Consulting Civil Engineers

Water Neutrality Report

Campsfield, Centenary Road, Southwater, Horsham RH13 9FU

For

Miller Homes

Rev – **P2**

Reference **C3538**

Date **25th March 2025**

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P	10.02.2025	Initial Issue	LH	CS
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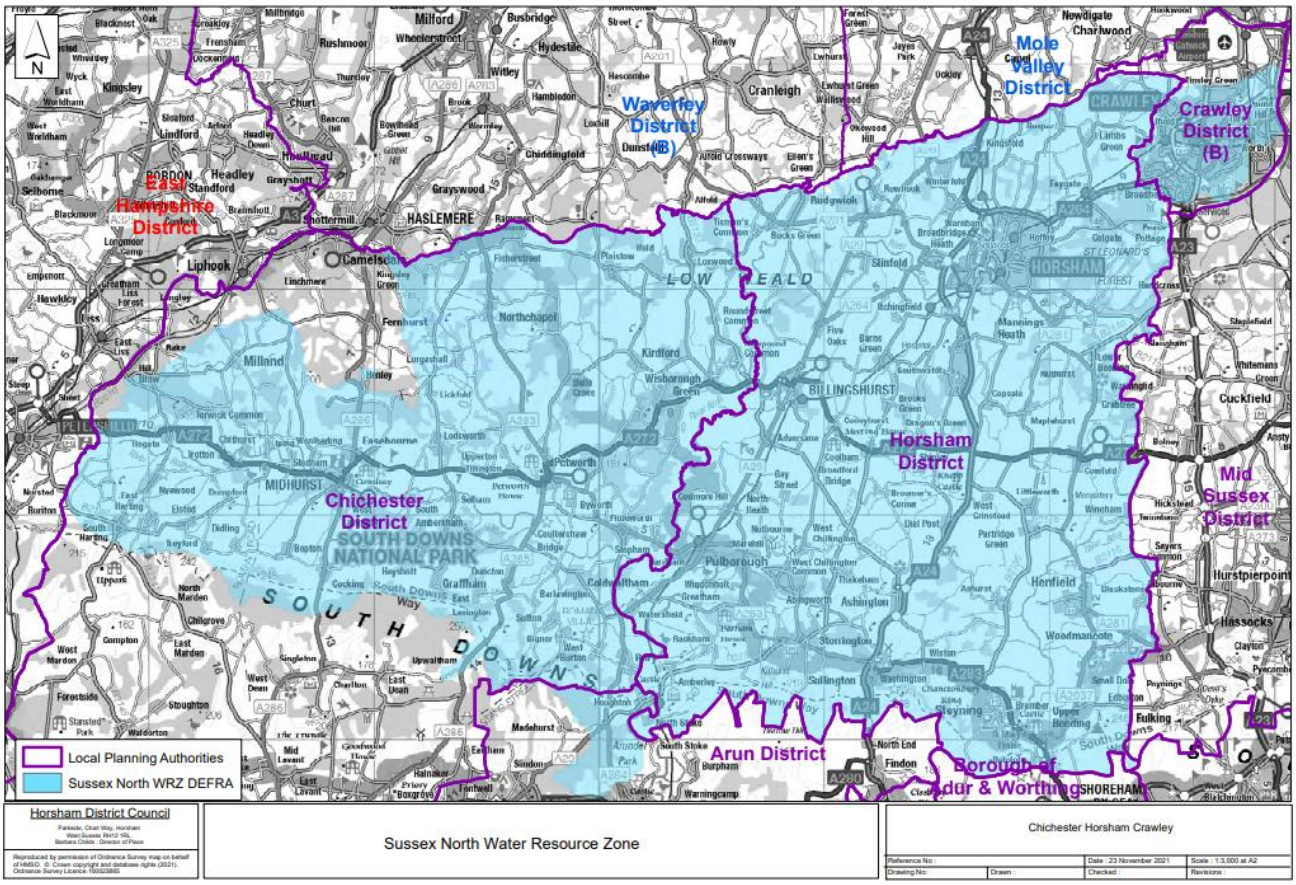
1 Introduction

1.1.1 CGS Civils Ltd has been appointed by Miller Homes to undertake a Water Neutrality Report for a proposed development at Campsfield in Southwater, Horsham. The proposed scheme will consist of the construction of 82 new dwellings in the land at Campsfield within Southwater, Horsham.

1.1.2 The site falls within the Sussex North Water Supply Zone, in which Natural England have written to all authorities within the zone providing a position statement for applications which may place increased pressure on this zone. This explains that recent case law has established that abstraction from the Supply Zone may be having an impact on protected sites (Arun Valley Special Area of Conservations (SAC), Special Protection Area (SPA) and Ramsar site).

1.1.3 As a result, developments within this zone must not add to this impact, as such, the purpose of this report is to therefore provide an overview on the potential water usage changes on the site because of the proposed development, and to confirm that the site is water neutral.

Fig 1. Sussex North Water Supply Zone Area



1.1.4 The proposed development is located at OS Grid Reference TQ 16061 24877 and has the post code RH13 9FU

Fig 1. Site Location

1.1.5 Waterwise defined Water Neutrality as:

'For every new development, total water use in the region after the development must be equal to or less than the total water uses in the region before the new development.'

1.1.6 Achieving water neutrality involves using a three-step approach. First, the demand for water from the new development must be reduced as far as is practicable, followed by the re-use of water; then the remaining demand should be offset within the region. Following this three-step approach allows the volume that requires offsetting to be reduced which ultimately reduces the cost of the overall scheme. This is noted within the Waterwise neutrality definition, which defines the three steps which should be undertaken in order to achieve water neutrality in their recent review dated January 2021.

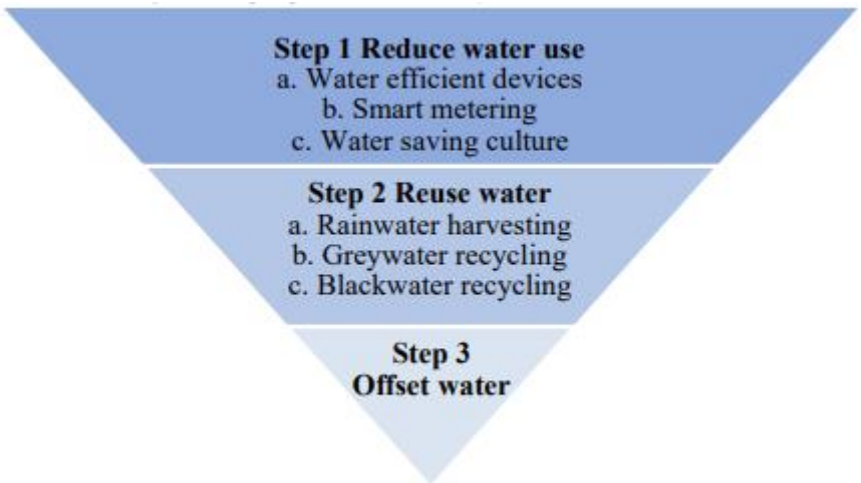
- Reduce water demand in the new development through improvement in efficiency.
- Re-use water, wherever possible.
- Offset the remaining water demand from the new development if required.

1.1.7 The report will be split into the following sections:

- A Review of Water Neutrality demand reduction
- A calculation of estimate water usage from proposed development
- Identification of measures that can be first used to reduce this demand
- Identification of measures that can be used to re-use water
- Establish solutions to offset that demand in order to achieve neutrality.

1.1.8 This report will follow the methods documented within *'A Review of Water Neutrality in the UK'* carried out by Waterwise in January 2021. The document provides details on how developments can achieve water neutrality by utilising the 3-stage approach.

Fig 2. 3-stage approach



1.1.9 Some increase in water demand within the region from planned development during the local plan period is inevitable. However, it can be minimised by making the site as water efficient as possible.

1.1.10 Per Capita Consumption (PCC) is used as a measure of water use and is the volume of water that is used by one person in one day. It is usually measured in litres per person per day (l/p/d). The average PCC within Southern Water's 'Sussex North Water Resource Zones (WRZ)' is 135 l/p/d. Homes without a water meter consume on average 160 l/p/d and for homes with a water meter, consume on average 131 l/p/d.

1.1.11 Part G of the Building regulations currently states that new build housing should achieve a minimum of 125 l/p/d. A tighter target of 110 l/p/d can be requested if the local authority can establish a clear need based on available evidence.

1.1.12 The table below indicates different demand scenarios including Southern Water's Target 100 Ambition to achieve 100 l/p/d, as well as further scenarios where water demand is cut more dramatically.

Table 1 PCC Demand Scenarios

Demand Scenario	Per Capita Consumption (l/p/d)
British Flows and Loads	150
Building Regulations Standard	125
Building Regulations Optional	110
Target 100	100
Realistic Achievable	85
Ambitious	62

1.1.13 The benefits of water neutrality are wide ranging, from financial and reputational to environment and social. For a new domestic building, they could include:

- **Saving Water** – Over 100,000 litres of water can be saved per year for each water neutral home built
- **Saving Carbon** – A significant CO2 saving can be achieved by reducing the demand for hot water for baths, showers, basins, dishwashers and washing machines
- **Saving Money** – Both water and energy bills will reduce
- **Reducing environmental impact** – Decreasing water abstracted from rivers and groundwater sources
- **Improved Resilience** – For the future by minimising the additional pressure on water resources
- **Enabling future housing growth** – In water scarce areas by reducing the impact of new homes and buildings
- **Reducing discharge to sewage** – by using less water, collecting rainwater and recycling greywater, less water is discharged to the drainage network
- **Short pay-back time** – After approximately 5 years the saving of water neutrality will outweigh the costs of doing so.

2 Executive Summary

2.1.1 The proposed scheme will consist of the construction of 82 No. new dwellings in the land at Campsfield, Horsham. The proposed scheme will have a water demand of **19,767 l/day** prior to any mitigation measures.

2.1.2 As demonstrated within this report, the use of water efficient fittings in addition to the installation of 2 No. boreholes is sufficient to result in a water neutral site.

Table 2 Water Usage Comparison

Existing Water usage	0 m^3
Proposed Scheme water usage prior to mitigation measures	19.77 m^3
Proposed Scheme water usage with water efficient fittings	16.00 m^3
Potable water abstracted from borehole	39 m^3
Proposed Scheme water usage equal to or lower than existing site	Yes

3 Calculation of estimated water usage from the proposed development

3.1.1 Before any necessary steps to achieve water neutrality can be determined, the total water demand for the proposed development must first be calculated. The proposed scheme will consist of 82 new build dwellings which are comprised of the following:

- 14 No. 1-bedroom dwellings
- 22 No. 2-bedroom dwellings
- 30 No. 3-bedroom dwellings
- 16 No. 4-bedroom dwellings

3.1.2 In accordance with the average occupancy levels set out by Horsham DC, the population for the dwellings will be, for a total site population of 218.86.

- 1-bedroom dwelling – 1.32.
- 2-bedroom dwellings – 1.88
- 3-bedroom dwellings – 2.47
- 4-bedroom dwellings – 2.86

Table 3 Average occupancy levels

Number of bedrooms	Average occupancy level
1	1.32
2	1.88
3	2.47
4	2.86
5	3.09

3.1.3 As the proposed site will consist of dwellings, Policy 37 of the Horsham District Planning Framework (HDPF) triggers the requirement for the optional building regulations standard of 110 litres per person per day (l/p/d), therefore:

1.32 x 110 l/p/d
= 145.2 l/day for each 1-bedroom dwelling

1.88 x 110 l/p/d
= 206.8 l/day for each 2-bedroom dwelling

2.47 x 110 l/p/d
= 271.7 l/day for each 3-bedroom dwelling

2.86 x 110 l/p/d
= 314.6 l/day for each 4-bedroom dwelling

Total Site water demand:
= 19,767 l/day or 19.77m³/day

3.1.4 The following sections within this report will cover measures that can be undertaken in order to reduce the water consumption of the proposed property and aim for the 'Ambitious' PCC of 62/l/p/d.

4 Step 1 – Identifying measures that can be used to reduce this demand

4.1.1 The first and most important step in achieving water neutrality will be to ensure that the water used by the proposed development is used as efficiently as possible; the smaller the water demand of the building due to the design and fittings, the less water is needed to be reused and offset. There are a number of ways of achieving a smaller water demand:

- Fitting homes with efficient products, such as:
  - Aerated Taps
  - Aerated Shower heads
  - Low Flush Toilets, or air flush toilets
  - Water efficient white goods
- Installing Smart Meters, this allows the consumer to see how much water they are using, and how this affects their water saving bill. This can help consumers to reduce water usage, identify leaks, and meet water saving targets, with the bonus of reduced bills.
- Designing home to encourage water saving behaviours, this can also help reduce water use and help ensure that other measures that are put in place are effective. Education and awareness are important components of achieving water neutrality.

4.1.2 Building Regulations Part G states that when the new fittings approach is used, the water consumption of the fittings must not exceed a total of 125 l/p/day/. The values are listed in the table 4 below:

Table 4 Maximum Fittings Consumption from Building Regulations Part G

Water Fitting	Maximum Rating
WC	6.4/ litres dual flush or 4.5 litres single flush
Shower	10 l/min
Bath	185 litres
Basin Taps	6 l/min
Sink Taps	8 l/min
Dishwasher	1.25 l/place setting
Washing Machine	8.17 l/kilogram

4.1.3 Should the proposed development be required to comply with the optional water efficiency as part of the conditions for planning permission, the estimated consumption of water can be calculated via the Optional requirement level of fittings consumption. This is listed within Building Regulations Part G, which also states that the water consumption must not exceed 110 l/p/day, and the maximum fittings consumption for optional requirement can be found in Table 5 below:

Table 5 Maximum fittings consumption optional requirement level from Building Regulations Part G

Water Fitting	National Base Level
WC	4/2.6 litres dual flush
Shower	8 l/min
Bath	170 litres
Basin Taps	5 l/min
Sink Taps	6 l/min
Dishwasher	1.25 l/place setting
Washing Machine	8.17 l/kilogram

4.1.4 However, to improve on the above requirements, the proposed site can implement the following measures in order to focus on becoming a water efficient development. By installing the following features, the development can achieve a water demand of around 85 l/p/d, which aligns with a 'Realistic Achievable' PCC. See Table 6 below:

Table 6 Water efficient fittings consumption

Water Fitting	Consumption Level
WC	4/2.6 litres dual flush
Shower	7 l/min
Bath	145 litres
Basin Taps	2.5 l/min
Sink Taps	5 l/min
Dishwasher	0.67 l/place setting
Washing Machine	5.5 l/kilogram

Please note that by accepting this report, you accept the low flow rates of the proposed fittings required to achieve water neutrality. CGS Civils cannot be held responsible for any reduced comfort levels that may arise from the use of these fittings.

4.1.5 Water demand can also be reduced through fitting metres, which help to identify leaks and track water consumption as a way to support and encourage behavioural changes such as, not leaving the tap running when brushing teeth and using eco settings on the washing machine and dishwasher. It should be noted that behavioural changes have not been used within the calculations within this report as it is impossible to enforce.

