IFA-Proficiency Testing Scheme for Water Analysis

Round M149
Metals

Sample Dispatch: 18 November 2019

TULLN

University of Natural Resources
and Life Sciences, Vienna

Address: **University of Natural Resources and Life Sciences, Vienna**
Department of Agrobiotechnology, IFA-Tulln
Institute of Bioanalytics and Agro-Metabolomics
Head: Prof. DI Dr. Rudolf Krska
Konrad-Lorenz-Str. 20
3430 Tulln
Austria

Website: www.ifatest.eu
www.ifa-tulln.boku.ac.at

Telephone/Fax: +43(0) 1 47654 - Ext
+43(0) 1 47654 - 97309

IFA-Proficiency Testing Scheme:

Technical manager:
Dipl.-HTL-Ing. Andrea Koutnik Ext 97306 andrea.koutnik@boku.ac.at

Quality assurance representative:
Dr. Wolfgang Kandler Ext 97308 wolfgang.kandler@boku.ac.at

Method specialists:
Ing. Uta Kachelmeier Ext 97361 uta.kachelmeier@boku.ac.at
Ing. Caroline Stadlmann Ext 97306 caroline.stadlmann@boku.ac.at

Approved by:	Dr. Wolfgang Kandler	
Round: M149	Date / Signature:	19.12.2019 W. Kandler

This report has 93 pages.

This report summarises the results of round M149 (trace metals) within the IFA-Proficiency Testing Scheme for Water Analysis. The samples M149A and M149B were distributed to 24 participants on Monday, 18 November 2019. Each participant received two samples of 275 mL filled into LDPE bottles.

Closing date for reporting results to the IFA-Tulln was Friday, 13 December 2019. 23 participants submitted results. To make the results of this round anonymous, each laboratory was given a laboratory code on a random basis.

Samples

The samples consisted of artificial ground water spiked with pure standards. For sample preparation, ultrapure water was spiked with concentrated solutions of salts in order to simulate the ionic composition of natural Austrian ground water. Ultrapure HNO_3 (0.5% v/v) was added to stabilise the sample at a pH below 2, which meets the standard sampling procedure in the Austrian monitoring program. The following ultrapure salts were used: $CaCO_3$, $Mg(NO_3)_2$, NaCl, KCl, besides ultrapure H_2SO_4 for sulphate. By this, the matrix of the samples consisted of about 38.6 mg/L Ca, 16.4 mg/L Mg, 9.5 mg/L Na, 1.03 mg/L K, 19.0 mg/L SO_4^{2-} and 16.2 mg/L Cl^-.

Traces of Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Se, U and Zn were added, using certified spectroscopy standards. For all compounds added to the samples, the target concentrations were higher than the minimum quantifiable values of the Austrian ground and river water monitoring program. The calculation of the target concentrations of the compounds was based on the mass of standard added to the samples.

Homogeneity, accuracy and stability tests at the IFA-Tulln

Some samples of the round M149A and M149B were analysed for all investigated parameters prior to shipment to the participants. The results are listed in the results tables and the parameter oriented part of the report ("IFA result").

To verify the stability, all parameters of samples M149A and M149B were analysed in some samples four weeks after shipment. The results are also listed in the results tables and the parameter oriented part of the report ("IFA result"). Due to problems with the ICP-MS instrument, our Al and As results of M149B were not evaluated for the stability measurement and will be determined later.

According to our experience, the concentrations of Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, U, and Zn in the samples remain stable up to 18 months when stored at 4-6 °C in the dark. For Hg a concentration decrease of 2% to 4% per month can be expected.

Results

Data evaluation was based on target concentrations that were calculated from the weights of the standards used to produce the samples. Their uncertainty intervals correspond to the expanded uncertainty (coverage factor k = 2) as described in the EURACHEM/CITAC Guide "Quantifying Uncertainty in Analytical Measurement, 3rd Edition (2012)".

Recoveries for individual laboratory results and overall mean values are related to the assigned concentrations. The results were tested for outliers by application of the Hampel outlier test (level of significance 99%). A minimum number of four results was required for the outlier test.

The recoveries of the target concentrations, calculated from outlier-corrected data mean values ranged between 91.2% (Cu in sample M149B) and 114.7% (Se in sample M149B).

The between laboratory CVs covered the range between 2.0% (U in sample M149B) and 12.0% (Cu in sample M149B).

All confidence intervals of the outlier-corrected laboratory mean values except that for Cu in sample M149A (94.2% ± 3.7%) encompass the corresponding target values with their uncertainties. For all other parameters no difference could be detected between target concentrations and outlier corrected laboratory means statistically.

z-scores

The most common approach is to form the z-score given by

$$z = \frac{x_i - X}{\sigma_{pt}}$$

z	z-score
x_i	result of laboratory
X	target value or mean value („consensus value“)
σ_{pt}	standard deviation for proficiency assessment

Thus, the z-score is the ratio of the estimated bias (difference between result and target value) and a standard deviation. The z-score criteria were determined from relative standard deviations from all interlaboratory comparisons that have been organised by the IFA-Tulln from 2008 to 2018. They represent average performance data of all former participating laboratories.

This approach was chosen, because standard deviations of the outlier-corrected measurements substantially vary between individual proficiency test rounds. Averaging standard deviations from proficiency testing rounds of several years can provide standard deviations for proficiency assessment on a broad data basis. It is therefore more suitable than a standard deviation taken directly from the interlaboratory comparison (EN ISO/IEC 17043:2010, B.3.1.3). Another advantage of previously determined standard deviations is that the participants can foresee which z-scores can be expected by their routine analysis methods before participation.

<u>Calculation example:</u>

A laboratory found 73.7 µg/L for the parameter Aluminium (recovery of 102%). The target value for Aluminium was 72.3 µg/L (100%). The relative standard deviation for proficiency assessment is given in the table below (as well as in the annual program www.ifatest.eu) by 8.6%, which is 6.2 µg/L Al, when based on the target value.

$$z = \frac{x_i - X}{\sigma_{pt}} = \frac{73.7\ \text{mg/L} - 72.3\ \text{mg/L}}{6.2\ \text{mg/L}} \quad 0.23 \qquad \textbf{or} \qquad \frac{102\% - 100\%}{8.6\%} \quad 23$$

z	z-score	
x_i	73.7 µg/L	equivalent to 102% (result of the laboratory)
X	72.3 µg/L	equivalent to 100% (target value)
σ_{pt}	6.2 µg/L	equivalent to 86% (standard deviation for proficiency assessment,see table below)

In the case of recalculation, deviations in the last digits may occur due to the fact that rounded values are given in the report for clarity.

The z-scores are given in the parameter-oriented evaluation in the tables next to the recoveries. Additionally, each laboratory receives a sheet on which the obtained z-scores are summarized and graphically represented. On this z-score sheet the criteria are given in concentration units.

The following table lists the standard deviations for proficiency assessment and their limits of applicability. Z-scores were only calculated, if the target values were above these limits.

Parameter	standard deviation for proficiency assessment	Lower limit
Aluminium	8.6%	8 µg/L
Arsenic	8.2%	0.5 µg/L
Cadmium	6.2%	0.1 µg/L
Chromium	6.7%	0.5 µg/L
Copper	9.0%	1.2 µg/L
Iron	7.4%	10 µg/L
Lead	7.3%	0.3 µg/L
Manganese	6.0%	2.0 µg/L
Mercury	11%	0.2 µg/L
Nickel	8.6%	1.0 µg/L
Selenium	12%	0.3 µg/L
Uranium	5.9%	0.4 µg/L
Zinc	9.0%	3 µg/L

Normally, a classification based on z-scores is made this way:

|z-Score|	Classification
<2	satisfactory
2<|z|<3	questionable
>3	unsatisfactory

The z-scores are listed together with the recoveries in the tables of the parameter oriented part. Additionally, each laboratory obtained for every sample a single sheet that summarises the z-scores of the laboratory in graphical and tabular form.

Illustration of results

An explanation to the illustration of the results is given on the following page.

The **laboratory oriented part** contains the measurement results and reported uncertainties of each individual laboratory for all parameters together with the achieved recoveries in graphical and tabular form. This part of the report also lists tables with the results originally reported by the laboratories.

