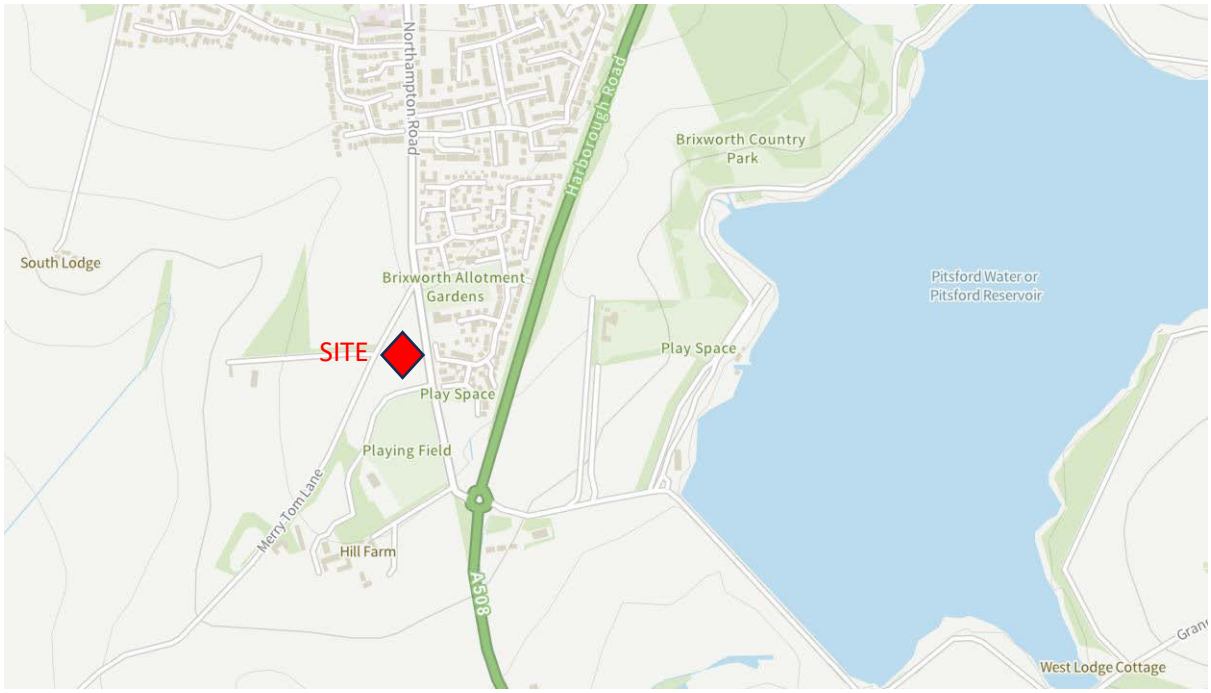
APPENDICES

APPENDIX A



LOCATION PLAN

APPENDIX B

Data updated: 31/10/23

Scale: 1:1250 | Date: 27/11/23 | Wastewater Plan A2

Map Centre: 474813,270119 | Our Ref: 1331912 - 1 | Powered by digdat

Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent Sewer
Rising Main*
Private Sewer*
Decommissioned Sewer*

Outfall*
Inlet*
Manhole*

Sewage Treatment Works
Public Pumping Station
Decommissioned Pumping Station

*(Colour denotes effluent type)

jonbullock@armstrongstokesclayton.co.uk

NORTHAMPTON ROAD, BR

love every drop anglianwater

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
8207	C	-	-	-
8208	C	-	-	-
8209	C	-	-	-
0001	F	-	-	-
0002	F	-	-	-
0101	F	-	-	-
0102	F	-	-	-
0103	F	-	-	-
0105	F	-	-	-
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9851	S	-	-	-
9852	S	-	-	-
9853	S	-	-	-
9854	S	-	-	-
9855	S	-	-	-
9856	S	-	-	-
9857	S	-	-	-
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APPENDIX C

KEY

A Existing Vineyard

B Existing Farm Land

C Approved Trekking Centre & Parking
Proposed Best of British Wine & Food Building &
Proposed Central Viticulture Academy

D Proposed Existing Barn Conversion to 5 Dwellings

E Approved 25 Extra Care Cottages

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G Approved 60 Bed Care Home (2023/6277/MAR)
with 78 parking spaces (13 EV spaces)

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74 parking spaces (29 EV spaces)

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K Proposed Brixworth Local Services
100 parking spaces (30 EV spaces)

L Proposed 2 Extracare Bungalows (WND/2023/0010)

M Approved & Built 7 Care Cottages

0m 13m 26m 39m 52m 65m

VISUAL SCALE 1:650 @ A1

KEY
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15KW SUPER EV CHARGING

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BRIXWORTH LOCAL SERVICES (K)
100 Parcking Spaces (30 EV Spaces)

16 x SEMI DETACHED AFFORDABLE HOMES (J)

APPROVED 60 BED CARE HOME (G)
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SPA & WELLNESS CENTRE (I)
Single storey building built on footprint of existing structure.
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EXISTING CRICKET & TENNIS CLUB (H)

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Recreation Facility To Be Transferred As A Brixworth Community Assest

EXISTING TREE BELT AND LANDSCAPING
SERVICE ROAD
EXISTING FOOTPATH
NORTHAMPTON ROAD
NEW CROSSING
BICYCLE ACCESS
SERVICE YARD
TURNING
NATIONAL SUPERMARKET OPERATOR 4500 sqft
PHARMACY 1500sqft
6 X DISABLED PARKING BAYS
21 X STANDARD PARKING BAYS
18 X 7KW ELECTRIC EV CHARGING
10 X 15KW SUPER EV CHARGING
BRIXWORTH LOCAL SERVICES
23 X STANDARD PARKING BAYS
2 x SMALL PROFESSIONAL OFFICE UNITS 750sqft
3 x SMALL PROFESSIONAL OFFICE UNITS 500sqft
PROFESSIONAL OFFICE UNIT 1500sqft
GYMNASIUM/ DANCE SCHOOL 3400sqft
DRIVE THROUGH COFFEE FACILITY WITH HIGHSPEED HUB LARGE SCREEN MEETING ROOM 3850sqft
DISABLED X 15KW SUPER EV CHARGING
SUDs
4 X DISABLED PARKING BAYS
5 X STANDARD PARKING BAYS
8 X STANDARD PARKING BAYS
16 X STANDARD PARKING BAYS
20 X 7KW ELECTRIC EV CHARGING
9 X 15KW SUPER EV CHARGING
SPA & WELLNESS CENTRE CENTRAL GARDENS

1 Site Plan (NORTH)
1 : 625

Revision	Description	Drawn	Date	Checked
1	Site plan updated following arboricultural survey	NS	19.12.2023	NS

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socratesarchitects.com

Client's Name: DR. DALLAS BURSTON

Job Title: BRIXWORTH

Drawing Title: PROPOSED SITE PLAN - (1 of 2) - NORTH

Scale: As indicated @A1

Job No: **2023028** Drawing No: **A101**

Status: Rev: **P1**

APPENDIX D

ARMSTRONG STOKES & CLAYTON LIMITED

Civil & Structural Engineering Consultants

Proposed Local Services
Northampton Road
Brixworth
Northamptonshire

Foul Drainage Scoping Report

December 2023

AUTHOR:	JS
CHECKED:	JB
APPROVED:	JS
REPORT REF:	FRA124, Brixworth Local Services, Northampton Road. Foul Scoping Report Rev. A
STATUS:	FINAL

Regus House, Herald Way, Pegasus Business Park,
Castle Donington, Derbyshire, DE74 2TZ
Tel: 01159 417 893

Registered in England No. 04960061

Introduction

1. This Foul Drainage Strategy Scoping Report has been prepared to assess foul drainage options for client consideration and to support a planning application with respect to a proposed development consisting or local services, a spa & wellness centre, and 16 semi-detached affordable homes all on land to the west of Northampton Road, Brixworth, Northamptonshire. The Scoping Report investigates the following foul outfall options for the development proposals, and advises where further detailed assessment work may be necessary:

   (i) The existing drainage associated with the development site and a review of the public sewer records.
   (ii) The viability of a connection to the public sewer network.
   (iii) The viability of on-site treatment of foul flows.

Existing Site

2. The development site is classified as Greenfield in its nature, and currently comprises of agricultural land situated to the west of Northampton Road and to the southern portion of the urbanisation of Brixworth. The proposed development land currently forms part of the Brixworth Castle redevelopment.

3. The development site is bounded to the west and north by Merry Tom Lane, with Northampton Road to the east and Brixworth Cricket Club to the south, with Brixworth Tennis Club beyond. *Figure 1* below illustrates the existing site.

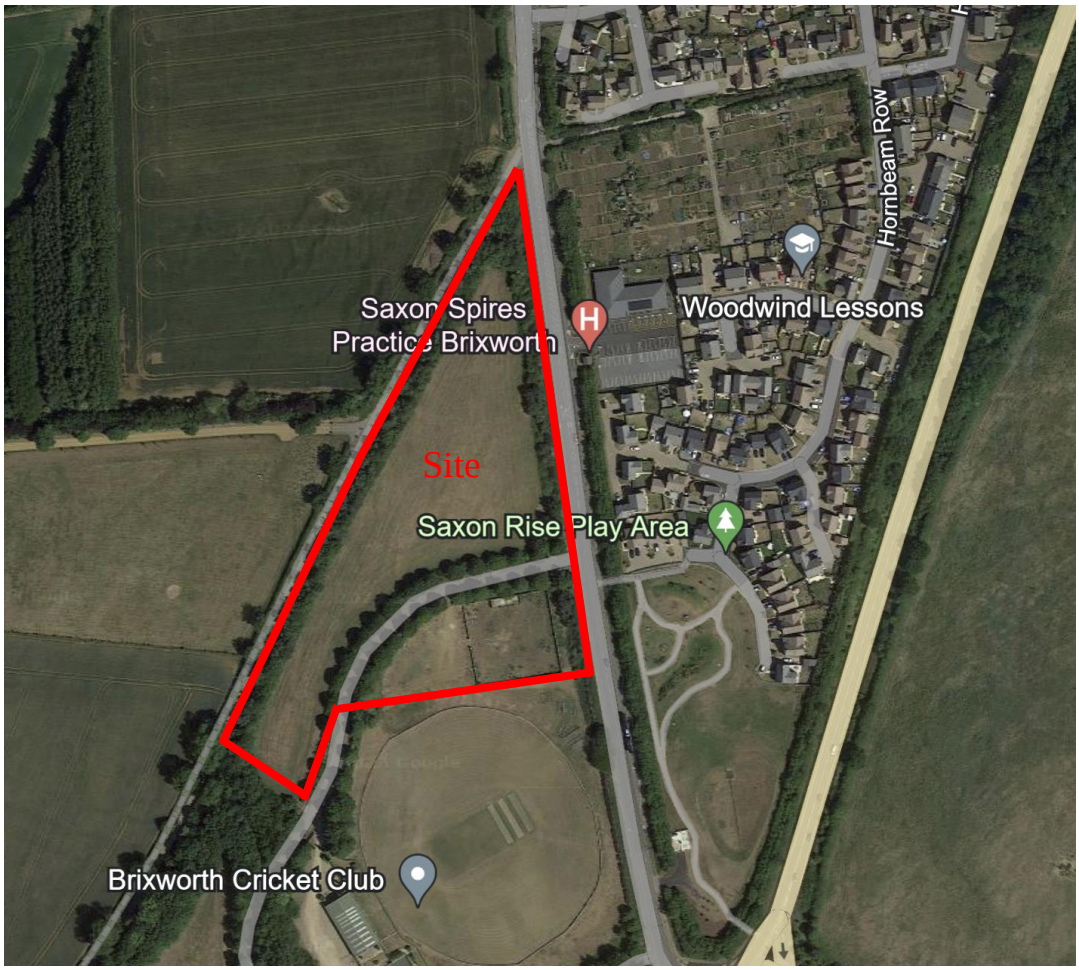

Figure 1

4. There is no known foul drainage associated with the site. There are however, two small package treatment plants associated with the 7 care cottages and 'Vineyard Gardens' dwelling conversions situated on land to the south of the application site.

Existing Public Foul Assets

5. Anglian Water (AW) act as the local water authority with regards to sewerage for Brixworth. Sewer records have been sourced from AW and they confirm that the nearest public foul asset exists circa 300m to the north of the application site. The nearest public foul asset is a high pressure rising main located within Northampton Road at the junction with The Ashway, which flows in a northerly direction along Northampton Road. The rising main then turns west along Froxhill Crescent, where it ultimately discharges to the gravity network at MH4101, located at the crown of the hill in close proximity to property No. 51 Froxhill Crescent. Within **Appendix A** is a copy of AW Sewer Record Plan.

6. The nearest public gravity foul asset is a 150mm diameter foul sewer situated to the west of Far Brook junction with The Ashway, some 400m north of the site.

7. Ultimately, the local public foul sewer network outfalls to the north at Brixworth Sewerage Works, which is circa 2.2 km to the northwest of the site. The sewerage works is accessed from Station Road, Brixworth.

Existing Section 104 of WIA 1991 / Private Foul Assets

8. It is evident that a main sewer network exists within the residential development associated with Hornbeam Row located to the east of the site, beyond Northampton Road. The Hornbeam Row development is accessed from Blackthorn Crescent, which in turn is accessed from Northampton Road 100m north of the site. The development drainage consists of gravity sewers and pressurised rising mains, with supporting foul pump station.

9. AW have confirmed that the sewers associated with this development have a Section 104 classification, confirming that the sewers are approved for adoption in accordance with the Water Industry Act 1991, but have yet to be fully vested with the water authority. The sewers are therefore currently private, within the control of a 3rd party. This includes the associated foul pump station, which is situated on the eastern side of Northampton Road as illustrated in *Figure 2* below.

Figure 2

10. The other known private sewers within the vicinity are those associated with the development to the east and situated within property curtilages.

Proposed Development

11. The development proposal will consist of local services, which will include various commercial / office enterprises and EV charging facilities, a spa & wellness centre, and 16 semi-detached affordable homes, all with associated landscaping, gardens, access / service roads and car parking, as illustrated within *Figure 3* below and **Appendix B**.

Figure 3

12. The proposed development will generate the following peak foul flow rates based on each primary use: -

- Local Services, with a total gross floor area equating to 1,700.0m2, based on 300 litres / day / 100m2 will equate to a peak discharge @ 6DWF + 20% of 0.425 l/s.

- Spa & Wellness Centre, with a total gross floor area equating to circa 1,500.0m2, based on 300 litres / day / 100m2 will equate to a peak discharge @ 6DWF + 20% of 0.375 l/s.

Thus, a total maximum peak foul discharge from the non-residential commercial development is 0.8 l/s (0.425 + 0.375).

- 16 Residential Affordable Homes @ 4000 l/unit/day will provide a peak foul discharge rate of 0.74 l/s.

13. The discharge from the commercial and residential uses will therefore result in a total peak foul discharge from the application site of 1.54 l/s.

New Development Connection to the Public Sewer Network

14. With consideration that no public sewer outfall is currently available adjacent to the site, a connection to the public sewer network could be pursued via a Section 98 of the Water Industry Act 1991, which requisitions an outfall sewer from the local water authority to the site boundary. The requisition process will determine available capacity within the existing public sewer networks, and if any upgrades to the network are required or if its more appropriate to limit the flow from the development with supporting attenuation. This will also be measured against phasing of the development and any upgrading that may be necessary to the existing treatment works.

15. In addition, and subject to confirmation from the local water authority, an on-site pump station may be necessary to discharge flows to the requisitioned outfall, and thus as a minimum, a private foul package pump station with a budget build cost of circa £25,000.00 + VAT should be allowed for within the proposals.

16. Additional costs will also involve the on-site sewerage infrastructure network and AW requisition costs for supplying the connecting outfall. Costs for on-site sewerage infrastructure will be determined following a design process, with the water authority determining the off-site costs following their assessment of a S98 application.

17. The time taken to complete the requisition process depends entirely on the complexity of the scheme. Under the 1991 Water Industry Act however, the requisitioned public sewer should be available for use within six months of: -

- The day on which the financial conditions are met or
- The day on which the locations of connection with on-site sewers / drains are agreed or determined, whichever is the greater.

Note these timescales can be varied with agreement when taking account of the complexity of a scheme. Thus, as a robust approach, it is suggested that a minimum of 12 months is allowed for a S98 requisition process.

18. To commence a dialogue with AW prior to a planning consent, it is recommended that a pre-planning enquiry is submitted to the water authority. This process carries an initial AW application fee of circa £500.00 incl. VAT.

On-site Treatment of Foul Flows

19. Whilst there are two small package treatment plants associated with the 7 care cottages and 'Vineyard Gardens' dwelling conversions situated on land to the south of the application site, and that the approved 60 bed care home is initially proposing a treatment package to accommodate foul flows due to the distance of the existing public foul sewer network, it is suggested that the use of treatment plants for the application development being assessed by this report, would be considered to be somewhat of a piecemeal approach to a foul drainage strategy.

20. With the natural formation being suitable for infiltration SuDS and therefore the treated effluent from a treatment package discharging to ground, an Environment Agency (EA) permit will be required. An application for a permit will require supporting evidence that a connection to a foul sewer network is not feasible, which is to include an examination of the location of the nearest existing foul drainage network, and the feasibility of access, with the cost and / or the requirement for accessing third party land examined.

21. The permitted discharge from the development will also need to consider whether antibiotics and harsh chemicals e.g. bleach, are present. If these are likely to exist, it would not be acceptable to the EA to discharge such flows through a typical treatment package process. Therefore, the type of development discharge from end users would need to be explored further, as these substances may form part of

an end users discharge process, and thus to separate them from domestic flows may be problematic without an appropriate dual treatment process being promoted.

22. Currently, to obtain a discharge permit from the EA can take circa 12 months.

Conclusion

23. To conclude, to provide a joined up foul drainage strategy that serves all the development proposals, and taking in to account that timescales for obtaining an EA permit and a AW S98 requisition are comparable, with an end user or operator preferring a positive outfall connection to the public sewer network due to a reduced ongoing maintenance regime when compared to an on-site treatment process, a positive foul drainage outfall to the public sewer network should be the preferred solution.

24. Therefore, a S98 requisition of the Water Industry Act 1991 for the foul discharge from the development should be explored with the water authority. The requisition process will provide an adoptable public sewer outfall to the site boundary and determine available capacity within the existing public sewer network. In addition, it will determine if any upgrades to the network are required or if its more appropriate to limit the flow from the development with supporting attenuation and / or a pump station. Capacities will also be measured against phasing of the development and any upgrading that may be necessary to the existing treatment works.

25. Initially, it is therefore recommended that a pre-planning enquiry is submitted to the water authority. This process carries an initial fee in favour of Anglian Water at circa £500.00 incl. VAT.

APPENDIX A

Anglian Water Sewer Record Plans

Data updated: 31/10/23

Scale: 1:1250 | Date: 27/11/23 | Wastewater Plan A2

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PHARMACY 1500sqft
NEW CROSSING
BICYCLE ACCESS
6 X DISABLED PARKING BAYS
21 X STANDARD PARKING BAYS
18 X 7KW ELECTRIC EV CHARGING
10 X 15KW SUPER EV CHARGING
BRIXWORTH LOCAL SERVICES
23 X STANDARD PARKING BAYS
UNLOADING
2 x SMALL PROFESSIONAL OFFICE UNITS 750sqft
3 x SMALL PROFESSIONAL OFFICE UNITS 500sqft
2 x SMALL PROFESSIONAL OFFICE UNITS 750sqft
3 x SMALL PROFESSIONAL OFFICE UNITS 500sqft
PROFESSIONAL OFFICE UNIT 1500sqft
GYMNASIUM/ DANCE SCHOOL 3400sqft
SUDs
DISABLED X 15KW SUPER EV CHARGING
DRIVE THROUGH COFFEE FACILITY WITH HIGHSPEED HUB LARGE SCREEN MEETING ROOM 3850sqft
4 X DISABLED PARKING BAYS
5 X STANDARD PARKING BAYS
8 X STANDARD PARKING BAYS
16 X STANDARD PARKING BAYS
20 X 7KW ELECTRIC EV CHARGING
9 X 15KW SUPER EV CHARGING
SPA & WELLNESS CENTRE CENTRAL GARDENS

1 Site Plan (NORTH)
1 : 625

Revision	Description	Drawn	Date	Checked
1	Site plan updated following arboricultural survey	NS	19.12.2023	NS

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Client's Name: DR. DALLAS BURSTON

Job Title: BRIXWORTH

Drawing Title: PROPOSED SITE PLAN - (1 of 2) - NORTH

Scale: As indicated @A1

Job No: **2023028** Drawing No: **A101**

Status: Rev: **P1**

APPENDIX F

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 229 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	117.350	0.650	16.0	267.4	O K
30 min Summer	117.471	0.771	18.3	337.6	O K
60 min Summer	117.563	0.863	20.1	395.6	O K
120 min Summer	117.612	0.912	21.1	428.0	O K
180 min Summer	117.612	0.912	21.1	427.8	O K
240 min Summer	117.603	0.903	20.9	422.0	O K
360 min Summer	117.582	0.882	20.5	408.0	O K
480 min Summer	117.558	0.858	20.0	391.8	O K
600 min Summer	117.531	0.831	19.4	375.0	O K
720 min Summer	117.506	0.806	18.9	358.6	O K
960 min Summer	117.457	0.757	18.0	328.8	O K
1440 min Summer	117.373	0.673	16.4	280.4	O K
2160 min Summer	117.271	0.571	14.5	225.6	O K
2880 min Summer	117.189	0.489	13.1	184.8	O K
4320 min Summer	117.061	0.361	11.0	127.5	O K
5760 min Summer	116.967	0.267	9.5	89.5	O K
7200 min Summer	116.895	0.195	8.4	62.8	O K
8640 min Summer	116.840	0.140	7.6	43.6	O K
10080 min Summer	116.796	0.096	7.0	29.1	O K
15 min Winter	117.409	0.709	17.1	300.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	150.893	0.0	25
30 min Summer	97.274	0.0	39
60 min Summer	59.609	0.0	66
120 min Summer	35.275	0.0	122
180 min Summer	25.618	0.0	162
240 min Summer	20.305	0.0	192
360 min Summer	14.625	0.0	258
480 min Summer	11.580	0.0	326
600 min Summer	9.656	0.0	394
720 min Summer	8.320	0.0	464
960 min Summer	6.574	0.0	600
1440 min Summer	4.711	0.0	866
2160 min Summer	3.371	0.0	1252
2880 min Summer	2.656	0.0	1620
4320 min Summer	1.896	0.0	2344
5760 min Summer	1.492	0.0	3064
7200 min Summer	1.238	0.0	3816
8640 min Summer	1.063	0.0	4496
10080 min Summer	0.934	0.0	5240
15 min Winter	150.893	0.0	25

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	117.540	0.840	19.6	380.2	O K
60 min Winter	117.640	0.940	21.6	447.1	O K
120 min Winter	117.697	0.997	22.8	487.4	O K
180 min Winter	117.700	1.000	22.9	489.5	O K
240 min Winter	117.687	0.987	22.6	480.6	O K
360 min Winter	117.662	0.962	22.1	462.6	O K
480 min Winter	117.631	0.931	21.5	440.6	O K
600 min Winter	117.596	0.896	20.8	417.5	O K
720 min Winter	117.562	0.862	20.1	394.7	O K
960 min Winter	117.496	0.796	18.7	352.6	O K
1440 min Winter	117.383	0.683	16.6	285.5	O K
2160 min Winter	117.247	0.547	14.1	213.3	O K
2880 min Winter	117.140	0.440	12.3	162.2	O K
4320 min Winter	116.984	0.284	9.7	95.9	O K
5760 min Winter	116.874	0.174	8.1	55.5	O K
7200 min Winter	116.797	0.097	7.0	29.4	O K
8640 min Winter	116.750	0.050	6.3	14.7	O K
10080 min Winter	116.744	0.044	5.6	13.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	97.274	0.0	39
60 min Winter	59.609	0.0	66
120 min Winter	35.275	0.0	120
180 min Winter	25.618	0.0	174
240 min Winter	20.305	0.0	200
360 min Winter	14.625	0.0	274
480 min Winter	11.580	0.0	350
600 min Winter	9.656	0.0	426
720 min Winter	8.320	0.0	500
960 min Winter	6.574	0.0	642
1440 min Winter	4.711	0.0	916
2160 min Winter	3.371	0.0	1308
2880 min Winter	2.656	0.0	1684
4320 min Winter	1.896	0.0	2424
5760 min Winter	1.492	0.0	3128
7200 min Winter	1.238	0.0	3824
8640 min Winter	1.063	0.0	4384
10080 min Winter	0.934	0.0	5128

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	21.000	Shortest Storm (mins)	15
Ratio R	0.442	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.000

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.334	4	8	0.333	8	12	0.333

Model Details

Storage is Online Cover Level (m) 118.000

Infiltration Basin Structure

Invert Level (m) 116.700 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.14112 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.14112

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	287.7	0.700	572.8	1.400	955.1	2.100	1434.6
0.100	322.5	0.800	621.5	1.500	1017.7	2.200	1511.1
0.200	359.2	0.900	672.1	1.600	1082.2	2.300	1589.5
0.300	398.0	1.000	724.7	1.700	1148.7	2.400	1669.9
0.400	438.7	1.100	779.3	1.800	1217.2	2.500	1752.3
0.500	481.4	1.200	835.9	1.900	1287.7		
0.600	526.1	1.300	894.5	2.000	1360.2		

APPENDIX G

ARMSTRONG STOKES & CLAYTON LIMITED
Civil & Structural Engineering Consultants

Proposed Local Services
Northampton Road
Brixworth
Northamptonshire

SuDS Maintenance Statement

December 2023

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Tel: 01159 417 893

Registered in England No. 04960061

INFILTRATION SYSTEMS

This includes soakaways, infiltration trenches and basins. The method of maintenance for these structures is to be in accordance with the CIRIA C753 SuDS MANUAL, Chapter 13 highlighted on the following pages.

Some normally highly permeable soils and soft rocks (eg chalk) can have their permeability significantly reduced by “smearing” of the surface during excavation, especially by mechanical diggers. It is recommended that the exposed surface of the soil is manually cleaned of any smearing before the geotextile and granular fill surrounding any infiltration system are installed.

13.11.2 Infiltration basins

Where possible, construction of infiltration basins should take place after the site has been stabilised, in order to minimise the risk of premature system failure due to high sediment loadings in runoff from disturbed ground. If this is not possible, then initial excavation should be carried out to within 450 mm of the basin floor, and final excavation should be delayed until after site stabilisation. It is essential that infiltration basins should not be used to manage construction runoff and trap construction sediments.

Topsoil should not be laid in basins when the ground or the topsoil is saturated. This may be a constraint to the use of infiltration basins if the construction programme is particularly tight.

All excavation and levelling should be performed by equipment with tracks that exert very light pressures, to prevent compaction of the basin floor, which may reduce infiltration capacity. Before and after construction, other vehicular movements should be prevented.

The base of the basin should be carefully prepared to an even grade with no significant undulations. The surface soils within the basin should not be smeared or compacted during construction. After final grading, the basin floor should be tilled to a depth of 150 mm to provide a well-aerated, porous surface texture.

Backfilling against inlet and outlet structures needs to be controlled to minimise settlement and erosion. The topsoils used to finish the side slopes need to be suitably fertile, porous and of sufficient depth to ensure healthy vegetation growth.

Immediately following basin construction, the base and side slopes should be stabilised with a dense coverage of water-tolerant grass.

13.12 OPERATION AND MAINTENANCE REQUIREMENTS

Infiltration systems will require regular maintenance to ensure continuing operation to design performance standards, and all designers should provide detailed specifications and frequencies for the required maintenance activities along with likely machinery requirements and typical annual costs – within the Maintenance Plan. Different designs will have different operation and maintenance requirements, and this section gives some generic guidance for different system types.

13.12.1 Soakaways, trenches and blankets

The design of soakaways, infiltration trenches and blankets should include monitoring points where the water level in the system can be observed or measured. This can either be via an inspection well or inspection cover (where the attenuation storage space is a void). For larger installations the inspection access should provide a clear view of the infiltration surface (even if the storage zone is filled). For small, filled soakaways, a 50 mm perforated pipe is adequate.

