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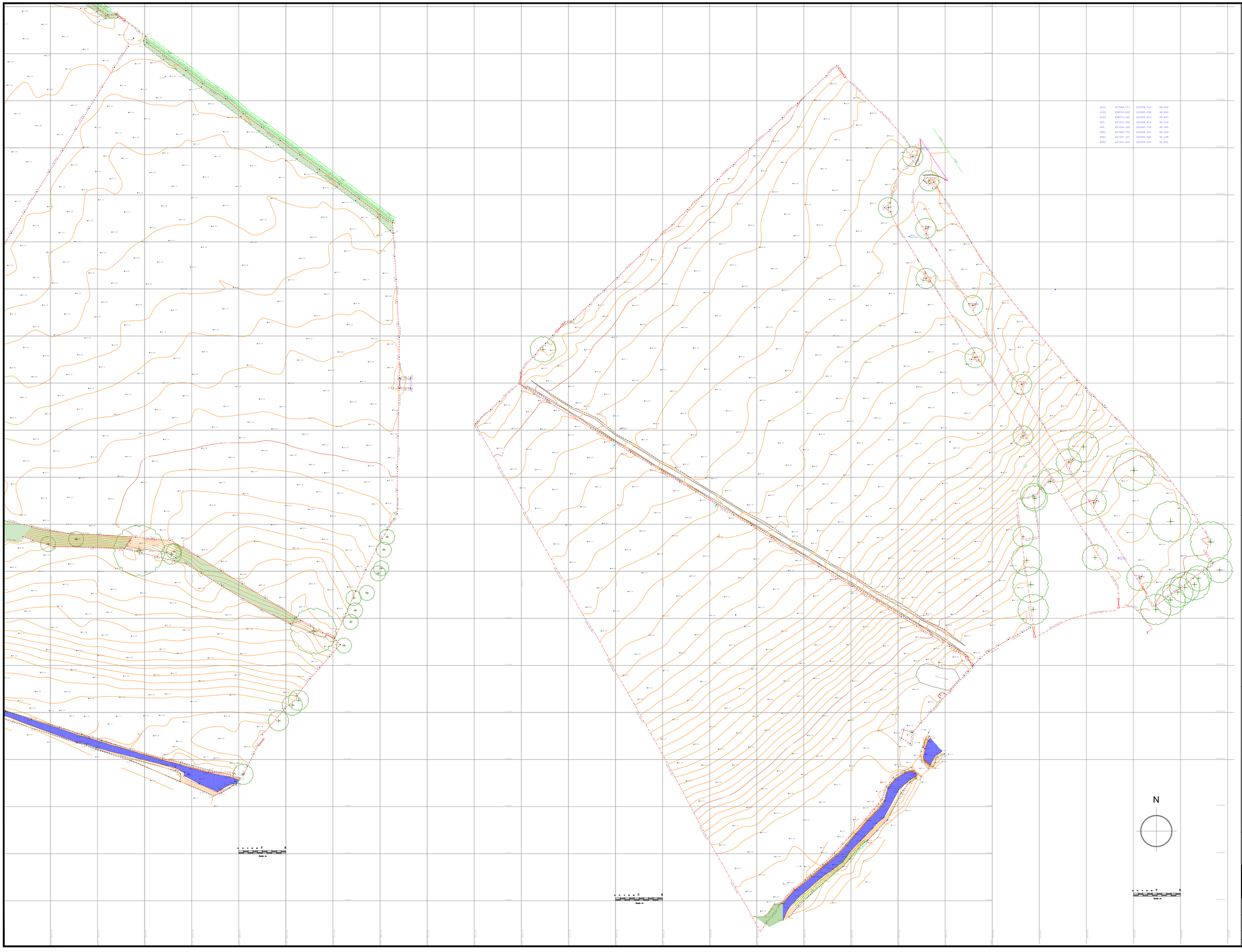
Appendix D

Topographic Survey



B101	457969.717	225259.716	89.246
B102	458033.600	225085.598	84.812
B103	458071.140	225034.412	85.447
BT3	457315.392	225356.816	92.212
BT4	457204.144	225343.762	92.185
BTS1	457944.755	225222.321	88.039
BTP1	457387.337	225305.490	92.188
BTP2	457501.425	225234.035	91.831

SHEET LAYOUT

Notes :

This plan should only be used for its original purpose. SV Surveying Ltd accepts no responsibility for this plan if supplied to any other party other than the original client.

All dimensions / levels should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and should be treated as approximate only.

Tree information (where applicable) has been surveyed from ground level and therefore should be treated as approximate only.

Contours are drawn at 0.2m intervals

The survey has been fixed to GPS OSGB 1936 using the active GPS network.

Legend:

	Building Canopy / Overhang	Trig	Trig Pillar
	Buildings / walls	Ridg	Ridge Level
	Kerb line	Eave	Eave Level
	Concrete edge	DPC	Dpc Level
	Centre Line	FL	Floor Level
	Barrier	Soff	Soffit Level
	Hedge	Tbx	Control Box
	Security Fence	LP	Lamp Post
	Field Fence	SP	Sign Post
	Overhead Powerline	pwr	Post
	Chambers	FS	Flag Staff
STN1	Survey Station & Name	MA	Gas Marker
		EP	Electric Post
BM	Bench Mark	TP	Telegraph Post
TBM	Temporary Bench Mark	Inv	Pipe Invert
		GU	Gully
		RP	Rodding Point
TRP	Tree / Sapling	BT	Bt Cover
		CO	Cover Unknown
	Area Of Undergrowth	EC	Electricity Cover
	Gate	FH	Fire Hydrant
		GAS	Gas Cover
IC	Inspection chamber	SV	Stop Valve
CL	Cover level	TV	Tv Cover
IL	Invert level	WM	Water Meter
Inv 95.25	Pipe invert (diameter)	BB	Bellsfea Beacon
Gy	Gully	BO	Bollard
Bg	Back Gully	BS	Bus Stop
MH	Manhole	ER	Earthing Rod
		Box	Post Box
		MS	Mile Stone
		TL	Traffic Light
		GV	Gas Valve
		PEG	Peg

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Project

ROB BOLTON
HOMEFARM

Drawing

TOPOGRAPHIC SITE SURVEY

Scales	Drawn/Paper Size
1:500	AB/IA/A0
Survey Date	Drawing No
05/03/20	19280-20-01

DO NOT SCALE

B101	457969.717	225259.716	89.246
B102	458053.400	225585.598	84.810
B103	458071.140	225054.412	85.447
BT3	457315.392	225356.816	92.212
BT4	457204.144	225343.762	92.189
BTG1	457944.755	225222.321	89.039
BTP1	457397.107	225305.690	92.188
BTP2	457501.425	225234.035	91.831

SHEET LAYOUT

B

A

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	Security Fence	LP	Lamp Post
	Panel Fence	SP	Sign Post
	Open Fence	post	Post
	Overhead Powerline	FS	Flag Staff
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3no Ø0.25	Pipe invert (diameter)	bol	Bollard
Gy	Gully	BS	Box Step
Rg	Back Gully	ER	Earthing Rod
MH	Manhole	Box	Post Box
		MS	Mile Stone
		TL	Traffic Light
		OV	Gas Valve
		PM	Peg

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Drawing

TOPOGRAPHIC SITE SURVEY

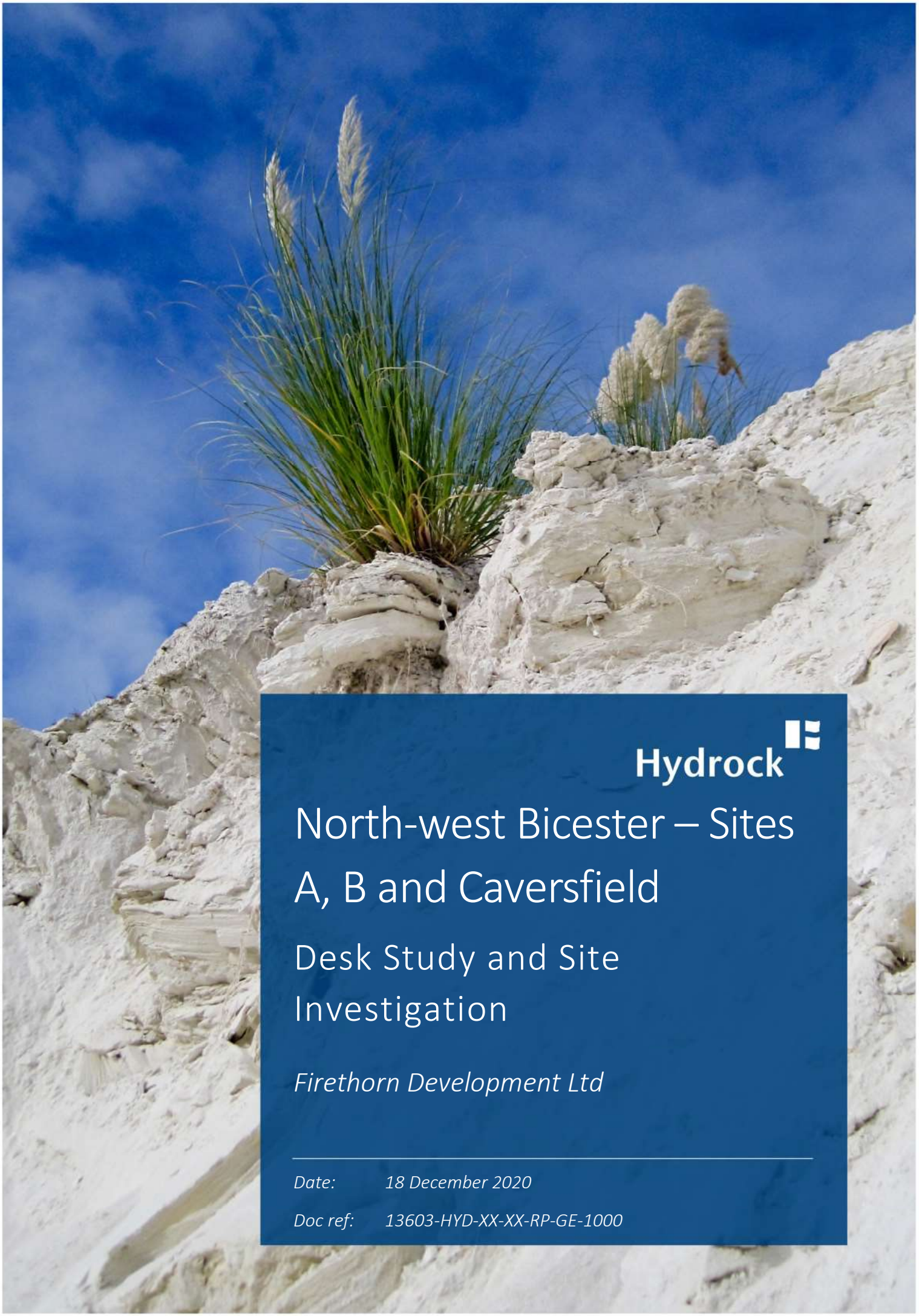
Scales	Drawn/Paper Size
1:500	AB/IA/A0
Survey Date	Drawing No
05/03/20	19280-20-01

DO NOT SCALE

vectos.

Appendix E

Site Investigation Extracts



Hydrock

North-west Bicester – Sites A, B and Caversfield

Desk Study and Site Investigation

Firethorn Development Ltd

Date: *18 December 2020*

Doc ref: *13603-HYD-XX-XX-RP-GE-1000*

DOCUMENT CONTROL SHEET

Issued by	Hydrock Consultants Limited Hawthorn Park Holdenby Road Spratton Northampton NN6 8LD	Tel: 01604 842888 E-mail: northampton@hydrock.com www.hydrock.com
Client	Firethorn Development Ltd	
Project name	North-west Bicester – Sites A, B and Caversfield	
Title	Desk Study and Site Investigation	
BIM reference	13603-HYD-XX-XX-RP-GE-1000	
Project reference	C-13603-C	
Date	18/12/2020	

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Prepared by		George Patterson BSc (Hons) MSc FGS Cameron Adams BSc (Hons) MSc FGS
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Approved by		Allan Bell BSC MSC CGeol RoGEP FGS

Document Revision Record			
Status	Revision	Date	Revision Details
S2	P01	18/12/20	Initial Issue

CONTENTS

Appendices

Tables

Figures

EXECUTIVE SUMMARY

SITE INFORMATION AND SETTING	
Objectives	The works have been commissioned to support the planning application and to assist with the design of the development.
Client	Firethorn Developments Ltd
Site name and location	North-west Bicester Eco Development – Sites A, B and Caversfield. The site is located to the south of the B4100, approximately 1.8 miles to the north-west of Bicester and approximately 1 mile east of Caversfield. The National Grid Reference of the approximate centre of the site is 457701E, 225165N.
Proposed development	Hydrock understands that the proposed development is to comprise residential properties (approximately 500 homes) with public open space and associated infrastructure.
GROUND MODEL	
Desk study summary	The site currently comprises open agricultural land, comprising from three land parcels. Site A (in the site centre) is formed of four fields with a wooded area in the south-west. Site B is to the west and is formed of the eastern end of an agricultural field with a wooded area present in the south-east. Caversfield is the eastern most land parcel and is formed of three fields. The whole site has an area of approximately 22 ha. There are streams on the southern and eastern boundaries and an existing residential development is present between Site A and Caversfield. The site slopes down towards the south and south east from 94m above Ordnance Datum (OD) in the north-west, to 83m OD in the south-east. The site slopes more steeply in the southern sections of Sites A and B towards the stream immediately to the south. The south-east of Caversfield also slopes steeply towards the stream immediately to the east, with a reduction in level from approximately 90m OD to 83.5m OD. Review of historical Ordnance Survey mapping indicates: • The site remained predominantly open land made up of several land parcels since 1881 to present day. There is a small quarry approximately 75m east of Caversfield from 1881 to 1922. • Bicester Aerodrome formally RAF Bicester, located approximately 1km to the south-east, appears on maps from 1952; however, is recorded dating back to 1916. • In the 1920s a filter bed is shown on Caversfield's south-east boundary and several quarries are shown approximately 500m east of the site; • Satellite imagery from 2017 shows construction of residential housing in the adjacent fields north and south; Charlotte Avenue and an attenuation pond are shown between Site A and Caversfield. A non-specialist UXO assessment indicates a low UXO risk. The geology at the site is anticipated to comprise local alluvium (associated with the streams), overlying the Cornbrash Formation and the Forest Marble Formation. The deeper geology comprises the White Limestone Formation. The superficial deposits, Cornbrash Formation and Forest Marble Formation are all Secondary A aquifers and the deeper laying White Limestone Formation is a Principal Aquifer. The site is not within a Source Protection Zone, but there are two groundwater abstractions within 1km of it.
Ground and groundwater conditions encountered by investigation	The ground conditions as proven by the investigation undertaken at the site comprise: • Topsoil across most of the site from surface to between 0.20m to 0.60m bgl, comprising brown locally orangish brown organic variably sandy gravelly clay with frequent rootlets. • Made Ground, encountered locally in the south-east of Site A and north-east of Caversfield, from the surface to 0.30m below ground level (bgl), to depths of between 0.25m to 1.60m bgl. The Made Ground comprised: - 'General' Made Ground comprising soft brown locally blackish brown variably sandy gravelly clay with fragments of brick, concrete and plastic; or

	- 'Reworked' Made Ground, in TP81 only, comprising soft brown slightly gravelly sandy clay and soft blackish brown slightly gravelly sandy clay. • Alluvium in the south of Site B (TP11 only) encountered between 0.30m bgl and 0.80m bgl comprising soft orangish brown slightly gravelly slightly sandy clay. • Head Deposits across most of the site from 0.25m bgl to 0.80m bgl, to depths of 0.50m bgl to 2.40m bgl, comprising soft (locally firm) orangish brown variably sandy gravelly clay with cobbles and boulders; orangish brown, reddish brown and cream variably sandy clayey gravel with cobbles and boulders; and reddish brown variously gravelly clayey sand. • Cornbrash Formation across the majority of the central and western sections of the site, but not at the lower topographic levels in the central south and the far east. This was recorded from 0.20m bgl to 2.00m bgl to depths of 1.00m bgl to 3.73m bgl. The Cornbrash Formation comprised firm to stiff orangish brown, light brown, yellowish brown and grey variously sandy gravelly clay, locally with shell fragments and calcareous nodules; and very weak to moderately weak locally fractured orangish brown, light grey and yellowish-brown limestone, locally with shells fragments. • Forest Marble Formation encountered beneath the Cornbrash Formation and locally sub-cropping below the superficial deposits in the central south-east and east. This was recorded from 0.60m bgl to 3.73m bgl to a maximum depth of 5.00m bgl (base not proven). The Forest Marble Formation comprised firm to very stiff bluish grey, greenish grey, light yellowish grey and orangish brown variably sandy gravelly silty clay; very weak to moderately weak light grey, dark grey, light yellowish brown and locally stained orangish brown limestone, locally with fossil and shell fragments; and extremely weak light grey and dark grey mudstone. Groundwater was encountered at depths between 0.8m bgl and 3.2m bgl during the investigation. Water levels recorded post-fieldwork ranged from 0.51m bgl to 4.37m bgl (91.65m OD to 83.50m OD). Shallow groundwater was encountered towards the base of the Cornbrash Formation, with local variations probably associated with varied permeability due to the alternating beds of clay and limestone recorded. There is also a deeper groundwater body in the Forest Marble Formation, notably identified in the south-east of the site (in Caversfield), where this stratum sub-crops. No visual or olfactory evidence of contamination was recorded.
GEOTECHNICAL CONCLUSIONS	
Conclusions of geotechnical assessment	Man-made obstructions are unlikely to be encountered. Topsoil should be removed from beneath all building and hardstanding areas. Shallow excavation should generally be achievable with standard excavation plant. Heavy duty excavation plant/breaking equipment will likely be required to excavate the limestone of the Cornbrash Formation and the Forest Marble Formation, especially with depth. Excavations during investigation were generally stable, although slight spalling should be expected from the Made Ground and overbreak should be expected where limestone bands are excavated through. Water seepages into excavations are likely to be adequately controlled by sump pumping. However, in periods of high rainfall, high-capacity pumps will likely be required. Strip/trench fill foundations are recommended for the majority of foundations. Deepening of foundations/heave protection is likely to be required to allow for the effects of trees. Piles may be required where in close proximity to trees. A permissible net bearing pressure of 125kN/m² should be available for strip/trench fill foundations up to 1.0m wide. Suspended ground floor slabs are recommended because of the depth of Made Ground (locally) and the presence of medium shrinkage potential clay soils. A design CBR 2.5% is recommended for design for most of the site, with <2.5% recommended in areas of Made Ground and Alluvium. Subject to further works, infiltration of surface water into the ground is possible for parts of the site. However, shallow groundwater was recorded and as such any infiltration drainage will be shallow and subject to design by a specialist.

	Design Sulfate Class - DS-1 and ACEC Class AC-1. Equivalent to Design Chemical Class DC-2 for a 50-year design life.
GEO-ENVIRONMENTAL CONCLUSIONS	
Conclusions of contamination Generic risk assessment	Human health and plant growth: • Low risks. No mitigation required. Ground gases or vapours: • Low risk from ground gases (subject to additional and on-going monitoring) and CS1 conditions apply and no mitigation required. Radon: • The is in a Radon Affected Area where recorded radon levels in 3-10% of homes are above the action level and basic radon protection measures are required. Water supply pipes: • Standard pipework is envisaged. However, confirmation should be sought from the water supply company at the earliest opportunity.
Waste management	Excavated soils which are to be disposed of as waste, are likely to be classed as: • Topsoil - non-hazardous waste (subject to organic content); • Made Ground - non-hazardous waste that is likely able to be disposed of at an inert landfill; and • Natural soils - non-hazardous waste that is likely able to be disposed of at an inert landfill.
FUTURE CONSIDERATIONS	
Further work	Following the ground investigation works undertaken to date, the following further works will be required: • completion and reporting of the ongoing gas monitoring, hence the conclusions in this report are provisional, subject to the completion of monitoring; • supplementary ground investigation to investigate the proposed attenuation pond in Site A, the proposed site wide shallow drainage and the areas of the site inaccessible at the time of the current investigation; • discussions with regulatory bodies and the warranty provider regarding the conclusions of this report; • geotechnical design; • production of a Materials Management Plan relating to reuse of soils at the site; and • verification of the earthworks and MMP works.

This Executive Summary forms part of Hydrock Consultants Limited report number 13603-HYD-XX-XX-RP-GE-1000 and should not be used as a separate document.

Reference	Key features on site	Key features off-site
Google Earth[2] 2017	No significant changes shown.	Charlotte Avenue is shown and crosses the boundary between Site A and Caversfield. Construction of residential housing is shown on parcels of land immediately north and south of the site.
Google Earth[2] 2018	No significant changes shown.	Excavation of an attenuation pond immediately east of Charlotte Avenue and immediately west of Caversfield (the land parcel).
Apple Maps[3] 2020 1:10,000	No significant changes shown.	Maps show further development of the two fields immediately north of the site.

2.5 Geology

The general geology of the site area is shown on the 1:10,000 British Geological Survey (BGS) map extract reproduced as part of the Envirocheck report and is summarised in Table 2.4. Extracts from the map are shown in Figure 2.7 and Figure 2.8.

Table 2.4: Geology

Ref. for Figures	Location	Stratigraphic Name	Description
Superficial Deposits (Figure 2.7)			
1	Along the south-east site boundary of site C.	Alluvium	Comprising clay, silt, sand and gravel and potentially peat/organic rich.
Solid Geology (Figure 2.8)			
FMB	On site.	Cornbrash Formation	Bioclastic limestone and interbedded calcareous mudstone. Bluish grey when fresh but upper layers weathered to olive or yellowish brown.
CB	On site.	Forest Marble Formation	Greenish and bluish grey limestone and silicate-mudstone weathering to clay, interbedded. Upper layers weathered brown.
WLM	Below the entire site at depth	White Limestone Formation	Pale grey to off-white or yellowish carbonate limestone.

