ANALYTICAL REPORT

WORLD RECOGNISED ACCREDITATION

CLIENT DETAILS		LABORATORY DETAILS	
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Project	**Summer Hill Water**	SGS Reference	**CE112556 R0**
Order Number	**3708**	Report Number	0000021328
Samples	2	Date Reported	11 Nov 2014
Date Started	11 Nov 2014	Date Received	10 Nov 2014

COMMENTS

Accredited for compliance with ISO/IEC 17025. NATA accredited laboratory 2562(3146)

SIGNATORIES

Anthony Nilsson Operations Manager	Jon Dicker Manager Northern QLD	Maristela Ganzan Metals Team Leader

Parameter	Units	LOR	Sample Number: CE112556.001 Sample Matrix: Water Sample Date: 09 Nov 2014 Sample Name: 967	Sample Number: CE112556.002 Sample Matrix: Water Sample Date: 09 Nov 2014 Sample Name: 968
pH in water Method: AN101				
pH**	pH Units	-	**8.1**	**8.1**
Conductivity and TDS by Calculation - Water Method: AN106				
Conductivity @ 25 C	µS/cm	5	**270**	**280**
Turbidity Method: AN119				
Turbidity	NTU	0.5	**2.6**	**2.2**
Fluoride by Ion Selective Electrode in Water Method: AN141				
Fluoride by ISE	mg/L	0.05	**0.97**	**0.98**
Metals in Water (Dissolved) by ICPOES Method: AN320/AN321				
Aluminium, Al	mg/L	0.005	<0.005	<0.005
Manganese, Mn	mg/L	0.005	**0.009**	**0.009**
Sulphur as Sulphate, SO4	mg/L	0.5	<0.5	<0.5
Sulphur, S	mg/L	0.1	<0.1	<0.1
Zinc, Zn	mg/L	0.005	<0.005	<0.005
Metals in Water (Total) by ICPOES Method: AN022/AN320/AN321				
Total Aluminium	mg/L	0.005	**0.034**	**0.025**
Total Manganese	mg/L	0.005	**0.24**	**0.18**
Total Zinc	mg/L	0.005	<0.005	<0.005
Metals in Water (Dissolved) by ICPOES-USN Method: AN320/AN322				
Arsenic, As	mg/L	0.003	**0.006**	**0.006**
Cadmium, Cd	mg/L	0.0001	<0.0001	<0.0001
Chromium, Cr	mg/L	0.001	<0.001	<0.001
Cobalt, Co	mg/L	0.001	<0.001	<0.001
Copper, Cu	mg/L	0.001	**0.001**	**0.001**
Lead, Pb	mg/L	0.001	<0.001	<0.001
Nickel, Ni	mg/L	0.001	<0.001	<0.001
Selenium, Se	mg/L	0.003	<0.003	<0.003
Tin, Sn	mg/L	0.002	<0.002	<0.002

Parameter	Units	LOR	Sample Number: CE112556.001 Sample Matrix: Water Sample Date: 09 Nov 2014 Sample Name: 967	Sample Number: CE112556.002 Sample Matrix: Water Sample Date: 09 Nov 2014 Sample Name: 968
Metals in Water (Total) by ICPOES-USN Method: AN320/AN322				
Total Arsenic, As	mg/L	0.003	**0.009**	**0.009**
Total Cadmium, Cd	mg/L	0.0001	<0.0001	<0.0001
Total Chromium, Cr	mg/L	0.001	<0.001	<0.001
Total Cobalt, Co	mg/L	0.001	<0.001	<0.001
Total Copper, Cu	mg/L	0.001	**0.001**	**0.001**
Total Lead, Pb	mg/L	0.001	<0.001	<0.001
Total Nickel, Ni	mg/L	0.001	<0.001	<0.001
Total Selenium, Se	mg/L	0.003	<0.003	<0.003
Total Tin, Sn	mg/L	0.002	<0.002	<0.002
Metals (dissolved) in Water by GF AAS Method: AN304				
Silver, Ag	µg/L	0.05	<0.05	<0.05
Metals (total-acid soluble) in Water by GF AAS Method: AN022/AN304				
Total (acid soluble) Silver, Ag	µg/L	0.05	<0.05	<0.05
Mercury (dissolved) in Water Method: AN311/AN312				
Mercury	mg/L	0.00005	<0.00005	<0.00005
Mercury (total) in Water Method: AN311/AN312				
Total Mercury	mg/L	0.00005	<0.00005	<0.00005

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Mercury (dissolved) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Mercury	LB021488	mg/L	0.00005	<0.00005	0%	108 - 110%

Mercury (total) in Water Method: ME-(AU)-[ENV]AN311/AN312

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery	MS %Recovery
Total Mercury	LB021489	mg/L	0.00005	<0.00005	0 - 13%	109 - 110%	124%

Metals (dissolved) in Water by GF AAS Method: ME-(AU)-[ENV]AN304

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Silver, Ag	LB021504	µg/L	0.05	<0.05	0%	103%

Metals (total-acid soluble) in Water by GF AAS Method: ME-(AU)-[ENV]AN022/AN304

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total (acid soluble) Silver, Ag	LB021501	µg/L	0.05	<0.05	0%	104%

Metals in Water (Total) by ICPOES Method: ME-(AU)-[ENV]AN022/AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Aluminium	LB021496	mg/L	0.005	<0.005	5%	99%
Total Manganese	LB021496	mg/L	0.005	<0.005	0%	109%
Total Zinc	LB021496	mg/L	0.005	<0.005	0%	110%

