



QUASIMEME

Quality assurance of information
for marine environmental monitoring

Certificate of Analysis



Sediment

REFERENCE MATERIAL

Sediment sample 28



Certificate of Analysis Sediment 28

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, the 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 8 results and a maximum relative uncertainty of 6.25%. Indicative Values are based on a maximum relative uncertainty of 35% and a minimum of 4 and maximum of 7 results, or a relative uncertainty greater than 6.25% when there are at least 8 results.

For each determinand the following parameters are given: mean, standard deviation, coefficient of variation, number of results, median, MAD (Median of Absolute Deviation), the uncertainty of the mean (consensus or indicative) value and the relative uncertainty.

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 °C and milled to pass a 0.5 mm sieve.

This Sediment sample 28 of Estuarine sediment from Firth of Forth, 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
2023.1	MS2	QOR154MS
2018.1	MS2	QOR135MS
2017.1	MS2	QOR131MS
2024.1	MS3	QPH121MS
2017.1	MS3	QPH093MS
2020.1	MS6	QSP072MS
2019.1	MS6	QSP068MS
2017.1	MS6	QSP061MS
2025.1	MS7	QBC083MS
2020.2	MS7	QBC064MS
2018.2	MS7	QBC056MS
2017.1	MS7	QBC050MS
2015.2	MS7	QBC044MS



Consensus Values MS2

Method: Chlorinated organics - MS2

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
pp'-DDE	µg/kg	0.822	0.226	27.5	41	0.860	0.120	0.044	5.36
HCB	µg/kg	18.2	6.15	33.8	49	18.7	3.72	1.10	6.03
PCB31	µg/kg	0.953	0.270	28.4	45	0.950	0.165	0.050	5.28
PCB52	µg/kg	1.19	0.322	27.2	55	1.20	0.220	0.054	4.58
PCB101	µg/kg	2.81	0.712	25.3	55	2.90	0.470	0.120	4.27
PCB105	µg/kg	0.560	0.162	28.9	38	0.563	0.095	0.033	5.86
PCB118	µg/kg	1.54	0.385	25.1	56	1.54	0.231	0.064	4.19
PCB138+PCB163	µg/kg	8.47	1.24	14.7	15	8.62	1.01	0.400	4.73
PCB153	µg/kg	6.64	1.70	25.6	57	6.59	1.07	0.282	4.24
PCB156	µg/kg	0.505	0.137	27.1	37	0.536	0.092	0.028	5.57
PCB180	µg/kg	4.11	1.15	28.0	57	4.27	0.590	0.191	4.64
PCB138	µg/kg	5.98	1.80	30.1	50	5.97	1.35	0.318	5.32
PCB170	µg/kg	2.30	0.340	14.8	10	2.31	0.170	0.134	5.85

Method: Carbon - MS2

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
TOC	%	3.14	0.336	10.7	36	3.15	0.250	0.070	2.23

Method: Nitrogen - MS2

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
PN	%	0.169	0.019	11.0	9	0.171	0.009	0.008	4.56