The useful life and effective operation of an infiltration component is related to the frequency of maintenance and the risk of sediment being introduced into the system.

An easement should be considered where multiple properties discharge to a single soakaway, to ensure long-term access for maintenance purposes.

Table 13.1 provides guidance on the type of operational and maintenance requirements that may be appropriate for soakaways. The list of actions is not exhaustive and some actions may not always be required.

TABLE 13.1 Operation and maintenance requirements for soakaways

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

Maintenance will usually be carried out manually, although a suction tanker can be used for sediment/debris removal for large systems. If maintenance is not undertaken for long periods, deposits can become hard-packed and require considerable effort to remove.

Replacement of the aggregate or geocellular units will be necessary if the system becomes blocked with silt. Effective monitoring will give information on changes in infiltration rate and provide a warning of potential failure in the long term.

Roads and/or parking areas draining to infiltration components should be regularly swept to prevent silt being washed off the surface. This will minimise the need for maintenance.

Maintenance responsibility should be placed with an appropriate organisation, and maintenance schedules should be developed during the design phase.

▶ Generic health and safety guidance is presented in **Chapter 36**.

CDM 2015 requires designers to ensure that all maintenance risks have been identified and eliminated/reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

13.12.2 Infiltration basins

Regular inspection and maintenance is important for the effective operation of infiltration basins as designed. Maintenance responsibility for an infiltration basin and its surrounding area should be placed with a responsible organisation.

Regular mowing in and around infiltration basins is only required along maintenance access routes, amenity areas (eg footpaths), across embankments and across the main storage area. The remaining areas can be managed as “meadow” or other appropriate vegetation, unless additional management is required for landscaping purposes. Grass cutting may need to accommodate specific sward mixes and specialist seed or turf supplier recommendations. As described earlier in this chapter, deep-rooting vegetation can maintain infiltration rates and minimise the need for remedial maintenance. All vegetation management activities should take account of the need to maximise biosecurity and prevent the spread of invasive species.

Adequate access should be provided to the infiltration basin for inspection and maintenance, including for appropriate equipment and vehicles such as mowing equipment. **Table 13.2** provides guidance on the type of operational and maintenance requirements that may be appropriate for infiltration basins. The list of actions is not exhaustive and some actions may not always be required.

TABLE 13.2 Operation and maintenance requirements for infiltration basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter, debris and trash	Monthly
	Cut grass – for landscaped areas and access routes	Monthly (during growing season) or as required
	Cut grass – meadow grass in and around basin	Half yearly: spring (before nesting season) and autumn
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
Occasional maintenance	Reseed areas of poor vegetation growth	Annually, or as required
	Prune and trim trees and remove cuttings	As required
	Remove sediment from pre-treatment system when 50% full	As required
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realign the rip-rap	As required
	Repair or rehabilitate inlets, outlets and overflows	As required
	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates	As required
	Relevel uneven surfaces and reinstate design levels	As required
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and pre-treatment systems for silt accumulation; establish appropriate silt removal frequencies	Half yearly
	Inspect infiltration surfaces for compaction and ponding	Monthly

Accumulated sediments on the surface of infiltration systems have been shown not to pose a hazard to human health, where people are using the basin as an open space (Scott Wilson, 2010). However, Scott Wilson (2010) shows that the accumulated material exceeded the total organic carbon (TOC) criteria for hazardous waste, and the accumulated sediment would require waste pre-treatment to lower the organic content before off-site disposal (other contaminant levels were well below hazardous waste criteria). Composting or windrowing might achieve this. Excavated sediment from infiltration basins or pre-treatment component that receive runoff from residential or standard road and roof areas are generally not toxic and can therefore be safely disposed of by either land application or off-site disposal. However, consultation should take place with the environmental regulator to confirm appropriate protocols. Sediment testing may be required before sediment excavation, to determine its classification and appropriate disposal methods. For industrial site runoff, sediment testing will be essential. In the majority of cases, it will be acceptable to distribute the sediment on site if there is an appropriate safe and acceptable location to do so.

▶ Further information on waste management is provided in **Chapter 33**.

Maintenance Plans and schedules should be developed before maintenance contracts are commissioned. Specific maintenance needs of the basin should be monitored, and maintenance schedules adjusted to suit requirements.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

▶ Generic health and safety guidance is presented in **Chapter 36**.

Provided preventive maintenance measures are conscientiously undertaken, the need for corrective maintenance should rarely arise.

▶ Additional detail on the preparation of maintenance specifications and schedules of work is given in **Chapter 32**.

13.13 REFERENCES

BRE (1991) *Soakaway design,* BRE Digest 365, Building Research Establishment, Bracknell, UK (ISBN: 0-85125-502-7)

EMERSON, C H and TRAVER, R G (2008) "Multi-year and seasonal variation of infiltration from stormwater best management practices" *Journal of irrigation and drainage engineering,* vol 134, special issue *Urban Storm-Water Management*, American Society of Civil Engineers, Reston, VA, USA, pp 598–605

SCOTT WILSON (2010) *Fate of highway contaminants in the unsaturated zone, final synthesis report*, Highways Consultancy Group, Highways Agency, London, UK (unpublished)

SIRIWARDENE, N R, DELETIC, A and FLETCHER, T D (2007) "Clogging of stormwater gravel infiltration systems and filters: Insights from a laboratory study" *Water Research,* vol 41, 7, National Center for Biotechnology Information, US National Library of Medicine, MD, USA, pp1433–1440

Statutes

BS 7533-13:2009 *Pavement constructed with clay, natural stone or concrete pavers. Guide for the design of permeable pavements constructed with concrete paving blocks and flags, natural stone slabs and setts and clay pavers*

Construction (Design and Management) Regulations 2015

PERMEABLE PAVING

The method of maintenance for this structure is to be in accordance with the CIRIA C753 SuDS MANUAL, Chapter 20 highlighted on the following pages.

20.14 OPERATION AND MAINTENANCE REQUIREMENTS

Regular inspection and maintenance is important for the effective operation of pervious pavements. Maintenance responsibility for a pervious pavement and its surrounding area should be placed with an appropriate responsible organisation. Before handing over the pavement to the client, it should be inspected for clogging, litter, weeds and water ponding, and all failures should be rectified. After handover, the pavement should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Pervious pavements need to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. Extensive experience suggests that sweeping once per year should be sufficient to maintain an acceptable infiltration rate on most sites. However, in some instances, more or less sweeping may be required and the frequency should be adjusted to suit site-specific circumstances and should be informed by inspection reports.

A brush and suction cleaner (which can be a lorry-mounted device or a smaller precinct sweeper) should be used for regular sweeping. Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material. Any lost material should be replaced. It is also possible to clean the surface using lightweight rotating brush cleaners combined with power spraying using hot water, as shown in Figure 20.30. This is done every two years at the site shown.

If the surface has clogged then a more specialist sweeper with water jetting and oscillating and rotating brushes may be required, especially for porous asphalt surfaces, to restore the surface infiltration rate to an acceptable level. The specialist equipment should be adjusted so that it does not strip binder from the aggregate in the asphalt.

Figure 20.30 Deep cleaning a supermarket car park, Dundee (courtesy Abertay University)

The likely design life of grass reinforcement will be dictated by trafficking and is likely to be about 20 years if designed correctly. For concrete block permeable paving the design life should be no different from standard paving, assuming that an effective maintenance regime is in place to minimise risks of infiltration clogging. Porous asphalt will lose strength and begin to fatigue due to oxidation of the binder. This is likely to occur slightly faster in porous asphalt than normal asphalt, so the design life will be reduced slightly. Porous concrete should have a similar design life to a normal concrete slab.

The reconstruction of failed areas of concrete block pavement should be less costly and disruptive than the rehabilitation of continuous concrete or asphalt porous surfaces due to the reduced area that is likely to be affected. Materials removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and may need to be disposed of as controlled waste. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

▶ Guidance on waste management is provided in Chapter 33.

Table 20.15 provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive and some actions may not always be required.

Maintenance Plans and schedules should be prepared during the design phase. Specific maintenance needs of the pervious pavement should be monitored, and maintenance schedules adjusted to suit requirements.

▶ Further detail on the preparation of maintenance specifications and schedules of work is given in Chapter 32.

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Many of the specific maintenance activities for pervious pavements can be undertaken as part of a general site cleaning contract (many car parks or roads are swept to remove litter and for visual reasons to keep them tidy) and therefore, if litter management is already required at site, this should have marginal cost implications.

Generally, pervious pavements require less frequent gritting in winter to prevent ice formation. There is also less risk of ice formation after snow melt, as the melt water drains directly into the underlying sub-base and does not have chance to refreeze. A slight frost may occur more frequently on the surface of pervious pavements compared to adjacent impermeable surfaces, but this is only likely to last for a few hours. It does not happen in all installations and, if necessary, this can be dealt with by application of salt. It is not likely to pose a hazard to vehicle movements.

▶ Generic health and safety guidance is presented in Chapter 36.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

OPERATION AND MAINTENANCE

This includes for general maintenance of SuDS structures. The method of maintenance for these structures is to be in accordance with the CIRIA C753 SuDS MANUAL, Chapter 32 highlighted on the following pages.

Chapter 32

Operation and maintenance

This chapter discusses general good practice for operation and maintenance activities, and the types of documents that can be developed to define the requirements at a particular site.

- *Specific maintenance requirements for each type of SuDS component are listed in detail towards the end of each of the SuDS component chapters (Chapters 11–23).*
- *Chapter 29 provides further detail on landscape design (including planting) for ease of maintenance.*
- *Chapter 33 provides guidance on waste management, including waste resulting from maintenance.*

32.1 INTRODUCTION

Many SuDS components are visible on the surface, form part of the overall site landscape and include a range of habitats. Depending on the design, maintenance regimes need to take account of the wider landscape context of amenity and biodiversity, as well as drainage requirements. The maintenance activities required to deliver the desired amenity, for example, may exceed those required to deliver the designed water quantity and water quality performance. In such cases, this needs to be recognised by those responsible for delivering and maintaining that functionality. Where SuDS components are hard surfaces or below ground, the maintenance will generally be based on engineering requirements.

For the purpose of this manual, maintenance refers to:

- inspections required to identify performance issues and plan appropriate maintenance needs
- operation and maintenance of the drainage system
- landscape management
- waste management associated with contaminated silt and other waste materials resulting from maintenance.

All maintenance will need to take the protection of habitats and associated ecology into account (Chapter 6). Maintenance regimes should be regularly assessed (eg once per year) to make sure that the approach is still meeting the drainage, landscape and any other objectives. This may result in changes to the maintenance of a feature or area. For example, more frequent vegetation management may be identified where vegetation growth is obstructing highway sight lines.

The function of the surface water management system should be understood by those responsible for maintenance, regardless of whether individual components are below ground or on the surface. When problems occur in vegetated components on the surface, they may be obvious and can be remedied using standard landscape or engineering practices. However, this is not always the case – particularly with more complex systems such as bioretention systems and pervious surfaces. If any system (whether above or below ground) is properly designed, monitored and maintained, performance deterioration can usually be minimised.

Ease of maintenance and access is therefore a necessary and important consideration of SuDS design (not least as part of CDM requirements to ensure that maintenance can be undertaken safely). Sufficient thought should be given to the likely required maintenance over the design life of the SuDS and its funding during the feasibility and planning stages of a scheme (**Chapter 35**). In particular, the following requirements should be given full consideration:

- maintenance access – ensuring appropriate and permanent access to all points in the system where future maintenance may be required
- forebays and/or appropriate pre-treatment systems to help trap sediment
- appropriate provision for temporary drainage, if required, during sediment management or other maintenance activities
- the availability of storage and disposal areas for green waste, such as grass cuttings and organic sediments.

Appropriate legal agreements between adoption and maintenance organisations that define maintenance responsibilities are presented in Shaffer *et al* (2004). Maintenance Plans will often be required as a condition of planning for the site. For example, many buildings are required to achieve a high BREEAM rating and a landscape management plan (LMP) is a mandatory requirement to achieve this. Planning authorities will include this in a planning condition.

The LMP can also form a useful tool for public or client engagement with SuDS and help them to understand the wider benefits of the system. They can include the provision for ecological re-survey, tree inspection and works and information about how the system delivers multiple benefits.

32.2 OPERATION AND MAINTENANCE MANUAL

Those responsible for SuDS within a development (owner, tenant, local authority, water company etc) should ideally be provided with an operation and maintenance manual by the designer. This could be part of the documentation provided under CDM (part of the health and safety file).

If the user of the system is not responsible for maintenance, then it is important to ensure that they know when the SuDS is not functioning correctly and who to contact if an issue arises, such as a blockage at a SuDS pond seen by a householder on a housing estate or a tenant on an industrial estate.

The operation and maintenance manual should be succinct and easy to use and should include the following:

- location of all SuDS components on the site
- brief summary of the design intent, how the SuDS components work, their purpose and potential performance risks
- depth of silt that will trigger requirement for removal
- visual indicators that will trigger maintenance
- depth of oil in separators etc that will trigger removal
- maintenance requirements (ie the Maintenance Plan) and a maintenance record pro forma
- explanation of the objectives of the maintenance proposed and potential implications of not meeting those objectives (it may be useful to split this into planted and hard elements, for clarity)
- identification of areas where certain activities are prohibited (eg stockpiling materials on pervious surfaces)
- an action plan for dealing with accidental spillages of pollutants

- advice on what to do if alterations are to be made to a development or if service companies need to undertake excavations or other similar works that could affect the SuDS
- details of whom to contact in the event that pollution is seen in the system or if it is not working correctly.

The operation and maintenance manual should also include brief details of the design concepts and performance criteria for the scheme and how the owner or operator should ensure that any works undertaken on a development do not compromise this. For example, householders should be made aware that surface water drainage is connected to soakaways, and be given full details and maintenance obligations for any rainwater harvesting systems in the property. This education is part of the wider community engagement process that is vital to the successful uptake of SuDS (**Chapter 34**). The operation and maintenance manual may also include the LMP.

It is important on industrial estates to clearly identify to everyone which areas drain to SuDS and which to foul sewer. For example, gullies and manhole covers could be colour coded or marked. Owner and tenants should be made aware of what is allowed to drain to the SuDS. Similarly, it is a good idea to use interpretation boards, for example at a pond on a housing estate, to increase householders' awareness of the purpose and benefits of the SuDS and to encourage them not to put polluting substances down the surface water drainage system (**Chapter 27**).

32.3 LEVEL OF OPERATION AND MAINTENANCE

There are many factors that will influence the type and frequency of maintenance required for a SuDS component or scheme at any particular site, including:

- the type of SuDS components
- the size of the contributing catchment in relation to the area of the SuDS components (this will affect the likely sediment loading rates and potential for erosion etc)
- the land use associated with the contributing catchment (this will affect the likely build-up of contamination)
- the level of continuing construction within the contributing catchment
- the SuDS planting scheme
- the habitat types that have been created as part of the scheme and how they are anticipated to evolve into a mature landscape
- the amenity and visual requirements of the area.

The demands on the SuDS component or scheme to perform a particular aesthetic function may be a key driver, with high frequencies of grass cutting and/or other vegetation management often being required for appearance and amenity value rather than for functional reasons. Specific habitats may dictate the time of year that is suitable for particular activities to be undertaken (eg reed cutting), and/or the extent of the system that should be subject to certain activities at any one time (eg sediment removal). Plants and trees tend to require different periodic management techniques as they mature. This is particularly relevant to coppice areas and woodland, or indeed shrub and herbaceous planting, some of which may require renewal after 10 years or so, depending on the planting and its purpose.

The maintenance regime of a site also needs to consider the response to extreme pollution events. A response action plan should be developed and communicated to all those involved in the operation of a site, so that if a spillage occurs it can be prevented from causing pollution to receiving waters.

It is recommended that SuDS are not handed over to those responsible for maintenance until upstream construction has ceased, the contributing catchment has stabilised, and any necessary rehabilitation of downstream components has been undertaken by the developer/contractor. However, if maintenance agreements have to be put in place in advance of this time, and the level of construction activity in the

contributing catchment is still high, maintenance specifications should be prepared that take account of high sediment accumulation rates and the increased risks of potential spillages.

32.4 OPERATION AND MAINTENANCE ACTIVITY CATEGORIES

Maintenance activities can be broadly defined as:

1 regular maintenance (including inspections) – Section 32.6
2 occasional maintenance – Section 32.7
3 remedial maintenance – Section 32.8.

There may also be initial one-off requirements sometimes referred to as "establishment maintenance", particularly for planting (eg weeding and watering). Regular maintenance consists of basic tasks carried out to a frequent and predictable schedule, including inspections/monitoring, silt or oil removal if required more frequently than once per year, vegetation management, sweeping of surfaces and litter and debris removal.

Occasional maintenance comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the regular tasks (eg sediment removal or filter replacement). Table 32.1 summarises the likely maintenance activities required for each SuDS component, and guidance on specific maintenance activities is given in the following sections.

Remedial maintenance describes the intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by good design, construction and regular maintenance activities. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and so timings are difficult to predict. Remedial maintenance can comprise activities such as:

- inlet and outlet repairs
- erosion repairs
- reinstatement or realignment of edgings, barriers, rip-rap or other erosion control
- infiltration surface rehabilitation
- replacement of blocked filter materials/fabrics
- construction stage sediment removal (although this activity should have been undertaken before the start of the maintenance contract)
- system rehabilitation immediately following a pollution event.

It is important to note that these remedial activities will not be required for all systems, but for the purpose of estimating whole life maintenance costs, a contingency sum of 15–20% should be added to the annual regular and occasional maintenance costs to cover the risk of these activities being required.

TABLE 32.1 Typical key SuDS components operation and maintenance activities (for full specifications, see Chapters 11–23)

Operation and maintenance activity	SuDS component												
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter drain	Modular storage	Pervious pavement	Swale/bioretention/ trees	Filter strip	Green roofs	Proprietary treatment systems
Regular maintenance													
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter and debris removal	■	■	■	■	□	■	■	□	■	■	■		□
Grass cutting	■	■	■	■	□	■	■	□	□	■	■		
Weed and invasive plant control	□	□	□	□		□	□		□		□	■	
Shrub management (including pruning)	□	□	□	□					□	□	□		
Shoreline vegetation management	■	■	□										
Aquatic vegetation management	■	■	□										
Occasional maintenance													
Sediment management[1]	■	■	■	■	■	■	■	■	■	■	■		■
Vegetation replacement	□	□	□	□						□	□	■	
Vacuum sweeping and brushing									■				
Remedial maintenance													
Structure rehabilitation /repair	□	□	□	□	□	□	□	□	□	□	□	□	
Infiltration surface reconditioning				□	□	□	□		□	□	□		

Key

■ will be required

□ may be required

Notes

1 Sediment should be collected and managed in pre-treatment systems, upstream of the main device.

32.5 HEALTH AND SAFETY

To comply with the Construction (Design and Management) Regulations (CDM) 2015, designers must assess all foreseeable risks during construction and maintenance and the design must minimise them by the following (in order of preference):

- avoid
- reduce
- identify and mitigate residual risks.

Designers must also make contractors and others aware of risks, in the health and safety file, which is a record of the key health and safety risks that will need to be managed during future maintenance work. For example, the file for a SuDS pond should contain information on the collection of hazardous compounds in the sediment, so that maintenance contractors are aware of it and can take appropriate

precautions. During construction, the residual risks must be identified and an action plan developed to deal with them safely (the health and safety plan and site rules).

All those responsible for maintenance should take appropriate health and safety precautions for all activities (including lone working, if relevant), and risk assessments should always be undertaken. Guidance on generic health and safety principles is provided in **Chapter 36**.

32.6 REGULAR MAINTENANCE

32.6.1 Inspections and reporting

An initial pre-handover inspection of the scheme is required, to ensure that it has been constructed as designed (**Chapter 31**).

Regular inspections of SuDS will then:

1 help determine optimum future maintenance activities

2 help establish ongoing hydraulic, water quality, amenity and biodiversity performance of the system

3 allow identification of potential performance failures, such as blockage, reduced infiltration and poor water quality resulting from lack of maintenance.

Maintenance of SuDS is carried out by a range of people, which can include school caretakers, highway authorities, facilities management companies and landscape contractors. Pervious surfaces and proprietary systems will most likely be managed by people familiar with highway or drainage maintenance. Landscaped systems will be managed by the landscape contractor, although connecting pipework may be managed by others.

Where the maintenance of a system is carried out by those responsible for the wider landscaped area, the inspections can generally be undertaken during routine site visits (eg for grass cutting, leaf collection and/or litter collection) for little extra cost, although there may need to be dedicated visits during some winter months.

The staff doing the landscape maintenance should have appropriate experience of SuDS maintenance and should be capable of keeping sufficiently detailed records of any inspections. If staff do not have appropriate experience, then specific inspection visits will be necessary.

Those with overall responsibility for the drainage system may not be responsible for maintenance of the wider landscape and in those circumstances specific inspection visits may also be required at a suitable interval.

Specific visits will also be required if the system includes proprietary treatment systems (**Chapter 14**).

Whichever arrangements are made, the inspections should be recorded, and the records saved for future reference (**Section 32.10 and Appendix B**).

During the first year of operation of all types of SuDS, inspections should usually be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.

Typical routine inspection questions that will indicate when occasional or remedial maintenance activities are required for any type of system include:

- Are inlets or outlets blocked?
- Does any part of the system appear to be leaking (especially ponds and wetlands)?
- Is the vegetation healthy?

- Is there evidence of poor water quality (eg algae, oils, milky froth, odour, unusual colourings)?
- Is there evidence of sediment build-up beyond the designer's stated limits?
- Is there visual evidence of oil accumulation?
- Is there evidence of ponding above an infiltration surface?
- Is there any evidence of structural damage that requires repair?
- Are there areas of erosion or channelling over vegetated surfaces?
- Is there any visual evidence of regular or unplanned over-topping of banks?

For large sites, it is recommended that an annual maintenance report and record should be prepared by the maintenance contractor, which should be retained with the operation and maintenance manual (Section 32.2). The report should provide the following information:

- observations resulting from inspections
- measured sediment depths (where appropriate)
- monitoring results, if flow or water quality monitoring is undertaken
- confirmation that any penstocks or valves are free and working correctly
- maintenance and operation activities undertaken during the year
- recommendations for inspection and maintenance programme for the following year.

As with any paved area, safety inspections of pervious surfaces will be necessary for tripping hazards. If pervious surfaces are to be used in a shopping centre car park or high footfall area, these should be inspected monthly as a minimum, and repairs made as necessary through the lifetime of the surface. This would apply to any type of surface. Guidance is provided by the Road Liaison Group (2005).

32.6.2 Litter and debris removal

Litter and debris removal is an integral part of SuDS maintenance for surface features, in order to reduce the risks of inlet and outlet blockages, to retain amenity value and to minimise pollution risks. High litter removal frequencies may be required where aesthetics are a major driver, for example on residential sites or at high profile commercial or retail parks. Litter removal is less of an issue for engineered or underground systems, such as pervious surfaces, filter drains and proprietary systems and will normally form part of routine open space maintenance.

32.6.3 Grass cutting

It is recommended that the grass cutting regime around SuDS components is carefully specified to maximise the performance of the SuDS and meet visual requirements. In general, allowing grass to grow tends to enhance water quality performance. Short grass around a wet system, such as a pond or wetland, provides an ideal habitat for nuisance wildlife species such as geese, but allowing the grass to grow is an effective means of discouraging them. Grass around wet pond or wetland systems should not be cut to the edge of the permanent water in order to deter large birds and to reduce the risks of nutrients associated with grass cuttings falling into the water.

Figure 32.1 Grass cuttings

Grass cutting is an activity primarily undertaken to enhance the perceived aesthetics of the

facility. The frequency of cutting will tend to depend on surrounding land uses, and public requirements. Grass cutting should be done as infrequently as possible, recognising the aesthetic preferences of local residents and other landscape management activities required at the site. Visibility around highways also needs to be considered. Grass around inlet and outlet infrastructure should be strimmed closely to reduce risks to system performance. If a manicured, parkland effect is required, then cutting will need to be undertaken more regularly than for meadow type grass areas, the latter aiming to maximise habitat and biodiversity potential. The impact of grass cutting on soil compaction should also be considered. The landscape management plan will usually identify the mowing regimes required in different areas or zones.

Guidance on designing a site to ease maintenance, such as limiting the slope of grassed areas, is provided in **Chapter 29**.

In the past there have been recommendations that keeping grass short in filter strips and swales prevents the grass lodging over (ie being pushed over and flattened by the flow of water) and improves pollution removal. However, the risk of pollution removal being compromised is now considered to be minimal and there is no reason for a blanket requirement to keep grass short in all swales and filter strips.

32.6.4 Weed and invasive plant control

Weeds are generally defined as vegetation types that are unwanted in a particular area. For SuDS, weeds can include:

- alien or invasive species (ie plants that are particularly aggressive, non-native species), the spread of which is generally undesirable
- plants that negatively affect the technical performance or amenity/biodiversity value of the system.

In some places, weeding has to be done by hand to prevent the destruction of surrounding vegetation (hand weeding should generally only be required during the first year, during plant establishment). However, mowing can be an effective weed management measure for grassed areas. Where the use of herbicides and pesticides is permitted (**Chapter 29**), this should be limited, where possible, to the establishment period, as the benefits of rapid sward/plant cover development are likely to outweigh any potential resulting water quality deterioration. The use of fertilisers should also be limited or prohibited, to minimise nutrient loadings, which are damaging to water bodies.

Specific advice on weed control for green roofs, filter drains and pervious pavements is provided in **Chapters 12, 16 and 20** respectively.

32.6.5 Shrub management

Shrubs may be densely planted and may mature very rapidly over the first year. They are likely to require weeding at the base, especially during the first year or two, to ensure that they get enough water, and mulching to retain water in the soils where possible. Bark mulch around shrubs should not be used, as it floats and clogs outlets. Pruning shrubs can result in a denser structure and better lateral growth, which may be desirable in SuDS.

32.6.6 Aquatic and shoreline vegetation management

Aquatic plant aftercare in the first 1–3 years may be required to ensure establishment of planted vegetation and to control nuisance weeds and invasive plants. Once it is established, the build-up of dead vegetation from previous seasons should be removed at convenient intervals (eg every 3 years and at the end of landscape contract periods) in order to reduce organic silt accumulation. Emergent vegetation may need to be harvested every 2–10 years in order to maintain flood attenuation volumes, optimise water quality treatment potential and ensure fresh growth. Where the density of vegetation is high, annual removal may be required. Care should be taken to avoid disturbance to nesting birds during the breeding season and habitats of target species (eg great crested newt and water voles) at critical times. The window for carrying out maintenance to achieve this is towards the end of the growing season (typically September and October, but this will vary with species). As vegetation matures, plant height may need

to be reviewed with respect to any health and safety framework or strategy such as if it blocks necessary sightlines to an open water feature.

Where emergent vegetation is managed, up to 25% can be removed by cutting at 100 mm above soil level using shearing action machinery. Up to 25% of submerged vegetation can be cut and raked out at any one time, using approved rakes, grabs or other techniques, depending on whether clay or waterproof membranes are present. Aquatic vegetation arisings should be stacked close to the water's edge for 48 hours to de-water it and allow wildlife to return to the SuDS feature. They should then be removed to wildlife piles, compost heaps or off site before decomposition, rotting or damage to existing vegetation can occur.

Algae removal may be undertaken for aesthetic purposes during the first 3–5 years of a pond/wetland's life. The growth of algae, which is considered by some to be visually intrusive, is encouraged by nutrients introduced into the water body. This situation should settle down once upstream construction activities are complete.

32.6.7 Sweeping pervious surfaces

Pervious surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. Typically this will be required no more than once per year and often less, where inspections indicate that it is not required. Refer to Chapter 20 for details of this process.

32.6.8 Oil removal and cleaning or replacing filters in proprietary systems

Oil removal from proprietary treatment systems should be undertaken at intervals recommended by the manufacturer. This will depend on the catchment characteristics. On small sites with a low pollution hazard, small amounts of oil may be removed by skimming, using small van-mounted equipment. This is relatively inexpensive. Those serving larger, more heavily polluted catchments may require tankers to remove the accumulated oil.

