



REPORT NUMBER R009248

**Emission Testing Report
Ingal Civil Products, Minto Plant**

Document Information

Template Version: 030620

Client Name: Ingal Civil Products
Report Number: R009248
Date of Issue: 23 June 2020
Attention: Amit Gupta
Address: 57-65 Airlds Road
Minto NSW 2566
Testing Laboratory: Ektimo Pty Ltd, ABN 86 600 381 413

Report Authorisation



NATA Accredited Laboratory
No. 14601

Steven Cooper
Client Manager

Accredited for compliance with ISO/IEC 17025 - Testing. NATA is a signatory to the ILAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

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1 EXECUTIVE SUMMARY

1.1 Background

Ektimo was engaged by Ingal Civil Products to perform emission monitoring as part of the yearly requirement stipulated in their NSW EPA Environment Protection Licence (12593).

Monitoring was performed as follows:

1.2 Project Objectives

The objectives of the project were to conduct a monitoring programme to quantify emissions from 2 discharge points to determine compliance with Ingal Civil Products' Environmental Licence.

Monitoring was performed as follows:

Location	Test Date	Test Parameters*
EPA 1 – Baghouse Stack	26 May 2020	Solid particles Hydrogen chloride Metals (type 1 & 2 substances including cadmium) + zinc Ammonia x 2
	11 June 2020	Odour x 2
EPA 2 – Galvanising Area Boiler	26 May 2020	Solid particles Nitrogen oxides, oxygen

* Flow rate, velocity, temperature and moisture were also determined.

All results are reported on a dry basis at STP (except odour wet – STP).

Plant operating conditions have been noted in the report.

1.3 Results Summary

The following licence comparison table shows that all analytes highlighted in green are within the licence limit and all analytes highlighted in red are outside the licence limit set by the NSW EPA as per licence 12593 (last amended on 15 November 2019).

EPA	Parameter	Units	Licence limit	Detected values	Detected values (corrected to 3% O ₂)
EPA 1 - Baghouse Stack	Type 1 & 2 substances in aggregate	mg/m ³	0.08	≤0.035	-
	Ammonia and ammonium compounds (Run 1)	mg/m ³	2	5.5	-
	Ammonia and ammonium compounds (Run 2)	mg/m ³	2	3.3	-
	Odour	odour units	520	49	-
	Zinc and zinc compounds	mg/m ³	5	0.044	-
	Hydrogen chloride	mg/m ³	5	<0.02	-
	Cadmium	mg/m ³	0.04	<0.0004	-
	Solid particles	mg/m ³	5	3.1	-
EPA 2 - Galvanising Area Boiler	Solid particles	mg/m ³	11	<2	<2
	Nitrogen oxides	mg/m ³	170	90	110

Please note that the measurement uncertainty associated with the test results was not considered when determining whether the results were compliant or non-compliant.

Refer to the Test Methods table for the measurement uncertainties.

2 RESULTS

2.1 EPA 1 – Baghouse Stack

Date	26/05/2020	Client	Ingal Civil Products
Report	R009248	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektimo Staff	Steven Cooper & Selin Sungur	State	NSW
Process Conditions	Routine galvanising operations		

200520

Sampling Plane Details

Sampling plane dimensions	1200 mm
Sampling plane area	1.13 m ²
Sampling port size, number	2" BSP (x2)
Access & height of ports	Elevated work platform 10 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 12
Sample plane compliance to AS4323.1	Ideal



Comments

The discharge is assumed to be composed of dry air and moisture

Stack Parameters

Moisture content, %v/v	1.9	
Gas molecular weight, g/g mole	28.8 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.29 (dry)

Gas Flow Parameters

Flow measurement time(s) (hhmm)	1020 & 1150
Temperature, °C	31
Temperature, K	304
Velocity at sampling plane, m/s	11
Volumetric flow rate, actual, m ³ /s	13
Volumetric flow rate (wet STP), m ³ /s	12
Volumetric flow rate (dry STP), m ³ /s	11
Mass flow rate (wet basis), kg/hour	53000