Table 7 Practical Summary of Step 1

Step 1: Reduce Water				
Toilets	Cistern displacement devices (toilet hippos)	Retrofit flush devices to dual flush	Fix leaky toilets	
Taps	Tap inserts (aerators)	Low flow restrictors	Push taps	Infrared Taps
Showers/baths	Low flow shower heads (less than 8litres/min)	Shower timers	Reduced bath frequency & volume	
Outdoors	Hosepipe flow restrictors	Hosepipe siphons	Water butts	Mulches and composting to keep soil moist
Smart Metering	Leakage information	Encourage behavioural changes	Innovative tariffs	Savings estimates

4.1.6 By installing the water efficient devices listed above, it is possible to reduce the water demand (Appendix A) on site from **19,767 l/day** down to **16,000 l/day**

1.32 x 89.04 l/p/d

= 117.5 l/day for each 1-bedroom dwelling

1.88 x 89.04 l/p/d

= 167.4 l/day for each 2-bedroom dwelling

2.47 x 89.04 l/p/d

= 219.9 l/day for each 3-bedroom dwelling

2.86 x 89.04 l/p/d

= 254.7 l/day for each 4-bedroom dwelling

Total Site water demand:

= 16,000 l/day or 16.00m³/day

5 Step 2 – Identify measures that can be used to re-use water

5.1.1 It is not currently proposed to implement rainwater harvesting on the proposed site.

6 Step 3 – Offsetting remaining water demand

6.1.1 Finally, the remaining water requirements for new homes or developments which cannot be satisfied with non-potable sources must be offset. Offsetting can generally be done by investing in schemes that save water within the local region such as retrofitting existing buildings with water efficient devices or water reuse systems.

6.1.2 In this instance however, the client has installed two boreholes on site which are to be utilised to abstract potable water from the Weald Clay Formation. A Hydrogeological assessment has already been carried out which details that the proposed abstraction rate is 1.62m^3/hour or 39m^3/day which is significantly more than the water demand of 16.00m^3/day for the proposed development.

6.1.3 Consent to drill the boreholes was granted in July 2024 and the boreholes were test pumped in September 2024. Further information on the boreholes can be found in the relevant Hydrogeological Impact assessment that has been supplied. A copy of the Hydrogeoglical impact assessment can be found within **Appendix D** and a copy of the borehole prognosis report can be found in **Appendix E.**

7 Conclusion

7.1.1 To summarise:

- The proposed development will use on average **19,767 l/day** prior to any mitigation techniques.
- This water demand can be reduced to **16,000 l/day** through the installation of water reducing appliances
- Rainwater harvesting is not to be utilised.
- The water demand from the proposed site is to be offset via the installation of 2 no. boreholes that have been installed on site. The boreholes are capable of abstracting 39m^3 of water per day which is sufficient to offset the demand from the proposed development.

8 Appendices

8.1 Appendix A:

Table 10 – Water Calculator from Building Regulations Part G – Information input from proposed site with water efficient devices from Table 6.

The Water Calculator for New Dwellings with Water efficient measures					
Installation Type	Unit of measure	Volume/ flow rate	Use factor	Fixed use	Litres/person/day
WC (Single Use)	Flush volume (l)	0	4.42	0	0
WC (Dual Flush)	Full Flush Vol.	4	1.46	0	5.84
	Part Flush vol.	2.6	2.96	0	7.696
WC (Multiple Fittings)	Average effective flush volume (l)	0	4.42	0	0
Taps (excl. Kitchen)	Flow rate (l/min)	2.5	1.58	1.58	5.53
Bath (shower also present)	Capacity to overflow (l)	145	0.11	0	15.95
Shower (bath also present)	Flow rate (l/min)	7	4.37	0	30.6
Bath only	Capacity to overflow (l)	0	0.5	0	0
Shower only	Flow rate (l/min)		5.6	0	0
Kitchen sink taps	Flow rate (l/min)	5	0.44	10.36	12.56
Washing Machine	Litres/kg dry load	5.5	2.1	0	11.55
Dishwasher	litres/place setting	0.73	3.6	0	2.62
Waste disposal unit	litres/use	0	3.08	0	0
Water softener	litres/person/day	0	1	0	0
		Total Calculated use (l/p/d)			92.358
		Contribution from greywater (l/p/d)			0
		Contribution from rainwater (l/p/d)			0
		Normalisation factor			0.91
		External water use			5
		Total water consumption (36(1)) (l/p/d)			89.045

8.2 Appendix B:

Potential Washing Machine data sheet – Fisher & Paykel WM1490F1 9kg:

Model	Cycle	Temp. (°C)	Load (kg)	Program Time On Display (min)	Remaining Moisture Content (%)	Energy Consumption (kWh/Cycle)	Water Consumption (L/Cycle)
WM1490F	Cottons Eco*	60	9	198	47	0.67	50
	Cottons	40	9	138	56	1.17	84
	Everyday	40	8	59	48	0.81	96
	Heavy	60	8	130	48	2.19	115
	Synthetic	40	4	121	40	0.98	53
	Delicate	40	4	45	65	0.70	65
	Sports	40	4	50	43	0.55	56

8.3 Appendix C:

Dish Washer Data Sheet – Bosch SMS6EDI02G:

Product information sheet COMMISSION DELEGATED REGULATION (EU) 2019/2017				
Supplier's name or trade mark [a] [b] :	Bosch			
Supplier's address [a] [b] :	BSH Hausgeräte GmbH, Carl-Wery-Str. 34, 81739 Munich, Germany			
Model identifier [a] :	SMS6EDI02G			
General product parameters:				
Parameter	Value	Parameter	Value	
Rated capacity [d] (ps)	13	Dimensions in cm [a] [b]	Height	85
			Width	60
			Depth	60
EEI [d]	44	Energy efficiency class [d]	C [c]	
Cleaning performance index [d]	1.121	Drying performance index [d]	1.061	
Energy consumption in kWh [per cycle], based on the eco programme using cold water fill. Actual energy consumption will depend on how the appliance is used.	0.736	Water consumption in litres [per cycle], based on the eco programme. Actual water consumption will depend on how the appliance is used and on the hardness of the water.	9.5	
Programme duration [d] (h:min)	4:35	Type	Freestanding	
Airborne acoustical noise emissions [d] (dB(A) re 1 pW)	46	Airborne acoustical noise emission class [d]	C [c]	
Off-mode (W) (if applicable)	-	Standby mode (W) (if applicable)	0.50	
Delay start (W) (if applicable)	4.00	Networked standby (W) (if applicable)	2.00	
Minimum duration of the guarantee offered by the supplier [a] [b] :			24 months	
Additional information [a] [b] :				
Weblink to the supplier's website, where the information in point 6 of Annex II to Commission Regulation (EU) 2019/2022 is found: www.bosch-home.com/energylabel				

8.4 Appendix D:

Hydrogeological impact assessment:

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Environmental Consulting Ltd

Centenary Road, Southwater: Hydrogeological Impact Assessment

Version control log

Document number	Date	Issued by	Issued to	Comments
2024-095-035-001v2	24/03/25	Steve Buss	Nicholls Boreholes	Final draft
2024-095-035-001	20/12/24	Steve Buss	Nicholls Boreholes	First draft

Client: Nicholls Boreholes

Dated: March 2025

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DISCLAIMER

This report has been prepared by Stephen Buss Environmental Consulting Ltd (SBEC) in its professional capacity as hydrogeologist, in a manner consistent with the level of care and skill ordinarily exercised by members of the geological and engineering professions practising at this time, within the agreed scope and terms of contract, and taking account of the manpower and resources devoted to it by agreement with its client.

The advice and opinions in this report should be read and relied on only in the context of the report as a whole. As with any environmental appraisal or investigation, the conclusions and observations are based on limited data. The risk of undiscovered environmental impairment of the property cannot be ruled out. SBEC cannot therefore warrant the actual conditions at the site and advice given is limited to those conditions for which information is held by SBEC at the time. The findings are based on the information made available to SBEC at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time.

The findings do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

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C Water features survey
D Water quality analyses

1. Introduction

1.1 Background

This is a hydrogeological impact assessment (HIA) to support an application for a licence for groundwater abstraction at Campsfield, Centenary Road, near Horsham.

The site address is Campsfield, Centenary Road, Southwater, Horsham, West Sussex RH13 9FU (Figure 1.1). Two private water supply boreholes have been constructed for the site that will abstract groundwater from the underlying Weald Clay.

The following aggregate abstraction rates (i.e. for both boreholes together) are being applied for.

Hourly	1.64 m^3/hour
Daily	39.39 m^3/day
Annually	14 377 m^3/year

1.2 This Report

This report has been prepared according to the guidance in Environment Agency Science Report SC040020/SR2 'Hydrogeological impact appraisal for groundwater abstractions'. After this introductory section the abstraction is described in Section 2. The hydrogeological conceptual model for the site is developed in Section 3 and the pumping test data is analysed in Section 4. Finally, in Section 5 the findings of the report are brought together in the format suggested in the Executive Summary of SC040020/SR2.

This report has been written by Dr Stephen Buss MA MSc CGeol, based on the field work and preparatory work of Nicholls Licensing and Consulting. Dr Buss is a UK-based independent hydrogeologist with more than 25 years' consulting experience in solving groundwater issues for the Environment Agency, water companies, private sector organisations and individual property holders. Dr Buss's CV and publications list is available at www.hydro-geology.co.uk.

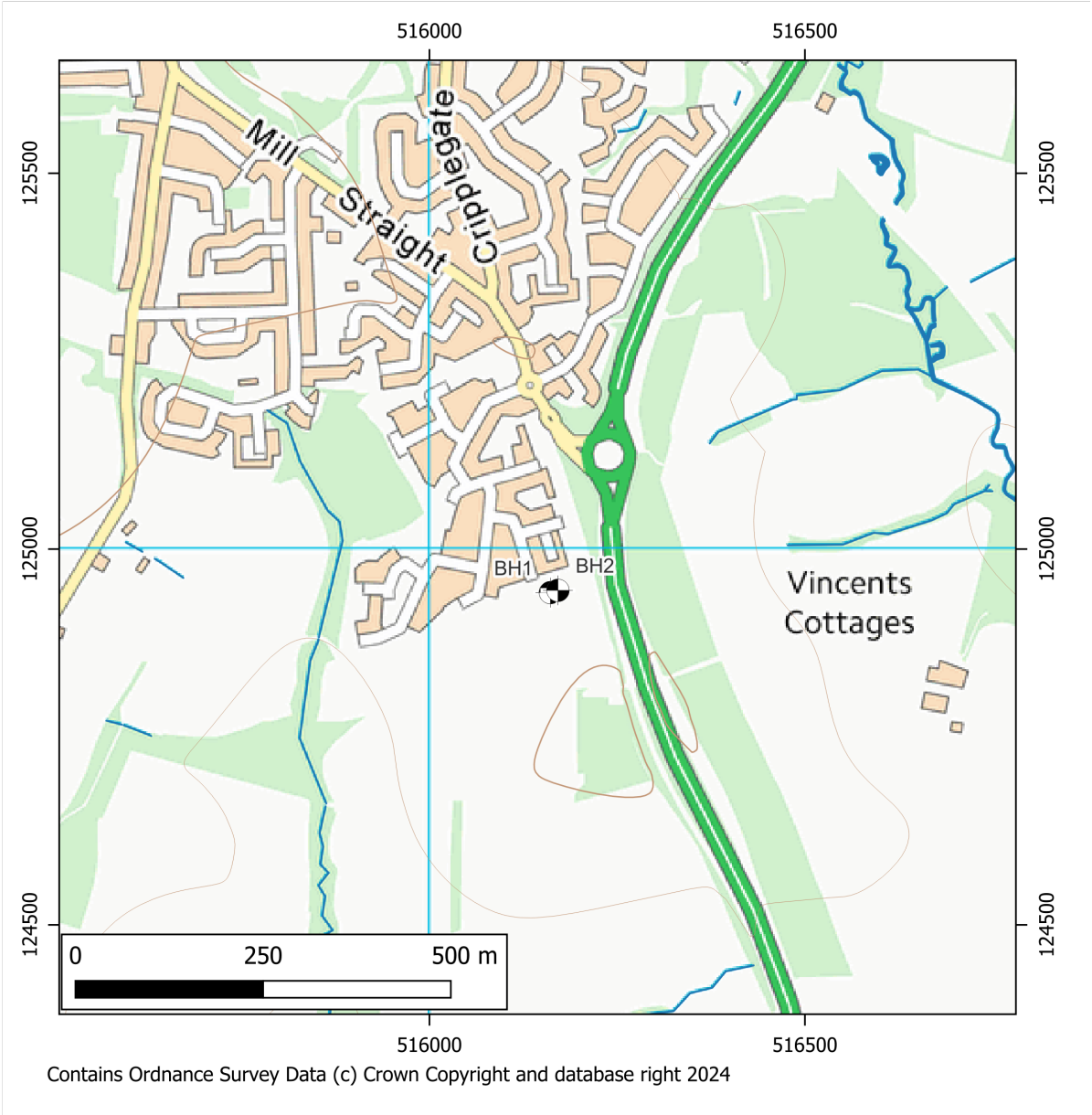

Figure 1.1: Site location

2. Details of Groundwater Source

2.1 The Boreholes

Consent to drill and test the boreholes was issued in July 2024 (consent number S/2024/342) (Appendix A).

The boreholes were drilled in July 2024 by Nicholls Boreholes Ltd (Appendix B). They are 10.4 m apart. The grid references are as follows. BH1: TQ 16161 24942, and BH2: TQ 16171 24945. Ground elevations, from Environment Agency LIDAR data, are as follows. BH1 c. 48.3 m above Ordnance Datum (AOD), and BH2: c. 48.5 m AOD.

Both boreholes were drilled to 100 m depth, at 241 mm diameter. In both boreholes solid uPVC casing at 125 mm was installed to 12 m, then 125 mm diameter slotted uPVC casing was installed to the bases of the boreholes.

Schematic borehole logs are shown in Figure 2.1. Each borehole encountered clay with claystone and siltstone layers of the Weald Clay Formation to the bases of the boreholes.

Rest groundwater level in both boreholes was at 9.8 m depth at the start of constant rate test monitoring (c. 38.5 m AOD in BH1 and 38.7 m AOD in BH2).

2.2 Water Features Survey

A water features survey (WFS) was provided to the Environment Agency with the application for the Schedule 32(3) consent (Appendix C). The survey radius was 250 m.

There were two shallow ponds within the search radius, about 130 m to the south west of the boreholes (points E and F in Appendix C). When viewed, in spring 2024 these were present, but not there were no inflows or outflows.

Just outside the search radius there was one well to the south (point A: Pollards Farm, TQ12SE21) and a stream to the west (point D). The well has no pumping equipment installed, is not licensed, and is not registered as a private water supply with the local authority.

