



QUASIMEME

Quality assurance of information
for marine environmental monitoring

Certificate of Analysis



Sediment

REFERENCE MATERIAL

Sediment sample 15



Certificate of Analysis Sediment 15

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 % probability) 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 15 of Estuarine sediment from Clyde estuary, Scotland 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
2019.2	MS1	QTM128MS
2016.2	MS3	QPH091MS
2016.1	MS6	QSP056MS
2015.2	MS1	QTM112MS



Consensus Values MS1

Method: Real totals - MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
Aluminium-RT	%	6.42	0.842	13.1	31	6.47	0.590	0.189	6.11	- 6.73
Arsenic-RT	mg/kg	18.0	1.93	10.7	30	18.1	1.30	0.44	17.3	- 18.8
Barium-RT	mg/kg	512	51.6	10.1	13	517	34.3	17.9	481	- 543
Cadmium-RT	µg/kg	1990	239	12.0	30	1990	162	55	1902	- 2081
Chromium-RT	mg/kg	338	26.9	8.0	33	338	19.0	5.9	328	- 347
Cobalt-RT	mg/kg	20.4	1.22	6.0	17	20.2	0.90	0.37	19.8	- 21.0
Copper-RT	mg/kg	189	16.5	8.7	32	188	11.6	3.6	183	- 195
Iron-RT	%	5.00	0.192	3.8	31	5.01	0.130	0.043	4.93	- 5.07
Lead-RT	mg/kg	237	15.1	6.4	31	239	10.2	3.4	232	- 243
Lithium-RT	mg/kg	47.0	5.43	11.6	25	47.4	3.60	1.36	44.8	- 49.3
Manganese-RT	mg/kg	762	55.9	7.3	27	765	38.0	13.4	740	- 784
Mercury-RT	µg/kg	698	59.9	8.6	31	683	39.3	13.5	676	- 720
Nickel-RT	mg/kg	55.6	5.41	9.7	33	55.9	3.70	1.18	53.7	- 57.6
Strontium-RT	mg/kg	171	9.7	5.7	13	170	6.3	3.4	165	- 177
Vanadium-RT	mg/kg	99.4	3.66	3.7	20	99.5	2.36	1.02	97.7	- 101.1
Zinc-RT	mg/kg	674	50.3	7.5	32	668	35.5	11.1	656	- 692

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

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
Arsenic-AE	mg/kg	17.4	1.96	11.3	39	17.1	1.30	0.39	16.8	- 18.0
Barium-AE	mg/kg	312	53.1	17.0	14	315	38.3	17.7	281	- 342
Cadmium-AE	µg/kg	1960	161	8.2	45	1930	112	30	1908	- 2005
Chromium-AE	mg/kg	310	22.3	7.2	41	312	16.0	4.4	303	- 317
Cobalt-AE	mg/kg	19.1	1.69	8.9	19	19.2	1.20	0.49	18.3	- 19.9
Copper-AE	mg/kg	187	9.9	5.3	47	187	6.5	1.8	184.0	- 189.8
Iron-AE	%	4.63	0.331	7.1	42	4.62	0.235	0.064	4.52	- 4.73
Lead-AE	mg/kg	234	16.4	7.0	47	236	11.5	3.0	229	- 239
Lithium-AE	mg/kg	41.0	3.35	8.2	18	40.9	2.20	0.99	39.4	- 42.7
Magnesium-AE	mg/kg	10500	1440	13.7	10	10500	1030	570	9520	- 11550
Manganese-AE	mg/kg	735	42.0	5.7	42	732	28.0	8.1	722	- 748
Mercury-AE	µg/kg	682	74.9	11.0	41	678	50.9	14.6	659	- 706
Nickel-AE	mg/kg	52.5	4.84	9.2	45	52.7	3.40	0.90	51.0	- 53.9
Vanadium-AE	mg/kg	76.4	8.12	10.6	24	76.4	5.27	2.07	73.0	- 79.8
Zinc-AE	mg/kg	652	26.5	4.1	47	650	18.0	4.8	644	- 659



Consensus Values MS1

Method: Carbon - MS1
Element
TOC

Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
%	6.37	0.570	8.9	25	6.46	0.395	0.142	6.14	-	6.61



Indicative Values MS1

Method: Real totals - MS1

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
Calcium-RT	g/kg	8.42	0.981	11.6	9	8.32	0.680	0.409	7.68	- 9.16
Magnesium-RT	mg/kg	10600	1180	11.1	9	10700	810	490	9720	- 11500
Molybdenum-RT	mg/kg	3.93	0.270	6.9	6	3.96	0.197	0.138	3.66	- 4.20
Phosphorus-RT	mg/kg	4730	346	7.3	8	4750	244	153	4445	- 5009
Potassium-RT	mg/kg	14300	920	6.4	7	14300	570	430	13500	- 15150
Rubidium-RT	mg/kg	51.6	15.93	30.9	6	53.3	11.03	8.13	35.7	- 67.5
Scandium-RT	mg/kg	10.8	0.25	2.4	6	10.9	0.20	0.13	10.51	- 11.02
Selenium-RT	mg/kg	1.89	0.130	6.9	5	1.92	0.080	0.073	1.74	- 2.04
Sodium-RT	mg/kg	15800	1230	7.8	6	15600	780	630	14570	- 17010
Sulfur-RT	mg/kg	8210	606	7.4	6	8000	469	309	7600	- 8810
Thallium-RT	µg/kg	604	95.0	15.7	5	595	68.5	53.1	495	- 714
Titanium-RT	mg/kg	5380	499	9.3	8	5320	317	220	4978	- 5791
Uranium-RT	mg/kg	2.66	0.180	6.8	7	2.64	0.128	0.085	2.50	- 2.82

