RAMBOLL

ENVIRONMENT
& HEALTH

Hydro Australia
Hart Road
Loxford NSW 2326
Attention: Richard Brown
Email: Richard.Brown@hydro.com

Date 29 January 2024

Sediment Basin Compliance Report

Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) engaged Ramboll to prepare this report demonstrating compliance with the requirements of Environment Protection Licence (EPL) 1548 in relation to the release of stormwater from on-site sediment basins.

Hydro operated the former aluminium smelter located off Hart Road, Loxford, which ceased operations in 2014. The Hydro Aluminium Remediation Project was approved in December 2020 as State Significant Development (SSD) 6666, which involves the construction of an on-site Engineered Containment Cell (ECC) and the relocation of smelter wastes into this ECC for long term secure storage. Hydro's EPL was updated in May 2021 to include the following conditions:

- Condition P1.2 - Addition of three new monitoring points (EPA ID 12, EPA ID 13 and EPA ID 14) to monitor discharge water quality from sediment basins within the vicinity of the new containment cell
- Condition M2 – Requirement to monitor concentrations of pollutants discharged
    - M2.1 For each monitoring/ discharge point…, the licensee must monitor (by sampling and obtaining results by analysis) the concentrations of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency specified in Column 1.
    - M2.2 Water and/ or Land Monitoring Requirements for EPA ID 12, 13, 14, monitoring of aluminium, cadmium, cyanide, fluoride and pH in milligrams per litre as a grab sample at Special Frequency 1
    - M2.3 For the purposes of the Licence, Special Frequency 1 means the collection of samples within the first 24 hours of any discharge event.
- Condition E3 – Sediment Dam Monitoring
    - E3.1 After three discharge events at sediment basins 1, 2 and 3 (corresponding to EPA ID 12, 13 and 14), the Licensee must submit a report to the EPA that provides the monitoring results

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required under Condition M2.2 along with any recommended actions. The report must be submitted via email to info@epa.nsw.gov.au.

These three discharge events occurred in August 2021, February 2022 and March 2022 during construction of the ECC. Ramboll prepared a letter report dated 2 May 2022 presenting water quality monitoring results from water quality monitoring of Sediment Basins 1, 2 and 3 after three discharge events, as per Condition E3.1. Water quality during these release events had the potential to be impacted by construction activities however, as transfer of aluminium smelter wastes to the ECC had not commenced, the discharge events were not representative of waste placement conditions. The following recommendations were made:

- Discharge monitoring from sediment basins is to be discontinued until the placement of aluminium smelter wastes in the ECC commences
- A second report be provided to EPA following the completion of three discharge monitoring events that occur during the placement of aluminium smelter wastes in the ECC and during ECC capping works
- EPA review the frequency and analytes required for the monitoring at EPA ID 12, 13 and 14 following receipt of the second report

Hydro's EPL was subsequently updated on 15 November 2023 as follows:

- Condition E2 Sediment Dam Monitoring
    - E2.1 Once the transfer of aluminium smelter waste into the Engineered Containment Cell has commenced and after three subsequent discharge events at sediment basins 1, 2 and 3 (corresponding to EPA ID 12, 13 and 14), the Licensee must submit a report to the EPA that provides the monitoring results required under Condition M2.2 along with any recommended actions. The report must be submitted via email to info@epa.nsw.gov.au
    - Note: Following the review of this report, it is the EPA's intention to review the frequency and analytes required for the monitoring at EPA ID 12, 13 and 14.

The purpose of this report is to present water quality monitoring results from water quality monitoring of Sediment Basins 1, 2 and 3, as per Condition E2.1.

Subsequent to revision of E2.1 and prior to the transfer of aluminium wastes to the ECC, discharge events occurred in May, July, August, September, October and November 2022. Reporting was not required for these events.

Sediment Basin Discharge & Monitoring Events

Since waste transfer to the ECC commencing in February 2023, two discharge events occurred in February 2023 and March 2023. No further discharge events occurred during the transfer of aluminium smelter waste to the ECC.

