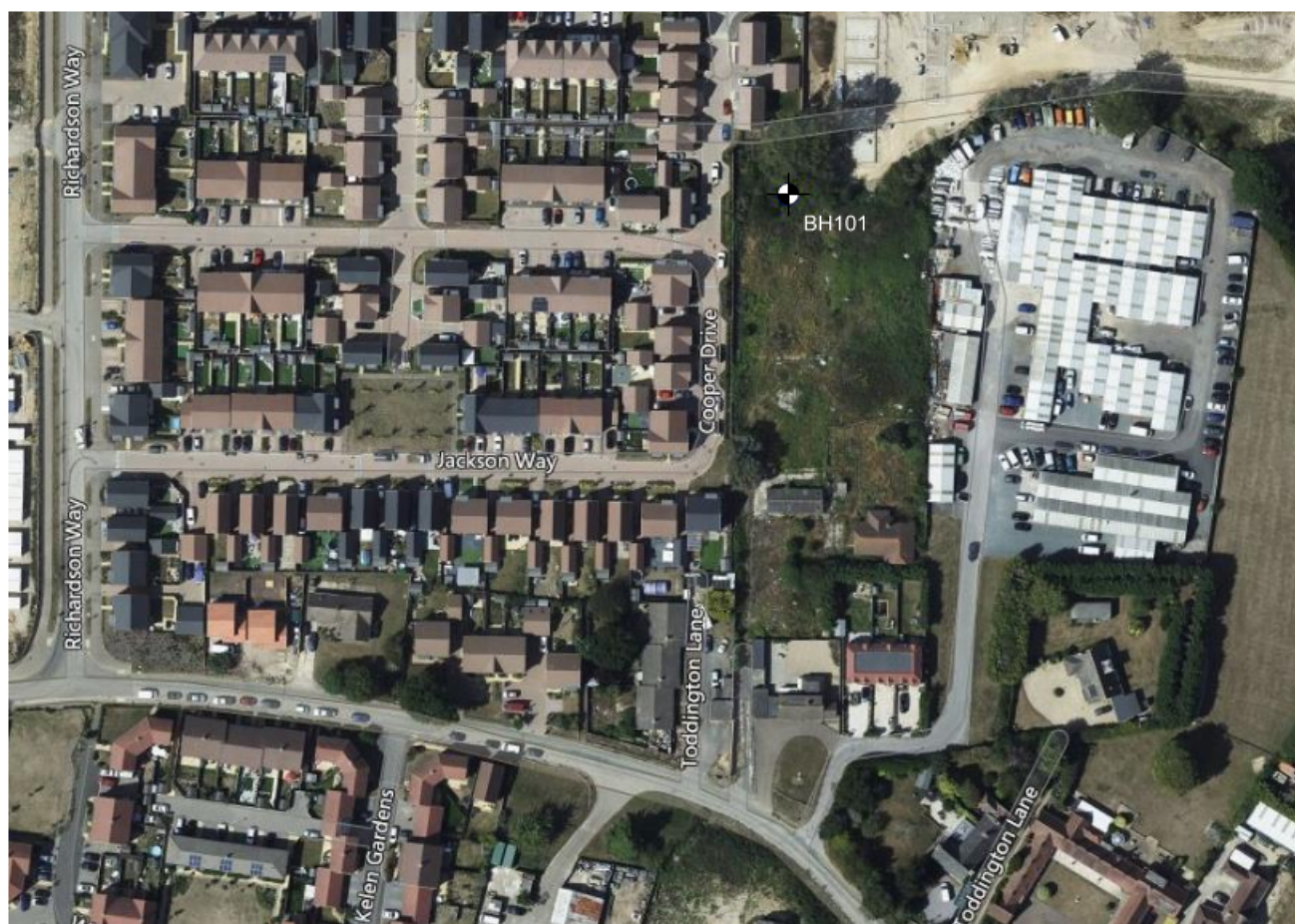
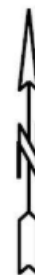




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Site:	Land at Westholme Nursery, Toddington Lane, Littlehampton	Project ID	JT0613
Figure 1	Site Location Plan	Date:	21/07/2025



NB: Positions of exploratory holes / test positions are only indicative unless dimensioned.

