX27 8BA **Date Tested:** 07/01/20
Dimensions: 0.70m x 1.0m x 1.3m **Test Location:** SA 302
 (width x length x depth)

Test Response Zone Description - : Forest Marble Formation

Time	Depth BGL	Time	Depth BGL	Time	Depth BGL
0	1.09	1283	1.11		
4	1.09	1668	1.11		
53	1.09				
99	1.09				
166	1.09				
219	1.09				
259	1.09				

Unable to Calculated Average Soil Infiltration Rate



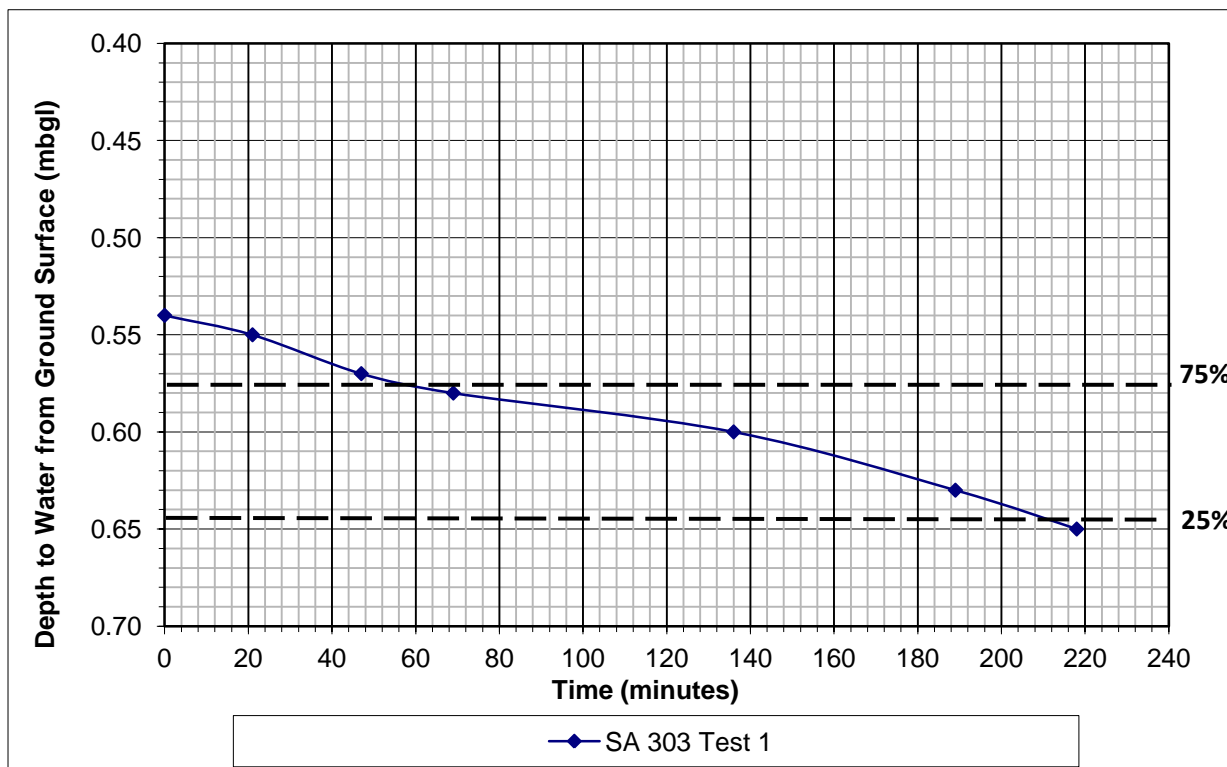
Trial Pit Infiltration Testing to BRE Digest 365

Client: A2 Dominion **Report No:** 19-12-10
Site: Elmsbrook Local Centre, OX27 8BA **Date Tested:** 07/01/20
Dimensions: 0.70m x 1.0m x 0.68m **Test Location:** SA 303
 (width x length x depth)

Test Response Zone Description - : Forest Marble Formation

Time	Depth BGL	Time	Depth BGL	Time	Depth BGL
0	0.54				
21	0.55				
47	0.57				
69	0.58				
136	0.60				
189	0.63				
218	0.65				