The following actions have been undertaken to manage surface water:

- Surface water has been pumped into one or two of the three available sediments basins
- Sediment load has been reduced by adding flocculant
- Surface water has been routinely tested for pH, conductivity, turbidity and total suspended solids prior to discharge
- On two occasions during waste transfer, surface water has been sampled and analysed as per Condition M2
- Upon receipt and review of test results, surface water has been discharged to Unnamed Creek

Monitoring of the two discharge events are summarised in **Table 1**. For each discharge event, laboratory analysis for pH, fluoride, cyanide, aluminium and cadmium was undertaken.

Table 1: Summary of Two Monitoring Events

Sediment Basin 1 (EPA ID 12)		Sediment Basin 2 (EPA ID 13)		Sediment Basin 3 (EPA ID 14)	
Date of Monitoring	**Discharge Volume**	**Date of Monitoring**	**Discharge Volume**	**Date of Monitoring**	**Discharge Volume**
24 February 2023	1.6 ML	24 February 2023	1.7 ML	24 February 2023	N/A
31 March 2023	1.6 ML	Not required	N/A	Not required	N/A

Water Quality Monitoring Results

Water quality monitoring was completed using the grab method to collect water samples directly into laboratory-supplied containers. Monitoring was completed within 24 hours after each discharge event, with samples submitted to a laboratory accredited by National Association of Testing Authority (NATA) for the analysis undertaken. The results of the two discharge and monitoring events are summarised in **Table 2**.

Table 2: Summary of Monitoring Results

Monitoring Date	Parameters	Sediment Basin 1 (EPA ID 12)	Sediment Basin 2 (EPA ID 13)	Sediment Basin 3 (EPA ID 14)
24/02/2023	pH	*	*	*
	Fluoride (mg/L)	0.8	1.0	2.4
	Cyanide (mg/L)	0.006	<0.005	<0.005
	Aluminium - dissolved (mg/L)	<0.05	<0.05	<0.05
	Cadmium - dissolved (mg/L)	<0.0002	<0.0002	<0.0002
31/3/2023	pH	7.30	-	-
	Fluoride (mg/L)	0.632	-	-
	Cyanide (mg/L)	<0.004	-	-
	Aluminium - dissolved (mg/L)	<0.0001	-	-
	Cadmium -dissolved (mg/L)	<0.001	-	-

*pH was requested on the Chain of Custody but was not reported by the laboratory

Conclusion and Recommended Actions

Condition E2.1 Sediment Dam Monitoring requires this monitoring report to be submitted to EPA along with any recommended actions.

Capping works commenced at the ECC in December 2023 and are anticipated to be completed in June 2024. The commencement of capping works involved the placement of a 300 mm layer of clay as a seal bearing layer over waste materials within the ECC. As such, rainfall over the footprint of the ECC and subsequent stormwater runoff to the three sediment basins no longer flows over waste materials and there is low potential for generation of contaminated stormwater.

The following recommendations are made:

- Discharge monitoring from sediment basins is discontinued as the generation of contaminated stormwater has been prevented by placement of the seal bearing layer and commencement of capping works

- EPA remove Special Condition E2 Sediment Dam Monitoring from Hydro's EPL as these sediment dams will be decommissioned in the first quarter of 2024 near the completion of capping works.

Yours sincerely

Kirsty Greenfield
Senior Environmental Consultant

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Attachments:
Lab reports

CHAIN OF CUSTODY RECORD

ABN 50 005 085 521

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Company	Ramboll	Project №	318000240	Project Manager	Kirsty Greenfield
Address	50 Glebe Road the Junction NSW 2289	Project Name	EPL Sampling	EDD Format (ESdat, EQuIS, Custom)	Excel and PDF
Contact Name	Sam Buckley				
Phone №	0481384112				
Special Directions					
Purchase Order					
Quote ID №					

Sampler(s)	S Buckley				
Handed over by	S Buckley				
Email for Invoice	kgreenfield@rambollcom				
Email for Results	kgreenfield@ramboll.com sbuckley@ramboll.com				

Analyses (Note: Where metals are requested, please specify "Total" or "Filtered") SUITE code must be used to attract SUITE pricing.