In the **parameter oriented part** the reported results and corresponding uncertainties are illustrated together with recoveries of the target values and the z-scores for each parameter and all laboratories. This information is presented in graphical and tabular form. Results, which were identified as outliers by the Hampel test are marked with an asterisk in the column “out”. These values were not considered for the calculation of statistical parameters (mean values, standard deviations and confidence intervals). Moreover, the parameter oriented part contains the uncertainties of the target values. The uncertainty intervals correspond to the expanded uncertainty (coverage factor k = 2) as described in the EURACHEM / CITAC Guide “Quantifying Uncertainty in Analytical Measurement” 3rd Edition (2012) “. The uncertainty interval of the reference concentration is illustrated in the graphs as a grey band around the 100% recovery line.

Results, for which no recoveries could be calculated, are illustrated by one of the following symbols: **FN** (false negative), **FP** (false positive) or • - symbol.

- “FN”: a result is considered false negative when the “< result” reported is lower than the corresponding target value
- “FP”: False positive results can only be obtained for compounds that were evaluated on the basis of a “< target value”. A result is termed FP if it does not include (strike) the “< target” with its measurement uncertainty.
- “•”: All other results for which no recoveries can be calculated are illustrated by this symbol

Tulln, 19 December 2019

EXPLANATION

Sample M106A

Parameter Copper

Target value ± U (k=2)	4,79 µg/l	±	0,13 µg/l	*Obtained from sample preperation, U=uncertainty*
IFA result ± U (k=2)	4,79 µg/l	±	0,38 µg/l	*Determined at IFA prior to shipment of samples*
Stability test ± U (k=2)	4,69 µg/l	±	0,38 µg/l	*Determined at IFA 3 weeks after sample dispatch*

Lab Code	Result	±	Unit	Recovery	z-Score
A	5,16	0,4128	µg/l	108%	0,90
B	4,22	0,42	µg/l	88%	-1,38
C	4,45	0,13	µg/l	93%	-0,83
D			µg/l		
E			µg/l		
F	4,10	0,08	µg/l	86%	-1,68
G			µg/l		
H			µg/l		
I	4,75	0,74	µg/l	99%	-0,10
J	<5		µg/l	•	
K	4,76		µg/l	99%	-0,07
L	<10		µg/l	•	
M	4,8	0,5	µg/l	100%	0,02
N	3,7	0,4	µg/l	77%	-2,65
O	4,47	0,447	µg/l	93%	-0,78
P	6,0		µg/l	125%	2,94
Q	4,17	0,2	µg/l	87%	-1,51
R	4,6	0,8	µg/l	96%	-0,46
S	4,44	0,67	µg/l	93%	-0,85
T			µg/l		
U	4,675	0,935	µg/l	98%	-0,28
V	5,0	0,50	µg/l	104%	0,51
W	3,54	0,3	µg/l	74%	-3,03
X	7,108 *	0,749	µg/l	148%	5,63
Y	<10		µg/l	•	
Z			µg/l		
AA	<3,0		µg/l	FN	
AB	3,775	0,107	µg/l	79%	-2,46
AC	<10,0		µg/l	•	

Recovery of target value in percent

z-Score of the laboratory

An asterik indicates a result detected as outlier by Hampel test

Interval expected to encompass target value as stated by participant

	All results	Outliers excl.	Unit
Mean ± CI(99%)	4,65 ± 0,57	4,51 ± 0,42	µg/l
Recov. ± CI(99%)	97,1 ± 12,0	94,1 ± 8,8	%
SD between labs	0,84	0,59	µg/l
RSD between labs	18,1	13,2	%
n for calculation	18	17	

Between laboratory standard deviation

Laboratory mean and recovery of target value with corresponding confidence intervals (p=99%)