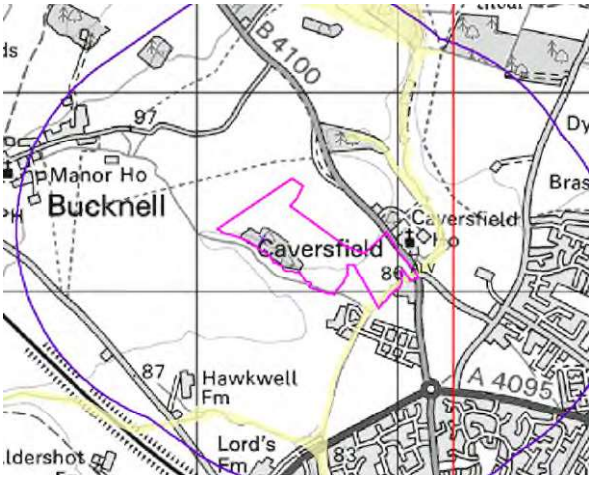


Figure 2.7: Superficial deposits.
(Reproduced with permission from Envirocheck)

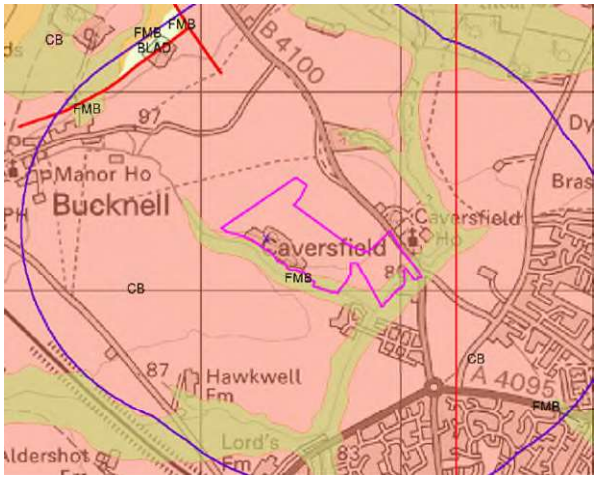


Figure 2.8: Solid geology.
(Reproduced with permission from Envirocheck)

Faulting is shown to the north of the site, tending approximately north-east to south-west and north-west to south-east. Downthrows to the south and east (throw in metres).

A number of borehole logs from the BGS archive have been reviewed. Selected records are summarised below:

- SP52SE55, located 600m to the south-west of the site at Caversfield foul water outfall sewer (NGR 458080E, 224550N), drilled to a depth of 5.50m and recorded:
  - Topsoil between ground level and 0.80m below ground level (bgl);
  - Moderately to highly weathered limestone between 0.80m and 3.05m bgl;
  - Calcareous clay interbedded with limestone between 3.05m and 5.50m bgl; and

The ground conditions proven by previous investigation of the wider NW Bicester Eco Development (Hyder Consulting (UK) Limited, 2011), comprise:

- Topsoil between ground level and 0.30m bgl;
- Superficial / Head deposits to a maximum depth of 0.80m bgl, comprising: red brown, clayey sandy gravel and cobbles, or in places gravelly sandy clay with cobbles.
- weathered limestone recovered as yellow grey sandy gravel or in places yellow grey clay to a maximum depth of 2.90m bgl (probable Cornbrash Formation).
- interbedded moderately strong to strong Limestone and stiff or hard clay and mudstone to depths greater than 7.00m bgl (probable Forest Marble Formation).

2.6 Hydrogeology

2.6.1 Aquifer designations

Based on the inferred geological sequence presented in Section 2.5 and the Environment Agency's interactive aquifer designation map, the aquifer system presented in Table 2.5 applies. Additional information on the hydraulic characteristics of the geological units has been abstracted from Allen et al (1997) and Jones et al (2000).

Table 2.5: Aquifer system

Stratum	Aquifer Designation	Comments
Alluvium	Secondary A Aquifer	Intergranular permeability. Varied, moderate to high permeability layers of sand and occasional gravel, interbedded with low permeability clay. Overall, this unit is likely to be relatively anisotropic in nature with horizontal permeability similar to vertical permeability (i.e. kh>kv). Groundwater flow is likely to be variable and discontinuous as water migrates around low permeability areas.
Solid Geology		
Cornbrash Formation	Secondary A Aquifer	Low permeability and low porosity clay, which is interbedded with moderate to high permeability layers of limestone. Potentially faulted and fractured, with high secondary permeability. Overall, this unit is likely to be relatively anisotropic in nature with horizontal permeability similar to vertical permeability (i.e. kh>kv).
Forest Marble Formation	Secondary A Aquifer	Dominated by low permeability and low porosity clay. Overall, this unit is likely to be anisotropic in nature due to clay bands, with horizontal permeability greater than vertical permeability (i.e. kh>kv)

Stratum	Aquifer Designation	Comments
White Limestone Formation	Principal Aquifer	Low intergranular permeabilities are likely, with high water secondary permeability through fractures often enlarged through solution. Overall, this unit is likely to be anisotropic in nature due to clay bands, with horizontal permeability greater than vertical permeability (i.e. kh>kv). High transmissivity and low

2.6.2 Groundwater abstraction

There are two active licensed groundwater abstractions within 1,000m of the site. They are listed in Table 2.6.

Table 2.6: Groundwater abstractions

Location Relative to Site	Purpose of Abstraction
674 south west	General farming and domestic
800m south east	General farming and domestic

2.6.3 Groundwater source protection zones and groundwater vulnerability

The site is not within a groundwater Source Protection Zone (SPZ).

The superficial and bedrock secondary A aquifers underlying the site are considered of high vulnerability, see Figure 2.9.

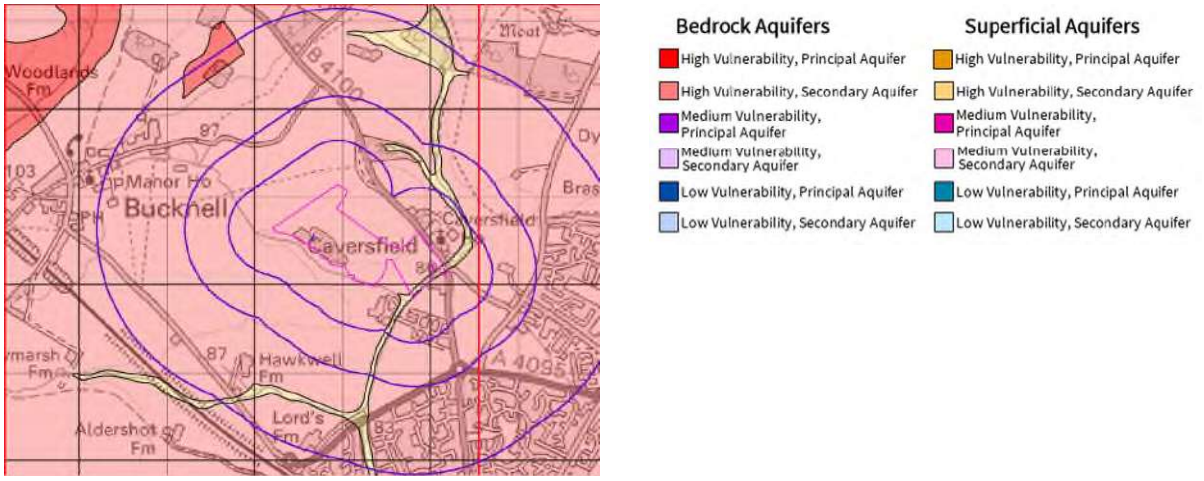


Figure 2.9: Groundwater abstraction zones
(Reproduced with permission from Groundsure)

2.6.4 Groundwater levels, recharge, and flow

Shallow groundwater is likely in the Cornbrash and Alluvial Deposits especially after heavy rainfall. There is a deeper groundwater body in the White Limestone Formation. The presence of the low permeability clays of the Forest Marble Formation is likely to inhibit vertical connection between these two potential groundwater bodies.

Where the Cornbrash Formation is at shallow depth, it is typically a seasonal aquifer, which recharges during sustained wetter periods of weather and discharges by natural drainage, or by abstraction, during drier periods.

Previous ground investigation (Hyder, 2011) recorded groundwater at between 0.6m bgl and 2.6m bgl typically in the top of limestone beds, and in six exploratory holes (off site) often after heavy rainfall. No groundwater was encountered in exploratory holes within Site A, B or Caversfield. It is anticipated that the installation of the man-made pond to the east of Charlotte Avenue (between Site A and Caversfield) in the south east corner of Site A may be locally modifying the groundwater flow regime.

Shallow groundwater below the site is likely to drain towards the adjacent streams, south of Site B and Site A and east of Caversfield.

2.6.5 Groundwater quality

The groundwater body beneath the site (Bicester-Otmoor Cornbrash) is currently (2019 Cycle 2) classified under the Water Framework Directive as 'poor', due to 'chemical drinking water protected area' conditions.

2.6.6 Groundwater flooding

The environmental data report indicates a potential risk of groundwater flooding to occur at the surface along the Caversfield south-east boundary and a potential risk of groundwater flooding of property situated below the ground along the Site A south-west boundary.

The areas of potential groundwater flooding correlate with the superficial Alluvium deposits and underlying Forest Marble along the streams adjacent to the site.

2.7 Hydrology

2.7.1 Surface water system and drainage

The surface water features in the vicinity of the site are listed in Table 2.7. Surface water on the site will runoff into the adjacent streams to the south east and south west which become the Town Brook.

Table 2.7: Surface water features

Feature	Location Relative to Site
Inland river	On site boundary (Caversfield south-east boundary).
Inland river	On site boundary (Site A and Site B south-west boundary).
Pond	10m east by Home Farm.
Town Brook	Approximately 50m south-west of the site.
Inland river	Approximately 500m north-east

2.7.2 Surface water abstractions and discharges

There are no recorded active licensed surface water abstractions within 500m of the site.

There is one active licensed surface water discharges within 500m of the site (as listed in Table 2.8).

Table 2.8: Surface water discharges

Location Relative to Site	Purpose of Abstraction
<10m east	Final treated effluent

4. GROUND INVESTIGATIONS

4.1 Investigation rationale

The ground investigation rationale was based on the findings of the preliminary risk assessment and is summarised in Table 4.1.

Table 4.1: Investigation rationale

Location	Purpose
Site A	
RBH05-10	To assess deeper ground conditions and to allow SPTs to be undertaken. To investigate the thickness and competency of limestone beds. To allow collection of samples for geotechnical characterisation. To allow installation of gas and groundwater monitoring wells. Targeted across the perimeter of the site in proximity to areas influenced by trees.
TP18, 19, 25, 27, 28, 30-39, 41, 42, 45, 46, 48-50, 56 and 57.	To provide general coverage across the proposed development area. To assess shallow ground conditions. To allow collection of samples for contamination testing and geotechnical characterisation. To undertake hand shear vane testing.
TP24, TP43, TP44, TP51, TP53 and TP54	To investigate the Public Open Space (POS) areas. To assess shallow ground conditions. To allow collection of samples for contamination testing and geotechnical characterisation.
TP26, TP29, TP40, TP47, TP52, TP55 and TP58	To undertake soil infiltration testing for permeable paving.
Site B	
RBH01-04	To assess deeper ground conditions and to allow SPTs to be undertaken. To investigate the thickness and competency of limestone beds. To allow collection of samples for geotechnical characterisation. To allow installation of gas and groundwater monitoring wells. Targeted across the perimeter of the site in proximity to areas influenced by trees.
TP01-06, 08, 11-14, 16, 17, 20, 22 and 23.	To provide general coverage across the proposed development area. To assess shallow ground conditions. To allow collection of samples for contamination testing and geotechnical characterisation. To undertake hand shear vane testing.
TP07, TP09, TP10, TP15, TP21	To undertake soil infiltration testing for permeable paving.
TP90-92	To further investigate the south-east corner (where accessible) in the area of potential historic quarrying (based on anecdotal evidence).

Caversfield	
RBH11-15	To assess deeper ground conditions and to allow SPTs to be undertaken. To investigate the thickness and competency of limestone beds. To allow collection of samples for geotechnical characterisation. To allow installation of gas and groundwater monitoring wells. Targeted across the perimeter of the site in proximity to areas influenced by trees.
TP59, 61, 67, 69, 70-73, 75, 77-79	To provide general coverage across the proposed development area. To assess shallow ground conditions. To allow collection of samples for contamination testing and geotechnical characterisation. To undertake hand shear vane testing.
TP62-65, 74, 80, 81, 83, 84, 86-89	To target the proposed allotment and areas of POS. To assess shallow ground conditions. To allow collection of samples for contamination testing and geotechnical characterisation.
TP82 and TP85	To undertake soil infiltration testing for the proposed attenuation pond in the south east.
TP60, TP66, TP68 and TP76	To undertake soil infiltration testing for permeable paving.

4.2 Constraints

The south-eastern corner of Site B and the central-south of Site A are densely wooded and were not accessible during the investigation.

4.3 Site works

The fieldwork took place between 2nd and 21st September and is summarised in Table 4.2.

The ground investigation locations were surveyed in using a Total Station GPS survey instrument and are shown on the Exploratory Hole Location Plan (Hydrock Drawing 13603-HYD-XX-ZZ-DR-GE-1003) in Appendix A.

The logs, including details of ground conditions, soil sampling, *in situ* testing and any installations, are also presented in Appendix E.

The weather conditions during the Hydrock fieldwork and for the previous week were sunny.

Table 4.2: Summary of site works

Activity	Method	No.	Depth Maximum (m bgl)	*In situ* tests	Notes (e.g. installations)
Drilling, Pitting and Probing					
Boreholes	Rotary cored	15	5.00	SPT	63mm HDPE wells with gas taps in 15 holes
Trial pits	Machine (8T tracked)	92	3.20	Hand shear vane (HSV)	-
Other in situ *testing or monitoring*					
Infiltration	BRE 365	18	2.20	Soil infiltration	-

Wells for monitoring groundwater levels and ground gas concentrations were installed in all of the rotary boreholes. A summary of the monitoring well installations is presented in Table 4.3.

Table 4.3: Summary of monitoring installations

Location	Ground level (m OD)	Standpipe diameter	Screen top and base depth (m bgl)	Screen top and base elevation (m OD)	Strata targeted
RBH01	91.44	50	2.00 to 5.00	89.44 to 86.44	Cornbrash Formation / Forest Marble Formation
RBH02	91.60	50	2.00 to 5.00	89.60 to 86.60	Forest Marble Formation
RBH03	92.16	50	1.00 to 5.00	91.16 to 87.16	Head Deposits / Cornbrash Formation / Forest Marble Formation
RBH04	92.18	50	0.50 to 5.00	91.68 to 87.18	Cornbrash Formation / Forest Marble Formation
RBH05	91.67	50	1.00 to 3.00	90.67 to 88.67	Head Deposits / Cornbrash Formation
RBH06	91.72	50	1.00 to 4.00	90.72 to 87.72	Head Deposits / Cornbrash Formation / Forest Marble Formation
RBH07	91.44	50	1.00 to 4.50	90.44 to 86.94	Cornbrash Formation / Forest Marble Formation
RBH08	90.33	50	1.00 to 5.00	89.33 to 85.33	Head Deposits / Cornbrash Formation / Forest Marble Formation
RBH09	88.47	50	1.00 to 5.00	87.47 to 83.47	Head Deposits / Forest Marble Formation
RBH10	90.67	50	0.50 to 3.50	90.17 to 87.17	Cornbrash Formation
RBH11	90.14	50	1.00 to 5.00	89.14 to 85.14	Cornbrash Formation / Forest Marble Formation
RBH12	90.12	50	2.00 to 5.00	88.12 to 85.12	
RBH13	88.56	50	1.00 to 5.00	87.56 to 83.56	
RBH14	87.41	50	1.00 to 5.00	86.41 to 82.41	Forest Marble Formation
RBH15	85.60	50	2.00 to 5.00	83.60 to 80.60	

4.4 Geo-environmental testing

4.4.1 Sampling strategy and protocols

Exploratory hole positions were determined by reference to the site conditions and uncertainties identified in the Initial Conceptual Model.

No specific sampling statistics or grid were utilised in this instance.

Samples were taken, stored and transported in general accordance with BS 10175:2011+A2:2017.

5. GROUND INVESTIGATION RECORDS AND DATA

5.1 Physical ground conditions

5.1.1 Summary of strata encountered

The following presents a summary of the properties of the ground and groundwater conditions encountered, based on field observations, interpretation of the field data and laboratory test results, taking into account drilling, excavation and sampling methods, transport, handling and specimen preparation.

Details of the Hydrock ground investigation works are provided in the logs in Appendix E, previous data are provided in Appendix D; a summary of the ground model is presented in Table 5.1 and the individual strata are described in the sections below. Relevant cross-sections and contour plans are presented in Appendix A with extracts shown in Figures 5.1 and 5.2 in the sections below.

Table 5.1: Strata encountered

Stratum	Depth to top (m bgl)	Depth to base (m bgl)	Thickness (m) (range)	Thickness (m) (average)
Topsoil	0.00	0.20 – 0.60	0.20 – 0.60	0.32
Made Ground	0.00 – 0.30	0.25 – 1.60	0.25 – 1.30	0.63
Alluvium (TP11 only)	0.30	0.80	0.50	0.50
Head Deposits	0.25 – 0.80	0.50 – 2.40	0.20 – >1.75	0.77
Cornbrash Formation	0.20 – 2.00	1.00 – 3.73	>0.02 – 2.60	1.28
Forest Marble Formation	0.60 – 3.73	>1.35 - >5.00	Not proven	Not proven

5.1.2 Topsoil

Topsoil was encountered across most of the site, from surface, to depths of 0.60m below ground level (bgl), with an average thickness of 0.32m. The Topsoil generally comprised brown, locally orangish brown, organic, variously sandy, gravelly clay, with frequent rootlets. The gravel component typically comprised limestone.

For the purposes of this report, Topsoil is defined as the upper layer of an *in situ* soil profile, usually darker in colour and more fertile than the layer below (subsoil), which is a product of natural chemical, physical, biological and environmental processes.

Three composite samples of the topsoil were tested for compliance with BS 3882:2015. Two were found to be non-compliant when compared to multi-purpose topsoil on the basis of the grading (clay content) and all were found to be non-compliant on available plant nutrients (carbon-nitrogen ratio, nitrogen and extractable phosphate). However, this does not preclude the use of the topsoil as a growing medium as long as it is recognised that the topsoil is clayey, will require careful excavation, suitable stockpiling and limited compaction to remain suitable for reuse, as well as regular application of general-purpose fertiliser. Subject to noting the above comments, and subject to approval by the Client, the landscape architect or the landscape Contractors, the topsoil is considered suitable for use.

5.1.3 Made Ground

Made Ground was encountered in TP54 and TP56 in the south-east of Site A and in TP81 and TP88 in the east of Caversfield, as shown on Hydrock Drawing 13603-HYD-XX-ZZ-DR-GE-1004 in Appendix A.

The Made Ground was recorded as:

- 'General' Made Ground comprising soft brown, locally blackish brown, variously sandy, gravelly clay with fragments of brick, concrete and plastic. The natural gravel component comprised limestone; and
- 'Reworked' Made Ground, in TP81, comprising soft brown, slightly gravelly sandy clay and soft blackish brown, slightly gravelly, sandy clay. The natural gravel component comprised limestone. This is reworked natural deposits without any anthropogenic fragments.

5.1.4 Alluvium

Alluvium was recorded in TP11, in the south of Site B, and north of the adjacent watercourse as soft, orangish brown, slightly gravelly, slightly sandy clay. The gravel component comprises quartz and limestone.

5.1.5 Head Deposits

Head Deposits were recorded across most of the site and are typically thicker at the base of, or on, sloped areas. The depth (m bgl) to the base of the Head Deposits is shown on Hydrock Drawing 13603-HYD-XX-ZZ-DR-GE-1006 in Appendix A.

The Head Deposits generally comprised soft (locally firm) orangish brown, variously sandy, gravelly clay, locally with a medium cobble and boulder content; orangish brown, reddish brown and cream variously sandy clayey gravel, locally with a medium to high cobble and boulder content; and reddish brown variously gravelly, clayey sand. The gravel, cobble and boulder component comprised limestone.

The Head Deposits consist of poorly sorted and poorly stratified sediments and are likely to have formed as a result of the slow progressive downslope movement of soils (by solifluction and gelifluction), soil creep and hill wash from post-glacial times under freeze/thaw conditions through to more recent soil movements.

5.1.6 Cornbrash Formation

Beneath the superficial deposits, the Cornbrash Formation was recorded across the majority of the central and western sections of the site, but not at the lower topographic levels in the central south and the far east. The level (m OD) to the base of the Cornbrash Formation is shown on Hydrock Drawing 13603-HYD-XX-ZZ-DR-GE-1007 in Appendix A.

The Cornbrash Formation was typically recorded as alternating bands of clay (weathered beds) and intact rock deposits, of varied spacing and thickness.

The clay bands comprised: firm to stiff orangish brown, light brown, yellowish brown and grey variously sandy, gravelly clay, locally with shell fragments and calcareous nodules. The gravel component comprised limestone and mudstone.

The limestone bands comprised: very weak to moderately weak locally fractured orangish brown, light grey and yellowish-brown limestone, locally with shells fragments.

5.1.7 Forest Marble Formation

The Forest Marble Formation was encountered beneath the Cornbrash Formation across the majority of the site, and locally sub-cropping below the superficial deposits, in the central south-east and east. The sub-crop of the Forest Marble Formation is shown on Hydrock Drawing 13603-HYD-XX-ZZ-DR-GE-1005 in Appendix A.

The Forest Marble Formation was typically recorded as alternating bands of clay (weathered beds) and intact rock deposits and the base of the Forest Marble Formation was not proven.

The clay bands comprised: firm to very stiff bluish grey, greenish grey, light yellowish grey and orangish brown variously sandy, gravelly, silty clay. The gravel component comprised limestone and mudstone.