Containers

Turnaround Time (TAT) Requirements (Default will be 5 days if not ticked)

☐ Overnight (9am)*
☑ 1 Day* ☐ 2 Day*
☐ 3 Day* ☐ 5 Day
* Surcharges apply
☐ Other ( )

№	Client Sample ID	Sampled Date/Time (dd/mm/yy hh:mm)	Matrix (Solid (S) Water (W))	PFAS 28 compound low level - trace	Aluminium (Total & Dissolved)	Cadmium (Total & Dissolved)	Cyanide	Fluoride	pH	1L Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
1	Sed Basin 1		W	X	X	X	X	X	X									
2	Sed Basin 2		W	X	X	X	X	X	X									
3	Sed Basin 3		W	X	X	X	X	X	X									
4	Leachate Pond		W	X	X	X	X	X	X									
5																		
6																		
7																		
8																		
9																		
10																		
	Total Counts			4	4	4	4	4	4									

Method of Shipment	☐ Courier (#)	☑ Hand Delivered	☐ Postal	Name	Sam Buckley	Signature	Date 24/02/2023 Time :__
Eurofins | mgt Laboratory Use Only	Received By Jaidyn Downes	SYD | BNE | MEL | PER | ADL | (NTL) | DRW		Signature		Date 27/2/23	Time 3:00 Temperature 9.6
	Received By	SYD | BNE | MEL | PER | ADL | NTL | DRW		Signature		Date __/__/__	Time __:__ Report №

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | mgt Standard Terms and Conditions unless agreed otherwise. A copy of Eurofins | mgt Standard Terms and Conditions is available on request.

Eurofins Environment Testing Australia Pty Ltd trading as Eurofins | mgt

QS3009_R7 Modified by: Dr. R Symons Approved by: T. Lakeland Approved on: 17 August 2017

Jake 967002

Ramboll Australia Pty Ltd
Level 3/100 Pacific Highway
North Sydney
NSW 2060

Attention: **Kirsty Greenfield**

Report **967002-W**
Project name EPL SAMPLING
Project ID 318000240
Received Date Feb 24, 2023

Client Sample ID			**SED BASIN 1**	**SED BASIN 2**	**SED BASIN 3**	**LEACHATE POND LD1**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**M23-Fe0060694**	**M23-Fe0060695**	**M23-Fe0060696**	**M23-Fe0060697**
Date Sampled			**Feb 24, 2023**	**Feb 24, 2023**	**Feb 24, 2023**	**Feb 24, 2023**
Test/Reference	LOR	Unit				
Cyanide (total)	0.005	mg/L	0.006	< 0.005	< 0.005	0.008
Fluoride	0.5	mg/L	0.8	1.0	2.4	1.0
Heavy Metals						
Aluminium	0.05	mg/L	0.49	0.39	2.1	5.8
Aluminium (filtered)	0.05	mg/L	< 0.05	< 0.05	< 0.05	0.18
Cadmium	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
PFASs Summations						
Sum (PFHxS + PFOS)*	0.001	ug/L	0.005	0.006	0.012	0.66
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.001	ug/L	0.005	0.006	0.012	0.674
Sum of PFASs (n=30)*	0.005	ug/L	0.007	0.008	0.014	0.783
Sum of US EPA PFAS (PFOS + PFOA)*	0.001	ug/L	0.003	0.004	0.01	0.514
Sum of WA DWER PFAS (n=10)*	0.005	ug/L	0.007	0.008	0.014	0.754
Perfluoroalkyl sulfonamido substances- Trace						
Perfluorooctane sulfonamide (FOSA)[N11]	0.005	ug/L	< 0.005	< 0.005	< 0.005	< 0.005
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.005	ug/L	< 0.005	< 0.005	< 0.005	< 0.005
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.005	ug/L	< 0.005	< 0.005	< 0.005	< 0.005
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)[N11]	0.005	ug/L	< 0.005	< 0.005	< 0.005	< 0.005
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)[N11]	0.005	ug/L	< 0.005	< 0.005	< 0.005	< 0.005
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.005	ug/L	< 0.005	< 0.005	< 0.005	< 0.005
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.005	ug/L	< 0.005	< 0.005	< 0.005	< 0.005
13C8-FOSA (surr.)	1	%	63	62	67	62
D3-N-MeFOSA (surr.)	1	%	26	27	28	19
D5-N-EtFOSA (surr.)	1	%	26	24	22	17
D7-N-MeFOSE (surr.)	1	%	27	31	26	16
D9-N-EtFOSE (surr.)	1	%	25	25	23	16
D5-N-EtFOSAA (surr.)	1	%	42	31	35	36
D3-N-MeFOSAA (surr.)	1	%	43	36	48	56