Isokinetic Results

Sampling time	Results	
	1040-1142	
	Concentration mg/m ³	Mass Rate g/min
Solid Particles	3.1	2.1
Chloride (as HCl)	<0.02	<0.01
Isokinetic Sampling Parameters		
Sampling time, min	60	
Isokinetic rate, %	99	
Velocity difference, %	2	

Date	26/05/2020	Client	Ingal Civil Products
Report	R009248	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektimo Staff	Steven Cooper & Selin Sungur	State	NSW
Process Conditions	Routine galvanising operations		200520

Sampling Plane Details

Sampling plane dimensions	1200 mm
Sampling plane area	1.13 m ²
Sampling port size, number	2" BSP (x2)
Access & height of ports	Elevated work platform 10 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 12
Sample plane compliance to AS4323.1	Ideal



Comments

The discharge is assumed to be composed of dry air and moisture

Stack Parameters

Moisture content, %v/v	1.9	
Gas molecular weight, g/g mole	28.8 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.29 (dry)

Gas Flow Parameters

Flow measurement time(s) (hhmm)	1150 & 1320
Temperature, °C	33
Temperature, K	306
Velocity at sampling plane, m/s	11
Volumetric flow rate, actual, m ³ /s	13
Volumetric flow rate (wet STP), m ³ /s	11
Volumetric flow rate (dry STP), m ³ /s	11
Mass flow rate (wet basis), kg/hour	53000

Isokinetic Results

Sampling time	Results	
	1215-1317	
	Concentration mg/m ³	Mass Rate g/min
Antimony	<0.004	<0.003
Arsenic	<0.002	<0.001
Beryllium	<0.0005	<0.0003
Cadmium	<0.0004	<0.0003
Chromium	0.0012	0.00083
Cobalt	<0.0006	<0.0004
Lead	0.0036	0.0024
Manganese	0.0037	0.0025
Mercury	<0.0003	<0.0002
Nickel	0.011	0.0075
Selenium	<0.005	<0.003
Tin	<0.002	<0.001
Vanadium	<0.001	<0.0007
Zinc	0.044	0.03
Type 1 & 2 Substances		
Upper Bound		
Total Type 1 Substances	≤0.011	≤0.0071
Total Type 2 Substances	≤0.025	≤0.017
Total Type 1 & 2 Substances	≤0.035	≤0.024
Isokinetic Sampling Parameters		
Sampling time, min	60	
Isokinetic rate, %	99	
Velocity difference, %	-3	

Date	26/05/2020	Client	Ingal Civil Products
Report	R009248	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektimo Staff	Steven Cooper & Selin Sungur	State	NSW
Process Conditions	Routine galvanising operations		200520

Sampling Plane Details

Sampling plane dimensions	1200 mm
Sampling plane area	1.13 m ²
Sampling port size, number	2" BSP (x2)
Access & height of ports	Elevated work platform 10 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 12
Sample plane compliance to AS4323.1	Ideal



Comments

The discharge is assumed to be composed of dry air and moisture

Stack Parameters

Moisture content, %v/v	2.1	
Gas molecular weight, g/g mole	28.7 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.29 (dry)

Gas Flow Parameters

Flow measurement time(s) (hhmm)	1320 & 1515
Temperature, °C	33
Temperature, K	306
Velocity at sampling plane, m/s	11
Volumetric flow rate, actual, m ³ /s	13
Volumetric flow rate (wet STP), m ³ /s	12
Volumetric flow rate (dry STP), m ³ /s	11
Mass flow rate (wet basis), kg/hour	53000

Isokinetic Results	Sampling time	Average		Test 1 1328-1432		Test 2 1404-1506	
		Concentration mg/m ³	Mass Rate g/min	Concentration mg/m ³	Mass Rate g/min	Concentration mg/m ³	Mass Rate g/min
Ammonia		4.4	3	5.5	3.7	3.3	2.3
Isokinetic Sampling Parameters							
Sampling time, min				60		60	
Isokinetic rate, %				102		103	
Velocity difference, %				5		5	

Date	11/06/2020	Client	Ingal Civil Products
Report	R009248	Stack ID	EPA 1 - Baghouse Stack
Licence No.	12593	Location	Minto
Ektimo Staff	Scott Woods, Joel Micale-David	State	NSW
Process Conditions	Routine galvanising operations		

