

Invicta Water Treatment

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Horley

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Chris Green

Littleworth Properties Limited

3c High Street

Esher

Surrey KT10 9RL

By email: chris.green@team-green.co.uk

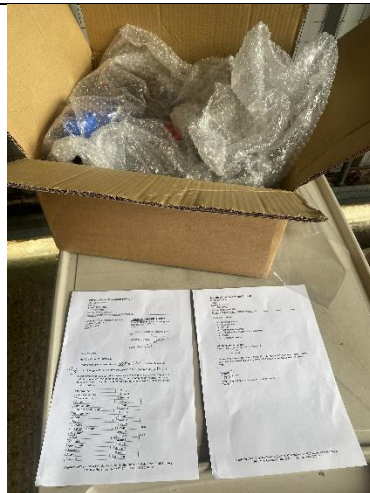
03/09/24

Dear Mr Green,

Re: Private Water Supply at Sandgate Nurseries Site – Raw Borehole Water Analysis (to date and inferences); Proposed Design and Compliance with PWS Regs 2016 Amended 2018 – Rev A

Further to the request that a raw borehole sample was taken by an accredited UKAS PWS Sampler, I can confirm that this was performed on 05/08/24 by Stefan Massingham. The borehole was allowed to flow for some 2 hours prior to sampling. It has been frequently flushed and allowed to develop during drilling prior to sampling. Visually, the water was turbid and grey in colour.

The samples were taken in accordance with DWI requirements (based on Group A & B Schedules PWS Regs 2016), with the correct bottles supplied by the UKAS Accredited lab, SE Water Scientific Services (SEWSS). and then duly transported to the lab thereafter, at the required transit temperatures (between 2°C and 8°C). Additional determinands were tested based on previous HDC requirements.



Signed acceptance of IWT Order by SEWSS

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Determinands to Date	Sample Number 1287680-3 Interim, 03/09/24
Alkalinity, mg/l	257.0
Ammonium (Ammonia and Ammonium ions), mg/l	0.081
Chloride, mg/l	33.50
Nitrate, mg/l	<0.9
Nitrite, mg/l	<0.004
Nitrite/nitrate, mg/l	0.000
Sulphate, mg/l	77.2
Total Hardness, mg/l	107.3
Odour – Qualitative	None
Odour – Quantitative	0
Colony Count 3 days at 22°C, cfu/ml	>300
Colony Count 2 days @ 37°C, cfu/ml	>300
E coli, mpn/100 ml	0
Total Coliforms, mpn/100 ml	3
Pseudomonas aeruginosa, cfu/100 ml	Competing growth, indicative count 0
Clostridium perfringens (including spore), cfu/100 ml	0
Enterococci, cfu/100 ml	0
Colour, mg/l Pt/Co	<2
Conductivity, uS/cm	569
Hydrogen ion, pH	7.5
Turbidity, NTU	2.770
Bromate, ug/l	<0.8
Antimony, ug/l	<0.2
Arsenic, ug/l	<1.0
Selenium, ug/l	1.5
Boron, mg/l	<0.040
Calcium, mg/l	105.3
Magnesium, mg/l	4.8
Sodium, mg/l	18.7
Fluoride, mg/l	0.121
Benzo(a)pyrene, ug/l	<0.003
Benzo(1,12)perylene, ug/l	<0.003
Benzo(11,12)fluoranthene, ug/l	<0.003
Benzo(3,4)fluoranthene, ug/l	<0.003
Indeno(1,2,3-cd)pyrene, ug/l	<0.003
PAH Total, ug/l	0.000
1,1,1 Trichloroethane, ug/l	<0.60
1,2-Dichloroethane, ug/l	<0.12
Benzene, ug/l	<0.02
Dibromochloromethane, ug/l	<0.50