Site:	Land at Westholme Nursery, Toddington Lane, Littlehampton	Project ID	JT0613
Figure 2	Exploratory Hole Location Plan	Date:	21/07/2025

Key to Exploratory Hole Logs, Plans and Sections

Backfill Symbols		Pipe Symbols		Principal Soil Types		Principal Rock Types		Drilling Records	
Arisings		Plain Pipe		Topsoil		Mudstone		Water Strike	
Concrete		Slotted Pipe		Made Ground		Claystone		Depth Water Rose	
Blacktop		Piezometer		Clay		Siltstone		Total Core Recovery (%) [TCR]	
Bentonite		Piezometer Tip		Silt		Sandstone		Solid Core Recovery (%) [SCR]	
Gravel Filter		Filter Tip		Sand		Limestone		Rock Quality Index (%) [RQI]	
Sand Filter		Extensometer		Gravel		Chalk		Fracture Index (fractures / m) [FI]	
		Inclinometers		Peat					

All soil and rock descriptions are in general accordance with BS5930 2015, BS EN ISO 14688-1:2002+A1:2013 and BS EN ISO 14689-1:2003. Chalk descriptions are also based on CIRIA C574 and "Logging the Chalk – R.N. Mortimer 2015". The Geology Code is only provided where a positive identification of the sample strata has been made.

Location / Method Identifiers		In-situ Test Location / Method	
BH	Borehole (undefined)	DP	Dynamic Probe
CP	Cable Percussive	CPT	Cone Penetration Test
RC	Rotary Core	CBR	In-situ CBR Test
RO	Rotary Open Hole	DCP	CBR using Dynamic Cone Penetrometer
ODC	Rotary ODEX/Symmetrix drilling cased	CBRT	CBR using TRL Probe
CP+RC	Cable Percussive to Rotary Core	PB	Plate Bearing Test
SNC	Sonic	SPT (S)	Standard Penetration Test (Split Barrel Sampler)
CFA	Continuous Flight Auger	SPT (C)	Standard Penetration Test (Solid Cone)
FA	Flight Auger	N	SPT Result
VC	Vibro Core	-/-	Blows/Penetration (mm) after seating drive
WLS+RC	Windowless (Dynamic) Sampler to Rotary Core	-*/-	Total Blows / Penetration (mm)
WLS	Windowless Sampler	()	Extrapolated Value
WS	Window Sampler	PPT	Perth Penetration (In-House Method - Equivalent N Value)
HA	Hand Auger	HP / UCS	Strength from Hand Penetrometer (kN/m ²)
C	Road / Pavement Core	IVN	Strength from Hand Vane ((kN/m ²) P = peak, R = residual)
IP	Inspection Pit (Hand Excavation)	PID	Photo Ionisation Detector (ppm)
TP	Trial Pit (Machine Excavated)	MEXE	Mexi-Cone CBR (%)
OP	Observation Pit (Supported Excavation Hand or Machine)		

Samples / Test Type	
B	Bulk Sample
BLK	Block Sample
C	Core Sample
CBRS	CBR Mould Sample
D	Small Disturbed Sample
ES	Environmental Sample (Soil)
EW	Environmental Sample (Water)
GS	Environmental Sample (Gas)

Samples / Test Type	
SPTLS	Standard Penetration Test Split Barrel Sample
TW	Thin Wall Push In Sample (e.g. Shelby Sampler)
U	Undisturbed Open Drive Sample (blows to take)
UT	Thin Wall Undisturbed Open Drive Sample (blows to take)
W	Water Sample (Geotechnical)
SP	Sample from Stockpile
P	Piston Sample
AMAL	Amalgamated Sample

				Start - End Date		Project ID:		Hole Type:		BH101		
www.southerntesting.co.uk tel:01342 333100 www.stconsult.co.uk tel:01604 500020						JT0613		CP		Sheet 1 of 1		
Project Name: Littlehampton				Remarks:		Co-ordinates:		Level:		Logger:		
						503413E - 104058N		3.61		CJB		
Location: Westholme Nursery, Toddington Lane, Littlehampton BN17 7SF				Groundwater level at 3.55m bgl upon completion of drilling.								
Client: Ashard Hussain												
Well	Water Strikes	Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description			
		Depth (m bgl)	Type	Results								
					2.8	(0.80)		0.80	Soft dark grey sandy gravelly CLAY. Gravel is fine to medium angular to subrounded flint, brick and concrete. MADE GROUND			1
					2.1	(0.70)		1.50	Soft brown very sandy silty CLAY. RIVER TERRACE DEPOSITS			2
						(1.60)			Structureless CHALK composed of white gravelly SILT. Clast is weak low density chalk. NEW PIT CHALK FORMATION			3
					0.5			3.10	Structureless CHALK composed of cobbly silty GRAVEL. Clast is weak and low density chalk. NEW PIT CHALK FORMATION			4
									<i>structured chalk.</i>			5
						(11.90)						6
												7
												8
												9
												10
												11
												12
												13
												14
					-11.4			15.00				15

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
15.00	200	12.00	200		2.70			2.50	20				

APPENDIX B

**Field Sampling and In-Situ
Test Methods and Results**

B

Soil and Rock Descriptions

All soil and rock descriptions are in general accordance with BS5930 Ref [1].

