RAMBOLL ENVIRON

ENVIRONMENT
& HEALTH

Sapa Extrusions Limited
Bedwas Plant
Pant Glas Industrial Estate
Bedwas
Caerphilly
CF83 8DR

Dear Ruth

SITE PROTECTION AND MONITORING PROGRAMME (SPMP), AUGUST 2017 (ROUND 28): ENVIRONMENTAL PERMIT REF. BX94551F

Date 28/09/2017

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Ref LUK17-24812_01

Background

Sapa Extrusions Ltd., (formerly Hydro Aluminium Extrusions) has carried out regular groundwater monitoring at the installation since August 2005. Ramboll Environ has carried out twenty-four rounds of monitoring between August 2005 and August 2017; and Mabbett and Associates Ltd (M&A) carried out monitoring on four occasions (between February 2009 and April 2010). In accordance with the SPMP, groundwater monitoring is required in order to assess the nature of any identified groundwater contamination arising from potential identified sources over the longer term; and to confirm improvements in site control and management have reduced the levels of contamination.

The main manufacturing operations at the site ceased in March 2014 and the installation was partially decommissioned, including decontamination works (cleaning of press-pits, removal of oil storage tanks etc.). However, anodising and extrusions activities re-commenced at the site in 2016 and are currently ongoing. Aluminium extrusions is no longer operational.

A Compliance Assessment Report (CAR), (Ref: CAR_NRW0020594) was issued by Natural Resources Wales (NRW) on 23rd May 2016 following its review of the previous SPMP monitoring results (Ramboll Environ Report Ref: UK17-22794_01, February 2016). NRW made the following recommendations in the CAR:

- the passive skimmer in BH12 could be removed, considering the minor amounts of product recorded over the past two years; and that the likely source of contamination (P16 Press Pit) has been emptied;

- further investigation should be carried out in order to understand the reason for discolouration in BH6 (sentry borehole). The groundwater has been black/ brown coloured for the last few monitoring rounds; however, the hydrocarbon concentration is not significantly elevated and the groundwater was not observed to have an oily sheen;
- the pH values across the site should continue to be monitored due to a previous spillage in the anodising plant. Although the majority of pH values have returned to more neutral levels, MW2 and BH6 continued to have slightly acidic values; and
- the frequency of monitoring could be reduced to an annual event if manufacturing had ceased, unless any production activities resume. *Given that production has resumed, Ramboll Environ recommends that that six monthly monitoring continues to be appropriate.*

This report details the results of the twenty-eighth round of groundwater monitoring which was undertaken on 10th August 2017. The monitoring has taken into account the aforementioned comments and recommendations made by NRW.

Scope of Works

Groundwater samples were recovered from the following eight SPMP monitoring wells (shown on Figure 1): BH1, BH4, BH6, BHS6, BH11, BH12, MW1 and MW2.

At each location, the depth to groundwater was recorded and, where present, the thickness of free product was recorded.

Groundwater samples were analysed for metals (As, B, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn, V, Be,), pH, total cyanide, sulphate, ammonia and Total Petroleum Hydrocarbons (TPH). Additionally, groundwater samples from BH4, BH5, BH6, BHS6 and BH11 were analysed for total suspended solids (TSS), total dissolved solids (TDS), total organic carbon (TOC), iron, and redox potential, in order to gain further information on the potential source of discolouration of groundwater in monitoring wells BH6 and BHS6.

For continuity, the results have been compared with UK Drinking Water Standards (UK DWS) in the groundwater analysis summary table (attached). However, given the objective of the SPMP, to identify increases in groundwater concentrations which may be attributable to the permitted operations, the UK DWS are presented for benchmarking purposes only. The 2017 concentrations should also be considered against the Reference Data.

A graphical representation of results over time is presented on the attached Figures and table. The Reference Data collected in August 2005 (BH1, BH4, BH6, BH11, BH12, MW1, MW2) and February 2009 (BHS6) is included in the table.

Results

A full set of laboratory certificates and a summary table are attached to this letter and the main findings are summarised below.

Passive Skimmer

A passive skimmer was installed in BH12 on 11th February 2011 due to consistent measurements of free phase product (up to 7mm in thickness). The amount of floating product recovered by the skimmer was measured periodically and a total volume of 177ml of floating product has been recovered since 2011.

However, over the past two years, no measurable layer of free product has been detected on the surface of the water in BH12 other than a slight oily sheen. Furthermore, the likely source of contamination (the adjacent P16 press pit) has been emptied as part of the decommissioning process. Accordingly, Ramboll Environ removed the passive skimmer in August 2016, as agreed by NRW in an email dated 31st May 2016.

During the most recent round of monitoring, an approximately 20mm layer of hydrocarbon was detected on the surface of the water in BH12. Overall, free product monitoring indicates that the amount of floating product present in the ground remains low and has decreased since passive skimming commenced. This also suggests that the source area of free phase hydrocarbons is likely to be limited in extent in the area of the borehole.

Groundwater Monitoring Results

A summary of the key findings of the groundwater monitoring and analysis results are presented below:

- Groundwater levels across the site ranged from 2.96m below ground level (bgl) (MW2) to 3.78m bgl (BHS6) and are slightly raised, compared to the previous round of monitoring in January 2017.
- Concentrations of TPH ranged from 0.01mg/l in BH4 to 121mg/l in BH12. Historically, the highest TPH concentration is found in BH12 with a strong hydrocarbon odour and an oily sheen on the surface of the sample observed. A thin layer (approximately 20mm) of free product was recorded during the most recent round of monitoring; this was removed with a disposable sampling bailer and a sample of groundwater was collected. The concentration of TPH in BH12 has increased from 90.2mg/l to 121mg/l since the last time it was recorded in August 2016. This most recent concentration is greater than the Reference Data concentration of 7.8mg/l; however, it does not represent a maximum recorded value at this location.
- The concentration of TPH in BH1 has increased from 9.03mg/l in January 2017 to 41mg/l in August 2017. The August 2017 concentration is greater than the Reference Data concentration of 9mg/l; however, it remains below elevated concentrations previously recorded at this location.
- The concentration of TPH has remained stable in BH4 (0.01mg/l) and decreased in BH6 (from 0.05mg/l to 0.02mg/l); BH11 (from 0.09mg/l to 0.08mg/l); MW1 (from 0.15mg/l to 0.06mg/l); and MW2 (from 0.12mg/l to 0.04mg/l).
- The groundwater sample recovered from BHS6 (the 'sentry borehole') was coloured black/brown which is consistent with previous monitoring rounds. During the most recent round of monitoring, the TPH concentration increased slightly to 0.15mg/l, which marginally exceeds the sentry borehole risk-based trigger concentration of 0.108mg/l. It is noted that the TPH concentration in MW2 (down-hydraulic gradient of BHS6) was the lowest recorded to date (0.04mg/l) at this location, therefore indicating that increased TPH in groundwater has not migrated to the south, i.e. towards the river. Furthermore, manufacturing activities are not currently undertaken within the adjacent Extrusions Building. In August 2016, groundwater from borehole BHS6 was removed by submersible pump for approximately one hour to ascertain whether discoloration of groundwater would reduce with an increased volume of purged water. No visible change to the colour of purged water was observed during groundwater removal.
- Black/brown coloured groundwater has previously been observed in monitoring wells BH6 and BH5, located adjacent east and west of BHS6. Samples of groundwater from BHS6 and BH6; and BH4,

BH11 and MW2 (across, up and down gradient monitoring wells) were analysed for TSS, TDS, TOC, iron and redox potential in order to gain further information on the potential source of discolouration of groundwater at locations BHS6, BH6 and BH5. The results are presented in Table 1 and are discussed further in the following section.

