QUASIMEME

Quality assurance of information for marine environmental monitoring

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Certificate of Analysis

Sediment

REFERENCE MATERIAL

Sediment sample 14

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis Sediment 14

General Information

In this report an overview is given of analytical data for this sample collected in our proficiency testing program. The consensus values are calculated using a robust statistical model. With this NDA model mean and standard deviation are calculated using all reported data when at least 4 results are left after removal of reported 'lower than' (<) and 0 (= zero) values. No outliers are removed.

This report is divided into two sections: Consensus Values and Indicative Values. The division is made on the reliability of the data. Consensus Values are based on at least 10 results while the relative uncertainty is smaller than 6.25%. Indicative Values are based on a relative uncertainty of maximum 35% with at least 4 and less than 10 results or a relative uncertainty higher than 6.25%.

For each determinand the following parameters are given: mean, standard deviation, coefficient of variation, number of results, median, MAD (Median of Absolute Deviation) and the uncertainty in the assigned value. The confidence limits (at 95 % probabilty) are calculated for these determinands.

The results of each determinand is expressed on dried sediment.

Sample information

QUASIMEME reference materials cover a range of natural Marine sediment species from contaminated waters from the North Sea and/or Mediterranean. There is no spiking, mixing or other alterations of the samples. For sample preparation the sediment samples are dried at 40 oC and milled to pass a 0.5 mm sieve.

This Sediment sample 14 of Open sea sediment from Off Tyne, Newcastle, United Kingdom is prepared for the QUASIMEME proficiency programs. The results on which the values in this report are based were taken from the periods given in the following table.

Year.Round	Program	Sample Round Id
2022.1	MS1	QTM138MS
2016.2	MS1	QTM116MS
2014.2	MS1	QTM108MS

Consensus Values MS1

Method: Real totals - MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Aluminium-RT	%	4.01	0.386	9.6	54	4.00	0.263	0.066	3.91 - 4.12
Arsenic-RT	mg/kg	7.43	1.026	13.8	51	7.45	0.730	0.180	7.14 - 7.72
Barium-RT	mg/kg	385	33.7	8.8	19	383	24.5	9.7	369 - 402
Cadmium-RT	µg/kg	112	26.7	23.9	50	116	19.3	4.7	104 - 120
Calcium-RT	g/kg	23.4	1.26	5.4	12	23.5	0.86	0.46	22.6 - 24.2
Chromium-RT	mg/kg	50.8	5.68	11.2	59	50.9	3.90	0.92	49.3 - 52.3
Cobalt-RT	mg/kg	6.45	0.661	10.2	26	6.49	0.445	0.162	6.19 - 6.72
Copper-RT	mg/kg	9.98	1.062	10.6	61	10.00	0.680	0.170	9.71 - 10.25
Iron-RT	%	1.79	0.133	7.4	55	1.79	0.090	0.022	1.75 - 1.83
Lead-RT	mg/kg	36.1	3.72	10.3	58	35.4	2.53	0.61	35.1 - 37.0
Lithium-RT	mg/kg	27.3	1.84	6.7	44	27.1	1.26	0.35	26.8 - 27.9
Magnesium-RT	mg/kg	7580	520	6.9	11	7500	332	196	7232 - 7922
Manganese-RT	mg/kg	268	19.4	7.2	55	268	13.7	3.3	263 - 273
Mercury-RT	µg/kg	77.8	10.00	12.8	42	77.8	6.83	1.93	74.7 - 81.0
Nickel-RT	mg/kg	18.4	1.57	8.5	54	18.4	1.06	0.27	18.0 - 18.9
Phosphorus-RT	mg/kg	520	45.3	8.7	13	518	28.4	15.7	493 - 547
Potassium-RT	mg/kg	16900	1320	7.8	12	17000	950	470	16080 - 17730
Strontium-RT	mg/kg	158	13.0	8.3	19	158	9.0	3.7	151 - 164
Vanadium-RT	mg/kg	52.4	4.06	7.7	32	52.3	2.80	0.90	50.9 - 53.8
Zinc-RT	mg/kg	70.9	4.60	6.5	60	70.8	3.00	0.74	69.7 - 72.1