Average Soil Infiltration Rate = 5.44×10^{-6} m/s



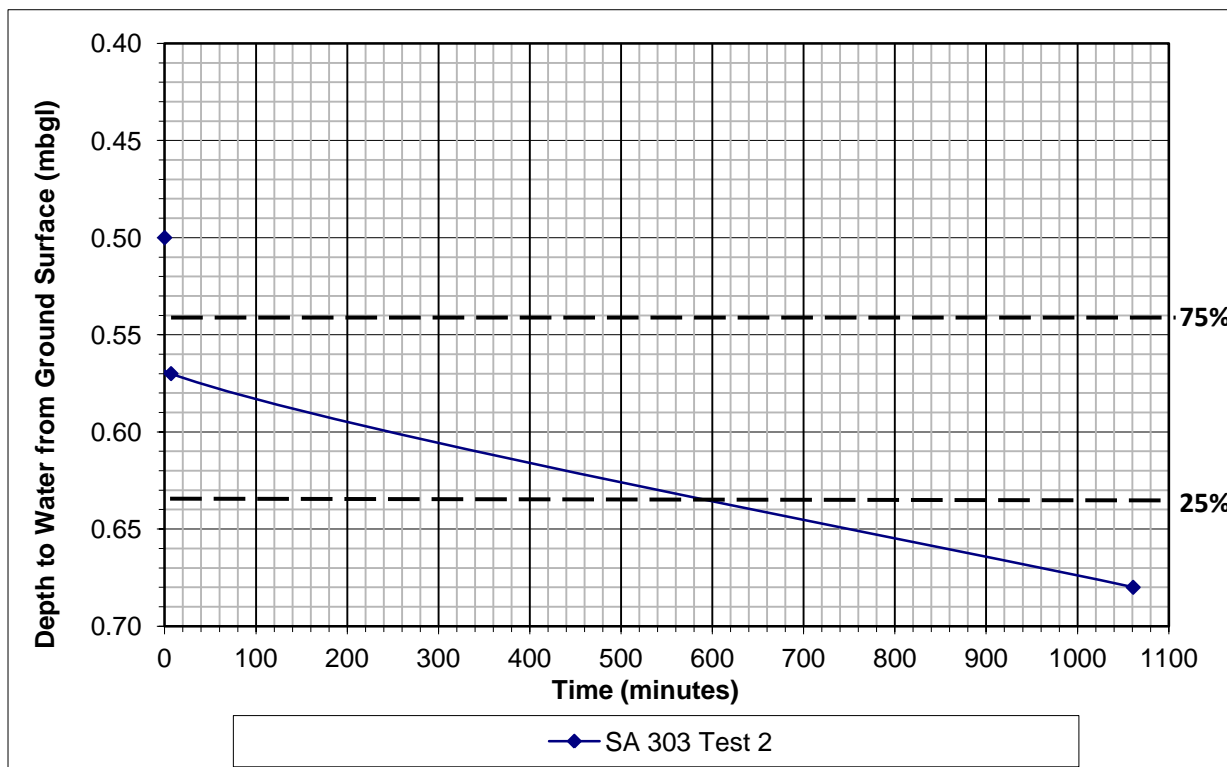
Trial Pit Infiltration Testing to BRE Digest 365

Client: A2 Dominion **Report No:** 19-12-10
Site: Elmsbrook Local Centre, OX27 8BA **Date Tested:** 07/01/20
Dimensions: 0.70m x 1.0m x 0.68m **Test Location:** SA 303
 (width x length x depth)

