



**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Sediment Exchange for Tests on Organic Contaminants

REFERENCE MATERIAL

SETOC sample 769



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 769 of Sediment from Finland is prepared for the WEPAL proficiency programs. The sample is used in 4 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
2014	4	4
2008	4	4
2007	1	3
2005	1	4



Consensus Values SETOC 769



Method: Polycyclic aromatic hydrocarbons

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
benz(a)anthracene	µg/kg	1670	401	24.0	182	1700	276	37	1613	-	1730
benzo(a)pyrene	µg/kg	1300	279	21.4	182	1310	188	26	1263	-	1345
benzo(ghi)perylene	µg/kg	900	197.5	21.9	181	901	134.9	18.4	871	-	929
benzo(k)fluoranthene	µg/kg	777	190.8	24.6	170	794	130.0	18.3	748	-	805
fluoranthene	µg/kg	3670	736	20.0	181	3690	500	68	3566	-	3782
pyrene	µg/kg	2780	594	21.4	158	2800	402	59	2686	-	2873

Method: Polychlorobiphenyls

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
PCB 105	µg/kg	0.820	0.1672	20.4	21	0.850	0.1200	0.0456	0.744	-	0.896

Method: Other parameters

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
AOX	mg/kg	94.9	21.55	22.7	19	99.0	15.00	6.18	84.5	-	105
CN - Total	mg/kg	1.98	0.417	21.0	47	1.95	0.290	0.076	1.86	-	2.11
EOX	mg/kg	25.3	5.33	21.0	60	24.6	3.62	0.86	24.0	-	26.7
Organic carbon	g/kg	16.2	2.69	16.7	56	16.2	1.90	0.45	15.4	-	16.9
Mineral oil, GC	mg/kg	238	57.4	24.1	126	240	40.0	6.4	228	-	249
Mineral oil, IR	mg/kg	343	82.1	23.9	26	341	55.5	20.1	310	-	376
Particles < 2 µm	%	17.2	2.14	12.4	33	17.1	1.49	0.47	16.5	-	18.0
Particles < 63 µm	%	41.9	9.29	22.2	21	42.4	6.47	2.53	37.7	-	46.1
Particles > 63 µm	%	55.4	6.30	11.4	18	55.7	4.25	1.86	52.3	-	58.5

Method: Metals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
As	mg/kg	11.9	1.77	14.9	93	12.0	1.20	0.23	11.50	-	12.22
Ba	mg/kg	878	78.4	8.9	16	873	57.2	24.5	836	-	919
Cd	mg/kg	1.73	0.183	10.6	98	1.74	0.125	0.023	1.69	-	1.77
Cr	mg/kg	51.5	6.51	12.6	96	51.7	4.54	0.83	50.2	-	52.9
Cu	mg/kg	135	10.5	7.8	96	135	7.0	1.3	133.0	-	137.3
Hg	mg/kg	88.3	8.10	9.2	92	87.4	5.59	1.06	86.7	-	90.0
Ni	mg/kg	31.9	3.66	11.5	96	32.1	2.53	0.47	31.2	-	32.7
Pb	mg/kg	145	17.1	11.8	96	148	11.9	2.2	141.4	-	148.3
Zn	mg/kg	268	18.2	6.8	95	267	12.2	2.3	264.5	-	271.9



Consensus Values SETOC 769

Method: Dibenzo-P Dioxin

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
C18DD	ng/kg	701	165.0	23.5	17	676	114.0	50.0	616	-	785

Method: Dibenzofuran

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
1,2,3,4,6,7,8 C17DF	ng/kg	2120	256	12.1	17	2100	184	77	1985	-	2247
1,2,3,4,7,8 C16DF	ng/kg	9510	2277	24.0	17	9300	1498	690	8340	-	10670
1,2,3,4,7,8,9 C17DF	ng/kg	786	133.3	17.0	17	800	93.0	40.4	718	-	855
1,2,3,6,7,8 C16DF	ng/kg	2010	467	23.2	17	1930	341	141	1775	-	2252
1,2,3,7,8 C15DF	ng/kg	9720	1992	20.5	17	9540	1410	604	8700	-	10740
2,3,4,7,8 C15DF	ng/kg	8620	1537	17.8	17	8750	1028	466	7830	-	9410
C18DF	ng/kg	5080	955	18.8	17	5170	632	290	4600	-	5570