200602

Sampling Plane Details

Sampling plane dimensions	1200 mm
Sampling plane area	1.13 m ²
Sampling port size, number	2" BSP (x2)
Access & height of ports	Fixed ladder 10 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 12
Sample plane compliance to AS4323.1	Ideal



Stack Parameters

Moisture content, %v/v	2.4	
Gas molecular weight, g/g mole	28.8 (wet)	29.0 (dry)
Gas density at STP, kg/m ³	1.28 (wet)	1.29 (dry)

Gas Flow Parameters

Flow measurement time(s) (hhmm)	1000 & 1030
Temperature, °C	28
Temperature, K	301
Velocity at sampling plane, m/s	11
Volumetric flow rate, actual, m ³ /s	12
Volumetric flow rate (wet STP), m ³ /s	11
Volumetric flow rate (dry STP), m ³ /s	11
Mass flow rate (wet basis), kg/hour	51000
Velocity difference, %	2

Odour	Sampling time	Average		Test 1 1005 - 1025		Test 2 1005 - 1025	
		Concentration ou	Mass Rate oum ³ /min	Concentration ou	Mass Rate oum ³ /min	Concentration ou	Mass Rate oum ³ /min
Results		49	32000	57	38000	40	27000
Lower uncertainty limit		37		26		18	
Upper uncertainty limit		64		130		89	
Hedonic tone				Neutral		Neutral	
Odour character				No discernable odour		No discernable odour	
Analysis date & time				11/06/20, 1400		11/06/20, 1400	
Holding time				4 hours		4 hours	
Dilution factor				1		1	
Bag material				Nalophan		Nalophan	
Butanol threshold (ppb)		55					
Laboratory temp (°C)		24					
Last calibration date		October 2019					

2.2 EPA 2 – Galvanising Area Boiler

Date	26/05/2020	Client	Ingal Civil Products
Report	R009248	Stack ID	EPA 2 - Galvanising Area Boiler
Licence No.	12593	Location	Minto
Ektime Staff	Steven Cooper & Selin Sungur	State	NSW
Process Conditions	Boiler operating normally		

200920

Sampling Plane Details

Sampling plane dimensions	260 mm
Sampling plane area	0.0531 m ²
Sampling port size, number	4" BSP (x2)
Access & height of ports	Elevated work platform 4 m
Duct orientation & shape	Vertical Circular
Downstream disturbance	Exit >2 D
Upstream disturbance	Bend >6 D
No. traverses & points sampled	2 4
Sample plane compliance to AS4323.1	Ideal



Stack Parameters

Moisture content, %v/v	11	
Gas molecular weight, g/g mole	28.5 (wet)	29.8 (dry)
Gas density at STP, kg/m ³	1.27 (wet)	1.33 (dry)
% Oxygen correction & Factor	3 %	1.28

Gas Flow Parameters

Flow measurement time(s) (hhmm)	0872 & 1645
Temperature, °C	159
Temperature, K	432
Velocity at sampling plane, m/s	5.9
Volumetric flow rate, actual, m ³ /s	0.31
Volumetric flow rate (wet STP), m ³ /s	0.2
Volumetric flow rate (dry STP), m ³ /s	0.18
Mass flow rate (wet basis), kg/hour	900

Gas Analyser Results		Average			Minimum			Maximum		
		1540 - 1639			1540 - 1639			1540 - 1639		
		Corrected to			Corrected to			Corrected to		
		Concentration	3% O ₂	Mass Rate	Concentration	3% O ₂	Mass Rate	Concentration	3% O ₂	Mass Rate
		mg/m ³	mg/m ³	g/min	mg/m ³	mg/m ³	g/min	mg/m ³	mg/m ³	g/min
Combustion Gases										
Nitrogen oxides (as NO ₂)		90	110	0.95	75	95	0.78	100	130	1.1
		Concentration			Concentration			Concentration		
		%v/v			%v/v			%v/v		
Oxygen		6.9			4.6			7.7		

Isokinetic Results

		Results		
		1538-1640		
		Corrected to		
		Concentration	3% O ₂	Mass Rate
		mg/m ³	mg/m ³	g/min
Solid Particles		<2	<2	<0.02
Isokinetic Sampling Parameters				
Sampling time, min		60		
Isokinetic rate, %		105		
Velocity difference, %		-9		

3 PLANT OPERATING CONDITIONS

See Ingal Civil Products records for complete process conditions.