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Dichlorobromomethane, ug/l	<0.43
Tetrachloroethene	<0.15
Tetrachloroethene/Trichloroethene- SUM, ug/l	0.00
Tetrachloromethane, ug/l	<0.11
Total Trihalomethane, ug/l	0.00
Tribromomethane, ug/l	<0.60
Trichloroethene, ug/l	<0.10
Trichloromethane, ug/l	<0.50
Aluminium, ug/l	<6.1
Copper, mg/l	<0.009
Iron, ug/l	325.5
Iron (free), ug/l	<7.3
Lead, mg/l	<0.9
Manganese, ug/l	41.1
Nickel, ug/l	4.1
Cadmium, ug/l	<0.12
Chromium, ug/l	0.8
Calc Pesticides – Total Substances	0.000
Aldrin, ug/l	<0.007
Dichlobenil, ug/l	<0.004
Heptachlor, ug/l	<0.009
Heptachlor Epoxide, ug/l	<0.005
Propyzamide, ug/l	<0.005
Tri-allate, ug/l	<0.005
2,4,5-T, ug/l	<0.007
2,4-D, ug/l	<0.007
Bentazone, ug/l	<0.007
Bromoxynil, ug/l	<0.007
Dicamba, ug/l	<0.020
Dichlorprop, ug/l	<0.003
Fluroxypyr, ug/l	<0.008
MCPA, ug/l	<0.008
MCPB, ug/l	<0.008
Mecoprop(MCPP), ug/l	<0.005
Triclopyr, ug/l	<0.015
Epichlorohydrin, ug/l	<0.1
Atrazine, ug/l	<0.002
Carbendazim, ug/l	<0.001
Carbetamide, ug/l	<0.002
Chlorotoluron, ug/l	<0.003
Diuron, ug/l	<0.004
Epoxiconazole, ug/l	<0.003
Flutriafol, ug/l	<0.003

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Isoproturon, ug/l	<0.003
Linuron, ug/l	<0.003
Oxadixyl, ug/l	<0.003
Pendimethalin, ug/l	<0.007
Prometryn, ug/l	<0.002
Simazine, ug/l	<0.003
Terbutryn, ug/l	<0.002
Trietazine, ug/l	<0.004
Mercury, ug/l	<0.04
% transmission	92.7
UV Abs (10 mm) @ 254 nm unfiltered, abs_unit	0.033
Bicarbonate Alkalinity, mg/l	256.17
Total Phosphate, ug/l	178
Total Organic Carbon, mg/l	1.2
Silica, mg/l	8.79
Suspended Solids, mg/l	6.4
Filtered Turbidity 0.45 um, NTU	0.0053
Filtered Aluminium 0.45 um, ug/l	<6.1

Treatment Prognosis

Based on the failures to date, the water treatment system will need to remove excess:

- iron (325.5 ug/l, maximum 200.0 ug/l)
- turbidity (2.770 NTU, maximum 1.000 NTU)
- suspended solids
- Bacteria – failures for Coliforms and general bacteria

The recommended treatment will be:

- Filtration to 5 um
- UV disinfection
- Chlorination

We propose the following equipment design:

- Borehole pump feeding
- Automatic backwashable media filter for sediment removal to 5 um or lower feeding
- 5 um security sediment filter for any stray particulate matter
- UV disinfection chamber with UV sensor for spore forming micro-organisms
- Automatic proportional chlorine dosing to provide disinfection residual to all points of use
- 30,000 litre treated water tank with level controls
- Booster pumps (duty/standby/assist)
- 5 um sediment filter
- Control panel with tank level indicators and pH/chlorine residual monitoring
- PVC rigid solvent weld pipework, MDPE pipework

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- High strength chlorination of all filtration pipework prior to use
- UKAS sampling of treated water as per PWS Regs

The total volume of treated water required is 17,216 litres per day. No EA abstraction licence is required as the volume is less than the 20,000 litre per day threshold. The yield is some 5.4 m³/h, so there is plenty of scope for future development, if required, subject to licence approval.

The filtration equipment is modular in nature and so upgrades are quite straight forward. The treated water will meet the PWS Regs requirements.

Compliance

With reference to the PWS Regs 2016 and amended 2018, this supply will be classified as Reg 9. We have allowed for a DWI risk assessment on the completed system by David Clapham (RIAMS independent consultant) along with the required sampling by a UKAS accredited sampler. We understand, under PWS Regs section 6 & 7, the duties of the council. We look for the council to provide clarity on this.