Indicative Values SETOC 769



Method: Polycyclic aromatic hydrocarbons

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
acenaphthene	µg/kg	88.0	28.50	32.4	136	89.2	19.15	3.06	83.2	-	92.9
anthracene	µg/kg	487	183.6	37.7	182	500	125.0	17.0	460	-	514
benzo(b)fluoranthene	µg/kg	1560	451	28.9	147	1560	307	46	1487	-	1634
chrysene	µg/kg	1590	493	31.0	181	1580	343	46	1516	-	1661
dibenz(ah)anthracene	µg/kg	246	93.0	37.7	158	261	64.8	9.2	232	-	261
fluorene	µg/kg	248	76.5	30.8	156	246	50.5	7.7	236	-	260
indeno(1,2,3-cd)pyrene	µg/kg	891	235.8	26.5	182	907	161.0	21.9	857	-	926
phenanthrene	µg/kg	2310	658	28.4	182	2230	448	61	2217	-	2410

Method: Polychlorobiphenyls

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
PCB 028	µg/kg	6.13	2.229	36.4	85	6.45	1.560	0.302	5.65	-	6.61
PCB 077	µg/kg	0.176	0.0357	20.3	14	0.180	0.0250	0.0119	0.156	-	0.196
PCB 081	µg/kg	0.120	0.0545	45.5	12	0.130	0.0365	0.0197	0.0855	-	0.154
PCB 101	µg/kg	3.62	1.700	46.9	90	4.00	1.220	0.224	3.27	-	3.98
PCB 118	µg/kg	2.52	0.933	37.1	79	2.51	0.650	0.131	2.31	-	2.73
PCB 126	µg/kg	0.0375	0.0136	36.3	14	0.0400	0.0100	0.0045	0.0297	-	0.0453
PCB 128	µg/kg	1.12	0.196	17.6	12	1.11	0.130	0.071	0.992	-	1.24
PCB 138	µg/kg	7.10	3.402	47.9	97	7.51	2.410	0.432	6.42	-	7.79
PCB 153	µg/kg	6.93	2.461	35.5	103	7.00	1.700	0.303	6.45	-	7.42
PCB 156	µg/kg	0.731	0.2115	28.9	17	0.740	0.1500	0.0641	0.623	-	0.839
PCB 157	µg/kg	0.112	0.0216	19.3	11	0.115	0.0150	0.0081	0.0975	-	0.126
PCB 167	µg/kg	0.391	0.0745	19.1	14	0.384	0.0500	0.0249	0.348	-	0.433
PCB 169	µg/kg	0.0166	0.0051	30.7	9	0.0170	0.0036	0.0021	0.0128	-	0.0205
PCB 180	µg/kg	5.43	2.297	42.3	96	5.64	1.630	0.293	4.97	-	5.90
PCB 189	µg/kg	0.153	0.0383	25.0	10	0.148	0.0250	0.0151	0.126	-	0.180

Method: Organochlorine pesticides

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
beta-HCH	µg/kg	41.8	18.08	43.2	41	41.9	12.40	3.53	36.1	-	47.5
cis-chlordane	µg/kg	26.2	10.73	41.0	23	27.0	7.73	2.80	21.6	-	30.8
gamma-HCH	µg/kg	10.3	4.74	46.1	39	11.0	3.51	0.95	8.75	-	11.8
hexachlorobutadiene	µg/kg	10.6	4.16	39.1	21	11.0	3.00	1.14	8.76	-	12.5
o,p'-DDD	µg/kg	745	225.8	30.3	60	749	157.0	36.4	687	-	803
o,p'-DDE	µg/kg	27.8	7.34	26.4	50	29.5	5.13	1.30	25.7	-	29.9
o,p'-DDT	µg/kg	1420	477	33.5	56	1460	327	80	1295	-	1551
p,p'-DDD	µg/kg	1680	700	41.7	70	1610	486	105	1510	-	1844



