

Martyn Grant
Environmental Manager
The Royal Mint
Llantrisant
Pontyclun
CF72 8YT

Dear Martyn,

FACTUAL REPORT ON GROUNDWATER SAMPLING IN OCTOBER 2018

Date 09/11/2018

Ramboll Environment & Health UK Ltd ('Ramboll') has been instructed by The Royal Mint to carry out groundwater monitoring during 2018 to 2019 at its site in Llantrisant, South Wales (Ramboll Quote ref: LQ1700002116, dated 13th April 2018). This letter presents a factual report on groundwater sampling from selected boreholes in the area of Building 9A, the Coin Press Room ("CPR"), the COMAH area and the southern site boundary, undertaken in October 2018.

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Background

Ramboll has carried out groundwater sampling at the site which previously identified elevated concentrations of metals in several areas. Elevated concentrations of nickel, copper and zinc have been identified in all boreholes monitored throughout 2017/18. The pH was also below [more acidic than] the acceptable EQS range in several locations across the site. It was recommended that monitoring should continue from selected boreholes.

Ref 1700002116_01 October
2018 GW Monitoring Report

Natural Resources Wales (NRW) issued a Compliance Assessment Report (CAR), (Ref: KP3135KV CAR_NRW0033153) in relation to surface and groundwater monitoring results at the site. NRW recommended that monitoring of groundwater should continue every four months for a further twelve-month period, at which time the frequency can be reviewed, (following a Compliance Review of Building 9A).

Groundwater Sampling

Groundwater samples were collected from the following boreholes: BH8, BH9, BH901R, BH10, BH13, BH32, and BH801 (shown on Figure 1, Appendix 3). Samples were analysed for a range of metals, pH and alkalinity at a UKAS accredited laboratory. *SPMP boreholes CBH6 and BHNP2D have been omitted*

Ramboll Environment and Health UK Limited
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from future monitoring rounds given the reduction in volatile organic compound (VOC) concentrations recorded during previous monitoring. VOC analysis has also been omitted from the suite of analysis based on no detections above the laboratory reporting limit.

The laboratory certificates of analysis are included in Appendix 1, which provide the method of analysis for each determinand. The analysis results are summarised in the table in Appendix 2 and represented graphically in Appendix 3.

The results have been benchmarked against previous analytical results from these monitoring wells and screened against EQS for freshwater. The results are summarised as follows:

- Borehole BH8 was sampled during the most recent round of monitoring; concentrations of copper, nickel, and zinc have all slightly increased since the last time it was sampled in October 2017. Concentrations of copper, nickel, and zinc were all recorded at concentrations in excess of the respective EQS values.
- Samples were collected from boreholes BH9 and the borehole installed in 2015 (referred to as BH901R), that is acting as a replacement for borehole BH901. With the exception of copper in BH901R, concentrations of nickel, copper and zinc have increased in since June 2018; and are more similar to those recorded in February 2018. All concentrations of copper, nickel, and zinc remain in excess of their respective EQS values.
- Concentrations of nickel, copper and zinc have all slightly decreased in borehole BH10 since the previous round of monitoring in June 2018; and the concentration of zinc was recorded below the relevant EQS values. Concentrations of copper and nickel have remained in excess of the relevant EQS values.
- In BH32, concentrations of nickel, copper, and zinc recorded in October 2018 are very similar to those recorded in the previous round of monitoring in June 2018. Concentrations remain above the relevant EQS.
- Concentrations of nickel, copper, and zinc in borehole BH13 have all decreased slightly since the previous round of monitoring in June 2018. However, concentrations remain above the relevant EQS for these determinands.
- Borehole BH801, located in the north of the site (adjacent to the copper plating building) and included within ongoing SPMP groundwater sampling, has been included again for the 2018-19 monitoring programme. Concentrations of nickel, copper, and zinc recorded in October 2018 are very similar to those recorded in the previous round of monitoring in June 2018. The concentration of nickel has remained at a concentration below the relevant EQS value; however, the concentrations of copper and zinc have remained at concentrations that exceed the relevant EQS values.
- Total chromium was not recorded above the laboratory limit of detection in any boreholes during the most recent monitoring round. Therefore, all concentrations were below the EQS value of 0.0047mg/l.
- The concentration of cadmium was recorded above the laboratory LOD (0.0001mg/l) in boreholes BH8, BH9, BH13, BH32, and BH901R, with a maximum recorded value of 0.0007mg/l in borehole BH8. All recorded values are above the EQS value of 0.00008mg/l.

- The following determinands did not exceed the screening criteria in any of the boreholes: lead, arsenic, boron, mercury, selenium and vanadium.
- Low (acidic) pH values (<pH 6) were detected in samples from BH8 (pH 4.5), BH9 (pH 5.0), BH13 (pH 5.1), and BH32 (5.9). Samples from these and several other locations have regularly recorded low pH values throughout the monitoring programme.

The next round of groundwater monitoring is due to be carried out in February 2019. Please do not hesitate to contact me if there is anything you wish to discuss.

Yours sincerely



Lucy Cleverley

Managing Consultant
Site Solutions

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Encl. Appendix 1, Laboratory Test Report
 Appendix 2, Results Summary Table
 Appendix 3, Figures and Graphs

Appendix 1

Laboratory Test Report

Our Ref: EXR/272204 (Ver. 2)

Your Ref: 1700002116

November 5, 2018



Environmental Chemistry

SOCOTEC UK Limited

Bretby Business Park

Ashby Road

Burton-on-Trent

Staffordshire

DE15 0YZ

Telephone: 01283 554400

Facsimile: 01283 554422

Rob Hodgson
Ramboll Environ
8 Village Way
Cardiff
CF15 7NE

For the attention of Rob Hodgson

Dear Rob Hodgson

Sample Analysis - Royal Mint Monitoring 2018/19

Samples from the above site have been analysed in accordance with the schedule supplied.

The sample details and the results of analyses for these samples are given in the appended report.

An invoice for this work will follow under a separate cover.

Please be aware that our policy for the retention of paper based laboratory records and analysis reports is 6 years.

The work was carried out in accordance with SOCOTEC UK Limited (Multi-Sector Services) Standard Terms and Conditions of Contract.

