East of 107a Gardner Road
Portslade

In Situ Infiltration Test Report

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TABLE OF CONTENTS

1.	**INTRODUCTION**	**1**
2.	**SITE CONTEXT**	**2**
2.1	Site Location	2
2.2	Geological and Hydrogeological Data	2
3.	**SITE WORKS**	**4**
4.	**GROUND CONDITIONS**	**5**
4.1	Stratigraphy	5
4.2	Groundwater Conditions and Stability	5
5.	**STORMWATER INFILTRATION SYSTEMS**	**6**

FIGURES & APPENDICES

Figure 1 Site Location Plan
Figure 2 Site Plan
Proposed Development Layout
Exploratory Hole Notes
Exploratory Hole Records
Summary of Falling Head Soakage Test Results

1. INTRODUCTION

Ashdown Site Investigation Ltd was requested to undertake in situ infiltration testing and groundwater monitoring at land to the east of 107a Gardner Road, Portslade to assist others with the drainage design of the proposed development. A copy of the proposed development layout is included in the Appendices to this report.

The specific objectives of the works were to:
a) Investigate the shallow ground and groundwater conditions at the site;
b) Undertake in situ infiltration testing and provide calculated infiltration rates to assist other with the drainage design; and
c) Undertake groundwater monitoring between January and April 2024.

The scope of the works covered by this report, and the terms and conditions under which they were undertaken, were set out within the offer letter Q13648Rev1, dated 6th December 2023. The instruction to proceed was received on behalf of the client.

2. SITE CONTEXT

2.1 Site Location

The site comprises a plot of land located to the east of 107a Gardner Road, Portslade, and is centred on the approximate Ordnance Survey national grid reference 525186, 105212. A site location plan and site plan are presented as Figure 1 and Figure 2, respectively.

2.2 Geological and Hydrogeological Data

2.2.1 Expected Geology and Aquifer Designation

The stratigraphic succession that may be expected to underlie the site is presented in the following table.

Table 1. Expected Strata and Aquifer Designation

Type	Stratum	Aquifer Designation
Superficial	River Terrace Deposits	Secondary B Aquifer
Bedrock	Tarrant Chalk Member (White Chalk Subgroup)	Principal Aquifer

The River Terrace Deposits in this area were formerly denoted as the Brickearth and comprise brown sandy (fine) silt or clay largely originating from the solution weathering of the previously existing chalk. The material will have been reworked by water flow to produce some lateral variability in the grain size of the soil (sand and gravel) and can be expected to contain a variable content of flint.

The Tarrant Chalk Member forms part of the White Chalk Subgroup. The formation is of Coniacian to Campanian age (72.1 to 89.4 million years old; Late Cretaceous). The Tarrant Chalk Member is composed of white chalks with numerous marl seams and flint bands. The formation is known to contain distinct phosphatic chalks of limited lateral extent. The formation is recorded by the BGS to range in thickness up to 90m.

2.2.2 Natural Ground Subsidence

The chalk can be expected to have a deeply convoluted upper surface as a result of solution weathering and erosion. The presence of natural cavities in the chalk is very rare and solution features, if present, can be expected to be infilled with Quaternary Superficial Deposits. The infill material may be significantly weaker than the surrounding chalk. Solution features can comprise pipes extending to several metres deep into the chalk or conical depressions and basin shaped structures.

The British Geological Survey GeoSure 5km hex grid indicates the generalised area of the site has a significant susceptibility from soluble rocks.

Further assessment of the natural ground hazards can be undertaken, if required, to provide more detailed comment specific to the site.

2.2.3 Mining and Ground Workings

Historically, chalk deposits were often mined locally. Most commonly historical mines characteristically comprise a narrow shaft with a number of chambers radiating from the base. These structures are colloquially known as "deneholes", "chalk-wells" or "chalkangles".

The depth of the features reflects the depth to the underlying chalk bedrock. The shaft width was commonly in the order of 2m to 3m, widening out into galleries at depth. The chalk was extracted for soil improvement and was usually applied directly to fields though sometimes the chalk was processed, typically by burning in kilns where the chalk was used to produce quicklime (calcium oxide).

Once they had reached their limits the mines were commonly capped. Various capping techniques were used; examples include the use of upturned trees or brick arching. Records pertaining to the distribution of these localised mines are incomplete, usually being limited to features marked as shafts or the occurrence of circular depressions on historic Ordnance Survey maps. In the field they are most likely to be visible as shallow depressions, if at all.

The British Geological Survey GeoIndex Onshore viewer records a ceased brickfield (Southern Cross Brickfield) some 300m to the north east, together with several active, inactive and ceased records for wharfs associated with the harbour to the south east. A search of the Chelsea Speleological Society records revealed no records within 1km of the site. The risk posed to the development is considered to be negligible to very low.

Further assessment of the mining hazards can be undertaken, if required, to provide more detailed comment specific to the site.

2.2.4 Groundwater Source Protection Zones

The Environment Agency defines SPZs as those areas where groundwater supplies are at risk from potentially polluting activities and accidental releases of pollutants. SPZs are primarily a policy tool used to control activities close to water supplies intended for human consumption.

The site does not lie within a SPZ.

3. SITE WORKS

The site works comprised a single dynamic sampler borehole, designated WS01-E, drilled to a total depth of 2.65m below ground level together with a trial pit, denoted TP01-E, hand dug to an average depth of 0.94m below ground level. The intrusive work was carried out on 19th January 2024. The exploratory hole locations are shown on Figure 2.

Falling head infiltration testing was undertaken in the borehole, when the borehole was at a depth of 2.65m, in general accordance with Kent County Council guidance[1]. In addition, in situ infiltration testing was undertaken in the trial pit in general accordance with the test method given in BRE guidance[2].

On completion of the borehole a standpipe was installed together with a data logger to enable long term groundwater monitoring to be undertaken from January 2024 to the end of April 2024. The data logger was programmed to collect readings at 15-minute intervals. The results of the groundwater monitoring will be issued on completion of the monitoring period.

Descriptions of the strata encountered and comments on groundwater conditions are shown in the exploratory hole records given in the appendices to this report, together with notes to assist in their interpretation. The results of the in situ infiltration testing are also included in the appendices.

[1] The Soakaway Design Guide published by Kent County Council, 2000.
[2] Section 3.2.3 of Building Research Establishment (BRE) Digest 365, 2016.

4. GROUND CONDITIONS

4.1 Stratigraphy

4.1.1 Surface Covering

Both exploratory holes were excavated through a surface cover of topsoil.

4.1.2 Made Ground

Made ground, comprising slightly gravelly/gravelly slightly sandy silty clay, was recorded to a depth of 0.50m below ground level in both the borehole and trial pit. The gravel fraction comprised variable quantities of flint, brick, ash-like material, chalk, concrete and plastic.

4.1.3 River Terrace Deposits

Underlying the made ground, the investigation generally progressed into brown gravelly (flint) slightly sandy silty clay which continued to the full depth of trial pit TP01-E, and to a depth of 1.10m below ground level in borehole WS01-E.