Indicative Values SETOC 769

Method: Organochlorine pesticides (cont.)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
p,p'-DDE	µg/kg	306	139.6	45.6	70	323	95.1	20.9	273	-	340
p,p'-DDT	µg/kg	5180	2214	42.8	70	5410	1488	331	4650	-	5710
pentachlorobenzene	µg/kg	64.4	31.03	48.2	40	64.9	21.54	6.13	54.5	-	74.3
trans-chlordane	µg/kg	37.1	10.31	27.7	23	37.0	7.03	2.69	32.7	-	41.6

Method: Metals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Co	mg/kg	12.0	1.10	9.2	15	12.0	0.70	0.36	11.4	-	12.6
Mo	mg/kg	2.10	0.294	14.0	14	2.16	0.200	0.098	1.93	-	2.27

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	123	20.0	16.2	15	122	14.0	6.4	112	-	134
1,2,3,4,7,8 Cl6DD	ng/kg	8.99	1.587	17.6	15	9.09	1.090	0.512	8.12	-	9.87
1,2,3,6,7,8 Cl6DD	ng/kg	11.8	2.09	17.7	15	12.0	1.50	0.67	10.6	-	12.9
1,2,3,7,8,9 Cl6DD	ng/kg	10.3	2.19	21.3	15	10.5	1.50	0.71	9.05	-	11.5
2,3,7,8 Cl4DD	ng/kg	6.04	1.482	24.5	12	6.00	1.000	0.535	5.11	-	6.97

Method: Dibenzofuran

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
2,3,4,6,7,8 Cl6DF	ng/kg	968	307.3	31.8	17	970	217.0	93.2	810	-	1125
2,3,7,8 Cl4DF	ng/kg	22400	5890	26.3	17	22600	3990	1790	19430	-	25460



Indicative Values SETOC 769

Method: Polycyclic aromatic hydrocarbons

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
acenaphthylene	µg/kg	201	89.7	120	100	24
naphthalene	µg/kg	250	123.2	162	115	12

Method: Polychlorobiphenyls

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
PCB 031	µg/kg	1.70	0.120	6	10.00	9
PCB 052	µg/kg	2.01	0.920	77	5.00	57
PCB 114	µg/kg	0.602	0.2170	14		
PCB 123	µg/kg	0.0950	0.0515	10	0.5000	8
PCB 149	µg/kg	4.80	1.750	14	10.00	6

Method: Organochlorine pesticides

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
1,2,3 trichlorobenzene	µg/kg	4.83	2.232	7	5.00	17
1,2,4 trichlorobenzene	µg/kg	34.0	12.53	5		
1,3,5 trichlorobenzene	µg/kg	20.0	9.55	5		
1,2,3,4 tetrachlorobenzene	µg/kg	8.00	2.946	9	10.00	17
aldrin	µg/kg	24.2	3.57	6	5.00	54
alpha-endosulfan	µg/kg	24.5	18.85	8	5.00	47
alpha-HCH	µg/kg	342	128.3	70		
beta-endosulfan	µg/kg	39.3	22.66	5	5.00	27
chlordane	µg/kg	48.0	5.50	4	5.00	5
delta-HCH	µg/kg	8.51	2.895	16	5.00	37
dieldrin	µg/kg	28.9	14.10	7	5.00	52
endrin	µg/kg	4.87	2.171	8	5.00	52
heptachlor	µg/kg	19.5	17.15	14	5.00	43
heptachlor epoxide	µg/kg	1.39	0.626	6	5.00	43
hexachlorobenzene	µg/kg	2290	791	72		
isodrin	µg/kg	12.6	5.40	6	5.00	39
telodrin	µg/kg	-	-	0	5.00	30

Method: Other parameters

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
CN - Free	mg/kg	0.195	0.1485	6	1.000	32



Indicative Values SETOC 769



Inorganic carbon	g/kg	1.50	0.600	19
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Indicative Values SETOC 769

Method: Dibenzo-P Dioxin

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
1,2,3,7,8 Cl5DD	ng/kg	10.00	5.600	11	10.00	5

Method: Dibenzofuran

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
1,2,3,7,8,9 Cl6DF	ng/kg	787	568.0	17		

Method: Experimental

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
DEHP	µg/kg	781	190.0	3		
Tributyl Tin (TBT)	µg/kg	-	-	0	4.00	12