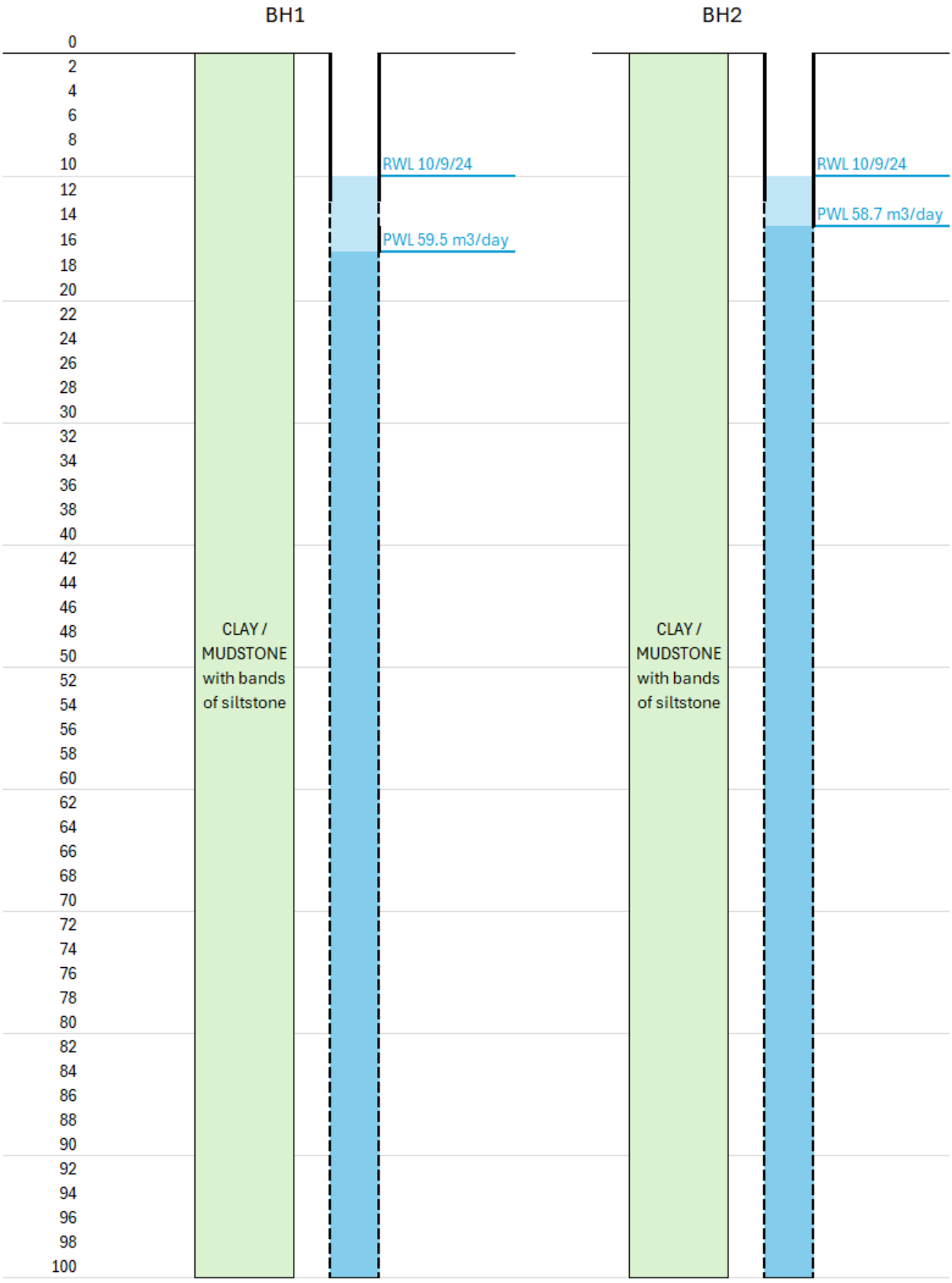

Figure 2.1: Schematic geological borehole logs, with water level observations

3. Hydrogeological Conceptual Model

3.1 Aquifers

Local bedrock is the Weald Clay Formation which comprises thinly-bedded mudstones with subordinate siltstones, and fine- to medium-grained sandstones. The boreholes have been drilled to exploit groundwater from within the Weald Clay Formation.

According to the British Geological Survey sheet 302 (Horsham), the geological strata here dip gently to the south or south-west (Figure 3.1). Outcrop geology beneath the site comprises Weald Clay mudstones, with thin mapped sandstone units cropping out to south. Given the shallow dip of strata (5 to 6°), the sandstone outcrop to the south should be present beneath the site at a depth intercepted by the boreholes. There are no superficial deposits at the site.

There are few water supply boreholes around the site. The closest[1] was at Pollards Hill Farm, about 250 m south of the Centenary Road boreholes. The borehole was 27 m deep, but there is no information on borehole yield.

The Weald Clay is not part of the "Wealden Greensand semi-confined aquifer", which is the main source of water for the Sussex North WSZ.

The site is not within, or adjacent to, an existing source protection zone (SPZ).

3.2 Surface Water

The site is on the catchment boundary between two un-named streams, though the ridge upon which it sits is bisected by the A24. Runoff from at the site therefore drains south-westwards towards a stream that feeds Kneppmill Pond, about 2.8 km south of the site. The stream to the east is also un-named and flows roughly southwards. Both streams are tributaries of the River Adur. The streams flow only across outcrop of Weald Clay (Figure 3.1).

Stream flows are not gauged on either of the adjacent streams. Flows are gauged on the Adur West Branch, at Hatterell Bridge, about 5.5 km south of the site (Table 3.1). Flow statistics for the un-named stream are estimated in Table 3.1 by pro-rating the flows in the River Adur to the catchment area of the streams before they come to confluence with the River Adur (Figure 3.2).

Table 3.1: Flows in the River Adur tributaries

	Catchment area (km^2)	Mean flow (m^3/day)	Q95 flow (m^3/day)
Adur West Branch at Hatterell Bridge [2]	109.1	100 224	2160
Un-named stream (west)	10.2	9370	202
Un-named stream (east)	22.9	21 037	453

[1] TQ12SE21: https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/578466
[2] https://nrfa.ceh.ac.uk/data/station/info/41010

3.3 Recharge

Recharge to the Weald Clay is mainly from the outcrop area surrounding the site. Potential recharge in the catchment of the boreholes can be determined using the data of Hughes et al. (2021). This is presented for the historical baseline dataset in Table 3.2. These values are accompanied by an estimate of the area of the contributing recharge catchment to the boreholes (assuming an abstraction rate of 14 783 m^3/year).

Table 3.2: Ranges of recharge* and estimated catchment areas

	Minimum	Mean	Maximum
Recharge rate (mm/year)	59	64	67
Catchment area (m^2)	216 000	226 000	243 000
Catchment radius (if it were a circle) (m)	262	268	278

* based on eleven climate scenarios used by Hughes et al., 2021.

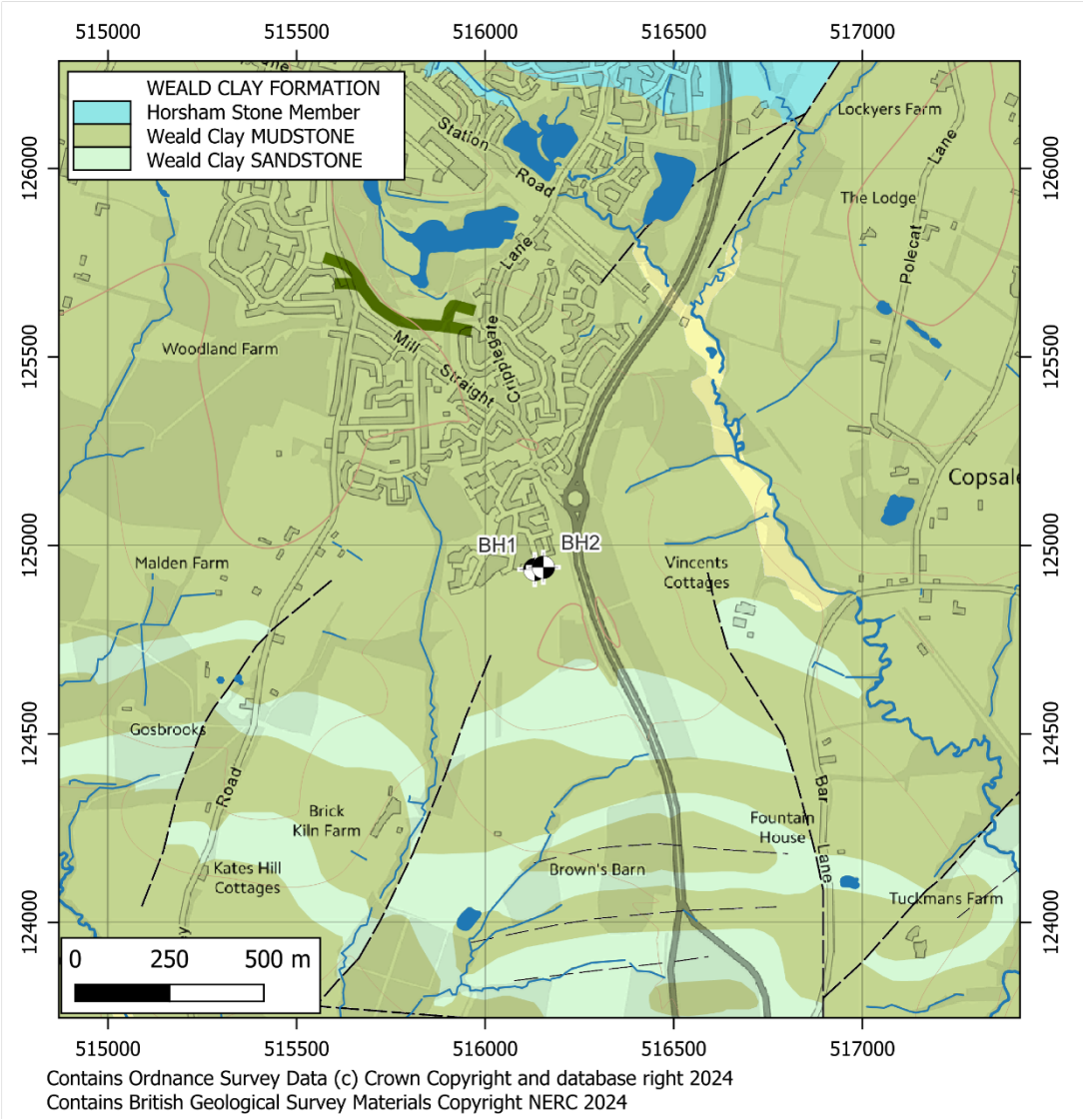

Figure 3.1: Bedrock geology

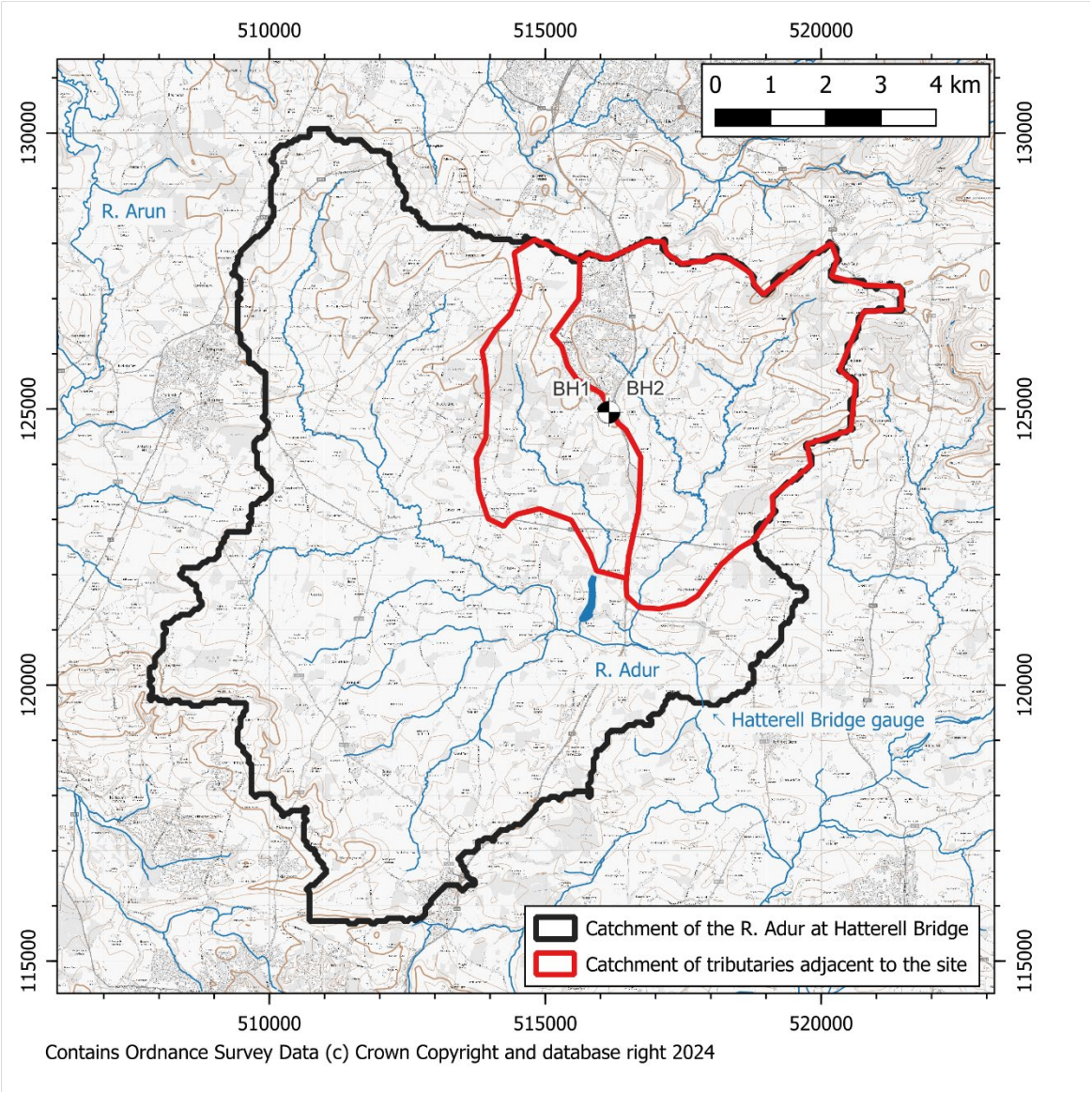

Figure 3.2: Surface water catchments

4. Pumping Test Details

4.1 Constant Rate Tests

The schedule of pumping tests was as follows.

- Constant rate test in BH1: 59.5 m^3/day for 48 hours from 12:00 on 10 September 2024
- Constant rate test in BH2: 58.7 m^3/day for 48 hours from 12:00 on 17 September 2024

Groundwater levels fell slightly throughout both tests (Figure 4.1). There was little rain during the actual test periods but quite heavy rain during recovery from the BH2 test, though no impact of this is discernible on the water levels. Figure 4.2 shows the drawdown datasets, uncorrected for the very small change in level over the test period.

Cooper-Jacob analysis (Figure 4.3) has been undertaken for the later drawdown data from the new borehole (Table 4.1). Theis analysis of the recovery data (Figure 4.4) also yields aquifer properties.

Table 4.1: Derived aquifer properties

	Method	BH1 test, BH1 data	BH1 test, BH2 data	BH2 test, BH2 data	BH2 test, BH1 data
Pumping rate (m^3/day)	-	59.5	-	58.7	-
Drawdown at 48 hours (m)	-	5.38	1.42	4.08	1.46
Specific capacity (m^2/day)	Pumping rate ÷ max. drawdown	11.1	-	14.4	-
Transmissivity (m^2/day)	Cooper-Jacob	22.2	24.6	21.1	24.0
	Theis recovery	23.8	28.2	22.4	29.9
Storage coefficient* (-)	Cooper-Jacob	-	5.1×10^{-4}	-	7.5×10^{-4}

Since the data points from later in the test plot along a relatively straight line in the semi-log plot of Figure 4.3 there is no indication of deviation from confined conditions during the duration of the test.