- Across the site, pH values ranged from pH 6.2 (MW2) to pH 7.7 (BHS6). Historically, low (acidic) pH values have been recorded at the site. During the most recent round of monitoring (August 2017) only one pH value was recorded below the lower limit identified in the Water Supply (Water Quality) Regulations 2000 (i.e. pH 6.5); this was recorded in MW2.
- Arsenic was detected above the laboratory LOD (1µg/l) in BHS6 at a concentration of 8µg/l, and in BH6 at a concentration of 1µg/l, i.e. below the UK DWS of 10µg/l and within the range of previously recorded values at these locations.
- Boron was recorded above the laboratory LOD (10µg/l) in samples from BH11 and MW2, each at a concentration of 80µg/l, during the most recent round of monitoring. These concentrations are above the Reference Data and represent maximum recorded concentrations at each location; however, concentrations remain well below the UK DWS of 1,000µg/l.
- Cadmium was detected at or above the laboratory LOD (<0.1µg/l) in BH6 (0.1µg/l) and BHS6 (0.3µg/l); both of which are below the UK DWS of 5µg/l.
- Chromium was recorded at or above the laboratory LOD (<1µg/l) in BH4 (1µg/l) and BHS6 (15µg/l); concentrations do not exceed the UK DWS of 50µg/l. Each recorded chromium concentration is within the range previously recorded at each location.
- Concentrations of copper were recorded above the laboratory LOD (<1µg/l) in monitoring wells BH6 (4µg/l) and BHS6 (71µg/l), which do not exceed the UK DWS of 2,000µg/l. Each recorded concentration is within the range of values previously recorded at each location.
- Lead was below the laboratory LOD (<1ug/l) in all monitoring wells except BHS6, recorded at a concentration of 8µg/l, which is below the UK DWS of 25µg/l.
- Mercury was not recorded above the laboratory LOD (<0.1µg/l) in any of the monitoring wells.
- The concentration of nickel ranged from below the laboratory LOD (<1µg/l) in BH1, BH4 and MW1 to 7µg/l in BHS6 (below the UK DWS of 20µg/l). Historically, elevated concentrations of nickel have been detected in MW2, located at the southern site boundary; however, concentrations have decreased over the monitoring period to date and are now below the screening criteria.
- Selenium was recorded above the laboratory LOD (<1ug/l) in monitoring wells BH6 (1µg/l) and BHS6 (4µg/l), which are below the UK DWS of 10µg/l.
- Concentrations of zinc ranged from below the laboratory LOD (<2µg/l) in BH4, BH6 and BH12 to 46µg/l in MW1. The maximum concentration detected does not exceed the UK DWS (5,000µg/l). Each recorded concentration is within the range of values previously recorded at each location.
- Concentrations of ammonia ranged from below the laboratory LOD (<10µg/l) in BH4, BH6 and MW1 to 200µg/l in BH11, which is below the UK DWS of 500µg/l. The UK DWS has been exceeded on four occasions at BH11 since 2012, with a maximum concentration of 2,100µg/l recorded in January 2017. This monitoring point is located up-hydraulic gradient of the main operations at the site and ammonia was not elevated at down-hydraulic gradient monitoring wells. The source of the ammonia is not known.

- Cyanide was below the laboratory LOD (<20µg/l) in all sampled monitoring wells.
- The concentrations of sulphate in groundwater ranged from below the laboratory LOD (<2mg/l) in BH12 to 55mg/l in BHS6. Sulphate concentrations do not exceed the UK DWS of 250mg/l at any of the monitoring locations.

Groundwater Discolouration

Table 1 below presents the results of additional analysis carried out on groundwater collected from BHS6 and BH6, which have previously been noted as discoloured; and BH4, BH11 and MW2, which are located up, down and across gradient of BHS6. Monitoring wells BHS6 and BH6 are located to the south of the main Extrusions Building (currently not operational); BH4 is located across gradient, to the west of BHS6; BH11 is located up hydraulic gradient of BHS6; and MW2 is located down hydraulic gradient of BHS6, in the south-east of the site.

Table 1: Additional Analysis

Determinand	BH4	BHS6	BH6	BH11	MW2
Total Suspended Solids (TSS) (mg/l)	162	92	26	267	758
Total Dissolved Solids (TDS) (mg/l)	191	953	321	390	166
Total Organic Carbon (TOC) (mg/l)	1.1	130	21	2.8	0.74
Iron (total dissolved) (µg/l)	90	2,970	220	120	50
Redox Potential (mV)	227.6	171.6	213.5	191.8	213.8
pH	6.7	7.7	6.8	7.0	6.2
Description	Pale brown	Black / brown	Dark brown	Brown, silty	Brown, silty

Notes: Descriptions are based on visual observations at the time of sampling. No hydrocarbon odours or oily sheens were noted during sample collection.

The results indicate that TDS, TOC and dissolved iron concentrations were higher in BHS6 (where the most prominent discolouration occurs) than in the other analysed samples. The discolouration is therefore likely to be related to the elevated concentration of iron and resultant dissolved solids causing the groundwater to appear black, rather than a hydrocarbon source. Hydrocarbons were not detected in significantly elevated concentrations at any of these locations and no oily sheen was observed on groundwater. Although redox potential and pH do not appear to correlate strongly with the discolouration, slight increases in dissolved metal concentrations do correlate with the increase in dissolved iron, suggesting that redox potential and TOC may be an influence on the groundwater chemistry in this area of the site.

The iron concentration in BHS6 (2,970µg/l) is elevated above the UK DWS (0.2µg/l). The UK DWS is considered to be conservative considering that groundwater is not abstracted for potable water in the area. For context, the Environmental Quality Standard (EQS) for inland surface water is 1,000µg/l. The

cause of the discolouration and dissolved iron is not known, but may indicate an area of less oxygenated groundwater in this area of the site. The absence of discolouration in BH4, BH11 and MW2, along with comparatively lower concentrations of iron, indicates that the area of impacted groundwater is restricted to monitoring wells BHS6 and BH6. The absence of discolouration recorded in monitoring wells BH11 and MW2 suggests that on-site or off-site migration of discoloured groundwater or higher dissolved iron contamination is considered unlikely. It is also unlikely that the discolouration is attributable to an operational activity.

Conclusions and Recommendations

The results of the twenty-eighth (August 2017) round of groundwater monitoring have identified minor variations in TPH concentrations across the site; however, all are within the range of concentrations previously recorded at each monitoring point.

The TPH concentration in the Sentry Borehole (BHS6) marginally exceeded the risk based trigger concentration of 0.108mg/l with a recorded concentration of 0.15mg/l. The trigger concentration is designed to be protective of the river from hydrocarbon (including free phase product) contamination in the west of the site. However, the borehole further down-hydraulic gradient (MW2) did not have an increase in TPH concentration, indicating that hydrocarbons are not migrating to the south/ south-east. The identified contamination is considered to be localised with limited migration in groundwater to the south-east (in the direction of the river). Should elevated concentrations of TPH in excess of the trigger concentration be consistently identified in subsequent monitoring rounds, then further investigation would be recommended.

The passive skimmer was removed from BH12 in August 2016 and the 2017 monitoring has confirmed that a minor quantity of free phase floating product (approximately 2mm in January and 20mm in August) has accumulated in monitoring well following removal of the skimmer.

The pH values in BH6 and MW2 have historically been low (acidic) over the early monitoring period, with a gradual increase towards neutral values in more recent monitoring rounds (throughout 2012 to 2015, the pH was generally more alkaline). During the most recent round of monitoring, August 2017, a single pH value was recorded below the lower limit identified in the Water Supply (Water Quality) Regulations 2000 (i.e. pH 6.5); this was in MW2, with a pH value of 6.2.

An elevated ammonia concentration, in excess of the UK DWS was recorded in BH11 in January 2017. During the most recent round of monitoring, the concentration of ammonia had returned to below the UK DWS, at a concentration of 200µg/l. The source of the ammonia has not been attributed to on site operational activities and is up-hydraulic gradient from the operational area of the site.

Investigation has continued into the presence of discoloured groundwater in BHS6 and BH6. The discolouration is localised and is considered unlikely to be migrating onto or off the site. The discolouration is also unlikely to be attributed to operational activities. Although redox potential and pH do not appear to correlate strongly with the discolouration, slight increases in dissolved metal concentrations do correlate with the increase in dissolved iron, suggesting that redox potential and TOC may be an influence on the groundwater chemistry in this area of the site.

Given that anodising and fabrication operations have resumed at the site; and considering the marginal increase in TPH within BHS6, Ramboll Environ recommends that monitoring continues on a six monthly basis.

Please do not hesitate to contact us if you wish to discuss any of the above.

