WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Sediment Exchange for Tests on Organic Contaminants

REFERENCE MATERIAL

SETOC sample 779

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis SETOC 779

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 8 results are left after removal of reported 'lower than' (<) and 0 (= zero) values. No outliers are removed.

This report is divided into three sections: Consensus Values, Indicative Values and Values for Information. The division is made on the reliability of the data. Consensus Values are based on at least 16 results while the coefficient of variation is smaller than 25 %. Indicative Values are based on at least 8 and less than 16 results or a coefficient of variation between 25 % and 50 %. Other values, based on more than 2 and less than 8 results or a coefficient of variation higher than 50 %, are given for information only.

In the sections with Consensus Values and Indicative Values the following parameters are given: mean, standard deviation, coefficient of variation, number of results, median and MAD (Median of Absolute Deviation) and the uncertainty in the consensus values. The confidence limits (at 95 % probability) are calculated for these determinands.
In the section with Information Values the following parameters are given: median, MAD and number of results. For determinands which have at least 5 results reported as smaller than (<) the median of these 'smaller than results' is calculated. In some cases this median of '<' values is much smaller than median and mean of the indicative values. This may be caused by a too optimistic (too low) value for the detection limit reported by a (small) majority of participating laboratories who report '<'-values.

All values, expressed on a weight basis (kg or %), are reported in oven dry (105 °C) material. Moisture is reported in the material as received.

Sample information

WEPAL reference materials are from natural sources only. There is no spiking, mixing or other alterations of the samples. For sample preparation the SETOC samples are dried at 40 °C and milled to pass a 0.5 mm sieve.

This SETOC sample 779 of Marine Sediment from Netherlands is prepared for the WEPAL proficiency programs. The sample is used in 5 periods (or rounds). The results on which the values in this report are based were taken from the periods given in the following table.

Year	Round	Number
2021	1	3
2018	1	3
2014	1	4
2011	1	1
2008	1	1

Consensus Values SETOC 779

Method: Polycyclic aromatic hydrocarbons

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
benzo(ghi)perylene	µg/kg	273	57.5	21.1	205	276	39.0	5.0	265 - 281
benzo(k)fluoranthene	µg/kg	191	42.3	22.1	196	190	29.0	3.8	185 - 197
chrysene	µg/kg	979	205.3	21.0	205	975	140.5	17.9	951 - 1008
fluoranthene	µg/kg	635	127.1	20.0	207	636	87.0	11.0	617 - 652
indeno(1,2,3-cd)pyrene	µg/kg	262	65.1	24.9	204	264	44.0	5.7	253 - 271
phenanthrene	µg/kg	1170	233	20.0	205	1160	158	20	1136 - 1200
pyrene	µg/kg	948	202.2	21.3	185	932	137.5	18.6	918 - 977
EPA ∑PAH(16)	µg/kg	5890	934	15.9	45	5980	623	174	5611 - 6171

Method: Polychlorobiphenyls

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
PCB 118	µg/kg	6.45	1.304	20.2	144	6.59	0.885	0.136	6.23 - 6.66
PCB 138	µg/kg	11.6	2.78	23.9	162	11.9	1.85	0.27	11.2 - 12.1
PCB 153	µg/kg	14.0	2.79	19.9	163	14.1	1.90	0.27	13.6 - 14.4
PCB 180	µg/kg	7.17	1.431	19.9	152	7.14	0.985	0.145	6.94 - 7.40
∑PCB(7)	µg/kg	64.8	9.43	14.5	27	65.9	6.90	2.27	61.1 - 68.5

Method: Organochlorine pesticides

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
dieldrin	µg/kg	14.1	3.20	22.7	24	14.3	2.32	0.82	12.8 - 15.5
p,p`-DDE	µg/kg	2.30	0.569	24.7	30	2.40	0.400	0.130	2.09 - 2.51

Method: Other parameters

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Inorganic carbon	g/kg	21.4	2.00	9.3	23	21.0	1.40	0.52	20.6 - 22.3
Organic carbon	g/kg	37.0	4.23	11.4	75	37.9	3.00	0.61	36.1 - 38.0
Mineral oil, IR	mg/kg	959	143.7	15.0	17	965	110.1	43.6	886 - 1033
Particles < 2 µm	%	28.5	5.47	19.2	22	30.0	3.75	1.46	26.1 - 30.9
Particles < 63 µm	%	86.7	13.61	15.7	20	85.9	9.75	3.80	80.4 - 93.1

Method: Metals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
As	mg/kg	17.9	1.79	10.0	87	17.9	1.20	0.24	17.52 - 18.28
Ba	mg/kg	201	27.5	13.7	49	198	18.6	4.9	193 - 209
Cd	mg/kg	2.38	0.227	9.6	91	2.38	0.150	0.030	2.33 - 2.42
Co	mg/kg	11.7	1.56	13.3	52	11.8	1.07	0.27	11.3 - 12.2
Cr	mg/kg	78.0	10.66	13.7	90	77.8	7.16	1.41	75.8 - 80.2