The limestone bands typically comprised: very weak to moderately weak light grey, dark grey, light yellowish brown and locally stained orangish brown, limestone, locally with fossil and shell fragments; and extremely weak light grey and dark grey mudstone.

5.1.8 Ground Model Summary

A summary of the ground model described above is shown on the extract of the 'Geology Map – Solid and Drift' (Hydrock Drawing 13603-HYD-XX-ZZ-DR-GE-1005) shown in Figure 5.1 and an extract of the geological cross section for the site (Hydrock Drawing 13603-HYD-XX-ZZ-DR-GE-1008) shown in Figure 5.2 below.

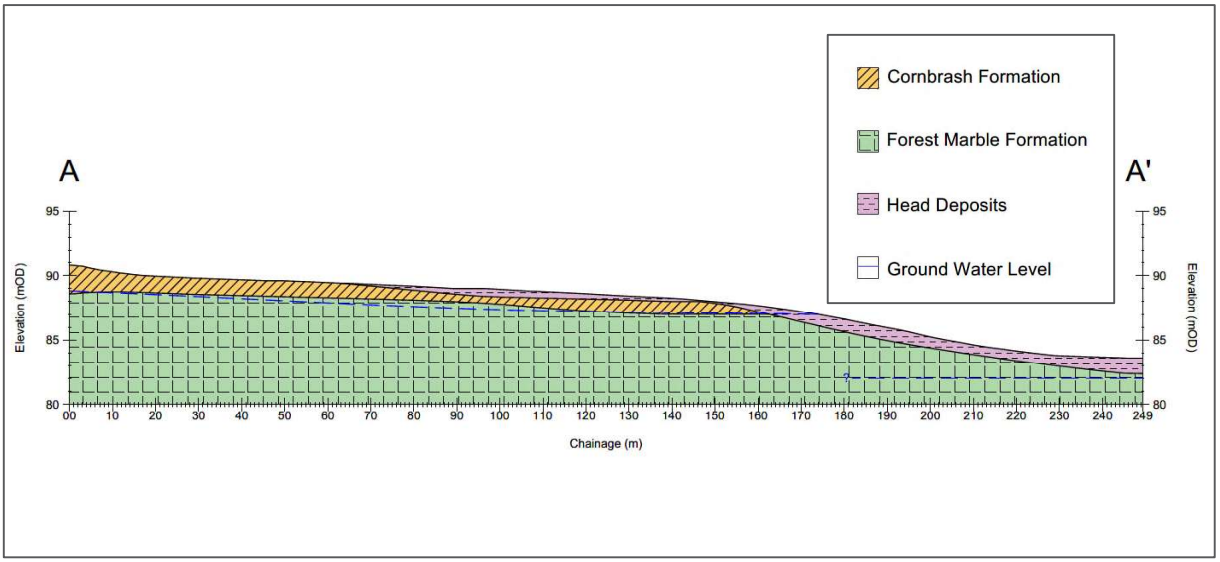
Figure 5.1: Extract of 'Geology Map - Solid and Drift'

As shown on Figure 5.1 there is a covering of Head Deposits across most of the site with sub-crops of the Cornbrash Formation in the west, centre and central east of the site, with the Forest Marble Formation underlying these deposits. The sub-crops of the Forest Marble Formation are limited to the

far east and central south, probably associated with the close proximity of the streams in these areas, where the overlying Cornbrash Formation has been eroded away.

Figure 5.2 shows a cross section trending North-west to south east across Caversfield with the Cornbrash Formation outcropping in the north-west, Head deposits are shown on the slope, with the Forest Marble Formation sub-cropping in the south-east. The topography of the site slopes down to the stream of the south-eastern boundary. North-west of the slope, the Forest Marble Formation was encountered at approximately 87 to 88mOD.

Figure 5.2: Cross section across Caversfield trending North-west to south east.



5.2 Groundwater

5.2.1 Groundwater observations and levels

Groundwater strikes were observed in thirty-four of the exploratory holes as listed in Table 5.2. A groundwater observation represents the depth at which groundwater was first observed and is likely to be deeper than the actual water table level at that location.

Table 5.2: Groundwater occurrence

Stratum	Date	Exploratory hole	Groundwater strike (m bgl)	Approximate flow rate
Head Deposits	04/09/20	TP10	1.00	Slow
	04/09/20	TP21	1.30	Slow
Cornbrash Formation	07/09/20	RBH01	2.00	Slow
	08/09/20	RBH03	1.30	Slow
	09/09/20	RBH04	1.10	Slow
	07/09/20	TP01	1.10	Slow
	07/09/20	TP02	1.10	Slow
	08/09/20	TP03	0.80	Moderate
	08/09/20	TP04	1.00	Fast

Stratum	Date	Exploratory hole	Groundwater strike (m bgl)	Approximate flow rate
Cornbrash Formation	08/09/20	TP05	1.10	Fast
	07/09/20	TP06	1.10	Moderate
	04/09/20	TP07	1.30	Slow
	08/09/20	TP08	1.10	Fast
	04/09/20	TP09	1.30	Slow
	08/09/20	TP12	1.10	Slow
	08/09/20	TP13	0.80	Fast
	08/09/20	TP14	1.40	Moderate
	04/09/20	TP15	1.20	Slow
	07/09/20	TP16	1.10	Moderate
	07/09/20	TP17	1.30	Moderate
	10/09/20	TP18	1.40	Slow
	08/09/20	TP20	2.40	Moderate
	10/09/20	TP25	2.10	Slow
	10/09/20	TP33	2.50	Slow
	11/09/20	TP34	2.70	Slow
Forest Marble Formation	07/09/20	TP11	3.20	Slow
	07/09/20	TP22	2.30	Slow
	07/09/20	TP23	2.30	Slow
	10/09/20	TP31	2.60	Slow
	15/09/20	TP43	1.75	Slow
	18/09/20	TP81	2.00	Moderate
	16/09/20	TP86	1.95	Moderate
	08/09/20	TP90	1.80	Moderate
	08/09/20	TP91	2.60	Moderate

Groundwater levels recorded during post-fieldwork monitoring are summarised in Table 5.3. Five visits (of twelve) have been carried out to date.

Table 5.3: Post-fieldwork groundwater level data summary

Location	Date range	Stratum	Depth to groundwater (range) (m bgl)	Groundwater elevation (range) (m OD)
RBH01	29/09/20 – 27/11/20	Cornbrash Formation / Forest Marble Formation	0.89 – 1.90	90.55 – 89.54
RBH02		Forest Marble Formation	1.55 – 2.22	90.05 – 89.38
RBH03		Head Deposits / Cornbrash Formation / Forest Marble Formation	0.51 – 1.10	91.65 – 91.06
RBH04		Cornbrash Formation / Forest Marble Formation	0.96 – 1.90	91.22 – 90.28
RBH05		Head Deposits / Cornbrash Formation	1.73 – 2.75	89.94 – 88.92

Location	Date range	Stratum	Depth to groundwater (range) (m bgl)	Groundwater elevation (range) (m OD)
RBH06		Head Deposits / Cornbrash Formation / Forest Marble Formation	0.85 – 1.85	90.87 – 89.87
RBH07		Cornbrash Formation / Forest Marble Formation	1.45 – 2.60	89.99 – 88.84
RBH08		Head Deposits / Cornbrash Formation / Forest Marble Formation	2.49 – 2.73	87.84 – 87.60
RBH09		Head Deposits / Forest Marble Formation	3.09 – >5.00 (Dry)	85.38 – >83.47 (Dry)
RBH10		Cornbrash Formation	1.19 – 1.75	89.48 – 88.92
RBH11		Cornbrash Formation / Forest Marble Formation	1.48 – 2.70	88.66 – 87.44
RBH12			1.09 – 2.35	89.03 – 87.77
RBH13			1.52 – 2.70	87.04 - 85.86
RBH14	29/09/20 – 27/11/20	Forest Marble Formation	4.37 – >5.00 (Dry)	83.04 – >82.41 (Dry)
RBH15			2.70 – 4.05	82.90 – 81.55

5.2.2 *Infiltration tests*

The results of the infiltration testing undertaken are summarised in Table 5.4. The results sheets are presented in Appendix E. Testing was carried out in general accordance with BRE Digest 365 (BRE DG365) (2016).

Table 5.4: Infiltration test results

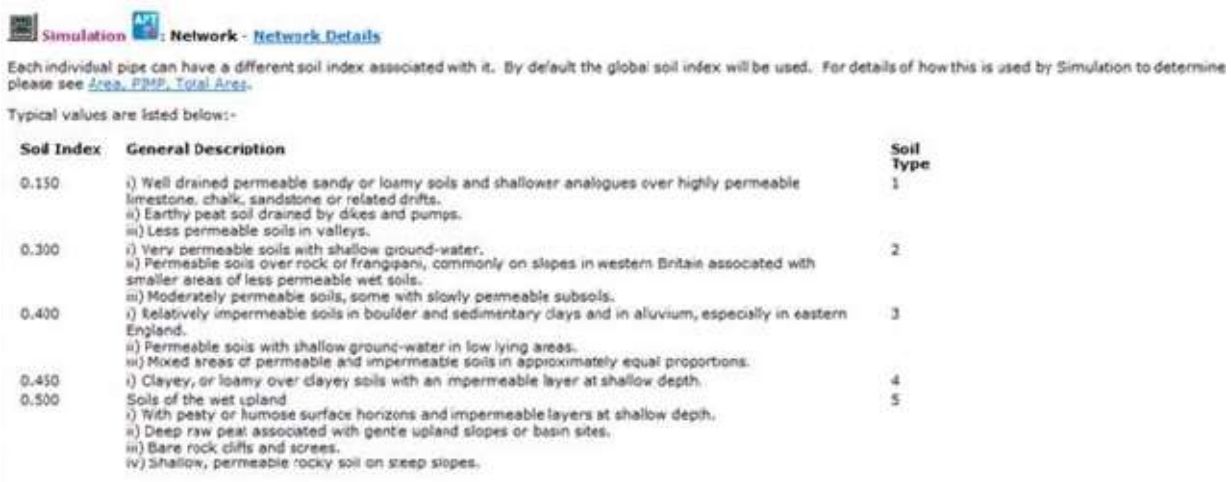
Stratum	Location	Depth to base of pit (m bgl)	Infiltration rate (m/s)			
			Run 1	Run 2	Run 3	Range
Head Deposits	TP10	1.00	2.37×10^{-6}	1.99×10^{-6}	1.96×10^{-6}	No infiltration in a number of locations. Where infiltration achieved 2.02×10^{-4} to 1.72×10^{-6}
	TP21	1.30	3.69×10^{-6}	3.16×10^{-6}	2.35×10^{-6}	
	TP26	1.20	No infiltration			
	TP29	1.10	No infiltration			
	TP40	1.40	No infiltration			
	TP47	1.00	6.26×10^{-6}	2.57×10^{-6}	2.62×10^{-6}	
	TP55	2.00	1.73×10^{-4}	1.73×10^{-4}	2.02×10^{-4}	
	TP58	1.10	2.42×10^{-6}	2.78×10^{-6}	1.72×10^{-6}	
Cornbrash Formation	TP07	1.60	4.05×10^{-5}	3.15×10^{-5}	2.44×10^{-5}	Where infiltration achieved 2.44×10^{-5} to 2.02×10^{-6}
	TP09	1.60	6.69×10^{-6}	7.61×10^{-6}	5.51×10^{-6}	
	TP15	1.50	No infiltration			
	TP66	1.30	2.55×10^{-6}	2.34×10^{-6}	2.02×10^{-6}	
Head Deposits / Forest Marble Formation	TP52	1.40	1.50×10^{-5}	1.17×10^{-5}	1.02×10^{-5}	1.50×10^{-5} to 1.02×10^{-5}

Stratum	Location	Depth to base of pit (m bgl)	Infiltration rate (m/s)			
			Run 1	Run 2	Run 3	Range
Cornbrash Formation / Forest Marble Formation	TP60	1.35	No infiltration			Where infiltration achieved 9.47×10^{-7} to 3.68×10^{-7}
	TP68	1.70	No infiltration			
	TP76	1.70	9.47×10^{-7}	4.22×10^{-7}	3.68×10^{-7}	
Forest Marble Formation	TP82	2.20	4.18×10^{-5}	3.59×10^{-5}	2.36×10^{-5}	1.23×10^{-4} to 2.36×10^{-5}
	TP85	2.20	2.25×10^{-4}	1.17×10^{-4}	1.23×10^{-4}	

5.2.3 *Recommendations for Wallingford Procedure Modelling Software*

Hydrock understands that in order to design the SuDS based drainage solution for the site, characteristic design parameters are required for use in the drainage modelling software (Micro-drainage). Hydrock have been provided with characteristic descriptions and parameters (by Vectos, the Client's drainage engineer) for comment on which soil type is considered applicable to the site. These are shown in Figure 5.3 below.

Figure 5.3: Characteristic soil descriptions and parameters (provided by Vectos).



Simulation : Network - Network Details

Each individual pipe can have a different soil index associated with it. By default the global soil index will be used. For details of how this is used by Simulation to determine please see Area, PIMP, Total Area.

Typical values are listed below:-

Soil Index	General Description	Soil Type
0.150	i) Well drained permeable sandy or loamy soils and shallower analogues over highly permeable limestone, chalk, sandstone or related drifts. ii) Earthy peat soil drained by dikes and pumps. iii) Less permeable soils in valleys.	1
0.300	i) Very permeable soils with shallow ground-water. ii) Permeable soils over rock or frangipani, commonly on slopes in western Britain associated with smaller areas of less permeable wet soils. iii) Moderately permeable soils, some with slowly permeable subsoils.	2
0.400	i) Relatively impermeable soils in boulder and sedimentary clays and in alluvium, especially in eastern England. ii) Permeable soils with shallow ground-water in low lying areas. iii) Mixed areas of permeable and impermeable soils in approximately equal proportions.	3
0.450	i) Clayey, or loamy over clayey soils with an impermeable layer at shallow depth.	4
0.500	Soils of the wet upland i) With peaty or humose surface horizons and impermeable layers at shallow depth. ii) Deep raw peat associated with gente upland slopes or basin sites. iii) Bare rock cliffs and screes. iv) Shallow, permeable rocky soil on steep slopes.	5

Hydrock considers Soil Type 2 (with an associated soil index of 0.3) to be the most applicable to the site, as:

- The geology proven by investigation comprises: superficial geology, which includes both lower permeability clays and higher permeability granular deposits, overlying Cornbrash Formation and Forest marble Formation, which comprise bands of higher permeability fractured rock deposits alternating with clay bands.
- The soils at the site have recorded varied permeability (see Table 5.4). However, in general, there are moderate infiltration rates.

5.2.4 *Groundwater summary*

In general, shallow groundwater was encountered towards the base of the Cornbrash Formation, above the Forest Marble Formation. However, there are local variations in the Cornbrash Formation probably associated with varied permeability in these deposits due the alternating beds of clay and limestone recorded.

There is also a deeper groundwater body in the Forest Marble Formation, notably identified in the south-east of the site (in Caversfield), where this stratum sub-crops.

The groundwater generally flows towards the south/south-east towards the streams on the southern and south-east site boundaries, and appears to be topographically controlled.

Overall, varied permeability, but in general moderate infiltration rates, have been recorded.

5.3 Ground gases (carbon dioxide and methane)

Records from the gas monitoring boreholes are presented in Appendix G and summarised in Table 5.5.

To date four monitoring visits have been undertaken, with a further eight visits to be undertaken as part of the current commission. The data are assessed in Section 7.5.

Table 5.5: Range of ground gas data

Stratum	Methane (%)	Carbon dioxide (%)	Oxygen (%)	Steady flow rate (l/hr)	Comment
Head Deposits / Cornbrash Formation	0.0	0.3 – 2.4	16.9 – 19.9	0.0 – 0.1	Methane is below detection, carbon dioxide below 5%.
Head Deposits / Forest Marble Formation	0.0	0.3 – 1.8	18.5 – 20.5	0.0	
Head Deposits / Cornbrash Formation / Forest Marble Formation	0.0	0.1 – 3.5	13.8 – 21.0	0.0 – 20.1	
Cornbrash Formation	0.0	0.5 -1.5	16.6 – 20.8	0.0 – 0.1	
Forest Marble Formation	0.0	1.4 – 3.9	7.4 – 20.2	0.0 – 19.4	
Cornbrash Formation / Forest Marble Formation	0.0	0.1 – 4.7	4.2 – 21.4	0.0 – 6.7	

6.7 Ground floor slabs

In accordance with the NHBC standards, as the site is underlain by clay soils of medium volume change potential, locally at least, Made Ground greater than 600mm thick, and following the earthworks, newly placed fill greater than 600mm thick, it is recommended that suspended floor slabs with a void be adopted.

6.8 Roads and pavements

Based on the test results and subject to *in situ* testing during construction, it is considered likely an equilibrium CBR of 2.5% will be achievable over the majority of the site. However, in the areas of Made Ground and Alluvium (TP11, TP54, TP56, TP81 and TP88) an equilibrium CBR of <2.5% is recommended.

Proof rolling of the formation level will be required and any loose or soft spots should be removed and replaced with an engineered fill, in accordance with a suitable Specification. The formation level will also need to be protected during inclement weather from deterioration; all slopes should be trimmed to falls to shed rain water and the surface sealed to limit infiltration.

Prior to the placement of the founding materials and the construction of the road pavement, the sub-formation and formation will need to be inspected and checked in accordance with a suitable specification to ensure the ground conditions are as expected. All testing should be carried out in accordance with DMRB IAN 73/06 to confirm that the ground conditions at time of construction are consistent with the previous design parameters.

Where the CBR is found to be less than 2.5%, the sub-grade may be unsuitable for both the trafficking of site plant and as support for a permanent foundation, without improvement works being undertaken. Improvement works should be carried out in accordance with DMRB IAN 73/06 Rev 1 Chapter 5. In summary, consideration may be given to the following potential remedial techniques:

- excavation and re-engineering or replacement of weaker soils;
- the inclusion of geosynthetic reinforcement within the unbound layers of the capping and sub-grade;
- where cohesive soils are present and they are deemed suitable for treatment with hydraulic binders, to employ modification and/or stabilisation techniques on the formation; and
- where granular soils are present, dewatering and re-engineering the formation.

6.9 Drainage

Indicative infiltration rates for the ground investigation are presented in Appendix F and are summarised in Table 5.4.

Infiltration rate testing indicates soakaways or infiltration as part of a Sustainable Urban Drainage System (SUDS) are potentially suitable for the site, subject to detailed drainage design by a specialist. However, the designer should note that whilst the infiltration tests indicate infiltration may work in principle, there is shallow groundwater at the site (up to 0.5 m bgl in places) as recorded in the monitoring standpipes. Therefore, in order to maintain the required minimum distance from groundwater when adopting a soakaway system (1.00m), it is likely that it may only be possible to adopt a permeable paving (or similar) system for soakaway surface water drainage at the site. Consultation with a suitability qualified drainage design specialist should be sought regarding this aspect.

In addition, the designer should consider the effects of soakaways on water levels and the potential for increased infiltration to cause spring-lines down slope, particularly in the south and south east where the Forest Marble Formation sub-crops.

Following detailed drainage design by a specialist to determine if soakaway drainage is possible further fully BRE DG 365 (2016) compliant infiltration testing would be required at the specific infiltration locations if the specialist indicates soakaway drainage is possible.

6.10 Concrete Class

Based on guidelines provided in BRE Special Digest 1 (BRE 2005) and the information presented in Section 5.4.9 (Table 5.13) the natural soils below the site (Alluvium, Head Deposits, Cornbrash Formation and Forest Marble Formation) can be classified as Design Sulfate Class DS-1 and ACEC Class AC-1. This equates to a Design Chemical Class[4] of DC-1.

The designer should check and confirm the classification of concrete using the information presented in Appendix E and Appendix F during the design.

[4] The calculated ACEC class can be used in accordance with BS 8500-1+A2 (2019), Table A.9 to select the Designated Concrete (DC) class for an intended working life of 50 years. However, the designer is referred to BS 8500-1+A2 (2019), for full details and notes to Table A.9, including any Additional Protective Measures (APMs).

TECHNICAL NOTE

Hydrock

Client	Firethorn Developments Ltd
Project name	North West Bicester Eco Development
Technical note title	Summary of Ground Conditions Following Supplementary Works
Document reference	C-13603-GEO-TN002
Author	Cameron Adams BSc (Hons) MSc FGS
Checked by	Allan Bell BSc MSc SiLC SQP EurGeol CGeol FGS
Revision	001
Date	20 January 2021

Further to the supplementary ground investigation works for the above site and in advance of Hydrock updating the Ground Investigation Report, please see below for an updated summary of the ground conditions encountered.

This TDN provides an updated ground model for the site based on all site investigation works (i.e September 2020 investigation and January 2021 investigation).

Further details and assessment, together with recommendations will be included in the updated interpretative report.

Background

The site comprises three parcels of land known as: Site A, Site B and Caversfield, located in the north of the wider North-west Bicester development site and are to form a single planning application.

The proposed development is to comprise approximately 500 homes split between the three, parcels of land, with associated gardens, infrastructure and Public Open Space.

It is understood that the drainage strategy will comprise a combination of permeable paving and attenuation in swales, attenuation ponds and oversize pipework, with discharge to the existing surface water drainage system in the adjacent development; or discharge to the brook to the south.

Following the initial ground investigation works on the site (September 2020), it is understood that the drainage strategy at the site has been updated to include the following:

- Two attenuation ponds in Site B, in the north and south of this land parcel respectively;
- An attenuation pond in the south eastern field of Site A;
- Shallow (approximately 0.5m to 0.8m below ground level) permeable paving across the site.

The attenuation pond in the east of the Caversfield site, in an area of Public Open Space, remains.

Site Works

September 2020 investigation has previously been reports and is not described in detail within this Technical Note.