Yours sincerely,

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Managing Consultant

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Encl. Appendix 1, Figures

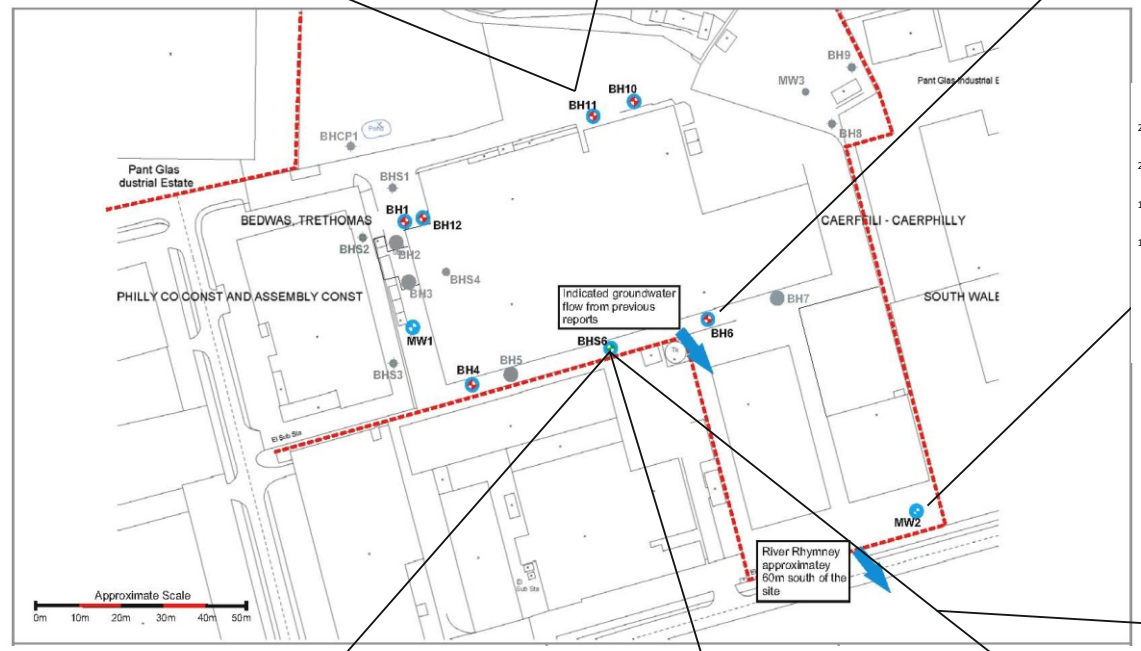
Appendix 2, Table of Groundwater Analysis Results

Appendix 3, Laboratory Certificate of Analysis

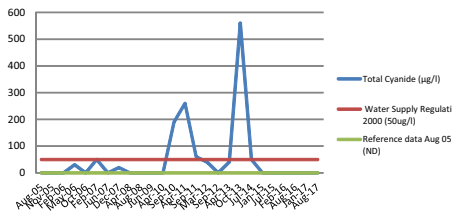
Appendix 1

Figures

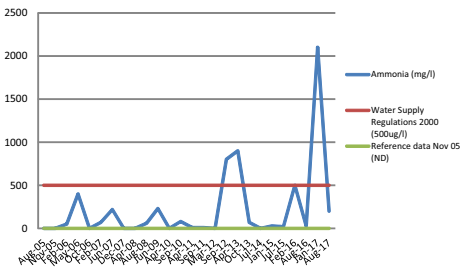
Contaminant Concentration Graphs



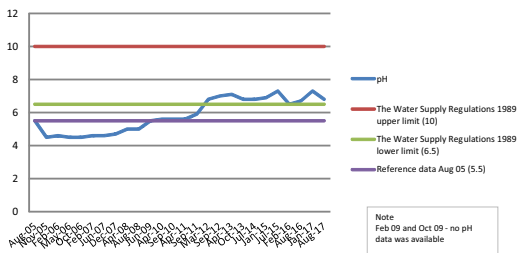
Borehole 11



Borehole 11

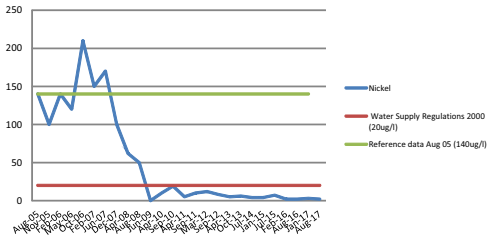


Borehole 6

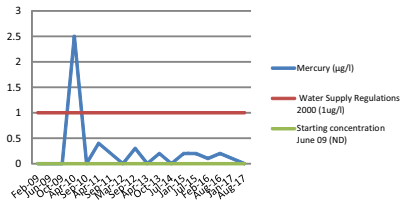


Note
Feb 09 and Oct 09 - no pH data was available

Monitoring Well 2



Sentry Borehole 6



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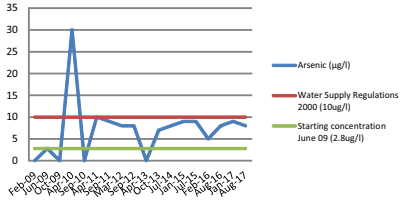

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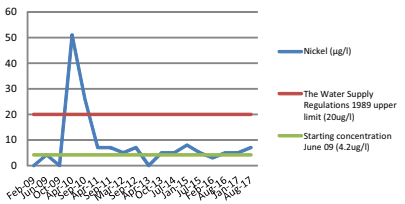

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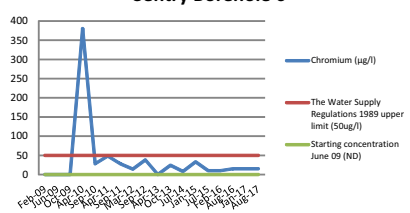

Legend

- Approximate Site Boundary
- Previously Installed Monitoring Well
- SPMP Monitoring Wells
- Previous locations
- ENVIRON Monitoring Well (installed 2005)
- Monitoring Well Location for Hydrocarbon Delineation

Title	Contaminant Concentration Graphs
Site	Sapa Extrusion Ltd, Bedwas Plant, Pantglas Industrial Estate, Bedwas, Caerphilly

Client	Sapa Extrusion Ltd
Project No.	UK17-24812
Issue	1
Date	August 2017
Drawn by	RH

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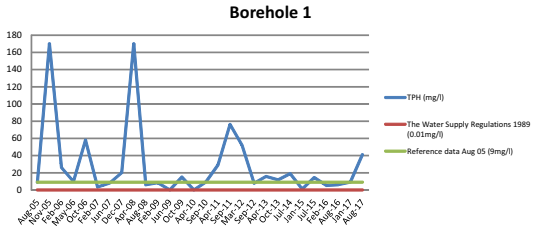
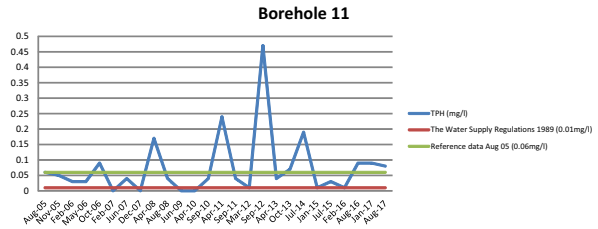
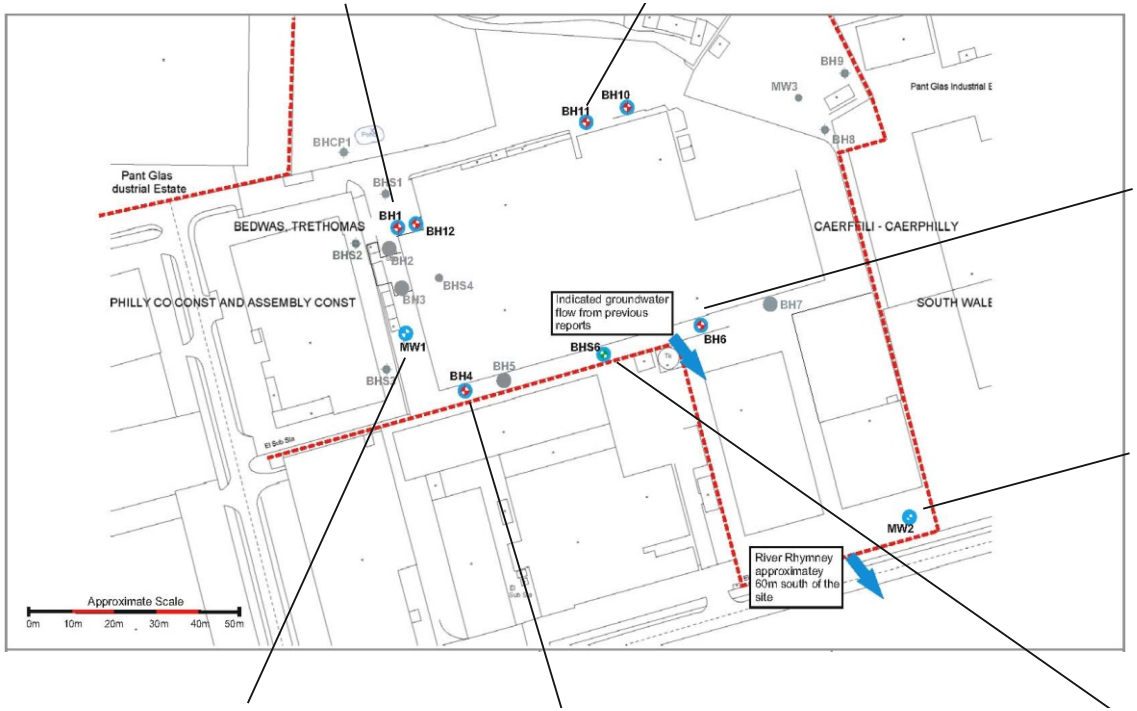
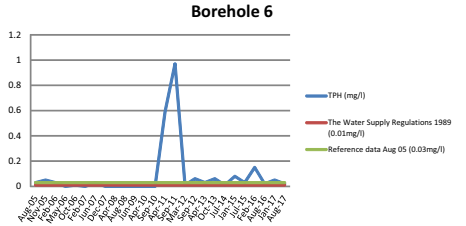
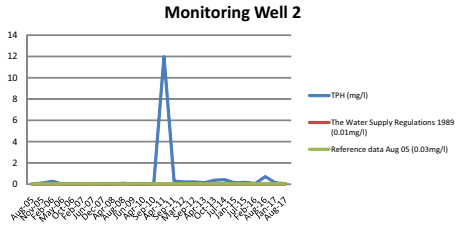
TPH Concentration Graphs