Client Sample ID			SED BASIN 1	SED BASIN 2	SED BASIN 3	LEACHATE POND LD1
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			M23-Fe0060694	M23-Fe0060695	M23-Fe0060696	M23-Fe0060697
Date Sampled			Feb 24, 2023	Feb 24, 2023	Feb 24, 2023	Feb 24, 2023
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs) - Trace						
Perfluorobutanoic acid (PFBA)[N11]	0.005	ug/L	< 0.005	< 0.005	< 0.005	0.010
Perfluoropentanoic acid (PFPeA)[N11]	0.001	ug/L	< 0.001	< 0.001	< 0.001	0.015
Perfluorohexanoic acid (PFHxA)[N11]	0.001	ug/L	0.002	0.002	0.002	0.037
Perfluoroheptanoic acid (PFHpA)[N11]	0.001	ug/L	< 0.001	< 0.001	< 0.001	[N09]0.006
Perfluorooctanoic acid (PFOA)[N11]	0.001	ug/L	< 0.001	< 0.001	< 0.001	[N09]0.014
Perfluorononanoic acid (PFNA)[N11]	0.001	ug/L	< 0.001	< 0.001	< 0.001	< 0.001
Perfluorodecanoic acid (PFDA)[N11]	0.001	ug/L	< 0.001	< 0.001	< 0.001	< 0.001
Perfluorotridecanoic acid (PFTrDA)[N15]	0.001	ug/L	< 0.001	< 0.001	< 0.001	< 0.001
Perfluoroundecanoic acid (PFUnDA)[N11]	0.001	ug/L	< 0.001	< 0.001	< 0.001	< 0.001
Perfluorododecanoic acid (PFDoDA)[N11]	0.001	ug/L	< 0.001	< 0.001	< 0.001	< 0.001
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.001	ug/L	< 0.001	< 0.001	< 0.001	< 0.001
13C4-PFBA (surr.)	1	%	58	55	63	53
13C5-PFPeA (surr.)	1	%	70	71	78	56
13C5-PFHxA (surr.)	1	%	90	91	98	71
13C4-PFHpA (surr.)	1	%	93	89	100	75
13C8-PFOA (surr.)	1	%	89	89	96	74
13C5-PFNA (surr.)	1	%	77	70	83	76
13C6-PFDA (surr.)	1	%	63	57	68	54
13C2-PFUnDA (surr.)	1	%	42	39	49	41
13C2-PFDoDA (surr.)	1	%	35	32	33	27
13C2-PFTeDA (surr.)	1	%	22	20	15	13
Perfluoroalkyl sulfonic acids (PFSAs)- Trace						
Perfluorobutanesulfonic acid (PFBS)[N11]	0.001	ug/L	< 0.001	< 0.001	< 0.001	0.012
Perfluorononanesulfonic acid (PFNS)[N15]	0.001	ug/L	< 0.001	< 0.001	< 0.001	< 0.001
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.001	ug/L	< 0.001	< 0.001	< 0.001	0.005
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.001	ug/L	< 0.001	< 0.001	< 0.001	[N09]0.013
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.001	ug/L	[N09]0.002	[N09]0.002	[N09]0.002	[N09]0.16
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.001	ug/L	< 0.001	< 0.001	< 0.001	[N09]0.011
Perfluorooctanesulfonic acid (PFOS)[N11]	0.001	ug/L	[N09]0.003	[N09]0.004	[N09]0.010	[N09]0.50
Perfluorodecanesulfonic acid (PFDS)[N15]	0.001	ug/L	< 0.001	< 0.001	< 0.001	< 0.001
13C3-PFBS (surr.)	1	%	85	93	88	78
18O2-PFHxS (surr.)	1	%	78	75	82	65
13C8-PFOS (surr.)	1	%	60	63	63	54
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)- Trace						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.001	ug/L	< 0.001	< 0.001	< 0.001	< 0.001
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	0.005	ug/L	< 0.005	< 0.005	< 0.005	< 0.005
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.001	ug/L	< 0.001	< 0.001	< 0.001	< 0.001
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.001	ug/L	< 0.001	< 0.001	< 0.001	< 0.001
13C2-4:2 FTSA (surr.)	1	%	75	84	122	81
13C2-6:2 FTSA (surr.)	1	%	125	121	150	147
13C2-8:2 FTSA (surr.)	1	%	90	87	105	96
13C2-10:2 FTSA (surr.)	1	%	39	38	48	43