Number of results used for calculation of statistic parameters

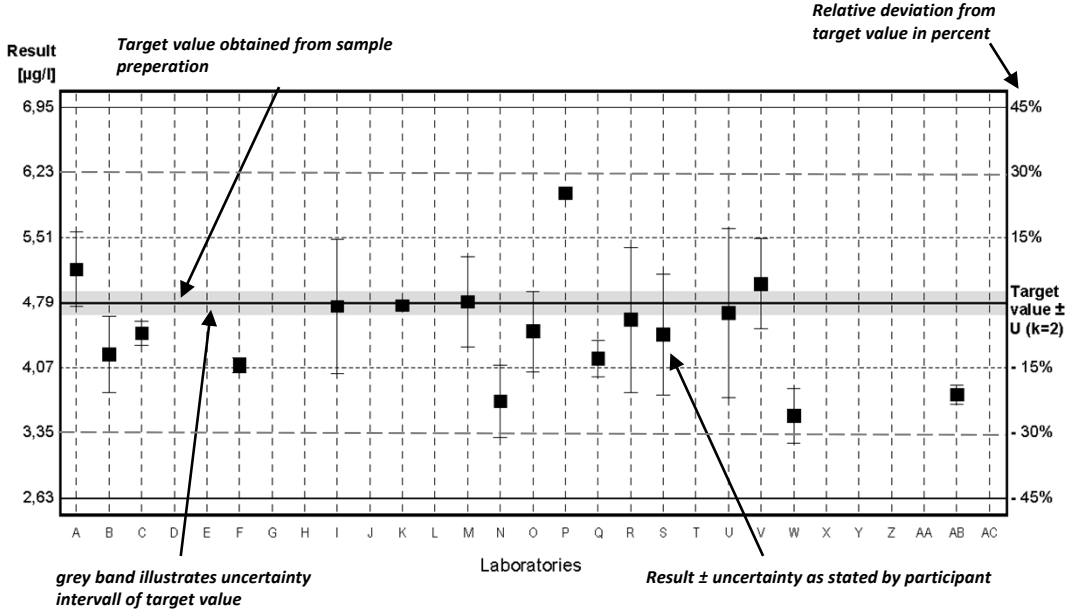


Diagram 1: Measurement results and their uncertainties

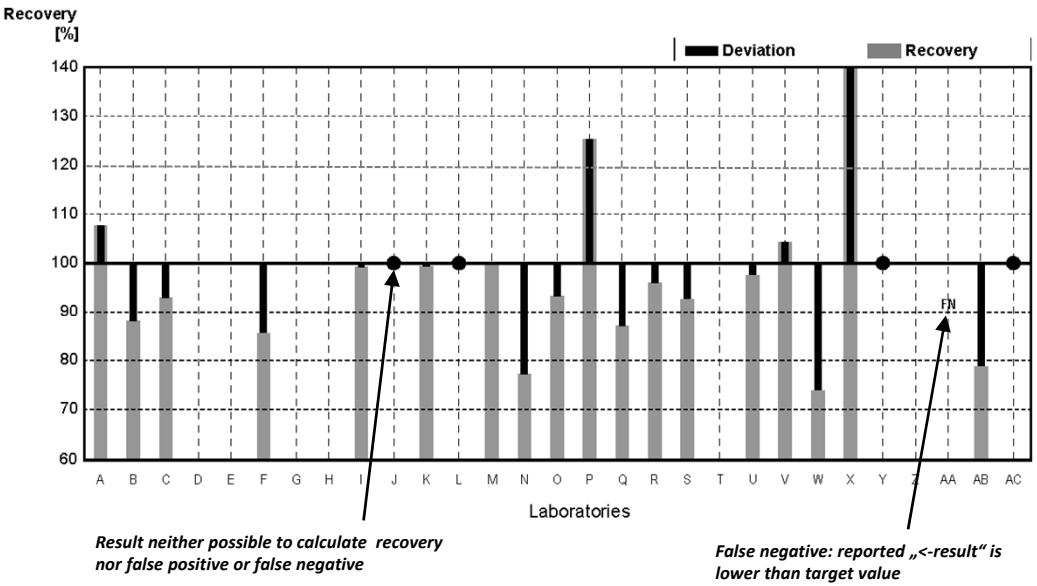


Diagram 2: Recoveries and deviations from target values

Illustration of Results
Tables and Parameter Oriented Part

Round M149
Metals

Sample Dispatch: 18 November 2019

TULLN

Results Sample M149A

	Aluminium	Arsenic	Lead	Cadmium	Chromium	Iron	Copper
Target value	72.3	6.38	8.03	2.11	6.39	52.7	11.2
IFA result	68.5	6.75	7.88	2.14	6.55	55.4	11.8
Stability test	73.1	6.45	7.98	2.09	6.15	53.3	10.8
A	73.7	6.25	7.53	1.99	5.92	48.4	9.65
B	71.7	6.68	8.08	2.21	6.74	52.6	10.9
C	102	8.36	8.01	3.26	6.71	50.5	9.91
D					5.84		
E	73	6.55	7.70	2.00	6.40	54	10.6
F	71	6.4	7.3	2.07	6.1	50	10.2
G	69.8	8.75	7.85	1.80	7.02	54	13.1
H	74.8	8.2	6.4	2.06	6.1	51.3	13.3
I	78.5	6.94	7.68	2.20	6.4	51.3	11.0
J	71.71	6.25	7.78	1.98	6.15	51.10	9.84
K	75					48.8	
L	77.4	6.61	8.26	2.14	6.46	49.3	11.1
M							
N	75.8	7.02	8.61	2.16	6.60	54.0	10.3
O	81	7.2	8.2	2.07	6.2	60	10.7
P	80.00	6.80	8.30	2.14	6.40	55.00	11.50
Q	71.0	6.10	7.73	1.90	5.83	51.7	9.97
R	73	6.3	7.8	2.23	6.2	51	10.5
S	75.6	6.59	8.77	2.12	6.25	53.0	11.6
T	71.9	6.43	8.07	2.07	7.03	50.2	10.4
U	69.3	6.74	7.89	2.13	6.28	52.2	11.1
V							
W							
X	73.8	6.78	7.61	2.15	4.75	54.6	10.1

All data in µg/L

Measurement Uncertainties Sample M149A

	Aluminium ±	Arsenic ±	Lead ±	Cadmium ±	Chromium ±	Iron ±	Copper ±
Target value	0.4	0.04	0.10	0.02	0.04	0.3	0.1
IFA result	3.4	0.54	0.32	0.15	0.33	5.5	1.1
Stability test	3.7	0.52	0.32	0.15	0.31	5.3	1.0
A	3.0	0.26	0.42	0.11	0.10	2.3	0.14
B	10.8	1.00	1.21	0.33	1.01	7.89	1.64
C	3	0.27	0.28	0.20	0.15	1.6	0.49
D					0.15		
E	5	0.1	0.1	0.1	0.2	0.4	0.5
F	7.1	0.6	0.7	0.21	0.6	5.0	1.0
G							
H							
I	2.9	0.18	0.12	0.1	0.8	0.7	1.2
J	14.34	1.44	1.79	0.47	1.05	13.29	2.56
K	20					7.3	
L	3.09	0.060	0.110	0.030	0.070	0.058	0.058
M							
N	11.67	1.05	1.47	0.15	0.55	4.43	2.68
O	10	1	1	0.1	1	30	2
P	8.00	0.816	0.664	0.171	0.768	14.30	0.92
Q	15	2	2	0.4	1	10	2
R	11	1.3	1.2	0.29	0.6	7.7	1.6
S	15.1	1.32	1.75	0.42	1.25	10.6	2.32
T	7.98	0.36	0.86	0.10	0.99	5.57	0.57
U	1.1	0.15	0.09	0.06	0.07	0.41	0.48
V							
W							
X	11.1	1.02	1.14	0.32	0.71	8.19	1.52

All data in µg/L

Results Sample M149A

	Manganese	Nickel	Mercury	Selenium	Uranium	Zinc
Target value	21.1	3.03	1.82	2.63	2.23	13.3
IFA result	22.1	3.04	1.87	2.65	2.14	14.9
Stability test	21.9	3.11	1.87	2.67	2.20	13.1
A	19.1	2.70	1.72	2.53	2.00	12.2
B	21.4	3.03	1.96	2.70	2.38	12.7
C	20.6	3.23			2.14	13.7
D						
E	21.0	3.05	2.00	2.50	2.10	12.5
F	20.2	2.77	1.88	2.62	2.13	12.1
G	22.3	3.33	1.85	2.56		13.5
H	20.9	2.69	1.69			12.3
I	21.4	2.70		2.71	2.51	13.3
J	20.22	2.95	1.83			12.70
K	19.4					
L	21.6	3.45	1.81	2.72	2.18	13.1
M						
N	21.8	2.77		<5.0		13.2
O	20.0	2.35	1.53			<20
P	21.00	3.10	1.70	2.90	2.27	13.00
Q	20.0	2.70	1.60	2.60	2.00	11.0
R	20.4	2.89	1.47	2.81	2.14	13.0
S	20.5	2.92	1.80	2.65	2.51	12.6
T	21.4	2.82	1.71	2.59	2.23	13.0
U	20.2	2.97	1.80	2.89	2.20	12.7
V			1.72			
W			1.89	3.26		
X	21.1	2.60	2.17	2.86	2.07	13.4

All data in µg/L

Measurement Uncertainties Sample M149A

	Manganese ±	Nickel ±	Mercury ±	Selenium ±	Uranium ±	Zinc ±
Target value	0.1	0.03	0.02	0.06	0.02	0.8
IFA result	2.0	0.27	0.19	0.37	0.21	3.0
Stability test	2.0	0.28	0.19	0.37	0.22	2.6
A	0.8	0.14	0.04	0.05	0.18	0.4
B	3.21	0.45	0.29	0.40	0.36	1.90
C	0.2	0.13			0.05	0.7
D						
E	1	0.1	0.1	0.2	0.1	0.5
F	2.02	0.28	0.19	0.26	0.21	1.2
G						
H						
I	0.5	0.2		0.1	0.37	2.6
J	3.23	0.71	0.04			2.03
K	4.1					
L	0.200	0.060	0.025	0.023	0.015	0.200
M						
N	2.05	0.34				1.85
O	15	1	0.2			
P	2.10	0.31	0.204	0.435	0.114	1.30
Q	4	1	0.4	0.6	0.4	3
R	2.0	0.29	0.29	0.42	0.21	1.2
S	4.10	0.58	0.36	0.53	0.50	2.52
T	1.17	0.22	0.27	0.31	0.24	0.81
U	0.65	0.16	0.03	0.15	0.11	0.48
V			0.4			
W			0.24	0.49		
X	3.17	0.39	0.33	0.43	0.31	2.01

All data in µg/L

Results Sample M149B

	Aluminium	Arsenic	Lead	Cadmium	Chromium	Iron	Copper
Target value	40.3	1.87	2.82	1.00	1.71	20.8	2.22
IFA result	41.3	1.90	2.76	1.04	1.80	21.6	2.30
Stability test			2.83	1.01	1.83	20.9	2.13
A	42.2	1.75	2.54	0.926	1.60	19.3	1.90
B	40.1	2.00	2.87	1.06	1.90	21.2	2.08
C	56.0	3.27	2.84	1.64	1.97	20.4	2.19
D					1.59		
E	41.0	1.95	2.65	1.00	1.70	23.0	2.20
F	39.7	1.91	2.55	0.99	1.68	20.4	2.12
G	38.1	3.32	2.34	1.48	2.07	19.7	3.98
H	42.6	3.35	1.29	0.91	1.65	18.8	3.64
I	42.7	2.17	2.73	1.02	<5	20.8	<5
J	39.97	1.98	2.85	0.88	1.68	21.32	2.06
K	41.2					19.0	
L	42.8	1.91	2.90	1.03	1.86	21.6	2.23
M							
N	42.4	2.69	2.63	1.02	<5.0	<30	0.766
O	54	2.42	2.37	1.02	1.55	<50	<2
P	44.00	1.90	2.90	0.99	1.60	22.00	2.30
Q	39.3	1.80	2.63	0.90	1.53	19.0	1.70
R	40.6	1.86	2.69	1.07	1.67	20.4	1.94
S	40.7	1.96	3.09	1.02	1.63	19.7	1.70
T	41.6	1.90	2.92	1.01	1.90	19.9	2.22
U	37.4	1.96	2.74	1.01	1.88	20.0	2.21
V							
W							
X	40.3	1.92	2.52	1.00	0.54	19.8	1.50