4 TEST METHODS

All sampling and analysis performed by Ektimo unless otherwise specified. Specific details of the methods are available upon request.

Parameter	Sampling Method	Analysis Method	Uncertainty*	NATA Accredited	
				Sampling	Analysis
Sample plane criteria	NSW TM-1	NA	NA	✓	NA
Flow rate, temperature and velocity	NA	NSW TM-2	8%, 2%, 7%	NA	✓
Moisture content	NSW TM-22	NSW TM-22	8%	✓	✓
Molecular weight	NA	NSW TM-23	not specified	NA	✓
Carbon dioxide	NSW TM-24	NSW TM-24	13%	✓	✓
Nitrogen oxides	NSW TM-11	NSW TM-11	12%	✓	✓
Oxygen	NSW TM-25	NSW TM-25	13%	✓	✓
Ammonia	USEPA CTM.027	EnviroLab Inorg-093	18%	✓	✓ [‡]
Hydrogen chloride	NSW TM-8	Ektimo 235	14%	✓	✓ [†]
Solid particles (total)	NSW TM-15	NSW TM-15 ^{††}	5%	✓	✓
Total (gaseous and particulate) metals and metallic compounds	NSW TM-12, NSW TM-13, NSW TM-14	EnviroLab inhouse Metals-006, Metals-022, Metals-021	15%	✓	✓ [‡]
Type 1 substances (Sb, As, Cd, Pb, Hg)	NSW TM-12	EnviroLab inhouse Metals-006, Metals-022, Metals-021	15%	✓	✓ [‡]
Type 2 substances (Be, Cr, Co, Mn, Ni, Se, Sn, V)	NSW TM-13	EnviroLab inhouse Metals-006, Metals-022	15%	✓	✓ [‡]
Odour	NSW OM-7	NSW OM-7 [‡]	Refer to results	✓	✓

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* Uncertainty values cited in this table are calculated at the 95% confidence level (coverage factor = 2)

[†] Analysis conducted at the Ektimo Mitcham, VIC laboratory, NATA accreditation number 14601. Results were reported on 9 June 2020 in report number R009248-Halides_Halogens.

^{††} Gravimetric analysis conducted at the Ektimo Unanderra, NSW laboratory, NATA accreditation number 14601.

[‡] Odour analysis conducted at the Unanderra, NSW laboratory, by forced choice olfactometry, NATA accreditation number 14601. Results were reported on 11 June 2020 in report number ON-00041.

[‡] Analysis performed by EnviroLab, NATA accreditation number 2901. Results were reported to Ektimo on 4 June 2020 in report number 243754.

5 DEVIATIONS FROM TEST METHODS

Due to COVID-19 social distancing requirements, the minimum number of panellists stipulated in the AS 4323.3 method of 4 was not adhered to. Three (3) panellists were used and the number of dilution series for each sample was increased to achieve comparable calculated uncertainty and meet the minimum ITE requirement (8) of the method.

6 QUALITY ASSURANCE/QUALITY CONTROL INFORMATION

Ektimo is accredited by the National Association of Testing Authorities (NATA) for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with the National Association of Testing Authorities. For full details, search for Ektimo at NATA's website www.nata.com.au.

Ektimo is accredited by NATA (National Association of Testing Authorities) to ISO/IEC 17025 - Testing. ISO/IEC 17025 - Testing requires that a laboratory have adequate equipment to perform the testing, as well as laboratory personnel with the competence to perform the testing. This quality assurance system is administered and maintained by the Quality Director.

NATA is a member of APLAC (Asia Pacific Laboratory Accreditation Co-operation) and of ILAC (International Laboratory Accreditation Co-operation). Through the mutual recognition arrangements with both of these organisations, NATA accreditation is recognised worldwide.