The supplementary January 2021 site investigation works comprised:

- Service clearance and GPS of exploratory hole locations;
- 10 shallow machine excavated trial pits to a maximum depth of 0.90m below ground level (bgl) with soil infiltration rate testing;
- 2 deeper machine excavated trial pits to a maximum depth of 3.00m with soil infiltration rate testing;
- 3 rotary boreholes to a maximum depth of 5.00m bgl;
- Ongoing gas and groundwater monitoring

The supplementary rotary boreholes, deeper trial pits and soil infiltration testing were positioned to target the proposed attenuation pond in the south of Site A.

The shallower trial pits and soil infiltration test locations were located in areas of lower permeability identified during the previous phase of works and to provide general coverage to assist with permeable paving design.

The exploratory hole locations are shown on the Hydrock 'Exploratory Hole Location Plan' (Drawing Reference: 13603-HYD-XX-ZZ-DR-GE-1003-P2) (attached).

Ground Conditions

The ground and groundwater conditions encountered are summarised in Table 1 below, with the stratum described below.

Table 1: Summary of strata encountered

Stratum	Depth to top (m bgl)	Depth to base (m bgl)	Thickness (m) (range)	Thickness (m) (average)
Topsoil	0.00	0.20 – 0.60	0.20 – 0.60	0.32
Made Ground	0.00 – 0.30	0.25 – 1.60	0.25 – 1.30	0.56
Alluvium*	0.30	0.80	0.50	0.50
Head Deposits	0.25 – 0.80	0.50 – 2.40	0.20 – >1.75	0.77
Cornbrash Formation	0.20 – 2.00	1.00 – 3.73	>0.02 – 2.60	1.28
Forest Marble Formation	0.60 – 3.73	>1.35 - >5.00	Not proven	Not proven
*TP11 only.				

Topsoil

Topsoil was encountered across most of the site, from surface, to depths of 0.60m below ground level (bgl), with an average thickness of 0.32m. The Topsoil generally comprised brown locally orangish brown organic variably sandy gravelly clay with frequent rootlets. The gravel component typically comprised limestone.

For the purposes of this Technical Note, Topsoil is defined as the upper layer of an *in-situ* soil profile, usually darker in colour and more fertile than the layer below (subsoil), which is a product of natural chemical, physical, biological and environmental processes.

Made Ground

Made Ground was encountered in TP54, TP56 and TP109in the south-east of Site A and in TP81 and TP88 in the east of Caversfield and was encountered from the surface to 0.30mbgl to depths of between 0.25m to 1.60mbgl and has an average thickness of 0.56m. The Made Ground was recorded as:

- 'General' Made Ground comprising soft brown locally blackish brown variably sandy gravelly clay with fragments of brick, concrete, ceramic and plastic. The natural gravel component comprised limestone; and
- 'Reworked' Made Ground, in TP81, comprising soft brown slightly gravelly sandy clay and soft blackish brown slightly gravelly sandy clay. The natural gravel component comprised limestone. This is re-worked natural deposits without any anthropogenic fragments.

Alluvium

Alluvium was recorded in TP11 in the south of Site B and north of the adjacent watercourse and was encountered from 0.30mbgl to a depth of 0.80mbgl and was 0.50m thick. The Alluvium was recorded as soft orangish brown slightly gravelly slightly sandy clay. The Gravel component comprises quartz and limestone.

Head Deposits

Head Deposits were recorded sporadically across the site and typically at the base of, or on, sloped areas, from 0.25mbgl to 0.80mbgl, to depths of 0.50mbgl to 2.40mbgl and have an average thickness of 0.77m.

The Head Deposits generally comprised soft (locally firm) orangish brown variably sandy gravelly clay locally with a medium cobble and boulder content; orangish brown, reddish brown and cream variably sandy clayey gravel locally with a medium to high cobble and boulder content; and reddish brown variably gravelly clayey sand. The gravel, cobble and boulder component comprised limestone.

The Head Deposits consist of poorly sorted and poorly stratified sediments and are likely to have formed as a result of the slow progressive downslope movement of soils (by solifluction and gelifluction), soil creep and hill wash from post-glacial times under freeze/thaw conditions through to more recent soil movements.

Cornbrash Formation

Beneath the superficial deposits, the Cornbrash Formation was recorded across the majority of the site.

The Cornbrash Formation was encountered from 0.20mbgl to 2.00mbgl to depths of 1.00mbgl to 3.73mbgl and with an average thickness of 1.28m.

The Cornbrash Formation was typically recorded as variable (spacing and thickness) alternating bands of clay (weathered horizons) and intact rock deposits.

The clay bands comprised: firm to stiff orangish brown, light brown, yellowish brown and grey variably sandy gravelly clay locally with shell fragments and calcareous nodules. The gravel component comprised limestone and mudstone.

The limestone bands comprised: very weak to moderately weak locally fractured orangish brown, light grey and yellowish-brown limestone locally with shells fragments.

Forest Marble Formation

Beneath the Cornbrash Formation in the majority of the site and locally below the superficial deposits (in the south-east and east), the Forest Marble Formation was encountered.

The Forest Marble Formation was typically recorded at a level of approximately 89m OD to 90m OD in the west of the site and at approximately 87m OD to 88m OD in the east of the site, and where present, was encountered from 0.60mbgl to 3.73mbgl and was typically recorded as alternating bands of clay (weathered horizons) and intact rock deposits.

The base of the Forest Marble Formation was not proven (to a depth of 5.00m bgl).

The clay bands comprised: firm to very stiff bluish grey, greenish grey, light yellowish grey and orangish brown variably sandy gravelly silty clay. The gravel component comprised limestone and mudstone.

The limestone bands typically comprised: very weak to moderately weak light grey, dark grey, light yellowish brown and locally stained orangish brown limestone locally with fossil and shell fragments; and extremely weak light grey and dark grey mudstone.

Groundwater

Groundwater strikes were observed in thirty-four of the exploratory holes, with the entries summarised in Table 2.

Table 2: Groundwater Entries

Stratum	Date	Exploratory hole	Fieldwork	
			Groundwater strike	
			Groundwater strike (m bgl)	Approximate flow rate
Head Deposits	04/09/20	TP10	1.00	Slow
	04/09/20	TP21	1.30	Slow
	07/01/21	TP101	0.55	Slow
Cornbrash Formation	07/09/20	RBH01	2.00	Slow
	08/09/20	RBH03	1.30	Slow
	09/09/20	RBH04	1.10	Slow
	07/09/20	TP01	1.10	Slow
	07/09/20	TP02	1.10	Slow
	08/09/20	TP03	0.80	Moderate
	08/09/20	TP04	1.00	Fast
	08/09/20	TP05	1.10	Fast
	07/09/20	TP06	1.10	Moderate
	04/09/20	TP07	1.30	Slow
	08/09/20	TP08	1.10	Fast
	04/09/20	TP09	1.30	Slow
	08/09/20	TP12	1.10	Slow
	08/09/20	TP13	0.80	Fast

Stratum	Date	Exploratory hole	Fieldwork	
			Groundwater strike	
			Groundwater strike (m bgl)	Approximate flow rate
	08/09/20	TP14	1.40	Moderate
	04/09/20	TP15	1.20	Slow
	07/09/20	TP16	1.10	Moderate
	07/09/20	TP17	1.30	Moderate
	10/09/20	TP18	1.40	Slow
	08/09/20	TP20	2.40	Moderate
	10/09/20	TP25	2.10	Slow
	10/09/20	TP33	2.50	Slow
	11/09/20	TP34	2.70	Slow
Forest Marble Formation	07/09/20	TP11	3.20	Slow
	07/09/20	TP22	2.30	Slow
	07/09/20	TP23	2.30	Slow
	10/09/20	TP31	2.60	Slow
	15/09/20	TP43	1.75	Slow
	18/09/20	TP81	2.00	Moderate
	16/09/20	TP86	1.95	Moderate
	08/09/20	TP90	1.80	Moderate
	08/09/20	TP91	2.60	Moderate
	05/01/21	TP108	2.00	Slow
		TP109	1.80	Slow

Groundwater levels recorded during post-fieldwork monitoring are summarised in Table 3. Seven monitoring visits have been carried out to date.

Table 3: Groundwater level data summary

Location	Date range	Stratum	Post-fieldwork monitoring	
			Depth to groundwater (range) (m bgl)	Groundwater elevation (range) (m OD)
RBH01	29/09/20 – 14/01/21	Cornbrash Formation / Forest Marble Formation	0.89 – 1.90	90.55 – 89.54
RBH02		Forest Marble Formation	1.10 – 2.22	90.50 – 89.38
RBH03		Head Deposits / Cornbrash Formation / Forest Marble Formation	0.10 – 1.10	92.06 – 91.06
RBH04		Cornbrash Formation / Forest Marble Formation	0.73 – 1.90	91.45 – 90.28
RBH05		Head Deposits / Cornbrash Formation	1.60 – 2.75	90.07 – 88.92
RBH06		Head Deposits / Cornbrash Formation / Forest Marble Formation	0.71 – 1.85	91.01 – 89.87

Location	Date range	Stratum	Post-fieldwork monitoring	
			Depth to groundwater (range) (m bgl)	Groundwater elevation (range) (m OD)
RBH07		Cornbrash Formation / Forest Marble Formation	1.30 – 2.60	90.14 – 88.84
RBH08		Head Deposits / Cornbrash Formation / Forest Marble Formation	2.32 – 2.73	88.01 – 87.60
RBH09		Head Deposits / Forest Marble Formation	2.85 – Dry (5.00)	85.62 – Dry (83.47)
RBH10		Cornbrash Formation	0.93 – 1.88	89.74 – 88.79
RBH11		Cornbrash Formation / Forest Marble Formation	1.00 – 2.70	89.14 – 87.44
RBH12			1.09 – 2.35	89.03 – 87.77
RBH13			1.31 – 2.70	87.25 - 85.86
RBH14		Forest Marble Formation	4.20 – Dry (5.00)	83.21 – Dry (82.41)
RBH15			2.46 – 4.05	83.14 – 81.55
RBH102	08/01/21 – 14/01/21	Head Deposits / Forest Marble Formation	1.15 – 1.16	84.90 – 84.91

Infiltration tests

The results of the infiltration testing undertaken are summarised in Table 4. Testing was carried out in general accordance with BRE Digest 365 (BRE DG365) (2016).

Table 4: Infiltration test results

Stratum	Location	Depth to base of pit (m bgl)	Infiltration rate (m/s)			
			Run 1	Run 2	Run 3	Range
Head Deposits	TP10	1.00	2.37×10^{-6}	1.99×10^{-6}	1.96×10^{-6}	No infiltration in a number of locations. Where infiltration achieved 2.02×10^{-4} to 1.72×10^{-6}
	TP21	1.30	3.69×10^{-6}	3.16×10^{-6}	2.35×10^{-6}	
	TP26	1.20	No infiltration			
	TP29	1.10	No infiltration			
	TP40	1.40	No infiltration			
	TP47	1.00	6.26×10^{-6}	2.57×10^{-6}	2.62×10^{-6}	
	TP55	2.00	1.73×10^{-4}	1.73×10^{-4}	2.02×10^{-4}	
	TP58	1.10	2.42×10^{-6}	2.78×10^{-6}	1.72×10^{-6}	
	TP101	0.55	No infiltration, shallow groundwater encountered at 0.50m rising to 0.20m before test.			
	TP106	0.80	1.70×10^{-5}	1.58×10^{-5}	1.26×10^{-5}	
	TP111	0.70	No infiltration			
Cornbrash Formation	TP07	1.60	4.05×10^{-5}	3.15×10^{-5}	2.44×10^{-5}	Where infiltration achieved 5.26×10^{-5} to 2.02×10^{-6}
	TP09	1.60	6.69×10^{-6}	7.61×10^{-6}	5.51×10^{-6}	
	TP15	1.50	No infiltration			
	TP66	1.30	2.55×10^{-6}	2.34×10^{-6}	2.02×10^{-6}	

Stratum	Location	Depth to base of pit (m bgl)	Infiltration rate (m/s)			
			Run 1	Run 2	Run 3	Range
	TP102	0.60	5.26×10^{-5}	3.96×10^{-5}	2.91×10^{-5}	
	TP103	0.80	No infiltration			
	TP104	0.50	1.52×10^{-5}	2.82×10^{-5}	1.83×10^{-5}	
	TP105	0.60	No infiltration			
	TP107	0.90	3.58×10^{-6}	3.17×10^{-6}	2.63×10^{-6}	
	TP110	0.60	No infiltration, shallow groundwater encountered at 0.50m rising to 0.20m before test.			
	TP112	0.80	4.34×10^{-5}	$2.70\ 10^{-5}$	1.94×10^{-5}	
Head Deposits / Forest Marble Formation	TP52	1.40	1.50×10^{-5}	1.17×10^{-5}	1.02×10^{-5}	1.50×10^{-5} to 2.15×10^{-6}
	TP108	2.30	7.06×10^{-6}	1.22×10^{-5}	2.15×10^{-6}	
Cornbrash Formation / Forest Marble Formation	TP60	1.35	No infiltration			Where infiltration achieved 9.47×10^{-7} to 3.68×10^{-7}
	TP68	1.70	No infiltration			
	TP76	1.70	9.47×10^{-7}	4.22×10^{-7}	3.68×10^{-7}	
Forest Marble Formation	TP82	2.20	4.18×10^{-5}	3.59×10^{-5}	2.36×10^{-5}	1.23×10^{-4} to 4.35×10^{-6}
	TP85	2.20	2.25×10^{-4}	1.17×10^{-4}	1.23×10^{-4}	
	TP109	3.00	6.52×10^{-6}	7.07×10^{-6}	4.35×10^{-6}	

Preliminary infiltration comments

Indicative infiltration rates are highly variable and range from no infiltration to 1.23×10^{-4}m/s. This data indicates soakaways or infiltration as part of a Sustainable Urban Drainage System (SUDS) are potentially suitable for the site, subject to detailed drainage design by a specialist. However:

- The data suggests that infiltration is sporadic across the site, with the same geological units being highly variable in infiltration rates, and as such the effectiveness of any single infiltration feature will be highly variable.
- Whilst the infiltration tests indicate infiltration may work in principle, there is shallow groundwater at the site (up to 0.5 m bgl in places) as recorded in the monitoring standpipes. Therefore, in order to maintain the required minimum distance from groundwater when adopting a soakaway system (1.00m), it is likely that it may only be possible to adopt a very shallow permeable paving (or similar) system for soakaway surface water drainage at the site, and even then, it is probably only possible where site levels are raised.
- The designer would need to consider the effects of soakaways on water levels and the potential for increased infiltration to cause spring-lines down slope, particularly in the south and south east where the Forest Marble Formation sub-crops.

Whilst specialist assessment is required. Hydrock's recommendation is that infiltration drainage is not adopted at the site.

Preliminary comments on attenuation ponds

Given the shallow groundwater present at the site, Hydrock consider that the ponds should be lined to prevent groundwater ingress.

It should be noted that if it is proposed to line the ponds, the potential hydrostatic uplift needs to be taken into account with the design and the liner will need to be placed at an over excavated depth and covered with soil to prevent the liner lifting.

We trust that the above and enclosed meet your requirements and look forward to hearing from you. However, if you have any queries or require any additional information, please contact us.

Yours sincerely
Cameron Adams
Senior Consultant
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Encl: Exploratory Hole Location Plan
Supplementary (January 2021) Exploratory Hole Logs
Supplementary (January 2021) Soil Infiltration Testing Calculation Sheets

OS NORTH

KEY

- Site Boundary (approximate)
- RBHXX — Rotary Borehole (Hydrock January 2021)
- TPXX — Soakaway Pit (Hydrock January 2021)
- RBHXX — Rotary Borehole (Hydrock September 2020)
- TP## — Trial Pit (Hydrock September 2020)
- SA## — Soakaway Pit (Hydrock September 2020)

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.

2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

3. This drawing has been based on the following drawings and information: SV Surveying Ltd drawing number: 19280-19-01 Rev 1 dated: 09/09/2019. Also based on image supplied by the Client.

REV.						
P02	SECOND ISSUE - UPDATED WITH ADDITIONAL HOLES FOR SUPPLEMENTARY INVESTIGATION					
	CA	16/12/2020	AB	16/12/2020	AB	16/12/2020
P01	FIRST ISSUE					
	SD	23/09/2020	CA	23/09/2020	AB	23/09/2020
	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

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CLIENT

Firethorn Developments Limited

PROJECT

North West Bicester ECO Development

TITLE

Exploratory Hole Location Plan

HYDROCK PROJECT NO.	SCALE @ A2
C-13603-C	1:2500
PURPOSE OF ISSUE: SUITABLE FOR INFORMATION	STATUS: S2
DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER): 13603-HYD-XX-ZZ-DR-GE-1003	REVISION: P02

Hydrock	Project: North West Bicester Eco Development	Borehole No RBH101 Page No. 1 of 1	
Method: Rotary Cored	Date(s): 05/01/2021	Logged By: SP	Drilled By: Marshall Drilling
Client: Firethorn Bicester Ltd	Co-ords: 457538.02, 225078.02	Checked By: CA	Flush: Water
Hydrock Project No: C-13603	Ground Level: 88.44m OD		Scale: 1:50

Sample/Core Run (m)	Samples / Tests			Mechanical Log				Water Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrumentation / Backfill
	Depth (m)	Type	Results	TCR	SCR	RQD	If: Min Mean Max							
									Soft reddish brown slightly gravelly silty CLAY. Gravel is sub-rounded fine to coarse limestone. (TOPSOIL)	0.30	(0.30)	88.14		
									Firm light brown locally light greyish brown and orange silty CLAY. (HEAD DEPOSITS)		(1.20)			
1.20 - 2.00	1.20	SPT	N=50 (2,4,4,4,8,34)	100	68	33	12			1.50		86.94		
									Weak light grey stained orange LIMESTONE. Fractures are horizontal very closely spaced planar rough. (FOREST MARBLE FORMATION)	1.65	(0.15)	86.79		
2.00 - 3.50	2.00	SPT	50/150mm (20,5,35,15)	91	66	30	4		Very weak light orange and light grey LIMESTONE. Fractures are very closely spaced horizontal undulating rough. (FOREST MARBLE FORMATION)		(1.55)			
										3.20		85.24		
3.50 - 5.00	3.50	SPT	N=29 (3,4,6,7,8,8)	100	30	30	2		Very stiff greenish grey locally with brown staining CLAY. (FOREST MARBLE FORMATION)	4.10	(0.90)	84.34		
									Very stiff grey mottled light orangish brown CLAY. (FOREST MARBLE FORMATION)	4.55	(0.45)	83.89		
	5.00	SPT	50/2mm (9,14,50)						Moderately weak light grey locally stained orange and green LIMESTONE. Fractures are horizontal closely spaced rough and clean. (FOREST MARBLE FORMATION)	5.00	(0.45)	83.44		
									End of Borehole at 5.00m					

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)
Commacchio 205	05/01	1700	5.00	1.20	142		Water	Grey/brown

Chiselling

From (m)	To (m)	Duration (HH:MM)

General Remarks:
1. Hand dug pit to 1.20m to check for services. 2. Groundwater not encountered. 3. Borehole advanced from 1.20m to 5.00m using rotary coring. 4. Borehole backfilled with bentonite on completion.

Logged in general accordance with BS5930:2015

Hydrock	Project: North West Bicester Eco Development	Borehole No RBH102 Page No. 1 of 1

Method: Rotary Cored	Date(s): 06/01/2021	Logged By: SP	Drilled By: Marshall Drilling
Client: Firethorn Bicester Ltd	Co-ords: 457610.04, 225028.18	Checked By: CA	Flush: Water
Hydrock Project No: C-13603	Ground Level: 86.06m OD		Scale: 1:50

Sample/Core Run (m)	Samples / Tests			Mechanical Log				Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrumentation / Backfill
	Depth (m)	Type	Results	TCR	SCR	RQD	If: Min Mean Max							
									Soft reddish brown slightly gravelly silty CLAY. Gravel is sub-rounded fine to coarse limestone. (TOPSOIL)	0.30	(0.30)	85.76		
									Soft locally firm orangish brown slightly gravelly slightly sandy CLAY. Gravel is sub-angular to sub-rounded fine to coarse limestone. (HEAD DEPOSITS)	1.20	(0.90)	84.86		
1.20 - 1.60 113mm 100% rec 1.20 - 3.00	1.20	SPT	N=6 (3,1,1,1,2,2)				8		Very weak very thinly bedded light grey LIMESTONE interbedded with firm brown CLAY. (FOREST MARBLE FORMATION)	1.50	(0.30)	84.56		
									Stiff light grey mottled brown slightly gravelly CLAY. Gravel is sub-angular medium to coarse limestone. (FOREST MARBLE FORMATION)	1.70	(0.20)	84.36		
				100	11	6			Weak light grey LIMESTONE recovered as gravel sized fragments. (FOREST MARBLE FORMATION) ... ...*Recovered as gravel sized fragments between 2.00 to 2.70m.*	2.10	(0.40)	83.96		
3.00 - 4.50	3.00	SPT	50/75mm (25,50)				3		Very weak light grey LIMESTONE. Fractures are horizontal closely spaced planar rough to undulating rough with local clay infill. (FOREST MARBLE FORMATION)	3.30	(1.20)	82.76		
				86	40	26			Very stiff light grey and light orangish brown slightly sandy SILT/CLAY. (FOREST MARBLE FORMATION)	3.90	(0.60)	82.16		
									Very weak grey with light orange staining MUDSTONE. Fractures are horizontal and sub-horizontal very closely spaced planar rough with local clay infill. (FOREST MARBLE FORMATION)	4.00	(0.10)	82.06		
									Very stiff light grey and light orangish brown slightly sandy SILT/CLAY. (FOREST MARBLE FORMATION)	4.30	(0.30)	81.76		
4.50 - 5.00	4.50	SPT	50/200mm (10,15,20,26,4)	100	68	48	4		Moderately weak grey LIMESTONE. Fractures are very close to closely spaced planar clean. (FOREST MARBLE FORMATION)	4.75	(0.45)	81.31		
	5.00	SPT	50/150mm (20,5,38,12)						Extremely weak dark brownish grey LIMESTONE with rare shell fossils. Fractures are very closely spaced planar rough with local clay infill. (FOREST MARBLE FORMATION)	5.00	(0.25)	81.06		
									End of Borehole at 5.00m					

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)
Commacchio 205	06/01	1400	5.00	1.20	142		Water	Grey/brown

Chiselling

From (m)	To (m)	Duration (HH:MM)

General Remarks:
1. Hand dug pit to 1.20m to check for services. 2. Groundwater not encountered. 3. Borehole advanced from 1.20m to 1.60m using dynamic sampling and from 1.60m to 5.00m using rotary coring. 4. Gas and groundwater monitoring well installed to 5.00m (0.80m to 5.00m response zone) topped with a monitoring cover on completion.

