WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Sediment Exchange for Tests on Organic Contaminants

REFERENCE MATERIAL

SETOC sample 698

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis SETOC 698

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.

All values, expressed on a weight basis (kg or %), are reported as oven-dried (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 698 of Sediment, from Germany, is prepared for the WEPAL proficiency programs. The sample has been used in 7 periods (or rounds). Only results from the last 5 periods are used. This way, the consensus values reflect the latest 'state of the art' analytical techniques used by the laboratories. The results on which the values in this report are based were taken from the periods given in the following table:

Year	Round	Number
2024	3	1
2023	4	3
2023	3	4
2023	2	1
2023	1	2

Consensus Values SETOC 698

Method: Polycyclic aromatic hydrocarbons

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
acenaphthylene	µg/kg	12.5	4.26	34.2	69	13.0	3.00	0.642	5.14
acenaphthene	µg/kg	6.08	1.23	20.2	62	6.09	0.745	0.195	3.20
fluorene	µg/kg	10.2	3.38	33.2	75	11.5	1.61	0.488	4.80
phenanthrene	µg/kg	114	19.8	17.4	135	114	11.9	2.13	1.87
anthracene	µg/kg	25.7	7.08	27.6	118	26.0	4.10	0.814	3.17
fluoranthene	µg/kg	288	36.8	12.8	137	287	22.7	3.93	1.36
pyrene	µg/kg	220	29.8	13.5	118	219	18.9	3.43	1.56
chrysene	µg/kg	161	27.3	16.9	139	162	17.4	2.90	1.80
benz(a)anthracene	µg/kg	127	19.6	15.5	138	127	12.0	2.09	1.65
benzo(b)fluoranthene	µg/kg	185	39.5	21.3	113	188	25.0	4.64	2.51
benzo(k)fluoranthene	µg/kg	87.8	14.5	16.6	136	88.9	9.35	1.56	1.78
benzo(a)pyrene	µg/kg	136	23.4	17.2	137	137	15.2	2.50	1.83
dibenz(ah)anthracene	µg/kg	29.7	5.00	16.9	106	30.3	3.28	0.607	2.05
indeno(1,2,3-cd)pyrene	µg/kg	118	20.8	17.6	131	119	13.5	2.28	1.93
benzo(ghi)perylene	µg/kg	124	19.7	15.9	135	124	12.1	2.12	1.72
EPA ∑PAH(16)	µg/kg	1694	239	14.1	82	1681	149	32.9	1.94

Method: Polychlorobiphenyls

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
PCB 028	µg/kg	18.5	5.77	31.1	126	18.8	3.95	0.642	3.46
PCB 031	µg/kg	19.9	3.90	19.6	16	20.5	2.10	1.22	6.13
PCB 052	µg/kg	147	30.1	20.5	129	148	17.7	3.31	2.26
PCB 101	µg/kg	220	41.6	18.9	128	220	28.4	4.60	2.09
PCB 105	µg/kg	30.3	4.81	15.9	30	29.9	3.45	1.10	3.62
PCB 118	µg/kg	114	21.0	18.5	127	117	13.0	2.33	2.05
PCB 128	µg/kg	10.1	0.759	7.5	27	10.0	0.400	0.183	1.81
PCB 138	µg/kg	70.5	13.2	18.7	128	70.0	7.07	1.46	2.07
PCB 149	µg/kg	76.6	15.4	20.1	19	74.0	10.0	4.42	5.76
PCB 153	µg/kg	78.1	13.1	16.7	128	78.0	7.75	1.44	1.85
PCB 156	µg/kg	3.75	0.461	12.3	26	3.82	0.380	0.113	3.01
PCB 180	µg/kg	11.6	1.89	16.3	127	11.5	1.20	0.210	1.81
PCB 114	µg/kg	2.34	0.467	19.9	18	2.32	0.320	0.138	5.88
PCB 167	µg/kg	1.75	0.333	19.1	16	1.70	0.165	0.104	5.97
∑PCB(7)	µg/kg	665	116	17.5	61	662	68.0	18.6	2.80

Consensus Values SETOC 698

Method: Organochlorine pesticides

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
hexachlorobenzene	µg/kg	40.0	5.54	13.9	39	39.8	3.60	1.11	2.77
pentachlorobenzene	µg/kg	1.41	0.266	18.9	20	1.40	0.189	0.074	5.28
p,p`-DDE	µg/kg	1.55	0.343	22.1	29	1.57	0.229	0.080	5.13

Method: Other parameters

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Mineral oil, GC	mg/kg	134	33.6	25.1	100	137	21.6	4.20	3.13
EOX	mg/kg	1.68	0.161	9.6	14	1.71	0.100	0.054	3.21
Organic carbon	g/kg	26.9	2.38	8.8	60	27.0	1.38	0.384	1.43
CN - Free	mg/kg	0.713	0.036	5.1	9	0.715	0.020	0.015	2.13

Method: Metals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
As	mg/kg	9.68	1.27	13.1	64	9.65	0.737	0.198	2.04
Cd	mg/kg	0.450	0.087	19.4	54	0.468	0.053	0.015	3.30
Cr	mg/kg	38.3	6.04	15.8	65	38.0	3.99	0.936	2.44
Cu	mg/kg	37.8	3.88	10.3	67	38.0	2.22	0.593	1.57
Hg	mg/kg	0.244	0.032	13.1	54	0.247	0.021	0.005	2.23
Ni	mg/kg	32.1	3.07	9.6	67	32.1	1.90	0.468	1.46
Pb	mg/kg	30.1	3.40	11.3	65	30.0	2.00	0.527	1.75
Zn	mg/kg	131	12.8	9.7	67	132	7.70	1.95	1.49
Ba	mg/kg	125	16.8	13.5	41	126	10.4	3.28	2.63
Co	mg/kg	8.30	0.950	11.5	50	8.32	0.640	0.168	2.03
Mo	mg/kg	0.727	0.141	19.5	36	0.721	0.088	0.029	4.05