Where proprietary systems use filters, they should be replaced or cleaned at the intervals recommended by the manufacturer. For example, the coalescing filters in an oil separator can require cleaning every 6 months if the runoff from the catchment has a high oil load (eg from a heavily used road).

32.7 OCCASIONAL MAINTENANCE

32.7.1 Sediment removal

To ensure the long-term performance of SuDS, the sediment that accumulates in treatment components should be removed periodically (whether landscaped or proprietary systems). The required frequency of sediment removal is dependent on many factors including:

- design of upstream drainage system
- type of system
- design silt storage volume
- size of upstream catchment in relation to surface area of SuDS component
- characteristics of upstream catchment area (eg land use, level of imperviousness, upstream construction activities, erosion control management and effectiveness of upstream pre-treatment).

Figure 32.2 De-silting (courtesy Bedford Group of Drainage Boards)

Sediment accumulation will typically be rapid for the entire construction period (including during the period of building, turfing and landscaping of all upstream development plots). Once a catchment is completely developed and all vegetation is well-established, sediment mobility (erosion) and accumulation is likely to drop significantly.

Detailed information on waste management (in particular with respect to sediment removal) is provided in **Chapter 33**.

For most small features, sediment can be removed either by hand or using small excavators. For any system that has a waterproof liner, the method of sediment removal should be chosen so there is minimal risk of damaging the liner.

For proprietary treatment systems, a suction tanker will be needed to remove the sediment. The size of tanker will depend on the scale of the proprietary system and its location. For small catchments using treatment channels, silt accumulation in the channel can often be removed with hand tools or a small suction tanker.

General sediment removal considerations

Sediment removal from SuDS systems should always be carried out such that no damage is caused to the SuDS, and impacts on ecological systems and aesthetic appearance are minimised. The appropriate method of sediment removal at a particular site will depend on the size of the SuDS component, the access, whether the sediments are submerged or lying on dry ground, the sediment properties, the design characteristics of the SuDS component, visual requirements and wildlife concerns and sediment depths.

For small source-control SuDS components where sediment volumes are likely to be small, it is usually appropriate to remove sediment using hand tools and appropriate protective equipment. Where components and associated sediment volumes are larger, or where the sediment has accumulated in a permanent water body, then mechanical equipment may be required.

In particular, it is recommended to do the following:

1 Establish how the structure is lined and avoid damage to clay puddle layers or waterproof membranes.

2 Undertake work between September and March to minimise impacts on receiving water bodies (high suspended solids can cause reduced dissolved oxygen levels, which causes particular problems during elevated summer temperatures). Where required, works may be restricted to September and October, in order to protect breeding or hibernating wildlife.

3 Where machinery or pumping is to be used, agree the sediment removal and management plan in advance with the environmental regulator.

4 Where machinery is used to excavate sediment, undertake the operation in dry weather when the surrounding ground is firm, and ideally operate from a hard surface.

5 Use machinery with an extending arm to avoid contact with edges, banks and other features within a minimum distance of 1 m from the edge. Use a bucket without teeth to avoid puncturing clay layers or waterproof membranes.

6 Secure consent for any de-watering operations with the environmental regulator, if required.

Specific requirements of different SuDS components are presented in subsequent sections. Individual SuDS component chapters should be referenced for further details.

Sediment removal from retention ponds

Ponds and wetlands may eventually accumulate sufficient sediment to impact on the storage capacity of the permanent pool. This loss of capacity can affect both the appearance and the pollution removal efficiency of the pond. The rate at which this occurs will depend on allowances made during storage

capacity design. The loss in storage will occur more rapidly if the pond receives additional sediment input during the construction phase. The accumulation of sediment should be monitored and where it is significant and/or if the quality in the pond begins to deteriorate, sediment characterisation should be undertaken to establish the need and options for its removal.

Figure 32.3 Floating excavator working in small pond (courtesy Land & Water)

The following issues should be considered:

1 Regular partial sediment removal is most effective, but may not be economic. However, where possible, sediment should not be removed from more than 50% of the pond or wetland area at any one time.
2 Appropriate bankside working areas should be selected, and wetland and bankside habitats protected.
3 Sufficient vegetation should be retained to ensure rapid re-colonisation of damaged areas.
4 Ideally, sediment removal should remove only accumulated inorganic and organic sediment, but not wetland subsoil or topsoil layers. In practice, this can be difficult to achieve.

Specialist contractors should generally undertake sediment removal from ponds or wetlands. The types of machines capable of removing sediment from a pond will vary. It may be possible to drain the pond and employ a mini excavator or excavator with swamp tracks to excavate sediments from within the feature, or else an excavator may have to be deployed from the bank. Standard hydraulic excavators have limited reach, but are normally sufficient to deal with removal from small features within sites. For large ponds, a long-reach excavator may be required that can reach up to 25 m.

A further option that may occasionally be necessary is to use machinery on floating pontoons and/or barges. **Figure 32.2** shows a floating excavator working in water.

For safety reasons excavators cannot operate close to overhead power lines and they need a clear area to swing their bucket and dump spoil. This should be taken into account when assessing the access required for maintenance (eg if a pond is surrounded by trees or buildings).

If de-watering of ponds in advance of sediment extraction is feasible at a site, and assuming that the water body can be left drained for a reasonable period of time (ie a few weeks), then this can considerably reduce the volume of material to be extracted and that will require disposal, and will often allow some biodegradation of organic material.

De-watering can be undertaken by:

1 draining down the pond using the penstock or outlet valve (if included within the design)
2 pumping out the pond.

Both options require consideration of the environmental impact of the de-watering, especially with respect to downstream receiving waters, which could be a sewer, watercourse or other water body. In some cases, water pumped from ponds or settlement channels has to be tankered off site. Discharge to a watercourse or body is likely to require discharge consent from the environmental regulator. Consent from the sewerage undertaker will be required if the discharge is to a sewer, and large-scale de-watering may also require planning permission. Testing of the system water quality (for COD, BOD, suspended solids and metals – in consultation with the environmental regulator) may be required to demonstrate the likely risks to the local environment and this can be undertaken together with the sediment sampling.

The water may contain high concentrations of suspended solids that are either already in suspension or become entrained as a result of the pumping process. Adequate sediment control should therefore be provided before the pumped water is discharged. Once the pumped water is running clear then the sediment control devices may be bypassed as long as sediment is not reintroduced into the system. Appropriate sediment control systems include:

- temporary traps formed by constructing an earth embankment with a gravel filled outlet across a swale
- sediment basins (this can include the use of floodable fields)
- sumps (either constructed or mobile proprietary units)
- geotextile filters.

A dump truck with a watertight tailgate is likely to be required to remove the sediment from the site.

Sediment removal from detention basins

Dry basins accumulate sediment with time that will gradually reduce the storage capacity available and can in some cases also reduce sediment trapping efficiency. Also, sediment may tend to accumulate around the control device, which increases the risk that either the orifice may become clogged or that sediment may become re-entrained into the outflow. Where basins are amenity features, sediment accumulation is likely to be unsightly and reduce the amenity value of the component. Sediment accumulation should be monitored as part of the inspection regime for the surface water management system and appropriate frequencies determined for removal and disposal. Small volumes of sediment can usually be removed by landscape contractors using hand tools. Sediment excavation using front-end loaders or backhoes is simple, if appropriate access is available for the equipment. Sediment removal will usually damage the vegetation, and re-establishment may be required.

Sediment removal from filter strips and swales

Sediment accumulation should be monitored as part of the inspection regime for the surface water management system and appropriate frequencies determined for removal and disposal. Filter strips and swales will only accumulate very small volumes of sediment which can be removed by landscape contractors using hand tools at appropriate frequencies depending on the impact of the accumulation on the performance of the component in terms of hydraulics (eg sheet flow characteristics), water quality (eg vegetation cover) and amenity (eg visual).

Sediment removal from infiltration basins

Infiltration basins should always have source control, a pre-treatment or other sediment trapping system upstream. Even with low sediment loads, the system performance can still become significantly impaired in a relatively short space of time. The sediment deposits reduce the storage capacity and may also clog the surface soils. Dense vegetation can minimise the risk of surface clogging (**Chapter 13, Section 13.12**).

Methods of removing sediment from infiltration basins are different from detention basins. Removal should not start until the basin has dried out, at which point the top layer should then be removed using lightweight equipment, with care being taken not to unduly compact the basin surface. The remaining soil can then be scarified or tilled to restore the surface infiltration capacity (see **Chapter 13** for detail of these methods). Vegetated areas disturbed during sediment removal should be replanted or re-sown immediately to reduce the risk of erosion. Suitable erosion control should also be provided.

Sediment removal from proprietary systems

Proprietary systems should be cleaned out regularly to prevent re-entry of any residuals or pollutants into the downstream system. The frequency will depend on the site-specific pollutant load, but most suppliers/ manufacturers recommend that cleaning operations should take place every 6 months. They can be cleaned by vacuum pumping which transfers a slurry of water and sediment to a tanker, or by adding chemicals to help solidify the residuals, which can then be removed using appropriate methods.

Maintenance of pervious pavement systems involves removing sediment from the pavement surface using vacuum sweeping. It is recommended that the pavement be vacuum swept once a year, and the collected sediments will require appropriate handling and disposal.

Sediment removal from filter drains

Filter drains will require occasional removal of the gravel infill which can be either cleaned and reused, or new material used as a replacement. The geotextile surrounds to the trench and to pipes may also require replacement at this time.

Small lengths would probably be cleaned using a small excavator to remove the material and replace it with clean. There are specialist companies that can clean long lengths of linear filter drain (eg alongside roads) using specialist machinery. The machinery can easily deal with single size material of 40 mm and Type B filter material (Chapter 30). It may require adapting, or the settings changed to deal with other infill materials. The machinery lifts the filter material from the trench, segregates and cleans it and then returns it to the trench. Typically the machines will clean the gravel to depths of 300 mm or exceptionally 600 mm.

Disposal of silt and debris that is removed is achieved via a belt which can discharge to a truck running alongside, or it can be deposited well back on the verge if permitted. The amount of spoil is usually in the order of 5–10 tonnes for every 100 m of drain cleaned to 300 mm depth.

32.7.2 Vegetation and plant replacement

Some replacement of plants may be required in the first 12 months after installation (ie the defects liability/rectification period), possibly after storm events. Dead or damaged plants should be removed and replaced, to restore the prescribed number of living plants per m^2. The responsibility for doing this should be made clear in the construction contract.

Inspection programmes should identify areas of filtration, or infiltration surfaces where vegetation growth is poor and likely to cause a reduced level of system performance. Such areas can then be rehabilitated, and plant growth repaired.

32.8 REMEDIAL MAINTENANCE

32.8.1 Structure rehabilitation and repair

The need for component rehabilitation (eg to remove clogged filters, geotextiles and gravels) will typically be 10–25 years, depending on the component design and factors such as the type of catchment and sediment load. The SuDS design should allow for vehicle access to undertake this work and consider how to implement such overhauls without causing major disruption to the functionality of the drainage system. For example, if geotextiles are used at a high level within a pervious surface, then reconstruction of the surface and bedding layer is all that is required if they become clogged, rather than reconstruction of the whole pavement depth.

Some form of rehabilitation is likely to be required at some point where component functionality relies on filtration through soils or aggregates. However, for many SuDS components, routine maintenance is sufficient.

Rehabilitation activities for each SuDS component are described in the individual component chapters. The requirements should be identified in the operation and maintenance manual.

32.8.2 Infiltration surface rehabilitation

Inspections should look for signs of infiltration surfaces becoming clogged, such as if water is standing for long periods on the surface or if it is flowing via an overflow channel and bypassing the basin. In the event that grassed surface permeability is unacceptably reduced, there are a number of landscape techniques that can be used to open the surface to encourage infiltration. Such activities are likely to be required in

circumstances where silt has not been effectively managed upstream, or the infiltration surface has been compacted by foot traffic (eg if a basin is also used as a recreational area).

Scarifying to remove "thatch"

Thatch is a tightly intermingled organic layer of dead and living shoots, stems and roots, developing between the zone of green vegetation and the soil surface. Scarifying with tractor-drawn or self-propelled equipment to a depth of at least 50 mm breaks up silt deposits, removes dead grass and other organic matter and relieves compaction of the soil surface.

Spiking or tining the soil, using aerating equipment to encourage water percolation

This is particularly effective where a hollow tine machine is used, and sand is dressed in, and is best undertaken when the soil is moist (note: the removal and disposal of the dried cores will be necessary). Spiking or tining with tractor-drawn or self-propelled equipment penetrates and perforates soil layers to a depth of at least 100 mm (at 100 mm centres) and allows the entry of air, water, nutrients and top dressing materials.

Air pressure treatment

If the infiltration capacity has reduced due to compaction, it may be possible to rehabilitate it using air pressure treatment. This process breaks up subsoil layers by driving probes into the ground. The probe is connected to a high pressure gas source (typically nitrogen bottles) and a high pressure stream of gas is quickly introduced into the soil. This causes the soil to rupture both vertically and horizontally.

As a last resort, it may be necessary to remove and replace the grass and topsoil by:

- removing accumulated silt and (subject to a toxicity test) applying to land or dispose off site
- removing damaged turf, which should be composted or disposed off site
- cultivating remaining topsoil to required levels
- re-turfing (using turf of a quality and appearance to match existing) or reseeding (to Clause 12.6 of BS 7370-3:1991) using seed to match existing turf) area to required levels. It may be necessary to supply and fix erosion protection to protect seeded soil. The placing or grading of turf and seeded areas should be undertaken carefully to ensure that final design levels are achieved. Watering will be required to promote successful germination and/or establishment.

32.9 FREQUENCY OF MAINTENANCE TASKS

Landscape maintenance contract periods are usually of 1–3 years in duration. The 3-year cycle is increasingly common to ensure continuity and commitment to long-term landscape care. The frequency of regular landscape maintenance tasks in a contract period can range from daily to once in the contract period. In practice, most site tasks are based on monthly or fortnightly site visits, except where grass or weed growth requires a higher frequency of work. In many cases, a performance specification is used with terms such as "beds shall be maintained weed-free" or "grass shall be cut to a height of 50 mm with a minimum height of 35 mm and a maximum height of 100 mm" to obtain the required standards.

Frequency can be specified within the schedule to include occasional items, such as "'meadow grass' – cut twice annually in July and September to a height of 75–100 mm (or to supplier's recommendations), all arisings raked off and removed to wildlife features, compost facility or other recycling facility", which provides flexibility for work that is not critical to the management of the site.

Maintenance tasks that suit a performance approach commonly include plant growth, grass cutting, pruning and tree maintenance. However, work tasks, such as sweeping paths, regular litter collection and cleaning road surfaces, will require work at an agreed frequency, with more specific timings such as weekly, monthly or annually. Where the frequency and timing of tasks is critical, a mixture of performance and frequency specification is necessary to provide effective maintenance.

SuDS maintenance generally tends towards a frequency requirement to ensure a predictable standard of care, which can be recorded on site and provides a reasonable basis for pricing work. A convenient frequency for many tasks is at a monthly inspection, as this is the usual minimum site attendance required in a landscape specification. The monthly frequency should provide for an inspection of all SuDS components and for the checking of all inlets and outlets. The inspection should be carried out by someone familiar with the operation of the specific SuDS components, and it should be recorded.

However, certain SuDS maintenance tasks fall outside this monthly cycle and need to be accommodated in the contract. The most obvious are:

- wetland vegetation maintenance
- silt management
- filter replacement in proprietary systems
- sweeping of pervious surfaces (unless loose, gravel surfaces).

There are other tasks associated with ensuring the long-term performance of the systems that may be more difficult to predict, and may even fall outside any contract period. It may, therefore, be more appropriate to review requirements, for example, for system rehabilitation at interim periods, when contracts are falling due for renewal.

The vast majority of well-designed SuDS, whether "hard" or "soft", do not seem to suffer from problems with excessive and rapid silt accumulation, if they apply the key concepts of the SuDS philosophy: source control with a correctly designed Management Train. The frequency of sediment removal will increase as the area of the catchment increases in relation to the surface area of the SuDS where sediment accumulates (whether this is within a proprietary system or a landscape feature).

32.10 APPLYING THE PRINCIPLES OF LANDSCAPE MANAGEMENT

Typical landscape management documentation and its potential application to SuDS is summarised in the following subsections.

32.10.1 Management plan

This document should include a clear statement of design intent and an explanation of each of the SuDS components and the benefits being delivered by the SuDS for the site. The document should describe the management objectives for the site over time, and the management strategies that should be employed to realise these objectives and reconcile any potential conflicts that may arise.

Where the drainage system has an impact on the wildlife value or public use of a site, the document should explain any habitat enhancement goals, health and safety issues and long-term management implications.

For SuDS, the management plan should include a Maintenance Plan, which will be required so that maintenance aspirations can be costed, in order to secure their long-term financing. The Maintenance Plan can also establish changes in maintenance regimes that may be required to match changes in objectives such as the need to adapt operation and maintenance practices to accommodate specific wildlife habitats that may develop.

Sites with special wildlife or amenity interest may require detailed management plans that monitor habitat development, infrastructure changes or damage to sites, and ensure rapid responses to such changes, should they occur. In these cases the management plan should be prepared in collaboration with an ecologist. Ecological supervision may be required for certain works.

It is common for smaller commercial, industrial and housing sites to have a simple maintenance statement. In this case, a single page explaining the site management (including the SuDS) would be useful for all parties involved in the care of the development.

An important part of a management plan is an annual and 3–5 yearly review of the Maintenance Plan (when maintenance contracts are typically renewed). This should apply to all types of SuDS, but is particularly important for the soft landscape element, as plants and trees require different periodic management techniques as they develop. The review should involve those responsible for the maintenance and those undertaking the work.

The management plan should be a living document that is reviewed periodically with reference to changes on site, as well as changes to adjacent sites that might impact the site.

Further guidance and an example of a Maintenance Plan (in the form of a checklist) is provided in **Appendix B**.

32.10.2 Conditions of Contract

Appropriate conditions of contract will be required. Advice can be sought from the Landscape Institute which publishes specific landscape maintenance contracts. Guidance is also provided in Shaffer *et al* (2004).

32.10.3 Specification

The specification details the materials to be used and the standard of work required.

A specification, usually preceded by preliminaries, details how work shall be carried out, and contains clauses that give general instructions to the contractor. It will normally be accompanied by a schedule of work (**Section 32.10.4**). Specific SuDS maintenance clauses may be included in a general specification or as a separate "SuDS maintenance specification" section either within or referenced by the management plan (**Section 32.10.1**).

32.10.4 Schedule of work

The schedule of work itemises the tasks to be undertaken and the frequency at which they will be performed.

The tasks required to maintain the site and the frequency necessary to achieve an acceptable standard should be set out in the schedule of work.

This document (and **Section 32.10.3**) will often form the basis of a pricing framework, and can also act as a checklist to ensure that the work has been carried out satisfactorily.

For further information on the development of appropriate schedules, see HR Wallingford (2004).

32.10.5 Maintenance record

It is vital that a record is kept of the inspections and maintenance work that has been carried out. This allows the response of the system to different maintenance regimes to be assessed in future, and also provides protection against legal claims should the capacity of the system be exceeded during a rainfall event and flooding occurs elsewhere as a result.

32.11 REFERENCES

HR WALLINGFORD (2004) *The operation and maintenance of sustainable drainage systems (and associated costs)*, SR 626, HR Wallingford, UK. Go to: **http://tinyurl.com/lcot2g6**

ROAD LIASON GROUP (2005) *Well-maintained highways. Code of practice for highway maintenance management*, The Stationery Office, London, UK (ISBN: 0-11552-643-9). Go to: **http://tinyurl.com/osm2juc**

SHAFFER, P, ELLIOTT, C, REED, J, HOLMES, J and WARD, M (2004) *Model agreements for sustainable water management systems. Model agreements for SuDS*, C625, CIRIA, London, UK (ISBN: 978-0-86017-625-1). Go to: **www.ciria.org**

APPENDIX E

IAN FARMER ASSOCIATES

DALLAS BURSTON PROPERTY LIMITED

BRIXWORTH PERCOLATION TESTING
NORTHAMPTON ROAD, BRIXWORTH

FACTUAL GROUND INVESTIGATION REPORT

Contract: 2221120

Date: October 2023

Ian Farmer Associates (1998) Limited
1 Fairfield Court, Seven Stars Industrial Estate
Wheler Road, Coventry, CV3 4LJ
Tel: 024 7630 3422
www.ianfarmer.co.uk

FACTUAL GROUND INVESTIGATION REPORT

Carried out at

BRIXWORTH PERCOLATION TESTING

NORTHAMPTON ROAD, BRIXWORTH

Prepared for

DALLAS BURSTON PROPERTY LIMITED
c/o Dallas Burston Polo Club
Stoneythorpe Estate
Southam
CV47 2DL

Contract No: 2221120

Date: October 2023

Ian Farmer Associates (1998) Limited
1 Fairfield Court, Seven Stars Industrial Estate
Wheler Road, Coventry, CV3 4LJ
Tel: 024 7630 3422
www.ianfarmer.co.uk

Document Control

Project reference: **2221120**

Project name: **BRIXWORTH PERCOLATION TESTING**

Report title: **FACTUAL GROUND INVESTIGATION REPORT**

Version	Date	Comment
01	31/10/2023	First Issue

Author	Technical Reviewer	Project Manager
P.C.G Bailey	D.W Bland	R Coleman
Regional Manager	Principal Engineering Geologist	Engineering Geologist

EXECUTIVE SUMMARY

On the instructions of Dallas Burston Property Limited (DBP), an investigation was undertaken to determine ground and groundwater conditions to enable a drainage assessment. It is understood that a mixed development is proposed at the site, with associated infrastructure, roadways and parking.

The site is situated within three parcels of land within Hill Farm, off the Northampton Road on the south-eastern outskirts of the village of Brixworth, and may be located by Landranger Grid Reference SP747693. Published geology indicates the site to be underlain by the Northampton Sand Formation.

Site work comprised the machine excavation of fifteen trial pits, with percolation testing carried out in a hand-dug extension to each pit.

CONTENTS

1.0 INTRODUCTION

1.1 On the instructions of Dallas Burston Property Limited (DBP), an investigation was undertaken to determine ground and groundwater conditions to enable a drainage assessment.

1.2 It is understood that a mixed development is proposed at the site, with associated infrastructure, roadways and parking.

1.3 It is recommended that a copy of this report be submitted to the relevant authorities to enable them to carry out their own site assessments and provide any comments.

1.4 This report has been prepared for the sole use of the Client for the purpose described and no extended duty of care to any third party is implied or offered. Third parties using any information contained within this report do so at their own risk.

1.5 The comments given in this report and the opinions expressed herein are based on the information received, the conditions encountered during site works, and on the results of tests made in the field and laboratory. However, there may be conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report.

1.6 The comments on groundwater conditions are based on observations made at the time the site work was carried out. It should be noted that groundwater levels vary owing to seasonal or other effects.

2.0 SITE SETTING

2.1 Site Location

2.1.1 The site is situated within three parcels of land within Hill Farm, off the Northampton Road on the south-eastern outskirts of the village of Brixworth, and may be located by Landranger Grid Reference SP747693.

2.1.2 A site location plan is included in Appendix 1, Figure A1.1.

2.2 Site Description

2.2.1 The area investigated was irregular in shape covering an area of approximately 3.5 hectares to the north and west of Brixworth cricket and tennis club and comprised three separate grassed fields with surrounding hedges and trees in part.

2.2.2 The existing Brixwoth Cricket and Tennis club to the east which is located to the west of the intersection of Harborough Road (A508) and Northampton Road. The land to the north and west was generally agricultural land.

2.2.3 The site was a relatively flat grassed field at the time of the investigation.

2.2.4 An exploratory hole location plan is given in Appendix 1, Figure A1.2.

2.3 Geological Setting

2.3.1 Details of the geology underlying the site have been obtained from BGS Sheet 185, ref. 4.1.

2.3.2 The geological map indicates superficial deposits to be absent, with the site directly underlain by the Northampton Sand Formation, described as “ferruginous ironstones and sandy limestones”.

2.3.3 Made Ground was not anticipated to be present, but there is always the potential that localised areas may exist on the site.

3.0 SITE WORK

3.1 The site work was carried out between the 24th and 26th October 2023. The locations of the exploratory holes have been stipulated by DBP.

3.2 The site work has been carried out on the basis of the practices set out in BS 5930:2015 ref. 4.3 and BS EN 1997-2:2007, ref 4.4. Additional references are noted within the table.

Exploratory Hole Type	Quantity	Hole Reference	Depths	Notes
Trial pits – machine excavated	15	TP01 to TP15	1.0m	
Percolation test pits – hand excavated	15	TP01 to TP15	1.3m	0.3m deep extension at base of each machine-excavated pit
Percolation tests, ref.4.8 / 4.9	15	TP01 to TP15	1.3m	Each test repeated up to 3 times

3.3 The positions of the above are shown on the exploratory hole location plan, Appendix 1, Figure A1.2.

3.4 The depths of the exploratory holes, descriptions of strata encountered and comments on groundwater conditions are given in the site work records in Appendix 2.

3.5 Photographic records of the trial pits are also given in Appendix 2.

3.6 Calculated percolation test records are also given in Appendix 2.

3.7 The ground levels at the exploratory hole locations were not determined. Approximate coordinates were determined by the use of the 'What Three Words' system and are presented on the logs.