Beneath these brown clay soils, the borehole encountered light brown and off white very gravelly (flint and chalk) silty clay deposits which continued to the full depth of the borehole.

These soils are considered to be representative of the River Terrace Deposits indicated to underlie the site on the published geology map.

4.2 Groundwater Conditions and Stability

Both exploratory holes remained dry and stable during the course of drilling/excavation.

It should be noted that the water levels within the exploratory holes may not have equilibrated with the groundwater table during the short duration of the excavation works and that groundwater levels should be expected to fluctuate seasonally and will possibly be tidally influenced.

The results of the long term groundwater monitoring will be issued under separate cover on completion of the monitoring period.

5. STORMWATER INFILTRATION SYSTEMS

In-situ infiltration testing[3] was carried out in trial pit TP01-E. For each test the soil infiltration rate (f) was calculated by dividing the volume of water lost between 75% and 25% of the initial test depth by the sum of the average surface area of the sides of the trial pit in contact with the water during the test monitoring period, and its base area. This figure was then divided by the test duration (time taken for the water level to fall between 75% and 25% of the initial test depth) to give the soil infiltration rate in metres per second.

In-situ infiltration testing[4] was also undertaken in borehole WS01-E. From the test results, calculations were made to estimate the infiltration rate that could be expected for soakaways constructed to discharge into the underlying soils within the test zone.

The infiltration rates derived from the tests are summarised in the following table.

Table 2. Calculated Infiltration Rates

Exploratory Hole	Test Response Zone Depth (m)		Stratum	Infiltration Rate (f) (m/sec)	Driving Head of Water (m)
	Top	Bottom			
TP01-E Test 1	0.47	0.94	River Terrace Deposits	2.24×10^{-5}	-
TP01-E Test 2	0.55	0.94	River Terrace Deposits	1.39×10^{-5}	-
WS01-E Test 1	1.65	2.65	River Terrace Deposits	6.10×10^{-5}	1.8
				2.29×10^{-5}	1.0
				8.46×10^{-6}	0.5
WS01-E Test 2	1.65	2.65	River Terrace Deposits	5.97×10^{-5}	1.9
				3.48×10^{-5}	1.0
				8.96×10^{-6}	0.6
WS01-E Test 3	1.65	2.65	River Terrace Deposits	4.85×10^{-5}	1.8
				2.24×10^{-5}	1.0
				1.24×10^{-5}	0.6

The value 'f' is equivalent to the soil infiltration coefficient 'q' quoted in the Construction Industry Research and Information Association (CIRIA) Report 156.

The results from the infiltration tests should be provided to engineers responsible for the design of the drainage system.

[3] Conducted in general accordance with the requirements of BRE 365, Soakaway Design.
[4] Conducted in accordance with The Soakaway Design Guide, published by Kent County Council, July 2000.

To comply with building regulations[5], point discharging infiltration systems (conventional ring or trench soakaways) are required to be constructed a minimum of 5.0m away from proposed or existing buildings.

Ashdown Site Investigation Ltd.

[5] The Building Regulations 2010; Part H; Drainage and Waste Disposal

FIGURES & APPENDICES

Figure 1 Site Location Plan
Figure 2 Site Plan
Proposed Development Layout
Exploratory Hole Notes
Exploratory Hole Records
Summary of Falling Head Soakage Test Results



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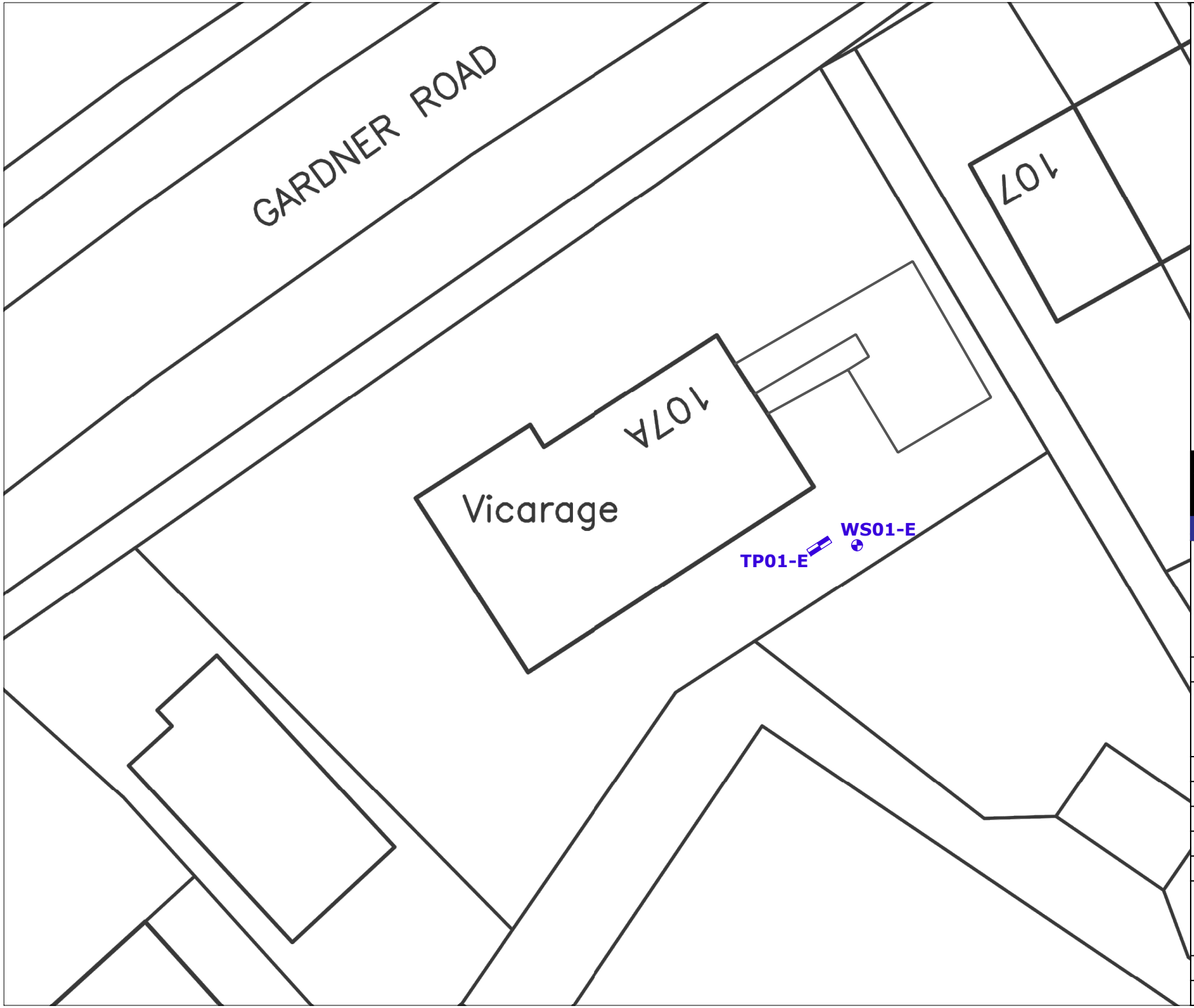
ASHDOWN SITE INVESTIGATION LIMITED	Site Location Plan	Site Name	Figure No.	Project Reference
		East of 107a Gardner Road, Portslade	1	P16448



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ASHDOWN SITE INVESTIGATION
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Unit 3
The Old Grain Store
Ditchling Common Business Park
Ditchling
East Sussex
BN6 8SG
01273 483119
contact@ashdownsi.co.uk

Site:

East of 107a Gardner Road
Portslade

Project Ref:

P16448

Figure No.