Anthropogenic soils ('made ground' or 'fill') describe materials which have been placed by man and can be divided into those composed of reworked natural soils and those composed of or containing man-made materials. 'Fill' is used to describe material placed in a controlled manner and 'made ground' is used to describe materials placed without strict engineering control.

The classification of materials such as topsoil is based on visual description only and should not be interpreted to mean that the material complies with criteria used in BS 3882 Ref [2].

Chalk descriptions are based on CIRIA C574 Ref [3] and Mortimore Ref [4].

The geology code is only provided on logs where a positive identification of the sample strata has been made.

Inspection Pit

Inspection pits are hand excavated from the surface (maximum depth 1.2 – 1.5m) using appropriate tools to locate and avoid existing buried services at exploratory hole positions. They are also regularly used as part of investigations on existing structures to expose and determine foundation detail.

Monitoring Well

A groundwater and/or ground gas monitoring well consists of a perforated pipe, which is installed in the ground. The standpipe is typically 50mm nominal in diameter and is installed in a lined borehole. It is perforated from the base with a sand/gravel surround through the soil horizon of interest to an appropriate depth below ground level. Above this there is a bentonite seal with solid pipework and is provided with an end cap or a gas valve at the top as appropriate.

Gas monitoring is carried out via the gas tap. Water sampling/purging can be undertaken by removing the gas tap and bung.

The well is usually completed at the surface with a flush cast iron cover or raised lockable cover.

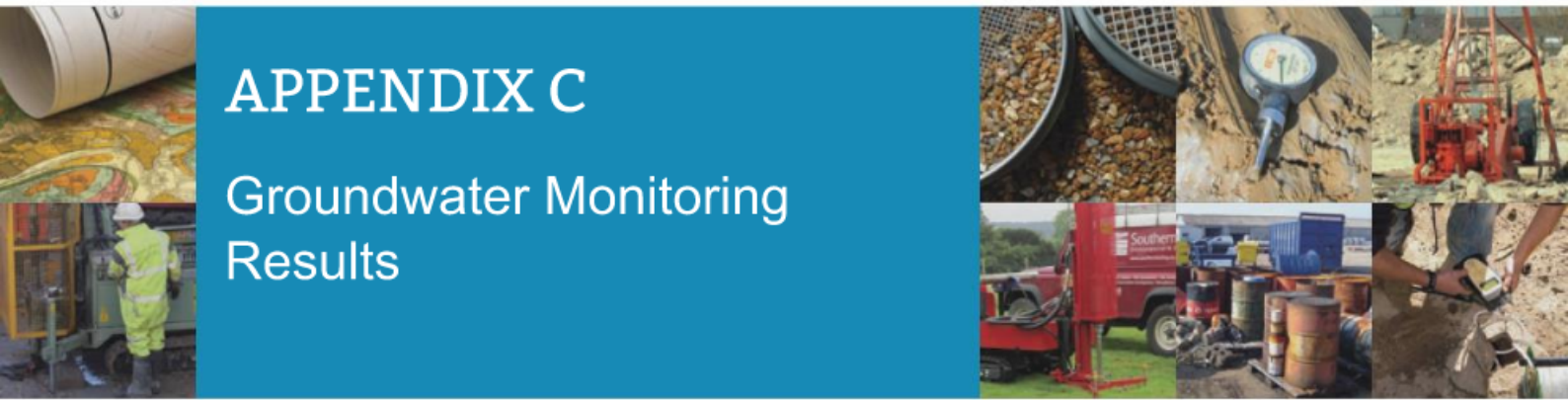
Groundwater Monitoring – Dip Meter

The dip meter is used to measure standing water levels within boreholes. The probe is lowered into the borehole until the meter detects the groundwater with an audible 'beep'. The level is then read from the tape.