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

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
Aluminium-AE	%	3.76	1.367	36.4	29	3.65	0.990	0.317	3.24	- 4.28
Calcium-AE	g/kg	8.29	0.822	9.9	8	8.20	0.573	0.363	7.62	- 8.96
Gallium-AE	µg/kg	17100	1500	8.8	4	16700	1050	940	15060	- 19240
Molybdenum-AE	mg/kg	2.87	0.386	13.5	7	2.85	0.250	0.182	2.52	- 3.21
Phosphorus-AE	mg/kg	4590	241	5.3	7	4590	160	114	4376	- 4807
Scandium-AE	mg/kg	9.33	0.969	10.4	5	9.61	0.690	0.542	8.21	- 10.4
Selenium-AE	mg/kg	1.83	0.388	21.2	7	1.80	0.280	0.183	1.48	- 2.17
Strontium-AE	mg/kg	123	6.6	5.3	7	123	4.0	3.1	117	- 129
Thallium-AE	µg/kg	408	76.2	18.7	5	432	48.0	42.6	320	- 495
Uranium-AE	mg/kg	1.46	0.184	12.6	7	1.46	0.129	0.087	1.30	- 1.63



Consensus Values MS3

Method: Polycyclic aromatic hydrocarbons - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Benzo[a]anthracene	µg/kg	994	194.3	19.6	24	996	132.2	49.6	912	-	1075
Benzo[e]pyrene	µg/kg	1030	125	12.1	12	1010	82	45	950	-	1107
Benzo[g,h,i]perylene	µg/kg	960	228.1	23.7	26	928	151.6	55.9	868	-	1052
Benzo[k]fluoranthene	µg/kg	622	125.4	20.2	23	598	83.8	32.7	568	-	676
Chrysene + Triphenylene	µg/kg	1160	78	6.8	11	1150	53	30	1107	-	1211
Fluoranthene	µg/kg	2020	430	21.3	25	1970	291	108	1842	-	2196
Phenanthrene	µg/kg	1150	185	16.2	24	1150	128	47	1069	-	1225
Pyrene	µg/kg	1710	277	16.2	24	1700	192	71	1597	-	1830

Method: Carbon - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
TOC	%	6.03	0.958	15.9	11	6.10	0.694	0.361	5.40	-	6.67



Indicative Values MS3

Method: Polycyclic aromatic hydrocarbons - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Acenaphthene	µg/kg	111	29.4	26.4	24	112	19.9	7.5	98.8	-	124
Acenaphthylene	µg/kg	44.8	21.75	48.6	21	47.0	14.19	5.93	34.9	-	54.6
Anthracene	µg/kg	186	57.8	31.0	25	193	41.0	14.4	163	-	210
Benzo[a]pyrene	µg/kg	734	212.0	28.9	25	730	155.0	53.0	646	-	821
Benzo[b]fluoranthene	µg/kg	1400	436	31.0	23	1330	295	114	1217	-	1593
Chrysene	µg/kg	1000	258	25.7	16	1020	176	81	865	-	1139
Dibenz[a,h]anthracene	µg/kg	195	51.2	26.3	23	196	34.3	13.3	173	-	217
Dibenzothiophene	µg/kg	117	23.0	19.6	12	117	14.8	8.3	103	-	132
Fluorene	µg/kg	97.5	28.03	28.8	23	97.5	19.40	7.31	85.4	-	110
Indeno[1,2,3-cd]pyrene	µg/kg	910	312.8	34.4	25	872	220.1	78.2	781	-	1039
Naphthalene	µg/kg	298	85.5	28.7	23	314	57.5	22.3	261	-	335
Perylene	µg/kg	273	88.8	32.6	11	275	63.0	33.5	214	-	331
2-methylphenanthrene	µg/kg	351	64.0	18.2	6	353	44.7	32.7	287	-	415
3-6-dimethylphenanthrene	µg/kg	135	54.6	40.4	6	136	37.2	27.8	80.6	-	190
C1-phenanthr.+anthrac.	µg/kg	1390	408	29.4	8	1330	270	180	1055	-	1721
C2-phenanthr.+anthrac.	µg/kg	1960	766	39.0	8	1900	505	339	1340	-	2590
C3-phenanthr.+anthrac.	µg/kg	1500	565	37.7	6	1430	397	288	934	-	2060
C1-pyrenes+fluoranthenes	µg/kg	1200	261	21.7	5	1260	175	146	903	-	1505
C1-chrysenes	µg/kg	1120	273	24.5	4	1140	178	171	737	-	1496



Indicative Values MS6

Method: Organometals - MS6

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Tributyltin (TBT)	µg Sn/kg	18.5	8.47	45.7	17	19.6	6.14	2.57	14.2	-	22.9
Dibutyltin (DBT)	µg Sn/kg	33.7	7.73	22.9	16	33.4	5.55	2.42	29.6	-	37.8
Monobutyltin (MBT)	µg Sn/kg	127	33.9	26.7	13	133	21.9	11.8	107	-	147