2

Drawing Title

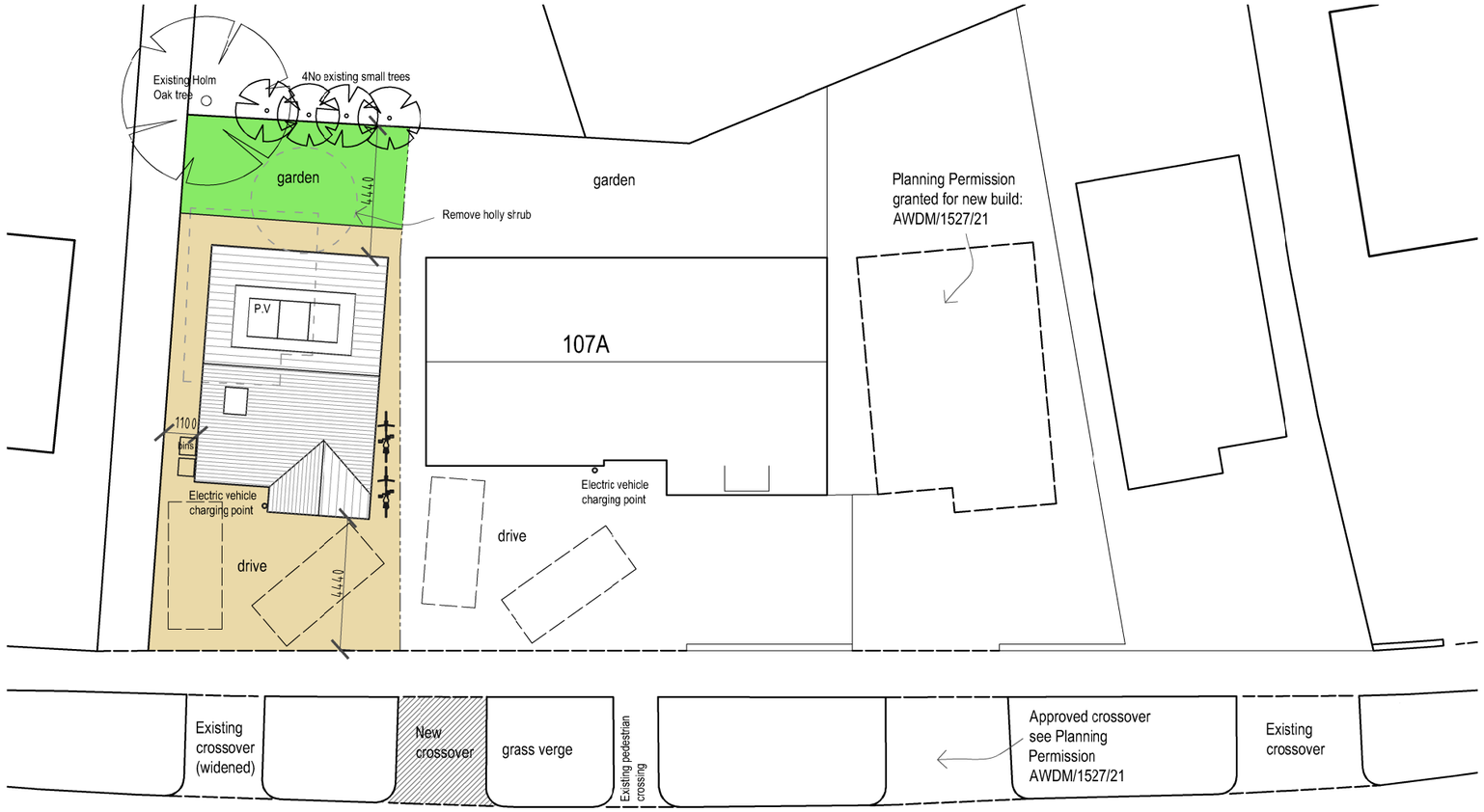
Site Plan

Scale

NTS

0 2 4 6 10m

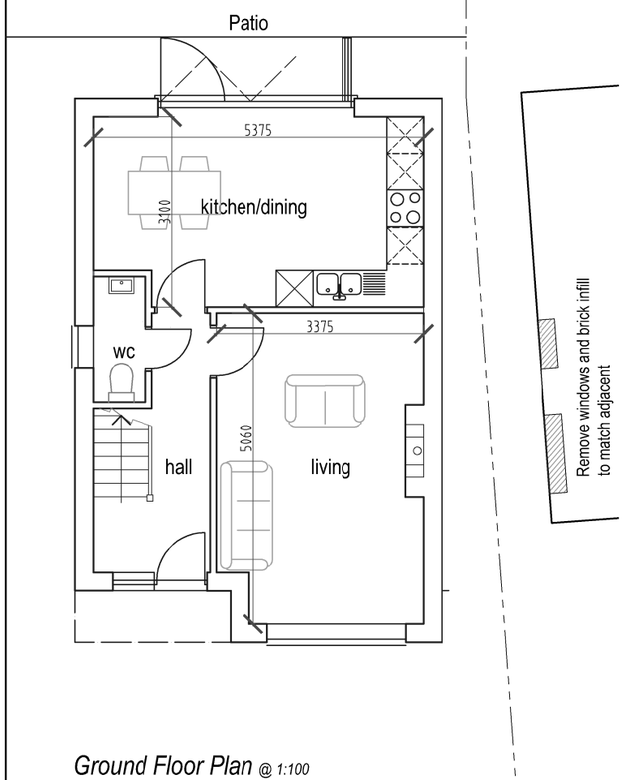
Scale 1:200



Site Plan @ 1:200

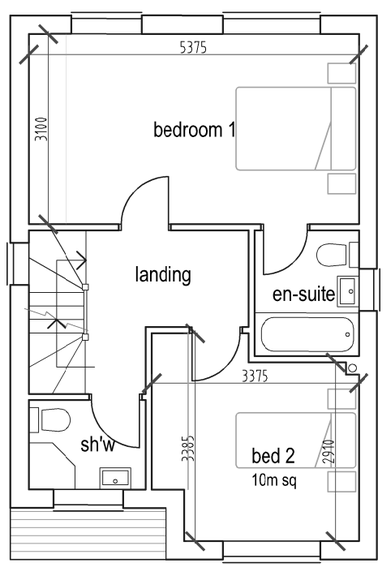
0 1 2 3 5m 10m

Scale 1:100



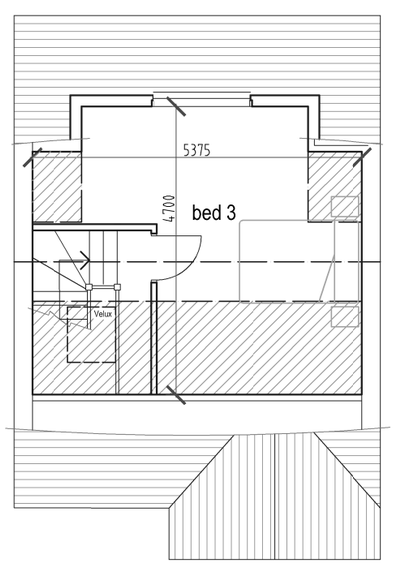
Ground Floor Plan @ 1:100

Gross Internal Area: 42.2m²



First Floor Plan @ 1:100

Gross Internal Area: 42.2m²



Roof Plan @ 1:100

Gross Internal Area: 19.4m²

Rev	Description	Date
F	Tree positions corrected	03.03.22
E	Existing trees added	08.02.22
D	New crossover adjusted	31.01.22
C	Existing crossover added	28.01.22
B	Traffic Island added and crossovers amended	24.01.22
A	Dimensions added to site plan	17.12.21

Job Reference	Client
New House 107A Gardner Road Southwick	Sinnis Ltd

Drawing Title	Drawing No	Rev
Proposed Plans	ADC1174/14	F

Date	Scale	Dwg Size	Plot Style	Drawn	Checked
07.12.21	1:100/200	A3	ADCcolourGR	CW	AD

All dimensions to be checked on site ~~and do not scale from this drawing~~. This drawing should be approved by Local Authority Building Control or other appropriate checking authority prior to commencement of work. This drawing should not be reproduced without the prior consent of the author.

ADC Alistair Dodd Consulting

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Explanatory Notes

Symbols and abbreviations on Exploratory Hole Records

Samples

U 'Undisturbed' Sample: - 100mm diameter by 450mm long. The number of blows to drive in the sampling tube is shown after the test index letter in the SPT column.
Pi Piston Sample: 'Undisturbed' sample 100mm diameter by 600mm long.
D Disturbed Sample
R Root Sample
B Bulk Disturbed Sample
W Water Sample
ES Environmental Suite (on older records may be referenced J T)

In Situ Testing

S Standard penetration test (SPT): Using the split spoon sampler.
C Standard Penetration Test (SPT): Using a solid cone instead of the sampler – conducted usually in coarse grained soils or weak rocks.
V Shear Vane Test: Undrained shear strength (cohesion) (kN/m^2) shown within the Vane/Pen Test and N Value column.
H Hand penetrometer Test: Undrained shear strength (cohesion) (kN/m^2) shown within the Vane/Pen Test and N Value column.
P Perth Penetrometer Test: Number of blows for 300mm penetration shown under Vane/Pen Test and N Value column.

Excavation Method

CP Cable Percussion Borehole
RC Rotary Cored Borehole
WLS Dynamic Sampler Borehole using windowless sampler tubes
WS Dynamic Sampler Borehole using window sampler tubes
TP Trial Pit excavated using mechanic excavator
HDP Trial Pit excavated using hand tools

Soil Description

Description and classification of soils has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of soil, Part 1 Identification and description (BS EN ISO 14688-1) and Part 2 Principles of classification (BS EN 14688-2) as well as the BS5930 code of Practice for Ground Investigations.

Rock Description

Description and classification of rocks has been carried out using as a general basis the British Standard Geotechnical investigation and testing – Identification and classification of rock, Part 1 Identification and classification (BS EN ISO 14689-1) as well as the BS5930 code of Practice for Ground Investigations. TCR – Total Core Recovery, SCR – Solid Core Recovery, RQD – Rock Quality Designation, NI – Non Intact, If – indicative fracture spacing (min/ave/max), FI – Fracture Index.