Ongoing Maintenance & Sampling

The water treatment system will require maintenance. We will provide a bespoke O&M manual, with specific procedures for your system along with the manufacturer's documentation. We will issue a line drawing of the water treatment process and provide hands-on training during the commissioning phase. Critical spares will be left on site and these are: spare UV lamp, quartz sleeve and sediment filters.

Regarding headings 3,4,5 in HDC Water Neutrality Compliance requirements. Please note 3 and 4 will be detailed at contract phase in the O&M manual. The manual will also cover recording. We have other applications/systems passed based on the same wording as in this report. With regard to recording: the designated maintenance contractor/owner/agent looking after the system will take necessary samples and record in the site log book, which forms part of the O&M manual. Until the system is commissioned, we cannot say which determinands need to be tracked but it is highly likely it is those which have failed and highlighted below. Specific SOPs, contained in the O&M, will be written once the system has been commissioned and will cover inspection, cleaning and maintenance. We will comply with PWS Regs 2016 amended 2018.

Sampling the raw borehole as well as the treated water is important to understand how the ground water is changing over time and how it reacts to weather events. We will only test pertinent process determinands and those required under the Schedules (see PWS Regs). If the council requires regulatory samples, we assume we will be instructed accordingly.

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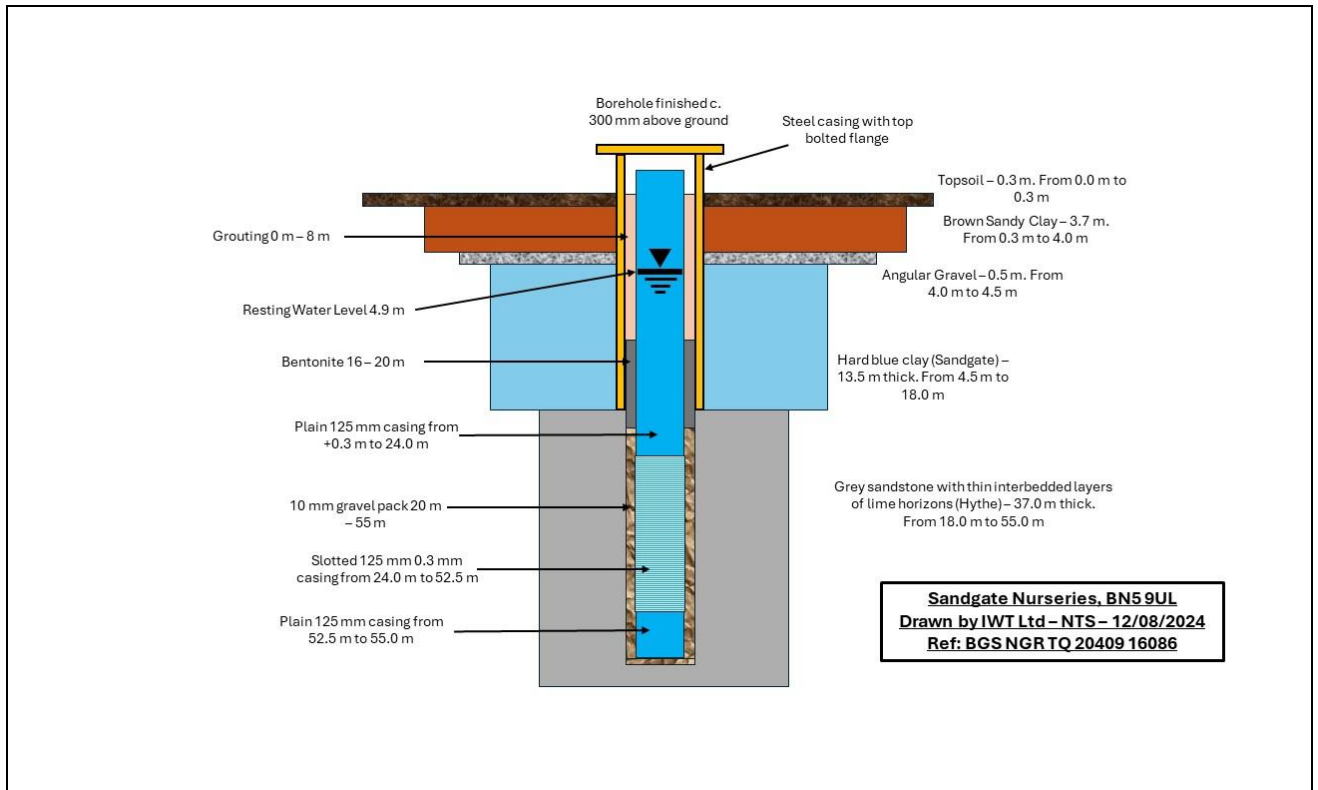
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Borehole Design As Drilled On Site