Logged in general accordance with BS5930:2015

Hydrock

Project: North West Bicester Eco Development

Borehole No
RBH103
Page No. 1 of 1

Method: Rotary Cored	Date(s): 05/01/2021	Logged By: SP	Drilled By: Marshall Drilling
Client: Firethorn Bicester Ltd	Co-ords: 457679.01, 225026.64	Checked By: CA	Flush: Water
Hydrock Project No: C-13603	Ground Level: 85.95m OD		Scale: 1:50

Sample/Core Run (m)	Samples / Tests			Mechanical Log				Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrumentation / Backfill
	Depth (m)	Type	Results	TCR	SCR	RQD	If: Min Mean Max							
									Soft reddish brown slightly gravelly silty CLAY. Gravel is sub-rounded fine to coarse limestone. (TOPSOIL)	0.30	(0.30)	85.65		
									Soft locally firm orangish brown slightly gravelly slightly sandy CLAY. Gravel is sub-angular to sub-rounded fine to coarse limestone. (HEAD DEPOSITS)	1.20	(0.90)	84.75		
1.20 - 2.00	1.20	SPT	50/75mm (25,40)	100	0	0			Very weak light grey LIMESTONE. Recovered as gravel sized fragments. (FOREST MARBLE FORMATION)	2.00	(0.80)	83.95		
2.00 - 3.50							5		Moderately weak light grey LIMESTONE with occasional bivalve shells. Fractures are horizontal to sub-vertical closely spaced planar rough . (FOREST MARBLE FORMATION)	2.40	(0.40)	83.55		
				76	70	53			Extremely weak light orangish grey LIMESTONE. Recovered as fine gravel sized fragments and sand. (FOREST MARBLE FORMATION)	2.75	(0.35)	83.20		
	3.00	SPT	50/17mm (25,50)						Moderately weak grey and orangish brown LIMESTONE. Fractures are closely spaced horizontal planar rough with local clay infill. (FOREST MARBLE FORMATION)					
3.50 - 5.00							5			4.10	(1.35)	81.85		
				100	74	74			Very weak thinly bedded greyish brown LIMESTONE interbedded with stiff brown CLAY. Fractures are very closely spaced horizontal planar rough with local clay infill. (FOREST MARBLE FORMATION)	4.45	(0.35)	81.50		
	4.50	SPT	50/25mm (25,50)						Moderately weak grey and orangish brown LIMESTONE. Fractures are closely spaced horizontal planar rough with local clay infill. (FOREST MARBLE FORMATION)	5.00	(0.55)	80.95		
	5.00	SPT	50/20mm (25,50)						End of Borehole at 5.00m					

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)
Commacchio 205	05/01	1330	5.00	1.20	142		Water	Grey/brown

Chiselling

From (m)	To (m)	Duration (HH:MM)

General Remarks:
1. Hand dug pit to 1.20m to check for services. 2. Groundwater not encountered. 3. Borehole advanced from 1.20m to 5.00m using rotary coring. 4. Borehole backfilled with bentonite on completion.

Logged in general accordance with BS5930:2015

Hydrock	Project: North West Bicester Eco Development	Trialpit No TP101 Page No. 1 of 1

Method: Hand-dug Pit	Date(s): 07/01/2021	Logged By: SP	Checked By: CA
Client: Firethorn Bicester Ltd	Co-ords: 457393.07, 225442.94	Stability: No Collapse	Dimensions: 0.30m x 0.30m; Scale: 1:10
Hydrock Project No: C-13603	Ground Level: 92.29m OD	Plant: Hand Tools	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Soft brown slightly gravelly slightly sandy CLAY with occasional rootlets. Gravel is sub-angular to fine to coarse limestone. (TOPSOIL)	0.30	(0.30)	91.99	
				Soft orangish brown slightly sandy slightly gravelly CLAY. Gravel is sub-angular to sub-rounded fine to coarse limestone. (HEAD DEPOSITS)	0.55	(0.25)	91.74	
				Base of Excavation at 0.55m				

General Remarks:
1. Trial pit excavated using handtools. 2. Groundwater encountered at 0.55m rising to 0.20m after 30 minutes and prior to starting infiltation testing. Infiltration testing at this location therefore cancelled due to shallow groundwater. 3. Trial pit backfilled with arisings on completion.

Logged in general accordance with BS5930:2015

Hydrock

Project: North West Bicester Eco Development

Trialpit No
TP102
Page No. 1 of 1

Method: Trial Pit	Date(s): 06/01/2021	Logged By: SP	Checked By: CA
Client: Firethorn Bicester Ltd	Co-ords: 457469.24, 225384.74	Stability: No Collapse	Dimensions: 2.20m x 0.70m; Scale: 1:25
Hydrock Project No: C-13603	Ground Level: 92.24m OD	Plant: 8T Tracked	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Soft brown slightly gravelly slightly sandy CLAY with occasional rootlets. Gravel is sub-angular to fine to coarse limestone. (TOPSOIL)	0.30	(0.30)	91.94	
				Weak to moderately weak very thinly bedded fractured orangish brown LIMESTONE. (CORNBRASH FORMATION)	0.60	(0.30)	91.64	
				Base of Excavation at 0.60m				

General Remarks:
1. Trial pit mechanically excavated. 2. Soil infiltration testing carried out in the trial pit, results reported seperately. 3. Trial pit backfilled with arisings on completion.

Logged in general accordance with BS5930:2015

Hydrock

Project: North West Bicester Eco Development

Trialpit No
TP103
Page No. 1 of 1

Method: Trial Pit	Date(s): 06/01/2021	Logged By: SP	Checked By: CA
Client: Firethorn Bicester Ltd	Co-ords: 457476.36, 225313.62	Stability: No Collapse	Dimensions: 2.20m x 0.70m / Scale: 1:25
Hydrock Project No: C-13603	Ground Level: 92.01m OD	Plant: 8T Tracked	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Soft brown slightly gravelly slightly sandy CLAY with occasional rootlets. Gravel is sub-angular to fine to coarse limestone. (TOPSOIL)	0.25	(0.25)	91.76	
				Weak to moderately weak very thinly bedded fractured orangish brown LIMESTONE. (CORNBRASH FORMATION)	0.80	(0.55)	91.21	
				Base of Excavation at 0.80m				

General Remarks:
1. Trial pit mechanically excavated. 2. Soil infiltration testing carried out in the trial pit, results reported seperately. 3. Trial pit backfilled with arisings on completion.

Logged in general accordance with BS5930:2015

Hydrock

Project: North West Bicester Eco Development

Trialpit No
TP104
Page No. 1 of 1

Method: Trial Pit	Date(s): 06/01/2021	Logged By: SP	Checked By: CA
Client: Firethorn Bicester Ltd	Co-ords: 457566.05, 225304.13	Stability: No Collapse	Dimensions: 2.20m x 0.70m; Scale: 1:25
Hydrock Project No: C-13603	Ground Level: 91.77m OD	Plant: 8T Tracked	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Soft brown slightly gravelly slightly sandy CLAY with occasional rootlets. Gravel is sub-angular to fine to coarse limestone. (TOPSOIL)	0.30	(0.30)	91.47	
				Weak to moderately weak very thinly bedded fractured orangish brown LIMESTONE. (CORNBRASH FORMATION)	0.50	(0.20)	91.27	
				Base of Excavation at 0.50m				

General Remarks:
1. Trial pit mechanically excavated. 2. Soil infiltration testing carried out in the trial pit, results reported seperately. 3. Trial pit backfilled with arisings on completion.

Logged in general accordance with BS5930:2015

Hydrock	Project: North West Bicester Eco Development	Trialpit No TP105 Page No. 1 of 1

Method: Trial Pit	Date(s): 06/01/2021	Logged By: SP	Checked By: CA
Client: Firethorn Bicester Ltd	Co-ords: 457630.22, 225264.05	Stability: No Collapse	Dimensions: 2.20m x 0.70m / Scale: 1:25
Hydrock Project No: C-13603	Ground Level: 91.30m OD	Plant: 8T Tracked	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Soft brown slightly gravelly slightly sandy CLAY with occasional rootlets. Gravel is sub-angular to fine to coarse limestone. (TOPSOIL)	0.30	(0.30)	91.00	
				Weak to moderately weak very thinly bedded fractured orangish brown LIMESTONE. (CORNBRASH FORMATION)	0.60	(0.30)	90.70	
				Base of Excavation at 0.60m				

General Remarks:
1. Trial pit mechanically excavated. 2. Soil infiltration testing carried out in the trial pit, results reported seperately. 3. Trial pit backfilled with arisings on completion.

Logged in general accordance with BS5930:2015

Hydrock	Project: North West Bicester Eco Development	Trialpit No TP106 Page No. 1 of 1

Method: Trial Pit	Date(s): 06/01/2021	Logged By: SP	Checked By: CA
Client: Firethorn Bicester Ltd	Co-ords: 457587.50, 225178.05	Stability: No Collapse	Dimensions: 2.20m x 0.70m / Scale: 1:25
Hydrock Project No: C-13603	Ground Level: 91.04m OD	Plant: 8T Tracked	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Soft brown slightly gravelly slightly sandy CLAY with occasional rootlets. Gravel is sub-angular to fine to coarse limestone. (TOPSOIL)	0.30	(0.30)	90.74	
				Light brown slightly gravelly clayey SAND. Gravel is angular fine to coarse limestone. (HEAD DEPOSITS)	0.80	(0.50)	90.24	
				Base of Excavation at 0.80m				

General Remarks:
1. Trial pit mechanically excavated. 2. Soil infiltration testing carried out in the trial pit, results reported seperately. 3. Trial pit backfilled with arisings on completion.

Logged in general accordance with BS5930:2015

Hydrock

Project: North West Bicester Eco Development

Trialpit No
TP107
Page No. 1 of 1

Method: Trial Pit	Date(s): 06/01/2021	Logged By: SP	Checked By: CA
Client: Firethorn Bicester Ltd	Co-ords: 457678.13, 225141.15	Stability: No Collapse	Dimensions: 2.20m x 0.70m / Scale: 1:25
Hydrock Project No: C-13603	Ground Level: 90.12m OD	Plant: 8T Tracked	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Soft brown slightly gravelly slightly sandy CLAY with occasional rootlets. Gravel is sub-angular to fine to coarse limestone. (TOPSOIL)	0.30	(0.30)	89.82	
				Weak to moderately weak very thinly bedded fractured orangish brown LIMESTONE. (CORNBRASH FORMATION)	0.60	(0.30)	89.52	
				Firm light yellowish brown silty CLAY. (CORNBRASH FORMATION)	0.90	(0.30)	89.22	
				Base of Excavation at 0.90m				

General Remarks:
1. Trial pit mechanically excavated. 2. Soil infiltration testing carried out in the trial pit, results reported seperately. 3. Trial pit backfilled with arisings on completion.

Logged in general accordance with BS5930:2015

Hydrock

Project: North West Bicester Eco Development

Trialpit No
TP108
Page No. 1 of 1

Method: Trial Pit	Date(s): 05/01/2021	Logged By: CA	Checked By: AB
Client: Firethorn Bicester Ltd	Co-ords: 457586.87, 225069.09	Stability: No Collapse	Dimensions: 2.10m x 0.70m; Scale: 1:25
Hydrock Project No: C-13603	Ground Level: 87.92m OD	Plant: 8T Tracked	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Soft brown organic slightly sandy slightly gravelly CLAY with occasional rootlets. Gravel is sub-angular to sub-rounded fine to coarse sandstone. (TOPSOIL)	0.50	(0.50)	87.42	
				Soft orangish brown slightly sandy slightly gravelly CLAY. Gravel is sub-angular to sub-rounded fine to coarse limestone. (HEAD DEPOSITS)				
				... . . . Becoming firm below 1.20m.	1.80	(1.30)	86.12	
			▼	Moderately weak light yellowish grey LIMESTONE. (FOREST MARBLE FORMATION)	2.30	(0.50)	85.62	
				Base of Excavation at 2.30m				

General Remarks:
1. Trial pit mechanically excavated. 2. Groundwater encountered at 2.00m, flow rate slow. 3. Soil infiltration testing carried out in the trial pit (gravel installed from 1.50m to 2.30m), results reported seperately. 4. Trial pit backfilled with arisings on completion.

Logged in general accordance with BS5930:2015

Hydrock	Project: North West Bicester Eco Development	Trialpit No TP109 Page No. 1 of 1

Method: Trial Pit	Date(s): 05/01/2021	Logged By: CA	Checked By: AB
Client: Firethorn Bicester Ltd	Co-ords: 457652.35, 225051.88	Stability: Collapse	Dimensions: 2.80m / 0.70m; Scale: 1:25
Hydrock Project No: C-13603	Ground Level: 87.44m OD	Plant: 8T Tracked	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Soft brown organic slightly sandy slightly gravelly CLAY with occasional rootlets. Gravel is sub-angular to sub-rounded fine to coarse sandstone. (TOPSOIL)	0.30	(0.30)	87.14	
				Soft orangish brown slightly sandy slightly gravelly CLAY with occasional gravel sized ceramic fragments. Gravel is sub-angular to sub-rounded fine to coarse limestone. (MADE GROUND)	0.60	(0.30)	86.84	
				Very weak light yellowish grey LIMESTONE. (FOREST MARBLE FORMATION)	1.80	(1.20)	85.64	
				Stiff dark bluish and greenish grey slightly gravelly CLAY. Gravel is sub-angular to sub-rounded fine to medium mudstone and limestone. (FOREST MARBLE FORMATION)	3.00	(1.20)	84.44	
				Base of Excavation at 3.00m				

General Remarks:
1. Trial pit mechanically excavated. 2. Groundwater encountered at 1.80m, flow rate slow. 3. Sidewalls collapsing locally in the trial pit between 1.40m and 1.80m. 4. Soil infiltration testing carried out in the trial pit (gravel installed from 1.60m to 3.00m), results reported seperately. 5. Trial pit backfilled with arisings on completion.

Logged in general accordance with BS5930:2015

Hydrock

Project: North West Bicester Eco Development

Trialpit No
TP110
Page No. 1 of 1

Method: Trial Pit	Date(s): 07/01/2021	Logged By: SP	Checked By: CA
Client: Firethorn Bicester Ltd	Co-ords: 457857.29, 225163.93	Stability: No Collapse	Dimensions: 2.20m x 0.70m; Scale: 1:25
Hydrock Project No: C-13603	Ground Level: 89.51m OD	Plant: 8T Tracked	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Soft brown slightly gravelly slightly sandy CLAY with occasional rootlets. Gravel is sub-angular to fine to coarse limestone. (TOPSOIL)	0.30	(0.30)	89.21	
				Weak to moderately weak very thinly bedded fractured orangish brown LIMESTONE. (CORNBRASH FORMATION)	0.60	(0.30)	88.91	
				Base of Excavation at 0.60m				

General Remarks:
1. Trial pit mechanically excavated. 2. Groundwater was encountered at 0.50m rising to 0.20m after one hour and prior to carrying out infiltration testing. Infiltration test therefore cancelled due to shallow groundwater. 3. Trial pit backfilled with arisings on completion.

Logged in general accordance with BS5930:2015

Hydrock	Project: North West Bicester Eco Development	Trialpit No TP111 Page No. 1 of 1

Method: Trial Pit	Date(s): 07/01/2021	Logged By: SP	Checked By: CA
Client: Firethorn Bicester Ltd	Co-ords: 457887.63, 225121.07	Stability: No Collapse	Dimensions: 2.20m / 0.70m; Scale: 1:25
Hydrock Project No: C-13603	Ground Level: 88.86m OD	Plant: 8T Tracked	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Soft brown slightly gravelly slightly sandy CLAY with occasional rootlets. Gravel is sub-angular to fine to coarse limestone. (TOPSOIL)	0.30	(0.30)	88.56	
				Dark reddish brown slightly gravelly clayey SAND. Gravel is angular medium to coarse limestone. (HEAD DEPOSITS)	0.70	(0.40)	88.16	
				Base of Excavation at 0.70m				

General Remarks:
1. Trial pit mechanically excavated. 2. Soil infiltration testing carried out in the trial pit, results reported seperately. 3. Trial pit backfilled with arisings on completion.

Logged in general accordance with BS5930:2015

Hydrock

Project: North West Bicester Eco Development

Trialpit No
TP112
Page No. 1 of 1

Method: Trial Pit	Date(s): 07/01/2021	Logged By: SP	Checked By: CA
Client: Firethorn Bicester Ltd	Co-ords: 457951.97, 225210.89	Stability: No Collapse	Dimensions: 2.20m x 0.70m; Scale: 1:25
Hydrock Project No: C-13603	Ground Level: 88.94m OD	Plant: 8T Tracked	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Soft brown slightly gravelly slightly sandy CLAY with occasional rootlets. Gravel is sub-angular to fine to coarse limestone. (TOPSOIL)	0.30	(0.30)	88.64	
				Dark reddish brown slightly gravelly clayey SAND. Gravel is angular medium to coarse limestone. (HEAD DEPOSITS)	0.70	(0.40)	88.24	
				Weak to moderately weak very thinly bedded fractured orangish brown LIMESTONE. (CORNBRASH FORMATION)	0.80	(0.10)	88.14	
				Base of Excavation at 0.80m				

General Remarks:
1. Trial pit mechanically excavated. 2. Soil infiltration testing carried out in the trial pit, results reported seperately. 3. Trial pit backfilled with arisings on completion.

Logged in general accordance with BS5930:2015

1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

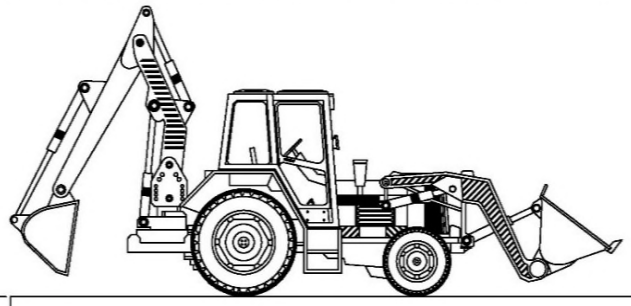
Site: NW Bicester

Client:

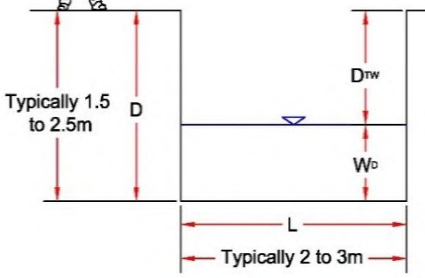
Test Location TP102 **Date of start** 06/01/2021 **Date at end** 08/01/2021

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
	See separate trial pit log
BASE OF PIT	BASE OF PIT

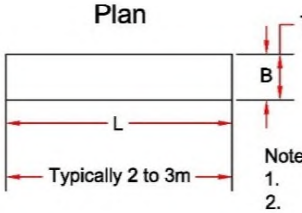
INFILTRATION ASSESSMENT PIT TYPICAL DIMENSIONS



Cross-Section



Plan



ACTUAL DIMENSIONS			
L			
B			
D			
D_{TW}			
W_D			

Abbreviations:
- L: Length of Infiltration Assessment Pit.
- B: Breadth / Width of Infiltration Assessment Pit.
- D: Depth of Infiltration Assessment Pit.
- D_{TW}: Initial Depth to Top of Water.
- W_D: Calculated Water Depth.

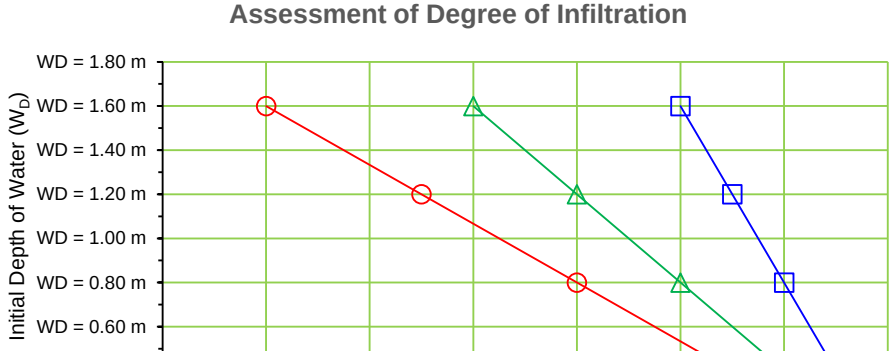
Calculated Water Depth (W_D) = $D - D_{TW}$

Maximum Fill Volume (V_w) = $W_D \times B \times L$

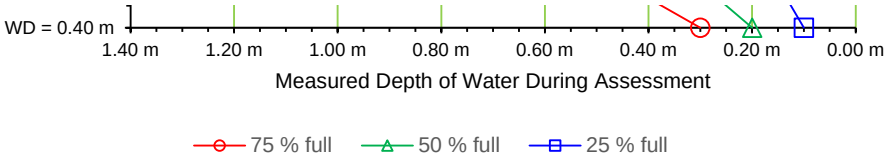
Corrected Water Volume (V_{wc}) = V_w x Gravel Porosity (P_t)

Notes:
1. Each Assessment shall be limited to a single stratum.
2. The base of the Infiltration Assessment Pit shall be below all Made Ground,
3. The water level shall not be raised above the base of the Made Ground.
4. The base of the Infiltration Assessment Pit shall be at least 1m into the stratum which is to be assessed.
5. The base of the Infiltration Assessment Pit shall be above the Water Table.
6. Minimum target depth of water of 1.0m.
7. Where any of the above conditions cannot be met, it shall be reported immediately to the Project Manager for additional guidance before the test is commenced.