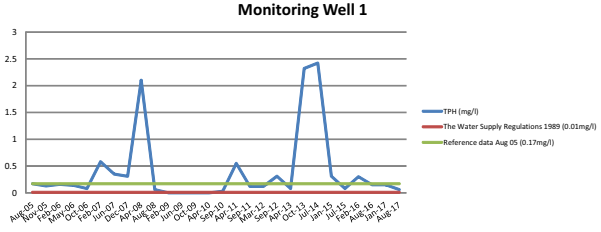


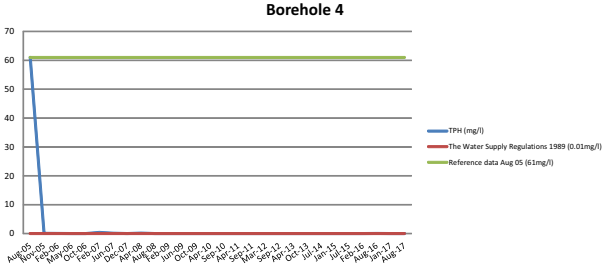


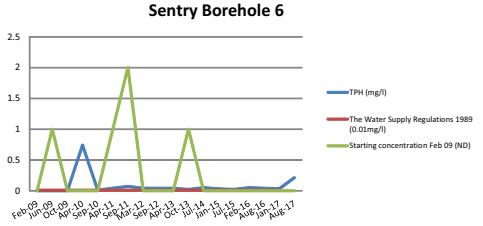












Legend

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Title TPH Concentration Graphs

Site Sapa Extrusions Ltd,
Bedwas Plant,
Pantglas Industrial Estate,
Bedwas,
Caerphilly

Client	Sapa Extrusions Ltd
Project No.	UK17-24812
Issue	1
Date	August 2017
Drawn by	RH

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Appendix 2

Table of Groundwater Analysis Results

Sapa (UK17-24812) - Summary of Groundwater Analysis Results (August 2017)

Borehole Location	Date	Analysis															Water Level (m bgl)
		TPH/EPH (mg/l)	Arsenic (µg/l)	Boron (µg/l)	Cadmium (µg/l)	Chromium (µg/l)	Copper (µg/l)	Lead (µg/l)	Mercury (µg/l)	Nickel (µg/l)	Selenium (µg/l)	Zinc (µg/l)	Ammonia as N (µg/l)	Total Cyanide (µg/l)	pH	Sulphate as SO_4 (mg/l)	
BH1	Aug-05	9	9	NA	ND	ND	ND	ND	ND	ND	ND	ND	1200	ND	6.5	10	3.85
	Nov-05	170	8	ND	ND	ND	ND	ND	ND	ND	ND	8	60	ND	6.5	12	2.90
	Feb-06	26	ND	16	ND	ND	ND	ND	ND	5	ND	ND	60	ND	6.4	ND	3.51
	May-06	9.7	ND	17	ND	11	ND	ND	ND	ND	ND	ND	ND	ND	6.5	49	3.36
	Oct-06	58	ND	26	ND	ND	ND	ND	ND	10	ND	7	60	ND	6.5	23	3.56
	Feb-07	3.4	ND	25	ND	ND	ND	ND	ND	ND	ND	ND	70	ND	6.5	ND	2.88
	Jun-07	7.9	ND	24	ND	ND	ND	ND	ND	8	ND	ND	730	ND	6.4	24	3.45
	Dec-07	20	ND	26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.2	ND	3.13
	Apr-08	170	ND	20	ND	ND	ND	ND	ND	ND	ND	8	ND	ND	6.6	ND	3.17
	Aug-08	6	ND	64	ND	7	ND	ND	ND	ND	ND	8	ND	ND	6.6	ND	3.17
	Feb-09	8.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.10
	Jun-09	ND	1.4	39	ND	9.9	ND	ND	ND	2.3	1.3	100	120	ND	6.5	5.1	3.68
	Oct-09	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.55
	Apr-10	ND	0.9	NA	0.03	14	ND	ND	ND	4	0.5	10	NA	NA	6.5	ND	3.12
	Sep-10	9.39	ND	20	ND	6	ND	ND	ND	2	ND	ND	30	ND	6.4	12	3.49
	Apr-11	28.95	ND	20	ND	2	2	ND	ND	2	ND	9	ND	ND	6.6	6	3.72
	Sep-11	76.31	ND	20	ND	7	ND	ND	ND	2	ND	2	50	ND	6.4	8	3.53
	Mar-12	51.97	1	ND	0.1	6	2	3	ND	2	1	6	20	20	7	8	3.60
	Sep-12	7.81	1	40	ND	2	3	4	ND	3	ND	20	70	ND	7.3	11	3.24
	Apr-13	15.75	ND	NA	ND	2	ND	ND	ND	ND	ND	5	20	ND	7.3	7	3.39
	Oct-13	11.7	ND	20	ND	3	ND	ND	ND	2	ND	7	70	ND	6.9	9	3.70
	Jul-14	19.01	ND	20	ND	2	ND	ND	ND	1	ND	3	ND	ND	6.6	6	3.72
	Jan-15	0.98	ND	ND	ND	ND	ND	ND	ND	1	ND	25	110	ND	6.9	7	2.80
	Jul-15	14.4	ND	ND	ND	ND	ND	ND	ND	3	ND	ND	70	ND	7.1	9	3.53
	Feb-16	5.2	ND	30	ND	ND	ND	ND	ND	4	ND	74	130	ND	6.6	13	2.41
	Aug-16	6.11	ND	10	ND	ND	ND	ND	ND	ND	ND	ND	80	ND	6.6	8.6	3.53
	Jan-17	9.03	ND	ND	ND	3	ND	ND	ND	4	ND	5	70	ND	7.1	8.9	3.55
	Aug-17	41	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	50	ND	6.6	10	3.46
BH4	Aug-05	61	10	NA	ND	ND	ND	ND	ND	ND	ND	ND	110	ND	6.8	34	4.02
	Nov-05	0.11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.6	20	3.10
	Feb-06	0.07	ND	24	ND	10	ND	ND	ND	ND	ND	ND	110	ND	6.8	25	3.73
	May-06	0.02	ND	23	ND	10	ND	ND	ND	ND	ND	ND	ND	ND	6.9	26	3.56
	Oct-06	0.02	ND	30	ND	ND	17	ND	ND	ND	ND	10	ND	ND	6.8	34	3.81
	Feb-07	0.4	ND	27	ND	ND	ND	ND	ND	ND	ND	ND	80	ND	7	21	3.11
	Jun-07	0.15	ND	30	ND	ND	ND	ND	ND	ND	ND	ND	210	ND	6.8	24	3.62
	Dec-07	ND	ND	27	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.8	24	3.28
	Apr-08	0.19	ND	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.1	20	3.39
	Aug-08	ND	ND	36	ND	7	ND	ND	ND	ND	ND	ND	ND	ND	6.8	19	3.30
	Feb-09	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.10
	Jun-09	ND	1.3	33	ND	12	1.3	ND	ND	ND	1.4	7.1	40	ND	7	15	3.80
	Oct-09	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.79
	Apr-10	ND	2	NA	ND	12	ND	ND	ND	3	0.7	5	NA	NA	6.9	17	3.35
	Sep-10	0.01	ND	20	ND	4	ND	ND	ND	ND	ND	ND	20	ND	6.8	15	3.62
	Apr-11	0.03	ND	30	ND	4	2	ND	ND	ND	ND	ND	ND	ND	7	16	3.84
	Sep-11	0.01	ND	20	ND	7	ND	ND	ND	ND	1	ND	30	ND	6.6	18	3.61
	Mar-12	0.03	ND	ND	0.1	6	3	2	ND	ND	2	5	ND	ND	7.3	21	3.75
	Sep-12	ND	ND	20	ND	3	1	ND	ND	ND	1	ND	ND	ND	7.5	19	3.42
	Apr-13	0.02	ND	NA	ND	3	ND	ND	ND	ND	ND	ND	10	ND	7.4	17	3.57
	Oct-13	0.02	ND	20	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	7.2	18	3.80
	Jul-14	ND	ND	20	ND	3	ND	ND	ND	ND	ND	ND	ND	ND	7	14	3.86
	Jan-15	ND	ND	ND	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	7.3	15	2.97
	Jul-15	ND	ND	20	ND	2	ND	ND	ND	ND	ND	ND	20	ND	7.5	16	3.65
	Feb-16	0.02	ND	30	ND	2	ND	ND	ND	ND	ND	21	10	ND	6.8	14	2.50
	Aug-16	0.04	ND	10	ND	ND	ND	ND	ND	ND	ND	2	ND	ND	6.8	17.5	3.69
	Jan-17	0.01	ND	ND	ND	2	ND	ND	ND	ND	ND	2	10	ND	7.4	17.6	3.70
	Aug-17	0.01	ND	ND	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	6.7	17	3.60
BH6	Aug-05	0.03	9	NA	2	ND	ND	ND	ND	48	ND	140	700	ND	5.5	440	3.68
	Nov-05	0.05	8	ND	2	ND	ND	ND	ND	58	ND	200	490	ND	4.5	450	3.07
	Feb-06	0.03	ND	23	2	7	7	ND	ND	45	ND	130	1200	ND	4.6	740	3.45
	May-06	ND	ND	25	2	ND	9	ND	ND	56	ND	160	920	ND	4.5	830	3.29
	Oct-06	0.01	ND	21	1	ND	7	ND	ND	46	ND	130	120	ND	4.5	380	3.41
	Feb-07	ND	ND	29	1	ND	5	ND	ND	36	ND	95	830	ND	4.6	340	2.99
	Jun-07	0.03	ND	27	ND	ND	ND	ND	ND	24	ND	54	470	ND	4.6	230	3.39
	Dec-07	ND	ND	29	ND	ND	ND	ND	ND	13	ND	53	200	ND	4.7	110	3.18
	Apr-08	ND	ND	27	ND	ND	ND	ND	ND	15	ND	39	140	ND	5.0	170	3.27
	Aug-08	ND	ND	31	ND	ND	ND	ND	ND	13	ND	31	140	ND	5.0	130	3.08
	Jun-09	ND	ND	34	ND	ND	ND	ND	ND	6.7	ND	23	160	ND	5.5	97	4.83
	Apr-10	ND	1.1	NA	0.22	3	ND	ND	ND	5	1.1	21	NA	NA	5.6	100	3.28
	Sep-10	ND	ND	20	0.3	2	ND	ND	ND	4	ND	54	20	ND	5.6	58	3.42
	Apr-11	0.59	ND	50	0.2	1	2	ND	ND	3	ND	20	ND	ND	5.6	61	3.60
	Sep-11	0.97	ND	20	0.2	4	ND	ND	ND	5	ND	11	20	ND	5.9	47	3.46
	Mar-12	0.01	ND	ND	0.3	2	ND	2	0.1	1	1	9	ND	ND	6.8	60	3.50
	Sep-12	0.06	ND	20	0.1	ND	ND	2	ND	1	2	12	ND	ND	7	51	3.24
	Apr-13	0.03	ND	NA	0.2	2	ND	ND	ND	1	1	29	ND	ND	7.1	49	3.36
	Oct-13	0.06	ND	20	0.1	2	ND	ND	ND	ND	1	13	ND	ND	6.8	32	3.56
	Jul-14	0.01	ND	20	ND	1	ND	ND	ND	ND	1	3	ND	ND	6.8	35	3.60
	Jan-15	0.08	ND	ND	ND	ND	2	ND	ND	4	ND	4	10	ND	6.9	37	2.95
	Jul-15	0.03	ND	20	ND	ND	ND	ND	ND	1	1	ND	20	ND	7.3	29	3.45
	Feb-16	0.15	1	80	0.2	ND	7	1	ND	8	1	64	20	ND	6.5	43	2.51
	Aug-16	0.02	ND	70	0.1	ND	3	ND	ND	6	ND	98	ND	ND	6.7	32.6	3.43
	Jan-17	0.05	1	ND	0.2	ND	5	ND	ND	7	ND	4	10	ND	7.3	36.2	3.43
	Aug-17	0.02	1	ND	0.1	ND	4	ND	ND	5	1	ND	ND	ND	6.8	38	3.37
BH11	Aug-05	0.06	11	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	ND	7.4	190	3.62
	Nov-05	0.05	6	ND	ND	ND	ND	ND	ND	ND	ND	7	ND	ND	6.8	140	2.79
	Feb-06	0.03	ND	34	ND	10	ND	ND	ND	ND	ND	6	50	ND	7.6	560	3.00
	May-06	0.03	ND	31	ND	ND	ND	ND	ND	ND	ND	ND	400	30	7.1	180	3.27
	Oct-06	0.09	ND	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.9	13	3.33
	Feb-07	ND	ND	34	ND	ND	ND	ND	ND	ND	ND	ND	70	50	6.8	31	2.77
	Jun-07	0.04	ND	32	ND	ND	ND	ND	ND	ND	ND	ND	220	ND	6.8	44	3.21
	Dec-07	ND	ND	31	ND	ND	ND	ND	ND	ND	ND	ND	ND	20	6.5	49	3.08
	Apr-08	0.17	ND	21	ND	ND	ND	ND	ND	ND	ND	47	ND	ND	7.0	30	3.00
	Aug-08	0.04	ND	25	ND	6	5	ND	ND	25	ND	94	60	ND	6.8	200	3.10
	Jun-09	ND	ND	ND	ND	ND	1.9	1.8	ND	2.5	ND	24	230	ND	6.7	23	3.50
	Apr-10	ND	1.7	NA	0.04	10	ND	ND	0.05	4	1.8	7	NA	NA	6.5	49	3.05
	Sep-10	0.04	ND	40	ND	3	ND	ND	ND	2	ND	12	80	190	7.0	53	3.36
	Apr-11	0.24	ND	30	ND	2	3	ND	ND	1	ND	5	10	260	7.3	28	3.56
	Sep-11	0.04	ND	20	ND	5	1	ND	ND	1	1	18	10	60	6.5	41	3.48
	Mar-12	0.01	ND	ND	ND	3	ND	ND	ND	ND	2	16	ND	40	7.3	28	3.51
	Sep-12	0.47	ND	20	ND	1	1	2	ND	6	ND	15	800	ND	7.1	18	3.11