7 DEFINITIONS

The following symbols and abbreviations may be used in this test report:

% v/v	Volume to volume ratio, dry or wet basis
~	Approximately
<	Less than
>	Greater than
≥	Greater than or equal to
APHA	American public health association, Standard Methods for the Examination of Water and Waste Water
AS	Australian Standard
BSP	British standard pipe
CARB	Californian Air Resources Board
CEM	Continuous Emission Monitoring
CEMS	Continuous Emission Monitoring System
CTM	Conditional test method
D	Duct diameter or equivalent duct diameter for rectangular ducts
D ₅₀	'Cut size' of a cyclone defined as the particle diameter at which the cyclone achieves a 50% collection efficiency ie. half of the particles are retained by the cyclone and half are not and pass through it to the next stage. The D ₅₀ method simplifies the capture efficiency distribution by assuming that a given cyclone stage captures all of the particles with a diameter equal to or greater than the D ₅₀ of that cyclone and less than the D ₅₀ of the preceding cyclone.
DECC	Department of Environment & Climate Change (NSW)
Disturbance	A flow obstruction or instability in the direction of the flow which may impede accurate flow determination. This includes centrifugal fans, axial fans, partially closed or closed dampers, louvres, bends, connections, junctions, direction changes or changes in pipe diameter.
DWER	Department of Water and Environmental Regulation (WA)
DEHP	Department of Environment and Heritage Protection (QLD)
EPA	Environment Protection Authority
FTIR	Fourier Transform Infra-red
ISC	Intersociety committee, Methods of Air Sampling and Analysis
ISO	International Organisation for Standardisation
Lower Bound	Defines values reported below detection as equal to zero.
Medium Bound	Defines values reported below detection are equal to half the detection limit.
NA	Not applicable
NATA	National Association of Testing Authorities
NIOSH	National Institute of Occupational Safety and Health
NT	Not tested or results not required
OM	Other approved method
OU	The number of odour units per unit of volume. The numerical value of the odour concentration is equal to the number of dilutions to arrive at the odour threshold (50% panel response).
PM ₁₀	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 10 microns (µm).
PM _{2.5}	Atmospheric suspended particulate matter having an equivalent aerodynamic diameter of less than approximately 2.5 microns (µm).
PSA	Particle size analysis
RATA	Relative Accuracy Test Audit
Semi-quantified VOCs	Unknown VOCs (those not matching a standard compound), are identified by matching the mass spectrum of the chromatographic peak to the NIST Standard Reference Database (version 14.0), with a match quality exceeding 70%. An estimated concentration will be determined by matching the integrated area of the peak with the nearest suitable compound in the analytical calibration standard mixture.
STP	Standard temperature and pressure. Gas volumes and concentrations are expressed on a dry basis at 0°C, at discharge oxygen concentration and an absolute pressure of 101.325 kPa, unless otherwise specified.
TM	Test Method
TOC	The sum of all compounds of carbon which contain at least one carbon to carbon bond, plus methane and its derivatives.
USEPA	United States Environmental Protection Agency
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
Velocity Difference	The percentage difference between the average of initial flows and afterflows.
Vic EPA	Victorian Environment Protection Authority
VOC	Any chemical compound based on carbon with a vapour pressure of at least 0.010 kPa at 25°C or having a corresponding volatility under the particular conditions of use. These compounds may contain oxygen, nitrogen and other elements, but specifically excluded are carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonate salts.
XRD	X-ray Diffractometry
Upper Bound	Defines values reported below detection are equal to the detection limit.
95% confidence interval	Range of values that contains the true result with 95% certainty. This means there is a 5% risk that the true result is outside this range.

8 APPENDIX: ENVIROLABS METALS/AMMONIA REPORT 191071.



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ABN 86 600 381 413

CERTIFICATE OF ANALYSIS 243754

Client Details

Client	Ektimo (Unanderra)
Attention	Steven Cooper
Address	1/251 Princes Hwy, Unanderra, NSW, 2526

Sample Details

Your Reference	<u>R009248</u>
Number of Samples	11 Liquid, 2 Filter
Date samples received	28/05/2020
Date completed instructions received	28/05/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.
 Samples were analysed as received from the client. Results relate specifically to the samples as received.
 Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