Metals in Water (Dissolved) by ICPOES Method: ME-(AU)-[ENV]AN320/AN321

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Aluminium, Al	LB021494	mg/L	0.005	<0.005	0%	99%
Manganese, Mn	LB021494	mg/L	0.005	<0.005	2%	109%
Sulphur as Sulphate, SO4	LB021494	mg/L	0.5	<0.5	0%	NA
Sulphur, S	LB021494	mg/L	0.1	<0.1	0%	99%
Zinc, Zn	LB021494	mg/L	0.005	<0.005	0%	110%

QC SUMMARY

MB blank results are compared to the Limit of Reporting
LCS and MS spike recoveries are measured as the percentage of analyte recovered from the sample compared the the amount of analyte spiked into the sample.
DUP and MSD relative percent differences are measured against their original counterpart samples according to the formula : *the absolute difference of the two results divided by the average of the two results as a percentage*. Where the DUP RPD is 'NA' , the results are less than the LOR and thus the RPD is not applicable.

Metals in Water (Dissolved) by ICPOES-USN Method: ME-(AU)-[ENV]AN320/AN322

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Arsenic, As	LB021498	mg/L	0.003	<0.003	4%	95%
Cadmium, Cd	LB021498	mg/L	0.0001	<0.0001	0%	105%
Chromium, Cr	LB021498	mg/L	0.001	<0.001	0%	97%
Cobalt, Co	LB021498	mg/L	0.001	<0.001	0%	101%
Copper, Cu	LB021498	mg/L	0.001	<0.001	4%	98%
Lead, Pb	LB021498	mg/L	0.001	<0.001	0%	100%
Nickel, Ni	LB021498	mg/L	0.001	<0.001	0%	102%
Selenium, Se	LB021498	mg/L	0.003	<0.003	0%	95%
Tin, Sn	LB021498	mg/L	0.002	<0.002	0%	92%

Metals in Water (Total) by ICPOES-USN Method: ME-(AU)-[ENV]AN320/AN322

Parameter	QC Reference	Units	LOR	MB	DUP %RPD	LCS %Recovery
Total Arsenic, As	LB021502	mg/L	0.003	<0.003	1%	95%
Total Cadmium, Cd	LB021502	mg/L	0.0001	<0.0001	0%	105%
Total Chromium, Cr	LB021502	mg/L	0.001	<0.001	0%	97%
Total Cobalt, Co	LB021502	mg/L	0.001	<0.001	0%	101%
Total Copper, Cu	LB021502	mg/L	0.001	<0.001	9%	98%
Total Lead, Pb	LB021502	mg/L	0.001	<0.001	0%	100%
Total Nickel, Ni	LB021502	mg/L	0.001	<0.001	0%	102%
Total Selenium, Se	LB021502	mg/L	0.003	<0.003	0%	95%
Total Tin, Sn	LB021502	mg/L	0.002	<0.002	0%	92%

Turbidity Method: ME-(AU)-[ENV]AN119

Parameter	QC Reference	Units	LOR	MB	DUP %RPD
Turbidity	LB021462	NTU	0.5	<0.5	16%

METHOD	METHODOLOGY SUMMARY
AN022/AN304	Total (acid soluble) metals by GF AAS: Unfiltered sample is digested with nitric acid prior to analysis by Graphite Furnace AAS. Referenced to APHA3113B.
AN022/AN320/AN321	Total (acid soluble) Metals by ICP-OES: Samples are digested in nitric or nitric and hydrochloric acids prior to analysis for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode (glass plus reference electrode) and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Total Dissolved Salts can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. SGS use 0.6. Reference APHA 2520 B.
AN119	Turbidity by Nepholometry: Small particles in a light beam scatter light at a range of angles. A turbidimeter measures this scatter and reports results compared to turbidity standards, in NTU. This procedure is not suitable for very dark coloured liquids or samples with high solids because light absorption causes artificially low light scatter and low turbidity. Reference APHA 2130B.
AN141	Determination of Fluoride by ISE: A fluoride ion selective electrode and reference electrode combination , in the presence of a pH/complexation buffer, is used to determine the fluoride concentration. The electrode millivolt response is measured logarithmically against fluoride concentration. Reference APHA F- C.
AN304	Filtered acidified sample analysed by GFAAS, referenced to APHA3113B.
AN311/AN312	Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
AN320/AN321	Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .
AN320/AN321	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B.
AN320/AN322	ICP-OES (Ultrasonic Nebuliser): After preservation with 10% nitric acid, a wide range of metals and some non-metals in solution can be measured by ICP- Ultrasonic nebulisation. Solutions are aspirated using an ultrasonic nebuliser into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN320/AN322	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B

METHOD SUMMARY

METHOD	METHODOLOGY SUMMARY
AN322	ICP-OES (Ultrasonic Nebuliser): After preservation with 10% nitric acid, a wide range of metals and some non-metals in solution can be measured by ICP- Ultrasonic nebulisation. Solutions are aspirated using an ultrasonic nebuliser into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components.
AN322	Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements. Reference APHA 3120 B

FOOTNOTES

IS	Insufficient sample for analysis.	LOR	Limit of Reporting
LNR	Sample listed, but not received.	↑↓	Raised or Lowered Limit of Reporting
*	This analysis is not covered by the scope of accreditation.	QFH	QC result is above the upper tolerance
**	Indicative data, theoretical holding time exceeded.	QFL	QC result is below the lower tolerance
^	Performed by outside laboratory.	-	The sample was not analysed for this analyte
		NVL	Not Validated

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: http://www.sgs.com.au/~/media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf