



## Measurement Uncertainty

All uncertainty data is calculated according to ISO GUM 1995. Evaluation of the measurement uncertainty complies with the requirements outlined in ISO/IEC 17025:2017(E) 3<sup>rd</sup> edition, which states the following:

**7.6.1** Laboratories shall identify the contributions to measurement uncertainty. When evaluating measurement uncertainty, all contributions that are of significance, including those arising from sampling, shall be taken into account using appropriate methods of analysis.

**7.6.3** A laboratory performing testing shall evaluate measurement uncertainty. Where the test method precludes rigorous evaluation of measurement uncertainty, an estimation shall be made based on an understanding of the theoretical principles or practical experience of the performance of the method.

### ***Measurement Uncertainty of Results***

The measurement uncertainty has been calculated from Certified Reference Materials (CRMs) that are analysed in tangent with samples. The reported uncertainty is an expanded uncertainty calculation using a coverage factor of two ( $k=2$ ).

Measurand	Matrix	
	Soil (±%)	Aqueous (±%)
<b>Acid Sulfate Soils</b>		
Acid Neutralizing Capacity (ANC)	17.9	N/A
Titrateable Actual Acidity (TAA)	8.9	N/A
Chromium Reducible Sulfur	15.0	N/A
HCl Extractable Sulfur	12.9	N/A
HCl Extractable Calcium	7.0	N/A
KCl Extractable Sulfur	8.6	N/A
KCl Extractable Calcium	11.1	N/A
pH – KCl	4.1	N/A
<b>Heavy Metals</b>		
Aluminium	7.7	5.5
Arsenic	10.3	2.7
Boron	16.5	6.0
Barium	28.2	1.5
Beryllium	13.7	2.6
Bismuth	5.4	2.1
Cadmium	7.3	1.7
Chromium	7.2	3.5
Cobalt	9.1	3.4
Copper	8.1	3.7
Iron	8.7	0.6
Lead	9.2	2.4
Manganese	5.2	1.3
Mercury	4.8	2.8
Molybdenum	8.3	1.8
Nickel	9.2	1.3
Zinc	9.5	0.6
Selenium	12.6	1.2
Vanadium	6.8	1.8
Phosphorus	13.1	1.7
Magnesium	15.8	0.5
Sodium	7.8	2.5
Potassium	18.1	0.5
Calcium	14.2	0.3
<b>Nutrients</b>		
Ammonia (as N)	NT	8.8
Nitrite (as N)	NT	9.6
Nitrate (as N)	NT	7.5
Nitrate and Nitrite (as N)	NT	12.2
Total Kjeldahl Nitrogen (as N)	NT	13.9
Total Nitrogen (as N)	NT	6.4
Ortho Phosphate (as P)	NT	6.3
Total Phosphate (as P)	NT	6.8
<b>Physico-Chemical Measurements</b>		
pH	NT	0.4
Conductivity	NT	0.3
Suspended Solids	NT	5.6
Total Dissolved Solids	NT	8
Total Solids	NT	6
Biochemical Oxygen Demand (BOD)	NT	6.9
Total Chlorine	NT	1.6
Free Chlorine	NT	3.0
True Colour	NT	2.7
Apparent Colour	NT	2.7
Turbidity	NT	9.6
Chloride	NT	4.6
Alkalinity	NT	1.8
Oil and Grease	NT	20

Analyte	Matrix
	Paint ( $\pm\%$ )
<b>Metals in Paint</b>	
Lead	6.1
Chromium	8.9
Cadmium	8.8

Analyte	Matrix
	Air Filters ( $\pm\%$ )
<b>Metals</b>	
Aluminium	2.0
Arsenic	3.4
Barium	1.3
Beryllium	1.8
Bismuth	1.8
Boron	1.4
Cadmium	1.4
Calcium	1.4
Chromium	1.1
Cobalt	1.6
Copper	1.4
Iron	11.8
Lead	1.9
Magnesium	18.2
Mercury	6.5
Molybdenum	16.0
Nickel	4.4
Phosphorus	2.9
Potassium	1.9
Selenium	3.1
Silicon	25.5
Silver	1.4
Sodium	1.6
Vanadium	15.2
Zinc	1.2
<b>Inhalable and Respirable Silica</b>	
Dust – Gravimetric	0.46
Respirable Crystalline Silica - Quartz	2.12



## Microbiology in Water

The measurement uncertainty of the microbiological methods is shown below. Total Coliforms, E. coli and Thermotolerant coliforms are analysed using Colilert-18 and Pseudomonas is analysed using Pseudalert. Calculations are based on "G108-Guidelines for Estimating uncertainty for Microbiological Counting Methods." The reported range is based on an expanded uncertainty calculation using a coverage factor of 2.145.

Raw Result (MPN/100mL)	Total Coliforms		E. coli		Thermotolerant Coliforms		Pseudomonas	
	Low	High	Low	High	Low	High	Low	High
1	0	3	0	3	1	2	0	3
10	4	26	4	27	7	15	4	27
20	8	51	8	53	13	30	8	53
30	12	77	11	80	20	46	11	80
40	16	102	15	106	26	61	15	106
50	20	128	19	133	33	76	19	133
60	24	153	23	160	39	91	36	99
70	27	179	26	186	46	107	42	115
80	31	204	30	213	52	122	49	132
90	35	230	34	239	59	137	55	148
100	39	255	38	266	66	152	61	165
110	43	281	41	292	72	168	67	181
120	47	306	45	319	79	183	73	198
130	51	332	49	346	85	198	79	214
140	55	357	53	372	92	213	85	231
150	59	383	56	399	98	229	91	247
160	63	408	60	425	105	244	97	264
170	67	434	64	452	112	259	103	280
180	71	459	68	479	118	274	109	297
190	74	485	71	505	125	290	115	313
200	78	510	75	532	131	305	121	330