The borehole has been drilled as per the drill log attached to the email and as below (page 1 of log). The borehole produces water from the grey sands/sandstone and red clay. The borehole has been finished above ground. There are no known sewage systems or ground contamination sources nearby.

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WR39a Borehole record form

Borehole record form



British
Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL



Environment
Agency

Water Resources Act 1991 (as amended by the Water Act 2003)

A Site details

Borehole drilled for Littleworth Properties Ltd
Location Sandgate Nurseries, West End Lane, Henfield West Sussex, BN5 9UL
NGR (ten digits) 10 20408 16086 Please attach site plan
Ground level (if known) 20 metres Above Ordnance Datum
Drilling company OT Drilling Ltd
Date drilling commenced 22/07/2024 (DD/MM/YYYY) Completed 05/08/2024 (DD/MM/YYYY)

B Construction details

Borehole datum (if not ground level) GL metres (m). Please tick if this is above ☐ or below ☐ ground level.
(point from which all measurements of depth are taken, for example, flange, edge of chamber)

Borehole drilled diameter 200 mm from 0 to 55 m/depth
1 mm from 0 to 0 m/depth
1 mm from 0 to 0 m/depth
1 mm from 0 to 0 m/depth

Casing material Mild Steel diameter 219 mm from +0.0 to 18.0 m/depth
and type (for example, if plain steel, plastic slotted). Please record permanent casing details, not temporary casing.

Casing material UPVC Plain diameter 125 mm from +0.0 to 24.0 m/depth

Casing material UPVC Slotted 0.3mm diameter 125 mm from 24.0 to 52.5 m/depth

Casing material 125 mm from 0 to 0 m/depth

Grouting details 40mm gravel placed in annulus around screen. Bentonite pellet grout placed 20-16m

Water struck at 1. 18.0 m (depth below datum - m(bd)) 2. 0 m (mbd)
3. 0 m (mbd) 4. 0 m (mbd)

C Test pumping summary (Please supply full details on form WR39)

Test pumping datum GL m. Please tick if this is above ☒ or below ☐ ground level.
(if different from borehole datum)

Pump suction depth 42 mbd

Water level (start of test) 4.8 mbd

Water level (end of test) 4.9 mbd

Type of test (for example, bailer, step, constant rate)
constant

Pumping rate 5.4 m³/hour ☒ or litres/second ☐. Please tick as appropriate.
for 1 days, 2 hours, 0 mins

Recovery to 4.8 mbd in 1 days, 0 hours, 0 mins
(from end of pumping)

Date(s) of measurements Pump started 05/08/2024 (DD/MM/YYYY)

Pump stopped 05/08/2024 (DD/MM/YYYY)

Please supply chemical analysis if available. If you have included this please tick this box ☐

WR39a Version 2, February 2011

page 1 of 3

Page 1 of 3 – see email attachments for full document

Summary

Invicta Water Treatment Limited registered office: Cheeld Wheeler & Co, Redhill Chambers, 2D High Street, Redhill, Surrey, RH1 1 RJ. Registration No. 4571271. VAT No. 920 2302 82

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We trust that there is enough information herein for HDC. Please keep us informed of your progress. HDC can contact me directly if they wish.

Please feel free to call 07970 154529 if you need any parts of the report clarified.

Regards

Stefan Massingham BSc (Hons Chem.) MSc (Cran) MWMSoc

Director - Invicta Water Treatment Limited

Qualified UKAS Private Water Supply Sampler

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Disclaimer

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