WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Manure and Refuse Sample Exchange Program

REFERENCE MATERIAL

MARSEP sample 288

WAGENINGEN
UNIVERSITY & RESEARCH

marsep

Certificate of Analysis MARSEP 288

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

This MARSEP sample 288 of Sewage sludge, from Switzerland, is prepared for the WEPAL proficiency programs. The sample has been used in 2 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
2024	3	3
2022	3	1

Consensus Values MARSEP 288

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	g/kg	21.1	1.31	6.2	20	21.1	0.700	0.367	1.74
As	mg/kg	6.81	0.653	9.6	22	6.81	0.355	0.174	2.55
B	mg/kg	29.2	5.20	17.8	18	29.2	2.42	1.53	5.25
Ba	mg/kg	460	52.7	11.5	10	451	37.5	20.8	4.53
Ca	g/kg	45.7	2.14	4.7	45	45.7	1.15	0.398	0.870
Cd	mg/kg	0.735	0.087	11.8	48	0.740	0.054	0.016	2.13
Co	mg/kg	6.41	0.531	8.3	34	6.35	0.365	0.114	1.78
Cr	mg/kg	56.3	4.59	8.1	47	55.7	3.25	0.837	1.49
Cu	mg/kg	351	19.6	5.6	50	350	14.3	3.46	0.985
Fe	g/kg	47.4	2.24	4.7	32	46.9	1.44	0.496	1.05
Hg	µg/kg	409	51.8	12.7	41	410	28.9	10.1	2.47
K	g/kg	2.24	0.467	20.8	56	2.25	0.280	0.078	3.48
Mg	g/kg	5.53	0.368	6.7	52	5.51	0.222	0.064	1.15
Mn	mg/kg	456	26.9	5.9	32	456	17.1	5.95	1.30
Mo	mg/kg	7.44	0.779	10.5	33	7.57	0.379	0.170	2.28
Na	g/kg	0.769	0.088	11.4	28	0.776	0.054	0.021	2.70
Ni	mg/kg	29.5	1.87	6.3	45	29.7	1.25	0.348	1.18
N	g/kg	41.2	1.14	2.8	54	41.2	0.700	0.195	0.472
P	g/kg	35.8	1.73	4.8	56	35.8	0.950	0.289	0.806
Pb	mg/kg	34.6	3.36	9.7	48	34.7	2.08	0.605	1.75
Se	µg/kg	2339	258	11.0	8	2334	154	114	4.87
Sn	mg/kg	24.9	1.92	7.7	9	25.0	0.800	0.798	3.21
Sr	mg/kg	319	38.3	12.0	8	321	19.0	16.9	5.31
V	mg/kg	27.4	3.00	11.0	12	27.6	2.43	1.08	3.95
Zn	mg/kg	1022	44.4	4.3	48	1022	28.1	8.02	0.785
S	mg/kg	8945	576	6.4	17	8886	410	175	1.95
TC =totalC (org+inorg)	g/kg	309	11.9	3.9	20	310	6.55	3.33	1.08

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
AOX	mg/kg	194	11.8	6.1	10	194	7.50	4.66	2.40
loss-on-ignition	%	57.8	0.606	1.0	46	57.8	0.385	0.112	0.193
dry weight	%	93.6	0.811	0.9	29	93.6	0.480	0.188	0.201

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Indicative Values MARSEP 288

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Ag	µg/kg	18990	1301	6.9	4	19100	600	813	4.28
Be	µg/kg	222	17.0	7.7	7	226	10.3	8.05	3.63
Bi	µg/kg	16482	676	4.1	5	16400	500	378	2.29
Li	mg/kg	5.94	1.28	21.5	5	5.89	0.735	0.713	12.0
Sb	µg/kg	2200	285	12.9	7	2260	160	134	6.11
Ti	mg/kg	260	86.6	33.4	4	251	44.5	54.1	20.8
Tl	µg/kg	93.5	44.0	47.0	5	126	26.0	24.6	26.3
U	mg/kg	3.57	0.314	8.8	4	3.59	0.146	0.196	5.50
TOC =total org.C	g/kg	307	37.9	12.3	7	305	25.0	17.9	5.83
OC = org.C	g/kg	296	58.9	19.9	4	296	29.0	36.8	12.4

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
residue-on-ignition	%	42.6	1.01	2.4	4	42.5	0.530	0.634	1.49