Chalk Description

Chalk description is based on BS EN ISO 14688, BS EN ISO 14689 and BS5930. The classification of chalk generally follows the guidance offered by the Construction Industry Research and Information Association (CIRIA) C574, 'Engineering in Chalk'. This is based on assessment of chalk density, discontinuity and aperture spacing, and the proportion of intact chalk to silt of chalk.

In Situ Strength Testing

Standard penetration testing (SPT) carried out in accordance with BS EN ISO 22476-3:2005.

Continuous dynamic probe testing conducted using a super heavy DPSH-B (As defined by BS EN ISO 22476-2:2005) probing geometry. The DPSH-B configuration is similar to that of the standard penetration test (SPT); the main differences being that the tip comprises a 90° cone, the driving rods are lighter than those used for SPT testing and the blow counts are recorded over 100mm increments rather than 300mm, as is the case for the SPT.

Perth penetrometer tests carried out in accordance with Australian Standard AS 1289:6.3.3-1997, Method of Testing Soils for Engineering Purposes; no equivalent European or British Standard having been published to date.

Undrained shear strength determinations made in-situ using a Geonor hand shear vane or a hand penetrometer.

Testing to determine the in-situ California Bearing Ratio (CBR) of soils conducted at shallow depths using a hand-held Transport Research Laboratory (TRL) cone penetrometer.

ASHDOWN SITE INVESTIGATION LIMITED
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Tel: 01273 483119

Site Name: East of 107a Gardner Road, Portslade

Job Number: P16448

Start Date: 19/01/2024

End Date: 19/01/2024

Borehole Number: **WS01-E**

Standpipe	Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result	Dynamic Probe 0 5 10 15 20 25 30	Legend	Depth	Stratum Description
							0.00	Topsoil over, MADE GROUND: Brown slightly gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to coarse flint with rare brick, ash-like material and chalk.
							0.30	MADE GROUND: Brown gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to coarse flint with rare brick, ash-like material, concrete and plastic.
							0.50	Brown gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse gravel of flint. With occasional cobbles of flint. (River Terrace Deposits)
	D	0.90						
							1.10	Light brown and off white very gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk with occasional cobbles of flint. (River Terrace Deposits)
	D	1.50						
	D	2.50						
							2.65	End of borehole at 2.65m

Remarks

Groundwater: Borehole dry on completion.

Stability: Borehole stable on completion.

Notes: No further progress below 2.65m depth - too dense/stiff.
Standpipe installed to 2.60m depth; 2.60m to 1.20m slotted pipe with gravel surround; 1.20m to ground level plain pipe with bentonite seal; completed with end cap and security cover concreted flush with ground surface.