All data in µg/L

Measurement Uncertainties Sample M149B

	Aluminium ±	Arsenic ±	Lead ±	Cadmium ±	Chromium ±	Iron ±	Copper ±
Target value	0.3	0.02	0.02	0.01	0.02	0.2	0.03
IFA result	2.1	0.15	0.11	0.07	0.09	2.2	0.21
Stability test			0.11	0.07	0.09	2.1	0.19
A	0.7	0.07	0.14	0.033	0.06	1.0	0.14
B	6.02	0.30	0.43	0.16	0.28	3.18	0.31
C	5.6	0.92	0.32	0.51	0.21	0.7	0.20
D					0.02		
E	3	0.1	0.1	0.1	0.2	3	0.4
F	4.0	0.19	0.26	0.10	0.17	2.0	0.21
G							
H							
I	1.2	0.21	0.11	0.04		0.8	
J	7.99	0.40	0.57	0.21	0.29	5.54	0.54
K	11.1					2.9	
L	1.25	0.072	0.067	0.012	0.035	0.265	0.040
M							
N	6.53	0.40	0.45	0.07			0.20
O	10	1	1	0.1	1		
P	4.40	0.228	0.232	0.0792	0.192	5.72	0.184
Q	8	0.4	0.5	0.2	0.4	4	0.4
R	6.1	0.37	0.40	0.14	0.17	3.1	0.29
S	8.1	0.39	0.62	0.20	0.33	3.9	0.34
T	4.62	0.11	0.31	0.05	0.27	2.21	0.12
U	1.1	0.17	0.09	0.02	0.08	0.46	0.12
V							
W							
X	6.05	0.29	0.38	0.15	0.08	2.97	0.23

All data in µg/L

Results Sample M149B

	Manganese	Nickel	Mercury	Selenium	Uranium	Zinc
Target value	9.25	1.83	0.79	0.87	0.80	7.56
IFA result	9.94	1.93	0.79	0.82	0.76	8.53
Stability test	9.47	1.78	0.76	0.92	0.80	8.11
A	8.40	1.59	0.767	0.834	0.70	7.13
B	9.55	1.81	0.885	<1	<1	7.03
C	9.35	2.02			0.781	8.31
D						
E	9.25	1.80	0.85	0.90	0.77	7.30
F	9.1	1.78	0.83	<1.0	0.77	7.5
G	9.34	2.59	0.91	1.19		7.7
H	92.6	1.82	0.87			7.0
I	9.3	1.86		1.05	<2	<10
J	9.10	1.82	0.71			7.70
K	<10					
L	9.52	2.15	0.787	0.986	0.758	7.71
M						
N	9.47	<2.0		<5.0		7.15
O	<20	1.42	0.65			<20
P	9.00	1.80	0.81	1.00	0.80	8.00
Q	8.47	1.60	0.61	<1	<1	<10
R	9.0	1.74	0.60	0.93	0.77	7.5
S	9.46	1.72	0.77	<2.0	<1.0	7.21
T	9.58	1.76	0.727	<1.00	0.781	7.30
U	<0.010	1.86	0.752	<1.00	<1.00	7.67
V			0.76			
W			0.841	1.08		
X	9.13	1.41	1.09	1.01	0.75	8.59

All data in µg/L

Measurement Uncertainties Sample M149B

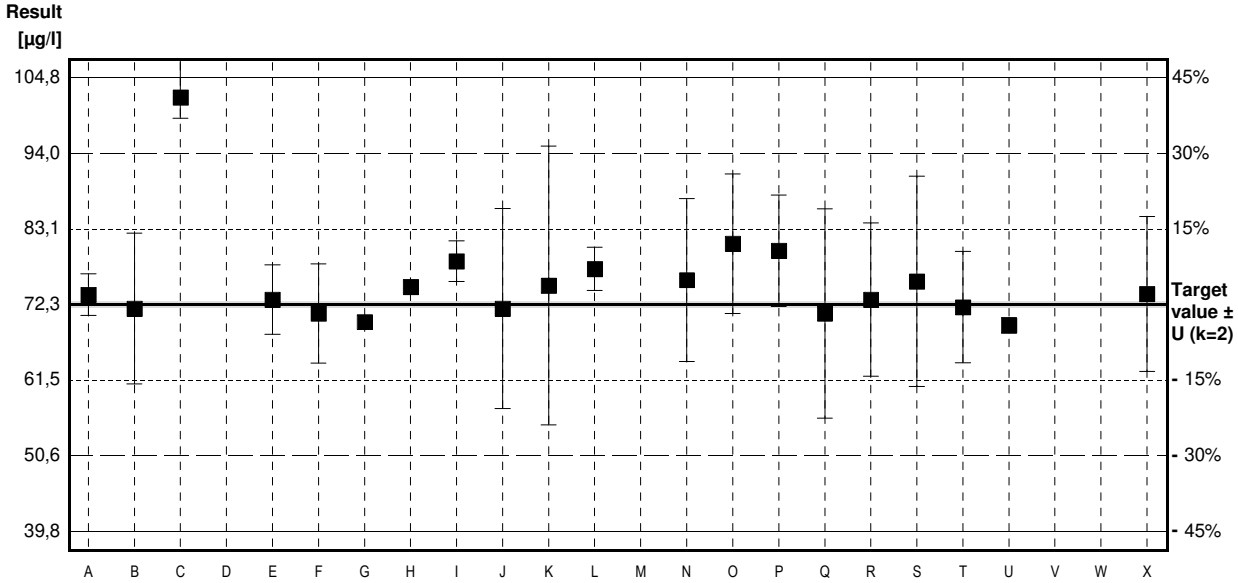
	Manganese ±	Nickel ±	Mercury ±	Selenium ±	Uranium ±	Zinc ±
Target value	0.07	0.02	0.01	0.06	0.01	0.79
IFA result	0.89	0.17	0.08	0.11	0.08	1.71
Stability test	0.85	0.16	0.08	0.13	0.08	1.62
A	0.36	0.06	0.049	0.018	0.05	0.35
B	1.43	0.27	0.133			1.05
C	1.05	0.48			0.066	1.39
D						
E	0.2	0.1	0.1	0.2	0.1	0.5
F	0.91	0.18	0.10		0.08	0.75
G						
H						
I	0.3	0.07		0.13		
J	1.46	0.44	0.03			1.23
K	2					
L	0.065	0.032	0.011	0.018	0.022	0.125
M						
N	0.89					1.00
O		1	0.1			
P	0.90	0.18	0.0972	0.15	0.04	0.80
Q	2	0.4	0.1			
R	0.9	0.17	0.14	0.14	0.08	0.7
S	1.89	0.34	0.15			1.44
T	0.52	0.13	0.113		0.083	0.46
U		0.17	0.030			0.54
V			0.2			
W			0.11	0.16		
X	1.37	0.21	0.16	0.15	0.11	1.29