If I can be of any further assistance please do not hesitate to contact me.

Yours sincerely

for SOCOTEC UK Limited

A handwritten signature in black ink, appearing to read 'C Lamb'.

C Lamb
Project Co-ordinator
01283 554463

TEST REPORT



1252

Report No. EXR/272204 (Ver. 2)

Ramboll Environ
8 Village Way
Cardiff
CF15 7NE

Site: Royal Mint Monitoring 2018/19

The 7 samples described in this report were registered for analysis by SOCOTEC UK Limited on 25-Oct-2018. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 05-Nov-2018

Tests where the accreditation is set to N or No, and any individual data items marked with a * are not UKAS accredited. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

The following tables are contained in this report:

Table 1 Main Analysis Results (Pages 2 to 3)
Analytical and Deviating Sample Overview (Page 4)
Table of Method Descriptions (Page 5)
Table of Report Notes (Page 6)
Table of Sample Descriptions (Appendix A Page 1 of 1)

On behalf of
SOCOTEC UK Lim
Becky Batham

Operations Manager
Energy & Waste Services

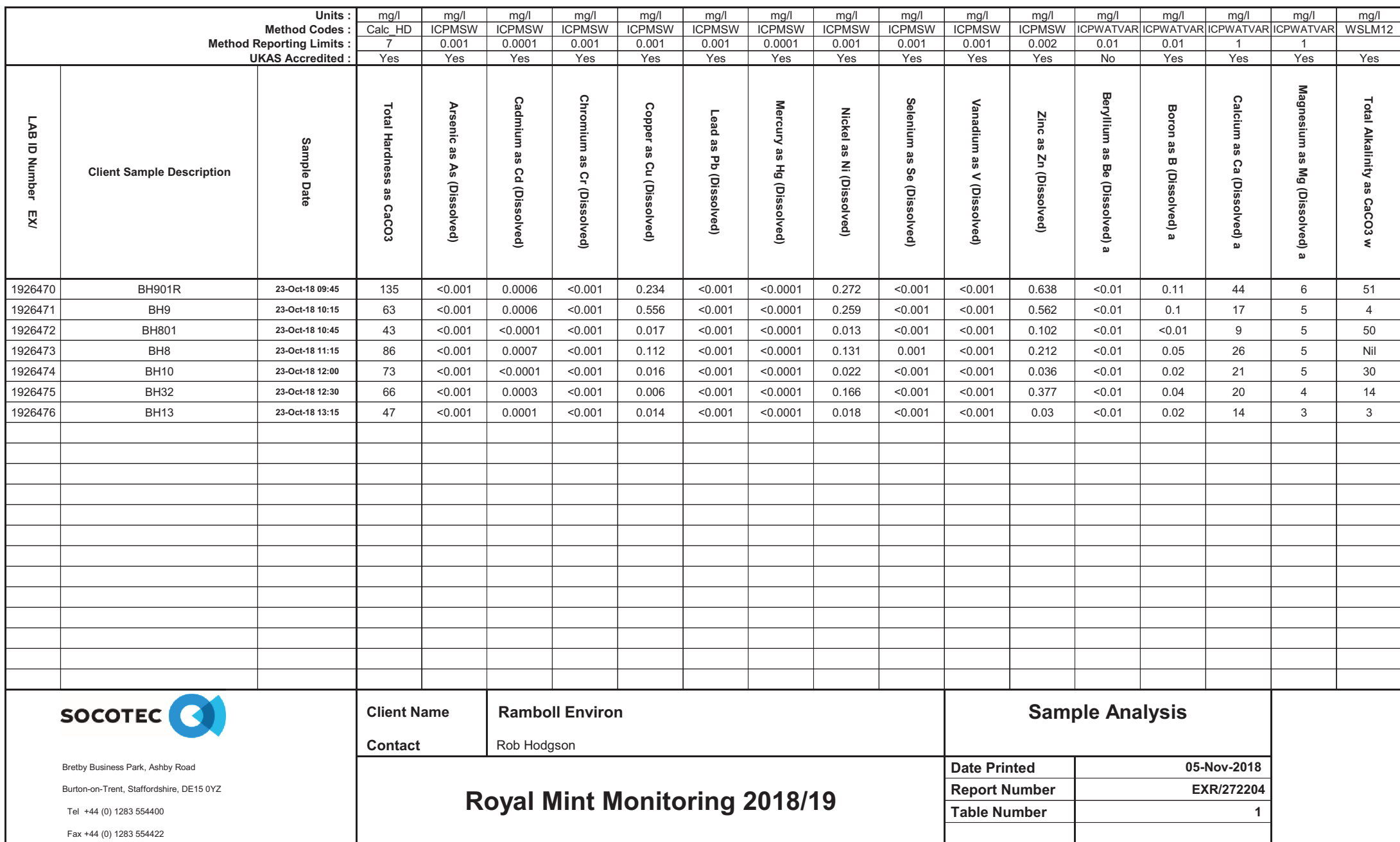
Date of Issue: 05-Nov-2018

Tests marked '^' have been subcontracted to another laboratory.

Where samples have been flagged as deviant on the Analytical and Deviating Sample Overview, for any reason, the data may not be representative of the sample at the point of sampling and the validity of the data may be affected.

SOCOTEC UK Limited accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.



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Client Name
Contact

Ramboll Environ
Rob Hodgson

Royal Mint Monitoring 2018/19

Sample Analysis

Date Printed	05-Nov-2018
Report Number	EXR/272204
Table Number	1

			Units :	pH units																
			Method Codes :	WSLM3																
			Method Reporting Limits :																	
			UKAS Accredited :	Yes																
LAB ID Number EX/	Client Sample Description	Sample Date	pH units w																	
				 Bretby Business Park, Ashby Road Burton-on-Trent, Staffordshire, DE15 0YZ Tel +44 (0) 1283 554400 Fax +44 (0) 1283 554422			Client Name	Ramboll Environ							Sample Analysis					
			Contact	Rob Hodgson																
			Royal Mint Monitoring 2018/19							Date Printed	05-Nov-2018									
										Report Number	EXR/272204									
										Table Number	1									

Sample Analysis

SOCOTEC UK Ltd Environmental Chemistry
Analytical and Deviating Sample Overview

W272204

Customer Ramboll Environ
Site Royal Mint Monitoring 2018/19
Report No W272204

Consignment No W145224
Date Logged 25-Oct-2018
In-House Report Due 31-Oct-2018

Please note the results for any subcontracted analysis (identified with a '^') is likely to take up to an additional five working days.