Excavation Method: WLS

Borehole Diameter: Various

Made By: TM

ASHDOWN SITE INVESTIGATION LIMITED
E-mail: contact@ashdownsi.co.uk
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Tel: 01273 483119

Site Name: East of 107a Gardner Road, Portslade

Job Number: P16448

Start Date: 19/01/2024

End Date: 19/01/2024

Trial Pit Number: **TP01-E**

Samples and In Situ Testing				Legend	Depth/ Reduced Level	Stratum Description
Sample/ Test Type	Depth From (m)	Depth To (m)	Test Result			
					0.00	Topsoil over, MADE GROUND: Brown slightly gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to coarse flint with rare brick, ash-like material and chalk.
					0.30	MADE GROUND: Brown gravelly slightly sandy silty clay. Gravel is subangular to subrounded fine to coarse flint with rare brick, ash-like material, concrete and plastic.
					0.50	Brown gravelly slightly sandy silty CLAY. Gravel is subangular to subrounded fine to coarse gravel of flint. With occasional cobbles of flint. (River Terrace Deposits) becoming very gravelly towards base.
					0.94	End of trial pit at 0.94m

Remarks

Groundwater: Trial pit dry on completion.

Stability: Trial pit stable on completion.

Notes: No further progress below 0.94m depth - too gravelly for hand tools.

Excavation Method: HDP

Pit Length: 1.00m

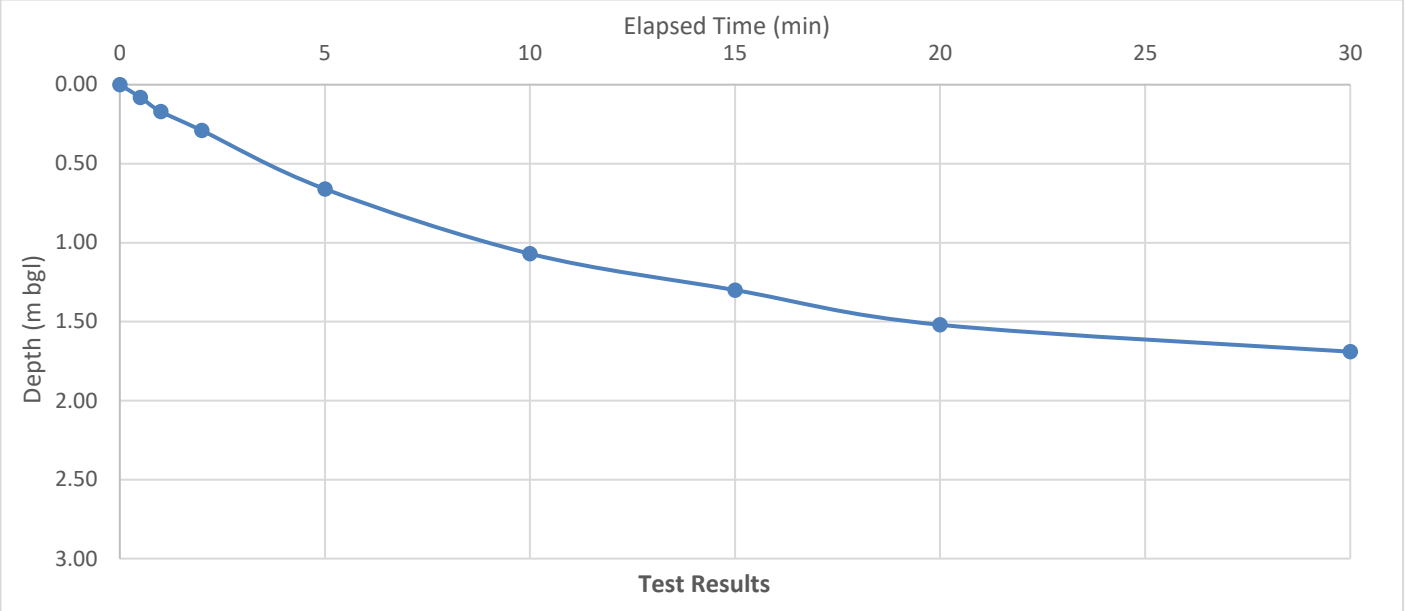
Pit Width: 0.29m

Made By: TM

Infiltration Test Results

Test Position	WS01-E
Test No.	1
Project No.	P16448
Project Name	East of 107a Gardner Road, Portslade

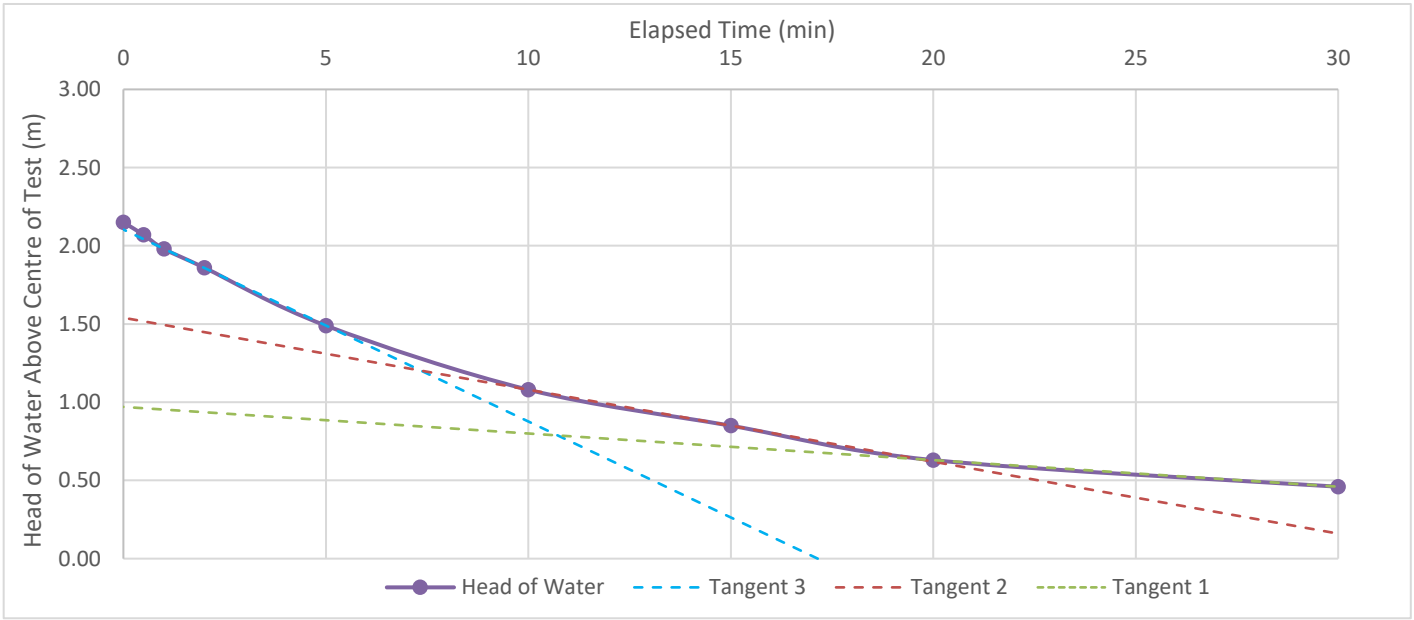
Casing Depth	1.65	m blg
Borehole Depth	2.65	m bgl
Casing Diameter	0.105	m
Average Borehole Diameter	0.092	m