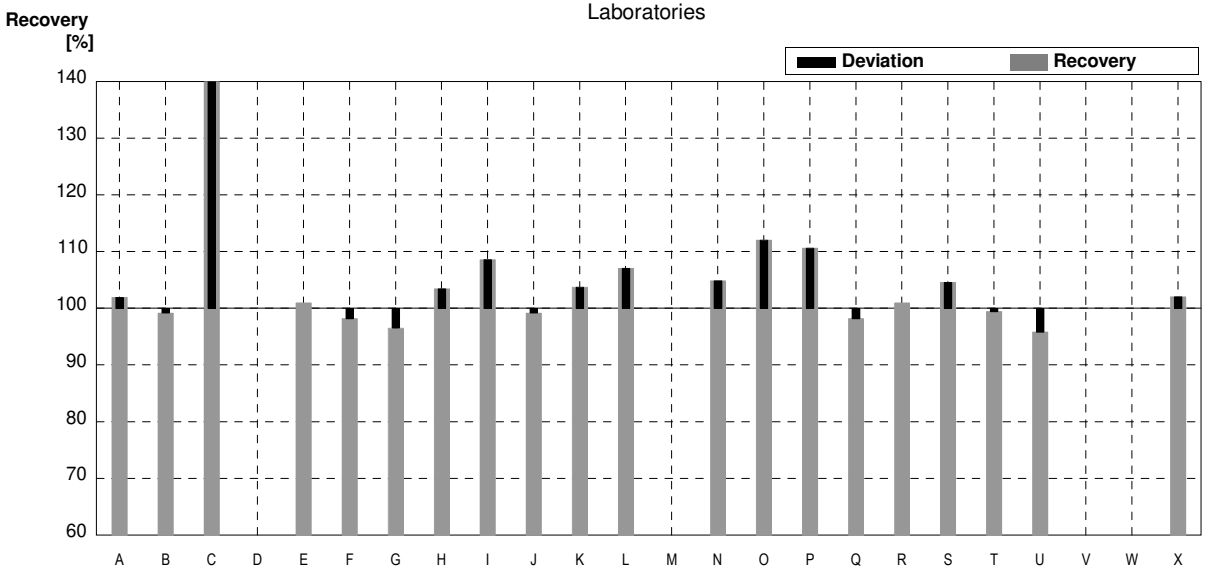
All data in µg/L

Sample M149A
Parameter Aluminium

Target value	± U (k=2)	72,3 µg/l	±	0,4 µg/l
IFA result	± U (k=2)	68,5 µg/l	±	3,4 µg/l
Stability test	± U (k=2)	73,1 µg/l	±	3,7 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	73,7	3,0	µg/l	102%	0,23
B	71,7	10,8	µg/l	99%	-0,10
C	102 *	3	µg/l	141%	4,78
D			µg/l		
E	73	5	µg/l	101%	0,11
F	71	7,1	µg/l	98%	-0,21
G	69,8		µg/l	97%	-0,40
H	74,8		µg/l	103%	0,40
I	78,5	2,9	µg/l	109%	1,00
J	71,71	14,34	µg/l	99%	-0,09
K	75	20	µg/l	104%	0,43
L	77,4	3,09	µg/l	107%	0,82
M			µg/l		
N	75,8	11,67	µg/l	105%	0,56
O	81	10	µg/l	112%	1,40
P	80,00	8,00	µg/l	111%	1,24
Q	71,0	15	µg/l	98%	-0,21
R	73	11	µg/l	101%	0,11
S	75,6	15,1	µg/l	105%	0,53
T	71,9	7,98	µg/l	99%	-0,06
U	69,3	1,1	µg/l	96%	-0,48
V			µg/l		
W			µg/l		
X	73,8	11,1	µg/l	102%	0,24



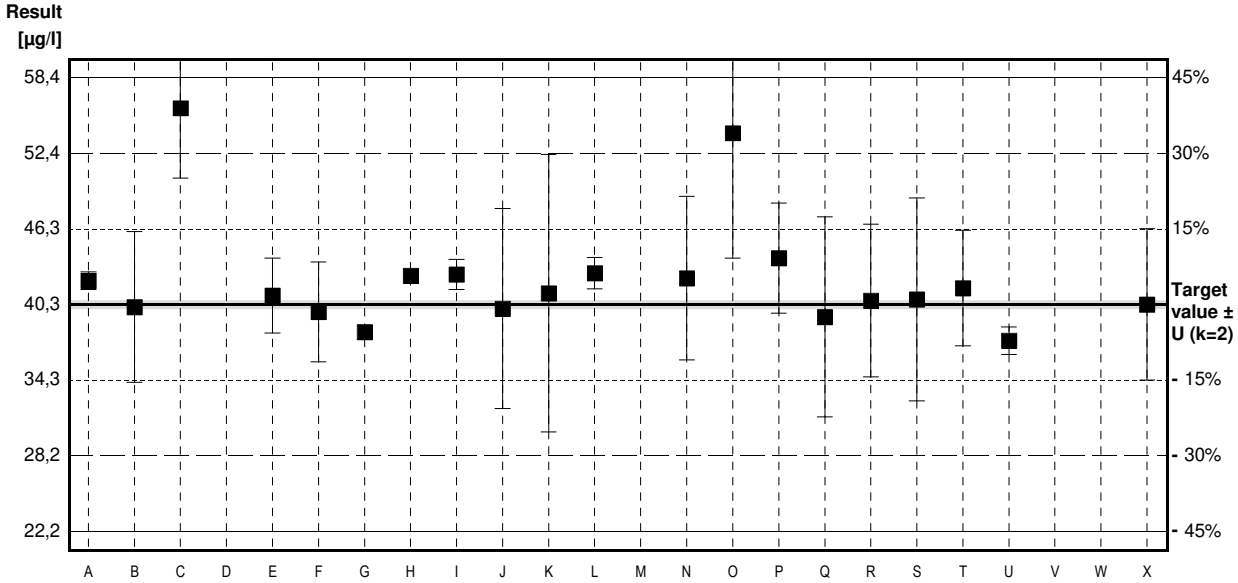


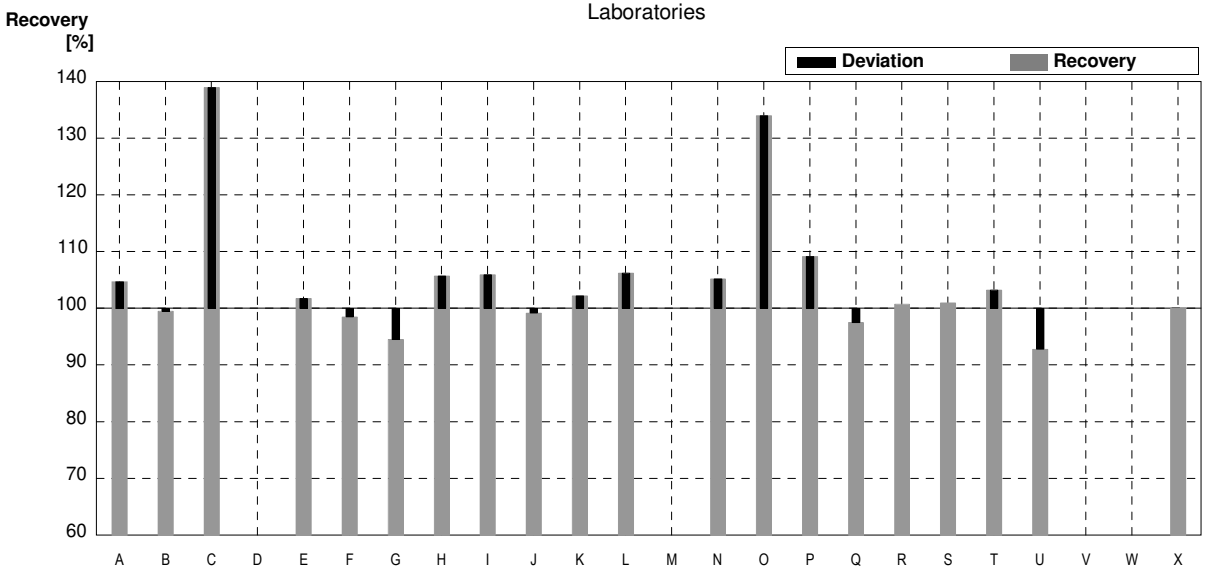
	All results	Outliers excl.	Unit
Mean ± CI(99%)	75,5 ± 4,5	74,1 ± 2,2	µg/l
Recov. ± CI(99%)	104,4 ± 6,2	102,5 ± 3,0	%
SD between labs	7,0	3,3	µg/l
RSD between labs	9,3	4,5	%
n for calculation	20	19	

Sample M149B
Parameter Aluminium

Target value ± U (k=2)	40,3	µg/l	±	0,3	µg/l
IFA result ± U (k=2)	41,3	µg/l	±	2,1	µg/l
Stability test ± U (k=2)		µg/l	±		µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	42,2	0,7	µg/l	105%	0,55
B	40,1	6,02	µg/l	100%	-0,06
C	56,0 *	5,6	µg/l	139%	4,53
D			µg/l		
E	41,0	3	µg/l	102%	0,20
F	39,7	4,0	µg/l	99%	-0,17
G	38,1		µg/l	95%	-0,63
H	42,6		µg/l	106%	0,66
I	42,7	1,2	µg/l	106%	0,69
J	39,97	7,99	µg/l	99%	-0,10
K	41,2	11,1	µg/l	102%	0,26
L	42,8	1,25	µg/l	106%	0,72
M			µg/l		
N	42,4	6,53	µg/l	105%	0,61
O	54 *	10	µg/l	134%	3,95
P	44,00	4,40	µg/l	109%	1,07
Q	39,3	8	µg/l	98%	-0,29
R	40,6	6,1	µg/l	101%	0,09
S	40,7	8,1	µg/l	101%	0,12
T	41,6	4,62	µg/l	103%	0,38
U	37,4	1,1	µg/l	93%	-0,84
V			µg/l		
W			µg/l		
X	40,3	6,05	µg/l	100%	0,00