Consensus Values SETOC 779

Method: Metals (cont.)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Cu	mg/kg	79.4	4.86	6.1	89	79.0	3.30	0.64	78.4 - 80.4
Hg	mg/kg	0.911	0.1067	11.7	91	0.912	0.0750	0.0140	0.888 - 0.933
Ni	mg/kg	35.4	4.72	13.3	90	35.7	3.29	0.62	34.4 - 36.4
Pb	mg/kg	83.0	9.75	11.7	91	83.8	6.63	1.28	81.0 - 85.1
Zn	mg/kg	387	24.8	6.4	89	388	17.0	3.3	382 - 393

Method: Dibenzo-P Dioxin

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
1,2,3,4,6,7,8 Cl7DD	ng/kg	78.9	18.67	23.7	20	80.2	13.25	5.22	70.1 - 87.6
1,2,3,6,7,8 Cl6DD	ng/kg	6.31	1.353	21.4	18	6.60	1.000	0.399	5.64 - 6.98
2,3,7,8 Cl4DD	ng/kg	9.59	1.686	17.6	19	9.46	1.200	0.484	8.78 - 10.4

Method: Dibenzofuran

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
1,2,3,4,6,7,8 Cl7DF	ng/kg	164	30.8	18.8	20	166	20.5	8.6	149 - 178
1,2,3,4,7,8 Cl6DF	ng/kg	47.5	11.61	24.4	20	48.3	7.79	3.24	42.1 - 52.9
1,2,3,6,7,8 Cl6DF	ng/kg	24.0	4.73	19.7	18	23.3	3.41	1.39	21.7 - 26.4
1,2,3,7,8 Cl5DF	ng/kg	15.1	2.10	13.9	19	15.1	1.55	0.60	14.1 - 16.1
2,3,7,8 Cl4DF	ng/kg	12.8	3.15	24.6	20	13.3	2.30	0.88	11.3 - 14.3

Method: Polycyclic aromatic hydrocarbons

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
acenaphthene	µg/kg	50.7	21.54	42.5	155	51.0	15.00	2.16	47.3 - 54.1
anthracene	µg/kg	134	42.2	31.4	200	136	28.8	3.7	128 - 140
benz(a)anthracene	µg/kg	487	123.7	25.4	202	493	83.0	10.9	470 - 505
benzo(a)pyrene	µg/kg	231	66.0	28.6	207	230	45.5	5.7	222 - 240
benzo(b)fluoranthene	µg/kg	481	133.3	27.7	173	481	89.9	12.7	461 - 501
dibenz(ah)anthracene	µg/kg	89.5	27.30	30.5	170	90.2	18.71	2.62	85.3 - 93.6
fluorene	µg/kg	104	45.5	43.7	175	103	30.9	4.3	97.2 - 111
naphthalene	µg/kg	149	72.7	48.9	194	146	49.3	6.5	138 - 159

Method: Polychlorobiphenyls

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
PCB 028	µg/kg	8.11	2.581	31.8	133	8.47	1.730	0.280	7.67 - 8.55
PCB 031	µg/kg	6.22	2.924	47.0	14	6.90	2.110	0.977	4.55 - 7.90
PCB 052	µg/kg	8.03	2.780	34.6	150	8.30	1.938	0.284	7.58 - 8.48
PCB 077	µg/kg	0.763	0.2857	37.5	11	0.848	0.2180	0.1077	0.573 - 0.952
PCB 101	µg/kg	9.86	2.523	25.6	158	10.23	1.765	0.251	9.46 - 10.3
PCB 105	µg/kg	1.26	0.536	42.4	21	1.40	0.419	0.146	1.02 - 1.51
PCB 128	µg/kg	2.02	0.454	22.4	14	2.05	0.320	0.152	1.76 - 2.29
PCB 149	µg/kg	10.5	1.62	15.5	15	10.0	1.10	0.52	9.57 - 11.4
PCB 156	µg/kg	1.12	0.439	39.2	17	1.10	0.300	0.133	0.894 - 1.34
PCB 157	µg/kg	0.168	0.0530	31.5	9	0.180	0.0400	0.0221	0.128 - 0.208
PCB 167	µg/kg	0.597	0.2776	46.5	11	0.549	0.2010	0.1046	0.412 - 0.781
PCB 189	µg/kg	0.191	0.0543	28.5	9	0.203	0.0400	0.0226	0.150 - 0.232

Method: Organochlorine pesticides

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
1,3,5 trichlorobenzene	µg/kg	11.5	4.14	36.0	9	11.0	2.92	1.73	8.39 - 14.6
isodrin	µg/kg	7.53	3.350	44.5	16	7.32	2.421	1.047	5.76 - 9.31
o,p`-DDT	µg/kg	7.39	1.930	26.1	10	7.60	1.400	0.763	6.03 - 8.75

Method: Other parameters

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
AOX	mg/kg	163	22.4	13.7	8	159	16.5	9.9	145 - 182
CN - Total	mg/kg	1.68	0.564	33.6	45	1.66	0.380	0.105	1.51 - 1.84
EOX	mg/kg	2.93	1.144	39.0	45	3.00	0.767	0.213	2.59 - 3.27
Mineral oil, GC	mg/kg	1050	276	26.4	158	1040	191	27	1004 - 1091
Particles > 63 µm	%	3.95	1.486	37.7	16	4.60	1.215	0.464	3.16 - 4.73