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



SITE OBSERVATIONS - VOLUME LOSS		
Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3



3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.

1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: NW Bicester

Client:

Test Location TP102 **Date of start** 08/01/2021 **Date at end** 08/01/2021

Test Run 1		Test Run 2		Test Run 3	
Pit Dimensions (m)		**Pit Dimensions (m)**		**Pit Dimensions (m)**	
Trial Pit Length (L)	2.200m	Trial Pit Length (L)	2.200m	Trial Pit Length (L)	2.200m
Trial Pit Breadth / Width (B)	0.700m	Trial Pit Breadth / Width (B)	0.700m	Trial Pit Breadth / Width (B)	0.700m
Effective Depth (D)	0.600m	Effective Depth (D)	0.600m	Effective Depth (D)	0.600m
Time at Start of Filling	9.49	Time at Start of Filling	10.08	Time at Start of Filling	10.25
Time at End of Filling	9.50	Time at End of Filling	10.09	Time at End of Filling	10.26
Depth from Surface to Water (D_{TW})	0.550m	Depth below Surface to Water (D_{TW})	0.480m	Depth below Surface to Water (D_{TW})	0.480m
Water Depth (W_D)	0.050m	Water Depth (W_D)	0.120m	Water Depth (W_D)	0.120m
Maximum Fill Volume (V_W)	0.077m³	Maximum Fill Volume (V_W)	0.185m³	Maximum Fill Volume (V_W)	0.185m³
Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No
Porosity of Gravel Backfill (P_t)	0.300	Porosity of Gravel Backfill (P_t)	0.300	Porosity of Gravel Backfill (P_t)	0.300
Corrected Water Volume (V_{WC})	0.077m³	Corrected Water Volume (V_{WC})	0.185m³	Corrected Water Volume (V_{WC})	0.185m³

Time to soakaway				Time to soakaway				Time to soakaway			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	9.500	0.550	0	1	10.090	0.480	0	1	10.260	0.480	0
1	9.510	0.560	60	1	10.100	0.500	60	1	10.280	0.490	120
1	9.520	0.570	120	1	10.120	0.530	180	1	10.300	0.500	240
1	9.530	0.580	180	1	10.150	0.550	360	1	10.350	0.530	540
1	9.540	0.590	240	1	10.190	0.570	600	1	10.450	0.570	1140
1	10.010	0.600	660	1	10.250	0.600	960	1	10.490	0.600	1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
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			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380

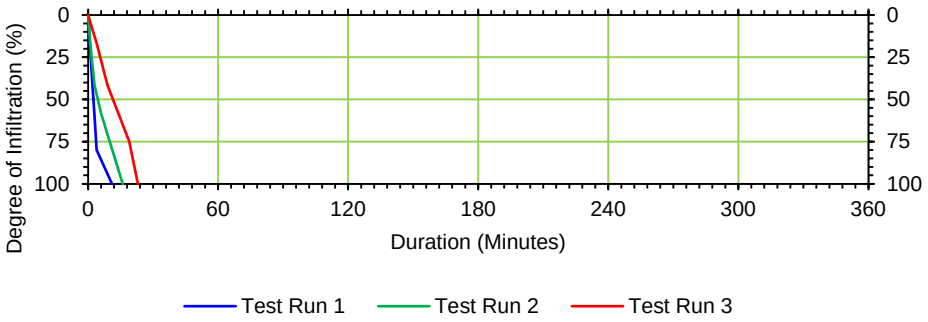
25% water loss (75% full)	0.563m	**25% water loss (75% full)**	0.510m	**25% water loss (75% full)**	0.510m
50% water loss (50% full)	0.575m	**50% water loss (50% full)**	0.540m	**50% water loss (50% full)**	0.540m
75% water loss (25% full)	0.588m	**75% water loss (25% full)**	0.570m	**75% water loss (25% full)**	0.570m
25% time (seconds)	75 sec	**25% time (seconds)**	100 sec	**25% time (seconds)**	340 sec
75% time (seconds)	225 sec	**75% time (seconds)**	600 sec	**75% time (seconds)**	1020 sec
Vp 75-25	0.039m³	**Vp 75-25**	0.092m³	**Vp 75-25**	0.092m³
as 50 (Actual area from test)	4.875m²	**as 50 (Actual area from test)**	4.672m²	**as 50 (Actual area from test)**	4.672m²
tp 75 - 25	150 sec	**tp 75 - 25**	500 sec	**tp 75 - 25**	680 sec
Soil Infiltration Rate	**5.26E-05m/s**	**Soil Infiltration Rate**	**3.96E-05m/s**	**Soil Infiltration Rate**	**2.91E-05m/s**

Duration (Seconds)

0 3600 7200 10800 14400 18000 21600

Form completed by

PRINT SP

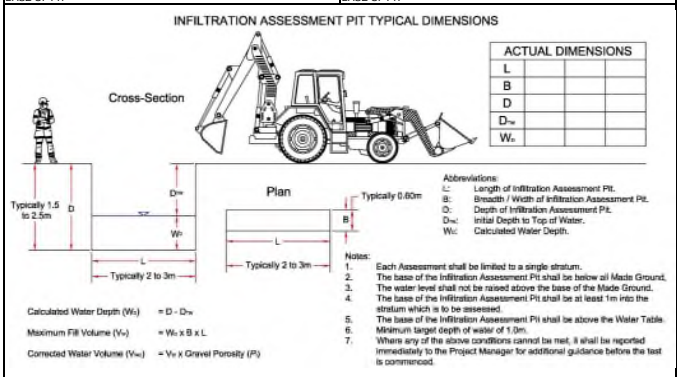


Tested By	SIGN	
	DATE	08/01/2021
Calculated By	PRINT	SP
	SIGN	
	DATE	08/01/2021
Checked by	PRINT	CA
	SIGN	
	DATE	20/01/2021

1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

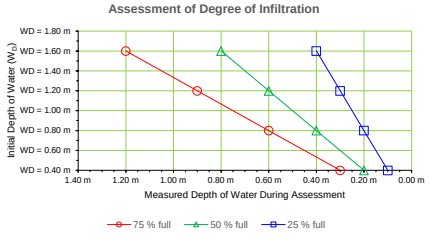
Site: NW Bicester
Client: Firethorn Developments Ltd
Test Location TP103 **Date of start** 06/01/2021 **Date at end** 06/01/2021

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
	See separate trial pit log
BASE OF PIT	BASE OF PIT



ACTUAL DIMENSIONS			
L			
B			
D			
D_w			
W_c			

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



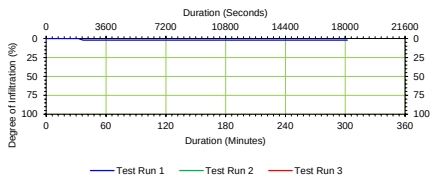
SITE OBSERVATIONS - VOLUME LOSS			
Test Run	Infiltration Records up to 6 Hours		Comments
1	<25%		Unlikely without significant attenuation
	<75%		Requires additional BRE DG365 testing
	>75%		Refer to results of Run 2
2	<25%		Unlikely without significant attenuation
	<75%		Requires additional BRE DG365 testing
	>75%		Refer to results of Run 3
3	<25%		Unlikely without significant attenuation
	<75%		Requires additional BRE DG365 testing
	>75%		Indicative Infiltration Rate achieved.

1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: NW Bicester
Client:
Test Location TP103 **Date of start** 06/01/2021 **Date at end** 06/01/2021

Test Run 1		Test Run 2		Test Run 3	
Pit Dimensions (m)		**Pit Dimensions (m)**		**Pit Dimensions (m)**	
Trial Pit Length (L)	2.200m	Trial Pit Length (L)	2.200m	Trial Pit Length (L)	2.200m
Trial Pit Breadth / Width (B)	0.700m	Trial Pit Breadth / Width (B)	0.700m	Trial Pit Breadth / Width (B)	0.700m
Effective Depth (D)	0.800m	Effective Depth (D)		Effective Depth (D)	
Time at Start of Filling	11.57	Time at Start of Filling		Time at Start of Filling	
Time at End of Filling	11.58	Time at End of Filling		Time at End of Filling	
Depth from Surface to Water (D_{TW})	0.330m	Depth below Surface to Water (D_{TW})		Depth below Surface to Water (D_{TW})	
Water Depth (W_D)	0.470m	Water Depth (W_D)	-	Water Depth (W_D)	-
Maximum Fill Volume (V_W)	0.724m³	Maximum Fill Volume (V_W)	-	Maximum Fill Volume (V_W)	-
Gravel used to backfill Test Pit	Yes	Gravel used to backfill Test Pit	Yes	Gravel used to backfill Test Pit	Yes
Porosity of Gravel Backfill (P_f)	0.300	Porosity of Gravel Backfill (P_f)	0.300	Porosity of Gravel Backfill (P_f)	0.300
Corrected Water Volume (V_{WC})	0.217m³	Corrected Water Volume (V_{WC})	-	Corrected Water Volume (V_{WC})	-

Time to soakaway				Time to soakaway				Time to soakaway			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	11.580	0.330	0								
1	12.000	0.330	120								
1	12.020	0.330	240								
1	12.050	0.330	420								
1	12.100	0.330	720								
1	12.200	0.330	1320								
1	12.300	0.330	1920								
1	12.350	0.340	2220								
1	13.080	0.340	4200								
1	17.000	0.340	18120								
			18120								
			18120								
			18120								
			18120								
			18120								
			18120								
			18120								
			18120								
			18120								
			18120								
			18120								
			18120								
			18120								
			18120								
			18120								
25% water loss (75% full)		0.448m		**25% water loss (75% full)**			-	**25% water loss (75% full)**			-
50% water loss (50% full)		0.565m		**50% water loss (50% full)**			-	**50% water loss (50% full)**			-
75% water loss (25% full)		0.683m		**75% water loss (25% full)**			-	**75% water loss (25% full)**			-
25% time (seconds)		-		**25% time (seconds)**			-	**25% time (seconds)**			-
75% time (seconds)		-		**75% time (seconds)**			-	**75% time (seconds)**			-
Vp 75-25		0.109m³		**Vp 75-25**			-	**Vp 75-25**			-
as 50 (Actual area from test)		4.817m²		**as 50 (Actual area from test)**			-	**as 50 (Actual area from test)**			-
tp 75 - 25				**tp 75 - 25**				**tp 75 - 25**			
Soil Infiltration Rate	-			**Soil Infiltration Rate**	-			**Soil Infiltration Rate**	-		



Form completed by		
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	SIGN	
	DATE	06/01/2021
Calculated By	PRINT	SP
	SIGN	
	DATE	06/01/2021
Checked by	PRINT	CA
	SIGN	
	DATE	20/01/2021

1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

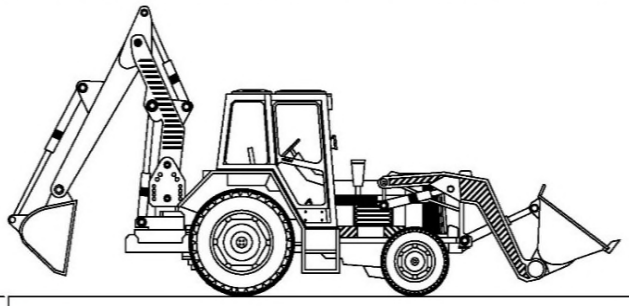
Site: NW Bicester

Client: Firethorn Developments Ltd

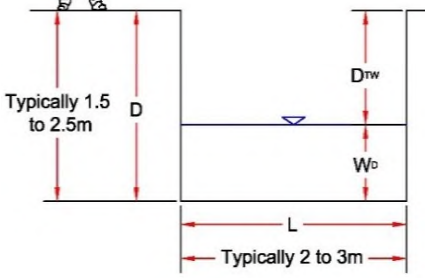
Test Location TP104 **Date of start** 06/01/2021 **Date at end** 06/01/2021

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
	See separate trial pit log
BASE OF PIT	BASE OF PIT

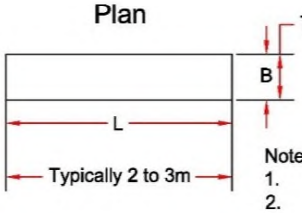
INFILTRATION ASSESSMENT PIT TYPICAL DIMENSIONS



Cross-Section



Plan



ACTUAL DIMENSIONS			
L			
B			
D			
D_{TW}			
W_D			

Abbreviations:
- L: Length of Infiltration Assessment Pit.
- B: Breadth / Width of Infiltration Assessment Pit.
- D: Depth of Infiltration Assessment Pit.
- D_{TW}: Initial Depth to Top of Water.
- W_D: Calculated Water Depth.

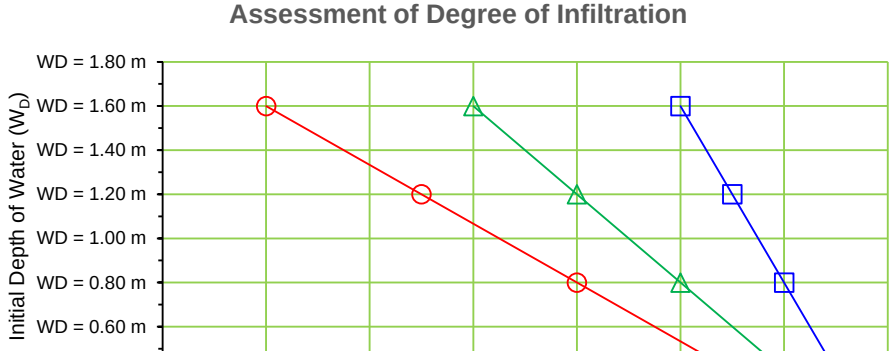
Calculated Water Depth (W_D) = D - D_{TW}

Maximum Fill Volume (V_w) = W_D x B x L

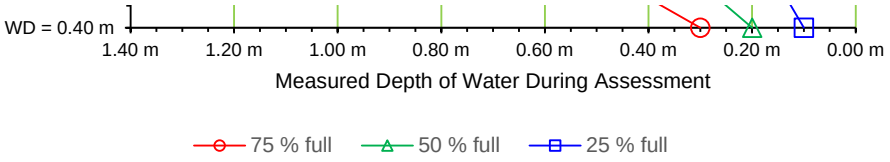
Corrected Water Volume (V_{wc}) = V_w x Gravel Porosity (P_t)

Notes:
1. Each Assessment shall be limited to a single stratum.
2. The base of the Infiltration Assessment Pit shall be below all Made Ground,
3. The water level shall not be raised above the base of the Made Ground.
4. The base of the Infiltration Assessment Pit shall be at least 1m into the stratum which is to be assessed.
5. The base of the Infiltration Assessment Pit shall be above the Water Table.
6. Minimum target depth of water of 1.0m.
7. Where any of the above conditions cannot be met, it shall be reported immediately to the Project Manager for additional guidance before the test is commenced.

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



SITE OBSERVATIONS - VOLUME LOSS		
Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3



3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.

1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: NW Bicester

Client: Firethorn Developments Ltd

Test Location TP104 **Date of start** 06/01/2021 **Date at end** 06/01/2021

Test Run 1		Test Run 2		Test Run 3	
Pit Dimensions (m)		**Pit Dimensions (m)**		**Pit Dimensions (m)**	
Trial Pit Length (L)	2.200m	Trial Pit Length (L)	2.200m	Trial Pit Length (L)	2.200m
Trial Pit Breadth / Width (B)	0.700m	Trial Pit Breadth / Width (B)	0.700m	Trial Pit Breadth / Width (B)	0.700m
Effective Depth (D)	0.500m	Effective Depth (D)	0.500m	Effective Depth (D)	0.500m
Time at Start of Filling	11.09	Time at Start of Filling	12.12	Time at Start of Filling	13.00
Time at End of Filling	11.10	Time at End of Filling	12.13	Time at End of Filling	13.01
Depth from Surface to Water (D_{TW})	0.330m	Depth below Surface to Water (D_{TW})	0.330m	Depth below Surface to Water (D_{TW})	0.330m
Water Depth (W_D)	0.170m	Water Depth (W_D)	0.170m	Water Depth (W_D)	0.170m
Maximum Fill Volume (V_W)	0.262m³	Maximum Fill Volume (V_W)	0.262m³	Maximum Fill Volume (V_W)	0.262m³
Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No
Porosity of Gravel Backfill (P_t)	0.300	Porosity of Gravel Backfill (P_t)	0.300	Porosity of Gravel Backfill (P_t)	0.300
Corrected Water Volume (V_{WC})	0.262m³	Corrected Water Volume (V_{WC})	0.262m³	Corrected Water Volume (V_{WC})	0.262m³

Time to soakaway

Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	11.100	0.330	0	1	12.130	0.330	0	1	13.010	0.330	0
1	11.110	0.330	60	1	12.140	0.330	60	1	13.110	0.350	600
1	11.180	0.330	480	1	12.150	0.350	120	1	13.280	0.410	1620
1	11.190	0.350	540	1	12.200	0.380	420	1	14.050	0.500	3840
1	11.200	0.350	600	1	12.250	0.430	720				3840
1	11.230	0.380	780	1	12.350	0.430	1320				3840
1	11.250	0.380	900	1	12.590	0.500	2760				3840
1	11.560	0.450	2760				2760				3840
1	12.110	0.500	3660				2760				3840
			3660				2760				3840
			3660				2760				3840
			3660				2760				3840
			3660				2760				3840
			3660				2760				3840
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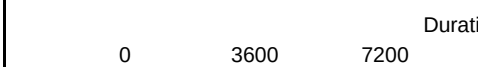
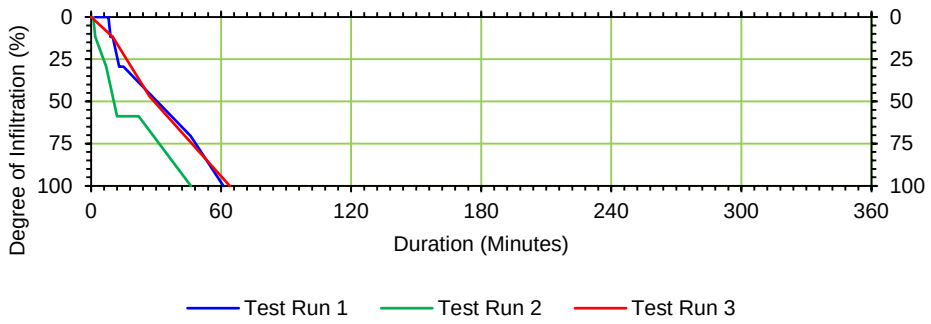
			3660				2760				3840
			3660				2760				3840
			3660				2760				3840
			3660				2760				3840
			3660				2760				3840

25% water loss (75% full)	0.373m	**25% water loss (75% full)**	0.373m	**25% water loss (75% full)**	0.373m
50% water loss (50% full)	0.415m	**50% water loss (50% full)**	0.415m	**50% water loss (50% full)**	0.415m
75% water loss (25% full)	0.458m	**75% water loss (25% full)**	0.458m	**75% water loss (25% full)**	0.458m
25% time (seconds)	720 sec	**25% time (seconds)**	345 sec	**25% time (seconds)**	982 sec
75% time (seconds)	2895 sec	**75% time (seconds)**	1521 sec	**75% time (seconds)**	2792 sec
Vp 75-25	0.131m³	**Vp 75-25**	0.131m³	**Vp 75-25**	0.131m³
as 50 (Actual area from test)	3.947m²	**as 50 (Actual area from test)**	3.947m²	**as 50 (Actual area from test)**	3.947m²
tp 75 - 25	2175 sec	**tp 75 - 25**	1176 sec	**tp 75 - 25**	1809 sec
Soil Infiltration Rate	**1.52E-05m/s**	**Soil Infiltration Rate**	**2.82E-05m/s**	**Soil Infiltration Rate**	**1.83E-05m/s**



Form completed by

PRINT SP



Tested By	SIGN	
	DATE	06/01/2021
Calculated By	PRINT	SP
	SIGN	
	DATE	06/01/2021
Checked by	PRINT	CA
	SIGN	
	DATE	20/01/2021

1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

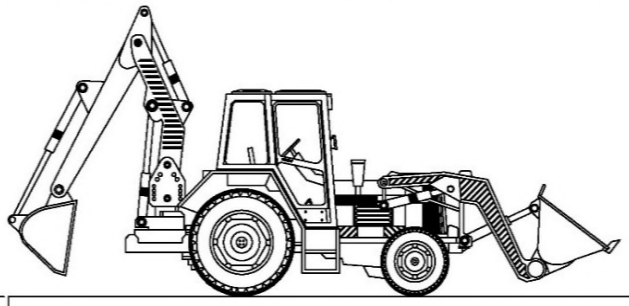
Site: NW Bicester

Client: Firethorn Developments Ltd

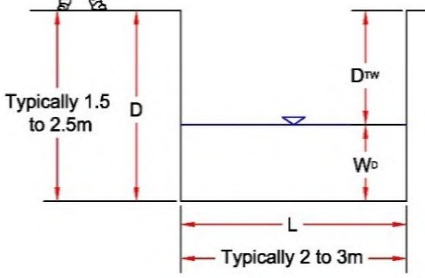
Test Location TP105 **Date of start** 06/01/2021 **Date at end** 07/01/2021

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
	See separate trial pit log
BASE OF PIT	BASE OF PIT

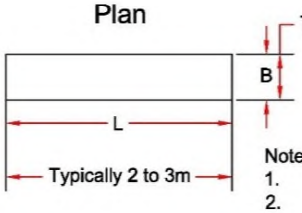
INFILTRATION ASSESSMENT PIT TYPICAL DIMENSIONS



Cross-Section



Plan



ACTUAL DIMENSIONS			
L			
B			
D			
D_{TW}			
W_D			

Abbreviations:
- L: Length of Infiltration Assessment Pit.
- B: Breadth / Width of Infiltration Assessment Pit.
- D: Depth of Infiltration Assessment Pit.
- D_{TW}: Initial Depth to Top of Water.
- W_D: Calculated Water Depth.