Groundwater Monitoring – Digital Level Loggers

Digital loggers placed within borehole standpipes measuring water pressure, barometric pressure and temperature were used to record data over the monitoring period. The data was processed, using proprietary software, to determine temperature and barometric pressure compensated water levels.

The equipment can record parameters at pre-determined time intervals and has a capacity of many thousands of readings and is therefore suitable for monitoring over extended periods of time.

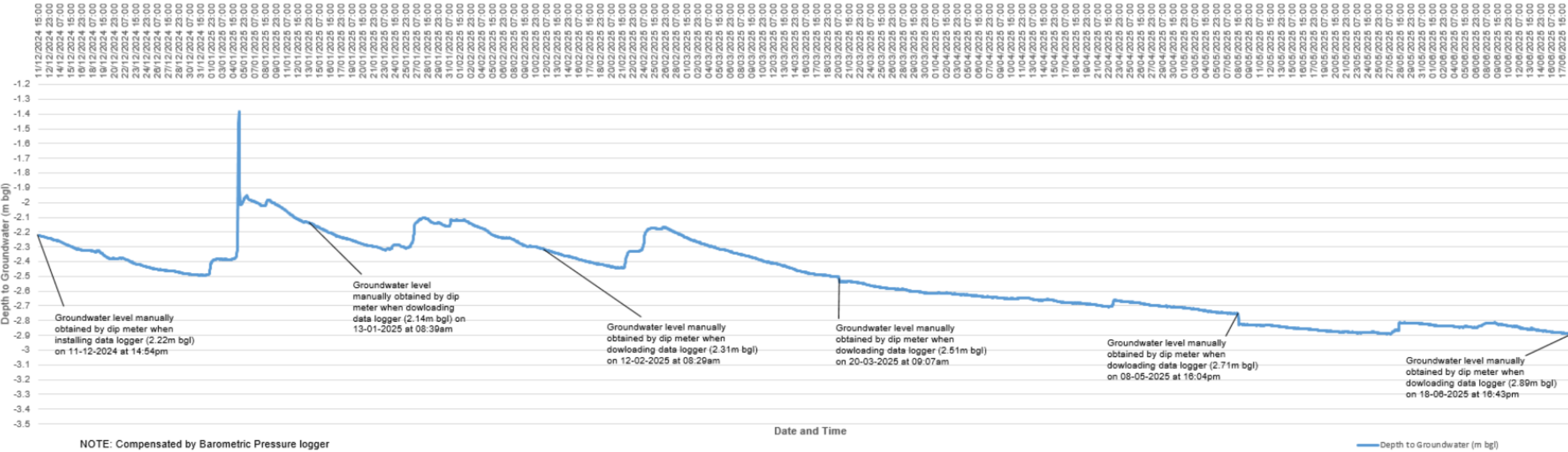


APPENDIX C

Groundwater Monitoring Results



BH101 - 11th December 2024 - 18th June 2025



Site: Westholme Nursery, Littlehampton

STL: JT0613

Fig No: 3

Date: 21 July 2025



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Soakage Test Report

Project Name: Westholme Nursery, Littlehampton

Location: Toddington Lane, Littlehampton, BN17 7SF

Client: Dr Arshad Hussain

Project ID: JT0613

Report Date: 20 December 2024

Report Issue: 1

Author	R Jiagge BSc (Hons) MSc FGS MEnvSc CSci	
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For and on behalf of Southern Testing Laboratories Limited

DOCUMENT HISTORY AND STATUS

Issue No.	Date	Purpose or Status	Author	Check / Review
1	20/12/2024	Issued to Client	RJ	SFP

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Site Plans and Exploratory Hole Logs

APPENDIX B

In-Situ Test Methods and Results

A INTRODUCTION

1 Authority

Our authority for carrying out this work is contained in Southern Testing Project Order form completed by Dr Arshad Hussain, and dated 28th October 2024.

2 Location

The site is located approximately 2km to the north east of Littlehampton Railway station in West Sussex. The approximate National Grid Reference of the site is TQ 03418 03915. The site location is indicated on Figure 1 within Appendix A.

3 Investigation Brief

In accordance with the Client's instructions, and our quotation, the following was included in our brief for this soakage investigation:

- 2 No. soakage tests were carried out on site using the BRE Digest 365 method.
- 15m cable percussive borehole for constant head test and installation of groundwater monitoring well

This work follows our earlier shallow soakage testing at the site, JT0593 dated 16th July 2024 to which the reader is referred. This latest work was designed to assess the feasibility of conventional soakaways at greater depths than previously tested, and to assess the feasibility of a borehole soakaway drainage solution.