Indicative Values MS2

Method: Chlorinated organics - MS2

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
a-HCH	µg/kg	0.041	0.027	66.7	22	0.047	0.016	0.007	17.8
g-HCH	µg/kg	0.067	0.060	90.2	20	0.071	0.033	0.017	25.2
Dieldrin	µg/kg	0.883	0.255	28.9	20	0.853	0.164	0.071	8.07
pp'-DDT	µg/kg	0.416	0.153	36.7	34	0.424	0.103	0.033	7.87
pp'-DDD	µg/kg	1.37	0.460	33.5	43	1.40	0.290	0.088	6.38
op'-DDT	µg/kg	0.066	0.146	222.9	10	0.370	0.242	0.058	88.1
b-HCH	µg/kg	0.054	0.046	84.8	22	0.058	0.031	0.012	22.6
PCB28	µg/kg	1.11	0.409	36.8	17	1.17	0.183	0.124	11.2
PCB18	µg/kg	0.364	0.187	51.3	7	0.433	0.109	0.088	24.2
PCB44	µg/kg	0.721	0.173	23.9	7	0.720	0.097	0.082	11.3
PCB47	µg/kg	0.285	0.040	14.1	6	0.279	0.019	0.020	7.17
PCB49	µg/kg	0.825	0.368	44.6	7	0.882	0.156	0.174	21.1
PCB66	µg/kg	1.04	0.222	21.4	6	1.04	0.133	0.113	10.9
PCB110	µg/kg	2.48	0.132	5.3	6	2.47	0.060	0.067	2.71
PCB128	µg/kg	0.841	0.202	24.0	9	0.887	0.152	0.084	10.0
PCB149	µg/kg	6.10	0.808	13.2	7	6.15	0.420	0.382	6.26
PCB183	µg/kg	1.06	0.229	21.6	8	1.11	0.110	0.101	9.55
PCB187	µg/kg	2.23	0.685	30.7	6	2.46	0.335	0.350	15.7
PCB158	µg/kg	0.663	0.165	24.9	7	0.657	0.099	0.078	11.8
PCB141	µg/kg	1.86	0.202	10.8	7	1.87	0.090	0.095	5.12
PCB151	µg/kg	1.79	0.627	35.0	7	1.93	0.460	0.296	16.5
PCB194	µg/kg	0.534	0.144	27.0	9	0.602	0.128	0.060	11.2



Consensus Values MS3

Method: Polycyclic aromatic hydrocarbons - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Chrysene + Triphenylene	µg/kg	234	45.9	19.7	16	231	29.4	14.3	6.14
Indeno[1,2,3-cd]pyrene	µg/kg	162	41.6	25.7	40	162	28.5	8.22	5.08
Phenanthrene	µg/kg	385	96.5	25.1	37	377	71.4	19.8	5.16
Pyrene	µg/kg	446	74.8	16.8	37	440	42.1	15.4	3.45
Benzo[g,h,i]perylene	µg/kg	198	57.2	28.9	42	203	41.9	11.0	5.56
Fluoranthene	µg/kg	425	84.2	19.8	39	440	48.5	16.8	3.97
Benzo[a]anthracene	µg/kg	210	43.0	20.5	39	212	25.3	8.62	4.11
Benzo[a]pyrene	µg/kg	208	45.9	22.1	41	214	27.6	8.97	4.31
Benzo[k]fluoranthene	µg/kg	107	22.7	21.1	36	111	14.2	4.73	4.40
Anthracene	µg/kg	111	27.7	24.9	41	110	18.2	5.41	4.86
Chrysene	µg/kg	168	45.5	27.0	30	179	29.8	10.4	6.16

Method: Carbon - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
TOC	%	3.16	0.267	8.4	22	3.16	0.124	0.071	2.25



