Eurofins Miljø A/S
Smedeskovvej 38
DK-8464 Galten

DANAK
RM Reg. nr. 535

VKI
REFERENCE MATERIALS

CERTIFICATE FOR

QC WW6

SUSPENDED SOLIDS (SS)

BATCH: VKI-31-4-0120

INSTRUCTIONS FOR USE OF THE REFERENCE MATERIAL

Description
This reference material consists of a bottle with concentrate for preparation of reference samples for quality control after dilution with water. The certificate includes documentation for the analytical parameter Suspended Solids (SS).

Quantity and Preservation
QC WW6 is a bottle containing 3.00 g concentrate from which 83 mL reference sample is prepared. The concentrate has been preserved by autoclaving.

Use
The reference material is intended for quality control, i.e. measurement and control of the accuracy and precision of analyses. It is typically intended for analyses of SS in wastewater samples. It may also be used in the quality control of other types of water samples and for the implementation and optimisation of analytical instruments and analytical methods.

It is important that the batch numbers of the reference material and on the certificate are identical.

Preparation for Use
Stabilise the bottle at room temperature (approx. 20°C). Open the bottle and add 80.0 mL water without a significant content of suspended solids (SS) to the bottle. Close the bottle and shake it well. Analyse the sample on the day when it is prepared. The certified concentration is given in the table on page 3 of this certificate.

Note: The reference material is to be prepared in the bottle. It is important to ensure sufficient purity of the water used for preparation.

If QC WW6 is used for other purposes than quality control of wastewater analyses, the dilution ratio between the concentrate and water can be altered.

Analysis
For quality control the reference material is analysed at the same time and in the same manner as other samples.

Storage and Durability
Store the bottle protected from sunlight, e.g. in the original box, and at room temperature or in a refrigerator. The certificate is valid until **1st of April 2028** provided the material is stored under the recommended conditions.

After preparation, the reference material has an expected storage time of up to 24 hours.

PRODUCTION OF THE REFERENCE MATERIAL AND DOCUMENTATION

Production
The production of this reference material is in accordance with the quality management procedures of Eurofins Miljø A/S, with the aim to obtain the intended quality of the material.

Documentation of Content
All documentation for the reference material has been performed after dilution as described above.

Internal control
The analytical quality of Eurofins Miljø has been documented and found satisfactory by regular participation in international proficiency tests.

Homogeneity:
The homogeneity has been investigated by measurements of SS in randomly selected bottles of QC WW6. Tests for homogeneity have been performed by comparing the standard deviation between the reference material units with the within batch standard deviation obtained from duplicate measurements of the reference material in the same bottle (F-test, 95%). In addition, homogeneity testing was included in the external control according to ISO Guide 35 /1/. No indication of heterogeneity was found.

Stability:
The stability of the reference material is being followed at 5°C, 20°C and 37°C.

External control
The external laboratory documentation was performed by selected laboratories in an external documentation in November 2020. The participating laboratories are skilled and have documented good analytical quality by participation in interlaboratory comparisons and by analysis of a control sample in the certification. The laboratories were requested to analyse five bottles of QC WW6: three bottles in the same analytical series, one as a duplicate determination and the others as a single determination, and in addition two bottles in two different analytical series as single determinations. In addition, the laboratories were requested to analyse a control sample sent together with the reference material. The statistics are in accordance with the international standard: ISO Guide 35 /1/. On the basis of the analytical results submitted by the laboratories the following statistical parameters have been calculated:

y_{char}: arithmetic mean of participants results, calculated in accordance with ISO Guide 35 (section A.2.4.)

s(y) : standard deviation between the laboratories, calculated in accordance with ISO Guide 35 (section A.2.5.):

$$\sqrt{\frac{\sum (y_i - y_{char})^2}{p-1}}$$

where

y_i: average for laboratory i
p: number of laboratories included in calculations

U_{CRM}: Expanded uncertainty of the certified reference material, calculated in accordance with ISO Guide 35 (section 10.2) with coverage factor $k = 2$.

The criteria for selection of laboratories were as follows:
- the laboratory results in the above-mentioned proficiency tests diverged less than 2 standard deviations from the nominal value,
- the laboratory analyses more than 20 series of samples each year or holds an accreditation for SS,
- the laboratory result for the control sample in the certification study deviated less than 15% from the nominal value, and
- the laboratory results in the certification study are not Cochran outliers, Grubbs outliers or deemed to be an outlier on the basis of a scientific evaluation.