4 Scope

This factual report presents our exploratory hole logs and test results only.

As with any site there may be differences in soil conditions between exploratory hole positions.

This report is not an engineering design and the figures and calculations contained in the report should be used by the Engineer, taking note that variations will apply, according to variations in design loading, in techniques used, and in site conditions. Our figures therefore should not supersede the Engineer's design.

The findings and opinions conveyed via this investigation report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd. believes are reliable. Nevertheless, Southern Testing Laboratories Ltd. cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

The investigation was conducted and this report has been prepared for the sole internal use and reliance of Dr Arshad Hussain and his appointed Engineers. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The recommendations contained in this report are made in respect of the particular context of the investigation as described in the report and may not be appropriate to alternative development schemes. This report should be considered in its entirety and Southern Testing Laboratories Ltd accepts no responsibility for and excludes liability in respect of any omission or alteration made by others, and any use of the report for any purpose other than that for which it was produced.

B SITE SETTING

5 Geological Records

No formal desk study has been carried out, but reference has been made to both online and published geological maps to put the site into context.

5.1 Geology

The British Geological Survey Map covering the site indicates that the site geology consists of River Terrace Deposits over New Pit Chalk Formation

5.1.1 River Terrace Deposits

The River Terrace Deposits are of fluvial origin and were laid down by the Thames when the climate was much wetter and cooler than at present. The terraces consist of sheets of gravel and sand with an overlying deposit of Brickearth (really an ancient alluvium). Some variability in soils is to be expected at junctions with the various terraces, as riverbanks existed there. The remains of these former riverbanks can be soft and silty or contain clay.

5.1.2 New Pit Chalk Formation (White Chalk Subgroup)

The New Pit Chalk Formation typically comprises a blocky creamy white, smooth textured chalk with well-developed marl seams. Small finger shaped flint occurs sporadically in the lower part of the sequence. Conjugate fractures are usually clay-coated and slickensided, reflecting the presence of many clay-rich marl seams.

The White Chalk outcrop in particular is frequently highly fractured and highly permeable, and usually has good infiltration characteristics. On the other hand, Chalk Head, highly weathered Chalk and Chalk under a low permeability superficial cover may have very poor infiltration characteristics.

Chalk is slightly soluble in water and, while it has excellent bearing properties when unweathered, this solubility can lead to deep weathering and softening, and the upper layers of chalk often have an irregular boundary with overlying strata

The Chalk may be softened by solution to a depth of 5 to 15 metres and bearing capacities and engineering properties improve with depth. Where there is an outcrop of impermeable soil overlying the chalk there may be a dramatically increased solution effect due to concentrated surface water flow to the Chalk close to the outcrop boundary.

Solution features are common in the Chalk, and these can present significant difficulties to development on affected sites.

C FIELDWORK

6 Strategy and Method

The strategy adopted for the soakage testing comprised the following:

Activity / Method	Purpose	Max Depth Range (mbgl)	Notes
SA101, SA101A & SA102 JCB 3CX	Trial pits to investigate the shallow ground conditions and allow for assessment of soakage potential using the BRE365 method.	2.7	BRE365 Soakage tests carried out in SA101A and SA102.

The test location SA101 was positioned within the Client's site boundary land near to the north-eastern boundary and SA102 was positioned within the adjacent neighbour's yard at a location agreed with the neighbour.

Due to instability of the trial pit SA101, soakage testing could not be carried out in the pit. A new pit (SA101A) was excavated approximately 5m to the west of SA101. Tests were initially scheduled to be deeper, however instability and water ingress forced the tests to be carried out at the depths indicated.

Exploratory hole locations are shown in Figures 2 and 2A in Appendix A.

In-situ test method descriptions employed are given in Appendix B together with the test results.

7 General Site Description

The site is a rectangular plot of land currently occupied by a single bungalow with soft landscaping to the front (south) and three dilapidated buildings some of which contain potential asbestos containing materials to the north. North of the buildings the front garden is laid to overgrown grass..

The site is bound to the north and west by new housing developments and to the east by private houses and commercial units. The south is bound by Toddington Lane.

Access to the site is from the south from Toddington Lane.

8 Weather Conditions

The soakage tests were carried out on 4th December 2024 at which time the weather was generally dry and mild. The borehole drilling was carried out on 10th December 2024 at which time the weather was dry on the day but there was some rainfall overnight making the ground wet.