WSLM3	pH units	✓	
WSLM12	Total Alkalinity as CaCO3	✓	
ICPMATVAR	Beryllium as Be (Dissolved) VAR		
	Boron as B (Dissolved) VAR	✓	
	Magnesium as Mg (Dissolved) VAR	✓	
	Calcium as Ca (Dissolved) VAR	✓	
	Vanadium as V MS (Dissolved)	✓	
	Selenium as Se MS (Dissolved)	✓	
	Mercury as Hg MS (Dissolved)	✓	
	Arsenic as As MS (Dissolved)	✓	
	Zinc as Zn MS (Dissolved)	✓	
	Lead as Pb MS (Dissolved)	✓	
ICPMSW	Copper as Cu MS (Dissolved)	✓	
	Cadmium as Cd MS (Dissolved)	✓	
	Chromium as Cr MS (Dissolved)	✓	
	Nickel as Ni MS (Dissolved)	✓	
	CUSTSERV	Report A	
Calc_HD		Total Hardness as CaCO3 (CALC)	✓
MethodID	Sampled	Matrix Type	Description
EX/1926470	BH901R	Groundwater	23/10/18
EX/1926471	BH9	Groundwater	23/10/18
EX/1926472	BH801	Groundwater	23/10/18
EX/1926473	BH8	Groundwater	23/10/18
EX/1926474	BH10	Groundwater	23/10/18
EX/1926475	BH32	Groundwater	23/10/18
EX/1926476	BH13	Groundwater	23/10/18

Note: We will endeavour to prioritise samples to complete analysis within holding time; however any delay could result in samples becoming deviant whilst being processed in the laboratory.

If sampling dates are missing or matrices unclassified then results will not be ISO 17025 accredited. Please contact us as soon as possible to provide missing information in order to reinstate accreditation.

Deviating Sample Key	
A	The sample was received in an inappropriate container for this analysis
B	The sample was received without the correct preservation for this analysis
C	Headspace present in the sample container
D	The sampling date was not supplied so holding time may be compromised - applicable to all analysis
E	Sample processing did not commence within the appropriate holding time
F	Sample processing did not commence within the appropriate handling time
Requested Analysis Key	
	Analysis Required
	Analysis dependant upon trigger result - Note: due date may be affected if triggered
	No analysis scheduled
^	Analysis Subcontracted - Note: due date may vary

The integrity of data for samples/analysis that have been categorised as Deviating may be compromised. Data may not be representative of the sample at the time of sampling. Where individual results are flagged see report notes for status.

Method Descriptions

Matrix	MethodID	Analysis Basis	Method Description
Water	Calc_HD	As Received	Calculation based on Dissolved metals analysis by ICPOES
Water	ICPMSW	As Received	Direct quantitative determination of Metals in water samples using ICPMS
Water	ICPWATVAR	As Received	Direct determination of Metals and Sulphate in water samples using ICPOES
Water	WSLM12	As Received	Titration with Sulphuric Acid to required pH
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Report Notes

Generic Notes

Soil/Solid Analysis

Unless stated otherwise,

- Results expressed as mg/kg have been calculated on the basis indicated in the Method Description table.
All results on MCERTS reports are reported on a 105°C dry weight basis with the exception of pH and conductivity.
- Sulphate analysis not conducted in accordance with BS1377
- Water Soluble Sulphate is on a 2:1 water:soil extract

Waters Analysis

Unless stated otherwise results are expressed as mg/l

Nil: Where "Nil" has been entered against Total Alkalinity or Total Acidity this indicates that a measurement was not required due to the inherent pH of the sample.

Oil analysis specific

Unless stated otherwise,

- Results are expressed as mg/kg
- SG is expressed as g/cm³@ 15°C

Gas (Tedlar bag) Analysis

Unless stated otherwise, results are expressed as ug/l

Asbestos Analysis

CH Denotes Chrysotile

TR Denotes Tremolite

CR Denotes Crocidolite

AC Denotes Actinolite

AM Denotes Amosite

AN Denotes Anthophyllite

NAIIS No Asbestos Identified in Sample

NADIS No Asbestos Detected In Sample

Symbol Reference

^ Sub-contracted analysis.

\$\$ Unable to analyse due to the nature of the sample

¶ Samples submitted for this analyte were not preserved on site in accordance with laboratory protocols.

This may have resulted in deterioration of the sample(s) during transit to the laboratory.

Consequently the reported data may not represent the concentration of the target analyte present in the sample at the time of sampling

¥ Results for guidance only due to possible interference

& Blank corrected result

I.S Insufficient sample to complete requested analysis

I.S(g) Insufficient sample to re-analyse, results for guidance only

Intf Unable to analyse due to interferences

N.D Not determined

N.Det Not detected

N.F No Flow

NS Information Not Supplied

Req Analysis requested, see attached sheets for results

▯ Raised detection limit due to nature of the sample

* All accreditation has been removed by the laboratory for this result

‡ MCERTS accreditation has been removed for this result

§ accreditation has been removed for this result as it is a non-accredited matrix

Note: The Laboratory may only claim that data is accredited when all of the requirements of our Quality System have been met. Where these requirements have not been met the laboratory may elect to include the data in its final report and remove the accreditation from individual data items if it believes that the validity of the data has not been affected. If further details are required of the circumstances which have led to the removal of accreditation then please do not hesitate to contact the laboratory.