4.2 Water Quality

Water samples were collected at the end of each pumping test (Appendix D).

Abstracted water quality is not good: it is very hard, with high sodium and conductivity. Ammonium, iron and manganese are high. There are slight exceedances of turbidity and total coliforms. These issues are amenable to treatment.

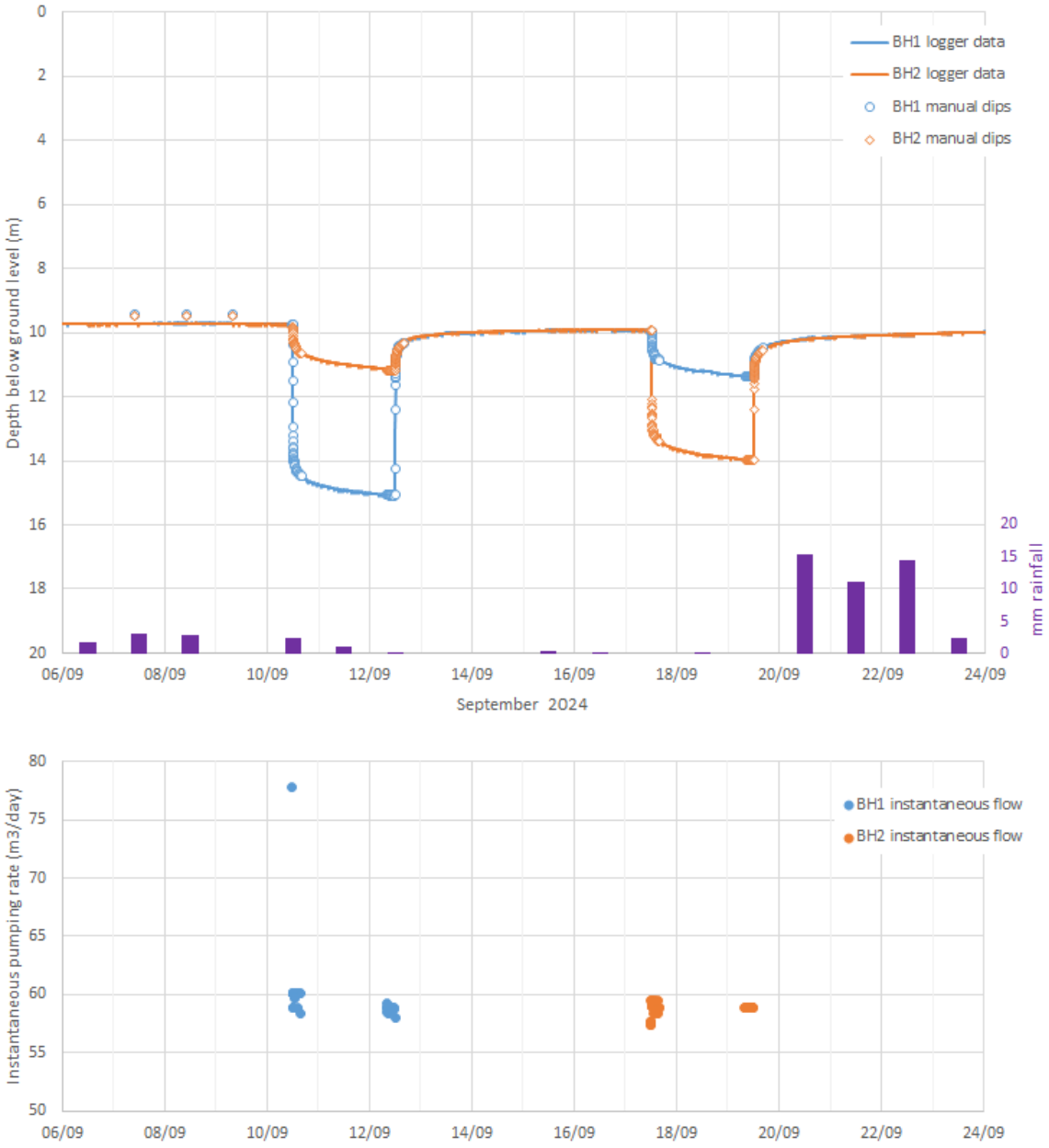

Figure 4.1: Depth to groundwater, rainfall, and pumping rates

(Rainfall is from the Environment Agency's Itchingfield rain gauge, about 4 km north-west of Southwater)

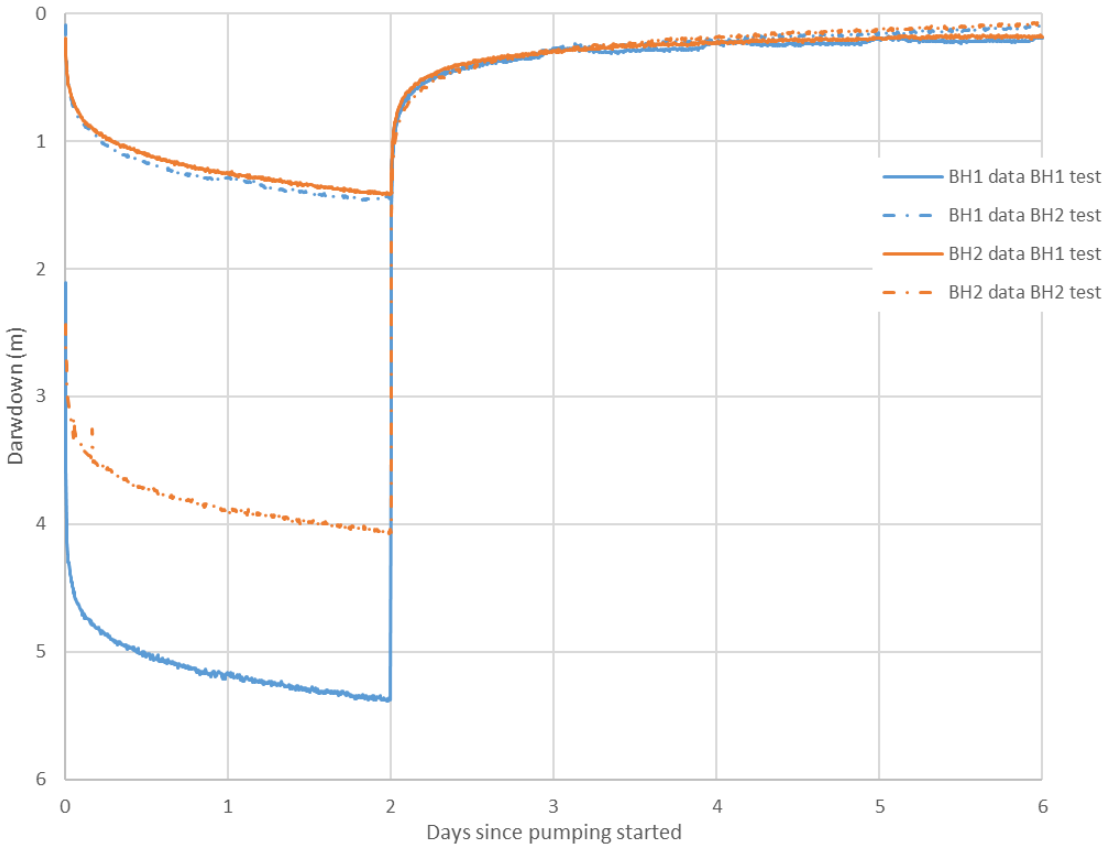

Figure 4.2: Drawdown

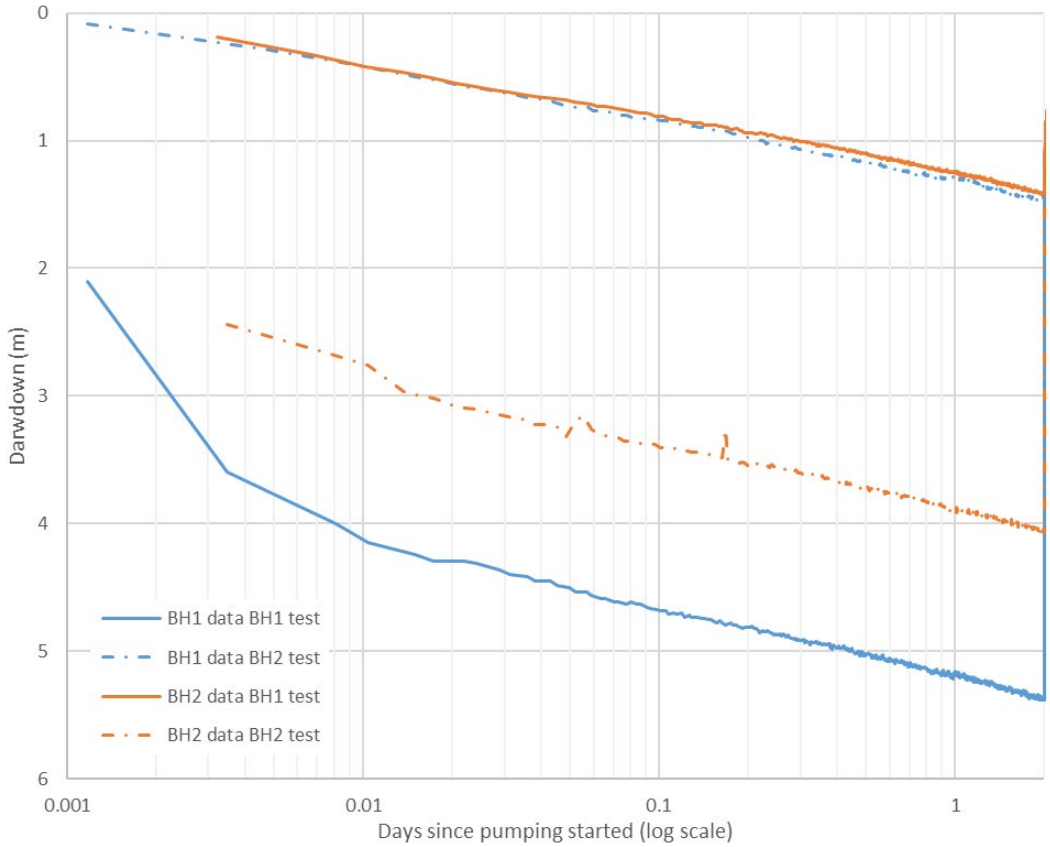

Figure 4.3: Drawdown on log time scale, for Cooper-Jacob analysis

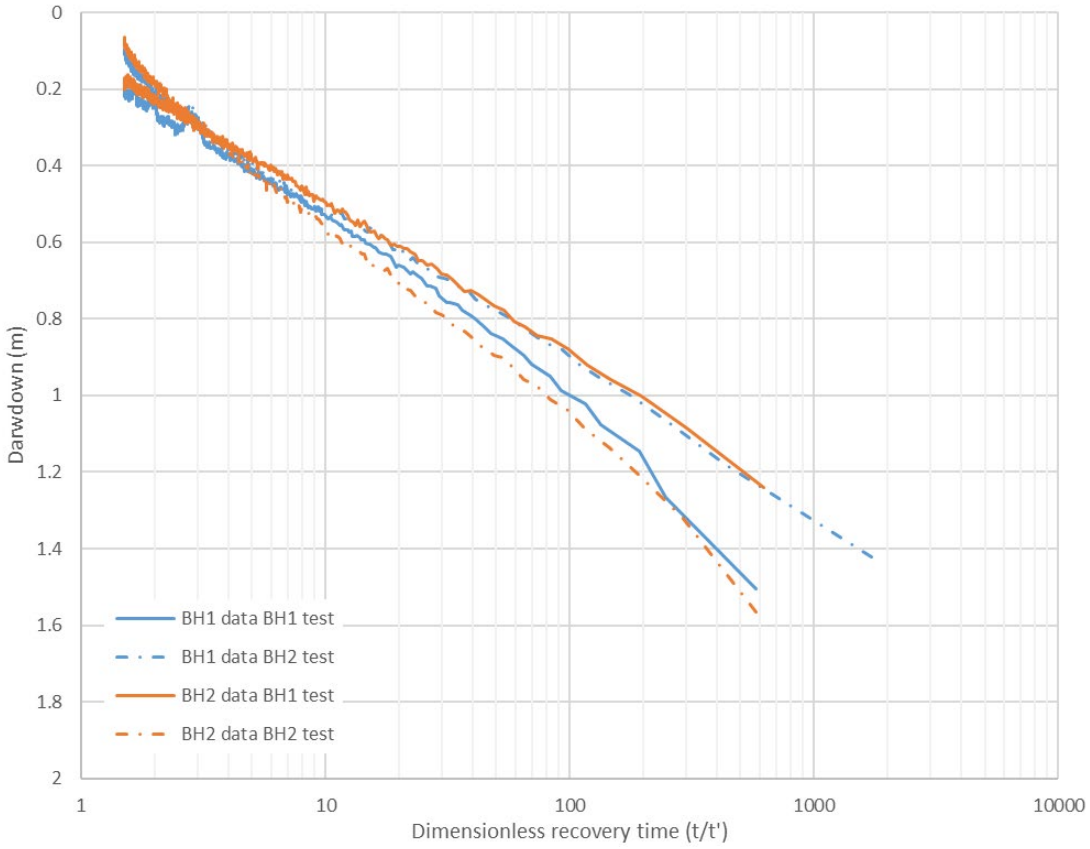

Figure 4.4: Residual drawdown on log t/t' scale, for Theis recovery analysis

5. Impact Assessment

The following sub-sections are headed as in the HIA methodology suggested in the Executive Summary of SC040020/SR2.

Step 1: Establish the regional water resource status.

The site lies within the Environment Agency's Adur and Ouse abstraction licensing strategy (ALS) catchment area. The most recent licensing strategy was published in March 2019. Being from the Weald Clay the site is not in a groundwater management unit, but the surface water body is discharge-rich so surface water is available.

Step 2: Develop a conceptual model for the abstraction and the surrounding area.

The hydrogeological conceptual model is described in Section 3. The source of groundwater is the Weald Clay Formation. This aquifer also contributes flow into the catchment of the River Adur.

Step 3: Identify all potential water features that are susceptible to flow impacts.

As part of the water features survey (Appendix C) several ponds were identified. All of these are shallow and have no inflows or outflows. There are two tributaries of the River Adur outside the search radius but are the most likely receptors for reduced baseflows as a result of the abstraction.

Step 4: Apportion the likely flow impacts to the water features.

Flow estimates for the un-named streams are presented in Table 3.1. Relative to estimated flow in the stream the proposed annual maximum abstraction rate of 14 377 m^3/year is 6.0% of the estimate of the total Q95 in both streams, and 0.1% of the estimate of mean flow in both streams.

The westernmost stream is the smallest; one half of the annual maximum abstraction rate is 8.7% of the Q95 in that streams, and 0.2% of the estimate of mean flow in that stream.

Step 5: Allow for the mitigating effects of any discharges, to arrive at net flow impacts.

The water will be returned to the environment as treated sewage effluent from Southern Water's Horsham sewage treatment works, which is outside of the catchment of the River Adur. The net flow impact is as above.