9 Soils as Found

The soils encountered are described in detail in the attached exploratory hole logs (Appendix A), with a summary below.

9.1 SA101

Made Ground comprising soft dark grey very sandy slightly gravelly CLAY with anthropogenic materials including 300mm x 300mm plastic liner and metal encountered to 0.7m bgl. The made ground was found to be underlain by River Terrace Deposit of soft light brown very sandy CLAY and loose orangish brown clayey SAND to 3.0m bgl. The River Terrace Deposits were in turn underlain by New Pit Chalk Formation comprising structureless chalk composed of white cobbly silty GRAVEL of weak, low density chalk clasts.

9.2 SA101A

Made Ground comprising loose dark grey clayey gravelly fine to coarse Sand with anthropogenic materials including occasional boulder size concrete, glass, metal and cable was encountered to a depth of 2.0m bgl. The made ground was found to be underlain by New Pit Chalk Formation comprising structureless chalk composed of white gravelly SILT with weak and low density chalk clasts.

9.3 SA102

Made Ground comprising loose black fine to coarse road planing Gravel with anthropogenic materials including with occasional brick cobble, ceramic tile and glass fragment was encountered to a depth of 0.7m bgl. The made ground was found to be underlain by River Terrace Deposits comprising soft brown very sandy Clay and firm grey silty organic Clay to a depth of 2.7m bgl. The River Terrace Deposits was in turn underlain by New Pit Chalk Formation comprising structureless chalk composed of white gravelly SILT with weak and low density chalk clasts.

9.4 BH101

Made Ground comprising soft dark grey sandy gravelly Clay with anthropogenic materials including brick and concrete was encountered to a depth of 0.8m bgl. The made ground was found to be underlain by River Terrace Deposits comprising soft brown very sandy silty Clay to a depth of 1.5m bgl. The River Terrace Deposits was in turn underlain by New Pit Chalk Formation comprising structureless chalk composed of white gravelly SILT to 3.1m bgl, cobbly silty Gravel to 8m bgl and becoming structured thereafter.

10 Groundwater Observations

Groundwater was observed in the exploratory holes as follows:

Hole ID	Water Strike Depth (m)	Comment	Stratum
SA101	2.9	Rose to 2.5m bgl. Moderate inflow	River Terrace Deposits
SA101A	2.6		New Pit Chalk Formation
SA102	2.65		New Pit Chalk Formation
BH101	2.7	Rose to 2.5m bgl in 20 minutes. Water level at 3.55m bgl upon completion of drilling.	New Pit Chalk Formation

D TEST RESULTS

11 Soakage Test Results

The BRE paper DG365, Ref [22] describes a method for site testing to determine soil infiltration rates at the proposed site of a soakaway. The in-situ test method is described in Appendix B.

The DG365 Ref [22], states that each pit should be allowed to drain three times to near empty, with filling on the same or consecutive days. This was not possible within SA102 given the poor soakage rate.

The infiltration rate from each trial hole is summarised in the table below. The soakage rate in this report is expressed as $\ell/m^2/\text{minute}$, which is a convenient rate to use. The BRE use a unit of m/sec , which is the value in $\ell/m^2/\text{minute}$ divided by 60,000.

Test ID	Test Depth (mbgl)	Test No.	Design Infiltration Rate		Notes
			$\ell/m^2/\text{minute}$	m/sec	
SA101A	2.7	1	3.86	6.43×10^{-5}	
		2	2.80	4.67×10^{-5}	
		3	2.36	3.94×10^{-5}	
SA102	3.0	2	0.482	8.04×10^{-6}	After 5hrs of monitoring, the water level did not fall to the effective 25% depth. Calculations were based on actual fall of water level achieved

Note: The Design Infiltration Rate is the lowest of the three tests

Where three fillings have not been carried out, a reduction factor should be applied to the result to provide a design infiltration rate.

Favourable soakage rates have been achieved at SA101A within the Client's site boundary. It should be noted that given the thickness of the Made Ground (2m in thickness) at this location, some of the water soaked away through about 500mm of Made Ground, as the water head was brought up to about 1.5m bgl during the test.

On the basis of the above, it is feasible that a soakaway can be installed within the Client's land. However, given the variation in the ground conditions on the site, it is recommended that where possible the soakaway is installed at the location of test pit SA101A.