Indicative Values MS3

Method: Polycyclic aromatic hydrocarbons - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Benzo[e]pyrene	µg/kg	189	56.0	29.6	28	189	40.5	13.2	6.99
Benzo[b]fluoranthene	µg/kg	237	74.6	31.5	35	245	48.7	15.8	6.66
Naphthalene	µg/kg	205	66.0	32.2	37	201	46.5	13.6	6.62
Dibenz[a,h]anthracene	µg/kg	35.0	11.4	32.7	40	34.7	7.73	2.26	6.47
Fluorene	µg/kg	52.6	16.3	31.0	37	52.9	11.3	3.35	6.37
Acenaphthene	µg/kg	30.3	12.3	40.6	36	31.5	8.63	2.56	8.45
Acenaphthylene	µg/kg	25.9	14.1	54.3	31	26.1	9.50	3.16	12.2
Dibenzothiophene	µg/kg	31.6	8.54	27.1	24	31.6	4.77	2.18	6.91
3-6-dimethylphenanthrene	µg/kg	26.8	8.60	32.1	10	28.9	6.54	3.40	12.7
2-methylphenanthrene	µg/kg	129	32.3	25.2	14	131	26.4	10.8	8.40
Perylene	µg/kg	103	34.3	33.4	23	100	23.5	8.94	8.70
Triphenylene	µg/kg	59.3	16.2	27.2	11	55.5	12.9	6.09	10.3
Benzo[a]fluoranthenes (a+b+j+k)	µg/kg	506	99.0	19.6	5	523	53.2	55.4	10.9
Benzo[a]fluoranthenes (b+j)	µg/kg	398	18.6	4.7	5	390	9.80	10.4	2.62
C1-phenanthr.+anthrac.	µg/kg	534	175	32.7	15	505	124	56.3	10.5
C2-phenanthr.+anthrac.	µg/kg	481	173	36.0	15	459	87.0	55.9	11.6
C3-phenanthr.+anthrac.	µg/kg	341	129	37.9	11	318	72.6	48.7	14.3
C1-pyrenes+fluoranthenes	µg/kg	465	230	49.5	12	473	165	83.1	17.9
C2-pyrenes+fluoranthenes	µg/kg	431	133	30.8	7	432	60.3	62.6	14.5
C1-chrysenes	µg/kg	302	83.6	27.7	10	313	48.5	33.0	11.0
C2-chrysenes	µg/kg	294	288	98.1	8	282	194	127	43.4
C1-naphtalenes	µg/kg	534	145	27.2	8	539	62.3	64.2	12.0
C2-naphtalenes	µg/kg	849	458	53.9	10	846	313	181	21.3
C3-naphtalenes	µg/kg	643	367	57.1	10	669	216	145	22.6
C1-dibenzothiophenes	µg/kg	78.3	35.0	44.7	7	75.2	18.6	16.5	21.1
C2-dibenzothiophenes	µg/kg	116	43.6	37.6	7	127	21.1	20.6	17.8
C3-dibenzothiophenes	µg/kg	78.9	20.0	25.4	7	80.2	8.77	9.46	12.0
1-methylphenanthrene	µg/kg	117	47.0	40.0	5	117	27.9	26.3	22.4
1-methylnaphtalene	µg/kg	247	97.7	39.5	8	229	73.4	43.2	17.5
2-methylnaphtalene	µg/kg	403	181	44.8	6	423	104	92.2	22.9

Method: Nitrogen - MS3

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
PN	%	0.187	0.023	12.2	5	0.182	0.015	0.013	6.83



Indicative Values MS6

Method: Organometals - MS6

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Tributyltin (TBT)	µg Sn/kg	2.90	1.34	46.3	48	2.90	1.19	0.242	8.35
Dibutyltin (DBT)	µg Sn/kg	2.22	1.10	49.4	42	2.31	0.737	0.212	9.54
Monobutyltin (MBT)	µg Sn/kg	5.87	2.44	41.6	40	5.98	1.40	0.483	8.23



Consensus Values MS7

Method: Brominated Flame Retardants - MS7

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
BDE047	µg/kg	0.275	0.047	17.1	60	0.280	0.026	0.008	2.76
BDE099	µg/kg	0.237	0.038	16.0	59	0.245	0.025	0.006	2.60
BDE100	µg/kg	0.054	0.014	26.6	46	0.056	0.008	0.003	4.91
BDE209	µg/kg	33.2	7.58	22.9	49	34.2	4.97	1.35	4.08



Indicative Values MS7

Method: Brominated Flame Retardants - MS7

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
BDE028	µg/kg	0.029	0.012	39.6	45	0.033	0.008	0.002	7.37
BDE153	µg/kg	0.046	0.020	42.4	45	0.046	0.012	0.004	7.90
BDE154	µg/kg	0.045	0.017	37.5	48	0.048	0.011	0.003	6.76
BDE183	µg/kg	0.053	0.034	64.8	43	0.058	0.020	0.007	12.4
TBBP-A	µg/kg	0.215	0.132	61.3	5	0.234	0.078	0.074	34.3
α-HBCD	µg/kg	0.143	0.038	26.8	5	0.144	0.024	0.021	15.0
β-HBCD	µg/kg	0.054	0.020	36.1	5	0.055	0.011	0.011	20.2
BDE66	µg/kg	0.024	0.010	39.1	33	0.027	0.007	0.002	8.50
BDE85	µg/kg	0.010	0.013	122.2	14	0.019	0.010	0.004	40.8
BDE49	µg/kg	0.131	0.015	11.5	6	0.133	0.010	0.008	5.88