Step 6: Assess the significance of the net flow impacts.

To put the flow impacts in context, within the Environment Agency (2018) it is generally considered that a reduction in flow of less than 5% is undiscernible. It is generally taken that at flow depletions lower than 15% at Q95 there is no risk of change in the aquatic ecology (Environment Agency, 2013). Hence there is no perceived risk of depletion of the un-named stream, and certainly not the River Adur which has much higher flow.

Step 7: Define the search area for drawdown impacts.

The search radius prescribed by the Science Report SC040020/SR2 (Table 4.2) for an abstraction between 20 and 100 m^3/day is 250 m. There are no groundwater features in the search area that could be impacted by drawdown other than the existing abstraction borehole.

There is one well at Pollards Farm, about 280 m south of the boreholes. This has no pumping equipment installed; it is not licensed and is not registered as a private water supply with the local authority.

Step 8: Identify all features in the search area that could be impacted by drawdown.

No protected groundwater receptors were identified in the Water Features Survey (Section 2.2). There is one well (Pollards Farm) a little more than 250 m from the boreholes but it has no pumping equipment installed, is not licensed, and is not registered as a private water supply with the local authority.

Step 9: For all these features, predict the likely drawdown impacts.

There are no groundwater receptors to be impacted by drawdown.

Step 10: Allow for the effects of measures taken to mitigate the drawdown impacts.

Not required: no groundwater receptors.

Step 11: Assess the significance of the net drawdown impacts.

Not required: no groundwater receptors.

Step 12: Assess the water quality impacts.

Not required: no groundwater receptors.

Step 13: If necessary, redesign the mitigation measures to minimise the impacts.

Not required: no groundwater receptors.

Step 14: Develop a monitoring strategy.

Not required: no groundwater receptors.

6. Conclusions

This report describes the proposed groundwater abstraction at Campsfield, Centenary Road, near Horsham. The new abstraction rate is proposed to be at a rate of 1.64 m^3/hour, 39.39 m^3/day and 14 377 m^3/year. The groundwater will be sourced from the Weald Clay.

A water features survey was undertaken. There were several shallow ponds. There are no groundwater receptors within the search radius.

Consent to drill and test the boreholes was issued in July 2024 and the boreholes were drilled in July 2024. The boreholes were test pumped in September 2024.

The results of the pumping tests are analysed here and are considered to show that the abstraction poses no risk to the water environment around the site.

The Weald Clay around Horsham is within the Environment Agency's Adur and Ouse abstraction licensing strategy catchment area. There is no statement of groundwater resource availability as the Weald Clay is considered an unproductive aquifer. The surface water status is that there is water available for licensing.

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8.5 Appendix E:

Borehole Prognosis report:

BOREHOLE PROGNOSIS REPORT

CENTENARY ROAD, SOUTHWATER, HORSHAM, WEST SUSSEX, RH13 9FU

BOREHOLE FEASIBILITY ASSESSMENT

SEPTEMBER 2023

NICHOLLS
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DOCUMENT CONTROL SHEET

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Report Reference: 62241301 / 001 / R384

Version: A

Issue Date: September 2023

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Distribution

ORGANISATION	CONTACT	FORMAT	COPIES
Nicholls Licensing and Consulting	Tracie Anderson	PDF (e)	1

LIMITATIONS

This report is presented to Nicholls Licensing and Consulting with respect to the Borehole Feasibility Assessment for Centenary Road, Southwater, Horsham, West Sussex, RH13 9FU and may not be used or relied on by any other person or by the client in relation to any other matters not covered specifically by the scope of this Report.

Notwithstanding anything to the contrary contained in the report, WSP UK (WSP) is obliged to exercise reasonable skill, care and diligence in the performance of the services required by Nicholls Licensing and Consulting, and WSP shall not be liable except to the extent that it has failed to exercise reasonable skill, care and diligence, and this report shall be read and construed accordingly.

This report has been prepared by WSP. No individual is personally liable in connection with the preparation of this report. By receiving this report and acting on it, the client or any other person accepts that no individual is personally liable whether in contract, tort, for breach of statutory duty or otherwise.

WSP has used reasonable skill, care and diligence in the design and interpretation of the ground investigation, however, the inherent variability of ground conditions allows only definition of the actual conditions at the location and depths of exploratory holes and samples/tests therefrom, while at intermediate locations conditions can only be inferred.

New information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

SUMMARY

A borehole prognosis has been completed, for a site located at Centenary Road, Southwater, Horsham, West Sussex, RH13 9FU. The prognosis has concluded that:

- A borehole drilled into the Weald Clay Formation, to a depth of approximately 100 mbgl is unlikely to provide a water supply of up to 110 m^3/d. However, the local borehole records do indicate that a yield of between 75 m^3/d to 80 m^3/d might be obtainable, provided that the productive strata (bands of limestone and sandstone within the Weald Clay Formation) are encountered. Additionally, drilling deeper into the Weald Clay Formation may provide more yield should the more productive layers be encountered at greater depth. The Tunbridge Wells Sand Formation is also a potential option for an alternative target for supply (note, this would require a borehole potentially >250 m in depth), however no local information with regards to its potential productivity or rest water level (RWL) was obtained and yields are likely to be limited due to its depth.
- The available data suggests a rest water level might be observed at a depth of 5 to 15 mbgl (35 to 25 mAOD) for the Weald Clay Formation. However, due to the complex nature of this formation, the RWL is dependent on the presence and water pressure within the productive layers at the location of the proposed borehole.
- The client should be aware that there is a risk that the abstracted water from the Weald Clay Formation may be brackish, and therefore may be unsuitable as a target for supply. However, the records which indicate groundwater quality come from boreholes situated a considerable distance away from the proposed site and therefore may not be necessarily representative of the conditions at the intended site.

PROJECT RISKS

Should the client still wish to proceed with developing a borehole, WSP expects the water-bearing layers within the Weald Clay Formation to be confined and artesian conditions are not expected. The proposed borehole is not located within a groundwater Source Protection Zone (SPZ). Due to limited storage and recharge to productive sandstone and limestone lenses within the Weald Clay Formation yields may decline over time.

The main risk of developing a borehole at the intended site is that the ground conditions at the proposed site are generally difficult for the development of a groundwater supply. Should the Client wish to go ahead with drilling a well we suggest developing a borehole which targets the productive bands of sandstone and limestone, within the Weald Clay Formation, as a target for potable supply. A borehole drilled into the Weald Clay Formation poses a risk of fines entering the borehole, hence a sand/gravel filter pack is essential for reducing the impact of fines.

The aquifers which underly the Hardham protected area (SPA, SSSI and SCA) are stratigraphically and hydrogeologically separated from the target aquifer Weald Clay Formation at the intended site.

Prior to drilling the following potential risks should be addressed:

- Underground services and tunnels, overhead cables;
- Avoid potential contaminant sources;
- Access and other (ecology) constraints.

GENERAL CONSIDERATIONS

The following should be considered for all borehole installations:

- If the water is to be used as a potable resource, there may be a requirement for some basic form of treatment which will need to be addressed prior to consumption. The local Environmental Health Department will be able to advise further on appropriate sampling regimes;
- It is recommended that the borehole is located as close to the intended supply as possible;
- Where possible boreholes should always be sited away from any potential source of contamination such as septic tanks (e.g. a minimum of 50 m away, in accordance with Environment Agency guidelines).
- A licence is required for abstraction rates >20 m^3/d;
- As per Section 198 of the *Water Resources Act 1991,* all abstraction boreholes drilled greater than 15mbgl must report operations and drillers' logs to the British Geological Survey.

SITE DESCRIPTION	
Location	Centenary Road, Southwater, Horsham, West Sussex, RH13 9FU
Grid Reference	TQ 15928 24825
Easting / Northing	515928, 124825
Latitude / Longitude	51.011134, -0.34886859
Approx. Elevation	40 mAOD (extracted from 1:10000 OS map)
FIGURE 1: Location of the Site (marked by arrow)	 (map derived from https://osmaps.ordnancesurvey.co.uk/osmaps/, accessed August 2023)

PURPOSE OF ABSTRACTION

The client has stated that the purpose of the abstraction is for it to be used primarily for potable supply. The client has confirmed that a yield of up to 110 m^3/d is required.

SUPERFICIAL DEPOSITS – based on the British Geological Survey (BGS) England and Wales Map Sheet 302 (solid and drift) and local borehole records		
Superficial Deposits	**Lithological Description**	**Expected Thickness (m)**
No superficial deposit present		

BEDROCK GEOLOGY – based on the BGS England and Wales Map Sheet 302 (solid and drift) and local borehole records			
Group	**Formation**	**Lithological Description**	**Expected Thickness (m)**
Wealden Group	Weald Clay Formation	Dark grey thinly bedded mudstones (shales) and mudstones with subordinate siltstones, fine- to medium-grained sandstones, including calcareous sandstone (e.g. Horsham Stone Member), shelly limestones (the so called "Paludina Limestones") and clay ironstones.	115 – 275
	Tunbridge Wells Sand Formation	Thinly bedded silty mudstones, siltstones, silty sandstones, and fine-grained sandstones are laterally persistent over long distances. Sandstones, which form prominent scarp and dip slope features, are typically fine-grained and quartzose, weathering to a pale yellowish grey or brown colour.	60 – 107
Table notes: The thickness for the Weald Clay Formation has been determined from the vertical section provided on BGS Map Sheet 302 and from BGS borehole record TQ12NE109 located approximately 1.12 km north of the intended site.			

HYDROGEOLOGY AND AQUIFER DESIGNATION	
Formation	**Description**
Weald Clay Formation	Mostly *Unproductive Strata* where mudstones predominate with some *Secondary A Aquifer* where sandstone and/or limestone bands are present. The hydrogeology of the Weald Clay Formation is complex and not well understood due to its heterogeneity. The formations are divided into a layered sequence composed of sandstone, limestone and clay deposits leading to some potential for unconfined/leaky aquifers in the discontinuous layers. The Weald Clay Formation is essentially an impermeable, confining clay formation, although it contains thin silty sandstones and limestones which may yield small local supplies (Jones et al, 2000). Yields are expected to decrease rapidly due to the slow rate of replenishment.
Tunbridge Wells Sand Formation	*Secondary A aquifer.* This aquifer contains permeable layers capable of supporting water at a local, rather than strategic scale. Groundwater flow within the Tunbridge Wells Sand Formation is both intergranular and through joints with variable yields (Jones et al., 2000). Based on BGS borehole investigations, transmissivity values for the Tunbridge Wells Sand Formation range from 6.1 – 39.5 m^2/d, with a geometric mean of 19.0 m^2/d; of 6 total samples, the minimum storage coefficient recorded was 4.8×10^{-4} and the maximum was 7.7×10^{-2} (Jones et al., 2000). Yields from the Tunbridge Wells Sand Formation are generally less than 400 m^3/d, and often less than 100 m^3/d, although significantly higher yields have been obtained on occasion (Jones et al, 2000). However, the Tunbridge Wells Sand Formation at the Site is at a great depth (>250 mbgl) with poor cementation and is therefore unlikely to be a productive aquifer at the site. Additionally, the outcrop of the formation is located ~2.6 km south-east of the site and recharge to the aquifer may be limited.

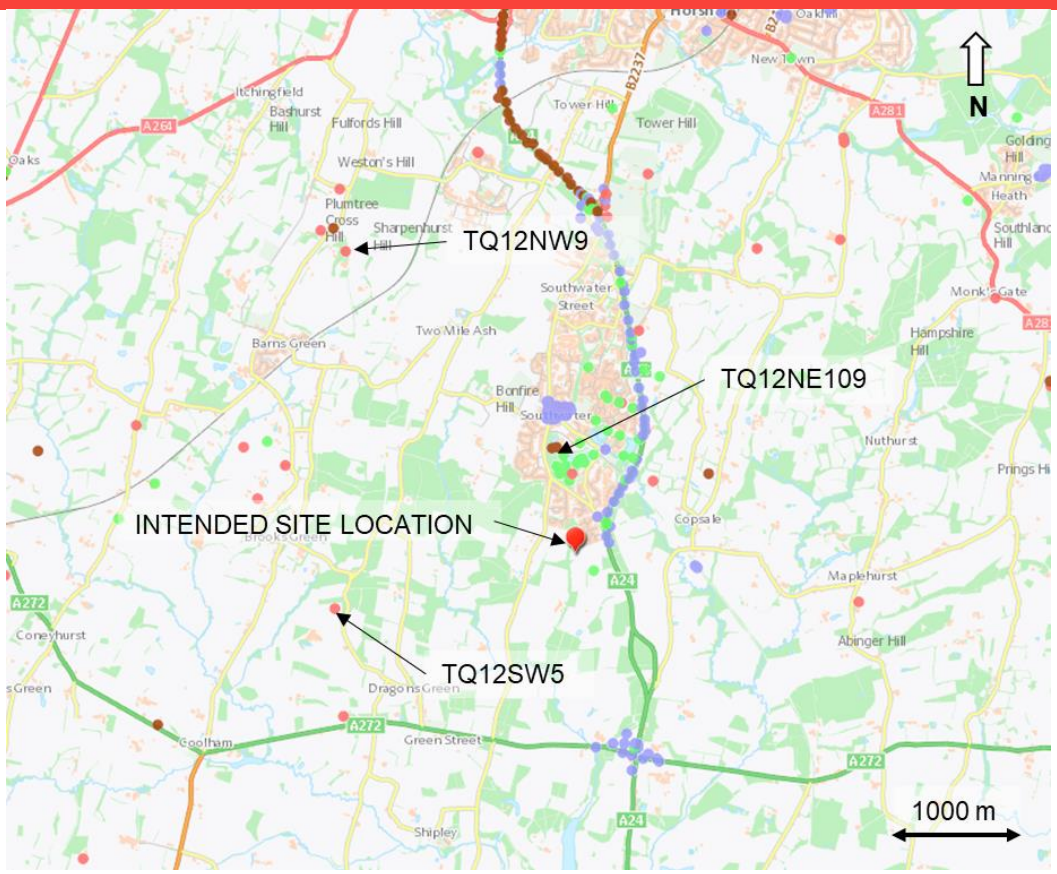
NEARBY SURFACE WATER FEATURES	
Type	**Location**
Stream	Approx. 86 m west of intended site

LOCAL BOREHOLE RECORDS DRILLED WITHIN ca 5000 m (BGS GeoIndex) (Appendix A)			
Well NGR:	TQ 15680 25930	TQ 13410 24250	TQ 13520 27990
Easting/Northing	515680,125930	513410, 124250	513520, 127990
Distance from Site	Approx. 1.12 km north of intended site	Approx. 2.6 km west-southwest of intended site	Approx. 3.9 km northwest of intended site
Location	**TQ12NE109 SOUTHWATER BRICKYARD - A**	**TQ12SW5 SHIPLEY-BAKERS FARM**	**TQ12NW9 MARLANDS ITCHINGFIELD**
Completion Date	1922	1925	1934
Completion Depth	131.37 m	61.57 m	30.48 m
Site Elevation	55.47 mAOD	30.48 mAOD	73.15 mAOD
Aquifer	Weald Clay Formation	Weald Clay Formation	Weald Clay Formation
Rest Water Level (RWL)	34.8 mAOD in 1922 (20.67 mbgl)	25.91 mAOD in 1925 (4.57 mbgl)	63.55 mAOD in 1934 (9.60 mbgl)
Pumping Test/ Groundwater Yield	81.83 m^3/d (700 g.p.h. recorded on log in 1940) 2.6 to 3.9 m^3/d (4,000 to 6,000 g.p.w recorded on log in 1957)	76.37 m^3/d (700 g.p.h. recorded on log)	13.09 m^3/d (120 g.p.h. recorded on log)

LOCAL BOREHOLE RECORDS DRILLED WITHIN ca 5000m (BGS GeoIndex) (Appendix A)

Figure 2:
Location of nearby boreholes

●	**Confidential**
●	**0-10m**
●	**10-30m**
●	**30+m**



WATER QUALITY

The intended site is not within a Nitrate Vulnerable Zone (NVZ) as specified by the Environment Agency (2017). The intended site is located in an 'unproductive' groundwater vulnerability zone; this zone is attributed to the Weald Clay Formation aquifer as inferred from BGS Geological Map Sheet 302.