It is prudent that the soakway is not installed to allow discharge within the Made Ground to help reduce the possibility of inundation settlement. Where it is not possible to find sufficient freeboard (at least 1m) between the base of the soakaway and the groundwater table and there will be a direct discharge into the groundwater, approval of the Environment Agency would be required. It should be noted that a high groundwater condition will reduce the available storage volume. Groundwater monitoring is currently ongoing.

12 Feasibility Borehole Soakaway Testing

A 200mm diameter cable percussive borehole was drilled to 15m bgl. The rationale was to establish the depth to groundwater and assess the viability of using a borehole soakaway on the site.

A constant head test carried out with the borehole recorded a soakage rate of 4.70 litres/hr.

As expected from the high water table on site, this poor flow rate demonstrates that borehole soakaways will not be viable for this site.

Upon completion of the testing, the borehole was installed with 50mm diameter pvc pipe for groundwater monitoring purposes.

Data loggers were installed within the borehole for daily measurement of groundwater on site. For the next four months, a site visit will be carried out once a month to download the data for processing and to help understand the groundwater level through the wet months of the year.

The results of the groundwater monitoring will be presented in a separate letter report at the end of the monitoring period.

12.1 General Guidance on Design of Soakaways

Any soakaway scheme may require the approval of the Environment Agency, Building Control and, where applicable, the adopting Highways Authority.

Soakaways are used to store the immediate surface water run-off from hard surfaced areas, such as roof or car parks, and allow for efficient infiltration into the adjacent soil. They should be designed to discharge their stored water sufficiently quickly to provide the necessary capacity to receive run-off from a subsequent storm. The time taken for discharge depends upon the soakaway shape and size, and the surrounding soil's infiltration characteristics.

Groundwater levels can vary considerably from season to season and year to year, often rising in wet or winter weather, and falling in periods of drought. As such, a high groundwater table may affect the storage capacity of soakaways. In addition, it should be noted that an unsaturated zone may be required between the base of soakaways and the groundwater table, by the Environment Agency. Longer term monitoring may be required to establish actual groundwater levels as part of the planning approval process.

The design of soakaways can be square, circular (conventional) or trench excavations, and may be rubble filled, perforated precast concrete ring units, plastic cells or any similar structure that collects rainwater and run-off and allow discharge directly into the ground. Depending on the geological conditions, and depth at which suitable infiltration is achieved, soakaways can also be deep bored.

Long-term maintenance and inspection must be considered during the design and construction process. Maintenance of silt traps, gully pots and interceptors will improve the long-term performance of soakaways. The use of wet well chambers within the soakaway system can further assist in pollutant trapping and extending the operating life of soakaways.

Risk of pollution to the quality of groundwater must be considered as part of the design.

Generally, roof and surface run-off should not significantly impact on groundwater quality and subject to appropriate approvals from the Environment Agency could be discharged directly to soakaways. However, although again subject to approvals from the Environment Agency, paved surface run-off for larger trafficked areas should generally be passed through a suitable form of oil interception device prior to discharge to the soakaway.

Care must be taken to ensure that the discharge of large volumes of surface run-off into the soil does not disrupt the existing sub-surface drainage patterns. Similarly in areas of sloping topography, consideration should be given to the siting of soakaways to avoid potential discharge and or flooding of down slope areas.

Soakaways should not normally be constructed closer than 10 m to buildings.