Sample Descriptions

Client : Ramboll Environ
Site : Royal Mint Monitoring 2018/19
Report Number : W27_2204

Appendix 2

Results Summary table

Groundwater Monitoring - Summary of Results

		Analysis												
Borehole	Date	pH	CaCO3 (mg/l)	Nickel (dissolved) mg/l	Chromium (dissolved) mg/l	Cadmium (dissolved) mg/l	Copper (dissolved) mg/l	Lead (dissolved) mg/l	Zinc (dissolved) mg/l	Arsenic (dissolved) mg/l	Boron (dissolved) mg/l	Mercury (dissolved) mg/l	Selenium (dissolved) mg/l	Vanadium (dissolved) mg/l
Guideline Value		6-9 (1)	NG	0.02 (1)	0.0047(1)	0.00008(1)	0.001-0.028* (1)	0.0072 (1)	0.008 - 0.125* (1)	0.05(1)	2 (1)	0.00005(1)	0.01(2)	0.02 - 0.06* (1)
BH801	01-Mar-06	6.5	120	0.23	<0.005	<0.001	<0.005	<0.005	0.042	<0.005	<0.005	<0.00005	<0.005	NT
	01-May-06	6.7	85	0.077	<0.005	<0.001	0.017	<0.005	0.18	<0.005	0.05	<0.00005	<0.005	NT
	01-Dec-06	6.6	76	0.014	<0.005	<0.001	0.14	<0.005	0.13	<0.005	0.006	<0.00005	<0.005	NT
	01-Aug-07	6.8	59	0.017	<0.005	<0.001	<0.005	<0.005	0.047	<0.005	0.006	<0.00005	<0.005	NT
	01-Aug-08	6.9	120	0.37	<0.005	<0.001	1.8	<0.005	0.66	<0.005	0.021	<0.00005	<0.005	NT
	01-Sep-09	7.63	235	0.01	0.005	<0.001	15.9	<0.005	0.467	<0.005	<0.018	<0.00005	<0.005	NT
	01-Oct-09	6.3	88	0.06	0.002	<0.001	0.362	<0.001	0.464	<0.001	0.03	0.0002	<0.001	NT
	01-Aug-10	6.5	68	0.048	0.001	<0.001	0.369	<0.001	0.819	<0.001	0.03	<0.00005	<0.001	NT
	01-Aug-11	6.7	80	0.058	0.002	0.0002	0.482	<0.001	1.312	<0.001	0.02	<0.0001	<0.001	NT
	20-Aug-12	7	72	0.017	<0.001	<0.0001	0.066	<0.001	0.347	<0.001	0.01	<0.0001	<0.001	NT
	30-Aug-13	6.9	100	0.043	0.002	0.0002	0.767	<0.001	3.119	<0.001	<0.01	<0.0001	<0.001	NT
	04-Sep-14	7.2	79	0.057	<0.001	0.0002	0.302	<0.001	1.37	<0.001	0.04	<0.0001	<0.001	NT
	04-Jun-15	7	113	0.079	<0.001	0.0007	2.627	<0.001	4.669	<0.001	<0.01	<0.0001	<0.001	<0.001
	12-Oct-15	6.6	52	0.031	<0.001	<0.0001	0.101	<0.001	0.776	<0.001	<0.01	<0.0001	<0.001	<0.001
	17-Feb-16	6.3	47	0.018	<0.001	<0.0001	0.098	<0.001	0.629	<0.001	<0.01	<0.0001	<0.001	<0.001
	30-Jun-16	6.5	66	0.075	<0.001	0.0003	0.422	<0.001	2.253	<0.001	0.01	<0.0001	<0.001	<0.001
	25-Oct-16	6.4	43	0.013	<0.001	<0.0001	0.029	<0.001	0.232	<0.001	<0.01	<0.0001	<0.001	<0.001
	14-Feb-17	6.3	54	0.009	<0.001	<0.0001	0.005	<0.001	0.053	<0.001	<0.01	<0.0001	<0.001	<0.001
	16-Jun-17	6.2	52	0.022	<0.001	0.001	0.086	<0.001	0.784	<0.001	0.01	<0.0001	<0.001	<0.001
	31-Oct-17	6.4	51	0.008	<0.001	<0.0001	0.002	<0.001	0.045	<0.001	<0.01	<0.0001	<0.001	<0.001
	07-Feb-18	6.6	54	0.012	<0.001	<0.0001	0.005	<0.001	0.166	<0.001	<0.01	<0.0001	<0.001	<0.001
	25-Jun-18	6.5	51	0.013	<0.001	0.0001	0.014	<0.001	0.141	<0.001	<0.01	<0.0001	<0.001	<0.001
	23-Oct-18	6.4	43	0.013	<0.001	<0.0001	0.017	<0.001	0.102	<0.001	<0.01	<0.0001	<0.001	<0.001
BH8	01-Oct-09	4.5	NT	0.571	0.001	0.0021	0.22	0.002	0.45	<0.001	0.05	<0.0001	0.002	<0.002
	01-Feb-10	4.3	NT	0.315	0.002	0.0027	0.239	0.002	0.68	<0.001	0.06	<0.0001	0.003	<0.002
	01-Apr-10	4.4	NT	0.141	<0.001	<0.0001	0.17	<0.001	0.952	<0.001	0.03	<0.0001	0.001	<0.002
	01-Jun-10	4.6	NT	0.57	0.001	0.0019	0.195	0.002	1.368	<0.001	0.04	<0.0001	0.001	<0.002
	25-Jan-13	5.2	14	0.162	<0.001	0.0013	0.283	0.002	0.379	<0.001	0.05	<0.0001	<0.001	0.001
	03-Apr-13	5.4	5	0.19	<0.001	0.0014	0.293	0.002	0.482	<0.001	<0.01	<0.0001	0.001	<0.001
	31-May-13	5.9	<30	0.307	0.001	0.0009	0.452	<0.001	1.325	<0.001	<0.01	<0.0001	<0.001	<0.001