Method: Acid extractable (So-called totals) - MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Arsenic-AE	mg/kg	6.45	0.917	14.2	66	6.40	0.610	0.141	6.22 - 6.67
Cadmium-AE	µg/kg	99.3	14.58	14.7	57	100.0	10.00	2.41	95.4 - 103.1
Calcium-AE	g/kg	20.7	0.61	2.9	13	20.8	0.40	0.21	20.34 - 21.07
Chromium-AE	mg/kg	30.0	7.08	23.6	63	29.8	4.90	1.11	28.2 - 31.8
Cobalt-AE	mg/kg	5.64	0.577	10.2	31	5.64	0.390	0.130	5.43 - 5.85
Copper-AE	mg/kg	7.74	0.876	11.3	66	7.88	0.617	0.135	7.53 - 7.96
Iron-AE	%	1.56	0.130	8.4	50	1.56	0.090	0.023	1.52 - 1.59
Lead-AE	mg/kg	29.6	3.35	11.3	67	29.7	2.32	0.51	28.8 - 30.5
Lithium-AE	mg/kg	20.5	3.83	18.7	29	21.0	2.50	0.89	19.1 - 22.0
Magnesium-AE	mg/kg	6860	690	10.1	16	6800	501	216	6495 - 7226
Manganese-AE	mg/kg	221	25.8	11.7	57	220	18.6	4.3	214 - 228
Mercury-AE	µg/kg	73.9	12.66	17.1	59	75.0	8.75	2.06	70.6 - 77.2
Nickel-AE	mg/kg	15.9	1.71	10.7	63	16.2	1.19	0.27	15.5 - 16.3

Consensus Values MS1

Phosphorus-AE	mg/kg	497	39.7	8.0	14	494	28.2	13.3	474	-	520
Method: Acid extractable (So-called totals) - MS1											(cont.)
Element	**Unit**	**Mean**	**Std.Dev.**	**CV %**	**N**	**Median**	**MAD**	**Uncertainty**	**95 % confidence limits**		
Strontium-AE	mg/kg	81.1	9.18	11.3	15	82.0	6.04	2.96	76.0	-	86.1
Vanadium-AE	mg/kg	34.4	7.85	22.8	39	34.0	5.40	1.57	31.8	-	36.9
Zinc-AE	mg/kg	66.4	3.25	4.9	65	66.8	2.14	0.50	65.6	-	67.2

Method: Carbon - MS1

Element	**Unit**	**Mean**	**Std.Dev.**	**CV %**	**N**	**Median**	**MAD**	**Uncertainty**	**95 % confidence limits**		
TOC	%	1.33	0.166	12.5	46	1.34	0.120	0.031	1.28	-	1.38

Indicative Values MS1

Method: Real totals - MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Cerium-RT	mg/kg	40.7	3.41	8.4	4	42.0	2.60	2.13	35.9 - 45.4
Cesium-RT	µg/kg	2430	52	2.2	5	2450	35	29	2370 - 2490
Rubidium-RT	mg/kg	60.4	6.64	11.0	8	61.0	4.42	2.93	55.0 - 65.8
Scandium-RT	mg/kg	6.48	1.026	15.8	9	6.58	0.720	0.427	5.71 - 7.25
Selenium-RT	mg/kg	0.697	0.4043	58.0	5	0.730	0.3100	0.2260	0.232 - 1.16
Sodium-RT	mg/kg	16000	250	1.5	8	16000	180	110	15838 - 16243
Sulfur-RT	mg/kg	1340	166	12.4	4	1280	128	104	1110 - 1572
Thallium-RT	µg/kg	392	19.4	4.9	4	385	14.9	12.1	365 - 419
Titanium-RT	mg/kg	2800	350	12.5	6	2820	234	179	2452 - 3152
Uranium-RT	mg/kg	1.66	0.055	3.3	7	1.67	0.040	0.026	1.62 - 1.71

Method: Acid extractable (So-called totals) - MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Aluminium-AE	%	1.43	0.583	40.8	41	1.57	0.400	0.114	1.24 - 1.61
Barium-AE	mg/kg	68.6	21.62	31.5	23	68.4	14.73	5.63	59.3 - 78.0
Gallium-AE	µg/kg	6100	2351	38.6	5	5890	1617	1314	3390 - 8800
Molybdenum-AE	mg/kg	0.413	0.1031	25.0	10	0.413	0.0700	0.0408	0.340 - 0.486
Potassium-AE	mg/kg	2750	752	27.4	8	2910	525	332	2130 - 3360
Rubidium-AE	mg/kg	24.2	12.17	50.2	4	24.5	8.58	7.61	7.34 - 41.1
Scandium-AE	mg/kg	4.49	1.238	27.6	7	4.40	0.860	0.585	3.38 - 5.60
Selenium-AE	mg/kg	0.375	0.2662	70.9	8	0.421	0.1925	0.1177	0.158 - 0.593
Sodium-AE	mg/kg	7090	556	7.8	8	7140	403	246	6640 - 7547
Sulfur-AE	mg/kg	1320	122	9.2	5	1330	90	68	1180 - 1460
Thallium-AE	µg/kg	158	74.9	47.4	9	164	56.0	31.2	102 - 214
Titanium-AE	mg/kg	325	142.2	43.8	7	363	99.7	67.2	198 - 452
Uranium-AE	mg/kg	0.718	0.1050	14.6	8	0.730	0.0665	0.0464	0.633 - 0.804

Method: Carbon - MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Inorganic-Carbonate	%	0.657	0.1544	23.5	18	0.666	0.1045	0.0455	0.580 - 0.733