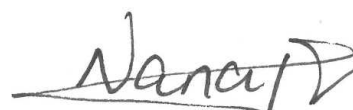
Report Details

Date results requested by	04/06/2020
Date of Issue	04/06/2020
NATA Accreditation Number 2901. This document shall not be reproduced except in full.	
Accredited for compliance with ISO/IEC 17025 - Testing. Tests not covered by NATA are denoted with *	

Results Approved By

Diego Bigolin, Team Leader, Inorganics
 Hannah Nguyen, Senior Chemist
 Loren Bardwell, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Metals on filters			
Our Reference		243754-12	243754-13
Your Reference	UNITS	N 11768	N 11769
Type of sample		Filter	Filter
Date prepared	-	29/05/2020	29/05/2020
Date analysed	-	29/05/2020	29/05/2020
Antimony	µg/filter	<5	<5
Arsenic	µg/filter	<2	<2
Cadmium	µg/filter	<0.5	<0.5
Lead	µg/filter	<1	3
Mercury	µg/filter	<0.2	<0.2
Beryllium	µg/filter	<0.5	<0.5
Chromium	µg/filter	2	3
Cobalt	µg/filter	<0.5	<0.5
Manganese	µg/filter	<0.5	2
Nickel	µg/filter	<1	9
Selenium	µg/filter	<5	<5
Tin	µg/filter	<2	<2
Vanadium	µg/filter	<1	<1
Zinc	µg/filter	3	43

Metals in water - mass units					
Our Reference		243754-1	243754-2	243754-3	243754-4
Your Reference	UNITS	N 11757	N 11758	N 11759	N 11760
Type of sample		Liquid	Liquid	Liquid	Liquid
Volume	mL	147	170	174	205
Antimony	µg	[NA]	[NA]	<0.5	<0.5
Arsenic	µg	[NA]	[NA]	<0.5	<0.5
Cadmium	µg	[NA]	[NA]	<0.05	<0.05
Lead	µg	[NA]	[NA]	<0.5	1
Mercury	µg	<1	<0.5	<10	<10
Beryllium	µg	[NA]	[NA]	<0.5	<0.5
Chromium	µg	[NA]	[NA]	<0.5	0.8
Cobalt	µg	[NA]	[NA]	<0.5	<0.5
Manganese	µg	[NA]	[NA]	<3	<3
Nickel	µg	[NA]	[NA]	<0.5	4
Selenium	µg	[NA]	[NA]	<0.5	<0.5
Vanadium	µg	[NA]	[NA]	<0.5	<0.5
Tin	µg	[NA]	[NA]	<0.5	<0.5
Zinc	µg	[NA]	[NA]	<0.5	13
Date prepared	-	02/06/2020	02/06/2020	02/06/2020	02/06/2020
Date analysed	-	02/06/2020	02/06/2020	02/06/2020	02/06/2020
Antimony-Dissolved	µg/L	[NA]	[NA]	<1	<1
Arsenic-Dissolved	µg/L	[NA]	[NA]	<1	<1
Cadmium-Dissolved	µg/L	[NA]	[NA]	<0.1	0.1
Lead-Dissolved	µg/L	[NA]	[NA]	<1	6
Mercury-Dissolved	µg/L	<0.1	0.06	<1	<1
Beryllium-Dissolved	µg/L	[NA]	[NA]	<0.5	<0.5
Chromium-Dissolved	µg/L	[NA]	[NA]	2	4
Cobalt-Dissolved	µg/L	[NA]	[NA]	<1	<1
Manganese-Dissolved	µg/L	[NA]	[NA]	<5	12
Nickel-Dissolved	µg/L	[NA]	[NA]	<1	21
Selenium-Dissolved	µg/L	[NA]	[NA]	<1	2
Vanadium-Dissolved	µg/L	[NA]	[NA]	<1	<1
Tin-Dissolved	µg/L	[NA]	[NA]	<1	<1
Zinc-Dissolved	µg/L	[NA]	[NA]	<1	62

