

## **EVALUATION OF MEASUREMENT UNCERTAINTY (MU)**

**SGS INDUSTRIES & ENVIROMENT, ENVIRONMENTAL TESTING:**

**CAIRNS LABORATORY, QLD**

Evaluation of measurement uncertainty (MU) was calculated at the 95% confidence interval, coverage factor  $k = 2$  using batch control sample results. The following MU values are derived from as mentioned batch control samples ranging from 10 to 100 times the limit of reporting (LOR). As analyte results decrease and approach the LOR, estimated MU will increase. At concentrations  $< 5 \times \text{LOR}$ , MU will be reported as the LOR concentration. i/s indicates insufficient data for MU Evaluation.

Microbiological measurement uncertainty (MU) is evaluated by analysis of client unknowns and PT samples by a minimum of two analysts and calculated from the standard deviation of the reproducibility of the final results which is then used to evaluate the uncertainty associated with the method.

Last Review Date: 16/05/2025

Method Number	Method Description and Scheme Code	Test/Analyte	Water	Water	Soil
			Relative MU % unless stated otherwise.	Relative MU % unless stated otherwise.	Relative MU % unless stated otherwise.
AN012	Total Sulphur	S			11.6
AN015	Colwell Phosphorus by DA (	Phosphorus			10.5
AN016	Boron by Calcium Chloride Extraction	Boron			10.4
AN025	DTPA Extractable Metals in Soil	Copper			17.9
		Iron			22.9
		Manganese			18.7
		Zinc			15.0
AN046	Exchangeable Aluminium by KCl Extraction	Al			20.9
AN065	Metals in Paint	Pb			15.2
AN101	pH soil sludge sed water	pH	0.5 pH units		1.2 pH units
AN106	Conductivity and TDS by Calculation	Conductivity	4.1		10.0
AN113	Total Dissolved Solids	TDS	12.1		
AN114	Total Suspended Solids	TSS	10.5		
AN119	Turbidity	Turbidity	3.2		
AN122	Exchangeable cations and Cation Exchange Capacity by Sum				
		Na			10.2
		K			7.7
		Ca			5.4
		Mg			8.7
AN135	Alkalinity in Aqueous Solution	Total Alkalinity	16.0		
AN140	Acidity	Acidity	12.5		
AN141	Fluoride (ion selective)	Fluoride	6.6		
AN142	Fluoride - soils	Fluoride			11.6
AN151	Sulfur by KCl Extraction at 40°C	Sulfur			8.2

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AN183	BOD	BOD	11.5		
AN185	Oil and Grease and hydrocarbons Water - Gravimetric	Oil & Grease	12.8		
AN190	Forms of Carbon in Water	NPOC	19.0		
AN205	Total Nitrogen by LECO	N			1.2
AN214	Acid Neutralising Capacity (ANC) ASS	ANC BT			6.4
AN216	Net Acid Generation (NAG)	NAG			11.9
		pH ox			12.6
		EC ox			12.2
AN240	Redox Potential	Eh	1.5		
AN217	Chromium Reducible Sulphur (CRS)	Cr <sub>s</sub>			12.7
AN218	TPA ANC SPOCAS	TPA			18.3
		Cap			13.8
		Mgp			10.2
		Sp			17.2
AN219	TAA SPOCAS	TAA			10.1
		Ca KCl			10.5
		Mg KCl			12.1
		S KCl			19.5
AN248	Oxidised Nitrogen forms AA NOx	Nitrate/Nitrite-N	19.1		15.7
AN272	Chemical Oxygen Demand DA	COD	8.8		
AN273	Total Organic Carbon DA	TOC			10.3
AN274	Chloride DA	Chloride	8.0		8.4
AN277	Nitrite DA	Nitrite	9.7		4.9
AN278	Reactive Phosphorus DA	Reactive P	8.6		
AN279	Total Phosphorus DA	Total P	15.1		