4.0 REFERENCES

4.1 BGS Sheet No.185, '*Northampton*', solid and drift edition, 1:50000 scale. British Geological Survey, 1990.

4.2 BS 10175: 2011 '*Investigation of potentially contaminated sites. Code of practice*', British Standards Institute, 2011

4.3 BS 5930: 2015+A1: 2020 '*Code of practice for ground investigations*', British Standards Institute, 2015

4.4 BS EN 1997, Part 2:2007, '*Eurocode 7 – Geotechnical Design – Part 2, Ground Investigation and Design*' British Standards Institute, 2007

4.5 BS EN ISO 22475-1:2006, '*Geotechnical Investigation and Testing – Sampling Methods and Groundwater Measurements*' *Part 1: Technical Principles for Execution*', British Standards Institute, 2006

4.6 BS EN ISO 14688 Part 1:2018 and Part 2:2018, '*Geotechnical Investigation and Testing – Identification and Classification of Soil*', British Standards Institute, 2018

4.7 BS EN ISO 14689-1:2018, '*Geotechnical investigation and testing – Identification and classification of rock. Part 1: Identification and description*' British Standards Institute, 2018

4.8 BS6297:2007. '*Code of practice for the design and installation of drainage fields for use in wastewater treatment*'. British Standard Institute, 2007

4.9 Building Regulations 2000: Approved Document H, '*Drainage and Waste Disposal*'.

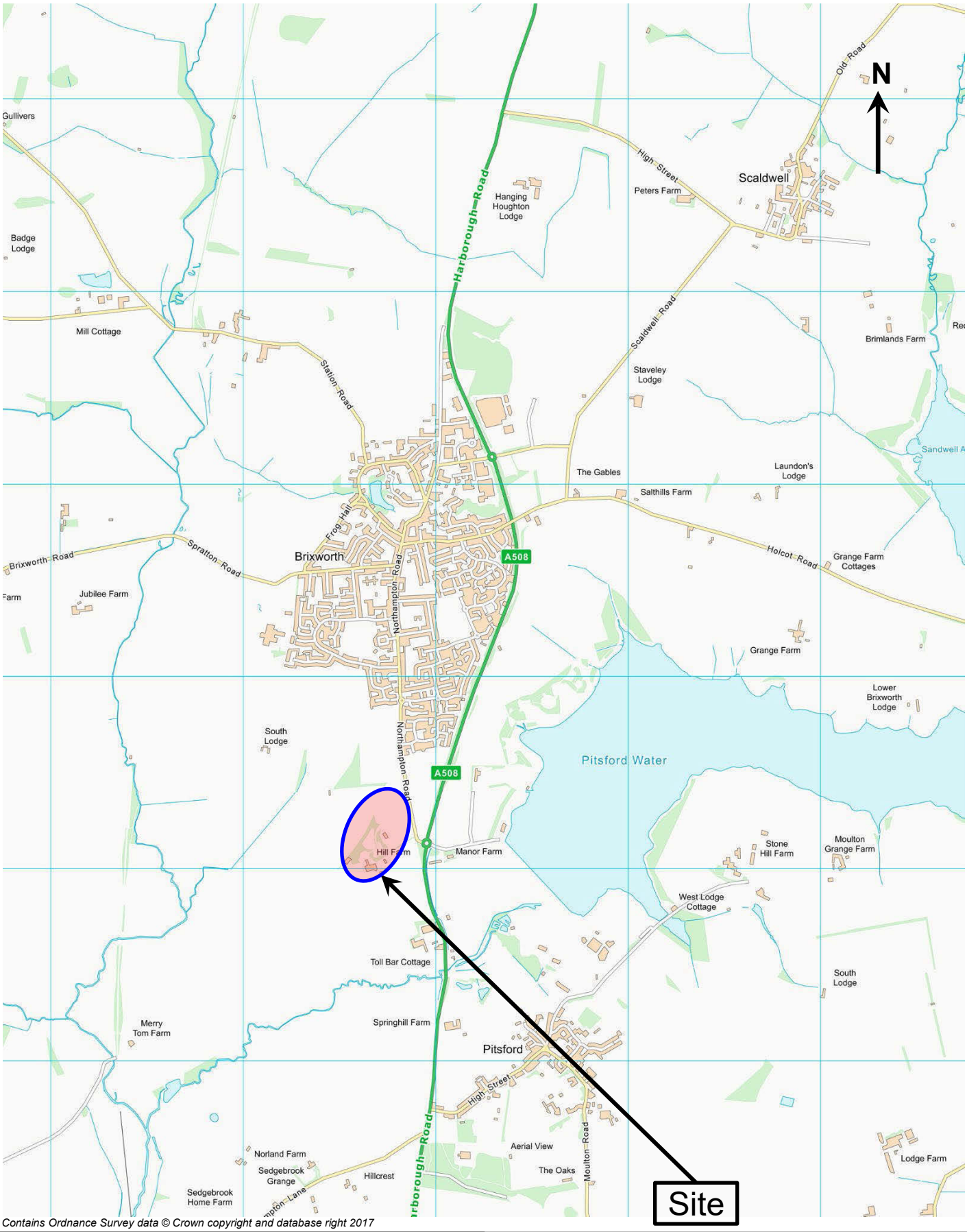
4.10 BRE Digest 365, '*Soakaway Design*', Building Research Establishment, 2016

4.11 HSG 185, '*Health and Safety in Excavations*', Health and Safety Executive, 1999

APPENDIX 1

DRAWINGS

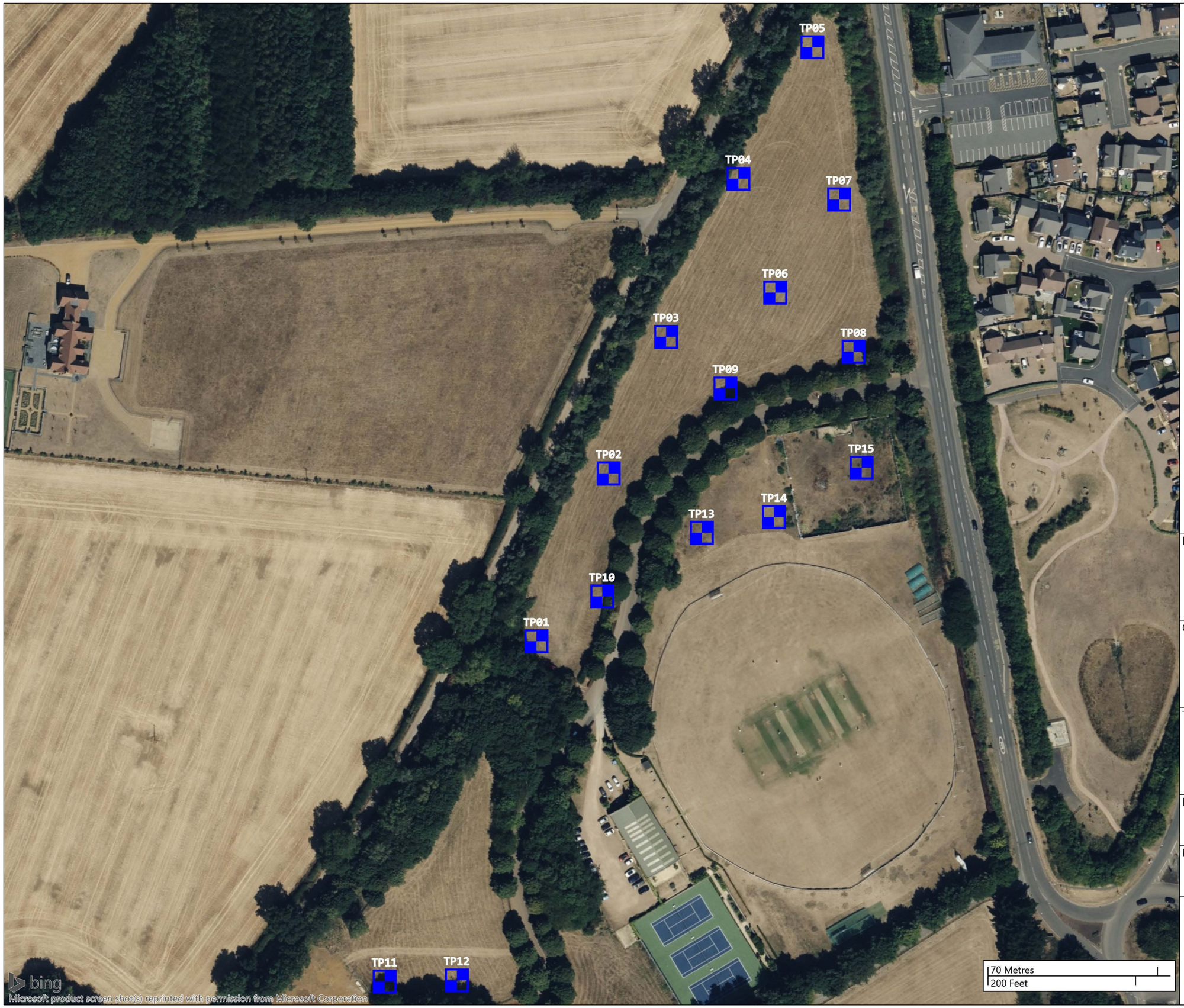
2221120: Brixworth Percolation Testing



Site Location Plan

Scale: NTS

Figure A1.1



Legend Key

Locations By Type - TP

Project:

Brixworth Percolation Testing

Client:

Dallas Burston Property Limited

Title:

Exploratory Hole Location Plan

Project ID:	Scale (at A3):
2221120	1:1500
Figure Number:	Revision:
Fig. A1.2	(00)

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APPENDIX 2

SITE WORK

APPENDIX 2

GENERAL NOTES ON SITE WORKS

A2.1 SITE WORK

A2.1.1 General

Site work is carried out in general accordance with the guidelines given in BS EN 1997, 4.4 and BS 5930, ref 4.3, and BS 10175, ref.4.2.

A2.1.2 Trial Pits

Shallow trial pits are generally dug by mechanical excavator, however, in difficult access locations or adjacent to structures, such pits may be hand dug. Pits are best used where the ground will stand unsupported and generally, the maximum depth of machine dug pits is 4m to 5m. Where personnel are required to enter pits, it is essential that side support is provided. Entry by personnel into unsupported pits deeper than 1.2m is not allowed for health and safety reasons.

Trial pits allow the in-situ condition of the ground to be examined both laterally and vertically and also allow discontinuities to be recorded. The field record should give the orientation of the pit with details of which face was logged, assessment of stability of sides of pit and groundwater as well as the strata encountered. Photographs of the pit may also be taken.

In-situ testing, such as hand penetrometer, hand vane, or similar, can be undertaken in the sides or base of pits while both disturbed and undisturbed samples may be recovered.

It is generally advisable to backfill the pits as soon as possible, open pits should not be left unattended.

A2.2 DESCRIPTION OF SOILS

A2.2.1 General

The procedures and principles given in BS EN ISO 14688 Parts 1 and 2, ref 4.6, supplemented by section 6 of BS 5930, ref. 4.3 have been used in the soil descriptions contained within this report.

A2.3 DESCRIPTION OF ROCK

A2.3.1 General

The procedures and principles given in BS EN ISO 14689, ref 4.7, supplemented by section 6 of BS 5930, ref. 4.3 have been used in the rock descriptions contained within this report.

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Plant used: JCB 3CX	Project: Brixworth Percolation Testing		Location ID: **TP01**
Dates: 24/10/2023	Client: Dallas Burston Property Limited		Sheet 1 of 1
Trial Pit Log	Location: 474694.00E 269253.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				(0.40) 0.40	Brown gravelly, silty fine to medium SAND with occasional rootlets. Gravel is angular to subrounded, fine to coarse of weathered ironstone and quartz. (Topsoil) *Below 0.20m: Low cobble content of angular to subrounded ironstone.*				
				(0.90) 1.30	Light yellowish brown, occasionally brown, sandy, very gravelly COBBLES. Cobbles are angular to subangular, weathered very weak to weak ironstone. Sand is fine to medium. Gravel is angular to sub-rounded, fine to coarse extremely weak to weak ironstone. (Northampton Sand Formation) *Below 0.70m: Medium boulder content of angular to subangular ironstone.*				
					End of Trial Pit at 1.30m				

Termination: Scheduled depth

Stability: Stable during excavation.

Dimensions (Length m x Width m): 2.20 x 1.90

Remarks: No groundwater ingress observed during excavation. Infiltration test undertaken 1.00 to 1.30m.

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Orientation:355° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3XC	Project: Brixworth Percolation Testing		Location ID: **TP02**
Dates: 24/10/2023	Client: Dallas Burston Property Limited		Sheet 1 of 1
Trial Pit Log	Location: 474723.00E 269323.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				(0.40)	Brown, slightly gravely, fine to medium SAND, with occasional rootlets. Gravel is angular to rounded, fine to course, ironstone and quartz. (Topsoil)				
				0.40	Light brown and brown, very sandy, silty, angular to sub-rounded, fine to coarse GRAVEL of ironstone. Medium cobble content of angular to subrounded, very weak to weak ironstone. (Northampton Sand Formation) *From 0.70: Medium boulder content of angular to subangular very weak to weak ironstone. Occasional boulder sized pockets of ironstone cobbles and boulders.*				
				(0.90)					
				1.30	End of Trial Pit at 1.30m				

Termination: Scheduled depth

Stability: Stable during excavation.

Remarks: No groundwater ingress observed during excavation. Infiltration test undertaken 1.00 to 1.30m.

Dimensions (Length m x Width m): 2.60 x 1.80

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Orientation:310° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3XC	Project: Brixworth Percolation Testing		Location ID: **TP03**
Dates: 24/10/2023	Client: Dallas Burston Property Limited		Sheet 1 of 1
Trial Pit Log	Location: 474746.00E 269380.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				0.20	Brown slightly gravelly, silty, fine to medium SAND with occasional rootlets. Gravel is angular to rounded, fine to coarse of ironstone, quartz and flint. (Topsoil)				
				(1.10)	Light pinkish brown, occasionally light brown, slightly sandy, slightly gravelly SILT. Gravel is angular to subangular fine to coarse of extremely weak to very weak ironstone. Sand is fine to medium. (Northampton Sand Formation)		1		
				1.30	End of Trial Pit at 1.30m		2		
							3		
							4		
							5		

Termination: Scheduled depth

Stability: Stable during excavation.

Remarks: No groundwater ingress observed during excavation. Infiltration test undertaken 1.00 to 1.30m.

Dimensions (Length m x Width m): 2.70 x 1.60

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Orientation: 130° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3CX	Project: Brixworth Percolation Testing		Location ID: **TP04**
Dates: 24/10/2023	Client: Dallas Burston Property Limited		Sheet 1 of 1
Trial Pit Log	Location: 474775.00E 269446.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				0.25	Brown, slightly gravelly, silty fine to medium SAND with occasional rootlets. Gravel is angular to rounded, fine of quartz, flint and ironstone. (Topsoil)				
				(0.55)	Light brown and brown, very sandy, silty GRAVEL, with high cobble content and medium boulder content. Sand is fine to medium. Gravel is angular to sub-rounded, fine to coarse (mostly medium to coarse) extremely to very weak of ironstone. Cobbles are angular to sub-angular very weak to weak ironstone. Boulders are angular to sub-angular, very weak to weak ironstone. (Northampton Sand Formation)				
				0.80					
				(0.50)	Light brown sandy gravelly angular to subangular COBBLES with medium boulder content. Cobbles are very weak to weak ironstone. Boulders are very weak ironstone. Gravel is angular to sub-rounded (mostly coarse) extremely to very weak ironstone. Sand is fine to medium (Northampton Sand Formation)		1		
				1.30	End of Trial Pit at 1.30m				
							2		
							3		
							4		
							5		

Termination: Scheduled depth

Stability: Stable during excavation.

Remarks: No groundwater ingress observed during excavation. Infiltration test undertaken 1.00 to 1.30m.

Dimensions (Length m x Width m): 2.70 x 1.60

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Orientation: 120° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3CX	Project: Brixworth Percolation Testing		Location ID: **TP05**
Dates: 24/10/2023	Client: Dallas Burston Property Limited		Sheet 1 of 1
Trial Pit Log	Location: 474805.00E 269501.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				0.20	Brown gravelly silty fine to medium SAND with frequent rootlets. Gravel is angular to rounded, fine to coarse, ironstone, flint and quartz. (Topsoil)				
				(1.10)	Light brown and brown gravelly silty fine to medium SAND. Gravel is angular to subrounded fine to coarse (mostly coarse) extremely weak to very weak of ironstone. (Northampton Sand Formation) *Below: 0.80m: Medium cobble content of angular to subangular of very weak to weak ironstone.* *Below 0.90m: Low boulder content of angular to subangular of very weak to weak ironstone.*		1		
				1.30	End of Trial Pit at 1.30m		2		
							3		
							4		
							5		

Termination: Scheduled depth

Stability: Stable during excavation.

Remarks: No groundwater ingress observed during excavation. Infiltration test undertaken 1.00 to 1.30m.

Dimensions (Length m x Width m): 2.40 x 1.60

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Orientation: 190° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3CX	Project: Brixworth Percolation Testing		Location ID: **TP06**
Dates: 25/10/2023	Client: Dallas Burston Property Limited		Sheet 1 of 1
Trial Pit Log	Location: 474791.00E 269399.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				0.20	Brown gravelly, silty fine to medium SAND with occasional rootlets. Gravel is angular to rounded, fine to coarse of limestone and quartz. Low cobble content of angular to sub-angular ironstone. (Topsoil)				
				(1.10)	Light brown to occasionally brown sandy, very gravelly. COBBLES. Cobbles are angular to sub-angular, very weak to weak ironstone. Gravel is angular to sub-angular very weak to weak ironstone. Sand is fine to medium. (Northampton Sand Formation) *0.40-0.60m: Subangular boulder of limestone.* *Below 0.90m: Light brown to yellowish brown.*		1		
				1.30	End of Trial Pit at 1.30m		2		
							3		
							4		
							5		

Termination: Scheduled depth

Stability: Stable during excavation.

Remarks: No groundwater ingress observed during excavation. Infiltration test undertaken 1.00 to 1.30m.

Dimensions (Length m x Width m): 2.90 x 1.60

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Orientation:355° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3CX	Project: Brixworth Percolation Testing		Location ID: **TP07**
Dates: 25/10/2023	Client: Dallas Burston Property Limited		Sheet 1 of 1
Trial Pit Log	Location: 474817.00E 269438.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				0.25	Brown, slightly gravelly, silty fine to medium, SAND with occasional rootlets. Gravel is angular to rounded, fine to coarse of quartz and ironstone. (Topsoil)				
				0.40	Brown and light brown gravelly, silty fine to medium SAND. Gravel is angular to rounded, fine to coarse of ironstone. (Northampton Sand Formation)				
				(0.30)	Brown and light brown, with occasional light yellowish brown SAND and GRAVEL with medium cobble content of angular to sub-angular, very weak to weak ironstone. Sand is fine to medium. Gravel is angular to sub-rounded, fine to coarse of very weak ironstone.				
				0.70	(Northampton Sand Formation)				
				(0.60)	Light brown to yellowish brown, occasionally brown sandy GRAVEL with high cobble content and low boulder content. Sand is fine to medium. Gravel is angular to subrounded, fine to coarse of very weak ironstone. Cobbles are angular to subangular of very weak to weak ironstone. Boulders are angular to subangular weak ironstone.		1		
				1.30	(Northampton Sand Formation)				
					End of Trial Pit at 1.30m		2		
							3		
							4		
							5		

Termination: Scheduled depth

Stability: Stable during excavation.

Dimensions (Length m x Width m): 2.90 x 1.60

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Remarks:
No groundwater ingress observed during excavation.
Infiltration test undertaken 1.00 to 1.30m.

Orientation:255° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3CX	Project: Brixworth Percolation Testing	Location ID: **TP08**	
Dates: 25/10/2023	Client: Dallas Burston Property Limited	Sheet 1 of 1	
Trial Pit Log	Location: 474824.00E 269375.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				(0.30) 0.30	Brown, gravelly silty fine to medium SAND with occasional rootlets. Gravel is angular to rounded fine to coarse of ironstone and quartz. Occasional gravel to boulder sized pockets of soft to firm sandy silt. (Topsoil)				
				(1.00)	Light yellowish brown to light brown slightly sandy, slight gravelly SILT with low cobble content of angular to subangular very weak to weak ironstone. Gravel is angular to subangular fine to coarse very weak ironstone. (Northampton Sand Formation) *Below 0.90m: Low boulder content of angular to subrounded, very weak to weak ironstone and gravelly with medium cobble content.*		1		
				1.30	End of Trial Pit at 1.30m		2 3 4 5		

Termination: Scheduled depth

Stability: Stable during excavation.

Remarks: No groundwater ingress observed during excavation. Infiltration test undertaken 1.00 to 1.30m.

Dimensions (Length m x Width m): 2.50 x 1.60

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Orientation:340° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3CX	Project: Brixworth Percolation Testing		Location ID: **TP09**
Dates: 25/10/2023	Client: Dallas Burston Property Limited		Sheet 1 of 1
Trial Pit Log	Location: 474771.00E 269359.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				(0.30) 0.30	Firm brown, slightly gravelly sandy SILT with occasional rootlets and roots. Gravel is angular to rounded, fine to coarse quartz and ironstone. Low cobble content of angular to sub-angular of very weak to weak ironstone. (Topsoil)				
				(1.00)	Soft to firm light brown, occasionally brown, slightly gravelly, sandy SILT with occasional roots and low cobble content. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of very weak ironstone and rare siliceous gravel. Cobbles are angular to subangular very weak to weak ironstone. (Northampton Sand Formation) *Below 0.90m: Low boulder content of angular to subangular weak ironstone.*		1		
				1.30	End of Trial Pit at 1.30m		2 3 4 5		

Termination: Scheduled depth	Stability: Stable during excavation.	Remarks: No groundwater ingress observed during excavation. Infiltration test undertaken 1.00 to 1.30m.
Dimensions (Length m x Width m): 2.20 x 1.70		

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Orientation:60° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3CX	Project: Brixworth Percolation Testing		Location ID: **TP10**
Dates: 25/10/2023	Client: Dallas Burston Property Limited		Sheet 1 of 1
Trial Pit Log	Location: 474721.00E 269272.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				(0.30)	Firm brown slightly gravelly sandy silt with occasional rootlets and roots. Gravel is angular to fine to coarse of quartz and ironstone. Low cobble content of angular to sub-angular very weak to weak ironstone. (Topsoil)				
				0.30					
				(0.50)	Light brown and light yellowish brown, very gravelly silty fine to medium SAND with low cobble content and occasional roots. Gravel is angular to subrounded, fine to coarse of very weak ironstone. Cobbles are angular to subangular of very weak to weak ironstone. (Northampton Sand Formation)				
				0.80					
				(0.50)	Light brown and light yellowish brown, very sandy, silty GRAVEL with medium cobble content. Sand is fine to medium. Gravel is angular to subrounded, very weak ironstone. Cobbles are angular to subangular very weak to weak ironstone. (Northampton Sand Formation)		1		
				1.30	End of Trial Pit at 1.30m		2		
							3		
							4		
							5		

Termination: Scheduled depth

Stability: Stable during excavation.

Remarks: No groundwater ingress observed during excavation. Infiltration test undertaken 1.00 to 1.30m.

Dimensions (Length m x Width m): 2.60 x 1.60

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Orientation:200° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3CX	Project: Brixworth Percolation Testing		Location ID: **TP11**
Dates: 26/10/2023	Client: Dallas Burston Property Limited		Sheet 1 of 1
Trial Pit Log	Location: 474633.00E 269111.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				(0.35)	Brown gravelly silty fine to medium SAND with occasional rootlets and roots. Gravel is angular to rounded, fine to coarse of quartz and ironstone. (Topsoil)				
				0.35					
				(0.95)	Light brown COBBLES with much sandy gravel. Sand is fine to medium. Gravel is angular to subrounded, fine to coarse of very weak ironstone. Cobbles are angular to subangular of very weak to weak ironstone. (Northampton Sand Formation) *0.35-1.30m: Eastern end of the pit is light brown gravelly silty sand with medium cobble content. Sand is fine to medium. Gravel is angular to subrounded, fine to coarse of very weak ironstone. Cobbles are angular to subangular of very weak to weak ironstone.*		1		
				1.30	End of Trial Pit at 1.30m		2 3 4 5		

Termination: Scheduled depth

Stability: Stable during excavation.

Dimensions (Length m x Width m): 2.40 x 1.60

Remarks: No groundwater ingress observed during excavation. Infiltration test undertaken 1.00 to 1.30m.

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Orientation:65° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3CX	Project: Brixworth Percolation Testing		Location ID: **TP12**
Dates: 26/10/2023	Client: Dallas Burston Property Limited		Sheet 1 of 1
Trial Pit Log	Location: 474663.00E 269112.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				(0.30)	Brown gravelly silty, fine to medium SAND with occasional rootlets and roots. Gravel is angular to sub-rounded, fine to coarse of ironstone a quartz. (Topsoil)				
				0.30	Light brown very gravelly silty fine to medium SAND with high cobble content and occasional roots. Gravel is angular to subrounded, fine to coarse of very weak ironstone. Cobbles are angular to subangular very weak to weak ironstone. (Northampton Sand Formation) *0.30-1.30m: Significantly higher proportion of cobbles on western half. Relict bedding visible.* *Below 0.80m: Western end of pit medium boulder content of angular to subangular of very weak to weak ironstone.*		1		
				(1.00)					
				1.30	End of Trial Pit at 1.30m		2		
							3		
							4		
							5		

Termination: Scheduled depth

Stability: Stable during excavation.

Remarks: No groundwater ingress observed during excavation. Infiltration test undertaken 1.00 to 1.30m.

Dimensions (Length m x Width m): 2.10 x 1.60

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Orientation:325° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3CX	Project: Brixworth Percolation Testing		Location ID: **TP13**
Dates: 26/10/2023	Client: Dallas Burston Property Limited		Sheet 1 of 1
Trial Pit Log	Location: 474762.00E 269299.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				0.10	MADE GROUND: Dark blueish, grey, gravelly fine to coarse sand with frequent rootlets. Gravel is angular to rounded, fine to medium of coal, clinker and ironstone.				
				0.25	MADE GROUND: Light brown, occasionally grey, sandy silty angular to subrounded fine to coarse gravel. Sand is fine to medium. Gravel of ironstone, rare clinker and wood fragments.				
				(1.05)	Light brown, slightly gravelly, silty fine to medium SAND with occasional roots and low cobble content. Gravel is angular to sub-rounded, fine to coarse of ironstone. Cobble content of angular to subangular very weak to weak ironstone. (Northampton Sand Formation) *Below 0.80m: Medium boulder content of angular to subangular, weak to medium ironstone.*		1		
				1.30	End of Trial Pit at 1.30m		2 3 4 5		

Termination: Scheduled depth	Stability: Stable during excavation.	Remarks: No groundwater ingress observed during excavation. Infiltration test undertaken 1.00 to 1.30m.
Dimensions (Length m x Width m): 2.20 x 1.70		

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Orientation:50° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3CX	Project: Brixworth Percolation Testing		Location ID: **TP14**
Dates: 26/10/2023	Client: Dallas Burston Property Limited		Sheet 1 of 1
Trial Pit Log	Location: 474792.00E 269306.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				0.20	MADE GROUND: Greyish brown sandy silty angular to rounded, fine to coarse gravel of flint, quartz ironstone and rare asphalt and clinker. 80% gravel is subangular to rounded. Frequent rootlets and medium cobble content of angular to sub-angular ironstone.				
				(1.10)	Light brown and occasionally light yellowish brown gravelly silty fine to medium SAND, with low cobble content of angular to subrounded very weak to weak ironstone and rare flint. (Northampton Sand Formation) *0.20-0.30m: Reworked in places with overlaying made ground.* *Below 0.50m: Slightly gravelly* *Below 0.80m: Light brown occasionally yellowish brown and brown.*		1 2 3 4 5		
				1.30	End of Trial Pit at 1.30m				

Termination: Scheduled depth	Stability: Stable during excavation.	Remarks: No groundwater ingress observed during excavation. Infiltration test undertaken 1.00 to 1.30m.
Dimensions (Length m x Width m): 2.30 x 1.60		

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Orientation:255° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: JCB 3CX	Project: Brixworth Percolation Testing	Location ID: **TP15**	
Dates: 26/10/2023	Client: Dallas Burston Property Limited	Sheet 1 of 1	
Trial Pit Log	Location: 474828.00E 269327.00N	Ground level:	Logged by: RC / Vertical scale: 1:25 / Contract ID: 2221120

Samples & In Situ Testing			Strata Details						
Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Scale	Water Strike	Backfill/ Installation
				0.25	Brown gravelly silty, fine to medium sand with frequent rootlets. Gravel is angular to sub-rounded, fine to coarse ironstone and quartz. (Topsoil)				
				(0.45)	Brown to light brown, gravelly, silty fine to medium SAND with medium cobble content of angular to subangular very weak to weak ironstone. Gravel is angular to subrounded, fine to coarse of very weak ironstone. (Northampton Sand Formation)				
				0.70					
				(0.60)	Light brown and light yellowish brown, gravelly, silty, fine to medium SAND with medium cobble content and medium boulder content. Gravel is angular to sub-rounded, fine to coarse of very weak ironstone. Cobbles are angular to sub-angular of very weak to weak ironstone. Boulders are angular to sub-angular weak ironstone, typically 30mm to 50mm in thickness. (Northampton Sand Formation)		1		
				1.30	End of Trial Pit at 1.30m				
							2		
							3		
							4		
							5		

Termination: Scheduled depth

Stability: Stable during excavation.

Dimensions (Length m x Width m): 2.70 x 1.50

Water Strikes

Strike (m)	Time (mins)	Rose to (m)	Remarks

Remarks:
No groundwater ingress observed during excavation.
Infiltration test undertaken 1.00 to 1.30m.