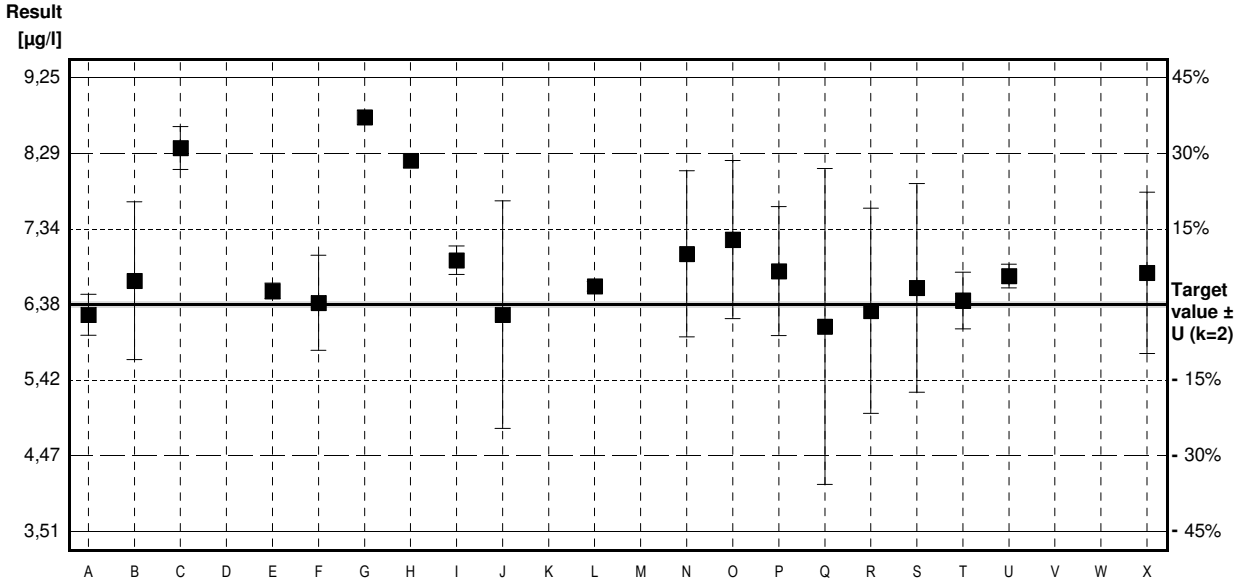


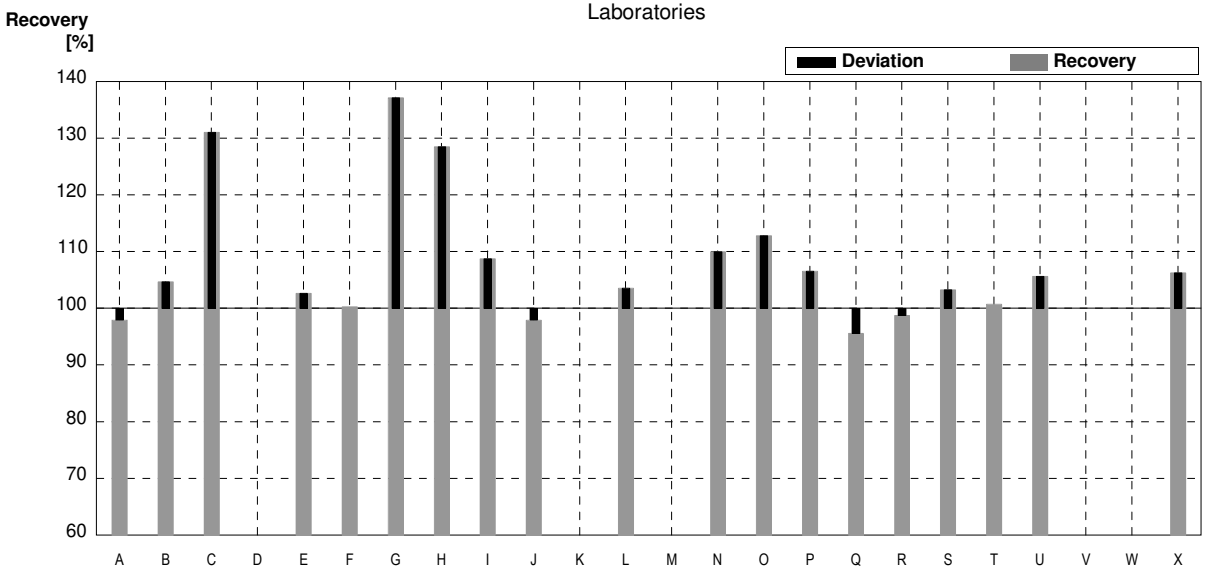
	All results	Outliers excl.	Unit
Mean ± CI(99%)	42,3 ± 3,0	40,9 ± 1,2	µg/l
Recov. ± CI(99%)	105,0 ± 7,4	101,6 ± 2,9	%
SD between labs	4,6	1,7	µg/l
RSD between labs	11,0	4,2	%
n for calculation	20	18	

Sample M149A
Parameter Arsenic

Target value ± U (k=2)	6,38 µg/l	±	0,04 µg/l
IFA result ± U (k=2)	6,75 µg/l	±	0,54 µg/l
Stability test ± U (k=2)	6,45 µg/l	±	0,52 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	6,25	0,26	µg/l	98%	-0,25
B	6,68	1,00	µg/l	105%	0,57
C	8,36 *	0,27	µg/l	131%	3,78
D			µg/l		
E	6,55	0,1	µg/l	103%	0,32
F	6,4	0,6	µg/l	100%	0,04
G	8,75 *		µg/l	137%	4,53
H	8,2 *		µg/l	129%	3,48
I	6,94	0,18	µg/l	109%	1,07
J	6,25	1,44	µg/l	98%	-0,25
K			µg/l		
L	6,61	0,060	µg/l	104%	0,44
M			µg/l		
N	7,02	1,05	µg/l	110%	1,22
O	7,2	1	µg/l	113%	1,57
P	6,80	0,816	µg/l	107%	0,80
Q	6,10	2	µg/l	96%	-0,54
R	6,3	1,3	µg/l	99%	-0,15
S	6,59	1,32	µg/l	103%	0,40
T	6,43	0,36	µg/l	101%	0,10
U	6,74	0,15	µg/l	106%	0,69
V			µg/l		
W			µg/l		
X	6,78	1,02	µg/l	106%	0,76