Test Response Zone Description - : Forest Marble Formation

Time	Depth BGL	Time	Depth BGL	Time	Depth BGL
0	0.50				
7	0.57				
1061	0.68				

Average Soil Infiltration Rate = 1.77×10^{-6} m/s





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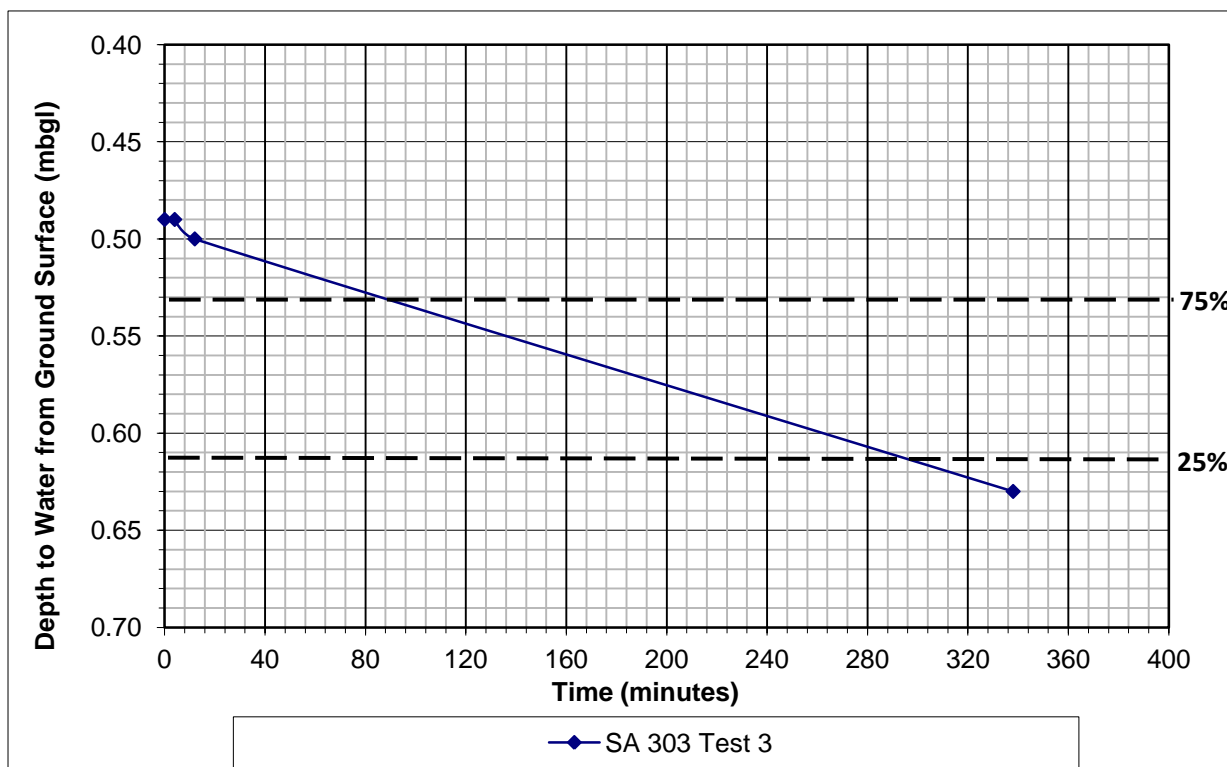
Trial Pit Infiltration Testing to BRE Digest 365

Client: A2 Dominion **Report No:** 19-12-10
Site: Elmsbrook Local Centre, OX27 8BA **Date Tested:** 07/01/20
Dimensions: 0.70m x 1.0m x 0.66m **Test Location:** SA 303
(width x length x depth)

Test Response Zone Description - : Forest Marble Formation

Time	Depth BGL	Time	Depth BGL	Time	Depth BGL
0	0.49				
4	0.49				
12	0.50				
338	0.63				

Average Soil Infiltration Rate = 4.77×10^{-6} m/s





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Trial Pit Infiltration Testing to BRE Digest 365

Client: A2 Dominion **Report No:** 19-12-10
Site: Elmsbrook Local Centre, OX27 8BA **Date Tested:** 07/01/20
Dimensions: 0.70m x 1.0m x 0.65m **Test Location:** SA 304
(width x length x depth)

Test Response Zone Description - : Alluvium

Time	Depth BGL	Time	Depth BGL	Time	Depth BGL
0	0.49				
2	0.49				
48	0.49				
121	0.49				
206	0.49				
1262	0.57				
1642	0.58				

Unable To Calculate Average Soil Infiltration Rate