Orientation:355° from north

Checked by:	DWB	IFA TP v01.01
Status:	FINAL	

2221120: Brixworth Percolation Testing

Trial Pit Photographs

TP01

2221120: Brixworth Percolation Testing

Trial Pit Photographs

TP02

2221120: Brixworth Percolation Testing

Trial Pit Photographs

TP03

2221120: Brixworth Percolation Testing

Trial Pit Photographs

TP04

2221120: Brixworth Percolation Testing

Trial Pit Photographs

TP05

2221120: Brixworth Percolation Testing

Trial Pit Photographs

TP06

2221120: Brixworth Percolation Testing

Trial Pit Photographs	**TP07**

2221120: Brixworth Percolation Testing

Trial Pit Photographs | **TP08**

2221120: Brixworth Percolation Testing

Trial Pit Photographs

TP09

2221120: Brixworth Percolation Testing

Trial Pit Photographs

TP10

2221120: Brixworth Percolation Testing

Trial Pit Photographs

TP11

2221120: Brixworth Percolation Testing

Trial Pit Photographs

TP12

2221120: Brixworth Percolation Testing

Trial Pit Photographs

TP13

2221120: Brixworth Percolation Testing

Trial Pit Photographs

TP14

2221120: Brixworth Percolation Testing

Trial Pit Photographs

TP15

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST to BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Date**	**30/10/2023**

TP No	Test No	Time (sec.)		Fall from 75% to 25% (sec.)	75% Depth mm	25% Depth mm	Percolation Value Vp (sec/mm)
		75% Full	25% Full				
TP01	1	60.0	1110.0	1050.0	90	230	7.50
	2	300.0	1680.0	1380.0	90	230	9.86
	3	360.0	1950.0	1590.0	105	235	12.23
						Average	**9.86**
TP02	1	48.0	153.0	105.0	97.5	232.5	0.78
	2	48.0	198.0	150.0	82.5	227.5	1.03
	3	42.0	204.0	162.0	82.5	227.5	1.12
						Average	**0.98**
TP03	1	480.0	4320.0	3840.0	75	225	25.60
						Average	**25.60**
TP04	1	24.0	210.0	186.0	97.5	232.5	1.38
	2	24.0	330.0	306.0	90	230	2.19
	2	30.0	540.0	510.0	112.5	237.5	4.08
						Average	**2.55**
TP05	1	54.0	1140.0	1086.0	82.5	227.5	7.49
	2	66.0	1710.0	1644.0	97.5	232.5	12.18
	3	54.0	2220.0	2166.0	97.5	232.5	16.04
						Average	**11.90**
TP06	1	9.0	27.0	18.0	127.5	242.5	0.16
	2	12.0	30.0	18.0	150	250	0.18
	3	12.0	30.0	18.0	150	250	0.18
						Average	**0.17**
TP07	1	72.0	432.0	360.0	127.5	242.5	3.13
	2	48.0	336.0	288.0	75	225	1.92
	3	36.0	600.0	564.0	120	240	4.70
						Average	**3.25**
TP08	1	18.0	48.0	30.0	105	235	0.23
	2	24.0	132.0	108.0	187.5	262.5	1.44
	3	15.0	180.0	165.0	150	250	1.65
						Average	**1.11**
TP09	1	18.0	66.0	48.0	127.5	242.5	0.42
	2	24.0	120.0	96.0	112.5	237.5	0.77
	3	90.0	1320.0	1230.0	97.5	232.5	9.11
						Average	**3.43**
TP10	1	12.0	72.0	60.0	127.5	242.5	0.52
	2	12.0	90.0	78.0	150	250	0.78
	3	15.0	96.0	81.0	135	245	0.74
						Average	**0.68**
TP11	1	7.2	22.8	15.6	187.5	262.5	0.21
	2	10.8	33.6	22.8	225	275	0.46
	3	18.0	90.0	72.0	210	270	1.20
						Average	**0.62**
TP12	1	45.0	438.0	393.0	157.5	252.5	4.14
	2	120.0	1140.0	1020.0	142.5	247.5	9.71
	3	135.0	1620.0	1485.0	157.5	252.5	15.63
						Average	**9.83**
TP13	1	96.0	4620.0	4524.0	75	225	30.16
						Average	**30.16**
TP14	1	39.0	153.0	114.0	112.5	237.5	0.91
	2	66.0	1020.0	954.0	75	225	6.36
	3	186.0	1500.0	1314.0	75	225	8.76
						Average	**5.34**
TP15	1	60.0	768.0	708.0	135	245	6.44
	2	54.0	1140.0	1086.0	116.25	238.75	8.87
	3	66.0	1080.0	1014.0	112.5	237.5	8.11
						Average	**7.80**

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP01: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

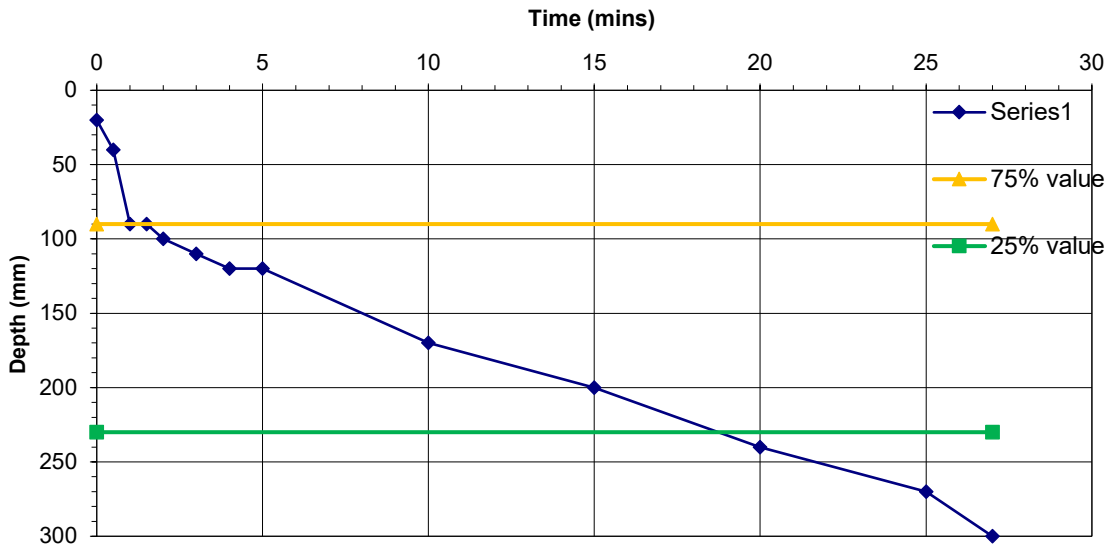
Time (mins)	Depth (mm)
0	20
0.5	40
1	90
1.5	90
2	100
3	110
4	120
5	120
10	170
15	200
20	240
25	270
27	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	20.0
Depth to base of pit =	300.0
Depth to water at 75% level =	90.0
Depth to water at 50% level =	160.0
Depth to water at 25% level =	230.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.258
Volume outflow 75 - 25% (m^3) =	0.013

From the graph:	
tp 75 (min) =	1
tp 25 (min) =	18.5

Soil infiltration rate, f, (m/s) =		**4.65E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**GK**	**Date:**	**25/10/2023**
Checked by:	**PB**	**Date:**	**25/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP01: Test 2**

CALCULATION OF SOIL INFILTRATION RATE

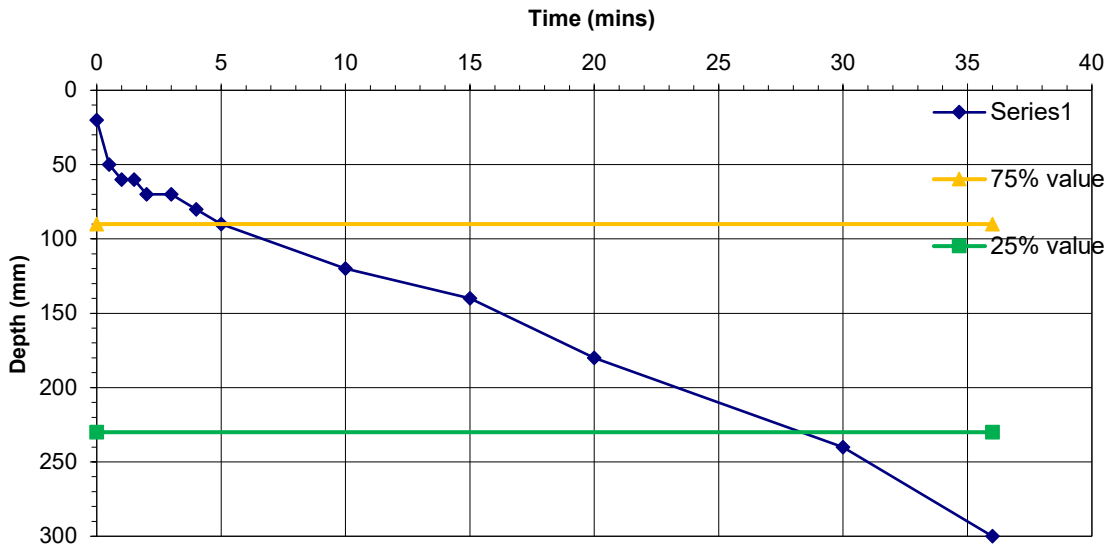
Time (mins)	Depth (mm)
0	20
0.5	50
1	60
1.5	60
2	70
3	70
4	80
5	90
10	120
15	140
20	180
30	240
36	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	20.0
Depth to base of pit =	300.0
Depth to water at 75% level =	90.0
Depth to water at 50% level =	160.0
Depth to water at 25% level =	230.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.258
Volume outflow 75 - 25% (m^3) =	0.013

From the graph:	
tp 75 (min) =	5
tp 25 (min) =	28

Soil infiltration rate, f, (m/s) =		**3.54E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**GK**	**Date:**	**25/10/2023**
Checked by:	**PB**	**Date:**	**25/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP01: Test 3**

CALCULATION OF SOIL INFILTRATION RATE

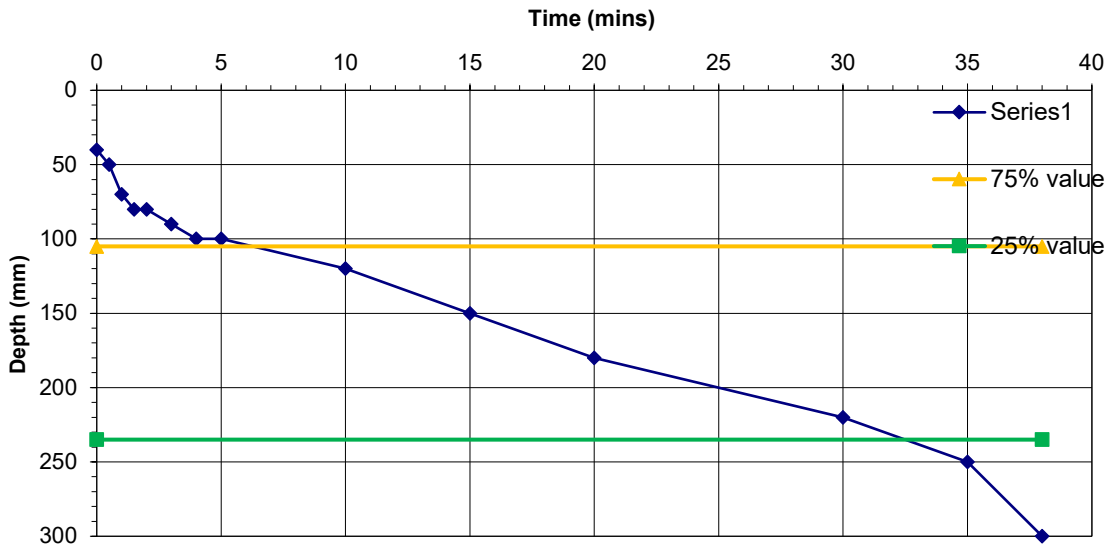
Time (mins)	Depth (mm)
0	40
0.5	50
1	70
1.5	80
2	80
3	90
4	100
5	100
10	120
15	150
20	180
30	220
35	250
38	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	40.0
Depth to base of pit =	300.0
Depth to water at 75% level =	105.0
Depth to water at 50% level =	170.0
Depth to water at 25% level =	235.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.246
Volume outflow 75 - 25% (m^3) =	0.012

From the graph:	
tp 75 (min) =	6
tp 25 (min) =	32.5

Soil infiltration rate, f, (m/s) =		**2.99E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**GK**	**Date:**	**25/10/2023**
Checked by:	**PB**	**Date:**	**25/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP02: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

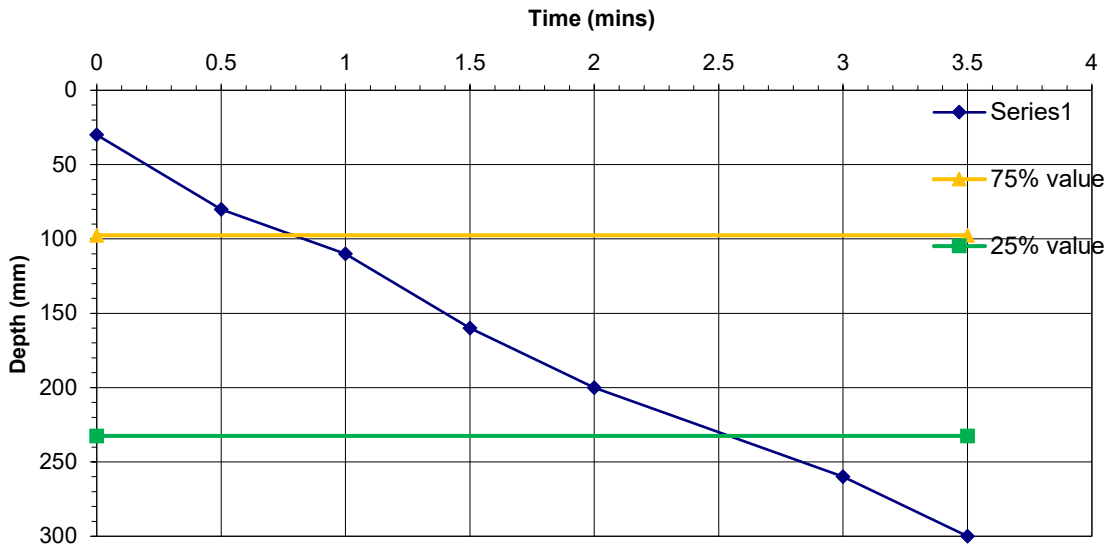
Time (mins)	Depth (mm)
0	30
0.50	80
1	110
1.5	160
2	200
3	260
3.5	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	30.0
Depth to base of pit =	300.0
Depth to water at 75% level =	97.5
Depth to water at 50% level =	165.0
Depth to water at 25% level =	232.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.252
Volume outflow 75 - 25% (m^3) =	0.012

From the graph:	
tp 75 (min) =	0.8
tp 25 (min) =	2.55

Soil infiltration rate, f, (m/s) =		**4.59E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**GK**	**Date:**	**25/10/2023**
Checked by:	**PB**	**Date:**	**25/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP02: Test 2**

CALCULATION OF SOIL INFILTRATION RATE

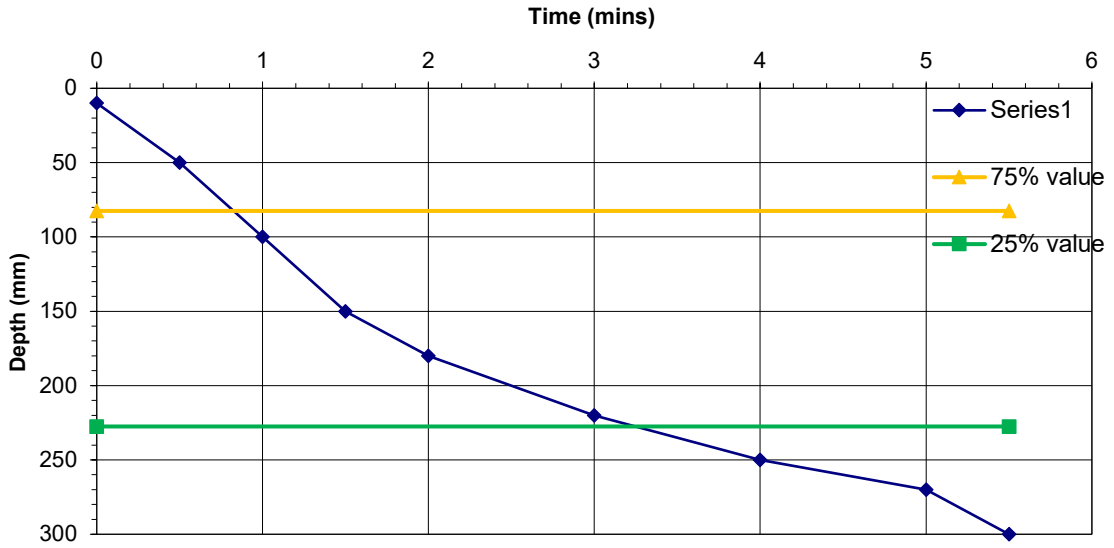
Time (mins)	Depth (mm)
0	10
0.5	50
1	100
1.5	150
2	180
3	220
4	250
5	270
5.5	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	10.0
Depth to base of pit =	300.0
Depth to water at 75% level =	82.5
Depth to water at 50% level =	155.0
Depth to water at 25% level =	227.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.264
Volume outflow 75 - 25% (m^3) =	0.013

From the graph:	
tp 75 (min) =	0.8
tp 25 (min) =	3.3

Soil infiltration rate, f, (m/s) =		**3.30E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**GK**	**Date:**	**25/10/2023**
Checked by:	**PB**	**Date:**	**25/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP02: Test 3**

CALCULATION OF SOIL INFILTRATION RATE

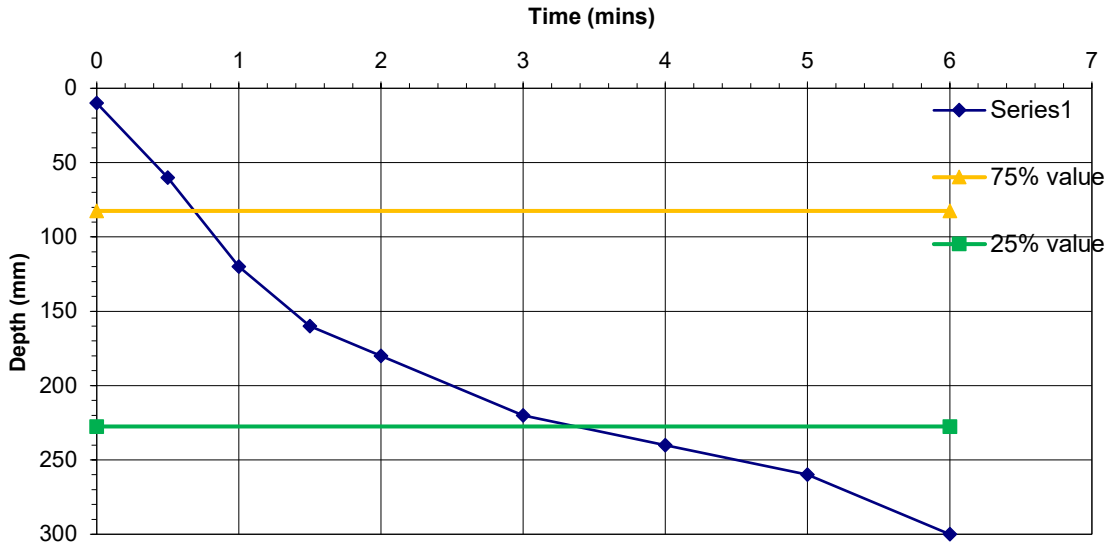
Time (mins)	Depth (mm)
0	10
0.5	60
1	120
1.5	160
2	180
3	220
4	240
5	260
6	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	10.0
Depth to base of pit =	300.0
Depth to water at 75% level =	82.5
Depth to water at 50% level =	155.0
Depth to water at 25% level =	227.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.264
Volume outflow 75 - 25% (m^3) =	0.013

From the graph:	
tp 75 (min) =	0.7
tp 25 (min) =	3.4

Soil infiltration rate, f, (m/s) =		**3.05E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**GK**	**Date:**	**25/10/2023**
Checked by:	**PB**	**Date:**	**25/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP03: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

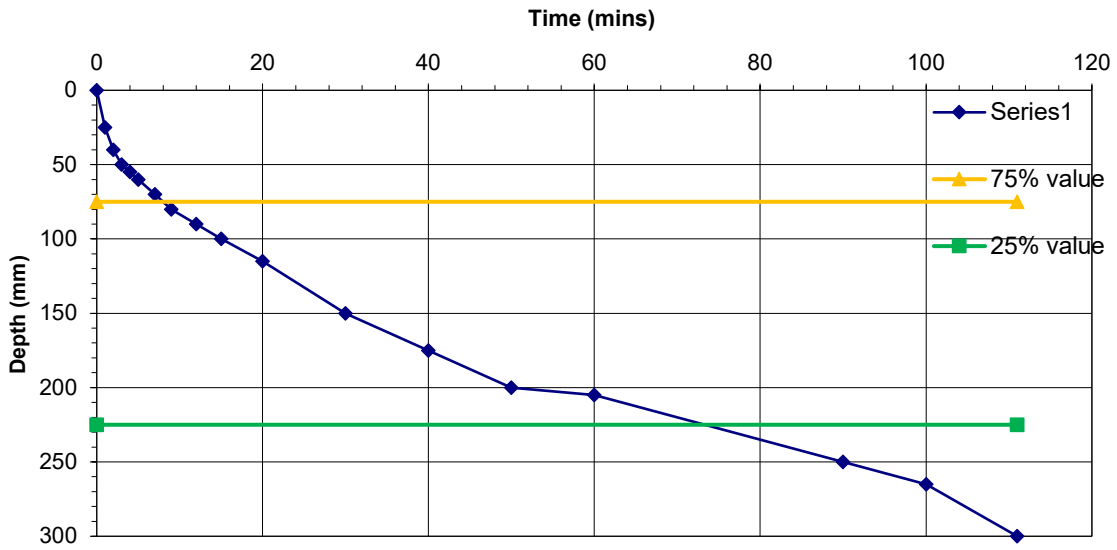
Time (mins)	Depth (mm)
0	0
1	25
2	40
3	50
4	55
5	60
7	70
9	80
12	90
15	100
20	115
30	150
40	175
50	200
60	205
90	250
100	265
111	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	0.0
Depth to base of pit =	300.0
Depth to water at 75% level =	75.0
Depth to water at 50% level =	150.0
Depth to water at 25% level =	225.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.270
Volume outflow 75 - 25% (m^3) =	0.014

From the graph:	
tp 75 (min) =	8
tp 25 (min) =	72

Soil infiltration rate, f, (m/s) =		**1.30E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**RC**	**Date:**	**25/10/2023**
Checked by:	**PB**	**Date:**	**25/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP04: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

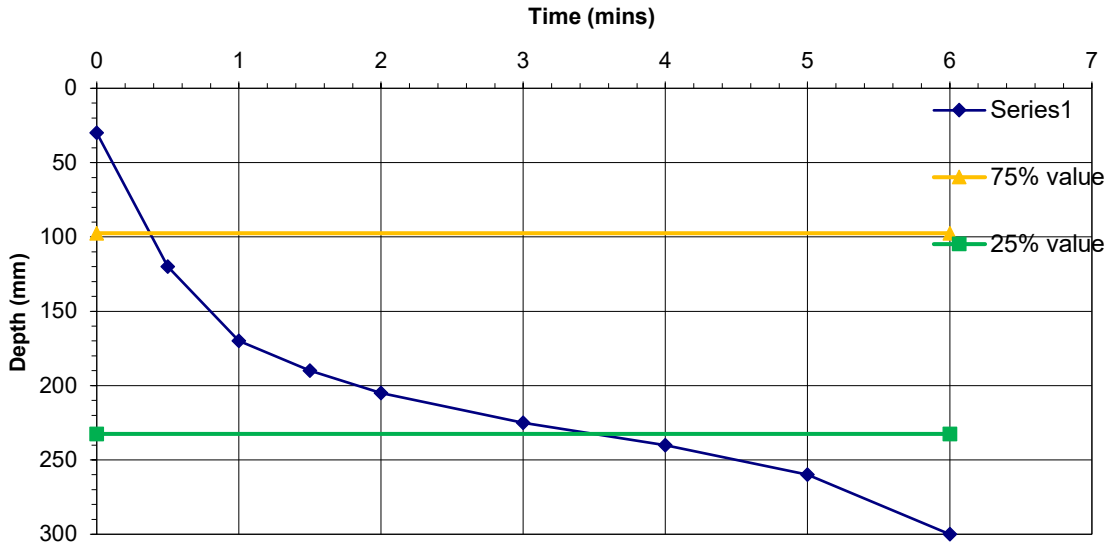
Time (mins)	Depth (mm)
0	30
0.5	120
1	170
1.5	190
2	205
3	225
4	240
5	260
6	300

Size of Trial Pit		
	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	30.0
Depth to base of pit =	300.0
Depth to water at 75% level =	97.5
Depth to water at 50% level =	165.0
Depth to water at 25% level =	232.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.252
Volume outflow 75 - 25% (m^3) =	0.012

From the graph:	
tp 75 (min) =	0.4
tp 25 (min) =	3.5

Soil infiltration rate, f, (m/s) =		**2.59E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**RC**	**Date:**	**25/10/2023**
Checked by:	**PB**	**Date:**	**25/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP04: Test 2**

CALCULATION OF SOIL INFILTRATION RATE

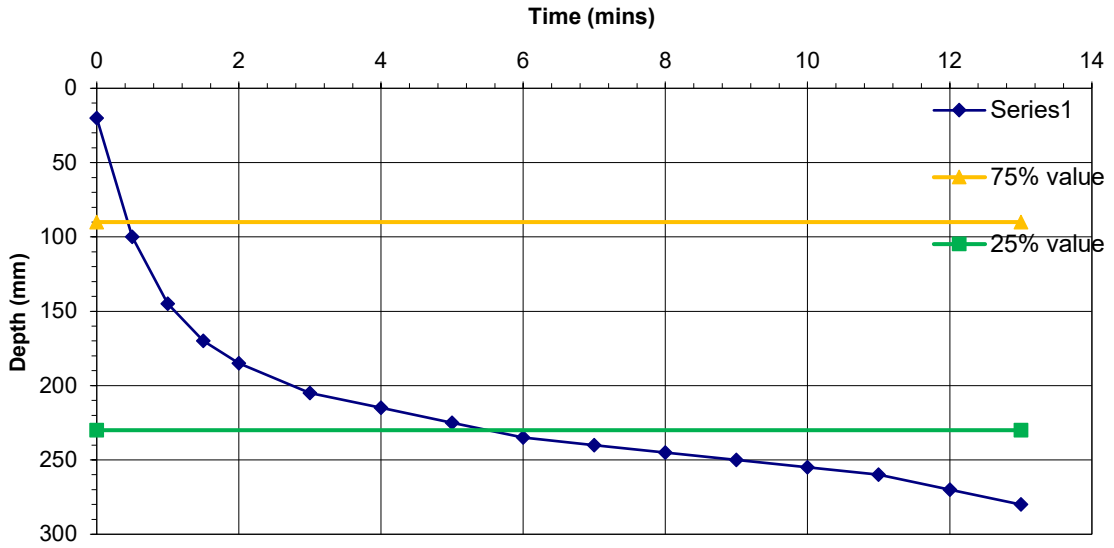
Time (mins)	Depth (mm)
0	20
0.5	100
1	145
1.5	170
2	185
3	205
4	215
5	225
6	235
7	240
8	245
9	250
10	255
11	260
12	270
13	280

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	20.0
Depth to base of pit =	300.0
Depth to water at 75% level =	90.0
Depth to water at 50% level =	160.0
Depth to water at 25% level =	230.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.258
Volume outflow 75 - 25% (m^3) =	0.013

From the graph:	
tp 75 (min) =	0.4
tp 25 (min) =	5.5

Soil infiltration rate, f, (m/s) =		**1.60E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**RC**	**Date:**	**25/10/2023**
Checked by:	**PB**	**Date:**	**25/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP04: Test 3**