Borehole Location	Date	Analysis															Water Level (m bgl)
		TPH/EPH (mg/l)	Arsenic (µg/l)	Boron (µg/l)	Cadmium (µg/l)	Chromium (µg/l)	Copper (µg/l)	Lead (µg/l)	Mercury (µg/l)	Nickel (µg/l)	Selenium (µg/l)	Zinc (µg/l)	Ammonia as N (µg/l)	Total Cyanide (µg/l)	pH	Sulphate as SO_4 (mg/l)	
	Apr-13	0.04	ND	NA	0.1	2	ND	ND	ND	3	1	10	900	40	7.1	31	3.26
	Oct-13	0.07	ND	30	ND	2	3	ND	ND	2	1	10	70	560	7.5	40	3.60
	Jul-14	0.19	ND	50	ND	1	1	ND	ND	1	ND	7	ND	50	6.8	23	3.64
	Jan-15	0.01	ND	ND	ND	ND	ND	ND	0.3	1	ND	18	30	ND	7.7	26	2.71
	Jul-15	0.03	ND	ND	ND	ND	ND	ND	ND	3	ND	10	20	ND	7.3	12	3.45
	Feb-16	0.01	ND	ND	ND	ND	ND	ND	ND	ND	2	5	500	ND	6.4	36	2.38
	Aug-16	0.09	ND	ND	ND	ND	ND	ND	ND	3	ND	13	30	ND	6.8	27	3.44
	Jan-17	0.09	ND	ND	ND	2	3	3	ND	8	ND	7	2100	ND	7.1	24.8	3.42
	Aug-17	0.08	ND	80	ND	ND	ND	ND	ND	2	ND	11	200	ND	7	39	3.36