Length of Test Zone	1.00 m	L
Depth to Center of Test Zone	2.15 m	X
Water level at start of test	0.00 m	
Water level at end of test	1.69 m	
Duration of test	30 min	
Average Depth Of Water	1.81 m	
Average Drained Area	0.53 m^2	
Volume of Water Lost	0.01 m^3	

Driving Head	**1.8**	**1.0**	**0.5**	**m**
Infiltration rate	**6.10E-05**	**2.29E-05**	**8.46E-06**	**m/sec**

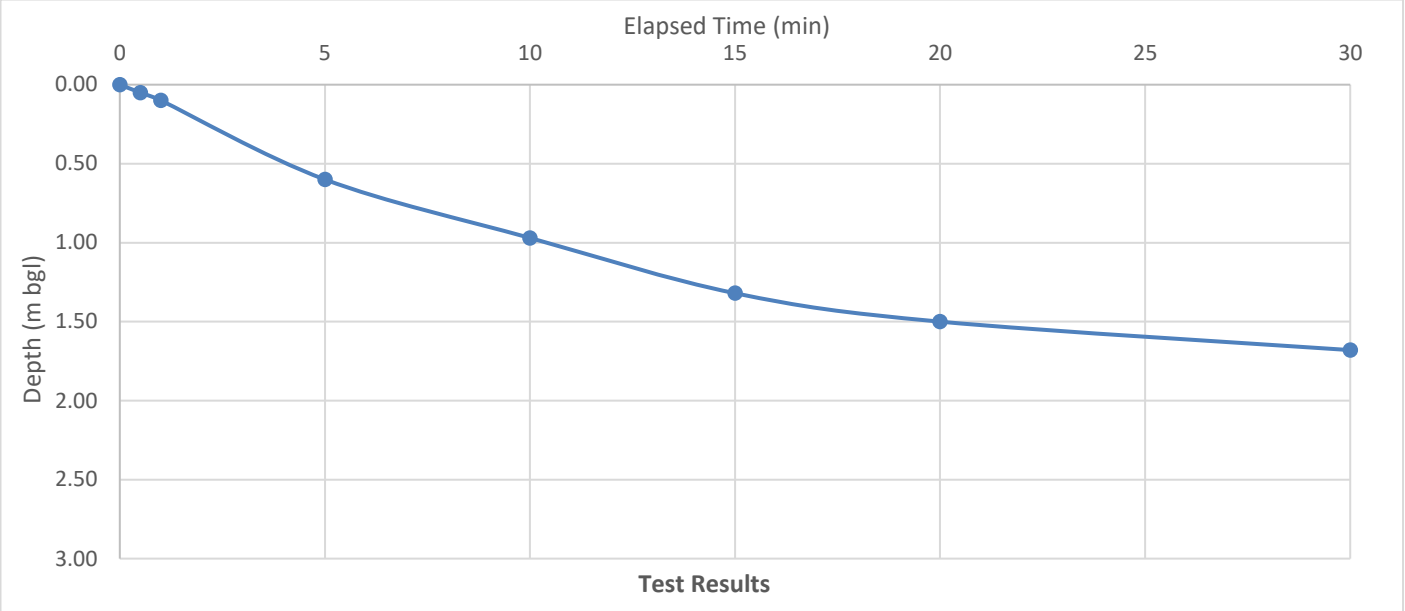
Calculation method: Calculated in accordance with The Soakaway Design Guide, published by Kent County Council, July 2000.



Infiltration Test Results

Test Position	WS01-E
Test No.	2
Project No.	P16448
Project Name	East of 107a Gardner Road, Portslade

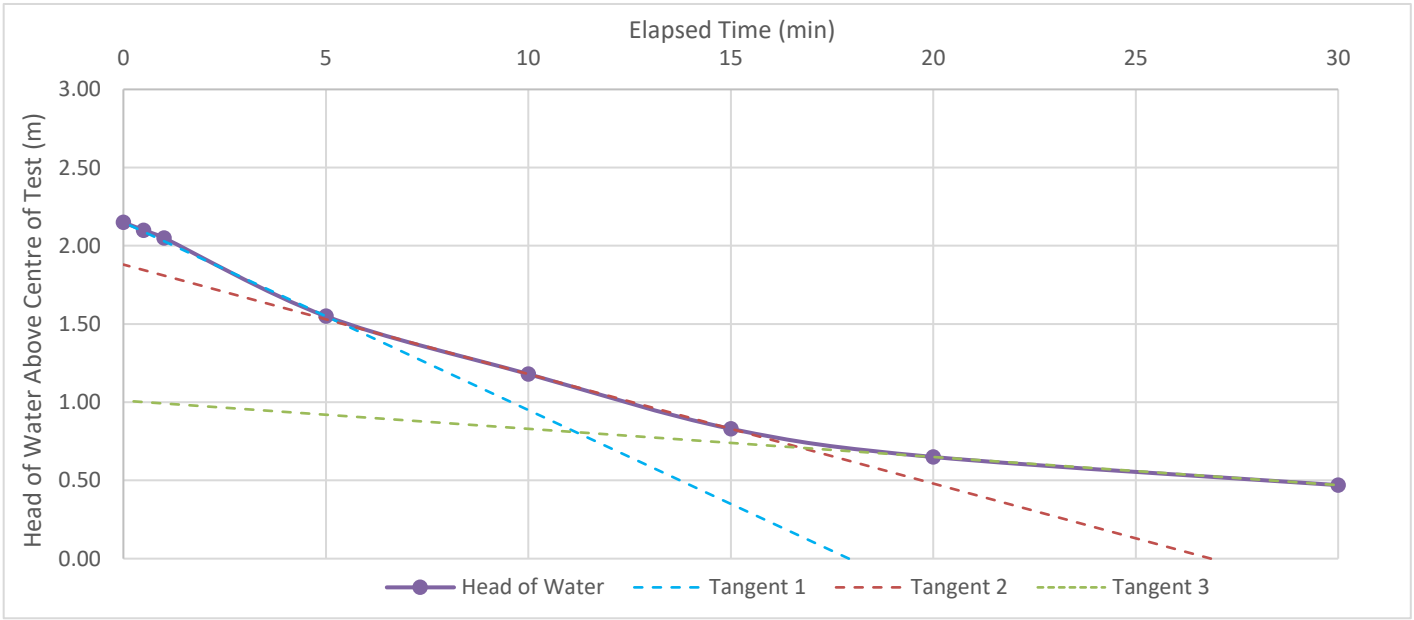
Casing Depth	1.65	m blg
Borehole Depth	2.65	m bgl
Casing Diameter	0.105	m
Average Borehole Diameter	0.092	m