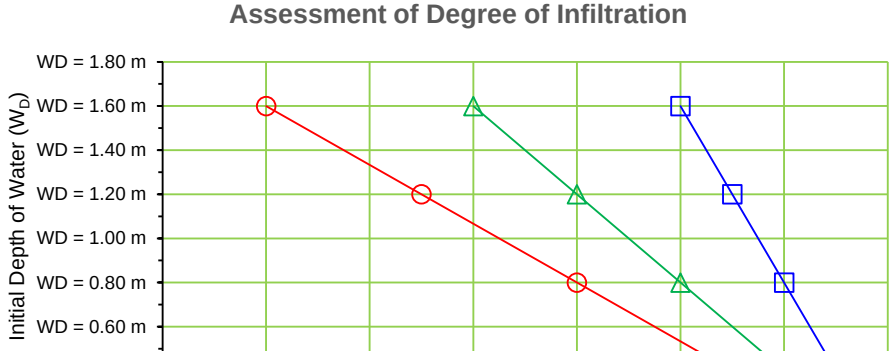
Calculated Water Depth (W_D) = D - D_{TW}

Maximum Fill Volume (V_w) = W_D x B x L

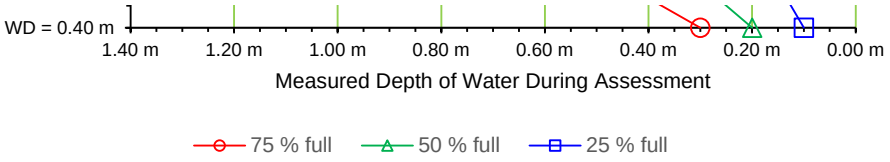
Corrected Water Volume (V_{wc}) = V_w x Gravel Porosity (P_t)

Notes:
1. Each Assessment shall be limited to a single stratum.
2. The base of the Infiltration Assessment Pit shall be below all Made Ground,
3. The water level shall not be raised above the base of the Made Ground.
4. The base of the Infiltration Assessment Pit shall be at least 1m into the stratum which is to be assessed.
5. The base of the Infiltration Assessment Pit shall be above the Water Table.
6. Minimum target depth of water of 1.0m.
7. Where any of the above conditions cannot be met, it shall be reported immediately to the Project Manager for additional guidance before the test is commenced.

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



SITE OBSERVATIONS - VOLUME LOSS		
Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3



3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.

1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: NW Bicester

Client: Firethorn Developments Ltd

Test Location TP105 **Date of start** 08/01/2021 **Date at end** 08/01/2021

Test Run 1		Test Run 2		Test Run 3	
Pit Dimensions (m)		**Pit Dimensions (m)**		**Pit Dimensions (m)**	
Trial Pit Length (L)	2.200m	Trial Pit Length (L)		Trial Pit Length (L)	
Trial Pit Breadth / Width (B)	0.700m	Trial Pit Breadth / Width (B)		Trial Pit Breadth / Width (B)	
Effective Depth (D)	0.650m	Effective Depth (D)		Effective Depth (D)	
Time at Start of Filling	13.41	Time at Start of Filling		Time at Start of Filling	
Time at End of Filling	13.42	Time at End of Filling		Time at End of Filling	
Depth from Surface to Water (D_{TW})	0.430m	Depth below Surface to Water (D_{TW})	0.750m	Depth below Surface to Water (D_{TW})	0.750m
Water Depth (W_D)	0.220m	Water Depth (W_D)	-0.750m	Water Depth (W_D)	-0.750m
Maximum Fill Volume (V_W)	0.339m³	Maximum Fill Volume (V_W)	0.000m³	Maximum Fill Volume (V_W)	0.000m³
Gravel used to backfill Test Pit	Yes	Gravel used to backfill Test Pit	Yes	Gravel used to backfill Test Pit	Yes
Porosity of Gravel Backfill (P_t)	0.300	Porosity of Gravel Backfill (P_t)	0.300	Porosity of Gravel Backfill (P_t)	0.300
Corrected Water Volume (V_{WC})	0.102m³	Corrected Water Volume (V_{WC})	0.000m³	Corrected Water Volume (V_{WC})	0.000m³

Time to soakaway

Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	13.420	0.430	0			0.750				0.750	
1	13.520	0.450	600								
1	14.080	0.460	1560								
1	14.230	0.470	2460								
1	14.280	0.480	2760								
1	14.460	0.490	3840								
1	15.300	0.520	6480								
1	16.000	0.520	8280								
1	16.150	0.520	9180								
2	9.030	0.530	69660								
			69660								
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			69660								

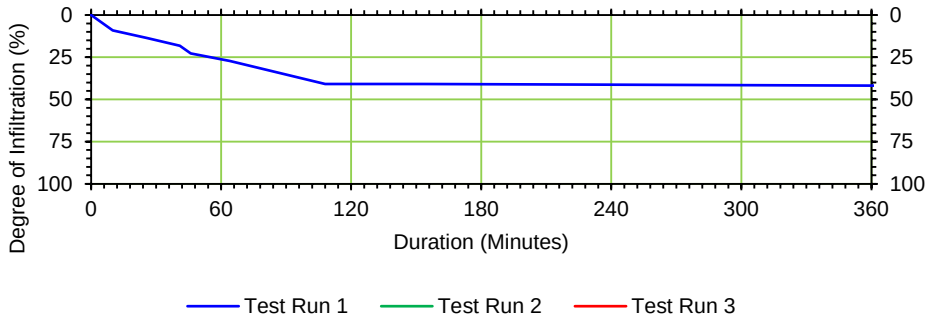
25% water loss (75% full)			0.485m	**25% water loss (75% full)**			0.563m	**25% water loss (75% full)**			0.563m
50% water loss (50% full)			0.540m	**50% water loss (50% full)**			0.375m	**50% water loss (50% full)**			0.375m
75% water loss (25% full)			0.595m	**75% water loss (25% full)**			0.188m	**75% water loss (25% full)**			0.188m
25% time (seconds)			3300 sec	**25% time (seconds)**				**25% time (seconds)**			
75% time (seconds)			-	**75% time (seconds)**				**75% time (seconds)**			
Vp 75-25			0.051m³	**Vp 75-25**			0.000m³	**Vp 75-25**			0.000m³
as 50 (Actual area from test)			4.672m²	**as 50 (Actual area from test)**			0.000m²	**as 50 (Actual area from test)**			0.000m²
tp 75 - 25				**tp 75 - 25**				**tp 75 - 25**			
Soil Infiltration Rate		-		**Soil Infiltration Rate**		#VALUE!		**Soil Infiltration Rate**		#VALUE!	

Duration (Seconds)

0 3600 7200 10800 14400 18000 21600

Form completed by

PRINT SP



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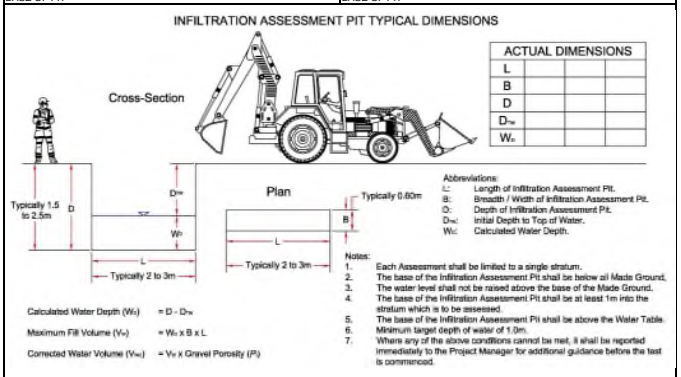
	DATE	07/01/2021
Calculated By	PRINT	SP
	SIGN	
	DATE	07/01/2021
Checked by	PRINT	CA
	SIGN	
	DATE	07/01/2021

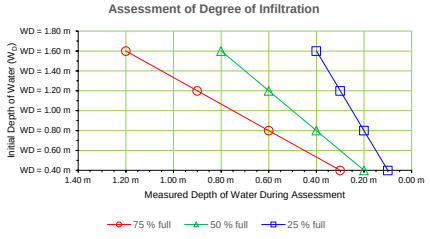
1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

Site: NW Bicester
Client: Firethorn Developments Ltd
Test Location TP106 **Date of start** 07/01/2021 **Date at end** 08/01/2021

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
	See separate trial pit log
BASE OF PIT	BASE OF PIT



Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



SITE OBSERVATIONS - VOLUME LOSS		
Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3
3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.

1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: NW Bicester
Client: Firethorn Developments Ltd
Test Location TP106 **Date of start** 07/01/2021 **Date at end** 08/01/2021

Test Run 1				Test Run 2				Test Run 3			
Pit Dimensions (m)				**Pit Dimensions (m)**				**Pit Dimensions (m)**			
Trial Pit Length (L)			2.200m	Trial Pit Length (L)			2.200m	Trial Pit Length (L)			2.200m
Trial Pit Breadth / Width (B)			0.700m	Trial Pit Breadth / Width (B)			0.700m	Trial Pit Breadth / Width (B)			0.700m
Effective Depth (D)			0.800m	Effective Depth (D)			0.800m	Effective Depth (D)			0.800m
Time at Start of Filling			10.19	Time at Start of Filling			10.27	Time at Start of Filling			13.29
Time at End of Filling			10.20	Time at End of Filling			10.28	Time at End of Filling			13.30
Depth from Surface to Water (D_{TW})			0.680m	Depth below Surface to Water (D_{TW})			0.680m	Depth below Surface to Water (D_{TW})			0.680m
Water Depth (W_D)			0.120m	Water Depth (W_D)			0.120m	Water Depth (W_D)			0.120m
Maximum Fill Volume (V_W)			0.185m³	Maximum Fill Volume (V_W)			0.185m³	Maximum Fill Volume (V_W)			0.185m³
Gravel used to backfill Test Pit			No	Gravel used to backfill Test Pit			No	Gravel used to backfill Test Pit			No
Porosity of Gravel Backfill (P_f)			0.300	Porosity of Gravel Backfill (P_f)				Porosity of Gravel Backfill (P_f)			
Corrected Water Volume (V_{WC})			0.185m³	Corrected Water Volume (V_{WC})			0.185m³	Corrected Water Volume (V_{WC})			0.185m³
Time to soakaway				**Time to soakaway**				**Time to soakaway**			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	10.200	0.680	0	1	10.280	0.680	0	1	13.300	0.680	0
1	10.250	0.680	300	1	10.410	0.730	780	1	13.340	0.710	240
1	10.280	0.700	480	1	11.070	0.820	2340	1	13.400	0.730	600
1	10.310	0.720	660				2340	1	13.460	0.740	960
1	10.390	0.750	1140				2340	1	13.490	0.760	1140
1	10.430	0.760	1380				2340	1	13.530	0.770	1380
1	10.510	0.800	1860				2340	1	14.010	0.780	1860
1	10.570	0.820	2220				2340				1860
			2220				2340				1860
			2220				2340				1860
			2220				2340				1860
			2220				2340				1860
			2220				2340				1860
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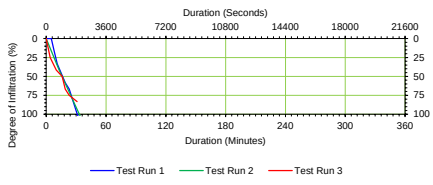
			2220				2340				1860
			2220				2340				1860
			2220				2340				1860
			2220				2340				1860
			2220				2340				1860
			2220				2340				1860
25% water loss (75% full)			0.710m	**25% water loss (75% full)**			0.710m	**25% water loss (75% full)**			0.710m
50% water loss (50% full)			0.740m	**50% water loss (50% full)**			0.740m	**50% water loss (50% full)**			0.740m
75% water loss (25% full)			0.770m	**75% water loss (25% full)**			0.770m	**75% water loss (25% full)**			0.770m
25% time (seconds)			570 sec	**25% time (seconds)**			468 sec	**25% time (seconds)**			240 sec
75% time (seconds)			1500 sec	**75% time (seconds)**			1473 sec	**75% time (seconds)**			1500 sec
Vp 75-25			0.092m³	**Vp 75-25**			0.092m³	**Vp 75-25**			0.092m³
as 50 (Actual area from test)			5.832m²	**as 50 (Actual area from test)**			5.832m²	**as 50 (Actual area from test)**			5.832m²
tp 75 - 25			930 sec	**tp 75 - 25**			1005 sec	**tp 75 - 25**			1260 sec
Soil Infiltration Rate			**1.70E-05m/s**	**Soil Infiltration Rate**			**1.58E-05m/s**	**Soil Infiltration Rate**			**1.26E-05m/s**



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Checked by	PRINT	CA
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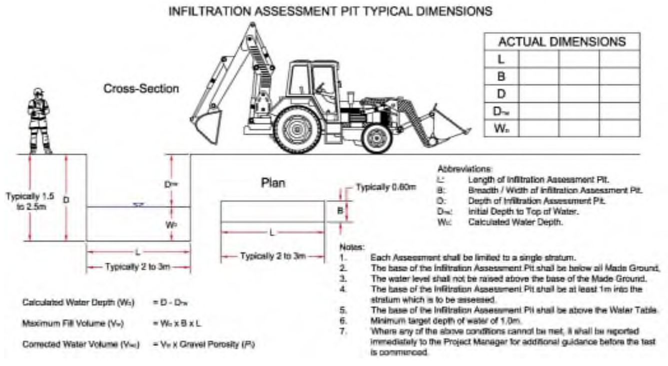
	DATE	20/01/2021

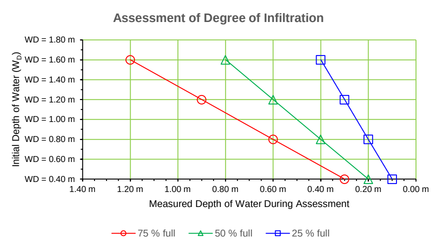
1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

Site: NW Bicester
Client: Firethorn Developments Ltd
Test Location TP107 **Date of start** 07/01/2021 **Date at end** 08/01/2021

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
	See separate trial pit log
BASE OF PIT	BASE OF PIT



Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



SITE OBSERVATIONS - VOLUME LOSS		
Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3
3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.

1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: NW Bicester
Client: Firethorn Developments Ltd
Test Location TP107 **Date of start** 07/01/2021 **Date at end** 08/01/2021

Test Run 1		Test Run 2		Test Run 3	
Pit Dimensions (m)		**Pit Dimensions (m)**		**Pit Dimensions (m)**	
Trial Pit Length (L)	2.200m	Trial Pit Length (L)	2.200m	Trial Pit Length (L)	2.200m
Trial Pit Breadth / Width (B)	0.700m	Trial Pit Breadth / Width (B)	0.700m	Trial Pit Breadth / Width (B)	0.700m
Effective Depth (D)	0.900m	Effective Depth (D)	0.900m	Effective Depth (D)	0.900m
Time at Start of Filling	11.19	Time at Start of Filling	13.27	Time at Start of Filling	9.04
Time at End of Filling	11.20	Time at End of Filling	13.28	Time at End of Filling	9.05
Depth from Surface to Water (D_{TW})	0.750m	Depth below Surface to Water (D_{TW})	0.750m	Depth below Surface to Water (D_{TW})	0.750m
Water Depth (W_D)	0.150m	Water Depth (W_D)	0.150m	Water Depth (W_D)	0.150m
Maximum Fill Volume (V_W)	0.231m³	Maximum Fill Volume (V_W)	0.231m³	Maximum Fill Volume (V_W)	0.231m³
Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No
Porosity of Gravel Backfill (P_t)	0.300	Porosity of Gravel Backfill (P_t)		Porosity of Gravel Backfill (P_t)	
Corrected Water Volume (V_{WC})	0.231m³	Corrected Water Volume (V_{WC})	0.231m³	Corrected Water Volume (V_{WC})	0.231m³

Time to soakaway				Time to soakaway				Time to soakaway			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	11.200	0.750	0	1	13.280	0.750	0	1	9.050	0.750	0
1	11.250	0.750	300	1	14.060	0.770	2280	1	9.070	0.750	120
1	11.450	0.780	1500	1	15.000	0.810	5520	1	10.000	0.780	3300
1	13.270	0.870	7620	1	15.500	0.850	8520	1	11.450	0.850	9600
			7620	1	16.150	0.870	10020	1	12.200	0.870	11700
			7620				10020				11700
			7620				10020				11700
			7620				10020				11700
			7620				10020				11700
			7620				10020				11700
			7620				10020				11700
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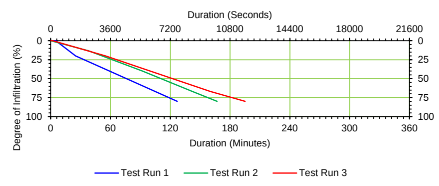
			7620				10020				11700
			7620				10020				11700
			7620				10020				11700
			7620				10020				11700
			7620				10020				11700

25% water loss (75% full)	0.788m	**25% water loss (75% full)**	0.788m	**25% water loss (75% full)**	0.788m
50% water loss (50% full)	0.825m	**50% water loss (50% full)**	0.825m	**50% water loss (50% full)**	0.825m
75% water loss (25% full)	0.863m	**75% water loss (25% full)**	0.863m	**75% water loss (25% full)**	0.863m
25% time (seconds)	2010 sec	**25% time (seconds)**	3698 sec	**25% time (seconds)**	3975 sec
75% time (seconds)	7110 sec	**75% time (seconds)**	9458 sec	**75% time (seconds)**	10913 sec
Vp 75-25	0.116m³	**Vp 75-25**	0.116m³	**Vp 75-25**	0.116m³
as 50 (Actual area from test)	6.325m²	**as 50 (Actual area from test)**	6.325m²	**as 50 (Actual area from test)**	6.325m²
tp 75 - 25	5100 sec	**tp 75 - 25**	5760 sec	**tp 75 - 25**	6938 sec
Soil Infiltration Rate	**3.58E-06m/s**	**Soil Infiltration Rate**	**3.17E-06m/s**	**Soil Infiltration Rate**	**2.63E-06m/s**



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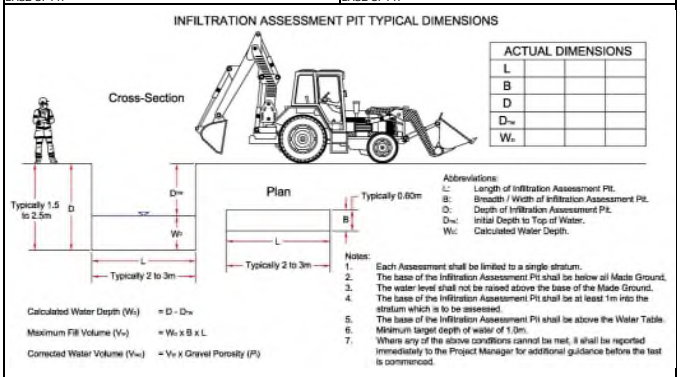
	DATE	08/01/2021
Checked by	PRINT	CA
	SIGN	
	DATE	20/01/2021

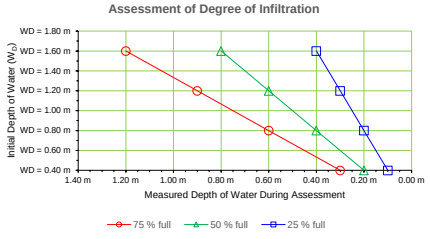
1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

Site: NW Bicester
Client: Firethorn Developments Ltd
Test Location TP108 **Date of start** 07/01/2021 **Date at end** 07/01/2021

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
	See separate trial pit log
BASE OF PIT	BASE OF PIT



Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



SITE OBSERVATIONS - VOLUME LOSS		
Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3
3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.