Borehole Location	Date	Analysis															Water Level (m bgl)
		TPH/EPH (mg/l)	Arsenic (µg/l)	Boron (µg/l)	Cadmium (µg/l)	Chromium (µg/l)	Copper (µg/l)	Lead (µg/l)	Mercury (µg/l)	Nickel (µg/l)	Selenium (µg/l)	Zinc (µg/l)	Ammonia as N (µg/l)	Total Cyanide (µg/l)	pH	Sulphate as SO_4 (mg/l)	
		TPH/EPH (mg/l)	Arsenic (µg/l)	Boron (µg/l)	Cadmium (µg/l)	Chromium (µg/l)	Copper (µg/l)	Lead (µg/l)	Mercury (µg/l)	Nickel (µg/l)	Selenium (µg/l)	Zinc (µg/l)	Ammonia as N (µg/l)	Total Cyanide (µg/l)	pH	Sulphate as SO_4 (mg/l)	Water Level (m bgl)
UK Drinking Water Standard		0.01mg/l**	10µg/l*	1,000* µg/l	5*µg/l	50*µg/l	2,000* µg/l	25*µg/l	1*µg/l	20*µg/l	10*µg/l	5,000µg/l**	500*µg/l	50*µg/l	6.5-10*	250mg/l*	
BH12	Aug-05	7.8	7	NA	ND	ND	ND	ND	ND	ND	ND	ND	1400	ND	6.6	5	4.00
	Nov-05	34	ND	ND	ND	20	ND	ND	ND	7	ND	9	ND	ND	6.4	22	3.02
	Feb-06	13	ND	16	ND	ND	ND	ND	ND	10	ND	ND	70	ND	6.3	ND	3.64
	May-06	71	ND	15	ND	10	ND	ND	ND	5	ND	ND	ND	ND	6.5	ND	3.51
	Oct-06	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	6.5	NS*	3.26
	Feb-07	21	ND	23	ND	ND	ND	ND	ND	ND	ND	ND	120	ND	6.5	ND	3.01
	Jun-07	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	6.4	NS*	3.12
	Dec-07	1000	ND	26	ND	ND	ND	ND	ND	7	ND	30	79	ND	6.3	ND	3.23
	Apr-08	34	ND	19	ND	ND	ND	ND	ND	5	ND	ND	ND	ND	6.6	ND	3.33
	Aug-08	260	ND	23	ND	ND	ND	ND	ND	ND	ND	8	ND	ND	6.5	ND	3.28
	Feb-09	48	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.45	NA	3.11
	Jun-09	240	ND	ND	ND	ND	2	1.5	ND	3.7	ND	15	190	ND	6.4	4.8	3.68
	Oct-09	380	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.45	NA	3.85
	Apr-10	72	1.7	NA	0.04	15	0.9	ND	ND	6	0.9	7	NA	NA	6.5	ND	3.45
	Sep-10	160.7	ND	20	ND	5	ND	ND	ND	2	ND	6	40	ND	6.4	ND	3.71
	Apr-13	45.98	1	NA	ND	2	ND	ND	ND	12	ND	10	10	ND	7.2	8	3.51
	Oct-13	128	ND	10	ND	3	ND	ND	ND	2	ND	8	80	ND	6.9	ND	3.80
	Jul-14	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	3.88
	Jan-15	34.2	ND	ND	ND	ND	ND	ND	ND	1	ND	67	60	ND	6.8	ND	2.92
	Jul-15	49	ND	ND	ND	ND	ND	ND	ND	4	ND	ND	80	ND	6.9	ND	3.68
	Feb-16	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	2.55
	Aug-16	90.2	ND	10	ND	ND	ND	ND	ND	2	ND	7	40	ND	6.5	ND	3.69
	Jan-17	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	NS*	3.70
	Aug-17	121	ND	ND	ND	ND	ND	ND	ND	2	ND	ND	50	ND	6.5	ND	3.63
MW1	Aug-05	0.17	11	NA	ND	ND	ND	ND	ND	ND	ND	32	160	ND	6.6	24	4.01
	Nov-05	0.13	ND	ND	ND	ND	ND	ND	ND	ND	ND	43	ND	ND	6.8	33	3.11
	Feb-06	0.16	ND	22	ND	ND	ND	ND	ND	ND	ND	80	50	ND	6.6	25	3.73
	May-06	0.14	ND	20	ND	8	ND	ND	ND	ND	ND	32	ND	ND	6.8	23	3.58
	Oct-06	0.08	12	20	ND	10	5	ND	ND	ND	ND	24	ND	ND	7.2	22	3.87
	Feb-07	0.58	ND	27	ND	ND	ND	ND	ND	ND	ND	51	230	ND	7	22	3.18
	Jun-07	0.35	ND	27	ND	ND	ND	ND	ND	ND	ND	40	80	ND	6.7	21	3.61
	Dec-07	0.31	ND	29	ND	ND	ND	ND	ND	ND	ND	40	ND	ND	6.5	22	3.29
	Apr-08	2.1	ND	26	ND	ND	ND	ND	ND	ND	ND	37	50	ND	6.8	20	3.41
	Aug-08	0.06	ND	26	ND	ND	ND	ND	ND	ND	ND	56	ND	ND	6.7	18	3.29
	Feb-09	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.44
	Jun-09	ND	ND	ND	ND	ND	10	14	ND	3.4	ND	120	210	ND	7	2.6	3.15
	Oct-09	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.87
	Apr-10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.41
	Sep-10	0.03	ND	20	0.1	4	1	ND	ND	1	ND	86	20	ND	6.6	24	3.64
	Apr-11	0.55	ND	30	0.1	1	5	ND	ND	2	ND	126	ND	ND	6.8	22	3.86
	Sep-11	0.12	ND	50	ND	4	1	ND	ND	1	ND	49	20	ND	6.7	26	3.64
	Mar-12	0.12	ND	ND	0.2	5	3	3	ND	2	1	126	ND	ND	7.1	22	3.75
	Sep-12	0.31	ND	20	ND	2	2	2	ND	1	1	46	ND	ND	7.3	19	3.41
	Apr-13	0.08	ND	NA	0.1	2	ND	ND	ND	2	ND	84	30	ND	7.3	17	3.56
	Oct-13	2.32	ND	20	ND	2	ND	ND	ND	2	1	73	ND	ND	7	22	3.80
	Jul-14	2.42	ND	20	ND	1	1	ND	ND	2	ND	40	ND	ND	6.9	15	3.86
	Jan-15	0.31	ND	ND	ND	ND	ND	ND	ND	ND	ND	36	10	ND	7.2	14	2.95
	Jul-15	0.08	ND	20	ND	ND	ND	ND	ND	1	ND	26	60	ND	7.4	20	3.65
	Feb-16	0.3	ND	ND	ND	ND	1	ND	ND	ND	ND	26	10	ND	6.8	26	2.47
	Aug-16	0.15	ND	10	ND	ND	1	ND	ND	ND	1	14	ND	ND	6.6	19.8	3.67
	Jan-17	0.15	ND	ND	ND	2	1	ND	ND	ND	ND	38	ND	ND	7.2	20.7	3.70
	Aug-17	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	46	ND	ND	6.8	24	3.60
MW2	Aug-05	0.03	6	NA	ND	ND	ND	ND	ND	140	ND	120	95	ND	5.5	370	3.19
	Nov-05	0.1	ND	ND	2	ND	ND	ND	ND	100	ND	100	ND	ND	5.4	380	2.60
	Feb-06	0.27	ND	24	4	6	ND	ND	ND	140	ND	110	70	ND	5.5	480	3.00
	May-06	ND	ND	25	3	ND	ND	ND	ND	120	ND	91	70	ND	5.6	580	2.94
	Oct-06	0.01	ND	27	7	ND	ND	ND	ND	210	ND	200	90	ND	5.8	790	3.04
	Feb-07	ND	ND	33	3	ND	ND	ND	ND	150	ND	110	90	ND	5.6	510	2.69
	Jun-07	0.03	ND	28	5	ND	ND	ND	ND	170	ND	170	240	ND	5.4	510	2.94
	Dec-07	ND	ND	29	3	ND	ND	ND	ND	100	ND	120	88	ND	5.5	350	2.68
	Apr-08	ND	ND	27	2	ND	ND	ND	ND	62	ND	72	ND	ND	5.5	210	2.83
	Aug-08	0.09	ND	30	1	ND	ND	ND	ND	50	ND	76	ND	ND	5.6	170	2.70
	Jun-09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.95	NA	2.78
	Apr-10	ND	0.5	NA	0.54	8	3.6	ND	ND	10	0.6	170	NA	NA	6.3	100	2.86
	Sep-10	0.04	ND	30	0.8	3	ND	ND	ND	19	ND	121	30	ND	6.1	82	2.94
	Apr-11	11.97	ND	30	0.1	2	2	ND	ND	5	ND	7	ND	ND	7.4	71	3.14
	Sep-11	0.3	ND	40	0.1	5	ND	ND	ND	10	ND	11	60	ND	6.4	71	3.00
	Mar-12	0.2	ND	ND	0.5	2	1	6	ND	12	1	33	ND	ND	7	61	3.09
	Sep-12	0.22	ND	20	0.1	ND	1	5	ND	8	ND	30	ND	ND	7.1	54	2.82
	Apr-13	0.13	ND	NA	0.4	2	ND	ND	ND	5	ND	21	30	ND	7.7	55	2.95
	Oct-13	0.38	ND	20	ND	1	ND	ND	ND	6	ND	17	10	ND	6.7	60	3.12
	Jul-14	0.42	ND	20	ND	ND	ND	ND	ND	4	ND	16	ND	ND	6.6	45	3.18
	Jan-15	0.11	ND	ND	0.1	ND	ND	ND	ND	4	ND	17	50	ND	6.8	44	2.58
	Jul-15	0.18	ND	30	ND	ND	ND	ND	ND	7	ND	21	50	ND	7	43	3.05
	Feb-16	0.06	ND	ND	0.1	ND	ND	ND	ND	2	ND	17	20	ND	6.3	36	2.11
	Aug-16	0.71	ND	ND	ND	ND	ND	ND	ND	2	ND	9	30	ND	6.3	36.4	3.02
	Jan-17	0.12	ND	ND	0.1	1	ND	ND	ND	3	ND	9	10	ND	6.9	39.4	3.04
	Aug-17	0.04	ND	80	ND	ND	ND	ND	ND	2	ND	8	10	ND	6.2	41	2.96
BHS6 (Sentry Borehole)	Feb-09	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.47
	Jun-09	ND	2.8	ND	ND	ND	13	1.1	ND	4.2	1.8	6.7	310	ND	7.3	NA	4.00
	Oct-09	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.00
	Apr-10	0.74	30	NA	1.8	380	410	41	2.5	51	21	71	NA	NA	7.5	81	3.65
	Sep-10	0.01	ND	30	1	28	1723	11	ND	26	ND	338	300	ND	7.3	46	3.86
	Apr-11	0.04	10	40	0.8	48	85	21	0.4	7	4	37	400	ND	7.8	55	4.03
	Sep-11	0.07	9	ND	1.1	28	81	22	0.2	7	4	24	400	ND	7.5	61	3.90
	Mar-12	0.04	8	ND	0.9	14	66	17	ND	5	3	22	330	ND	7.9	63	3.95
	Sep-12	0.04	8	ND	0.8	38	99	20	0.3	7	3	15	160	ND	8.2	59	3.66
	Apr-13	0.04	ND	NA	10.6	ND	189	ND	ND	ND	ND	515	60800	ND	8.2	60	3.81
	Oct-13	0.02	7	50	0.5	24	62	14	0.2	5	2	20	280	ND	7.5	ND	3.97
	Jul-14	0.05	8	ND	0.5	8	38	4	ND	5	2	11	240	ND	7.9	47	4.02
	Jan-15	0.03	9	ND	0.4	33	119	12	0.2	8	1	9	250	ND	7.7	3	3.30
	Jul-15	0.02	9	ND	0.3	10	66	7	0.2	5	3	8	320	ND	7.8	29	3.85
	Feb-16	0.05	5	30	0.1	10	38	3	0.1	3	2	48	160	ND	7.4	56	2.85
	Aug-16	0.04	8	60	0.3	15	75	7	0.2	5	1	58	180	ND	8.1	63.4	3.86
	Jan-17	0.03	9	ND	0.3	15	81	7	0.1	5	1	19	220	ND	8.2	57.9	3.87
	Sep-17	0.15	8	ND	0.3	15	71	8	ND	7	4	27	180	ND	7.7	55	3.78