Groundwater was sampled from the Weald Clay Formation at historic borehole TQ12NE110 located which is located 1.6 km north-east of the intended site. Results found 3620 mg/l, 76.26 mg/l, 0.014 mg/l and 2.85 mg/l of Total Solids, chlorine, ammonia and nitrates respectively. Groundwater was recorded to be 'unsuitable for drinking owing to the large amount of Total Solids (3620 mg/l) and"...owing to its extreme hardness and large amount of salts in solution…". These water quality results were conducted in 1918; therefore, the results may not be representative of current conditions.

Where groundwater is to be used for potable supply, the regulations maintained by the Local Health Authority (The Private Water Supplies (England) (Amendment) Regulations 2018) will need to be met to ensure that no risk to public health is caused by the supply i.e. the water will have to be sampled and tested to ensure that it is fit for human consumption. The Nicholls Licensing and Consultancy Team will be able to advise further on appropriate sampling regimes if the abstracted groundwater is to be used for potable supply.

SOURCE PROTECTION ZONE (SPZ)

The intended site (RH13 9FU) is not located within a Groundwater SPZ and there are no SPZs within 5 km of the intended site.

CONCLUSIONS AND RECOMMENDATIONS

Based on the local borehole records, the British Geological Survey Geological Map (Map Sheet 302) and the literature review, WSP would recommend drilling into the Weald Clay Formation as a primary target for a water supply to be used for topping up ponds and lakes, albeit at an abstraction rate lower than the demand yield.

As suggested by some local borehole records, minor yields may be available where interbedded sandstone and limestone layers are present in the Weald Clay Formation, albeit groundwater quantities may be finite and/or slow to recover (Jones et al, 2000). Local borehole logs indicated that a borehole which targets the productive strata within the Weald Clay Formation would likely not be capable of providing the desired yield of 110 m^3/d over the medium to long-term, due to these layers being thin and recharge zones being limited in size. However, the evidence indicates that it might be capable of providing a sustained reduced yield of up to 75 m^3/d to 80 m^3/d. Additionally, drilling deeper into the Weald Clay Formation may provide more yield should the more productive layers be encountered at greater depth.

The Tunbridge Wells Sand Formation may be an option for an alternative target for supply, however it is very deeply confined beneath the Weald Clay and no records were found indicating that any nearby boreholes encountered this horizon. Therefore, it's productivity as an aquifer in this location are not known, but it is likely to be low productivity.

A borehole record located 1.6 km northeast of the intended site indicates that the water is unlikely to be suitable for potable use. This borehole is situated quite far from the intended site and therefore, it is possible that the water quality at the intended site may be suitable, if the target limestone and sandstone bands are hydraulically disconnected to those elsewhere where water quality is less than adequate. Water quality sampling should be undertaken to determine the suitability of the supply for the intended use.

A rest water level (RWL) is expected at approximately 5 to 15 mbgl (35 to 25 mAOD) for the Weald Clay Formation. However, due to the complex nature of this formation, it is dependent on where the productive layers are intercepted at the location of the proposed borehole.

The table below provides a feasibility design for the proposed borehole targeting the Weald Clay Formation, based upon the findings and recommendations in this report.

Drilling should be carried out by a competent driller, who understands the nature of the work and can provide the client with a cost for drilling that includes an assessment of any associated risks that may be encountered (e.g. infrastructure, services etc.).

Borehole Construction – Feasibility Design*	
Target Formation Strata & Slotted Screen Section Depths	Productive Bands of Sandstone or Limestone within Weald Clay Formation 10 mbgl – 100 mbgl (30 mAOD to - 60 mAOD)
Borehole Completion Details	In an ideal scenario the borehole construction should include plain casing and grout to approximately 10 mbgl. Below this depth there would be slotted screen casing targeting productive horizons with a suitable sand/gravel pack through to a depth of approximately 100 mbgl. Borehole headworks should be completed in such a way that any future risk of contamination of the borehole is minimised as far as practicable. A schematic illustrating these construction details is presented in Appendix B.
* The client should be aware that the feasibility borehole design is not a substitute for a formal borehole design, which should be proposed prior to commencement of the drilling, and finalised during the construction of the borehole. WSP are happy to assist in offering the client a formal borehole design if required.	

HYDRAULIC CONNECTIVITY TO PROTECTED AREAS		
Protected Area	**Designation**	**Distance from intended site**
Hardham	Several designated sites in the local area of Hardham; including but not limited to Pulborough Brooks and Waltham Brooks which are designated as a Special Protected Area (SPA), Site of Specific Scientific Interest (SSSI) and Special Conservation Area (SCA).	14.2 km southwest

The proposed borehole will target Sandstone or Limestone units within the Weald Clay Formation aquifer. Cross sections on BGS Geological Map Sheet 302 indicate the Weald Clay Formation dips south-west below the Lower Greensand Group, which suggests groundwater flow direction will follow a similar direction.

The area of Hardham features several protected areas which are recorded as a Ground Water Dependent Terrestrial Ecosystem by the Environment Agency (2020). Geological maps indicate the designated site is underlain by the Folkestone Formation, Gault Formation and superficial deposits of alluvium, river terrace and head. The aquifers which underly Hardham are stratigraphically and hydrogeologically separated from the target aquifer Weald Clay Formation at the intended site.

LICENCE

The drilling and pump testing of a borehole for quantities <20 m^3/d do not require a licence. A licence is required for abstraction rates >20 m^3/d and a '*Groundwater Investigation Consent*' needs to be obtained from the Environment Agency before drilling and test pumping of such a borehole.

WSP understands that up to 110 m^3/d is required from this borehole (Centenary Road, Southwater, Horsham, West Sussex, RH13 9FU); therefore, an abstraction licence would be required. An application for an abstraction licence would need to be submitted to and approved by the Environment Agency. Correspondingly, a preceding application to the EA for consent to drill & test will be required.

IMPORTANT

This prognosis is based on a limited range of available data, including the published historic geological map supplied by the British Geological Survey[1]. Whilst this map is generally reliable, it provides only indicative geological information based on available borehole information and field mapping.

In the preparation of this report, WSP has used professional experience and skills to provide the best estimates of thickness of the various formations, and the likely success of obtaining a satisfactory yield from the intended borehole site. It is emphasised that the yield and groundwater quality cannot be guaranteed.

The decision to proceed with the borehole rests with those parties that are responsible for the procurement and installation of the intended borehole. This report has been designed to provide those parties with readily available hydrogeologically based facts, and associated interpretations intended to inform any such decision. WSP will not be held responsible for either the decision to proceed or for any subsequent issues arising from any such decision to proceed.

[1] https://largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001794, accessed September 2023

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ACRONYMS	
BGS	British Geological Survey
EA	Environment Agency
g.p.h.	Gallons per hour
NGR	National Grid Reference
mAOD	Metres above ordnance datum
mbgl	Metres below ground level
m^3/d	Cubic metres per day
mg/l	Milligrams per litre

GLOSSARY	
Secondary A Aquifer	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.
Unproductive Strata	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
Source Protection Zone (SPZ)	Source Protection Zones (SPZs) for groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk
Nitrate Vulnerable Zone (NVZ)	Existing NVZ are the zones which apply from 1st January 2013 – 31st December 2016 and relate to surface and ground waters, and also eutrophic waters. With relation to groundwater – water held underground in the soil or in pores and crevices in rock that has or could have if action is not taken, a nitrate concentration of >50mg/L
Groundwater Vulnerability	Assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one-kilometre square grid.
Special Area of Conservation (SAC)	Designates a conservation area which protects one or more special habitats and/or species – terrestrial or marine – listed in the Habitats Directive.
Special Protected Area (SPA)	Special Protection Areas are selected to protect one or more rare, threatened or vulnerable bird species listed in Annex I of the Birds Directive, or certain regularly occurring migratory species.
Site of Special Scientific Interest (SSSI)	A formal conservation designation, usually, used to describe an area which is of particular interest to science due to the rare species of fauna or flora it contains - or even important geological or physiological features that may lie in its boundaries.
Groundwater Dependent Terrestrial Ecosystems (GWDTE)	Groundwater Dependent Terrestrial Ecosystems are wetlands which critically depend on groundwater flows or chemistries. They are safeguarded by the Water Framework Directive (WFD) and are sensitive to hydrological and ecological changes caused by developments.

APPENDIX A

HISTORIC BOREHOLE LOGS

TQ12NE109

British Geological Survey

BGS ID: 578429 : BGS Reference: TQ12NE109
British National Grid (27700) : 515680,125930

TQ12/19 A+B

302/9 Sussex and Dorking United Brick Co., Southwater, Horsham

(a) (Disused). W.S.Sx.III, p. 131. Surface +182. Shaft 39; rest bore 8 in reduced to 5 in at depth. Lining tubes: from ? 3 down. *Featherby, 1910.*

(b) W.S.Sx.III, p. 134. Surface +176. Shaft 100 × 5½. R.W.L. +128. *Dando, 1922.* Well-top +166. Yield 700 g.p.h. *1940;* 700 g.p.h., 6 h.p.d. *1947.* R.W.L. +124½. Yield 4,000-6,000 g.p.w. *Nov. 1957.*

(a)	WC	...	...	c.274	c.274
	UTW	...	...	c.157	431

(a)

NB. A plan of the clay pit dated 1958 (MISC. FILE 302) suggests that the site of this must lie between 150 & 160 OD at the present time. RGK

Put down in 1910

was deepened [illegible] 23.2.00

Original well top = 182.

Well top has been lowered 10' since

302/9A

	Thickness Ft.	Depth Ft.	
Weald Clay ? Horsham Stone at 144 ft. — Brown slate-coloured shales [40 grey shaly clay; 50 and 75 light-coloured rather sandy clay; 80 grey clay; 90 grey rather sandy clay]	90	90	Weald Clay (WC) exposed in brickpit to south.
Grey shales...	10	100	
Slate-coloured shales [grey clay]	6	106	
Whitish grey stone, very gritty [broken up small, stone, clay and sand]	1	107	Upper Bed of Horsham Stone (HSt)
Blue marl [light-grey rather sandy clay]	5½	112½	
Grey stone [small bits, with clay, etc.]	2½	115	
Blue marl [light-grey clay, mottled light-brown]	3	118	
Grey stone	1	119	
Blue marl [light-grey clay, slightly mottled light-brown] ...	8	127	Intermediate Clay & Sandstone (WC)
Dark brown marl [light-grey and brown mottled clay]	3	130	
Dark bluey grey shale [grey clay]	7	137	
Dark bluey grey shale [light-grey clay, rather sandy]	2	139	Lower Bed of Horsham Stone (HSt)
Bluey-grey very fine live sand [light-grey and buff]	2	141	
Light-grey sandy rock	1½	142½	
Bluey-grey shale [light-grey and brown clay]	1½	144	
Hard blue limestone [grey, calcareous sandstone ?]	2½	146½	
	5½	152	Horsham Stone of authors + OS Geol maps
Grey shale [light-grey clay] ...	11	163	
Weald Clay ? Horsham Stone at 144 ft. — Brown shale [brownish-grey clay]			
Dark slate-coloured shale [grey clay]	9	172	
Grey shale [clay]	1	173	
Blue shale [grey clay]	25	198	
Brown marl [brownish-grey clay]	2	200	
Dark blue marl [light-grey rather sandy clay]	15½	215½	Lower part of Weald Clay (WC)
Brown shale [light-brownish clay, partly rather sandy]	2	217½	
Light-grey shale [sandy clay or clayey sand, of very fine grain, soft]	12½	230	
Light-grey shale [clay, rather sandy]	33	263	
Dark-grey shale [light-grey and brownish clay, partly rather sandy]	1	264	
Very hard grey shale [stony] ...	2	266	
Tough sticky red marl [brownish and light-grey mottled clay] ...	4	270	WC ↓ ?
Bluey-grey marl [light-grey clay]	4	274	
Very hard grey shale [light-grey bedded soft stone]	2	276	Upper Tunbridge Wells Sand to bottom.
Hard grey shale [light-grey soft stone]	4	280	
Sticky blue clay [light-grey clay, rather sandy]	1½	281½	
Sandy compact limestone [light-grey soft stone]	1½	283	
Light-grey clay	12	295	
Very friable dark slate-coloured shale [soft grey stone, hard shale]	7	302	
Grey shale [bits of soft sand and hard clay]	4	306	
Weald Clay — Soft shale [bits of stone, hard shale ?]	44	350	
Yellowish-grey [bits of stone and very fine soft sand, light-coloured]...	4	354	
Dark-grey clay [light-grey and buff]	26	380	

WC UTW c.274 c.157 c.274 431 ✓/66

A. TQ 1575 2594

B. TQ 1572 2594

Contact BGS: ngdc@bgs.ac.uk

BGS British Geological Survey
BGS ID: 578429 : BGS Reference: TQ12NE109
British National Grid (27700) : 515680,125930

2

TQ12/19
A+B

302/9A
Contd

	Dark grey shale [grey soft stone]	1	381
	Very sharp compact white sandstone [light-brown fine sharp sand]	1½	382½
	Soft grey clay [light-coloured, partly rather sandy]	½	383
	Hard sandstone [bits of soft sandstone, and sand]	2	385
	Softer sandstone [like above] ...	1	386
	Very hard and fine rock-bed (sand) [fine pale buff sand, some bits of stone]	1	387
	Coarser rock-bed [darker sharp sand, small bits of stone] ...	1½	388½
	Finer rock-bed [buff sharp sand]	½	389
	Coarser rock-bed [darker sand] ...	1	390
	Fine sandy clay or clayey sandstone [buff bedded stone] ...	2	392
	Blue shale [pale grey clay] ...	8	400
	Dark shale [brownish-grey soft sandstone]	4	404
Tunbridge Wells Sand	Blue and brown friable clay [grey and brownish sandy clay] ...	3½	407½
	Slate-coloured shale [grey stone]	2	409½
	Sharp white sandstone [light-grey and brownish fine sharp sand]	4	413½
	Grey clay and shale [light-coloured sandy clay or clayey sand]	3	416½
	Dark shale [brownish-grey stone]	1	417½
	Light-grey shale [pale greyish sandy clay; very fine soft grains, may be mainly soft marly sand, compacted]	1½	419
	Dark-grey shale [brownish-grey hard clay and soft stone] ...	4½	423½
	Sharp white sand [light-coloured, fine]	½	424
	Grey clay and shale [brownish sandy clay, some hard] ...	2	426
	Sticky blue clay, with rock-bands [one set, bits of brownish stone, another mud]	5	431

b) No details known.