The data included in the external control and names of the participating laboratories are listed in an annex to this certificate. On the basis of the selected results, the following has been calculated:

Certified Value

DETERMINAND	UNIT	MEAN	BETWEEN LABORATORY STANDARD DEVIATION	EXPANDED UNCERTAINTY ON CERTIFIED VALUE	NUMBER OF DATA SETS IN CALCULATIONS/ METHOD	EXCLUDED DATA SETS C: Cochran outlier G: Grubbs outlier
		y_{char}	s(y)	U_{CRM}	(p)	
SS	mg/L	236	5.7	8.3	11 / AL 5 / BL 6 / CL 1 / ZL	2C

Methods

Filter type

A Filtration through a GFA filter (1,6 µm pore width).

B Filtration through a GFC filter (1,3 µm pore width).

C Filtration through a Munktell MGA filter.

Z Other pre-treatment

Analyse

L EN 872

REFERENCES

/1/ ISO guide 35:2017. Reference materials – Guidance for characterization and assessment of homogeneity and stability.

/2/ ISO guide 31:2015 Reference materials - Contents of certificates, labels and accompanying documentation.

Date of issue: May 2023

RESPONSIBLE SCIENTIST

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Certificate revision history: May 2023 (original certificate date)

ANNEX TO CERTIFICATE QC WW6

Laboratory Measurements

SS					
y_i mg/L	s_{ri} mg/L	n_{ri}	s_{Li} mg/L	n_{Li}	Method
240.5	3.81	4	3.38	3	CL
242.2	4.71	4	10.18	3	AL
238.2	6.61	4	2.36	3	CL
238.5	4.11	4	1.09	3	BL
236.7	1.91	4	1.69	3	AL
222.1	1.44	4	4.02	3	AL
230.3	1.50	4	3.13	3	AL
242.4	2.51	4	1.49	3	CL
244.7	3.16	4	2.83	3	AL
236.6	5.60	4	1.11	3	AL
228.0	5.88	4	4.65	3	AL
242.3	1.73	4	4.25	3	AL
238.3	1.73	4	3.86	3	BL
230.0	5.00	4	6.61	3	BL
235.9	3.01	4	3.85	3	CL
232.1	4.16	4	1.94	3	CL
239.9	2.33	4	3.26	3	AL
240.6	1.18	4	1.42	3	BL
231.2	5.62	4	4.06	3	BL
233.3	8.87	4	4.51	3	CL
233.8	2.85	4	4.65	3	AL
230.3	4.28	4	4.83	3	ZL
230.7	3.70	4	5.58	3	AL

External Control Values

y_i : average for laboratory i
s_{ri} : standard deviation for laboratory i within an analytical series
n_{ri} : number of results for determination of s_{ri}
s_{Li} : standard deviation for laboratory i between analytical series
n_{Li} : number of results for determination of s_{Li}

Methods: See explanation on page 3

ANNEX TO CERTIFICATE QC WW6

Certifying Laboratories

Denmark
Eurofins Miljø A/S, Vejen
Højvang Laboratorier A/S, Dianalund

Norway
Eurofins Environment Testing Norway AS, Moss
Hardanger Miljøsenter AS, Odda
Labora AS, Bodø
Mjøslab I&S, Gjøvik
SINTEF Molab AS Lokasjon Molde, Molde
SNJ, IVAR IKS, Randaberg
VAV Vann- og avløpsetaten, Oslo

Sweden
ALS Scandinavia AB, Danderyd
Eurofins Water Testing Sweden AB, Lidköping
Gällivare Kommun/Kavahedens Reningsverk, Gällivare
Göteborgs Kemanalys AB, Västra Frölunda
Hallsta Pappersbruk, Hallstavik
Iggesund Paperboard AB, Iggesund
Käppalaförbundet, Lidingö
Njudung Energi Vetlanda AB, Vattenlaboratoriet, Vetlanda
Nodra AB, Laboratorium Slottshagens Renningsverk, NorrKöping
"Smedjeholms avloppsreningsverk, Laboratoriet, VIVAB, Falkenberg"
St1 Refinery AB, Gothenburg
Trollhättan Energi AB, Trollhättan
VA SYD, Laboratorieenheten, Malmö
Vallviks Bruk AB, Vallvik