Borehole Location	Date	Analysis															Water Level (m bgl)
		TPH/EPH (mg/l)	Arsenic (µg/l)	Boron (µg/l)	Cadmium (µg/l)	Chromium (µg/l)	Copper (µg/l)	Lead (µg/l)	Mercury (µg/l)	Nickel (µg/l)	Selenium (µg/l)	Zinc (µg/l)	Ammonia as N (µg/l)	Total Cyanide (µg/l)	pH	Sulphate as SO_4 (mg/l)	
		TPH/EPH (mg/l)	Arsenic (µg/l)	Boron (µg/l)	Cadmium (µg/l)	Chromium (µg/l)	Copper (µg/l)	Lead (µg/l)	Mercury (µg/l)	Nickel (µg/l)	Selenium (µg/l)	Zinc (µg/l)	Ammonia as N (µg/l)	Total Cyanide (µg/l)	pH	Sulphate as SO_4 (mg/l)	Water Level (m bgl)
UK Drinking Water Standard		0.01mg/l**	10µg/l*	1,000* µg/l	5*µg/l	50*µg/l	2,000* µg/l	25*µg/l	1*µg/l	20*µg/l	10*µg/l	5,000µg/l**	500*µg/l	50*µg/l	6.5-10*	250mg/l*	

Notes:
The red cells indicate where the concentration exceeds the UK Drinking Water Standard
The yellow cells indicate where laboratory detection limits have been raised due to matrix interference
The green cells indicate rounds of monitoring carried out by Mabbett & Associates Ltd

*Water Supply (Water Quality) Regulations 2000
* *The Water Supply (Water Quality) Regulations 1989
No data available but data put in for graphs
Current SPMP monitoring locations

NS* = No sample taken - free product present
ND = Not detected above laboratory detection limits
NA = Not analysed

RAMBOLL ENVIRON

Appendix 3

Laboratory Certificate of Analysis

Our Ref: EXR/246928 (Ver. 1)
Your Ref: UK17-24812

August 25, 2017

Environmental Chemistry
ESG
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 - Sapa SPMP Round 28

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 Environmental Scientifics Group Ltd (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 ESG

dgoddard

D Goddard
Project Co-ordinator
01283 554362

TEST REPORT

UKAS TESTING
1252

Report No. EXR/246928 (Ver. 1)

Ramboll Environ
8 Village Way
Cardiff
CF15 7NE

Site: Sapa SPMP Round 28

The 8 samples described in this report were registered for analysis by ESG on 11-Aug-2017. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 25-Aug-2017

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:

On behalf of
ESG :
Tim Barnes

Operations Director
Energy & Waste Services

Date of Issue: 25-Aug-2017

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. ESG accepts no responsibility for any sampling not carried out by our personnel.

Units :			pH units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Method Codes :			WSLM3	WSLM10	Calc_HD	ICPWATVAR	ICPWATVAR	ICPWATVAR	ICPMSW	ICPMSW	ICPMSW	ICPMSW	ICPMSW	ICPMSW	ICPWATVAR	ICPMSW	ICPWATVAR	ICPMSW
Method Reporting Limits :				5	7	3	1	1	0.001	0.001	0.0001	0.001	0.001	0.002	0.01	0.001	0.01	0.0001
UKAS Accredited :			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LAB ID Number EXR	**Client Sample Description**	**Sample Date**	**pH units w**	**Suspended Solids w**	**Total Hardness as CaCO3**	**Total Sulphur as SO4 (Dissolved) a**	**Calcium as Ca (Dissolved) a**	**Magnesium as Mg (Dissolved) a**	**Nickel as Ni (Dissolved)**	**Chromium as Cr (Dissolved)**	**Cadmium as Cd (Dissolved)**	**Copper as Cu (Dissolved)**	**Lead as Pb (Dissolved)**	**Zinc as Zn (Dissolved)**	**Iron as Fe (Dissolved) a**	**Arsenic as As (Dissolved)**	**Boron as B (Dissolved) a**	**Mercury as Hg (Dissolved)**
1819180	MW2	10-Aug-17 10:30	6.2	758	81	41	21	7	0.002	<0.001	<0.0001	<0.001	<0.001	0.008	0.05	<0.001	0.08	<0.0001
1819181	BH6	10-Aug-17 11:00	6.8	26	46	38	12	4	0.005	<0.001	0.0001	0.004	<0.001	<0.002	0.22	0.001	<0.01	<0.0001
1819182	BHS6	10-Aug-17 11:30	7.7	92	<12	55	3	<1	0.007	0.015	0.0003	0.071	0.008	0.027	2.97	0.008	<0.01	<0.0001
1819183	BH4	10-Aug-17 12:00	6.7	162	139	17	41	9	<0.001	0.001	<0.0001	<0.001	<0.001	<0.002	0.09	<0.001	<0.01	<0.0001
1819184	BH11	10-Aug-17 12:30	7	267	229	39	67	15	0.002	<0.001	<0.0001	<0.001	<0.001	0.011	0.12	<0.001	0.08	<0.0001
1819185	MW1	10-Aug-17 13:00	6.8		154	24	47	9	<0.001	<0.001	<0.0001	<0.001	<0.001	0.046		<0.001	<0.01	<0.0001
1819186	BH1	10-Aug-17 13:30	6.6		254	10	72	18	<0.001	<0.001	<0.0001	<0.001	<0.001	0.002		<0.001	<0.01	<0.0001
1819187	BH12	10-Aug-17 14:00	6.5		251	<3	71	18	0.002	<0.001	<0.0001	<0.001	<0.001	<0.002		<0.001	<0.01	<0.0001

ESG

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**

Contact Rob Hodgson

Sapa SPMP Round 28

Sample Analysis

Date Printed	**25-Aug-2017**
Report Number	**EXR/246928**
Table Number	**1**

Where individual results are flagged see report notes for status.