Method: Polycyclic aromatic hydrocarbons

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
naphthalene	µg/kg	20.4	10.1	49.5	93	22.0	6.70	1.31	6.42
VROM∑PAH10	µg/kg	1194	40.1	3.4	6	1196	21.5	20.5	1.72

Method: Polychlorobiphenyls

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
PCB 077	µg/kg	1.53	0.497	32.4	14	1.71	0.330	0.166	10.8
PCB 081	µg/kg	0.069	0.024	34.8	4	0.082	0.009	0.015	21.7
PCB 123	µg/kg	8.09	4.43	54.8	16	8.88	2.66	1.39	17.1
PCB 126	µg/kg	0.050	0.024	49.2	5	0.045	0.021	0.014	27.5
PCB 157	µg/kg	0.838	0.659	78.7	10	1.20	0.476	0.261	31.1
PCB 189	µg/kg	0.152	0.024	16.0	5	0.151	0.014	0.014	8.95

Method: Organochlorine pesticides

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
hexachlorobutadiene	µg/kg	0.759	0.386	50.9	4	0.755	0.175	0.242	31.8
1,2,4 trichlorobenzene	µg/kg	2.80	0.831	29.7	12	2.86	0.420	0.300	10.7
1,3,5 trichlorobenzene	µg/kg	3.92	1.33	33.8	13	3.90	0.854	0.460	11.7
dieldrin	µg/kg	1.26	0.903	71.5	19	1.69	0.630	0.259	20.5
p,p`-DDT	µg/kg	1.61	0.463	28.8	24	1.74	0.298	0.118	7.34
p,p`-DDD	µg/kg	1.08	0.300	27.9	25	1.21	0.146	0.075	6.98
o,p`-DDD	µg/kg	0.826	0.365	44.2	13	0.817	0.223	0.127	15.3
Sum tetrachlorobenzenes	µg/kg	2.91	0.965	33.2	4	2.88	0.445	0.603	20.7

Method: Other parameters

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Inorganic carbon	g/kg	31.8	5.86	18.4	8	32.0	3.27	2.59	8.13
Particles < 2 µm	%	17.0	7.74	45.6	9	19.2	3.02	3.23	19.0
Particles < 63 µm	%	60.0	23.4	38.9	13	62.5	13.9	8.10	13.5
Particles > 63 µm	%	15.1	9.50	63.1	11	12.8	5.74	3.58	23.8
CN - Total	mg/kg	0.777	0.253	32.5	25	0.781	0.172	0.063	8.13
Particles < 16 µm	%	35.5	9.23	26.0	4	37.0	4.59	5.77	16.2
Particles < 50 µm	%	59.6	6.49	10.9	6	59.0	4.10	3.31	5.56

Method: Dibenzo-P Dioxin

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
1,2,3,7,8 Cl5DD	ng/kg	1.16	0.544	47.1	5	1.44	0.340	0.304	26.3
1,2,3,4,7,8 Cl6DD	ng/kg	1.00	0.641	63.9	6	1.34	0.452	0.327	32.6

Method: Dibenzo-P Dioxin (cont.)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
1,2,3,7,8,9 Cl6DD	ng/kg	1.97	1.13	57.6	6	2.50	0.894	0.578	29.4
1,2,3,6,7,8 Cl6DD	ng/kg	2.65	0.938	35.4	7	2.80	0.600	0.443	16.7
1,2,3,4,6,7,8 Cl7DD	ng/kg	50.7	16.5	32.7	9	52.0	11.3	6.90	13.6
Cl8DD	ng/kg	1235	417	33.8	9	1300	232	174	14.1

Method: Dibenzofuran

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
2,3,7,8 Cl4DF	ng/kg	8.57	2.42	28.3	9	8.74	1.87	1.01	11.8
2,3,4,7,8 Cl5DF	ng/kg	2.96	0.551	18.6	7	3.15	0.346	0.260	8.80
1,2,3,7,8 Cl5DF	ng/kg	2.24	0.327	14.6	6	2.32	0.173	0.167	7.47
1,2,3,4,7,8 Cl6DF	ng/kg	4.88	1.25	25.7	7	5.10	0.800	0.592	12.1
1,2,3,6,7,8 Cl6DF	ng/kg	2.04	0.341	16.7	6	2.19	0.286	0.174	8.50
2,3,4,6,7,8 Cl6DF	ng/kg	2.26	0.806	35.7	6	2.50	0.426	0.411	18.2
1,2,3,4,6,7,8 Cl7DF	ng/kg	15.5	7.51	48.5	9	14.0	4.00	3.13	20.2
1,2,3,4,7,8,9 Cl7DF	ng/kg	2.37	0.150	6.3	5	2.40	0.100	0.084	3.54
Cl8DF	ng/kg	175	53.6	30.5	9	180	30.0	22.3	12.7

Method: Brominated Flame Retardants

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
BDE 047	ng/kg	316	117	37.0	4	312	53.8	73.0	23.1
BDE 099	ng/kg	586	192	32.9	4	593	118	120	20.5
BDE 100	ng/kg	108	48.3	44.8	4	104	23.0	30.2	28.0

Method: Experimental

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
DEHP	µg/kg	718	149	20.7	4	737	73.6	92.8	12.9