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 578429 : BGS Reference: TQ12NE109
British National Grid (27700) : 515680,125930

1 3

ADDITIONAL INFORMATION SHEET

Licence No. 302/9

Date of completion of well catalogue Jan 1965

Date of publication

302/9B TQ12/19B

Additional Sheet No.

DATE	*	ADDITIONAL INFORMATION	INIT.
25/10/68	B	Thickness (ft) Depth (ft).	
		Weald Clay 100 100	D.D.M.
		DATA Bank	

FILMED

* Insert Well Reference Letter, If More Than One Well At Site

P.T.O.

Section 6	Pumping test	Observ. well	Recorder	E.R. log

Geological Survey, Water Department South Kensington, London, S.W.7.

(4130) Wt.34984/P.S.127 5m 9/63 G.W.B.Ltd. Gp.863

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey
BGS ID: 578429 : BGS Reference: TQ12NE109
British National Grid (27700) : 515680,125930

DATE	*	ADDITIONAL INFORMATION	INIT.

FILMED ....

INSERT WELL REFERENCE LETTER, IF MORE THAN ONE WELL AT SITE

Additional Information Sheet No.................... Commenced....................

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 578429 : BGS Reference: TQ12NE109
British National Grid (27700) : 515680,125930

SOUTHWATER BRICKYARD, near Southwater railway station. Ht. above O.D. about 130 ft. Map 24 N.E. Two wells.

257.[1] Boring. +182 ?

		Thickness Ft.	Depth Ft.
Weald Clay ? Horsham Stone at 144 ft.	Brown slate-coloured shales [40 grey shaly clay; 50 and 75 light-coloured rather sandy clay; 80 grey clay; 90 grey rather sandy clay]	90	90
	Grey shales...	10	100
	Slate-coloured shales [grey clay]	6	106
	Whitish grey stone, very gritty [broken up small, stone, clay and sand]	1	107
	Blue marl [light-grey rather sandy clay]	5½	112½
	Grey stone [small bits, with clay, etc.]	2½	115
	Blue marl [light-grey clay, mottled light-brown]	3	118
	Grey stone	1	119
	Blue marl [light-grey clay, slightly mottled light-brown] ...	8	127
	Dark brown marl [light-grey and brown mottled clay]	3	130
	Dark bluey grey shale [grey clay]	7	137
	Dark bluey grey shale [light-grey clay, rather sandy]	2	139
	Bluey-grey very fine live sand [light-grey and buff]	2	141
	Light-grey sandy rock	1½	142½
	Bluey-grey shale [light-grey and brown clay]	1½	144
	Hard blue limestone [grey, calcareous sandstone ?]	2½	146½
	Grey shale [light-grey clay ...	5½	152
	Brown shale [brownish-grey clay	11	163
	Dark slate-coloured shale [grey clay	9	172
	Grey shale clay	1	173
	Blue shale grey clay	25	198
	Brown marl [brownish-grey clay]	2	200
	Dark blue marl [light-grey rather sandy clay]	15½	215½
	Brown shale [light-brownish clay, partly rather sandy]	2	217½
	Light-grey shale [sandy clay or clayey sand, of very fine grain, soft]	12½	230
	Light-grey shale [clay, rather sandy]	33	263
	Dark-grey shale [light-grey and brownish clay, partly rather sandy]	1	264
	Very hard grey shale stony ...	2	266
	Tough sticky red marl [brownish and light-grey mottled clay] ...	4	270
	Bluey-grey marl [light-grey clay]	4	274
	Very hard grey shale [light-grey bedded soft stone]	2	276
	Hard grey shale [light-grey soft stone]	4	280
	Sticky blue clay [light-grey clay, rather sandy]	1½	281½
	Sandy compact limestone [light-grey soft stone]	1½	283
	Light-grey clay	12	295
Weald Clay	Very friable dark slate-coloured shale [soft grey stone, hard shale]	7	302
	Grey shale [bits of soft sand and hard clay]	4	306
	Soft shale [bits of stone, hard shale ?]	44	350
	Yellowish-grey [bits of stone and very fine soft sand, light-coloured]	4	354
	Dark-grey clay [light-grey and buff]	26	380
	Dark grey shale [grey soft stone]	1	381
	Very sharp compact white sandstone [light-brown fine sharp sand]	1½	382½
	Soft grey clay [light-coloured, partly rather sandy]	½	383
	Hard sandstone [bits of soft sandstone, and sand]	2	385
	Softer sandstone [like above] ...	1	386
	Very hard and fine rock-bed (sand) [fine pale buff sand, some bits of stone]	1	387
	Coarser rock-bed [darker sharp sand, small bits of stone] ...	1½	388½
	Finer rock-bed [buff sharp sand]	½	389
	Coarser rock-bed [darker sand] ...	1	390
	Fine sandy clay or clayey sandstone [buff bedded stone] ...	2	392
	Blue shale [pale grey clay] ...	8	400
	Dark shale [brownish-grey soft sandstone]	4	404
Tunbridge Wells Sand	Blue and brown friable clay [grey and brownish sandy clay] ...	3½	407½
	Slate-coloured shale [grey stone]	2	409½
	Sharp white sandstone [light-grey and brownish fine sharp sand]	4	413½
	Grey clay and shale [light-coloured sandy clay or clayey sand]	3	416½
	Dark shale [brownish-grey stone]	1	417½
	Light-grey shale [pale greyish sandy clay; very fine soft grains, may be mainly soft marly sand, compacted]	1½	419
	Dark-grey shale [brownish-grey hard clay and soft stone] ...	4½	423½
	Sharp white sand [light-coloured, fine]	½	424
	Grey clay and shale [brownish sandy clay, some hard] ...	2	426
	Sticky blue clay, with rock-bands [one set, bits of brownish stone, another mud]	5	431

This section is of interest as showing the varying character of the Weald

Shaft 39 ft., the rest a boring. At first 8 in. clear diameter; reduced to 6 and then to 5. Top of tubes 3 ft. down. Information from Mr. H. G. Featherby.

258. Sunk well, 1922.

Weald Clay to 100 ft.

Level of water—16 ft. of water in 8 hours.

21½	,,	12	,,
36	,,	36	,,
43	,,	48	,,
46	,,	69	,,
52	,,	ultimately.	

Information from Messrs. Duke and Ockenden, Ltd.

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 578429 : BGS Reference: TQ12NE109
British National Grid (27700) : 515680,125930

HORSHAM SOUTHWATER

Surveyed. 24 NE/W New Sussex Worthing United Brick Co. Southwater & Horsham. 19.11.57 84

TQ12/19 A+B

A. 3 A, B

SOUTHWATER BRICKYARD, near Southwater railway station. Ht. above O.D. about 130 ft. Map 24 N.E. Two wells.

257.* Boring. +182 ?

		Thickness Ft.	Depth Ft.
Weald Clay. ? Horsham Stone at 144 ft.	Brown slate-coloured shales [40 grey shaly clay; 50 and 75 light-coloured rather sandy clay; 80 grey clay; 90 grey rather sandy clay]	90	90
	Grey shales...	10	100
	Slate-coloured shales [grey clay]	6	106
	Whitish grey stone, very gritty [broken up small, stone, clay and sand]	1	107
	Blue marl [light-grey rather sandy clay]	5½	112½
	Very sharp, compact whitish sandstone [colour]	4	354
	Dark grey shale [grey soft stone]	1	381
	Dark-grey clay [light-grey and buff]	26	380

Map 15 S.E.

261.* RAILWAY STATION. 1896. Ht. above O.D. 200 ft.

R.L.W. 84 ft. down. Information from Messrs. LeGrand and Sutcliff.

		Thickness Ft.	Depth Ft.
Ashdown Sand	Soft marl	7	120
	Sandstone and sand	3	113
	Blue sandy marl and sandstone ...	7	110
	Blue marl	3	103
	Sandy marl	10	100
	Red loamy sand	2	90
	Sandy marl	6	88
	Blue marl	12	82
	Sandstone and marl	6	70
	Sandstone	3	64
	Very hard blue marl	9	61
	Sandstone, top half loamy	6	52
	Clay	2	46
Weald (? old), the rest bored	... ...	—	44

260.* ODDYNES HOLT, ¾ mile W. of church. 1905. Ht. above O.D. 210 ft. Map 15 S.E.

(287 ft. perforated). Information from Messrs. C. Isler and Co., Ltd.

R.L.W. 7 ft. down. Lined 20 ft. of 7¼ in. tubes, 361 ft. of 5 in.

		Thickness Ft.	Depth Ft.
Ashdown Sand	White stone	12½	25½
	Blue marl	1½	27
	Stone and marl	5½	32½
	White stone	73½	106
	Hard stone	255½	361½
Wadhurst Clay	Yellow clay	6	6
	Clay shale	2	8
	Blue and yellow clay	5	13

Horsted Keynes—Maps O.S.G. 5, N.S. 302, 303.

259. " RAVENSWOOD," House at road fork ¾ mile N.E. of railway station. Ht. above O.D. 300 ft. Map 15 S.E.

		Thickness Ft.	Depth Ft.
Wadhurst Clay	Yellow clay	6	6
	Clay shale	2	8
	Blue and yellow clay	5	13
Ashdown Sand	White stone	12½	25½
	Blue marl	1½	27
	Stone and marl	5½	32½
	White stone	73½	106
	Hard stone	255½	361½

R.L.W. 7 ft. down. Lined 20 ft. of 7¼ in. tubes, 361 ft. of 5 in. (287 ft. perforated). Information from Messrs. C. Isler and Co., Ltd.

260.* ODDYNES HOLT, ¾ mile W. of church. 1905. Ht. above O.D. 210 ft. Map 15 S.E.

		Thickness Ft.	Depth Ft.
Weald (? old), the rest bored	... ...	—	44
Ashdown Sand	Clay	2	46
	Sandstone, top half loamy	6	52
	Very hard blue marl	9	61
	Sandstone	3	64
	Sandstone and marl	6	70
	Blue marl	12	82
	Sandy marl	6	88
	Red loamy sand	2	90
	Sandy marl	10	100
	Blue marl	3	103
	Blue sandy marl and sandstone ...	7	110
	Sandstone and sand	3	113
	Soft marl	7	120

261.* RAILWAY STATION. 1896. Ht. above O.D. 200 ft. Map 15 S.E.

		Thickness Ft.	Depth Ft.
	Very sharp, compact whitish sandstone [colour]	4	354
	Dark grey shale [grey soft stone]	1	381
	Dark-grey clay [light-grey and buff]	26	380

R.L.W. 84 ft. down. Information from Messrs. LeGrand and Sutcliff.

262. " " ultimately.

Information from Messrs. Duke and Ockenden, Ltd.

Horsted Keynes—Maps O.S.G. 5, N.S. 302, 303.

259. " RAVENSWOOD," House at road fork ¾ mile N.E. of railway station. Ht. above O.D. 300 ft. Map 15 S.E.

		Thickness Ft.	Depth Ft.
Wadhurst Clay	Yellow clay	6	6
	Clay shale	2	8
	Blue and yellow clay	5	13
Ashdown Sand	White stone	12½	25½
	Blue marl	1½	27
	Stone and marl	5½	32½
	White stone	73½	106
	Hard stone	255½	361½

R.L.W. 7 ft. down. Lined 20 ft. of 7¼ in. tubes, 361 ft. of 5 in. (287 ft. perforated). Information from Messrs. C. Isler and Co., Ltd.

260.* ODDYNES HOLT, ¾ mile W. of church. 1905. Ht. above O.D. 210 ft. Map 15 S.E.

		Thickness Ft.	Depth Ft.
Weald (? old), the rest bored	... ...	—	44
Ashdown Sand	Clay	2	46
	Sandstone, top half loamy	6	52
	Very hard blue marl	9	61
	Sandstone	3	64
	Sandstone and marl	6	70
	Blue marl	12	82
	Sandy marl	6	88
	Red loamy sand	2	90
	Sandy marl	10	100
	Blue marl	3	103
	Blue sandy marl and sandstone ...	7	110
	Sandstone and sand	3	113
	Soft marl	7	120

261.* RAILWAY STATION. 1896. Ht. above O.D. 200 ft. Map 15 S.E.

		Thickness Ft.	Depth Ft.
	Very sharp, compact whitish sandstone [colour]	4	354
	Dark grey shale [grey soft stone]	1	381
	Dark-grey clay [light-grey and buff]	26	380

R.L.W. 84 ft. down. Information from Messrs. LeGrand and Sutcliff.

262. " " ultimately.

Information from Messrs. Duke and Ockenden, Ltd.

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 578429 : BGS Reference: TQ12NE109
British National Grid (27700) : 515680,125930

b) Well c. 90 feet deep, diam. 5½ feet.
R.W.L. 41' 5½" below well top.
Yield 4-6,000 g.p.h. Used for boiler and one house.
O.D. of well top + 166.
Visited 19.11.57. BN.

a) Disused

b) Yield 700 g.p.h
R.W.L. c. 80'
Pump 6 hrs p.d. 7 d.p wk

Sited on Sussex 24 NE/W
S.M.'s C.M.
2.6.97

Contact BGS: ngdc@bgs.ac.uk

TQ12SW5

British Geological Survey

BGS ID: 578444 : BGS Reference: TQ12SW5
British National Grid (27700) : 513410,124250

TQ12/12

WELL BORING at Shipley. Horsham County Sussex

Geol. map 1 in. map New Series 6 in. map 24 SW/E.

Made by Isler & Co. Date 1925

Sunk feet. Bored 302 feet.

Communicated by Isler & Co.

Height above Ordnance Datum Rest level of water 15 ft.

Yield 700 gallons per hour.

Quality (with copy of analysis on separate sheet)

TQ12 SW5 TQ 1341 2425

GEOLOGICAL FORMATION.	NATURE OF STRATA.	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
Weald Clay	Light brown clay	4	–	4	–
	Mottled clay	12	–	16	–
	Blue clay	15	–	31	–
	Light Brown clay	6	–	37	–
	Dark mottled clay.	30	–	67	–
	Stone	1	6	68	6
	Blue marl clay.	21		89	6
	" " and stone	20	6	110	–
	Blue clay and bands of stone	92	–	202	–
	R.L.W. ~~Rest level water~~ 15 ft down				
	Yields 700 g. p. hour.				

For Major Bell
@ Baker's Farm
Shipley
Horsham.

65' of 8" tubes above surface 1 foot.
140' of 5" (perforated) level with surface.

Information from Messrs C. Isler and Co Ltd

Published in 'Wells & Springs' of Sussex, page 185/6

OD 100

Weald Clay

Shipley—Maps O.S.G. 9, N.S. 302.

413. Bakers Farm, 1 mile N.E. of Coolham cross-roads. 1925.
Ht. above O.D. about 90 ft. Map 24 S.W.

		Thickness Ft.	Depth Ft.
Weald Clay	Light brown clay	4	4
	Mottled clay	12	16
	Blue clay	15	31
	Light brown clay	6	37
	Dark mottled clay	30	67
	Stone	1½	68½
	Blue marl clay	21	89½
	Blue marl and stone	20½	110
	Blue clay and bands of stone	92	202

R.L.W. 15 ft. down. Yield 700 g. p. hour.
Lined 65 ft. of 8 in. tubes 1 ft. above surface; 140 ft. of 5 in. tubes (perforated) level with surface.
Information from Messrs. C. Isler and Co., Ltd.