CALCULATION OF SOIL INFILTRATION RATE

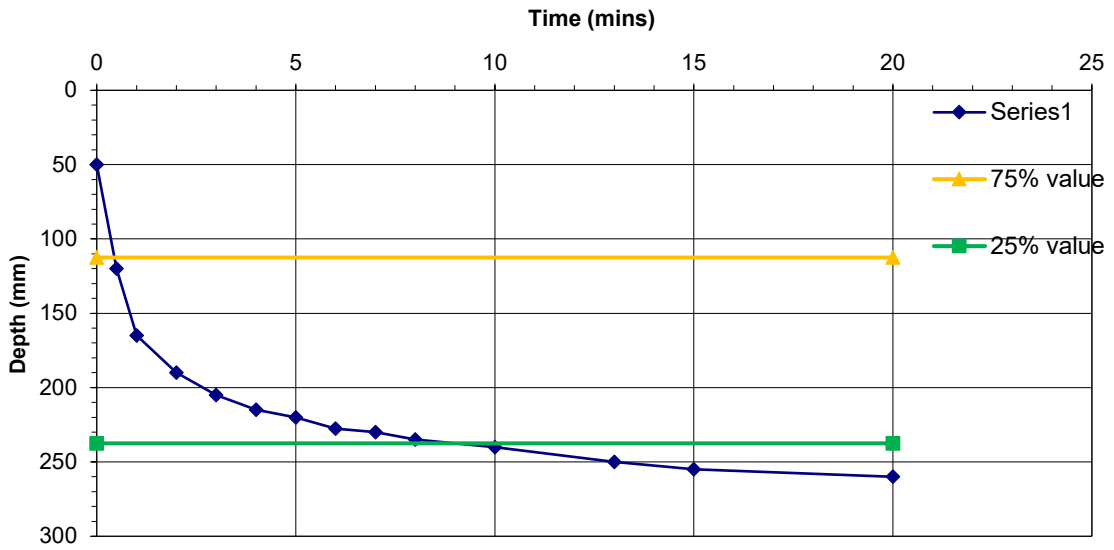
Time (mins)	Depth (mm)
0	50
0.5	120
1	165
2	190
3	205
4	215
5	220
6	227.5
7	230
8	235
10	240
13	250
15	255
20	260

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	50.0
Depth to base of pit =	300.0
Depth to water at 75% level =	112.5
Depth to water at 50% level =	175.0
Depth to water at 25% level =	237.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.240
Volume outflow 75 - 25% (m^3) =	0.011

From the graph:	
tp 75 (min) =	0.5
tp 25 (min) =	9

Soil infiltration rate, f, (m/s) =		**9.19E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**RC**	**Date:**	**25/10/2023**
Checked by:	**PB**	**Date:**	**25/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP05: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

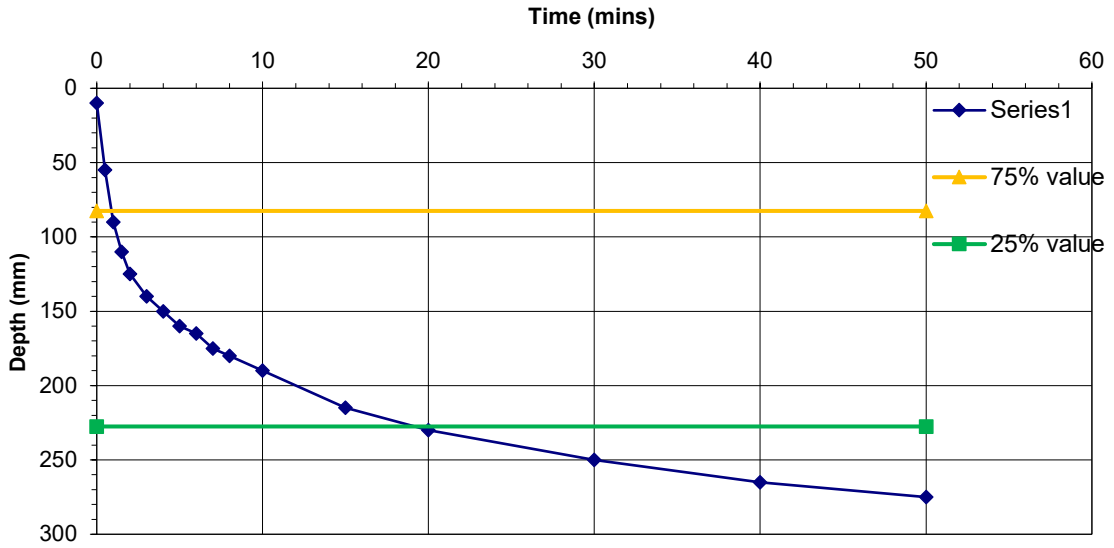
Time (mins)	Depth (mm)
0	10
0.50	55
1.0	90
1.5	110
2	125
3	140
4	150
5	160
6	165
7	175
8	180
10	190
15	215
20	230
30	250
40	265
50	275

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.25
	Depth (m) =	0.30

Depth to water at start of test =	10.0
Depth to base of pit =	300.0
Depth to water at 75% level =	82.5
Depth to water at 50% level =	155.0
Depth to water at 25% level =	227.5
Base area of pit (m^2) =	0.075
Eff area of loss 75 - 25% (m^2) =	0.235
Volume outflow 75 - 25% (m^3) =	0.011

From the graph:	
tp 75 (min) =	0.9
tp 25 (min) =	19

Soil infiltration rate, f, (m/s) =		**4.27E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**RC**	**Date:**	**25/10/2023**
Checked by:	**PB**	**Date:**	**25/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP05: Test 2**

CALCULATION OF SOIL INFILTRATION RATE

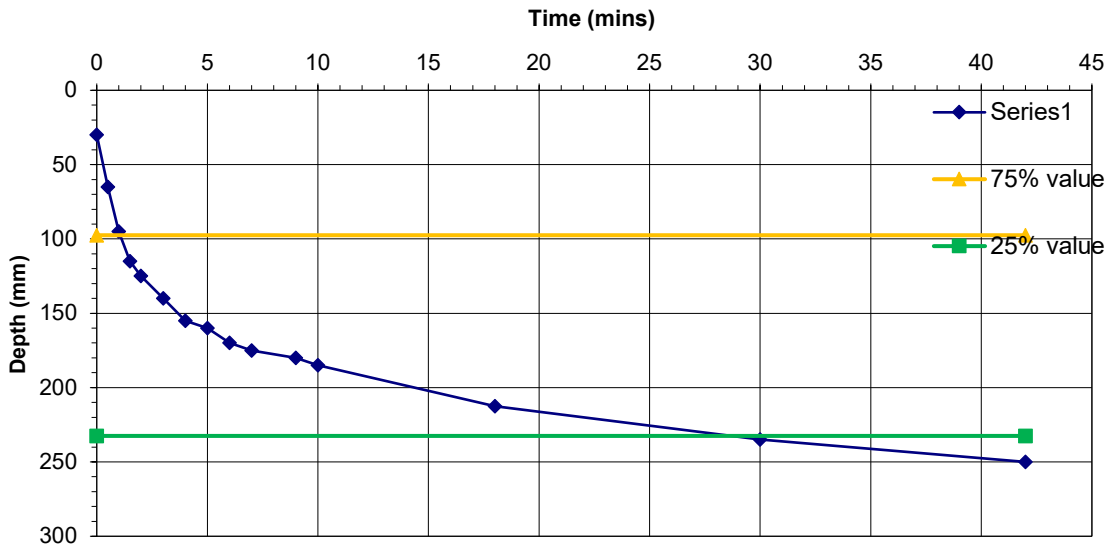
Time (mins)	Depth (mm)
0	30
0.50	65
1.0	95
1.5	115
2	125
3	140
4	155
5	160
6	170
7	175
9	180
10	185
18	212.5
30	235
42	250

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	30.0
Depth to base of pit =	300.0
Depth to water at 75% level =	97.5
Depth to water at 50% level =	165.0
Depth to water at 25% level =	232.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.252
Volume outflow 75 - 25% (m^3) =	0.012

From the graph:	
tp 75 (min) =	1.1
tp 25 (min) =	28.5

Soil infiltration rate, f, (m/s) =		**2.93E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**RC**	**Date:**	**25/10/2023**
Checked by:	**PB**	**Date:**	**25/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP05: Test 3**

CALCULATION OF SOIL INFILTRATION RATE

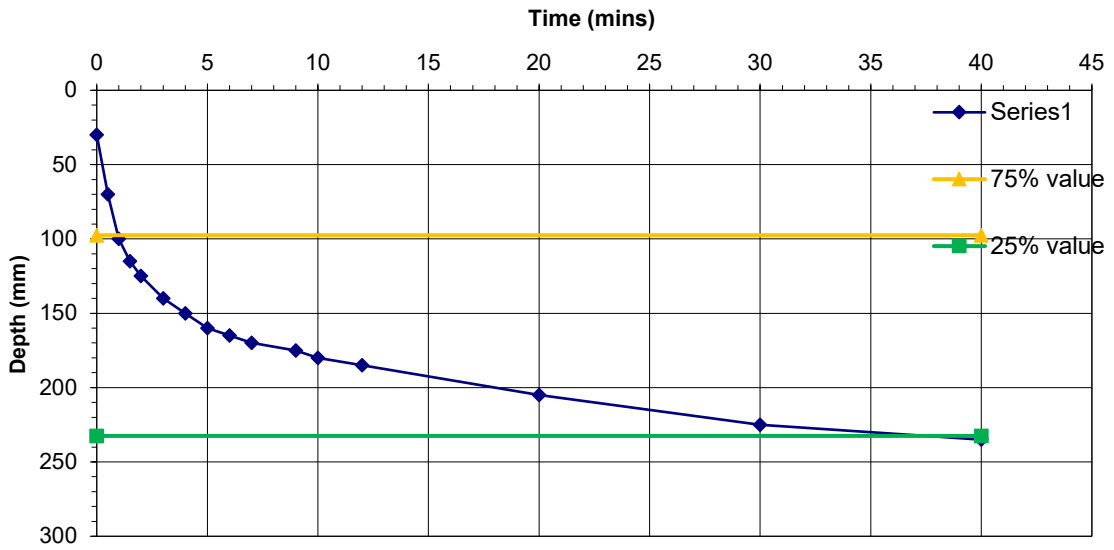
Time (mins)	Depth (mm)
0	30
0.50	70
1.0	100
1.5	115
2	125
3	140
4	150
5	160
6	165
7	170
9	175
10	180
12	185
20	205
30	225
40	235

Size of Trial Pit		
	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	30.0
Depth to base of pit =	300.0
Depth to water at 75% level =	97.5
Depth to water at 50% level =	165.0
Depth to water at 25% level =	232.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.252
Volume outflow 75 - 25% (m^3) =	0.012

From the graph:	
tp 75 (min) =	0.9
tp 25 (min) =	37

Soil infiltration rate, f, (m/s) =		**2.23E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**RC**	**Date:**	**22/09/2023**
Checked by:	**PB**	**Date:**	**27/09/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP06: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

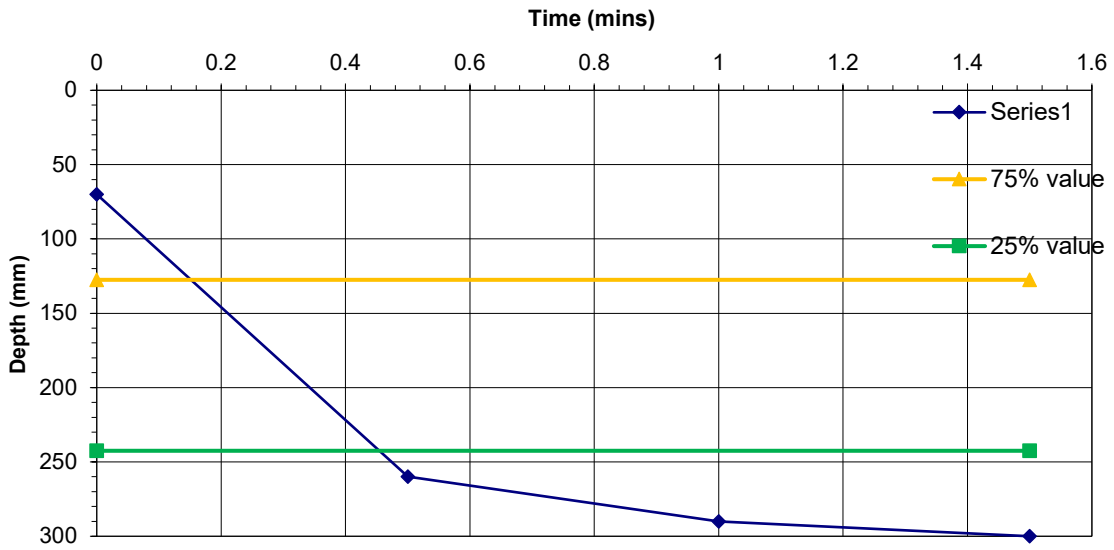
Time (mins)	Depth (mm)
0	70
0.5	260
1	290
1.5	300

Size of Trial Pit	Length (m) =	0.50
	Width (m) =	0.40
	Depth (m) =	0.30

Depth to water at start of test =	70.0
Depth to base of pit =	300.0
Depth to water at 75% level =	127.5
Depth to water at 50% level =	185.0
Depth to water at 25% level =	242.5
Base area of pit (m^2) =	0.200
Eff area of loss 75 - 25% (m^2) =	0.407
Volume outflow 75 - 25% (m^3) =	0.023

From the graph:	
tp 75 (min) =	0.15
tp 25 (min) =	0.45

Soil infiltration rate, f, (m/s) =		**3.14E-03**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**RC**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP06: Test 2**

CALCULATION OF SOIL INFILTRATION RATE

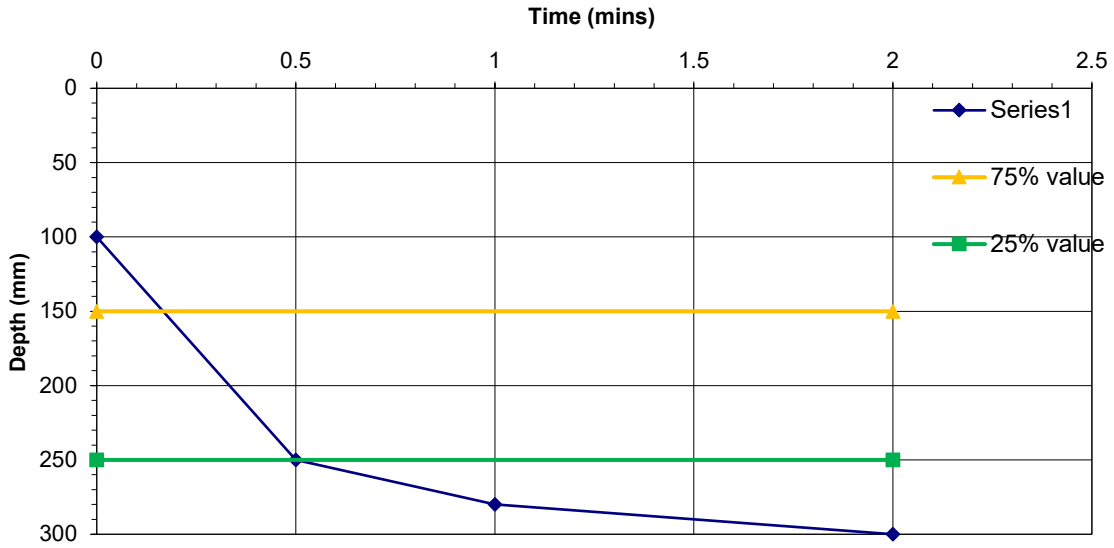
Time (mins)	Depth (mm)
0	100
0.5	250
1	280
2	300

Size of Trial Pit		
	Length (m) =	0.50
	Width (m) =	0.40
	Depth (m) =	0.30

Depth to water at start of test =	100.0
Depth to base of pit =	300.0
Depth to water at 75% level =	150.0
Depth to water at 50% level =	200.0
Depth to water at 25% level =	250.0
Base area of pit (m^2) =	0.200
Eff area of loss 75 - 25% (m^2) =	0.380
Volume outflow 75 - 25% (m^3) =	0.020

From the graph:	
tp 75 (min) =	0.2
tp 25 (min) =	0.5

Soil infiltration rate, f, (m/s) =		**2.92E-03**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP06: Test 3**

CALCULATION OF SOIL INFILTRATION RATE

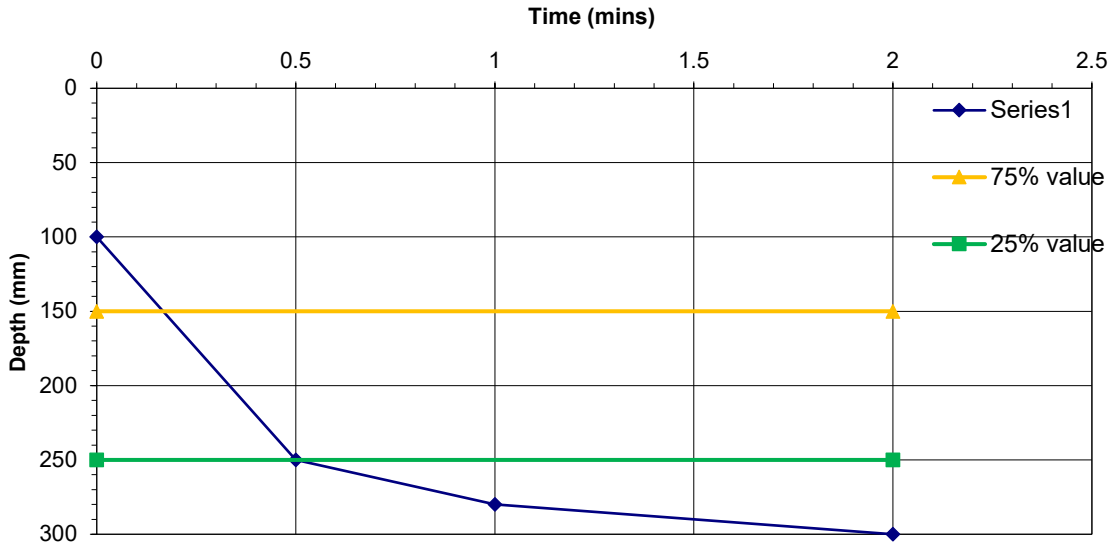
Time (mins)	Depth (mm)
0	100
0.5	250
1	280
2	300

Size of Trial Pit		
	Length (m) =	0.50
	Width (m) =	0.40
	Depth (m) =	0.30

Depth to water at start of test =	100.0
Depth to base of pit =	300.0
Depth to water at 75% level =	150.0
Depth to water at 50% level =	200.0
Depth to water at 25% level =	250.0
Base area of pit (m^2) =	0.200
Eff area of loss 75 - 25% (m^2) =	0.380
Volume outflow 75 - 25% (m^3) =	0.020

From the graph:	
tp 75 (min) =	0.2
tp 25 (min) =	0.5

Soil infiltration rate, f, (m/s) =		**2.92E-03**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP07: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

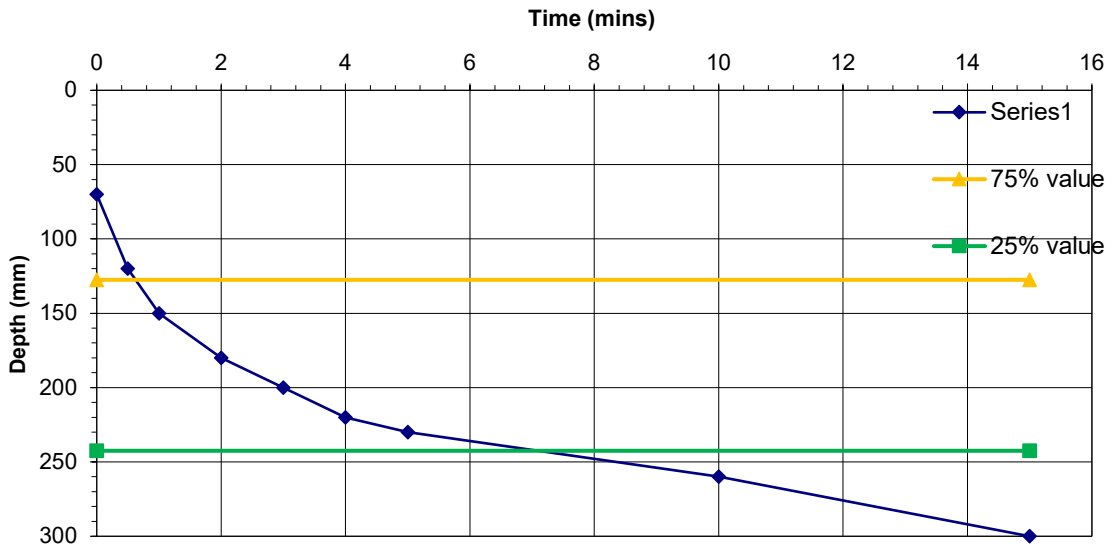
Time (mins)	Depth (mm)
0	70
0.5	120
1	150
2	180
3	200
4	220
5	230
10	260
15	300

Size of Trial Pit		
	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	70.0
Depth to base of pit =	300.0
Depth to water at 75% level =	127.5
Depth to water at 50% level =	185.0
Depth to water at 25% level =	242.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.228
Volume outflow 75 - 25% (m^3) =	0.010

From the graph:	
tp 75 (min) =	1.2
tp 25 (min) =	7.2

Soil infiltration rate, f, (m/s) =		**1.26E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP07: Test 2**

CALCULATION OF SOIL INFILTRATION RATE

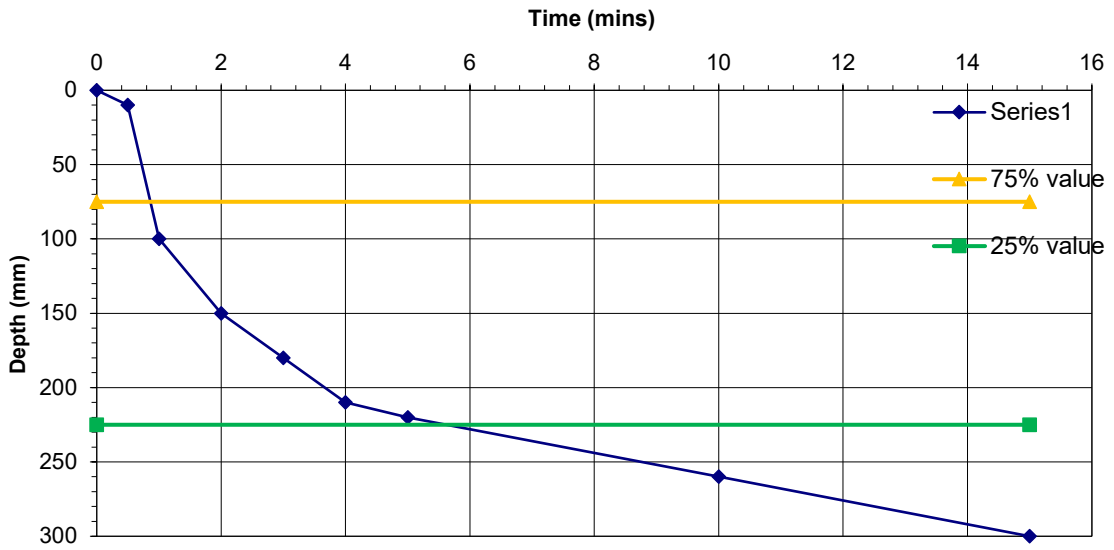
Time (mins)	Depth (mm)
0	0
0.5	10
1	100
2	150
3	180
4	210
5	220
10	260
15	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	0.0
Depth to base of pit =	300.0
Depth to water at 75% level =	75.0
Depth to water at 50% level =	150.0
Depth to water at 25% level =	225.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.270
Volume outflow 75 - 25% (m^3) =	0.014

From the graph:	
tp 75 (min) =	0.8
tp 25 (min) =	5.6

Soil infiltration rate, f, (m/s) =		**1.74E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP07: Test 3**

CALCULATION OF SOIL INFILTRATION RATE

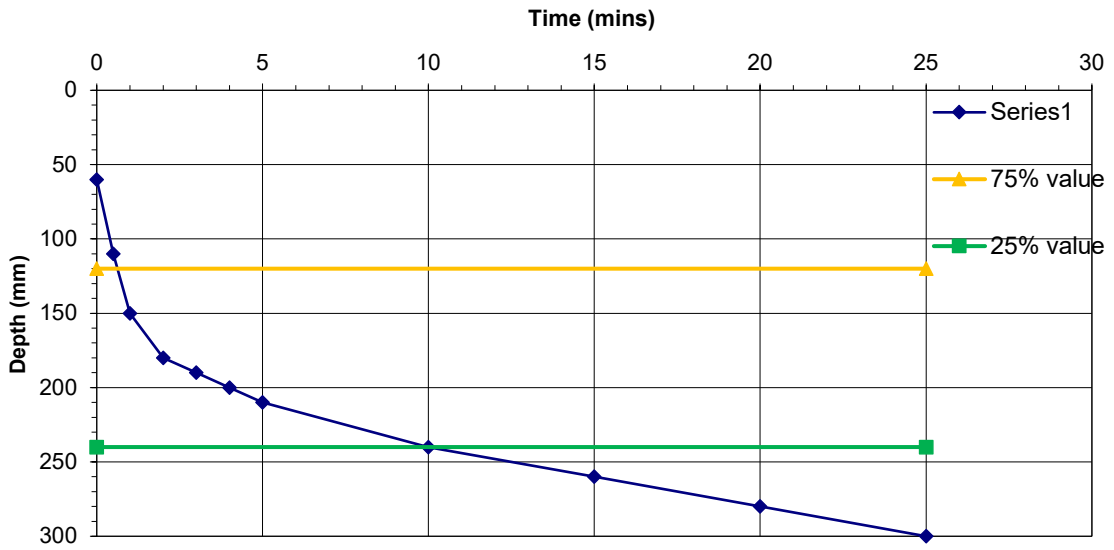
Time (mins)	Depth (mm)
0	60
0.5	110
1	150
2	180
3	190
4	200
5	210
10	240
15	260
20	280
25	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	60.0
Depth to base of pit =	300.0
Depth to water at 75% level =	120.0
Depth to water at 50% level =	180.0
Depth to water at 25% level =	240.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.234
Volume outflow 75 - 25% (m^3) =	0.011

From the graph:	
tp 75 (min) =	0.6
tp 25 (min) =	10

Soil infiltration rate, f, (m/s) =		**8.18E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP08: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

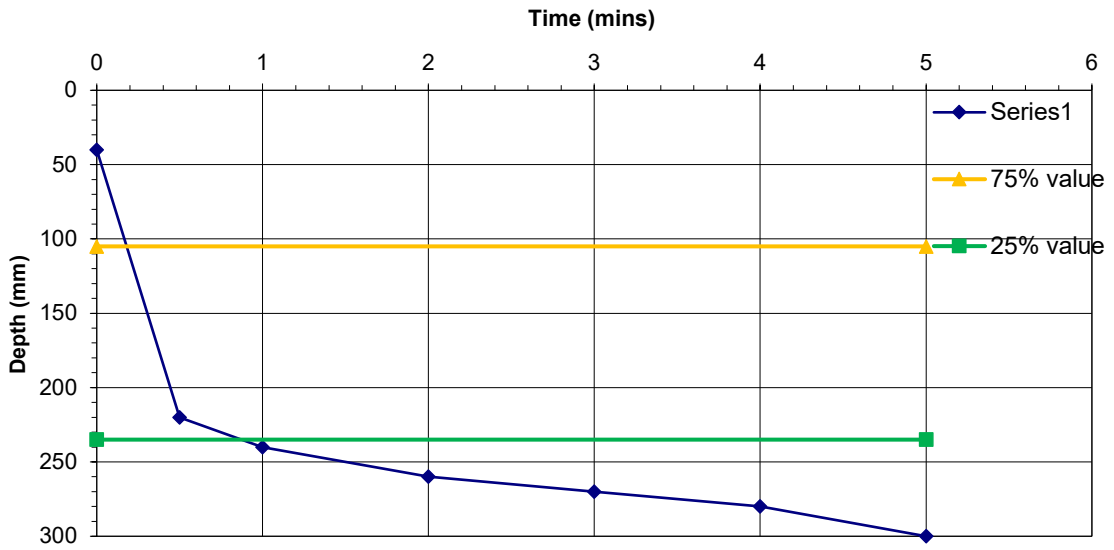
Time (mins)	Depth (mm)
0	40
0.5	220
1	240
2	260
3	270
4	280
5	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	40.0
Depth to base of pit =	300.0
Depth to water at 75% level =	105.0
Depth to water at 50% level =	170.0
Depth to water at 25% level =	235.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.246
Volume outflow 75 - 25% (m^3) =	0.012

From the graph:	
tp 75 (min) =	0.3
tp 25 (min) =	0.8

Soil infiltration rate, f, (m/s) =		**1.59E-03**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP08: Test 2**