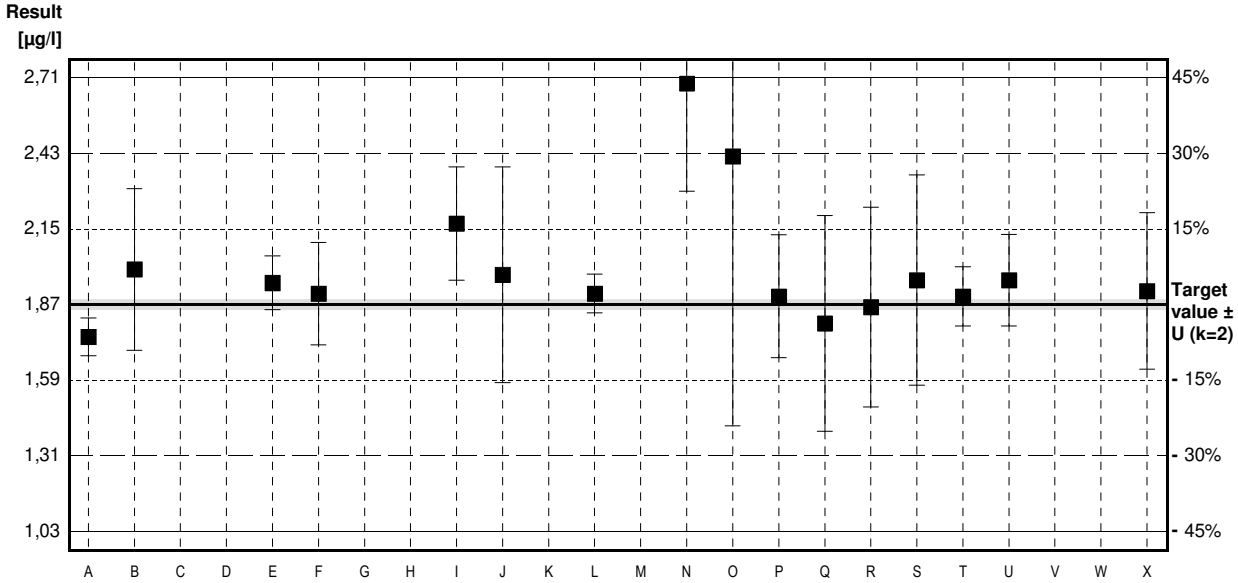


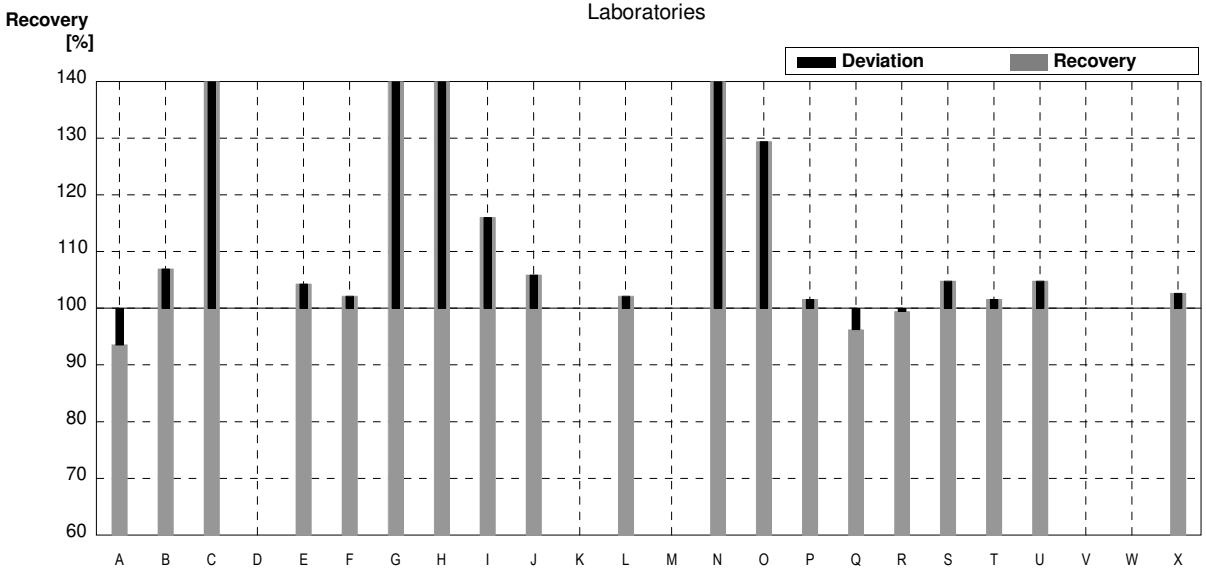
	All results	Outliers excl.	Unit
Mean ± CI(99%)	6,89 ± 0,49	6,60 ± 0,23	µg/l
Recov. ± CI(99%)	108,0 ± 7,7	103,5 ± 3,5	%
SD between labs	0,75	0,31	µg/l
RSD between labs	10,9	4,6	%
n for calculation	19	16	

Sample M149B
Parameter Arsenic

Target value ± U (k=2)	1,87	µg/l	±	0,02	µg/l
IFA result ± U (k=2)	1,90	µg/l	±	0,15	µg/l
Stability test ± U (k=2)		µg/l	±		µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	1,75	0,07	µg/l	94%	-0,78
B	2,00	0,30	µg/l	107%	0,85
C	3,27 *	0,92	µg/l	175%	9,13
D			µg/l		
E	1,95	0,1	µg/l	104%	0,52
F	1,91	0,19	µg/l	102%	0,26
G	3,32 *		µg/l	178%	9,46
H	3,35 *		µg/l	179%	9,65
I	2,17	0,21	µg/l	116%	1,96
J	1,98	0,40	µg/l	106%	0,72
K			µg/l		
L	1,91	0,072	µg/l	102%	0,26
M			µg/l		
N	2,69 *	0,40	µg/l	144%	5,35
O	2,42 *	1	µg/l	129%	3,59
P	1,90	0,228	µg/l	102%	0,20
Q	1,80	0,4	µg/l	96%	-0,46
R	1,86	0,37	µg/l	99%	-0,07
S	1,96	0,39	µg/l	105%	0,59
T	1,90	0,11	µg/l	102%	0,20
U	1,96	0,17	µg/l	105%	0,59
V			µg/l		
W			µg/l		
X	1,92	0,29	µg/l	103%	0,33





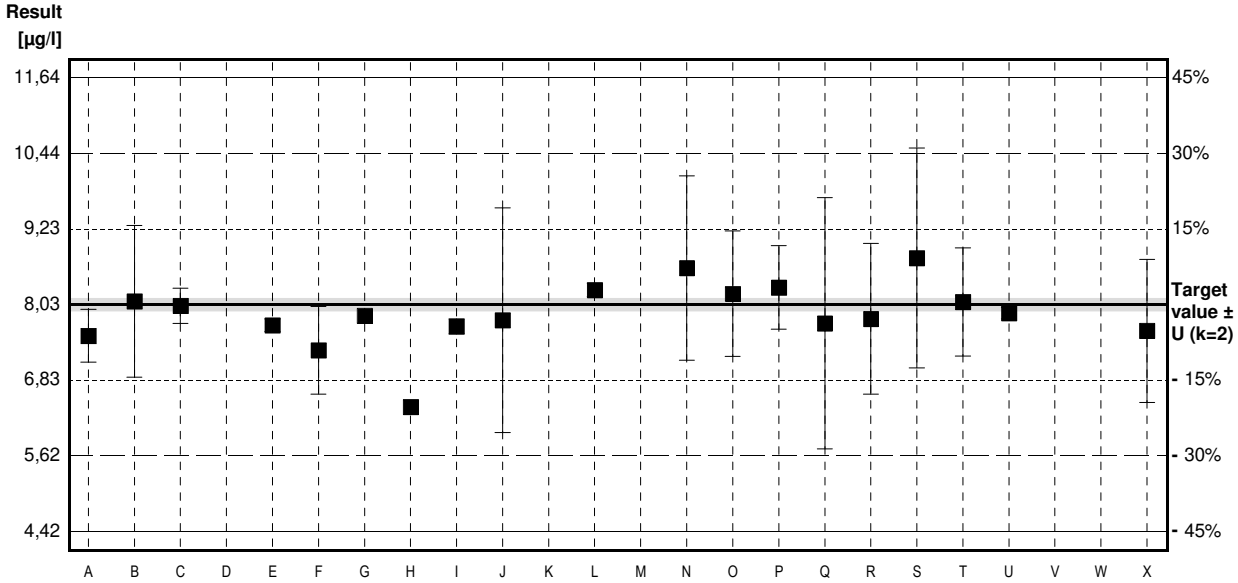
	All results	Outliers excl.	Unit
Mean ± CI(99%)	2,21 ± 0,35	1,93 ± 0,08	µg/l
Recov. ± CI(99%)	118,3 ± 19,0	103,0 ± 4,2	%
SD between labs	0,54	0,10	µg/l
RSD between labs	24,3	5,1	%
n for calculation	19	14	