Indicative Values SETOC 779

Method: Metals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Mo	mg/kg	1.15	0.356	30.9	37	1.21	0.255	0.073	1.03 - 1.27

Method: Dibenzo-P Dioxin

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
1,2,3,4,7,8 Cl6DD	ng/kg	3.37	1.555	46.1	15	4.07	1.170	0.502	2.52 - 4.23
Cl8DD	ng/kg	761	291.4	38.3	21	761	217.0	79.5	628 - 893

Method: Dibenzofuran

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
1,2,3,4,7,8,9 Cl7DF	ng/kg	27.0	7.76	28.7	19	28.0	5.35	2.23	23.3 - 30.8
2,3,4,6,7,8 Cl6DF	ng/kg	16.2	7.62	47.1	19	17.0	5.20	2.18	12.5 - 19.8
2,3,4,7,8 Cl5DF	ng/kg	15.1	4.55	30.1	20	15.0	3.20	1.27	13.0 - 17.2

Method: Experimental

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Tributyl Tin (TBT)	µg/kg	18.1	5.45	30.1	14	20.3	4.02	1.82	15.0 - 21.3

Method: Polycyclic aromatic hydrocarbons

Element	Unit	Median	MAD	N	Results smaller than (<) Median of <	N
acenaphthylene	µg/kg	34.7	12.30	141	90.0	42

Method: Polychlorobiphenyls

Element	Unit	Median	MAD	N	Results smaller than (<) Median of <	N
PCB 081	µg/kg	0.0325	0.0270	8	1.0000	15
PCB 114	µg/kg	0.0685	0.0185	6	1.0000	16
PCB 123	µg/kg	1.38	0.720	11	1.00	13
PCB 126	µg/kg	0.0370	0.0220	7	1.0000	24
PCB 169	µg/kg	0.0750	0.0710	12	1.0000	18

Method: Organochlorine pesticides

Element	Unit	Median	MAD	N	Results smaller than (<) Median of <	N
1,2,3 trichlorobenzene	µg/kg	2.11	1.336	6	10.00	14
1,2,4 trichlorobenzene	µg/kg	17.7	7.71	10		
1,2,3,4 tetrachlorobenzene	µg/kg	1.70	0.600	7	10.00	15
1,2,4,5 tetrachlorobenzene	µg/kg	3.09	0.676	3		
aldrin	µg/kg	19.0	12.45	29	4.00	34
alpha-endosulfan	µg/kg	2.06	1.064	4	3.00	53
alpha-HCH	µg/kg	4.00	1.000	5	3.00	65
beta-endosulfan	µg/kg	-	-	0	5.00	34
beta-HCH	µg/kg	2.22	1.960	5	2.00	64
cis-chlordane	µg/kg	-	-	0	2.00	38
delta-HCH	µg/kg	-	-	0	2.00	56
endosulfan	µg/kg	-	-	0	5.00	14
endosulfan sulfate	µg/kg	-	-	0	5.00	37
endrin	µg/kg	5.86	2.695	8	5.00	50
gamma-HCH	µg/kg	2.00	0.990	3	3.00	61
heptachlor	µg/kg	-	-	0	2.10	53
heptachlor epoxide	µg/kg	-	-	0	5.00	49
hexachlorobenzene	µg/kg	4.33	1.550	44	8.55	34
hexachlorobutadiene	µg/kg	1.50	0.500	13	5.00	25
o,p`-DDD	µg/kg	2.25	1.780	14	2.00	47
o,p`-DDE	µg/kg	1.55	0.500	6	1.00	55
p,p`-DDD	µg/kg	2.92	1.621	24	3.00	47

p,p`-DDT	µg/kg	2.49	1.593	18	3.00	55
pentachlorobenzene	µg/kg	1.35	0.647	17	5.00	29
telodrin	µg/kg	13.5	5.49	20	5.00	13

Method: Organochlorine pesticides — **Results smaller than (<)** (cont.)

Element	Unit	Median	MAD	N	Median of <	N
trans-chlordane	µg/kg	-	-	0	2.00	38

Method: Other parameters — **Results smaller than (<)**

Element	Unit	Median	MAD	N	Median of <	N
CN - Free	mg/kg	0.440	0.1100	4	1.000	33

Method: Dibenzo-P Dioxin — **Results smaller than (<)**

Element	Unit	Median	MAD	N	Median of <	N
1,2,3,7,8 Cl5DD	ng/kg	3.42	1.220	15	5.00	5
1,2,3,7,8,9 Cl6DD	ng/kg	4.75	1.449	19		

Method: Dibenzofuran

Element	Unit	Median	MAD	N
1,2,3,7,8,9 Cl6DF	ng/kg	12.00	4.115	18
Cl8DF	ng/kg	637	234.1	21

Method: Experimental

Element	Unit	Median	MAD	N
DEHP	µg/kg	2500	1629	6