CALCULATION OF SOIL INFILTRATION RATE

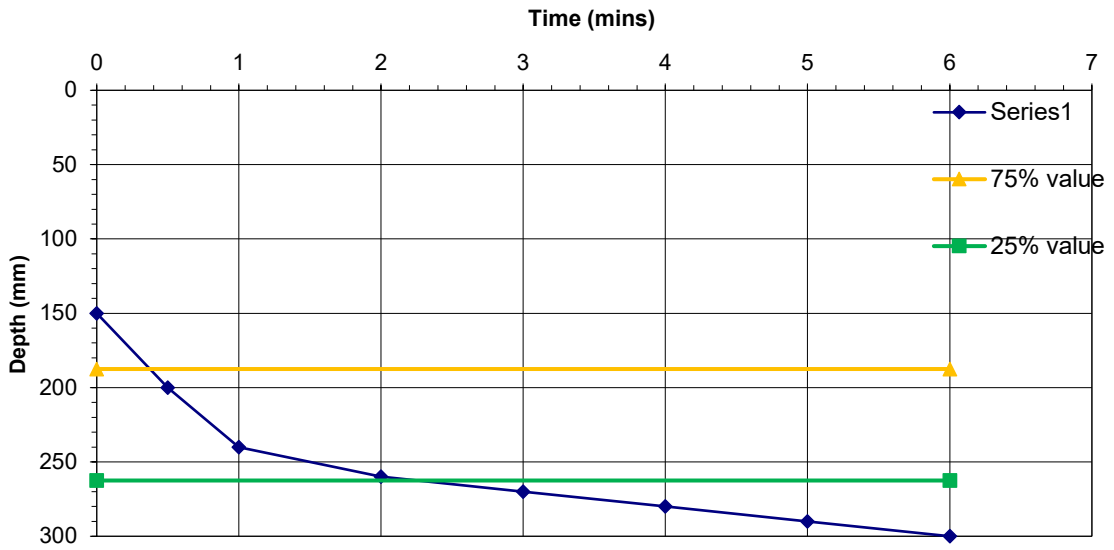
Time (mins)	Depth (mm)
0	150
0.5	200
1	240
2	260
3	270
4	280
5	290
6	300

Size of Trial Pit		
	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	150.0
Depth to base of pit =	300.0
Depth to water at 75% level =	187.5
Depth to water at 50% level =	225.0
Depth to water at 25% level =	262.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.180
Volume outflow 75 - 25% (m^3) =	0.007

From the graph:	
tp 75 (min) =	0.4
tp 25 (min) =	2.2

Soil infiltration rate, f, (m/s) =		**3.47E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP08: Test 3**

CALCULATION OF SOIL INFILTRATION RATE

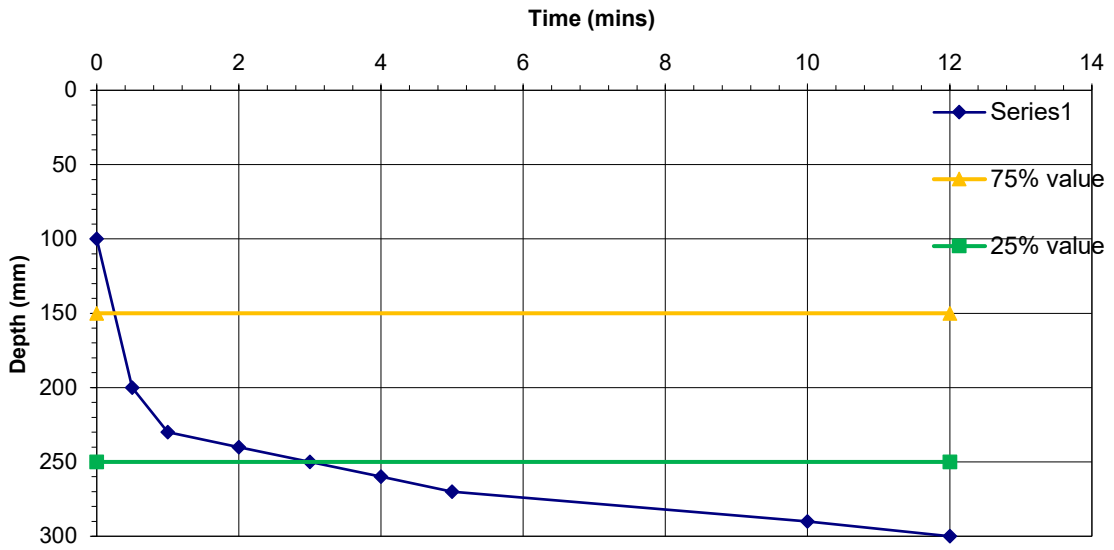
Time (mins)	Depth (mm)
0	100
0.5	200
1	230
2	240
3	250
4	260
5	270
10	290
12	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	100.0
Depth to base of pit =	300.0
Depth to water at 75% level =	150.0
Depth to water at 50% level =	200.0
Depth to water at 25% level =	250.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.210
Volume outflow 75 - 25% (m^3) =	0.009

From the graph:	
tp 75 (min) =	0.25
tp 25 (min) =	3

Soil infiltration rate, f, (m/s) =		**2.60E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP09: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

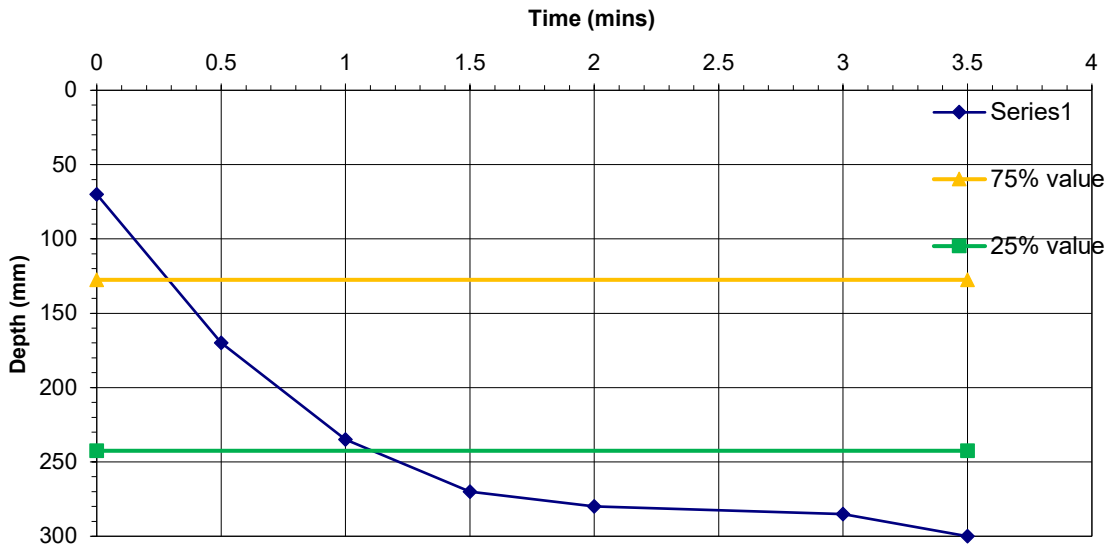
Time (mins)	Depth (mm)
0	70
0.5	170
1	235
1.5	270
2	280
3	285
3.5	300

Size of Trial Pit		
	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	70.0
Depth to base of pit =	300.0
Depth to water at 75% level =	127.5
Depth to water at 50% level =	185.0
Depth to water at 25% level =	242.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.228
Volume outflow 75 - 25% (m^3) =	0.010

From the graph:	
tp 75 (min) =	0.3
tp 25 (min) =	1.1

Soil infiltration rate, f, (m/s) =		**9.46E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP09: Test 2**

CALCULATION OF SOIL INFILTRATION RATE

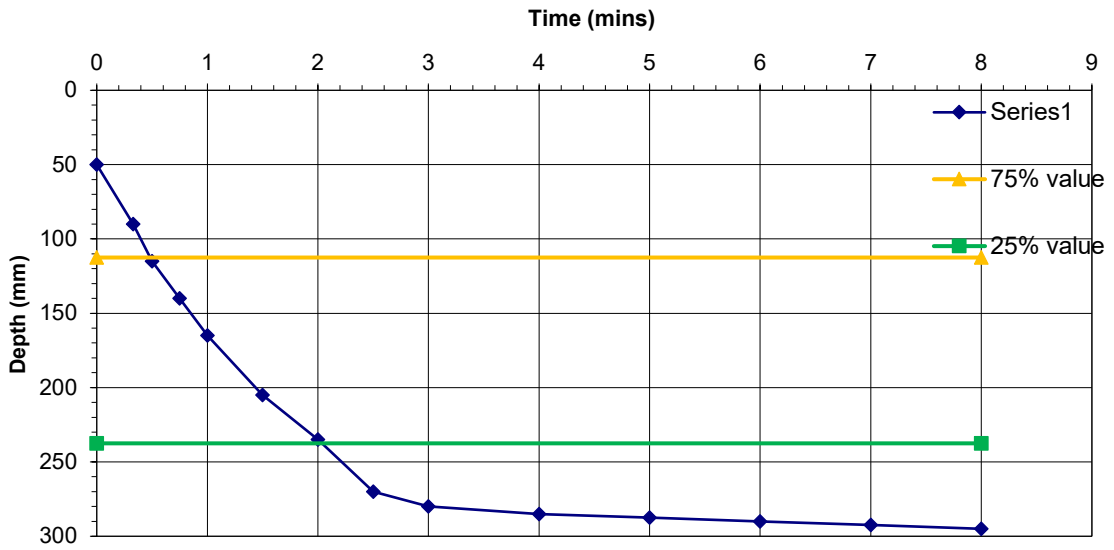
Time (mins)	Depth (mm)
0	50
0.33	90
0.5	115
0.75	140
1	165
1.5	205
2	235
2.5	270
3	280
4	285
5	287.5
6	290
7	292.5
8	295

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	50.0
Depth to base of pit =	300.0
Depth to water at 75% level =	112.5
Depth to water at 50% level =	175.0
Depth to water at 25% level =	237.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.240
Volume outflow 75 - 25% (m^3) =	0.011

From the graph:	
tp 75 (min) =	0.4
tp 25 (min) =	2

Soil infiltration rate, f, (m/s) =		**4.88E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP09: Test 3**

CALCULATION OF SOIL INFILTRATION RATE

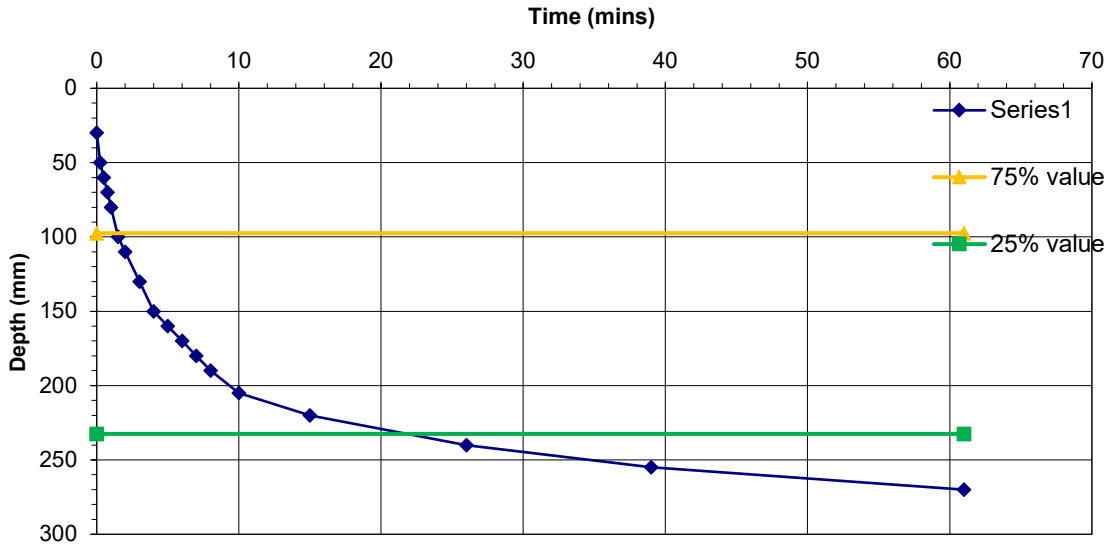
Time (mins)	Depth (mm)
0	30
0.25	50
0.5	60
0.75	70
1	80
1.5	100
2	110
3	130
4	150
5	160
6	170
7	180
8	190
10	205
15	220
26	240
39	255
61	270

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	30.0
Depth to base of pit =	300.0
Depth to water at 75% level =	97.5
Depth to water at 50% level =	165.0
Depth to water at 25% level =	232.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.252
Volume outflow 75 - 25% (m^3) =	0.012

From the graph:	
tp 75 (min) =	1.5
tp 25 (min) =	22

Soil infiltration rate, f, (m/s) =		**3.92E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP10: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

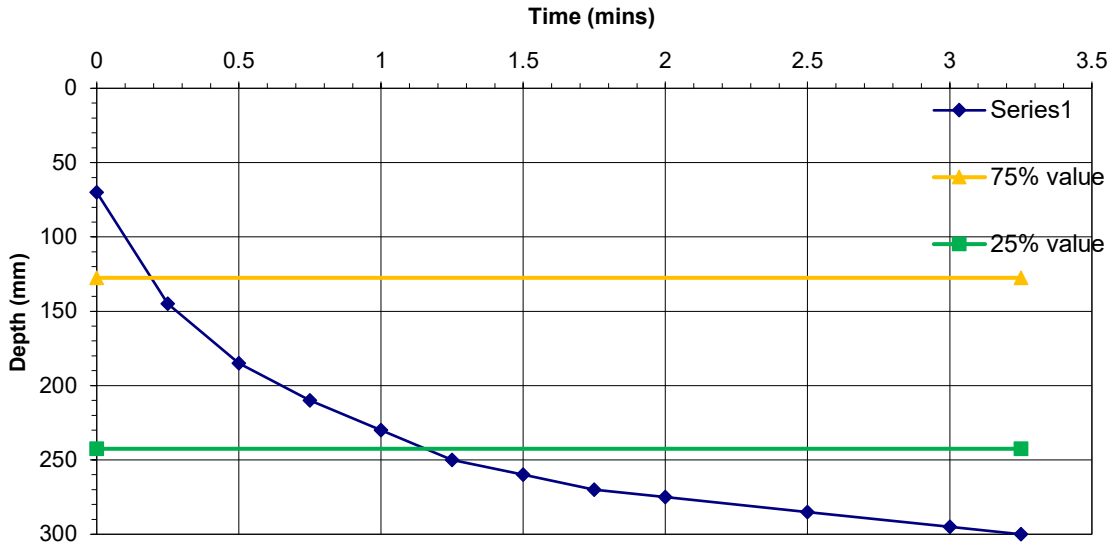
Time (mins)	Depth (mm)
0	70
0.25	145
0.5	185
0.75	210
1	230
1.25	250
1.5	260
1.75	270
2	275
2.5	285
3	295
3.25	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	70.0
Depth to base of pit =	300.0
Depth to water at 75% level =	127.5
Depth to water at 50% level =	185.0
Depth to water at 25% level =	242.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.228
Volume outflow 75 - 25% (m^3) =	0.010

From the graph:	
tp 75 (min) =	0.2
tp 25 (min) =	1.2

Soil infiltration rate, f, (m/s) =		**7.57E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP10: Test 2**

CALCULATION OF SOIL INFILTRATION RATE

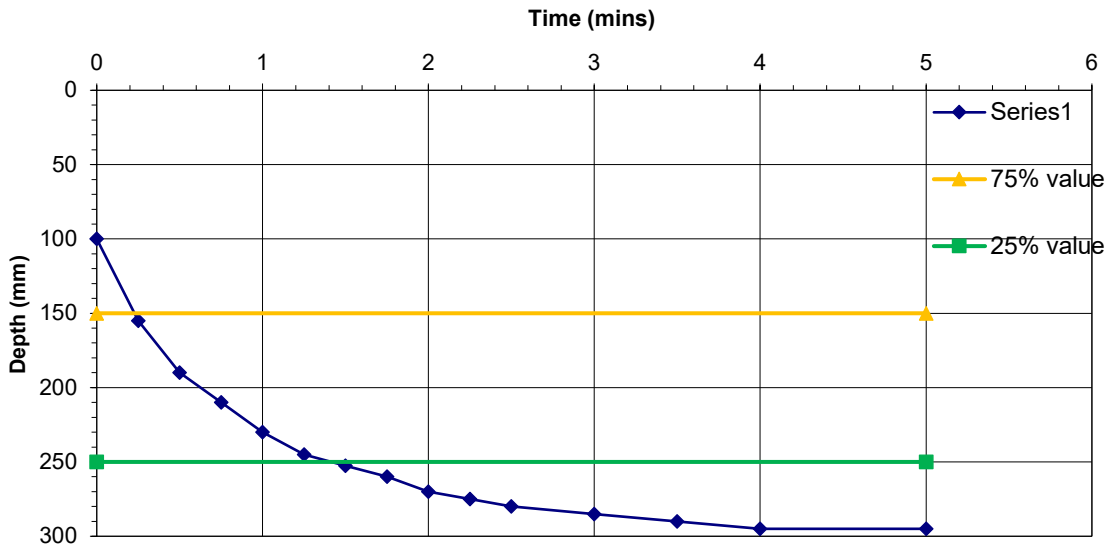
Time (mins)	Depth (mm)
0	100
0.25	155
0.5	190
0.75	210
1	230
1.25	245
1.5	252.5
1.75	260
2	270
2.25	275
2.5	280
3	285
3.5	290
4	295
5	295

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	100.0
Depth to base of pit =	300.0
Depth to water at 75% level =	150.0
Depth to water at 50% level =	200.0
Depth to water at 25% level =	250.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.210
Volume outflow 75 - 25% (m^3) =	0.009

From the graph:	
tp 75 (min) =	0.2
tp 25 (min) =	1.5

Soil infiltration rate, f, (m/s) =		**5.49E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP10: Test 3**

CALCULATION OF SOIL INFILTRATION RATE

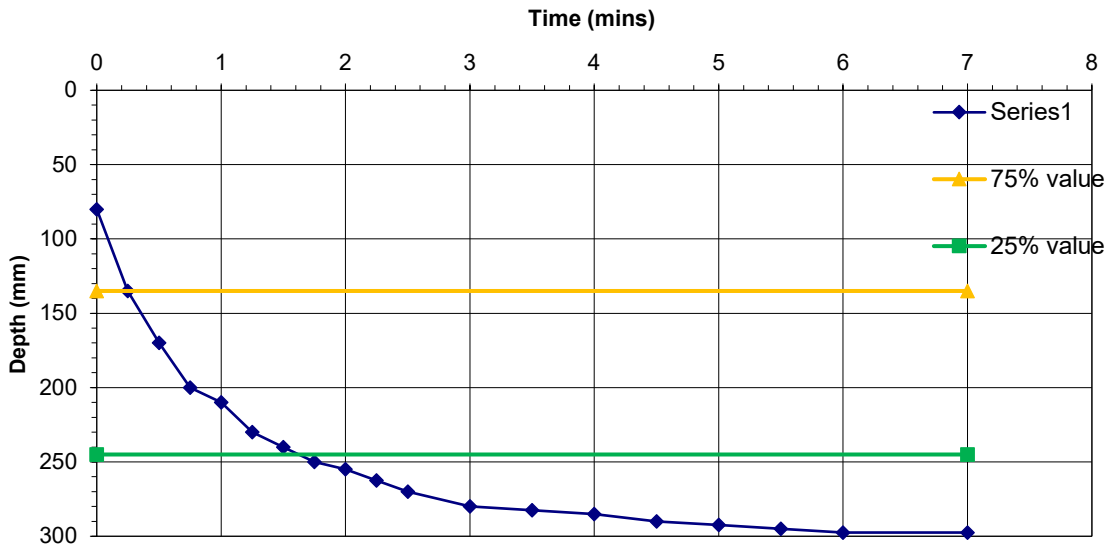
Time (mins)	Depth (mm)
0	80
0.25	135
0.5	170
0.75	200
1	210
1.25	230
1.5	240
1.75	250
2	255
2.25	262.5
2.5	270
3	280
3.5	282.5
4	285
4.5	290
5	292.5
5.5	295
6	297.5
7	297.5

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	80.0
Depth to base of pit =	300.0
Depth to water at 75% level =	135.0
Depth to water at 50% level =	190.0
Depth to water at 25% level =	245.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.222
Volume outflow 75 - 25% (m^3) =	0.010

From the graph:	
tp 75 (min) =	0.25
tp 25 (min) =	1.6

Soil infiltration rate, f, (m/s) =		**5.51E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP11: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

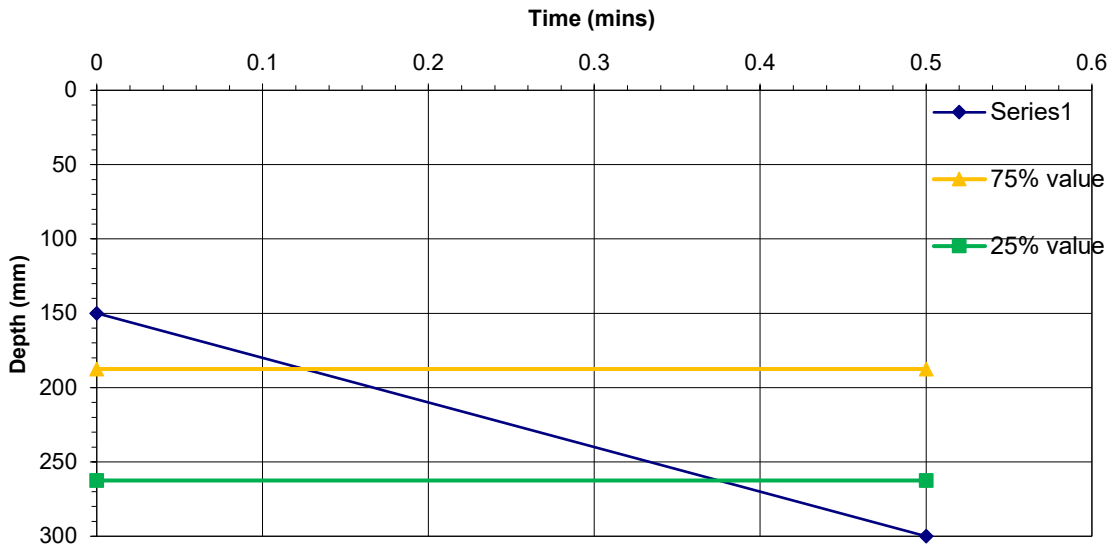
Time (mins)	Depth (mm)
0	150
0.5	300

Size of Trial Pit	Length (m) =	0.50
	Width (m) =	0.40
	Depth (m) =	0.30

Depth to water at start of test =	150.0
Depth to base of pit =	300.0
Depth to water at 75% level =	187.5
Depth to water at 50% level =	225.0
Depth to water at 25% level =	262.5
Base area of pit (m^2) =	0.200
Eff area of loss 75 - 25% (m^2) =	0.335
Volume outflow 75 - 25% (m^3) =	0.015

From the graph:	
tp 75 (min) =	0.12
tp 25 (min) =	0.38

Soil infiltration rate, f, (m/s) =		**2.87E-03**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP11: Test 2**

CALCULATION OF SOIL INFILTRATION RATE

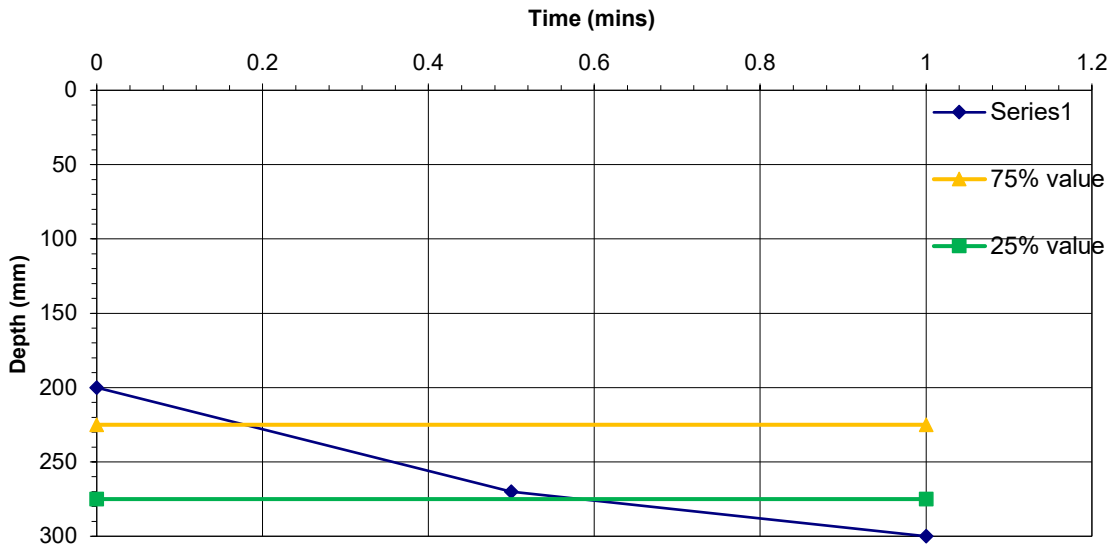
Time (mins)	Depth (mm)
0	200
0.5	270
1	300

Size of Trial Pit	Length (m) =	0.50
	Width (m) =	0.40
	Depth (m) =	0.30

Depth to water at start of test =	200.0
Depth to base of pit =	300.0
Depth to water at 75% level =	225.0
Depth to water at 50% level =	250.0
Depth to water at 25% level =	275.0
Base area of pit (m^2) =	0.200
Eff area of loss 75 - 25% (m^2) =	0.290
Volume outflow 75 - 25% (m^3) =	0.010

From the graph:	
tp 75 (min) =	0.18
tp 25 (min) =	0.56

Soil infiltration rate, f, (m/s) =		**1.51E-03**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP11: Test 3**

CALCULATION OF SOIL INFILTRATION RATE

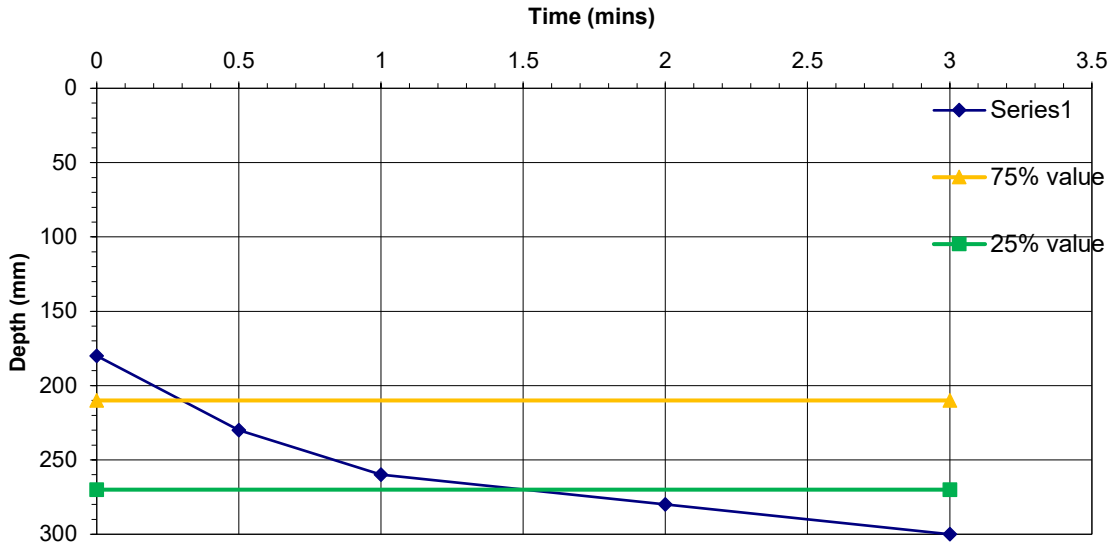
Time (mins)	Depth (mm)
0	180
0.5	230
1	260
2	280
3	300

Size of Trial Pit	Length (m) = 0.50
	Width (m) = 0.40
	Depth (m) = 0.30

Depth to water at start of test =	180.0
Depth to base of pit =	300.0
Depth to water at 75% level =	210.0
Depth to water at 50% level =	240.0
Depth to water at 25% level =	270.0
Base area of pit (m^2) =	0.200
Eff area of loss 75 - 25% (m^2) =	0.308
Volume outflow 75 - 25% (m^3) =	0.012