	26-Jul-13	4.9	<2	0.176	<0.001	0.0017	0.262	0.004	0.703	<0.001	0.02	<0.0001	<0.001	<0.001
	07-Oct-13	5.4	0	0.111	<0.001	0.001	0.225	0.003	0.323	<0.001	0.02	<0.0001	<0.001	<0.001
	25-Nov-13	6.6	7	0.103	0.001	0.0007	0.152	<0.001	0.232	<0.001	0.03	<0.0001	<0.001	<0.001
	30-Jan-14	5.9	8	0.08	<0.001	0.0007	0.099	<0.001	0.205	<0.001	0.03	<0.0001	<0.001	<0.001
	04-Jun-14	4.8	6	0.085	<0.001	0.0007	0.132	0.001	0.23	<0.001	<0.01	<0.0001	<0.001	<0.001
	08-Oct-14	6.5	<2	0.235	<0.001	0.0014	0.285	0.003	0.564	<0.001	0.03	<0.0001	<0.001	<0.001
	10-Feb-15	5.3	5	0.104	<0.001	0.0006	0.112	<0.001	0.21	<0.001	0.03	<0.0001	0.001	<0.001
	04-Jun-15	6.2	0	0.243	<0.001	0.0012	0.258	0.002	0.487	<0.001	0.04	<0.0001	0.003	<0.001
	12-Oct-15	5.6	59	0.135	0.001	0.0008	0.168	<0.001	0.28	<0.001	<0.01	<0.0001	<0.001	<0.001
	17-Feb-16	4.7	71	0.101	<0.001	0.0007	0.122	0.001	0.195	<0.001	<0.01	<0.0001	0.001	<0.001
	30-Jun-16	4.4	82	0.154	<0.001	0.0009	0.179	0.002	0.316	<0.001	0.03	<0.0001	<0.001	<0.001
	25-Oct-16	4.5	67	0.127	<0.001	0.0008	0.139	0.002	0.27	<0.001	0.02	<0.0001	<0.001	<0.001
	14-Feb-17	4.9	61	0.097	<0.001	0.0007	0.105	0.001	0.214	<0.001	0.02	<0.0001	<0.001	<0.001
	16-Jun-17	4.3	77	0.19	<0.001	0.0009	0.197	0.002	0.346	<0.001	0.06	<0.0001	<0.001	<0.001
	31-Oct-17	4.8	56	0.086	<0.001	0.0006	0.09	<0.001	0.166	<0.001	<0.01	<0.0001	<0.001	<0.001
	07-Feb-18	Not Sampled							Not Sampled					
25-Jun-18	Not Sampled							Not Sampled						Not Sampled
23-Oct-18	4.5	86	0.131	<0.001	0.0007	0.112	<0.001	0.212	<0.001	0.05	<0.0001	0.001	<0.001	<0.001
BH9	15-Oct-09	7.5	NA	0.002	0.001	<0.0001	0.001	<0.001	0.005	<0.001	0.05	<0.0001	<0.001	<0.002
	06-Sep-11	4.5	NA	1.011	0.006	0.0012	1.11	<0.001	5.872	0.001	0.07	<0.0001	<0.001	<0.001
	27-Sep-11	4.5	NA	3.96	0.004	0.0049	2.081	<0.001	19.61	<0.001	0.07	<0.0001	0.002	0.001
	31-Oct-11	4.4	0	7.402	0.02	0.0022	9.91	0.002	31.02	0.001	NA	<0.0001	<0.001	NA
	14-Dec-11	4.7	0	10.4	0.013	0.0059	9.567	<0.001	40.3	<0.001	0.3	<0.0001	0.003	<0.001
	13-Mar-12	6.1	3	2.57	0.027	0.0017	3.452	0.005	22.99	0.001	<0.01	<0.0001	<0.001	0.014
	14-May-12	4.7	0	2.254	0.012	0.0015	4.592	0.002	7.107	<0.001	0.08	<0.0001	<0.001	<0.001
	10-Jul-12	4.5	0	1.122	0.014	0.0011	2.581	0.002	5.178	0.001	0.08	<0.0001	<0.001	0.002
	18-Sep-12	6.7	0	0.458	0.003	0.0006	1.41	<0.001	1.921	<0.001	0.06	<0.0001	<0.001	<0.001
	27-Nov-12	6.8	9	0.679	0.002	0.0009	1.29	<0.001	2.205	<0.001	0.09	<0.0001	<0.001	<0.001
	25-Jan-13	7.5	24	0.546	<0.001	0.0008	0.771	<0.001	1.765	<0.001	0.11	<0.0001	<0.001	0.001
	03-Apr-13	6.2	17	0.522	0.001	0.0008	2.185	<0.001	1.806	<0.001	0.04	<0.0001	<0.001	<0.001
	31-May-13	5.1	117	0.754	0.006	0.0014	2.888	0.001	2.901	<0.001	0.08	<0.0001	<0.001	<0.001
	26-Jul-13	5.4	<2	0.329	0.002	0.0009	1.397	<0.001	1.313	<0.001	0.04	<0.0001	<0.001	<0.001
	07-Oct-13	5.1	10	1.176	0.005	0.0014	1.906	<0.001	2.568	<0.001	0.1	<0.0001	<0.001	<0.001
	25-Nov-13	6.7	104	0.227	<0.001	0.0005	0.123	0.006	0.575	<0.001	0.07	<0.0001	<0.001	<0.001
	30-Jan-14	6.7	111	0.121	<0.001	0.0002	0.051	<0.001	0.154	<0.001	0.05	<0.0001	<0.001	<0.001
	04-Jun-14	6.2	115	0.066	0.001	0.0003	0.054	<0.001	0.192	<0.001	0.01	<0.0001	<0.001	<0.001
	08-Oct-14	8	83	0.107	0.001	0.0004	0.048	<0.001	0.264	<0.001	0.02	<0.0001	<0.001	0.001
	10-Feb-15	6.4	134	0.16	<0.001	0.0004	0.115	<0.001	0.315	<0.001	0.05	<0.0001	<0.001	<0.001
	04-Jun-15	6.4	0	0.27										