Length of Test Zone	1.00 m	L
Depth to Center of Test Zone	2.15 m	X
Water level at start of test	0.00 m	
Water level at end of test	1.68 m	
Duration of test	30 min	
Average Depth Of Water	1.81 m	
Average Drained Area	0.53 m^2	
Volume of Water Lost	0.01 m^3	

Driving Head	**1.9**	**1.0**	**0.6**	**m**
Infiltration rate	**5.97E-05**	**3.48E-05**	**8.96E-06**	**m/sec**

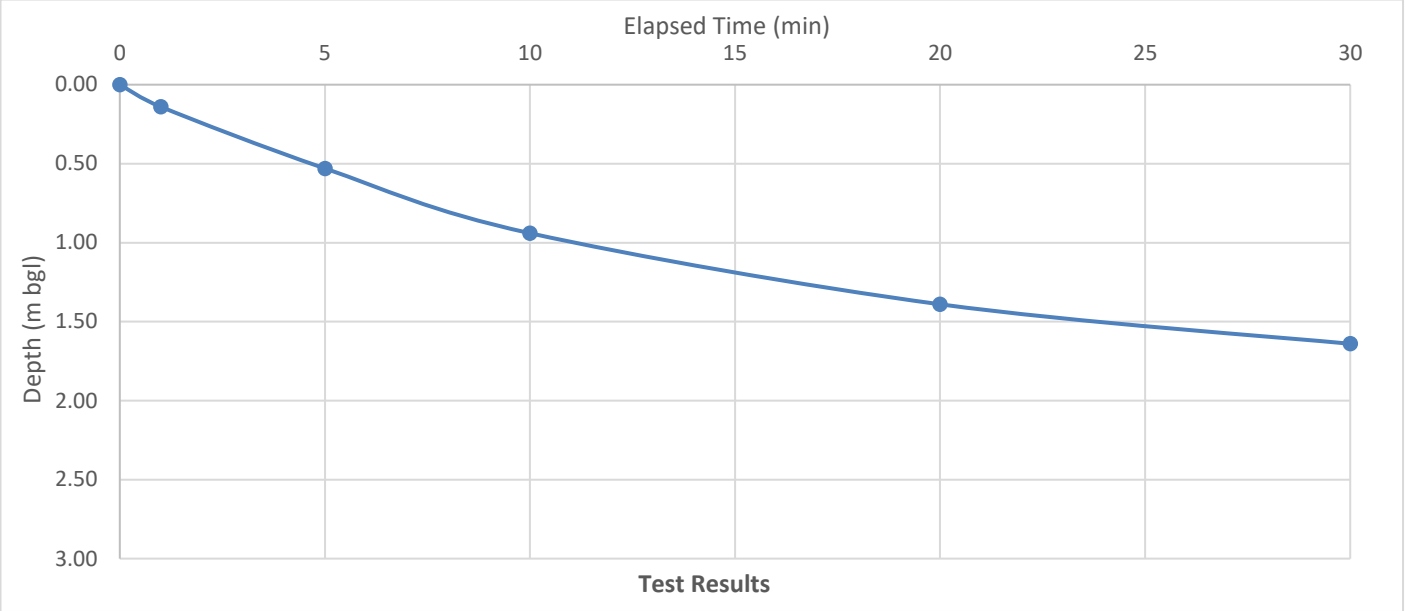
Calculation method: Calculated in accordance with The Soakaway Design Guide, published by Kent County Council, July 2000.



Infiltration Test Results

Test Position	WS01-E
Test No.	3
Project No.	P16448
Project Name	East of 107a Gardner Road, Portslade

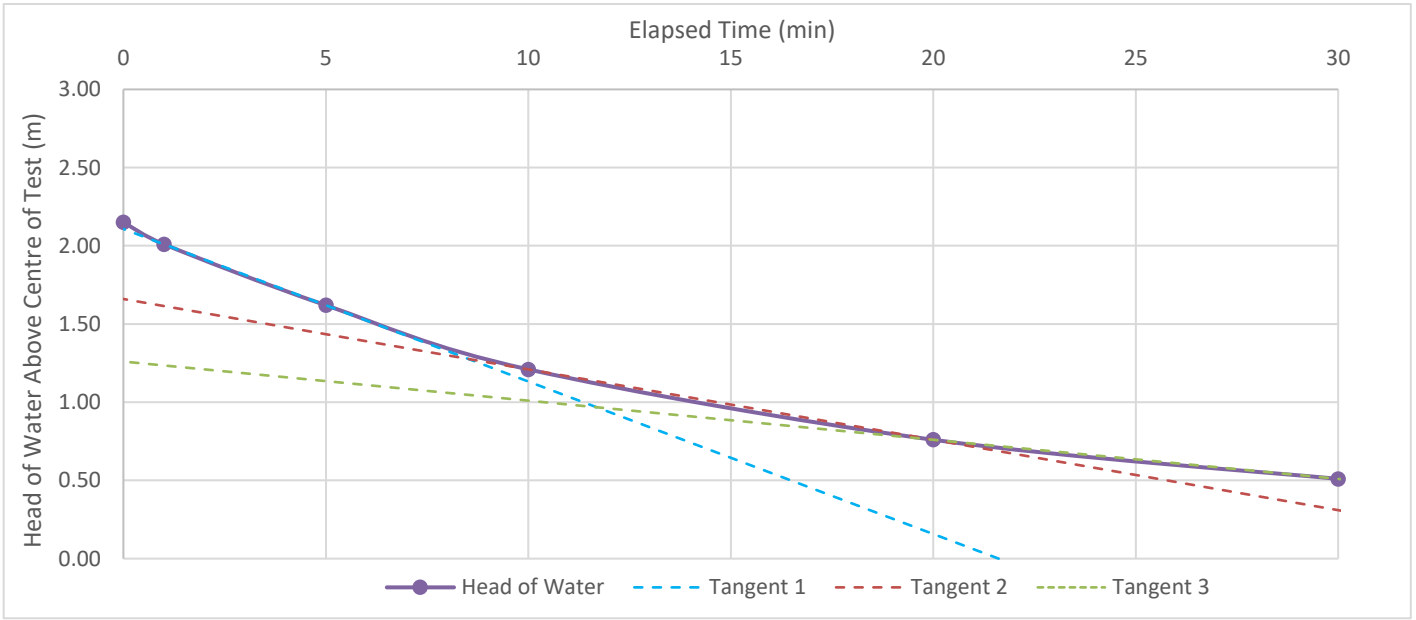
Casing Depth	1.65	m blg
Borehole Depth	2.65	m bgl
Casing Diameter	0.105	m
Average Borehole Diameter	0.092	m