REFERENCES

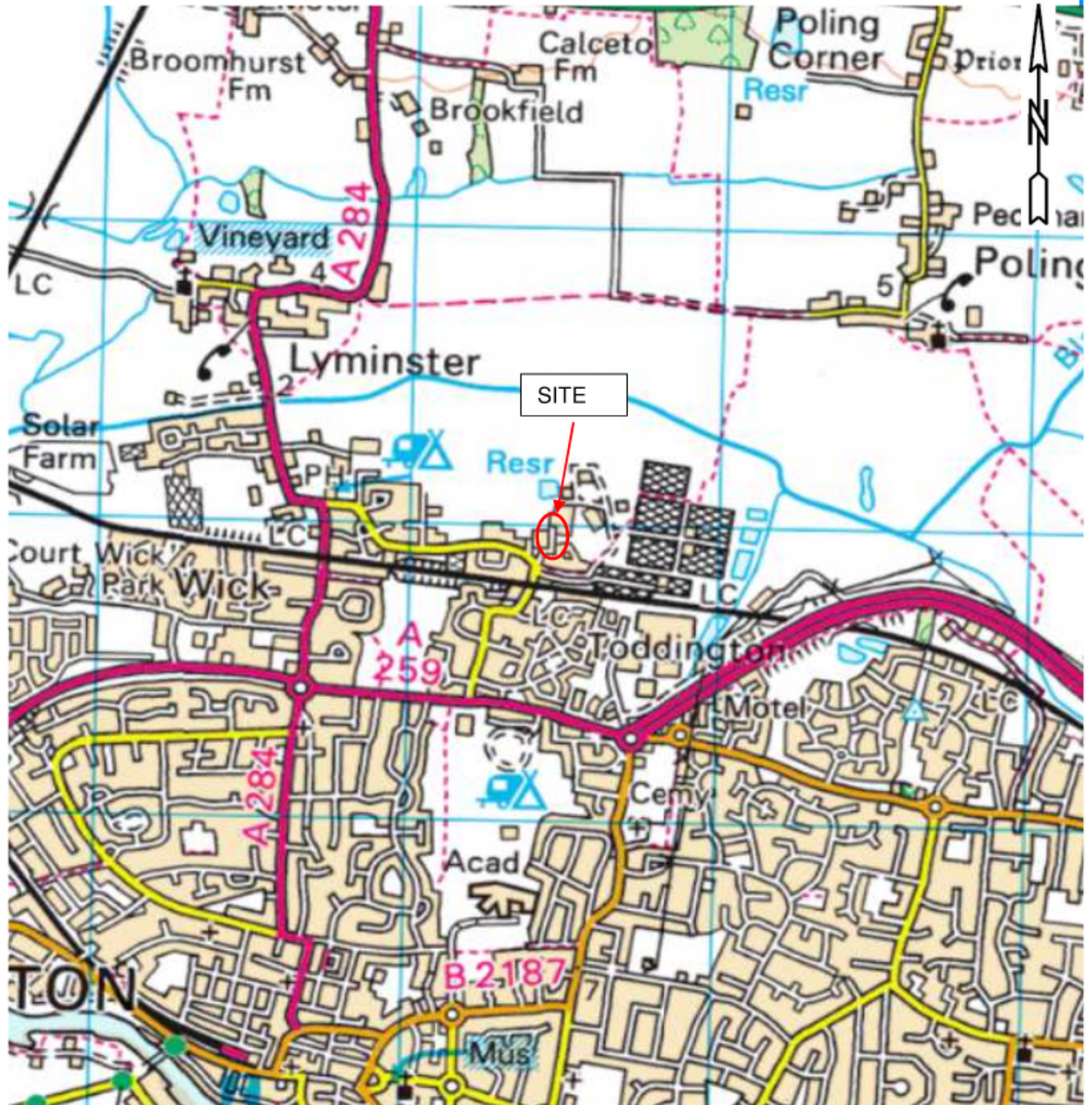
- [1] Building Research Establishment (BRE), "DG365 Soakaway Design," 2016.
- [2] BSI Standards, "BS 5930 Code of practice for ground investigations," 2015.
- [3] BSI Standards, "BS 3882:2015 Specification for Topsoil," 2015.
- [4] CIRIA, "C574 Engineering in Chalk," 2002.
- [5] R. N. Mortimore, Logging the Chalk, 2014.

A collage of six images related to geotechnical engineering. Top left: A large white pipe and a colorful soil profile map. Top middle: A close-up of a soil sample in a sieve. Top right: A pressure gauge and a red drilling rig. Bottom left: A worker in a high-visibility suit. Bottom middle: A red truck with 'Southern' on the side and various equipment. Bottom right: A person using a tool to sample soil.

APPENDIX A

Site Plans and Exploratory Hole Logs





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Site:	Toddington Lane, Littlehampton, BN17 7SF	Project ID	JT0613
Figure 1	Site Location Plan	Date:	20/12/2024



KEY



SA101 & SA102 - BRE365
soakage test



BH101 – Borehole soakage test &
Groundwater monitoring well

NB: Positions of exploratory holes / test positions are only indicative unless dimensioned.

Site:	Toddington Lane, Littlehampton, BN17 7SF	Project ID	JT0613
Figure 1	Site Investigation Layout Plan	Date:	02/12/2024

Project Name:	Littlehampton	Project ID:	JT0613	Site Plan
Location:	Westholme Nursery, Toddington Lane, Littlehampton BN17 7SF	Engineer:	RJ	
Client:	Ashard Hussain	Scale:	1:1500	



Legend Key

-  Locations By Type - CP
-  Locations By Type - TP