Groundwater Monitoring - Summary of Results

		Analysis												
Borehole	Date	pH	CaCO3 (mg/l)	Nickel (dissolved) mg/l	Chromium (dissolved) mg/l	Cadmium (dissolved) mg/l	Copper (dissolved) mg/l	Lead (dissolved) mg/l	Zinc (dissolved) mg/l	Arsenic (dissolved) mg/l	Boron (dissolved) mg/l	Mercury (dissolved) mg/l	Selenium (dissolved) mg/l	Vanadium (dissolved) mg/l
Guideline Value		6-9 (1)	NG	0.02 (1)	0.0047(1)	0.00008(1)	0.001-0.028* (1)	0.0072 (1)	0.008 - 0.125* (1)	0.05(1)	2 (1)	0.00005(1)	0.01(2)	0.02 - 0.06* (1)
BH10	01-Jun-10	4.6	NA	0.176	<0.001	0.0003	0.184	<0.001	0.314	<0.001	0.02	<0.0001	<0.001	<0.002
	06-Sep-11	5.6	NA	0.097	<0.001	0.0001	0.044	<0.001	0.428	<0.001	NA	<0.0001	<0.001	<0.001
	27-Sep-11	5.8	NA	0.052	<0.001	<0.0001	0.012	<0.001	0.154	<0.001	0.02	<0.0001	<0.001	<0.001
	31-Oct-11	6.8	13	0.073	0.001	<0.0001	0.032	<0.001	0.291	<0.001	NA	<0.0001	<0.001	NA
	14-Dec-11	7.2	50	0.009	0.001	<0.0001	0.009	<0.001	0.027	<0.001	0.07	<0.0001	0.001	<0.001
	13-Mar-12	5	0	4.727	0.001	0.0034	0.686	0.003	20.9	<0.001	0.01	<0.0001	0.002	0.001
	14-May-12	5.2	0	1.558	<0.001	0.0017	0.709	0.002	5.341	<0.001	0.04	<0.0001	<0.001	<0.001
	10-Jul-12	4.7	0	0.998	0.001	0.002	1.117	0.003	6.488	<0.001	0.05	<0.0001	0.001	<0.001
	18-Sep-12	5.1	0	0.755	0.001	0.0013	1.806	0.002	3.781	<0.001	0.04	<0.0001	<0.001	<0.001
	27-Nov-12	4.8	<2	0.752	<0.001	0.0013	0.728	0.002	3.319	<0.001	0.07	<0.0001	<0.001	<0.001
	25-Jan-13	5.4	16	0.617	<0.001	0.0011	0.984	0.002	2.05	<0.001	0.1	<0.0001	<0.001	<0.001
	03-Apr-13	5.6	4	0.596	<0.001	0.0011	1.537	0.002	1.898	<0.001	0.02	<0.0001	<0.001	<0.001
	31-May-13	5.7	49	0.464	<0.001	0.0009	1.244	0.002	1.704	<0.001	0.02	<0.0001	<0.001	<0.001
	26-Jul-13	5.4	<2	0.203	<0.001	0.0005	0.491	0.001	0.726	<0.001	<0.01	0.0002	<0.001	<0.001
	07-Oct-13	5.9	0	0.221	<0.001	0.0006	0.435	0.001	0.801	<0.001	0.03	<0.0001	<0.001	<0.001
	25-Nov-13	6.3	0	0.34	<0.001	0.0006	0.531	0.001	1.003	<0.001	0.05	<0.0001	<0.001	<0.001
	30-Jan-14	5.3	3	0.277	<0.001	0.0006	0.434	<0.001	0.945	<0.001	0.06	<0.0001	<0.001	<0.001
	04-Jun-14	4.8	4	0.138	<0.001	0.0004	0.352	0.001	0.38	<0.001	0.01	<0.0001	<0.001	<0.001
	08-Oct-14	8.1	38	0.003	<0.001	<0.0001	0.006	<0.001	0.007	<0.001	0.01	<0.0001	<0.001	<0.001
	10-Feb-15	6.8	53	0.002	<0.001	<0.0001	0.009	<0.001	0.011	<0.001	<0.01	<0.0001	<0.001	<0.001
	04-Jun-15	7.3	36	0.013	0.001	<0.0001	0.008	<0.001	0.015	<0.001	<0.01	<0.0001	<0.001	<0.001
	12-Oct-15	6.7	85	0.02	0.001	<0.0001	0.015	<0.001	0.048	<0.001	<0.01	<0.0001	<0.001	<0.001
	17-Feb-16	6.1	83	0.046	<0.001	0.0001	0.026	<0.001	0.076	<0.001	<0.01	<0.0001	<0.001	<0.001
	30-Jun-16	6.1	71	0.029	<0.001	<0.0001	0.021	<0.001	0.059	<0.001	0.03	<0.0001	<0.001	<0.001
	25-Oct-16	5.9	67	0.097	<0.001	0.0002	0.084	<0.001	0.194	<0.001	0.03	<0.0001	<0.001	<0.001
	14-Feb-17	6.2	71	0.064	<0.001	0.0001	0.06	<0.001	0.151	<0.001	0.03	<0.0001	<0.001	<0.001
	16-Jun-17	6.2	59	0.027	<0.001	<0.0001	0.03	<0.001	0.055	<0.001	0.02	<0.0001	<0.001	<0.001
	31-Oct-17	6.3	85	0.047	<0.001	0.0001	0.03	<0.001	0.085	<0.001	<0.01	<0.0001	<0.001	<0.001
	07-Feb-18	6.3	113	0.121	<0.001	0.0003	0.105	<0.001	0.186	<0.001	<0.01	<0.0001	<0.001	<0.001
	25-Jun-18	6.0	63	0.074	<0.001	0.0002	0.086	<0.001	0.117	<0.001	0.02	<0.0001	<0.001	<0.001