1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: NW Bicester
Client: Firethorn Developments Ltd
Test Location TP108 **Date of start** 07/01/2021 **Date at end** 07/01/2021

Test Run 1				Test Run 2				Test Run 3			
Pit Dimensions (m)				**Pit Dimensions (m)**				**Pit Dimensions (m)**			
Trial Pit Length (L)			2.200m	Trial Pit Length (L)			2.200m	Trial Pit Length (L)			2.200m
Trial Pit Breadth / Width (B)			0.700m	Trial Pit Breadth / Width (B)			0.700m	Trial Pit Breadth / Width (B)			0.700m
Effective Depth (D)			1.920m	Effective Depth (D)			1.920m	Effective Depth (D)			1.920m
Time at Start of Filling			9.12	Time at Start of Filling			12.40	Time at Start of Filling			12.58
Time at End of Filling			9.16	Time at End of Filling			12.44	Time at End of Filling			13.01
Depth from Surface to Water (D_{TW})			1.670m	Depth below Surface to Water (D_{TW})			1.550m	Depth below Surface to Water (D_{TW})			1.750m
Water Depth (W_D)			0.250m	Water Depth (W_D)			0.370m	Water Depth (W_D)			0.170m
Maximum Fill Volume (V_W)			0.385m³	Maximum Fill Volume (V_W)			0.570m³	Maximum Fill Volume (V_W)			0.262m³
Gravel used to backfill Test Pit			Yes	Gravel used to backfill Test Pit			Yes	Gravel used to backfill Test Pit			Yes
Porosity of Gravel Backfill (P_r)			0.300	Porosity of Gravel Backfill (P_r)			0.300	Porosity of Gravel Backfill (P_r)			0.300
Corrected Water Volume (V_{WC})			0.116m³	Corrected Water Volume (V_{WC})			0.171m³	Corrected Water Volume (V_{WC})			0.079m³
Time to soakaway				**Time to soakaway**				**Time to soakaway**			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	9.160	1.670	0	1	12.440	1.550	0	1	13.010	1.750	0
1	9.180	1.770	120	1	12.450	1.600	60	1	13.040	1.790	180
1	9.210	1.810	300	1	12.460	1.670	120	1	13.060	1.810	300
1	9.270	1.830	660	1	12.480	1.740	240	1	13.150	1.840	840
1	9.300	1.880	840	1	12.490	1.780	300	1	13.200	1.850	1140
			840	1	12.520	1.800	480	1	13.220	1.855	1260
			840	1	12.560	1.830	720	1	13.300	1.880	1740
			840	1	12.580	1.850	840	1	13.350	1.890	2040
			840				840				2040
			840				840				2040
			840				840				2040
			840				840				2040
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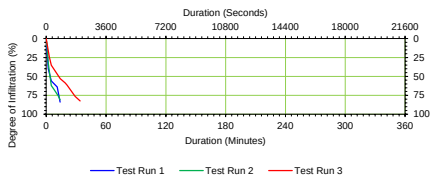
			840				840				2040
25% water loss (75% full)			1.733m	**25% water loss (75% full)**			1.643m	**25% water loss (75% full)**			1.793m
50% water loss (50% full)			1.795m	**50% water loss (50% full)**			1.735m	**50% water loss (50% full)**			1.835m
75% water loss (25% full)			1.858m	**75% water loss (25% full)**			1.828m	**75% water loss (25% full)**			1.878m
25% time (seconds)			75 sec	**25% time (seconds)**			96 sec	**25% time (seconds)**			195 sec
75% time (seconds)			759 sec	**75% time (seconds)**			700 sec	**75% time (seconds)**			1692 sec
Vp 75-25			0.058m³	**Vp 75-25**			0.085m³	**Vp 75-25**			0.039m³
as 50 (Actual area from test)			11.951m²	**as 50 (Actual area from test)**			11.603m²	**as 50 (Actual area from test)**			12.183m²
tp 75 - 25			684 sec	**tp 75 - 25**			604 sec	**tp 75 - 25**			1497 sec
Soil Infiltration Rate			7.06E-06m/s	**Soil Infiltration Rate**			1.22E-05m/s	**Soil Infiltration Rate**			2.15E-06m/s



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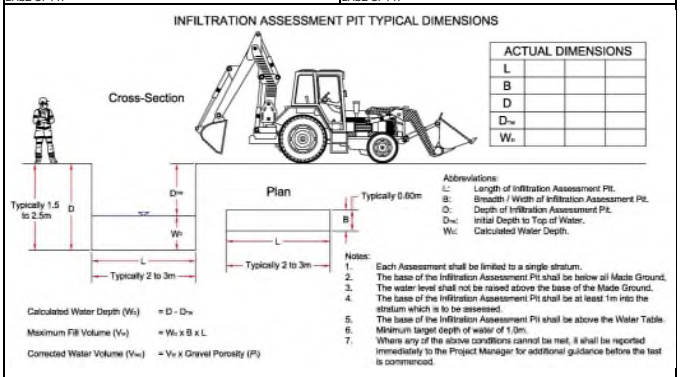
Checked by	PRINT	CA
	SIGN	
	DATE	20/01/2021

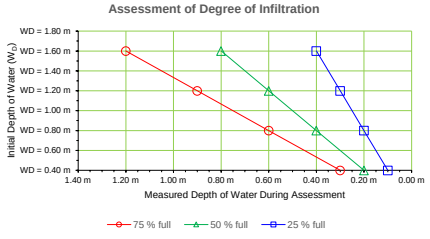
1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

Site: NW Bicester
Client: Firethorn Bicester Ltd
Test Location TP109 **Date of start** 07/01/2021 **Date at end** 07/01/2021

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
	See separate trial pit log
BASE OF PIT	BASE OF PIT



Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



SITE OBSERVATIONS - VOLUME LOSS			
Test Run	Infiltration Records up to 6 Hours		Comments
1	<25%		Unlikely without significant attenuation
	<75%		Requires additional BRE DG365 testing
	>75%		Refer to results of Run 2
2	<25%		Unlikely without significant attenuation
	<75%		Requires additional BRE DG365 testing
	>75%		Refer to results of Run 3
3	<25%		Unlikely without significant attenuation
	<75%		Requires additional BRE DG365 testing
	>75%		Indicative Infiltration Rate achieved.

1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: NW Bicester
Client: Firethorn Bicester Ltd
Test Location TP109 **Date of start** 07/01/2021 **Date at end** 07/01/2021

Test Run 1				Test Run 2				Test Run 3			
Pit Dimensions (m)				**Pit Dimensions (m)**				**Pit Dimensions (m)**			
Trial Pit Length (L)			2.200m	Trial Pit Length (L)			2.200m	Trial Pit Length (L)			2.200m
Trial Pit Breadth / Width (B)			0.700m	Trial Pit Breadth / Width (B)			0.700m	Trial Pit Breadth / Width (B)			0.700m
Effective Depth (D)			2.250m	Effective Depth (D)			2.250m	Effective Depth (D)			2.250m
Time at Start of Filling			9.34	Time at Start of Filling			11.50	Time at Start of Filling			12.08
Time at End of Filling			9.40	Time at End of Filling			11.53	Time at End of Filling			12.11
Depth from Surface to Water (D_{TW})			1.990m	Depth below Surface to Water (D_{TW})			1.970m	Depth below Surface to Water (D_{TW})			1.970m
Water Depth (W_D)			0.260m	Water Depth (W_D)			0.280m	Water Depth (W_D)			0.280m
Maximum Fill Volume (V_W)			0.400m³	Maximum Fill Volume (V_W)			0.431m³	Maximum Fill Volume (V_W)			0.431m³
Gravel used to backfill Test Pit			Yes	Gravel used to backfill Test Pit			Yes	Gravel used to backfill Test Pit			Yes
Porosity of Gravel Backfill (P_f)			0.300	Porosity of Gravel Backfill (P_f)			0.300	Porosity of Gravel Backfill (P_f)			0.300
Corrected Water Volume (V_{WC})			0.120m³	Corrected Water Volume (V_{WC})			0.129m³	Corrected Water Volume (V_{WC})			0.129m³
Time to soakaway				**Time to soakaway**				**Time to soakaway**			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	9.400	1.990	0	1	11.530	1.970	0	1	12.110	1.970	0
1	9.410	2.030	60	1	11.550	2.120	120	1	12.130	2.110	120
1	9.450	2.140	300	1	11.560	2.130	180	1	12.150	2.130	240
1	9.470	2.160	420	1	12.000	2.170	420	1	12.210	2.160	600
1	9.510	2.170	660	1	12.050	2.180	720	1	12.260	2.175	900
1	9.550	2.200	900	1	12.080	2.190	900	1	12.300	2.180	1140
			900				900	1	12.360	2.190	1500
			900				900				1500
			900				900				1500
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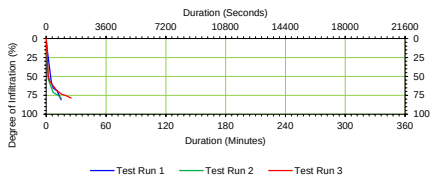
			900				900				1500
			900				900				1500
			900				900				1500
			900				900				1500
			900				900				1500
			900				900				1500
25% water loss (75% full)			2.055m	**25% water loss (75% full)**			2.040m	**25% water loss (75% full)**			2.040m
50% water loss (50% full)			2.120m	**50% water loss (50% full)**			2.110m	**50% water loss (50% full)**			2.110m
75% water loss (25% full)			2.185m	**75% water loss (25% full)**			2.180m	**75% water loss (25% full)**			2.180m
25% time (seconds)			115 sec	**25% time (seconds)**			56 sec	**25% time (seconds)**			60 sec
75% time (seconds)			780 sec	**75% time (seconds)**			720 sec	**75% time (seconds)**			1140 sec
Vp 75-25			0.060m³	**Vp 75-25**			0.065m³	**Vp 75-25**			0.065m³
as 50 (Actual area from test)			13.836m²	**as 50 (Actual area from test)**			13.778m²	**as 50 (Actual area from test)**			13.778m²
tp 75 - 25			665 sec	**tp 75 - 25**			664 sec	**tp 75 - 25**			1080 sec
Soil Infiltration Rate			**6.52E-06m/s**	**Soil Infiltration Rate**			**7.07E-06m/s**	**Soil Infiltration Rate**			**4.35E-06m/s**



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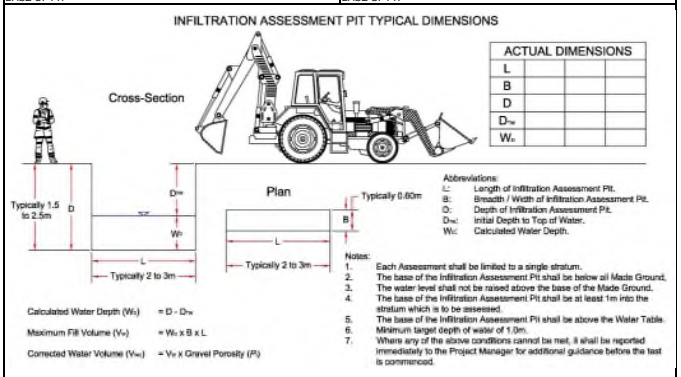
1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

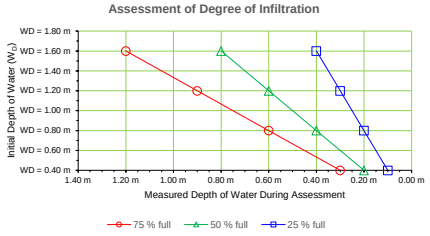
Site: NW Bicester
Client: Firethorn Developments Ltd
Test Location TP111 **Date of start** 08/01/2021 **Date at end** 08/01/2021

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
	See separate trial pit log
BASE OF PIT	BASE OF PIT



ACTUAL DIMENSIONS			
L			
B			
D			
D_w			
W_w			

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



SITE OBSERVATIONS - VOLUME LOSS			
Test Run	Infiltration Records up to 6 Hours		Comments
1	<25%		Unlikely without significant attenuation
	<75%		Requires additional BRE DG365 testing
	>75%		Refer to results of Run 2
2	<25%		Unlikely without significant attenuation
	<75%		Requires additional BRE DG365 testing
	>75%		Refer to results of Run 3
3	<25%		Unlikely without significant attenuation
	<75%		Requires additional BRE DG365 testing
	>75%		Indicative Infiltration Rate achieved.

1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: NW Bicester
Client: Firethorn Developments Ltd
Test Location TP112 **Date of start** 08/01/2021 **Date at end** 08/01/2021

Test Run 1				Test Run 2				Test Run 3			
Pit Dimensions (m)				**Pit Dimensions (m)**				**Pit Dimensions (m)**			
Trial Pit Length (L)			2.200m	Trial Pit Length (L)				Trial Pit Length (L)			
Trial Pit Breadth / Width (B)			0.700m	Trial Pit Breadth / Width (B)				Trial Pit Breadth / Width (B)			
Effective Depth (D)			0.880m	Effective Depth (D)				Effective Depth (D)			
Time at Start of Filling			9.44	Time at Start of Filling				Time at Start of Filling			
Time at End of Filling			9.45	Time at End of Filling				Time at End of Filling			
Depth from Surface to Water (D_{TW})			0.450m	Depth below Surface to Water (D_{TW})				Depth below Surface to Water (D_{TW})			
Water Depth (W_D)			0.430m	Water Depth (W_D)			-	Water Depth (W_D)			-
Maximum Fill Volume (V_W)			0.662m³	Maximum Fill Volume (V_W)			-	Maximum Fill Volume (V_W)			-
Gravel used to backfill Test Pit			No	Gravel used to backfill Test Pit				Gravel used to backfill Test Pit			
Porosity of Gravel Backfill (P_f)			0.300	Porosity of Gravel Backfill (P_f)				Porosity of Gravel Backfill (P_f)			
Corrected Water Volume (V_{WC})			0.662m³	Corrected Water Volume (V_{WC})			-	Corrected Water Volume (V_{WC})			-
Time to soakaway				**Time to soakaway**				**Time to soakaway**			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	9.450	0.450	0								
1	9.560	0.460	660								
1	10.030	0.480	1080								
1	10.140	0.480	1740								
1	11.020	0.480	4620								
1	15.500	0.480	21900								
			21900								
			21900								
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			21900								
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			21900								
			21900								
25% water loss (75% full)			0.558m	**25% water loss (75% full)**			-	**25% water loss (75% full)**			-
50% water loss (50% full)			0.665m	**50% water loss (50% full)**			-	**50% water loss (50% full)**			-
75% water loss (25% full)			0.773m	**75% water loss (25% full)**			-	**75% water loss (25% full)**			-
25% time (seconds)			-	**25% time (seconds)**			-	**25% time (seconds)**			-
75% time (seconds)			-	**75% time (seconds)**			-	**75% time (seconds)**			-
Vp 75-25			0.331m³	**Vp 75-25**			-	**Vp 75-25**			-
as 50 (Actual area from test)			5.397m²	**as 50 (Actual area from test)**			-	**as 50 (Actual area from test)**			-
tp 75 - 25				**tp 75 - 25**				**tp 75 - 25**			
Soil Infiltration Rate			-	**Soil Infiltration Rate**			-	**Soil Infiltration Rate**			-

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	DATE	20/01/2021

1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

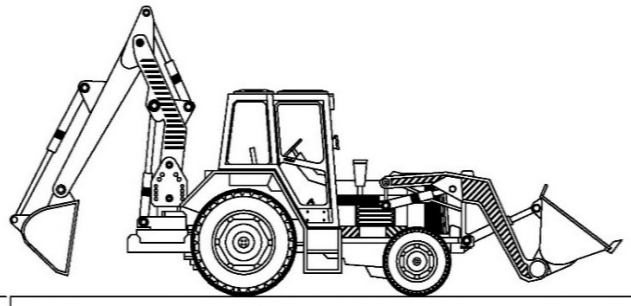
Site: NW Bicester

Client: Firethorn Developments Ltd

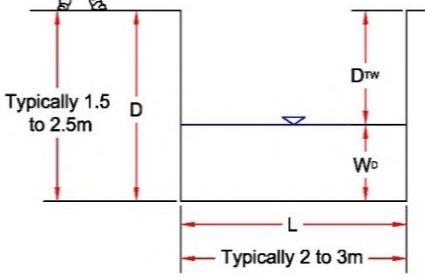
Test Location TP112 **Date of start** 08/01/2021 **Date at end** 08/01/2021

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
	See separate trial pit log
BASE OF PIT	BASE OF PIT

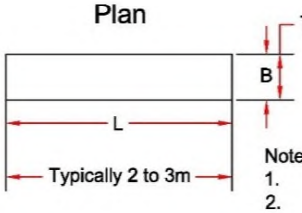
INFILTRATION ASSESSMENT PIT TYPICAL DIMENSIONS



Cross-Section



Plan



ACTUAL DIMENSIONS			
L			
B			
D			
D_{TW}			
W_D			

Abbreviations:
- L: Length of Infiltration Assessment Pit.
- B: Breadth / Width of Infiltration Assessment Pit.
- D: Depth of Infiltration Assessment Pit.
- D_{TW}: Initial Depth to Top of Water.
- W_D: Calculated Water Depth.

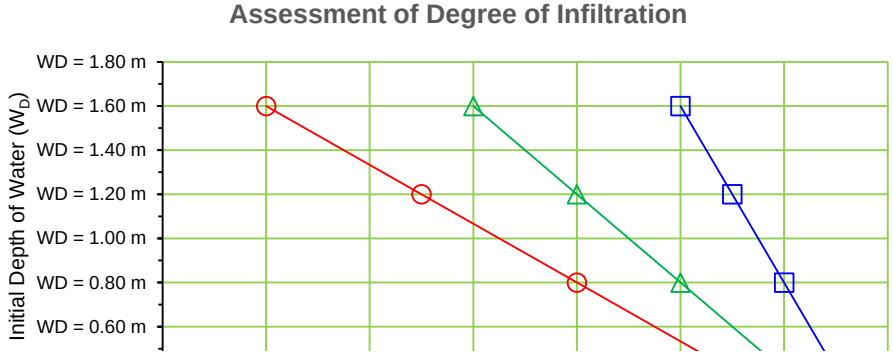
Calculated Water Depth (W_D) = D - D_{TW}

Maximum Fill Volume (V_w) = W_D x B x L

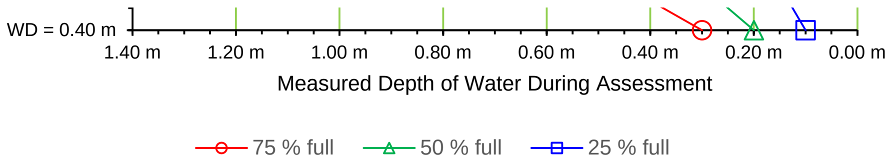
Corrected Water Volume (V_{wc}) = V_w x Gravel Porosity (P_t)

Notes:
1. Each Assessment shall be limited to a single stratum.
2. The base of the Infiltration Assessment Pit shall be below all Made Ground,
3. The water level shall not be raised above the base of the Made Ground.
4. The base of the Infiltration Assessment Pit shall be at least 1m into the stratum which is to be assessed.
5. The base of the Infiltration Assessment Pit shall be above the Water Table.
6. Minimum target depth of water of 1.0m.
7. Where any of the above conditions cannot be met, it shall be reported immediately to the Project Manager for additional guidance before the test is commenced.

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



SITE OBSERVATIONS - VOLUME LOSS		
Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3



3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.

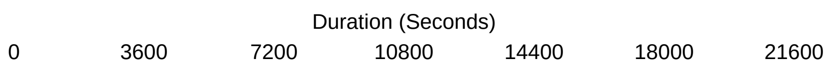
1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: NW Bicester

Client: Firethorn Developments Ltd

Test Location TP112 **Date of start** 08/01/2021 **Date at end** 08/01/2021

Test Run 1				**Test Run 2**				**Test Run 3**			
Pit Dimensions (m)				**Pit Dimensions (m)**				**Pit Dimensions (m)**			
Trial Pit Length (L)			2.200m	Trial Pit Length (L)			2.200m	Trial Pit Length (L)			2.200m
Trial Pit Breadth / Width (B)			0.700m	Trial Pit Breadth / Width (B)			0.700m	Trial Pit Breadth / Width (B)			0.700m
Effective Depth (D)			0.780m	Effective Depth (D)			0.780m	Effective Depth (D)			0.780m
Time at Start of Filling			9.49	Time at Start of Filling			10.08	Time at Start of Filling			10.25
Time at End of Filling			9.50	Time at End of Filling			10.09	Time at End of Filling			10.26
Depth from Surface to Water (D_{TW})			0.730m	Depth below Surface to Water (D_{TW})			0.650m	Depth below Surface to Water (D_{TW})			0.650m
Water Depth (W_D)			0.050m	Water Depth (W_D)			0.130m	Water Depth (W_D)			0.130m
Maximum Fill Volume (V_W)			0.077m³	Maximum Fill Volume (V_W)			0.200m³	Maximum Fill Volume (V_W)			0.200m³
Gravel used to backfill Test Pit			No	Gravel used to backfill Test Pit			No	Gravel used to backfill Test Pit			No
Porosity of Gravel Backfill (P_t)			0.300	Porosity of Gravel Backfill (P_t)			0.300	Porosity of Gravel Backfill (P_t)			0.300
Corrected Water Volume (V_{WC})			0.077m³	Corrected Water Volume (V_{WC})			0.200m³	Corrected Water Volume (V_{WC})			0.200m³
Time to soakaway				**Time to soakaway**				**Time to soakaway**			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	9.500	0.730	0	1	10.090	0.650	0	1	10.260	0.650	0
1	9.510	0.740	60	1	10.100	0.700	60	1	10.270	0.660	60
1	9.520	0.750	120	1	10.120	0.710	180	1	10.300	0.690	240
1	9.530	0.760	180	1	10.150	0.730	360	1	10.350	0.710	540
1	9.540	0.770	240	1	10.190	0.740	600	1	10.450	0.750	1140
1	10.010	0.780	660	1	10.250	0.770	960	1	10.490	0.780	1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
			660				960				1380
25% water loss (75% full)			0.743m	**25% water loss (75% full)**			0.683m	**25% water loss (75% full)**			0.683m
50% water loss (50% full)			0.755m	**50% water loss (50% full)**			0.715m	**50% water loss (50% full)**			0.715m
75% water loss (25% full)			0.768m	**75% water loss (25% full)**			0.748m	**75% water loss (25% full)**			0.748m
25% time (seconds)			75 sec	**25% time (seconds)**			39 sec	**25% time (seconds)**			195 sec
75% time (seconds)			225 sec	**75% time (seconds)**			690 sec	**75% time (seconds)**			1103 sec
Vp 75-25			0.039m³	**Vp 75-25**			0.100m³	**Vp 75-25**			0.100m³
as 50 (Actual area from test)			5.919m²	**as 50 (Actual area from test)**			5.687m²	**as 50 (Actual area from test)**			5.687m²
tp 75 - 25			150 sec	**tp 75 - 25**			651 sec	**tp 75 - 25**			907 sec
Soil Infiltration Rate		**4.34E-05m/s**		**Soil Infiltration Rate**		**2.70E-05m/s**		**Soil Infiltration Rate**		**1.94E-05m/s**	



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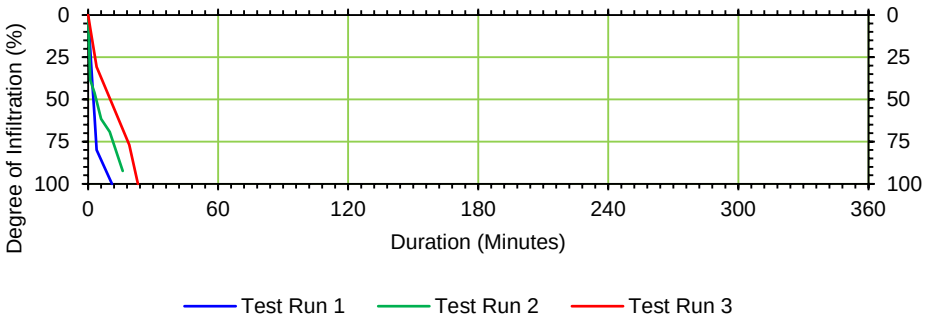

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