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<b>AN280</b>	<b>Ammonia DA</b>	Ammonia N	8.7		
<b>AN281S</b>	<b>TKN DA</b>	TKN	21.8		20.1
<b>AN312</b>	<b>Metals Cold Vapour - Mercury</b>	Hg	11.1	8.9	12.0
<b>AN318</b>	<b>ICP MS</b>		<b>Soluble</b>	<b>Total</b>	
		Arsenic	11.5	16.3	
		Antimony	13.7	12.2	
		Beryllium	12.3	13.7	
		Bismuth	13.2	12.8	
		Cadmium	10.0	11.7	
		Chromium	8.8	9.7	
		Cobalt	11.8	13.1	
		Copper	12.2	11.4	
		Manganese	11.4	12.5	
		Molybdenum	11.9	9.2	
		Nickel	11.3	6.9	
		Lead	11.6	13.5	
		Selenium	12.7	11.5	
		Silver	18.9	16.5	
		Tin	10.0	11.5	
		Thallium	19.0	11.6	
		Uranium	12.7	10.6	
		Vanadium	12.7	12.8	
		Zinc	13.1	15.1	
<b>AN320</b>	<b>Metals ICP OES</b>		<b>Soluble</b>	<b>Total</b>	
		Aluminium, Al	4.2	5.7	12.8
		Antimony			21.3
		Arsenic			8.1
		Barium	5.7	6.9	6.8
		Boron	7.8	7.0	6.1
		Cadmium			6.5
		Calcium	6.4	5.5	9.5
		Chromium			7.8
		Cobalt			8.6
		Copper			6.7
		Iron	7.5	6.1	13.5
		Lead			8.1
		Indium	6.2	6.4	

Method Number	Method Description and Scheme Code	Test/Analyte	Water	Water	Soil
			Relative MU % unless stated otherwise.	Relative MU % unless stated otherwise.	Relative MU % unless stated otherwise.
		Lithium	10.0	9.0	12.7
		Magnesium	3.0	5.1	12.7
		Manganese	11.8	9.0	14.5
		Molybdenum			11.7
		Nickel			6.4
		Potassium	10.0	8.0	12.9
		Phosphorus	8.7	8.6	8.9
		Selenium			13.1
		Silicon	4.1	13.2	
		Silver			12.1
		Sodium	6.9	6.7	20.1
		Strontium	10.8	10.2	
		Sulfur as SO <sub>4</sub>	6.9	8.3	
		Thallium	7.1	7.2	
		Tin			17.1
		Titanium	6.7	4.2	9.3
		Vanadium	8.1	7.7	6.3
		Zinc	11.0	10.2	11.9
	<b>Metals ICP OES - Ultra Sonic Nebuliser (USN)</b>				
		Arsenic	14.5	14.3	
		Antimony	17.2	15.3	
		Beryllium	13.8	13.4	
		Cadmium	14.2	11.6	
		Chromium	9.5	9.5	
		Cobalt	10.8	11.7	
		Copper	14.0	10.9	
		Lead	11.1	10.4	
		Molybdenum	11.3	12.6	
		Nickel	13.5	12.6	
		Selenium	19.2	21.1	
		Tin	15.7	16.4	
		Vanadium	11.3	10.7	
<b>AN701</b>	<b>Heterotrophic (Std or Total) Plate Count- Pour Plate Technique</b>	Heterotrophic Plate Count	0.24 log <sub>10</sub> cfu/mL		
<b>AN735</b>	<b>E.coli and Faecal Coliforms by Colilert-18 (Defined Substrate Technology)</b>	Coliforms	0.37 log <sub>10</sub> MPN/100mL		
		E. coli	0.38 log <sub>10</sub> MPN/100mL		
		Thermotolerant Coliforms	0.20 log <sub>10</sub> MPN/100mL		
<b>AN750</b>	<b>Enterococci- Enterolert (Defined Substrate Technology)</b>	Enterococci	0.26 log <sub>10</sub> MPN/100mL		