Length of Test Zone	1.00	m	L
Depth to Center of Test Zone	2.15	m	X
Water level at start of test	0.00	m	
Water level at end of test	1.64	m	
Duration of test	30	min	
Average Depth Of Water	1.83	m	
Average Drained Area	0.54	m^2	
Volume of Water Lost	0.01	m^3	

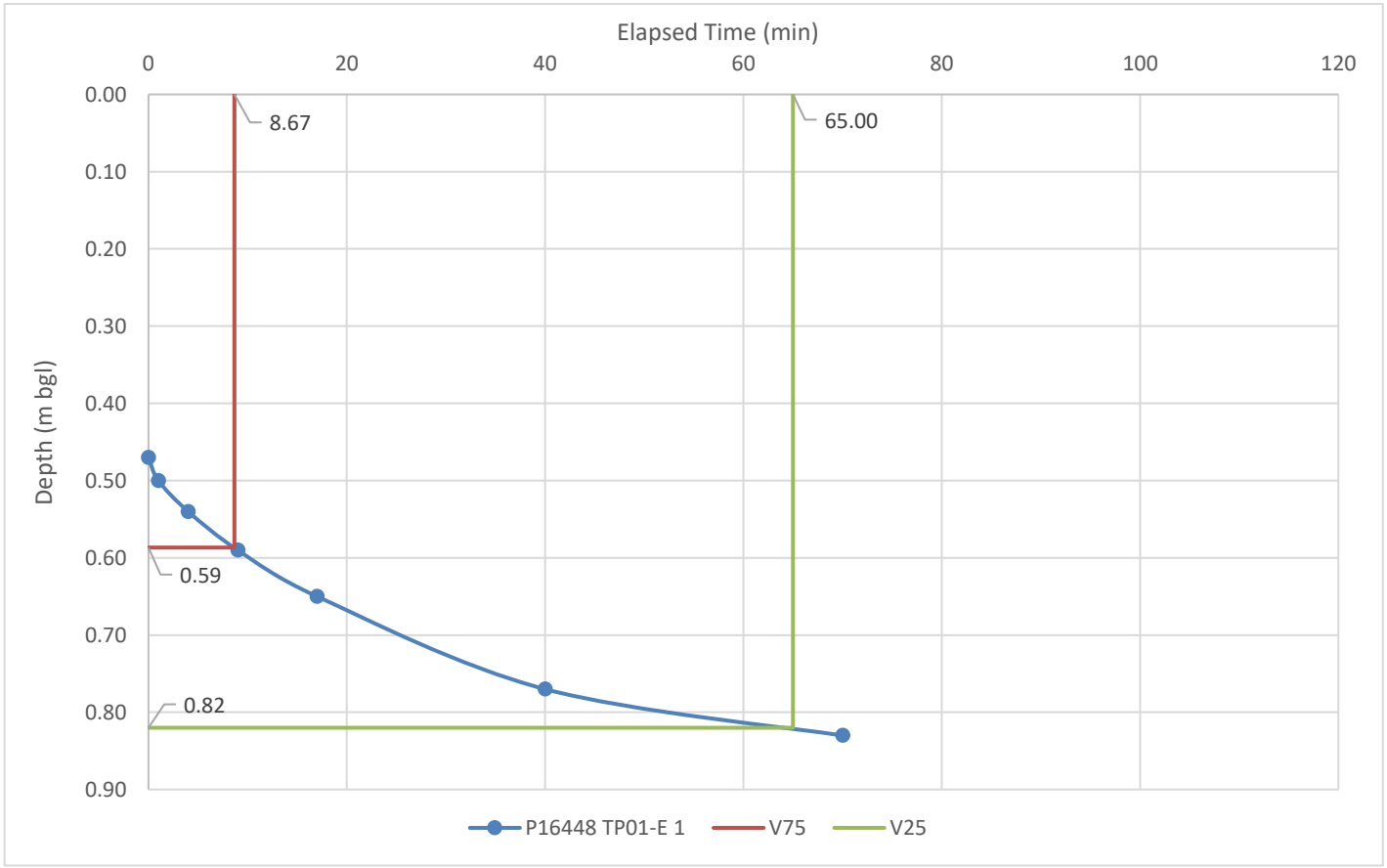
Driving Head	**1.8**	**1.0**	**0.6**	**m**
Infiltration rate	**4.85E-05**	**2.24E-05**	**1.24E-05**	**m/sec**

Calculation method: Calculated in accordance with The Soakaway Design Guide, published by Kent County Council, July 2000.



Infiltration Test Results

Test Position	TP01-E			
Test No.	1			
Project No.	P16448			
Project Name	East of 107a Gardner Road, Portslade			
Width of Pit		0.29	m	W
Length of Pit		1.00	m	L
Depth of Pit		0.94	m	D
Pit type		Open		
Volume of water introduced into pit		0.135	m^3	
Initial head of water		0.47	m	h_o
Water level at start of test		0.47	m	
Water level at end of test		0.83	m	
Volume of water discharged from pit		0.104	m^3	
Duration of test		70	min	
Average soaked surface area		1.03	m^2	
Time for water level to fall to 75% of initial head		8.67	min	t_{p75}
Time for water level to fall to 25% of initial head		65.00	min	t_{p25}
Depth to water at 75% of initial head		0.59	m	d_{75}
Depth to water at 25% of initial head		0.82	m	d_{25}
Time for the water level to fall from 75% to 25% of initial head		56.33	min	t_{p75-25}
Effective storage volume of water in the soakage trial pit between 75% and 25% of initial head		0.067	m^3	V_{p75-25}
Internal surface area of the soakage trial pit up to 50% of initial head and including the base area		0.89	m^2	a_{s50}
Infiltration rate		**2.24E-05**	**m/sec**	**f**
Calculation method:	BRE 365			



Infiltration Test Results

Test Position	TP01-E
Test No.	2
Project No.	P16448
Project Name	East of 107a Gardner Road, Portslade

Width of Pit	0.29	m	W
Length of Pit	1.00	m	L
Depth of Pit	0.94	m	D
Pit type	Open		
Volume of water introduced into pit	0.112	m^3	
Initial head of water	0.39	m	h_o
Water level at start of test	0.55	m	
Water level at end of test	0.85	m	
Volume of water discharged from pit	0.087	m^3	
Duration of test	110	min	
Average soaked surface area	0.90	m^2	
Time for water level to fall to 75% of initial head	20.10	min	t_{p75}
Time for water level to fall to 25% of initial head	105.00	min	t_{p25}
Depth to water at 75% of initial head	0.65	m	d_{75}
Depth to water at 25% of initial head	0.84	m	d_{25}
Time for the water level to fall from 75% to 25% of initial head	84.90	min	t_{p75-25}
Effective storage volume of water in the soakage trial pit between 75% and 25% of initial head	0.056	m^3	V_{p75-25}
Internal surface area of the soakage trial pit up to 50% of initial head and including the base area	0.79	m^2	a_{s50}
Infiltration rate	**1.39E-05**	**m/sec**	**f**

Calculation method: BRE 365

