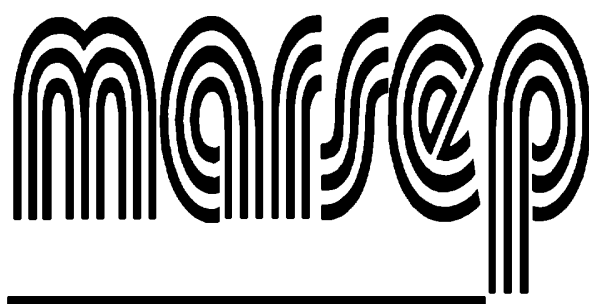




WEPAL-QUASIMEME

Certificate of Analysis



International Manure and Refuse Sample Exchange Program

REFERENCE MATERIAL

MARSEP sample 250

2026-Jul-30

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 measurand 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.

Please note: Most WEPAL-QUASIMEME reference materials are found to be stable over the long term (>10 years) for most measurand/matrix combinations. There are a few exceptions known to us as being less stable over the long term. These are organotins in sediment (MS6), ASP in shellfish (BT7), some PAHs and PCBs in sediment (SETOC) and N-NH₄ (as N) & N-NO₃ (as N) in clay soils (ISE).

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 MARSEP samples are dried at 40°C and milled to pass a 0.5 mm sieve.

This MARSEP sample 250 of Sewage Sludge, from Netherlands, is prepared for the WEPAL proficiency programs. The sample has been used in 57 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. It also gives a better estimate of the concentrations of non-stable or volatile measurands. The results on which the values in this report are based were taken from the rounds given in the following table:

Year	Round	Number
2026	2	2
2024	4	3
2024	3	4
2024	2	1
2024	1	2

Consensus Values MARSEP 250

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Ag	µg/kg	14236	761	5.3	14	14185	619	254	1.79
Al	g/kg	21.3	1.57	7.4	55	21.4	0.750	0.265	1.25
As	mg/kg	11.1	0.993	8.9	57	11.1	0.666	0.164	1.48
B	mg/kg	32.4	5.32	16.4	39	33.3	3.70	1.07	3.28
Ba	mg/kg	349	49.2	14.1	25	345	34.9	12.3	3.53
Ca	g/kg	38.2	2.04	5.3	106	38.2	1.20	0.248	0.649
Cd	mg/kg	1.92	0.146	7.6	108	1.93	0.093	0.018	0.914
Co	mg/kg	5.16	0.357	6.9	90	5.17	0.239	0.047	0.912
Cr	mg/kg	47.1	3.32	7.0	106	47.0	1.90	0.403	0.855
Cu	mg/kg	387	19.9	5.1	111	387	13.0	2.36	0.610
Fe	g/kg	51.1	3.13	6.1	81	50.8	2.00	0.435	0.852
Hg	µg/kg	1810	175	9.7	95	1819	106	22.4	1.24
K	g/kg	1.86	0.170	9.1	125	1.88	0.097	0.019	1.02
Li	mg/kg	3.90	0.168	4.3	9	3.90	0.100	0.070	1.80
Mg	g/kg	3.39	0.233	6.9	117	3.40	0.160	0.027	0.792
Mn	mg/kg	499	27.6	5.5	80	498	17.1	3.86	0.774
Mo	mg/kg	6.41	0.530	8.3	84	6.41	0.320	0.072	1.13
Na	g/kg	1.14	0.103	9.0	73	1.13	0.069	0.015	1.32
Ni	mg/kg	38.6	2.28	5.9	106	38.6	1.42	0.277	0.718
N	g/kg	44.2	1.72	3.9	112	44.2	1.08	0.203	0.459
P	g/kg	32.0	1.68	5.3	125	31.9	1.01	0.188	0.588
Pb	mg/kg	163	11.8	7.2	108	163	8.02	1.42	0.869
Sb	µg/kg	3010	443	14.7	21	3049	201	121	4.02
Se	µg/kg	1739	201	11.6	27	1738	128	48.5	2.79
Sn	mg/kg	34.3	3.63	10.6	22	35.0	1.68	0.967	2.82
Sr	mg/kg	302	37.5	12.4	14	298	22.2	12.5	4.14
V	mg/kg	14.1	1.11	7.9	34	14.2	0.665	0.239	1.69
Zn	mg/kg	1142	62.6	5.5	110	1143	43.1	7.46	0.653
S	mg/kg	12779	1208	9.5	55	12680	665	204	1.59
TC =total C (org+inorg)	g/kg	322	14.2	4.4	40	323	8.52	2.80	0.871
Tl	µg/kg	97.1	9.80	10.1	13	100	8.40	3.40	3.50
U	mg/kg	1.79	0.119	6.6	15	1.82	0.086	0.038	2.14
TOC =total org.C	g/kg	326	28.6	8.8	13	327	15.0	9.91	3.03
OC = org.C	g/kg	345	21.7	6.3	10	352	10.8	8.57	2.48

Consensus Values MARSEP 250

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
AOX	mg/kg	230	13.4	5.8	17	231	10.0	4.05	1.76
loss-on-ignition	%	60.5	0.495	0.8	89	60.5	0.330	0.066	0.108
residue-on-ignition	%	39.4	0.678	1.7	19	39.3	0.400	0.195	0.494
dry weight	%	91.9	0.657	0.7	63	92.0	0.500	0.103	0.113

Indicative Values MARSEP 250

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Be	µg/kg	200	41.9	21.0	17	205	25.0	12.7	6.35
Bi	µg/kg	5976	931	15.6	6	5645	640	475	7.95
N - NH4 (as N)	mg/kg	1706	823	48.3	5	1686	264	460	27.0
S - SO4 (as S)	mg/kg	12760	1532	12.0	5	12308	1099	857	6.71
Ti	mg/kg	217	108	49.7	6	235	72.5	55.0	25.4