Units :			mg/l	mg/l	mg/l	mg/l	mg/l	mV	mg/l										
Method Codes :			ICPMSW	KONENS	SFAPI	WSLM13	TPHFID	WSLM25	WSLM27										
Method Reporting Limits :			0.001	0.01	0.02	0.2	0.01		5										
UKAS Accredited :			Yes	Yes	Yes	Yes	Yes	No	No										
LAB ID Number EXR	**Client Sample Description**	**Sample Date**	**Selenium as Se (Dissolved)**	**Ammoniacal Nitrogen as N**	**Cyanide (Total) as CN**	**Total Organic Carbon w**	**TPH GC**	**Redox Potential mV w**	**Total Dissolved Solids w**										
1819180	MW2	**10-Aug-17 10:30**	<0.001	0.01	<0.02	0.74	0.04	213.8	166										
1819181	BH6	**10-Aug-17 11:00**	0.001	<0.01	<0.02	21	0.02	213.5	321										
1819182	BHS6	**10-Aug-17 11:30**	0.004	0.18	<0.02	130	0.21	171.6	953										
1819183	BH4	**10-Aug-17 12:00**	<0.001	<0.01	<0.02	1.1	0.01	227.6	191										
1819184	BH11	**10-Aug-17 12:30**	<0.001	0.2	<0.02	2.8	0.08	191.8	390										
1819185	MW1	**10-Aug-17 13:00**	<0.001	<0.01	<0.02		0.06												
1819186	BH1	**10-Aug-17 13:30**	<0.001	0.05	<0.02		41.0												
1819187	BH12	**10-Aug-17 14:00**	<0.001	0.05	<0.02		121												

ESG

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Client Name **Ramboll Environ**

Contact Rob Hodgson

Sapa SPMP Round 28

Sample Analysis

Date Printed	**25-Aug-2017**
Report Number	**EXR/246928**
Table Number	**1**

Where individual results are flagged see report notes for status.

Sample Analysis

ESG Environmental Chemistry
Analytical and Deviating Sample Overview

W246928

Customer Ramboll Environ
Site Sapa SPMP Round 28
Report No W246928

Consignment No W124593
Date Logged 11-Aug-2017
In-House Report Due 18-Aug-2017
Please note the results for any subcontracted analysis (identified with a '^') is likely to take up to an additional five working days.

ID Number	Description	Matrix Type	Sampled	MethodID	Calc_HD	CUSTSERV	ICPMSW									ICPWATVAR					KONENS	SFAPI
					Total Hardness as CaCO3 (CALC)	Report A	Nickel as Ni MS (Dissolved)	Chromium as Cr MS (Dissolved)	Cadmium as Cd MS (Dissolved)	Copper as Cu MS (Dissolved)	Lead as Pb MS (Dissolved)	Zinc as Zn MS (Dissolved)	Arsenic as As MS (Dissolved)	Mercury as Hg MS (Dissolved)	Selenium as Se MS (Dissolved)	Total Sulphur as SO4 (Diss) VAR	Calcium as Ca (Dissolved) VAR	Magnesium as Mg (Dissolved) VAR	Iron as Fe (Dissolved) VAR	Boron as B (Dissolved) VAR	Ammoniacal Nitrogen (Kone)	Cyanide (Total) as CN SFA
					✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EX/1819180	MW2	Groundwater	10/08/17																			
EX/1819181	BH6	Groundwater	10/08/17																			
EX/1819182	BHS6	Groundwater	10/08/17																			
EX/1819183	BH4	Groundwater	10/08/17																			
EX/1819184	BH11	Groundwater	10/08/17																			
EX/1819185	MW1	Groundwater	10/08/17																			
EX/1819186	BH1	Groundwater	10/08/17																			
EX/1819187	BH12	Groundwater	10/08/17																			

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.

Sample Analysis

ESG Environmental Chemistry
Analytical and Deviating Sample Overview

W246928

Customer **Ramboll Environ**
Site **Sapa SPMP Round 28**
Report No **W246928**

Consignment No W124593
Date Logged 11-Aug-2017
In-House Report Due 18-Aug-2017
Please note the results for any subcontracted analysis (identified with a '^') is likely to take up to an additional five working days.

ID Number	Description	Matrix Type	Sampled	TPH GC	Suspended Solids	Total Organic Carbon	Redox Potential mV	Total Dissolved Solids	pH units
		MethodID		TPHFID	WSLM10	WSLM13	WSLM25	WSLM27	WSLM3
				✓	✓	✓			✓
EX/1819180	MW2	Groundwater	10/08/17						E
EX/1819181	BH6	Groundwater	10/08/17						E
EX/1819182	BHS6	Groundwater	10/08/17						E
EX/1819183	BH4	Groundwater	10/08/17						E
EX/1819184	BH11	Groundwater	10/08/17						E
EX/1819185	MW1	Groundwater	10/08/17						E
EX/1819186	BH1	Groundwater	10/08/17						E
EX/1819187	BH12	Groundwater	10/08/17						E

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.

Report Number : W/EXR/246928

Additional Report Notes

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
WSLM10	EX/1819180, EX/1819182	Due to the sample matrix, the volume of sample analysed was lowered to complete the filtration process. As a result the detection limit has been raised.
TPHFID	EX1819182	The matrix of this sample has been found to interfere with the result for this test. The sample has therefore been diluted to improve the signal to noise ratio but in doing so, the detection limit for this test has been elevated.

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	KONENS	As Received	Direct analysis using discrete colorimetric analysis
Water	SFAPI	As Received	Segmented flow analysis with colorimetric detection
Water	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID
Water	WSLM10	As Received	Determination of Suspended Solids in waters by gravimetry
Water	WSLM13	As Received	Instrumental analysis using acid/persulphate digestion and non-dispersive IR detection
Water	WSLM25	As Received	Direct determination using Redox Potential Probe
Water	WSLM27	As Received	Gravimetric Determination
Water	WSLM3	As Received	Determination of the pH of water samples by pH probe

Where individual results are flagged see report notes for status.

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 105ºC 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/cm^3@ 15^{o}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 Anthophylite
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
Þ 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 : Sapa SPMP Round 28
Report Number : W24_6928

Lab ID Number	Client ID	Description
EX/1819180	MW2	Groundwater
EX/1819181	BH6	Groundwater
EX/1819182	BHS6	Groundwater
EX/1819183	BH4	Groundwater
EX/1819184	BH11	Groundwater
EX/1819185	MW1	Groundwater
EX/1819186	BH1	Groundwater
EX/1819187	BH12	Groundwater

Our Ref: EXR/249345 (Ver. 1)
Your Ref: UK17-24812

September 28, 2017

Environmental Chemistry
ESG
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 - Sapa SPMP Round 28

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 Environmental Scientifics Group Ltd (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 ESG

J Chislett
Project Co-ordinator
01283 554458

TEST REPORT

UKAS TESTING
1252

Report No. EXR/249345 (Ver. 1)

Ramboll Environ
8 Village Way
Cardiff
CF15 7NE

Site: Sapa SPMP Round 28

The 1 sample described in this report were registered for analysis by ESG on 22-Sep-2017. This report supersedes any versions previously issued by the laboratory.

The analysis was completed by: 28-Sep-2017

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:

On behalf of
ESG :
Tim Barnes

Operations Director
Energy & Waste Services

Date of Issue: 28-Sep-2017

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.
ESG accepts no responsibility for any sampling not carried out by our personnel.

Where individual results are flagged see report notes for status.

		Units :	mg/l																
		Method Codes :	TPHFID																
		Method Reporting Limits :	0.01																
		UKAS Accredited :	Yes																
LAB ID Number EXR	**Client Sample Description**	**Sample Date**	**TPH GC**																
1829332	BH56	**20-Sep-17 11:30**	0.15																

ESG

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**
Contact	Rob Hodgson

Sapa SPMP Round 28

Sample Analysis

Date Printed	**28-Sep-2017**
Report Number	**EXR/249345**
Table Number	**1**

Sample Analysis

ESG Environmental Chemistry
Analytical and Deviating Sample Overview

W249345

Customer Ramboll Environ
Site Sapa SPMP Round 28
Report No W249345

Consignment No W126519
Date Logged 22-Sep-2017
In-House Report Due 28-Sep-2017
Please note the results for any subcontracted analysis (identified with a '^') is likely to take up to an additional five working days.

ID Number	Description	Matrix Type	Sampled	Report A	TPH GC
		MethodID		CUSTSERV	TPHFID
					✓
EX/1829332	BH56	Groundwater	20/09/17		

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	TPHFID	As Received	Determination of pentane extractable hydrocarbons in water by GCFID

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 105ºC 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/cm^3@ 15^{o}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 Anthophylite
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
Þ 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 : Sapa SPMP Round 28
Report Number : W24_9345

Lab ID Number	Client ID	Description
EX/1829332	BH56	Groundwater