Miscellaneous Inorganics

Our Reference		243754-5	243754-6	243754-7	243754-8	243754-9
Your Reference	UNITS	N 11761	N 11762	N 11763	N 11764	N 11765
Type of sample		Liquid	Liquid	Liquid	Liquid	Liquid
Date prepared	-	01/06/2020	01/06/2020	01/06/2020	01/06/2020	01/06/2020
Date analysed	-	01/06/2020	01/06/2020	01/06/2020	01/06/2020	01/06/2020
Volume	mL	100	77	78	92	90
Ammonia as N in impinger	mg	<0.01	5.2	0.46	3.5	0.11
Ammonia as N in water	mg/L	<0.005	68	5.9	38	1.3

Miscellaneous Inorganics

Our Reference		243754-10	243754-11
Your Reference	UNITS	N 11766	N 11767
Type of sample		Liquid	Liquid
Date prepared	-	01/06/2020	01/06/2020
Date analysed	-	01/06/2020	01/06/2020
Volume	mL	75	64
Ammonia as N in impinger	mg	0.26	0.03
Ammonia as N in water	mg/L	3.4	0.49

Method ID	Methodology Summary
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-093	Ammonia in impingers/filter pads using Discrete Analyser.
Metals-020/021/022	Determination of various metals on filters by ICP-AES/MS and or CV/AAS.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Metals on filters					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			29/05/2020	[NT]	[NT]	[NT]	[NT]	29/05/2020	[NT]
Date analysed	-			29/05/2020	[NT]	[NT]	[NT]	[NT]	29/05/2020	[NT]
Antimony	µg/filter	5	Metals-020/021/022	<5	[NT]	[NT]	[NT]	[NT]	106	[NT]
Arsenic	µg/filter	2	Metals-020/021/022	<2	[NT]	[NT]	[NT]	[NT]	94	[NT]
Cadmium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	88	[NT]
Lead	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Mercury	µg/filter	0.2	Metals-020/021/022	<0.2	[NT]	[NT]	[NT]	[NT]	93	[NT]
Beryllium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	88	[NT]
Chromium	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	104	[NT]
Cobalt	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	104	[NT]
Manganese	µg/filter	0.5	Metals-020/021/022	<0.5	[NT]	[NT]	[NT]	[NT]	92	[NT]
Nickel	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Selenium	µg/filter	5	Metals-020/021/022	<5	[NT]	[NT]	[NT]	[NT]	99	[NT]
Tin	µg/filter	2	Metals-020/021/022	<2	[NT]	[NT]	[NT]	[NT]	94	[NT]
Vanadium	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	93	[NT]
Zinc	µg/filter	1	Metals-020/021/022	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]

QUALITY CONTROL: Metals in water - mass units					Duplicate			Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Antimony	µg	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Arsenic	µg	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Cadmium	µg	0.05	Metals-022	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Lead	µg	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mercury	µg	0.5	Metals-021	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Beryllium	µg	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chromium	µg	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Cobalt	µg	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Manganese	µg	3	Metals-022	<3	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Nickel	µg	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Selenium	µg	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Vanadium	µg	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Tin	µg	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Zinc	µg	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Date prepared	-			02/06/2020	[NT]	[NT]	[NT]	[NT]	02/06/2020	[NT]
Date analysed	-			02/06/2020	[NT]	[NT]	[NT]	[NT]	02/06/2020	[NT]
Antimony-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	88	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	[NT]	[NT]	[NT]	[NT]	91	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	[NT]	[NT]	110	[NT]
Beryllium-Dissolved	µg/L	0.5	Metals-022	<0.5	[NT]	[NT]	[NT]	[NT]	89	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	<5	[NT]	[NT]	[NT]	[NT]	95	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	94	[NT]
Selenium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	95	[NT]
Vanadium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	97	[NT]
Tin-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	92	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	96	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			01/06/2020	5	01/06/2020	01/06/2020		01/06/2020	[NT]
Date analysed	-			01/06/2020	5	01/06/2020	01/06/2020		01/06/2020	[NT]
Ammonia as N in impinger	mg	0.01	Inorg-093	<0.01	5	<0.01	<0.01	0	91	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	5	<0.005	<0.005	0	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.
Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.	
The recommended maximums for analytes in urine are taken from "2018 TLVs and BEIs", as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.	
Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2	

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Metals in water - mass units - The PQL has been raised due to the sample matrix requiring dilution.