From the graph:	
tp 75 (min) =	0.3
tp 25 (min) =	1.5

Soil infiltration rate, f, (m/s) =		**5.41E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP12: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

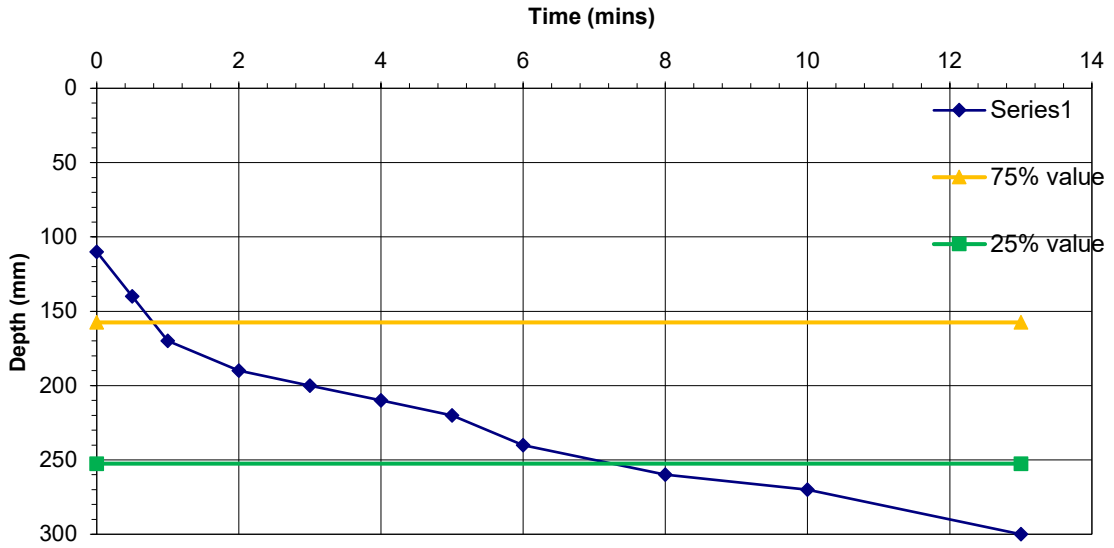
Time (mins)	Depth (mm)
0	110
0.5	140
1	170
2	190
3	200
4	210
5	220
6	240
8	260
10	270
13	300

Size of Trial Pit		
	Length (m) =	0.50
	Width (m) =	0.40
	Depth (m) =	0.30

Depth to water at start of test =	110.0
Depth to base of pit =	300.0
Depth to water at 75% level =	157.5
Depth to water at 50% level =	205.0
Depth to water at 25% level =	252.5
Base area of pit (m^2) =	0.200
Eff area of loss 75 - 25% (m^2) =	0.371
Volume outflow 75 - 25% (m^3) =	0.019

From the graph:	
tp 75 (min) =	0.75
tp 25 (min) =	7.3

Soil infiltration rate, f, (m/s) =		**1.30E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP12: Test 2**

CALCULATION OF SOIL INFILTRATION RATE

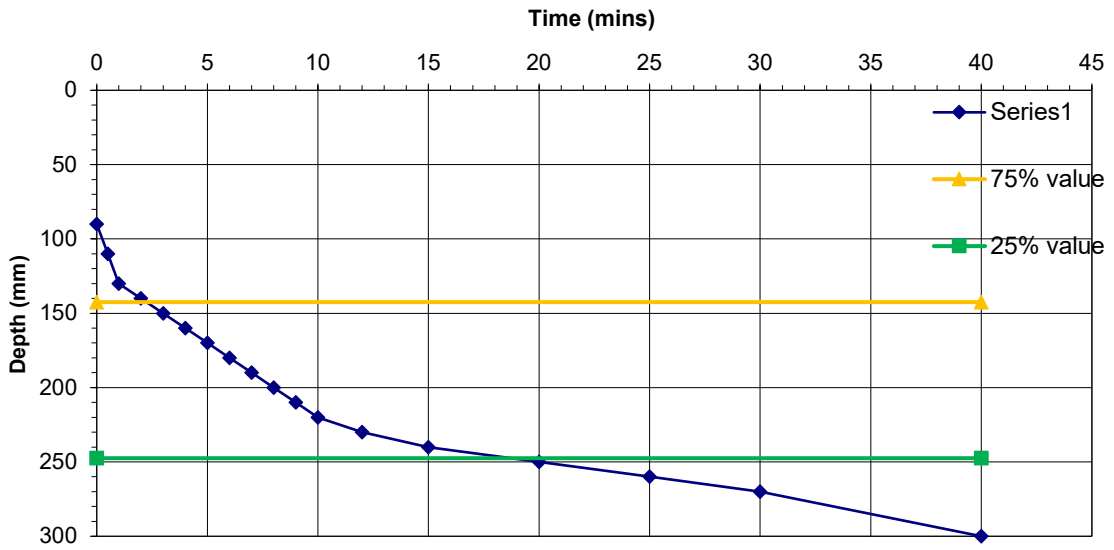
Time (mins)	Depth (mm)
0	90
0.5	110
1	130
2	140
3	150
4	160
5	170
6	180
7	190
8	200
9	210
10	220
12	230
15	240
20	250
25	260
30	270
40	300

Size of Trial Pit	Length (m) =	0.50
	Width (m) =	0.40
	Depth (m) =	0.30

Depth to water at start of test =	90.0
Depth to base of pit =	300.0
Depth to water at 75% level =	142.5
Depth to water at 50% level =	195.0
Depth to water at 25% level =	247.5
Base area of pit (m^2) =	0.200
Eff area of loss 75 - 25% (m^2) =	0.389
Volume outflow 75 - 25% (m^3) =	0.021

From the graph:	
tp 75 (min) =	2
tp 25 (min) =	19

Soil infiltration rate, f, (m/s) =		**5.29E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP12: Test 3**

CALCULATION OF SOIL INFILTRATION RATE

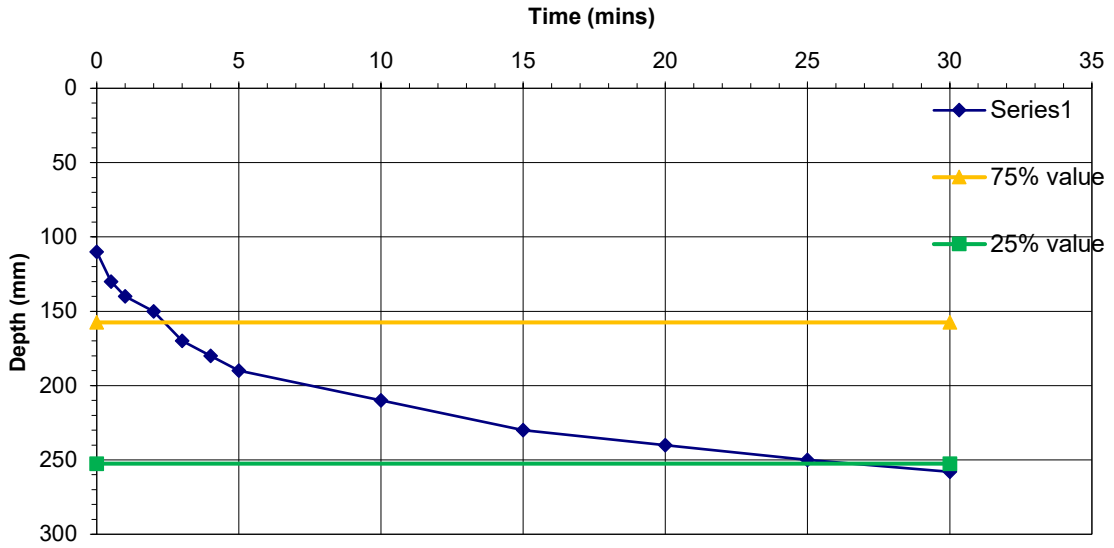
Time (mins)	Depth (mm)
0	110
0.5	130
1	140
2	150
3	170
4	180
5	190
10	210
15	230
20	240
25	250
30	258

Size of Trial Pit		
	Length (m) =	0.50
	Width (m) =	0.40
	Depth (m) =	0.30

Depth to water at start of test =	110.0
Depth to base of pit =	300.0
Depth to water at 75% level =	157.5
Depth to water at 50% level =	205.0
Depth to water at 25% level =	252.5
Base area of pit (m^2) =	0.200
Eff area of loss 75 - 25% (m^2) =	0.371
Volume outflow 75 - 25% (m^3) =	0.019

From the graph:	
tp 75 (min) =	2.25
tp 25 (min) =	27

Soil infiltration rate, f, (m/s) =		**3.45E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP13: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

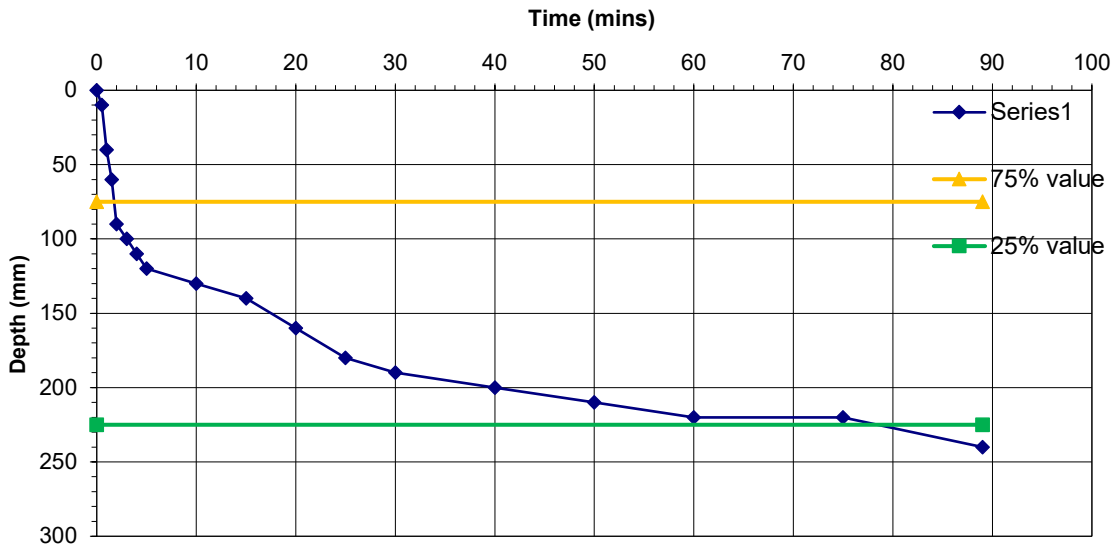
Time (mins)	Depth (mm)
0	0
0.5	10
1	40
1.5	60
2	90
3	100
4	110
5	120
10	130
15	140
20	160
25	180
30	190
40	200
50	210
60	220
75	220
89	240

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	0.0
Depth to base of pit =	300.0
Depth to water at 75% level =	75.0
Depth to water at 50% level =	150.0
Depth to water at 25% level =	225.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.270
Volume outflow 75 - 25% (m^3) =	0.014

From the graph:	
tp 75 (min) =	1.6
tp 25 (min) =	77

Soil infiltration rate, f, (m/s) =		**1.11E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP14: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

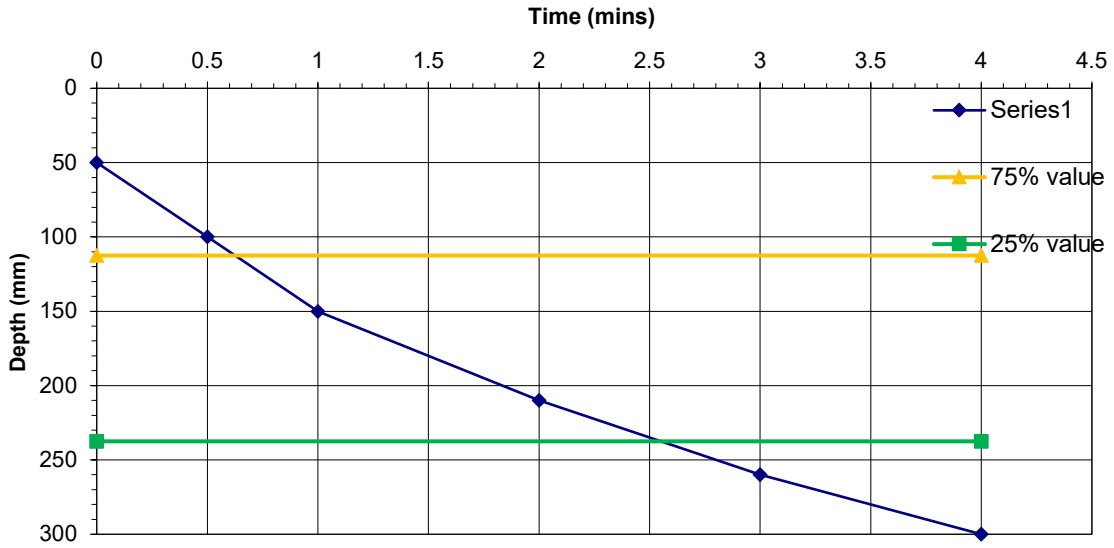
Time (mins)	Depth (mm)
0	50
0.5	100
1	150
2	210
3	260
4	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	50.0
Depth to base of pit =	300.0
Depth to water at 75% level =	112.5
Depth to water at 50% level =	175.0
Depth to water at 25% level =	237.5
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.240
Volume outflow 75 - 25% (m^3) =	0.011

From the graph:	
tp 75 (min) =	0.65
tp 25 (min) =	2.55

Soil infiltration rate, f, (m/s) =		**4.11E-04**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP14: Test 2**

CALCULATION OF SOIL INFILTRATION RATE

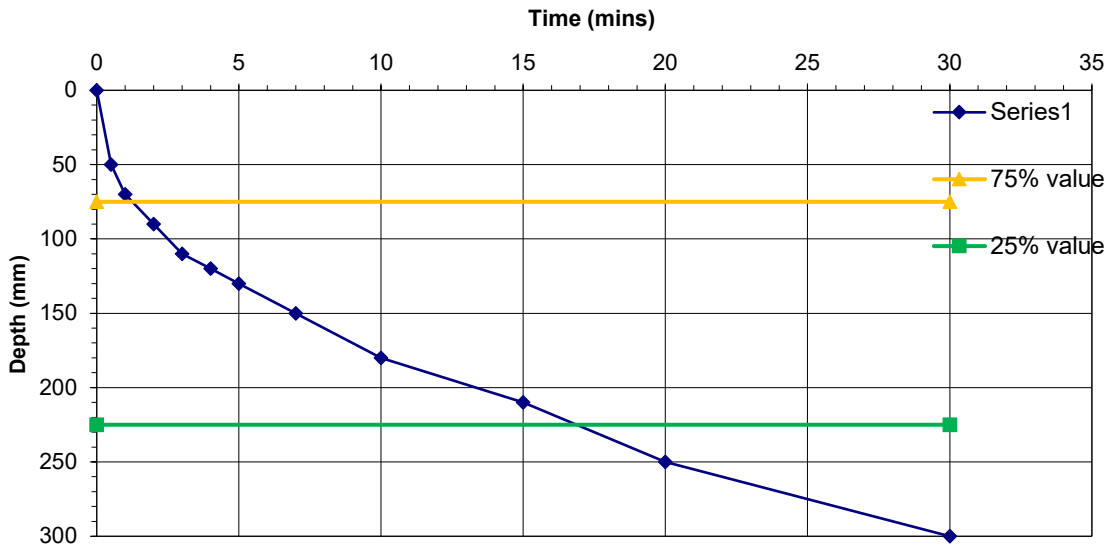
Time (mins)	Depth (mm)
0	0
0.5	50
1	70
2	90
3	110
4	120
5	130
7	150
10	180
15	210
20	250
30	300

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	0.0
Depth to base of pit =	300.0
Depth to water at 75% level =	75.0
Depth to water at 50% level =	150.0
Depth to water at 25% level =	225.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.270
Volume outflow 75 - 25% (m^3) =	0.014

From the graph:	
tp 75 (min) =	1.1
tp 25 (min) =	17

Soil infiltration rate, f, (m/s) =		**5.24E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

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SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP14: Test 3**

CALCULATION OF SOIL INFILTRATION RATE

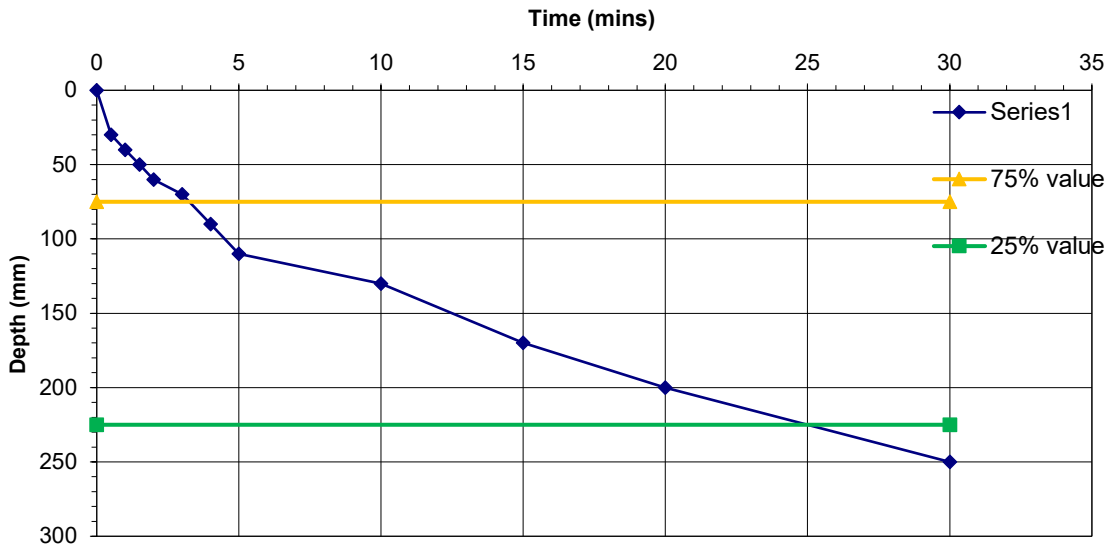
Time (mins)	Depth (mm)
0	0
0.5	30
1	40
1.5	50
2	60
3	70
4	90
5	110
10	130
15	170
20	200
30	250

Size of Trial Pit	Length (m) =	0.30
	Width (m) =	0.30
	Depth (m) =	0.30

Depth to water at start of test =	0.0
Depth to base of pit =	300.0
Depth to water at 75% level =	75.0
Depth to water at 50% level =	150.0
Depth to water at 25% level =	225.0
Base area of pit (m^2) =	0.090
Eff area of loss 75 - 25% (m^2) =	0.270
Volume outflow 75 - 25% (m^3) =	0.014

From the graph:	
tp 75 (min) =	3.1
tp 25 (min) =	25

Soil infiltration rate, f, (m/s) =		**3.81E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

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SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP15: Test 1**

CALCULATION OF SOIL INFILTRATION RATE

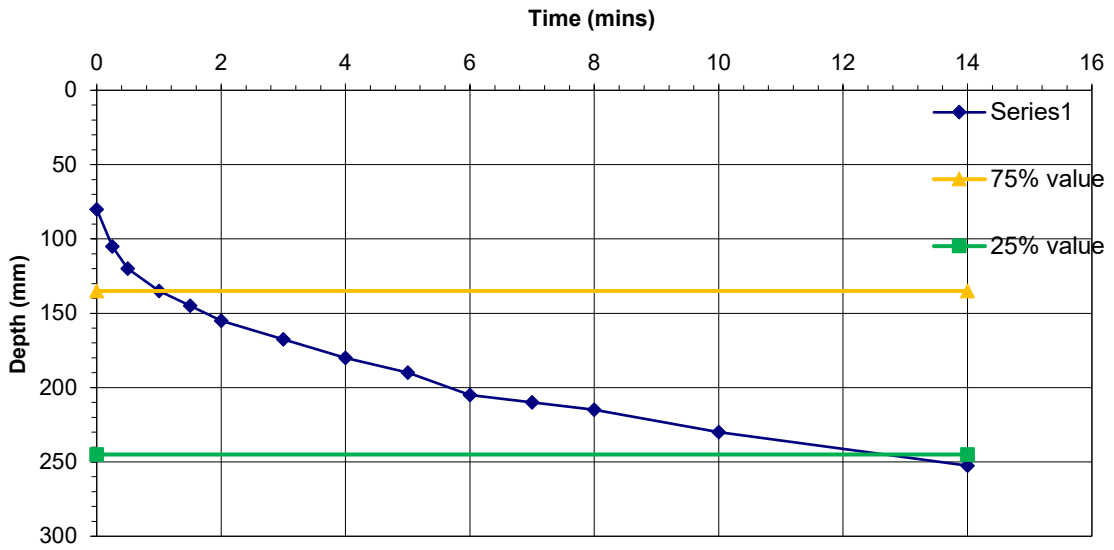
Time (mins)	Depth (mm)
0	80
0.25	105
0.5	120
1	135
1.5	145
2	155
3	167.5
4	180
5	190
6	205
7	210
8	215
10	230
14	252.5

Size of Trial Pit	Length (m) =	0.35
	Width (m) =	0.35
	Depth (m) =	0.30

Depth to water at start of test =	80.0
Depth to base of pit =	300.0
Depth to water at 75% level =	135.0
Depth to water at 50% level =	190.0
Depth to water at 25% level =	245.0
Base area of pit (m^2) =	0.123
Eff area of loss 75 - 25% (m^2) =	0.277
Volume outflow 75 - 25% (m^3) =	0.013

From the graph:	
tp 75 (min) =	1
tp 25 (min) =	12.8

Soil infiltration rate, f, (m/s) =		**6.88E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

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SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP15: Test 2**

CALCULATION OF SOIL INFILTRATION RATE

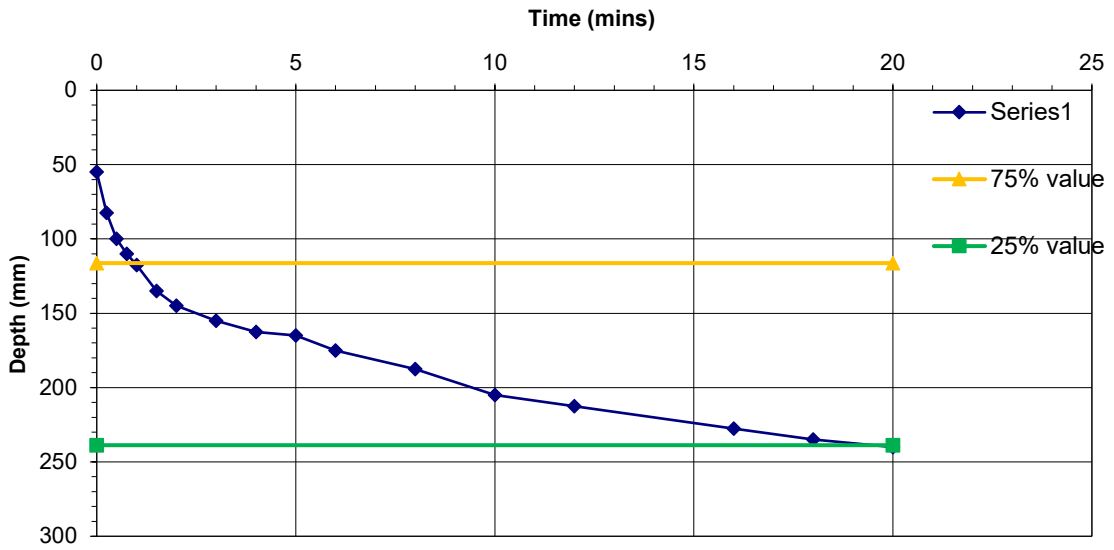
Time (mins)	Depth (mm)
0	55
0.25	82.5
0.5	100
0.75	110
1	117.5
1.5	135
2	145
3	155
4	162.5
5	165
6	175
8	187.5
10	205
12	212.5
16	227.5
18	235
20	240

Size of Trial Pit	Length (m) =	0.35
	Width (m) =	0.35
	Depth (m) =	0.30

Depth to water at start of test =	55.0
Depth to base of pit =	300.0
Depth to water at 75% level =	116.3
Depth to water at 50% level =	177.5
Depth to water at 25% level =	238.8
Base area of pit (m^2) =	0.123
Eff area of loss 75 - 25% (m^2) =	0.294
Volume outflow 75 - 25% (m^3) =	0.015

From the graph:	
tp 75 (min) =	0.9
tp 25 (min) =	19

Soil infiltration rate, f, (m/s) =		**4.70E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

IAN FARMER ASSOCIATES

SOIL PERCOLATION TEST
Building Regulations: 2000: Approved Document H and BS6297+A1: 2008

Client:	**Dallas Burston Property Limited**		
Site:	**Brixworth Percolation Testing**		
Job No:	**2221120**	**Test No:**	**TP15: Test 3**

CALCULATION OF SOIL INFILTRATION RATE

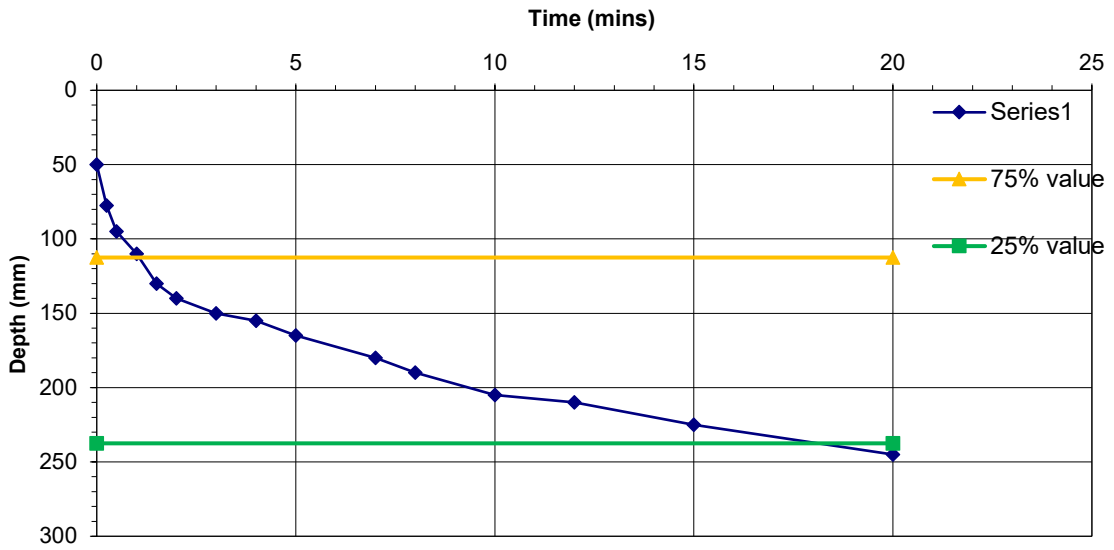
Time (mins)	Depth (mm)
0	50
0.25	77.5
0.5	95
1	110
1.5	130
2	140
3	150
4	155
5	165
7	180
8	190
10	205
12	210
15	225
20	245

Size of Trial Pit		
	Length (m) =	0.35
	Width (m) =	0.35
	Depth (m) =	0.30

Depth to water at start of test =	50.0
Depth to base of pit =	300.0
Depth to water at 75% level =	112.5
Depth to water at 50% level =	175.0
Depth to water at 25% level =	237.5
Base area of pit (m^2) =	0.123
Eff area of loss 75 - 25% (m^2) =	0.298
Volume outflow 75 - 25% (m^3) =	0.015

From the graph:	
tp 75 (min) =	1.1
tp 25 (min) =	18

Soil infiltration rate, f, (m/s) =		**5.08E-05**	**normal test**
Time for 1mm (Vp) =			**Seconds**
Input by:	**DS**	**Date:**	**26/10/2023**
Checked by:	**PB**	**Date:**	**30/10/2023**



Notes

Test pit from 1.00m to 1.30mbgl.

- Coventry
- Glasgow
- Hemel Hempstead
- Newcastle-upon-Tyne
- Warrington
- Washington

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