	23-Oct-18	6.4	73	0.022	<0.001	<0.0001	0.016	<0.001	0.036	<0.001	0.02	<0.0001	<0.001	<0.001
BH32	01-Jun-10	6.6	NA	0.004	0.001	<0.0001	0.002	<0.001	<0.002	<0.001	0.02	<0.0001	<0.001	<0.002
	06-Sep-11	5.6	NA	2.18	0.003	0.0023	0.029	<0.001	4.856	<0.001	0.06	<0.0001	<0.001	<0.001
	27-Sep-11	6.3	NA	1.992	0.004	0.0014	0.006	<0.001	2.702	<0.001	0.06	<0.0001	0.001	0.001
	31-Oct-11	5.8	18	6.396	0.003	0.0042	0.04	<0.001	16.36	<0.001	NA	<0.0001	0.002	NA
	14-Dec-11	6.9	177	0.247	0.004	0.0002	0.003	<0.001	0.265	<0.001	0.07	<0.0001	0.002	0.002
	13-Mar-12	7.2	80	0.688	0.003	0.0006	0.003	<0.001	0.963	<0.001	<0.01	<0.0001	0.001	0.002
	14-May-12	7.2	166	0.465	0.004	0.0003	0.004	<0.001	0.871	<0.001	0.03	<0.0001	0.002	0.002
	10-Jul-12	6.8	13	1.96	0.001	0.0031	0.03	<0.001	4.906	<0.001	0.07	0.0001	<0.001	<0.001
	18-Sep-12	6.6	9	2.488	0.002	0.004	0.038	<0.001	6.379	<0.001	0.11	<0.0001	<0.001	<0.001
	27-Nov-12	7.2	67	0.834	0.001	0.001	0.009	<0.001	1.657	<0.001	0.06	<0.0001	<0.001	<0.001
	25-Jan-13	7	20	0.862	<0.001	0.0013	0.012	<0.001	1.903	<0.001	0.08	<0.0001	<0.001	0.001
	03-Apr-13	7.2	26	0.952	<0.001	0.001	0.006	<0.001	1.767	<0.001	0.04	<0.0001	<0.001	<0.001
	31-May-13	6.9	52	1.87	0.001	0.0028	0.044	<0.001	3.44	<0.001	0.06	<0.0001	<0.001	<0.001
	26-Jul-13	5.4	8	2.461	0.001	0.0043	0.069	<0.001	7.082	<0.001	0.08	<0.0001	<0.001	<0.001
	07-Oct-13	5.7	13	2.991	0.001	0.0051	0.136	<0.001	6.877	<0.001	0.1	<0.0001	<0.001	<0.001
	25-Nov-13	6.7	82	0.511	<0.001	0.0007	0.005	<0.001	1.32	<0.001	0.07	<0.0001	0.003	<0.001
	30-Jan-14	6.4	66	0.298	<0.001	0.0004	0.008	<0.001	0.785	<0.001	0.05	<0.0001	0.002	<0.001
	04-Jun-14	5.8	40	0.512	<0.001	0.0008	0.005	<0.001	1.157	<0.001	0.04	<0.0001	0.001	<0.001
	08-Oct-14	7.2	7	1.349	<0.001	0.0025	0.119	<0.001	2.669	<0.001	0.08	<0.0001	<0.001	<0.001
	10-Feb-15	6.4	156	0.085	<0.001	0.0002	0.037	<0.001	0.248	<0.001	0.01	<0.0001	0.003	<0.001
	04-Jun-15	6.9	54	0.097	<0.001	0.0001	0.003	<0.001	0.226	<0.001	0.03	<0.0001	0.001	<0.001
	12-Oct-15	6.4	87	0.2	0.001	0.0003	0.005	<0.001	0.459	<0.001	0.03	<0.0001	<0.001	<0.001
	17-Feb-16	6	113	0.362	<0.001	0.0008	0.022	<0.001	0.699	<0.001	<0.01	<0.0001	<0.001	<0.001
	30-Jun-16	5.8	111	0.236	<0.001	0.0004	0.005	<0.001	0.585	<0.001	0.06	<0.0001	<0.001	<0.001
	25-Oct-16	5.7	145	0.391	<0.001	0.0007	0.009	<0.001	0.85	<0.001	0.06	<0.0001	<0.001	<0.001
	14-Feb-17	6.4	115	0.242	<0.001	0.0004	0.005	<0.001	0.581	<0.001	0.05	<0.0001	<0.001	<0.001
	16-Jun-17	5.5	96	0.345	<0.001	0.0007	0.025	<0.001	0.811	<0.001	0.07	<0.0001	<0.001	<0.001
	31-Oct-17	6.1	85	0.173	<0.001	0.0004	0.01	<0.001	0.423	<0.001	<0.01	<0.0001	<0.001	<0.001
	07-Feb-18	6.3	147	0.306	<0.001	0.0006	0.017	<0.001	0.711	<0.001	<0.01	<0.0001	0.002	<0.001
	25-Jun-18	6.1	76	0.163	<0.001	0.0003	0.007	<0.001	0.362	<0.001	0.03	<0.0001	<0.001	<0.001
	23-Oct-18	5.9	66	0.166	<0.001	0.0003	0.006	<0.001	0.377	<0.001	0.04	<0.0001	<0.001	<0.001
BH13	01-Oct-09	5.2	NA	0.721	0.001	0.002	0.243	<0.001	0.611	<0.001	0.04	0.0001	<0.001	<0.002
	01-Feb-10	5.5	NA	0.263	0.001	0.0008	0.24	<0.001	0.055	<0.001	0.03	<0.0001	<0.001	<0.002
	01-Apr-10	5.5	NA	0.214	<0.001	0.0006	0.092	<0.001	0.154	<0.001	0.01	<0.0001	<0.001	<0.002
	01-Jun-10	4.6	NA>											