123. 2500. 11/25. Gp. 160 O.A.

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 578444 : BGS Reference: TQ12SW5
British National Grid (27700) : 513410,124250

TQ12/12

TQ 12 SW/5

302/38

2.6.47.

Only source of water supplies house and farm including stock.

water pumped into reservoir 2 or 3 days a week.

Yield not known.

B.A.C.

TQ12/12.
TQ12SW5

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 578444 : BGS Reference: TQ12SW5
British National Grid (27700) : 513410,124250

1

TQ 12/12

302/38 Bakers Farm, Shipley

W.S.Sx.III, p. 185. Surface +100. Lining tubes: 65 × 8 in from 1 above; 140 × 5 in from surface (perforated). R.W.L. +85. Yield 700 g.p.h. *Isler, 1925.*

	Light brown clay	...	4	4
	Mottled clay	...	12	16
	Blue clay	...	15	31
WC	Light brown clay	...	6	37
202	Dark mottled clay	...	30	67
	Stone...	...	1½	68½
	Blue marl and clay	...	21	89½
	Blue marl and stone	...	20½	110
	Blue clay and bands of stone		92	202

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 578444 : BGS Reference: TQ12SW5
British National Grid (27700) : 513410,124250

TQ 12/12

WELL BORING at Shipley Horsham County Sussex

Geol. map 1 in. map New Series 6 in. map 24 SW/E.

Made by Isler & Co Date 1925

Sunk feet. Bored 304 feet.

Communicated by Isler & Co.

Height above Ordnance Datum +100 Rest level of water 15 ft.

Yield 700 galls per hour.

Quality (with copy of analysis on separate sheet) TQ 1343 2425

GEOLOGICAL FORMATION.	NATURE OF STRATA.	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
Wealden Clay	Light brown clay	4	—	4	—
	Mottled clay	12	—	16	—
	Blue clay	15	—	31	—
	Light Brown clay	6	—	37	—
	Dark mottled clay.	30	—	67	—
	Stone	1	6	68	6
	Blue marl clay.	21		89	6
	" " and stone	20	6	110	—
	Blue clay and bands of stone	92	—	202	—

R.L.W. ~~Kirkland Wells~~ 15 ft down
Yield 700 g. p. hour.

For Major Bell
@ Baker's Farm
Shipley
Horsham.

65' of 8" tubes above surface 1 foot.
140' of 5" " (perforated) level with surface.

Information for Messrs C. Isler and Co Ltd

Published in
'Wells & Springs
of Sussex,' III
page 185/6

Shipley—Maps O.S.G. 9, N.S. 302.

413. BAKERS FARM, 1 mile N.E. of Coolham cross-roads. 1925.
Ht. above O.D. about 90 ft. Map 24 S.W.

OD 100
Weald
Duchan
23.2.40.

		Thickness Ft.	Depth Ft.
Weald Clay	Light brown clay	4	4
	Mottled clay	12	16
	Blue clay	15	31
	Light brown clay	6	37
	Dark mottled clay	30	67
	Stone	1½	68½
	Blue marl clay	21	89½
	Blue marl and stone	20½	110
	Blue clay and bands of stone	92	202

R.L.W. 15 ft. down. Yield 700 g. p. hour.
Lined 65 ft. of 8 in. tubes 1 ft. above surface; 140 ft. of 5 in. tubes (perforated) level with surface.
Information from Messrs. C. Isler and Co., Ltd.

123. 2500. 11/25. Gp. 169. O.A.

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 578444 : BGS Reference: TQ12SW5
British National Grid (27700) : 513410,124250

TQ 12/12

2

302/33

2.6.47.

Only source of water supplies house and farm including stock.

Water pumped into reservoir 2 or 3 days a week.

Yield not known.

B.H.C.

DATA Bank

Contact BGS: ngdc@bgs.ac.uk

TQ12NW9

British Geological Survey
BGS ID: 578315 : BGS Reference: TQ12NW9
British National Grid (27700) : 513520,127990

TQ 12 NW 9

RECORD of WELL or BORING

TQ12/46

Survey No. 471
1" N.S. 302
1" O.S.
Six-inch map 13 SW
Popular Edition one-inch map. Sheet
Square

302

at (house or farm) Marlando
Town, Village, &c. Itchingfield (Horsham) County Sussex
Exact site (unless a tracing from a map is supplied, give distance and direction from parish church, cross-roads, or other object shown on maps). ⅓ mile SSE of Itchingfield Church
Surface level of ground 230 ft. above Ordnance Datum. Well or Bore commenced at ft. below surface level of ground.
Sunk — ft., diameter — ft. Bored 100 ft.; diameter of boring: at top 4½ in., at bottom 4½ in.
Details of lining tubes (internal diameters preferred) 4½ in. ifa tubes to 75' 8"
perforated from 21' to 33' 8"
NGR 1352 2799
Water struck at depths of (feet) 22'
Rest-level of water below top of well or bore 31½ ft. Pumping level ft. Time of recovery hours.
Suction at ft. depth. Yield: (i) on test 120 galls. per hour (ii) normal galls. per
Quality (attach copy of analysis if available)
Made by Duke & Ockenden, Ltd for Mr. H. G. Latella Date of boring 1934
Information from do. London & Littlehampton.

(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA. (and any additional remarks)	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
Reg. K.P.G. 4.1.35					
Weald Clay	Yellow clay	22	.	22	.
	Blue clay with hard & soft layers	17	6	39	6
	Brown clay	9	6	49	.
	Brownish blue clay	4	.	53	.
	Hard blue clay	17	.	70	.
	Shale	10	.	80	.
	Blue clay	18	.	98	.
	Shale	2	.	100	.

Borehole abandoned owing to the small yield.

OD 240
visited S Buchan 22.2.40.

Geological Survey and Museum, South Kensington, London, S.W.7.

For Survey use only.

Date received.	G.S.M.	M. of H. notified.	Site marked on 1" map.
8/1/35	1.2.35		K.H.

British Geological Survey

BGS ID: 578315 : BGS Reference: TQ12NW9
British National Grid (27700) : 513520,127990

1 302/74 Marlands, Itchingfield. Trial TQ 12/6

Surface +240. Lining tubes: 75¾ × 4½ in from surface (perforated 21 to 33¾). Water struck at +218. R.W.L. +208½. Yield 120 g.p.h. (test). *Dando, 1934.*

WC 100 100

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS	DEPTH
WEALD CLAY	YELLOW CLAY	22'	22'
	BLUE CLAY WITH HARD & SOFT LAYERS	17' 6	39' 6
	BROWN CLAY	9' 6	49'
	BROWNISH BLUE CLAY	4'	53'
	HARD BLUE CLAY	17'	70'
	SHALE	10'	80'
	BLUE CLAY	18'	98'
	SHALE	2'	100'

KPC 4-1-35

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 578315 : BGS Reference: TQ12NW9
British National Grid (27700) : 513520,127990

RECORD of WELL or BORING

TQ 12/6

Survey No. 471
1" N.S. 302
1" O.S.
Six-inch map 13 SW.
Popular Edition (Sheet
of
one-inch map. (Square

302
74

at (house or farm) Marlands
Town, Village, &c. Stichingfield (Horsham) County Sussex
Exact site (unless a tracing from a map is supplied, give distance and direction from parish church, cross-roads, or other object shown on maps). ½ mile SSE of Stichingfield Church

Surface level of ground 230 ft. above Ordnance Datum. Well or Bore commenced at ft. below surface level of ground.
Sunk — ft., diameter — ft. Bored 100 ft.; diameter of boring: at top 4" in., at bottom 4" in.
Details of lining tubes (internal diameters preferred) 4" in. i/a tubes to 75' 8".
perforated from 21' to 33' 8"
TQ 1353 2797
Water struck at depths of (feet) 33'
Rest-level of water below ~~above~~ top of well or bore 31' ft. Pumping level ft. Time of recovery hours.
Suction at ft. depth. Yield: (i) on test 120 galls. per hour, (ii) normal galls. per
Quality (attach copy of analysis if available)
Made by Duke & Ockenden, Ltd for Mr. H. G. Latella London & Littlehampton Date of boring 1934
Information from do.

(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA. (and any additional remarks)	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
Log R.P.G. 4.1.35					
Weald Clay.	Yellow clay	22	.	22	.
	Blue clay with hard & soft layers	17	6	39	6
	Brown clay	9	6	49	.
	Brownish blue clay	4	.	53	.
	Hard blue clay	17	.	70	.
	Shale	10	.	80	.
	Blue clay	18	.	98	.
	Shale	2	.	100	.

Borehole abandoned owing to the small yield.

OD 240
visited S Buchan 22-2-40.

DATA Bank

Geological Survey and Museum, South Kensington, London, S.W.7.

For Survey use only.

Date received.	G.S.M.	M. of H. notified.	Site marked on 1" map.
Jan/35.	6378		✓ AT.

(11969B) Wt 10256/0175 2,500 9/32 H, J, R & L, Ld Gp 616

Contact BGS: ngdc@bgs.ac.uk

TQ12NE110

British Geological Survey

BGS ID: 578430 : BGS Reference: TQ12NE110
British National Grid (27700) : 517320,125660

From Well at Broadwater Cottage - Broadwater Lane, Southwater Nuthurst (Copsale)

TQ 12/20

REPORT ON A SAMPLE OF WATER,

302/104

Received on Aug 15th from Mrs. F. Boyliss (Horsham R.D. Council)

Marked .....

Surrey 24 NE E

TQ 1738 2567

By RICHARD A. CRIPPS, F.I.C.,

Public Analyst for the County Borough of Bournemouth,

Analyst and Consulting Chemist to the Brighton and Hove Dairymen's Association, and the Hants., Wilts., and Dorset Mineral Water Manufacturers' Association.

Author of "Galenic Pharmacy," &c.

~~LONDON OFFICE:~~
~~ST. STEPHEN'S HOUSE,~~
~~VICTORIA EMBANKMENT, S.W.~~

D'AVIGDOR ROAD,
HOVE,

Aug. 19th 1918

SOUTHWATER, Broadwater Cottage, Broadwater Lane.

~~This Sample yields the following results on Analysis:~~

	GRAINS PER GALLON.
Total Solids	254·0
Chlorine	5·35
Ammonia	·00098
Albuminoid Ammonia	·00098
Nitrogen as Nitrites	Absent
,, ,, Nitrates	·02
Lead	Absent
Total Hardness (Clark's Scale)	115·0
Microscopic Examination	Satisfactory

I am of opinion that this water is free from organic pollution, but owing to its extreme "hardness" and large amount of salts in solution I cannot advise its use for drinking purposes.

By Mr R.A. Cripps F.I.C.

Aug 15th 1918

Visited. Site corrected on Sussex 24 NE E at Broadwater Cottage. Owner Mrs Forrester Disused. Filled up with rubbish

OD. 164

20.11.54 RM

Well commences in Weald Clay, depth not known.

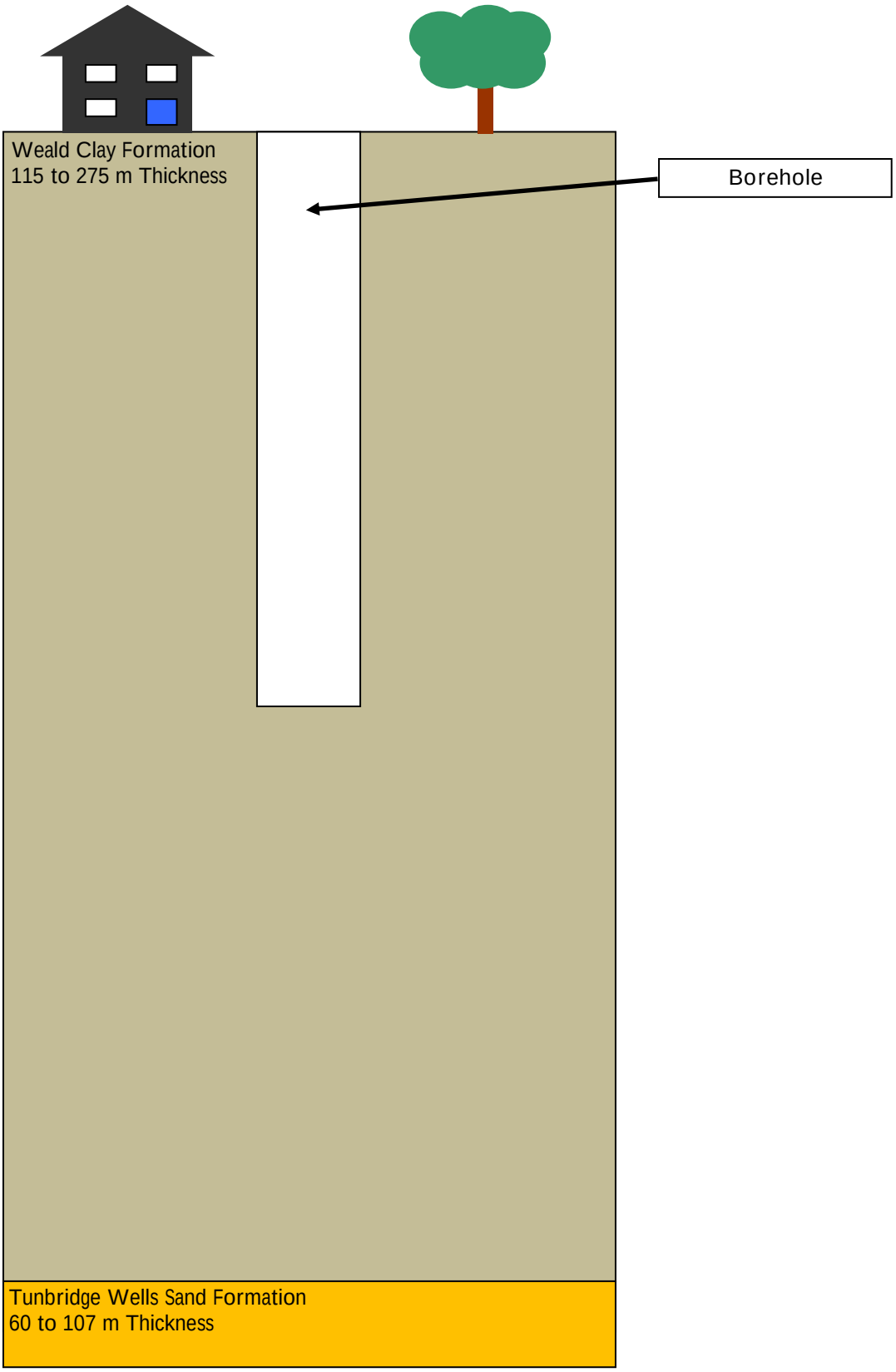
pp. F. Mather.

30·10·68.

Contact BGS: ngdc@bgs.ac.uk

APPENDIX B

BOREHOLE SCHEMATIC



Schematic not to scale - for indicative use only
Formation thickness scale is based upon medium values when ranges are used.

wsp	Project No: 62241301/001/384	Site: Centenary Road, Southwater, Horsham, West Sussex, RH13 9FU
	Borehole Schematic	