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Cyanide (total)	Melbourne	Feb 27, 2023	14 Days
- Method: LTM-INO-4020 Total Free WAD Cyanide by CFA			
Fluoride	Melbourne	Feb 27, 2023	28 Days
- Method: in-house method LTM-INO-4390 Fluoride by Discrete Analyser			
Heavy Metals	Melbourne	Feb 27, 2023	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Heavy Metals (filtered)	Melbourne	Feb 27, 2023	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Per- and Polyfluoroalkyl Substances (PFASs) - Trace			
PFASs Summations	Melbourne	Feb 27, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS) - low level			
Perfluoroalkyl sulfonamido substances- Trace	Melbourne	Feb 27, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS) - low level			
Perfluoroalkyl carboxylic acids (PFCAs) - Trace	Melbourne	Feb 27, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS) - low level			
Perfluoroalkyl sulfonic acids (PFSAs)- Trace	Melbourne	Feb 27, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS) - low level			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)- Trace	Melbourne	Feb 27, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS) - low level			

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Company Name: Ramboll Australia Pty Ltd
Address: Level 3/100 Pacific Highway
North Sydney
NSW 2060

Project Name: EPL SAMPLING
Project ID: 318000240

Order No.:
Report #: 967002
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Feb 24, 2023 3:00 PM
Due: Feb 28, 2023
Priority: 1 Day
Contact Name: Kirsty Greenfield

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Aluminium	Aluminium (filtered)	Cadmium	Cadmium (filtered)	Cyanide (total)	Fluoride	Per- and Polyfluoroalkyl Substances (PFASs) - Trace
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X	X	X	X	X
External Laboratory												
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**							
1	SED BASIN 1	Feb 24, 2023		Water	M23-Fe0060694	X	X	X	X	X	X	X
2	SED BASIN 2	Feb 24, 2023		Water	M23-Fe0060695	X	X	X	X	X	X	X
3	SED BASIN 3	Feb 24, 2023		Water	M23-Fe0060696	X	X	X	X	X	X	X
4	LEACHATE POND LD1	Feb 24, 2023		Water	M23-Fe0060697	X	X	X	X	X	X	X
Test Counts						4	4	4	4	4	4	4

