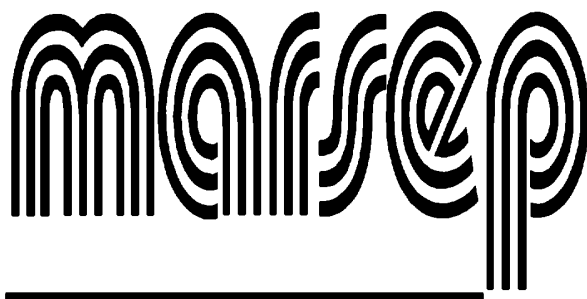




**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Manure and Refuse Sample Exchange Program

REFERENCE MATERIAL

MARSEP sample 287

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 287 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	2	2
2022	1	1

Consensus Values MARSEP 287

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	g/kg	22.4	1.80	8.0	23	22.4	1.19	0.469	2.09
As	mg/kg	14.6	1.14	7.8	23	15.0	0.790	0.297	2.04
Ba	mg/kg	280	25.9	9.2	9	282	23.5	10.8	3.85
Ca	g/kg	40.8	2.59	6.3	45	40.6	1.40	0.482	1.18
Cd	mg/kg	0.889	0.095	10.7	45	0.900	0.060	0.018	1.99
Co	mg/kg	7.93	0.534	6.7	39	7.92	0.410	0.107	1.35
Cr	mg/kg	68.0	7.17	10.5	45	66.9	4.44	1.34	1.96
Cu	mg/kg	300	15.8	5.3	48	300	9.96	2.86	0.951
Fe	g/kg	49.3	2.94	6.0	34	49.0	1.77	0.631	1.28
Hg	µg/kg	318	48.2	15.1	40	317	30.1	9.53	2.99
K	g/kg	2.55	0.590	23.1	56	2.60	0.332	0.099	3.86
Mg	g/kg	4.45	0.282	6.3	49	4.49	0.210	0.050	1.13
Mn	mg/kg	654	26.4	4.0	32	654	14.5	5.83	0.892
Mo	mg/kg	7.50	0.788	10.5	37	7.58	0.590	0.162	2.16
Na	g/kg	1.88	0.203	10.8	29	1.88	0.135	0.047	2.51
Ni	mg/kg	31.2	2.24	7.2	46	31.0	1.46	0.412	1.32
N	g/kg	40.9	1.42	3.5	47	40.7	0.825	0.260	0.636
P	g/kg	26.5	1.66	6.3	55	26.6	1.00	0.279	1.05
Pb	mg/kg	43.2	3.57	8.3	46	43.4	2.35	0.658	1.52
Sb	µg/kg	3084	173	5.6	9	3100	73.0	71.9	2.33
Se	µg/kg	1653	98.5	6.0	10	1653	60.5	38.9	2.36
Sn	mg/kg	27.0	3.37	12.5	8	27.6	2.12	1.49	5.52
V	mg/kg	16.7	2.52	15.1	14	16.9	1.29	0.843	5.05
Zn	mg/kg	753	50.7	6.7	49	752	30.0	9.06	1.20
S	mg/kg	10629	1439	13.5	20	10660	684	402	3.78
TC =totalC (org+inorg)	g/kg	304	20.9	6.9	13	306	10.7	7.24	2.38

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
loss-on-ignition	%	56.3	0.750	1.3	39	56.2	0.500	0.150	0.267
dry weight	%	92.3	0.836	0.9	22	92.3	0.532	0.223	0.241

Indicative Values MARSEP 287

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
B	mg/kg	26.3	7.24	27.5	14	27.4	4.68	2.42	9.20
Be	µg/kg	217	7.75	3.6	6	218	3.51	3.95	1.82
Sr	mg/kg	232	65.1	28.0	4	232	32.0	40.7	17.5
Tl	µg/kg	95.1	25.7	27.0	4	99.2	10.7	16.1	16.9
U	mg/kg	2.31	0.163	7.1	4	2.33	0.073	0.102	4.41
OC = org.C	g/kg	329	9.54	2.9	5	329	5.46	5.33	1.62

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
AOX	mg/kg	156	15.6	10.0	7	157	9.00	7.36	4.72
residu-on-ignition	%	43.8	0.414	0.9	5	43.8	0.130	0.231	0.528