Groundwater Monitoring - Summary of Results

		Analysis												
Borehole	Date	pH	CaCO3 (mg/l)	Nickel (dissolved) mg/l	Chromium (dissolved) mg/l	Cadmium (dissolved) mg/l	Copper (dissolved) mg/l	Lead (dissolved) mg/l	Zinc (dissolved) mg/l	Arsenic (dissolved) mg/l	Boron (dissolved) mg/l	Mercury (dissolved) mg/l	Selenium (dissolved) mg/l	Vanadium (dissolved) mg/l
Guideline Value		6-9 (1)	NG	0.02 (1)	0.0047(1)	0.00008(1)	0.001-0.028* (1)	0.0072 (1)	0.008 - 0.125* (1)	0.05(1)	2 (1)	0.00005(1)	0.01(2)	0.02 - 0.06* (1)
BH901	01-Mar-06	5.8	<20	0.076	0.008	<0.001	0.074	<0.005	0.031	<0.005	<0.005	<0.00005	<0.005	NA
	01-May-06	4.3	<20	2.7	<0.005	0.002	2.2	<0.005	0.89	<0.005	0.032	<0.00005	<0.005	NA
	01-Dec-06	3.5	<20	3.8	0.006	0.005	2.3	<0.005	1.6	<0.005	0.140	<0.00005	<0.005	NA
	01-Aug-07	6.70	62	0.09	<0.005	<0.001	0.013	<0.005	0.018	<0.005	0.031	<0.00005	<0.005	NA
	01-Aug-08	3.3	<20	2.1	<0.005	0.003	0.96	<0.005	2.5	<0.005	0.060	<0.00005	<0.005	NA
	01-Sep-09	5.36	6.5	0.342	<0.005	<0.001	0.401	<0.005	0.522	<0.005	<0.018	<0.00005	<0.005	NA
	01-Aug-10	6.40	41	0.035	0.001	<0.001	0.019	<0.001	0.142	<0.001	0.030	<0.00005	<0.005	NA
	01-Aug-11	6.70	11	0.185	<0.001	0.0003	0.067	<0.001	0.749	<0.001	0.030	<0.0001	<0.001	NA
	14-Dec-11	6	<2	0.608	<0.001	0.0008	0.3	<0.001	2.682	<0.001	0.11	<0.0001	0.001	<0.001
	13-Mar-12	5.2	0	0.44	0.002	0.0011	2.143	0.002	2.89	<0.001	<0.01	<0.0001	<0.001	0.001
	14-May-12	6.7	0	3.982	0.007	0.0031	6.873	0.003	17.55	<0.001	0.03	<0.0001	0.003	<0.001
	10-Jul-12	4.9	0	0.279	0.002	0.0005	0.834	<0.001	1.561	<0.001	0.02	<0.0001	<0.001	<0.001
	18-Sep-12	6.1	0	0.212	0.001	0.0006	0.394	<0.001	0.815	<0.001	0.04	<0.0001	<0.001	<0.001
	27-Nov-12	4.7	<0	0.283	0.001	0.0006	0.523	0.002	1.196	<0.001	0.04	<0.0001	<0.001	<0.001
	25-Jan-13	6.4	13	0.319	<0.001	0.0008	0.536	0.002	1.19	<0.001	0.05	<0.0001	<0.001	0.001
	03-Apr-13	7.1	24	0.136	<0.001	0.0003	0.234	<0.001	0.462	<0.001	<0.01	<0.0001	<0.001	<0.001
	31-May-13	5.9	<30	0.307	0.001	0.0009	0.452	<0.001	1.325	<0.001	<0.01	<0.0001	<0.001	<0.001
	26-Jul-13	4.7	<2	0.316	<0.001	0.0013	0.272	0.002	1.394	<0.001	0.03	<0.0001	<0.001	<0.001
	07-Oct-13	5.4	0	0.36	<0.001	0.0014	0.437	<0.001	1.474	<0.001	0.04	<0.0001	<0.001	<0.001
	25-Nov-13	6	2	0.738	<0.001	0.0015	0.777	0.001	2.073	<0.001	0.1	<0.0001	<0.001	<0.001
	30-Jan-14	4.2	<2	0.553	<0.001	0.0009	1.356	0.003	1.592	<0.001	0.11	<0.0001	<0.001	<0.001
	04-Jun-14	4.3	0	0.521	<0.001	0.0036	1.612	0.003	2.457	<0.001	0.04	<0.0001	<0.001	<0.001
	08-Oct-14	6.3	<2	1.048	0.001	0.008	0.772	0.003	2.042	<0.001	0.04	<0.0001	<0.001	<0.001
	10-Feb-15	4.6	0	0.386	<0.001	0.0009	1.219	<0.001	1.098	<0.001	0.12	0.0002	<0.001	<0.001
	04-Jun-15	5.5	0	0.58	0.002	0.0028	1.03	0.001	1.482	<0.001	0.06	<0.0001	0.002	<0.001
	12-Oct-15	Not Sampled						Not Sampled						Not Sampled
BH901R	17-Feb-16	5.9	114	0.447	<0.001	0.0011	0.633	<0.001	1.214	<0.001	0.06	<0.0001	<0.001	<0.001
	30-Jun-16	5.9	131	0.266	<0.001	0.0006	0.184	<0.001	0.702	<0.001	0.05	<0.0001	<0.001	<0.001
	25-Oct-16	5.6	49	0.167	<0.001	0.0003	0.402	<0.001	0.448	<0.001	0.03	<0.0001	<0.001	<0.001
	14-Feb-17	6.2	125	0.202	<0.001	0.0004	0.252	<0.001	0.497	<0.001	0.06	<0.0001	<0.001	<0.001
	16-Jun-17	6.2	45	0.13	<0.001	0.0004	0.319	<0.001	0.392	<0.001	0.05	<0.0001	<0.001	<0.001
	31-Oct-17	6.3	103	0.158	<0.001	0.0003	0.222	<0.001	0.368	<0.001	0.09	<0.0001	<0.001	<0.001
	07-Feb-18	6.4	134	0.394	<0.001	0.0008	0.519	<0.001	1.154	<0.001	0.08	<0.0001	<0.001	<0.001
	25-Jun-18	5.7	73	0.146	<0.001	0.0004	0.344	<0.001	0.412	<0.001	0.05	<0.0001	<0.001	<0.001
	23-Oct-18	6.2	135	0.272	<0.001	0.0006	0.234	<0.001	0.638	<0.001	0.11	<0.0001	<0.001	<0.001

Notes:
Yellow cells indicate elevated concentrations compared with Environmental Quality Standards and UK Drinking Water Standards.
Blue cells are results obtained from the Site Protection Monitoring Programme (SPMP).
NG = No Guideline
NA = Not Available

(1)= European Environmental Quality Standard (EQS): The River Basin Districts Typology, Standards and Groundwater threshold Values (Water Framework Directive (England and Wales) Directions 2010
(2)= Water Supply (Water Quality) (England and Wales) Regulations 2000 (SI 2000/3184) (as amended); Water Supply (Water Quality) (Wales) Regulations 2001 (SI 3911 W.323) (as amended)
* = Range determined by alkalinity

Appendix 3

Figures and Graphs