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Cyanide (total)	mg/L	< 0.005			0.005	Pass	
Fluoride	mg/L	< 0.5			0.5	Pass	
Method Blank							
Heavy Metals							
Aluminium	mg/L	< 0.05			0.05	Pass	
Aluminium (filtered)	mg/L	< 0.05			0.05	Pass	
Cadmium	mg/L	< 0.0002			0.0002	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances- Trace							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.005			0.005	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.005			0.005	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.005			0.005	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	ug/L	< 0.005			0.005	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	ug/L	< 0.005			0.005	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.005			0.005	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.005			0.005	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs) - Trace							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.005			0.005	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.001			0.001	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.001			0.001	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.001			0.001	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.001			0.001	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.001			0.001	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.001			0.001	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.001			0.001	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.001			0.001	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.001			0.001	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.001			0.001	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)- Trace							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.001			0.001	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.001			0.001	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.001			0.001	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.001			0.001	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.001			0.001	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.001			0.001	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.001			0.001	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.001			0.001	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)- Trace							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.001			0.001	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	ug/L	< 0.005			0.005	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.001			0.001	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.001			0.001	Pass	
LCS - % Recovery							
Cyanide (total)	%	112			70-130	Pass	
Fluoride	%	101			70-130	Pass	
LCS - % Recovery							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Heavy Metals							
Aluminium	%	100			80-120	Pass	
Aluminium (filtered)	%	97			80-120	Pass	
Cadmium	%	92			80-120	Pass	
Cadmium (filtered)	%	90			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances- Trace							
Perfluorooctane sulfonamide (FOSA)	%	100			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	119			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	121			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	%	91			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	%	98			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	86			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	94			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs) - Trace							
Perfluorobutanoic acid (PFBA)	%	112			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	104			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	98			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	91			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	89			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	88			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	95			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	105			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	90			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	103			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	101			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)- Trace							
Perfluorobutanesulfonic acid (PFBS)	%	84			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	58			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	90			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	93			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	87			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	105			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	100			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	57			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)- Trace							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	92			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	%	107			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	104			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	146			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Aluminium (filtered)	M23-Fe0051900	NCP	%	100			75-125	Pass	
Cadmium (filtered)	M23-Fe0051900	NCP	%	86			75-125	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances- Trace				Result 1					
Perfluorooctane sulfonamide (FOSA)	M23-Fe0062224	NCP	%	103			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Fe0062224	NCP	%	125			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Fe0062224	NCP	%	96			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Fe0062224	NCP	%	109			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Fe0062224	NCP	%	103			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Fe0062224	NCP	%	107			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Fe0062224	NCP	%	88			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs) - Trace				Result 1					
Perfluorobutanoic acid (PFBA)	M23-Fe0062224	NCP	%	128			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Fe0062224	NCP	%	117			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Fe0062224	NCP	%	107			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Fe0062224	NCP	%	102			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M23-Fe0062224	NCP	%	105			50-150	Pass	
Perfluorononanoic acid (PFNA)	M23-Fe0062224	NCP	%	100			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M23-Fe0062224	NCP	%	114			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Fe0062224	NCP	%	146			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Fe0062224	NCP	%	99			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Fe0062224	NCP	%	103			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Fe0062224	NCP	%	117			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)- Trace				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M23-Fe0062224	NCP	%	98			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Fe0062224	NCP	%	118			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Fe0062224	NCP	%	104			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Fe0062224	NCP	%	97			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Fe0062224	NCP	%	82			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Fe0062224	NCP	%	121			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Fe0062224	NCP	%	115			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Fe0062224	NCP	%	93			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)- Trace				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Fe0062224	NCP	%	103			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Fe0062224	NCP	%	110			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Fe0062224	NCP	%	108			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Fe0062224	NCP	%	117			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Fluoride	M23-Fe0055161	NCP	mg/L	0.9	0.7	26	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Aluminium	M23-Fe0051152	NCP	mg/L	26	27	4.6	30%	Pass	
Aluminium (filtered)	M23-Fe0051900	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Cadmium	M23-Fe0051152	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Cadmium (filtered)	M23-Fe0051900	NCP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances- Trace				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M23-Fe0062225	NCP	ug/L	< 0.005	< 0.005	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Fe0062225	NCP	ug/L	< 0.005	< 0.005	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Fe0062225	NCP	ug/L	< 0.005	< 0.005	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Fe0062225	NCP	ug/L	< 0.005	< 0.005	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Fe0062225	NCP	ug/L	< 0.005	< 0.005	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Fe0062225	NCP	ug/L	< 0.005	< 0.005	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Fe0062225	NCP	ug/L	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs) - Trace				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M23-Fe0062225	NCP	ug/L	< 0.005	< 0.005	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Fe0062225	NCP	ug/L	< 0.001	0.017	190	30%	Fail	Q02
Perfluoroheptanoic acid (PFHpA)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)- Trace				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	

Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)- Trace				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Fe0062225	NCP	ug/L	< 0.005	0.027	190	30%	Fail	Q15
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Fe0062225	NCP	ug/L	< 0.001	< 0.001	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).
Q02	The duplicate %RPD is outside the recommended acceptance criteria. Further analysis indicates sample heterogeneity as the cause
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Andrew Black	Analytical Services Manager
Joseph Edouard	Senior Analyst-PFAS
Mary Makarios	Senior Analyst-Inorganic
Scott Beddoes	Senior Analyst-Inorganic
Scott Beddoes	Senior Analyst-Metal

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

Ramboll	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: 50 Glebe Road, The Junction NSW 2291		☐ Non Standard or urgent TAT (List due date): 03/04/2023	Custody Seal Intact? Yes No N/A
PROJECT: EPL Sampling PROJECT NO 318000240	ALS QUOTE NO.: SY/466/21	COC SEQUENCE NUMBER (Circle)	Free ice/ frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: PURCHASE ORDER NO.:	COUNTRY OF ORIGIN: Australia	COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 3.1 °C
PROJECT MANAGER: Kirsty Greenfield	CONTACT PH: 0407 149 176	OF: 1 2 3 4 5 6 7	Other comment:
SAMPLER: Sam Buckley	SAMPLER MOBILE: 0481 384 112		
COC Emailed to ALS? YES	EDD FORMAT: equis, esdat, pdf, excel		
Email Reports to: sbuckley@ramboll.com & kgreenfield@ramboll.com			
Email Invoice to: kgreenfield@ramboll.com			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Sam Buckley	JN 31.3.23		
DATE/TIME: 31/03/23	DATE/TIME: 1540	DATE/TIME: 31/3/23 5pm.	DATE/TIME: 31/3/23 1645

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Aluminium (Toal and Dissolved)	Cadmium (Toal and Dissolved)	Un-ionised Cyanide	Soluble Fluoride	pH			Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	Sed Basin 1	31/03/2023 0:00	W	Lab bottles	4	X	X	X	X	X			
				TOTAL	4								

E-MAILED

LAB OF ORIGIN: NEWCASTLE

pH @ WN

Environmental Division Sydney
Work Order Reference
ES2310901

Telephone : + 61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserv Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CERTIFICATE OF ANALYSIS

Work Order	: **ES2310901**	Page	: 1 of 2
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS KIRSTY GREENFIELD	Contact	: Customer Services ES
Address	: PO BOX 435 THE JUNCTION 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 4934 4354	Telephone	: +61-2-8784 8555
Project	: 318000240 EPL Sampling	Date Samples Received	: 31-Mar-2023 15:42
Order number	: 318001335	Date Analysis Commenced	: 31-Mar-2023
C-O-C number	: ----	Issue Date	: 03-Apr-2023 15:47
Sampler	: Sam Buckley		
Site	: ----		
Quote number	: SY/466/21_V5		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ruby Buller	Laboratory Technician	Chemistry, Newcastle West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	Sed Basin 1	----	----	----	----
			Sampling date / time	31-Mar-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2310901-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005: pH								
pH Value	----	0.01	pH Unit	**7.30**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.24**	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	----	----	----	----
ED009: Anions								
Fluoride	16984-48-8	0.010	mg/L	**0.632**	----	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle - Water, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(WATER) EA005: pH

QUALITY CONTROL REPORT

Work Order	: **ES2310901**	Page	: 1 of 3
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS KIRSTY GREENFIELD	Contact	: Customer Services ES
Address	: PO BOX 435 THE JUNCTION 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 4934 4354	Telephone	: +61-2-8784 8555
Project	: 318000240 EPL Sampling	Date Samples Received	: 31-Mar-2023
Order number	: 318001335	Date Analysis Commenced	: 31-Mar-2023
C-O-C number	: ----	Issue Date	: 03-Apr-2023
Sampler	: Sam Buckley		
Site	: ----		
Quote number	: SY/466/21_V5		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ruby Buller	Laboratory Technician	Chemistry, Newcastle West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED009: Anions (QC Lot: 4967333)									
ES2310901-001	Sed Basin 1	ED009-X: Fluoride	16984-48-8	0.01	mg/L	0.632	0.607	4.0	0% - 20%
EA005: pH (QC Lot: 4968555)									
ES2310860-006	Anonymous	EA005: pH Value	----	0.01	pH Unit	9.58	9.58	0.0	0% - 20%
ES2310913-010	Anonymous	EA005: pH Value	----	0.01	pH Unit	4.57	4.59	0.4	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4967521)									
ES2310858-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.27	0.26	4.0	0% - 20%
EG020T: Total Metals by ICP-MS (QC Lot: 4967541)									
ES2310858-007	Anonymous	EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.06	0.06	0.0	No Limit
ES2310838-001	Anonymous	EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.11	0.11	0.0	0% - 50%
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4968112)									
ES2310728-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
ES2310567-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED009: Anions (QCLot: 4967333)								
ED009-X: Fluoride	16984-48-8	0.01	mg/L	<0.010	2 mg/L	105	84.0	118
EA005: pH (QCLot: 4968555)								
EA005: pH Value	----	----	pH Unit	----	7.6 pH Unit	100	98.5	102
EG020F: Dissolved Metals by ICP-MS (QCLot: 4967521)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	87.8	80.0	116
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	88.7	84.0	110
EG020T: Total Metals by ICP-MS (QCLot: 4967541)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	89.8	82.0	120
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	91.5	86.0	116
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4968112)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	105	73.0	133

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED009: Anions (QCLot: 4967333)							
ES2310901-001	Sed Basin 1	ED009-X: Fluoride	16984-48-8	0.2 mg/L	110	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 4967521)							
ES2310858-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.25 mg/L	82.5	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 4967541)							
EN2302950-002	Anonymous	EG020A-T: Chromium	7440-47-3	1 mg/L	114	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4968112)							
ES2310567-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	103	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2310901**	Page	: 1 of 4
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MS KIRSTY GREENFIELD	Telephone	: +61-2-8784 8555
Project	: 318000240 EPL Sampling	Date Samples Received	: 31-Mar-2023
Site	: ----	Issue Date	: 03-Apr-2023
Sampler	: Sam Buckley	No. of samples received	: 1
Order number	: 318001335	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EK026SF: Total CN by Segmented Flow Analyser						
Clear Plastic Bottle - NaOH Filtered						
Sed Basin 1	----	----	----	03-Apr-2023	01-Apr-2023	**2**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005: pH							
Clear Plastic Bottle - Natural (REGIONAL LAB) (EA005)							
Sed Basin 1	**31-Mar-2023**	**----**	----	**----**	**31-Mar-2023**	31-Mar-2023	✓
ED009: Anions							
Clear Plastic Bottle - Natural (ED009-X)							
Sed Basin 1	**31-Mar-2023**	**----**	----	**----**	**31-Mar-2023**	27-Apr-2023	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
Sed Basin 1	**31-Mar-2023**	**----**	----	**----**	**01-Apr-2023**	26-Sep-2023	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
Sed Basin 1	**31-Mar-2023**	**01-Apr-2023**	26-Sep-2023	✓	**01-Apr-2023**	26-Sep-2023	✓
EK026SF: Total CN by Segmented Flow Analyser							
Clear Plastic Bottle - NaOH Filtered (EK026SF)							
Sed Basin 1	**31-Mar-2023**	**----**	----	**----**	**03-Apr-2023**	01-Apr-2023	×

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH	EA005	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH	EA005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Standard Anions -by IC (Extended Method)	ED009-X	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH	EA005	WATER	In house: Referenced to APHA 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM Schedule B(3)
Standard Anions -by IC (Extended Method)	ED009-X	WATER	In house: Referenced to APHA 4110B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)