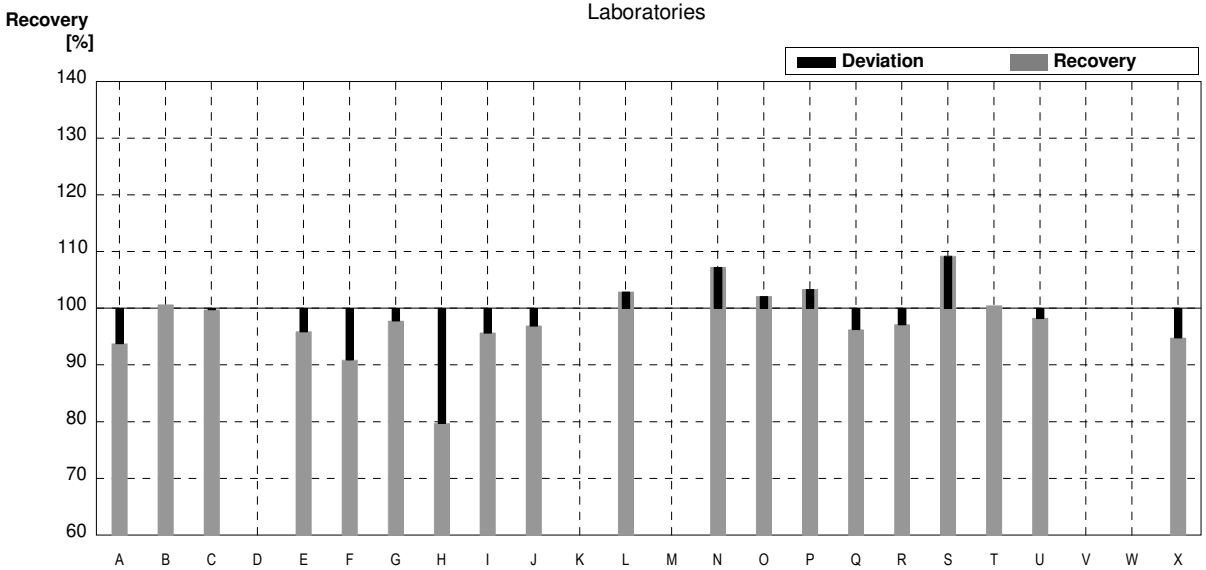
Sample M149A

Parameter Lead

Target value	± U (k=2)	8,03 µg/l	±	0,10 µg/l
IFA result	± U (k=2)	7,88 µg/l	±	0,32 µg/l
Stability test	± U (k=2)	7,98 µg/l	±	0,32 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	7,53	0,42	µg/l	94%	-0,85
B	8,08	1,21	µg/l	101%	0,09
C	8,01	0,28	µg/l	100%	-0,03
D			µg/l		
E	7,70	0,1	µg/l	96%	-0,56
F	7,3	0,7	µg/l	91%	-1,25
G	7,85		µg/l	98%	-0,31
H	6,4 *		µg/l	80%	-2,78
I	7,68	0,12	µg/l	96%	-0,60
J	7,78	1,79	µg/l	97%	-0,43
K			µg/l		
L	8,26	0,110	µg/l	103%	0,39
M			µg/l		
N	8,61	1,47	µg/l	107%	0,99
O	8,2	1	µg/l	102%	0,29
P	8,30	0,664	µg/l	103%	0,46
Q	7,73	2	µg/l	96%	-0,51
R	7,8	1,2	µg/l	97%	-0,39
S	8,77	1,75	µg/l	109%	1,26
T	8,07	0,86	µg/l	100%	0,07
U	7,89	0,09	µg/l	98%	-0,24
V			µg/l		
W			µg/l		
X	7,61	1,14	µg/l	95%	-0,72



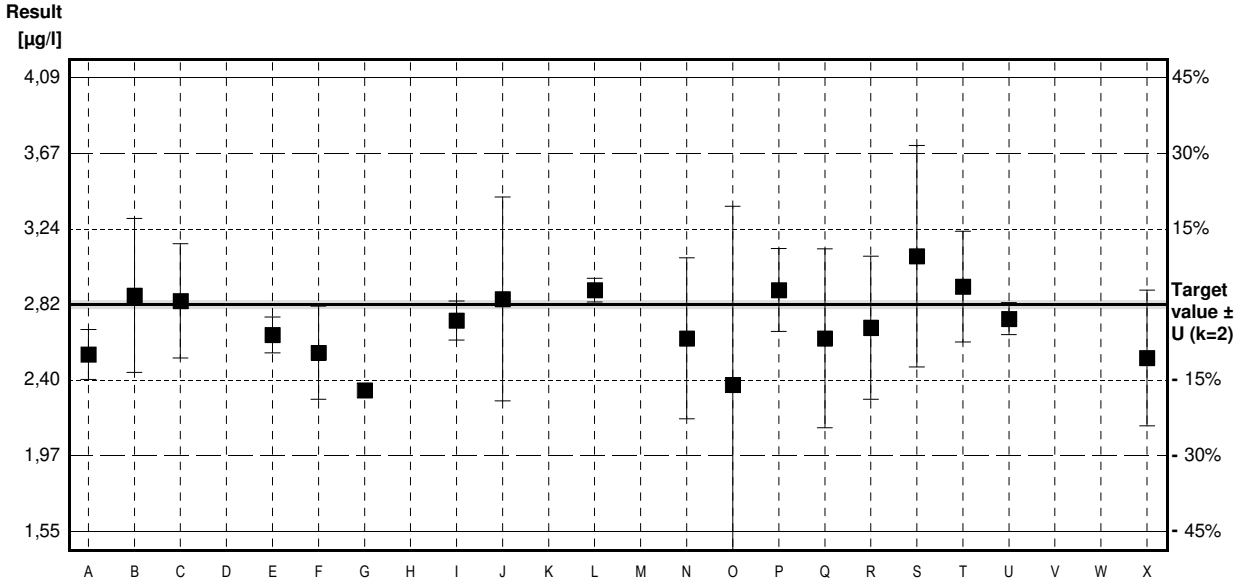


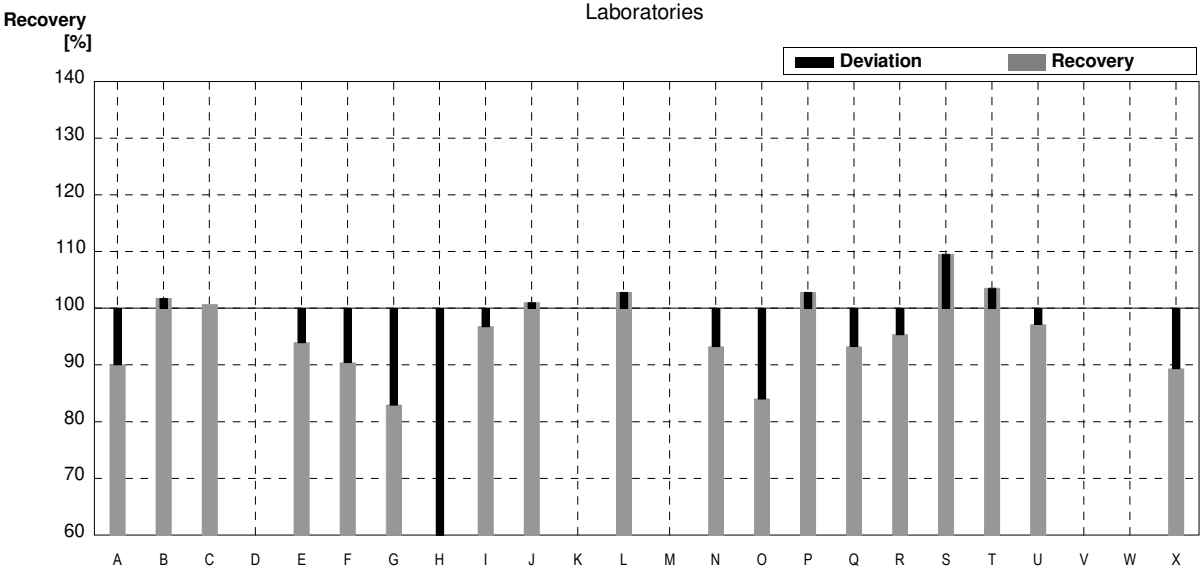
	All results	Outliers excl.	Unit
Mean ± CI(99%)	7,87 ± 0,34	7,95 ± 0,26	µg/l
Recov. ± CI(99%)	98,0 ± 4,2	99,1 ± 3,2	%
SD between labs	0,51	0,37	µg/l
RSD between labs	6,5	4,7	%
n for calculation	19	18	

Sample M149B
Parameter Lead

Target value	± U (k=2)	2,82 µg/l	±	0,02 µg/l
IFA result	± U (k=2)	2,76 µg/l	±	0,11 µg/l
Stability test	± U (k=2)	2,83 µg/l	±	0,11 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	2,54	0,14	µg/l	90%	-1,36
B	2,87	0,43	µg/l	102%	0,24
C	2,84	0,32	µg/l	101%	0,10
D			µg/l		
E	2,65	0,1	µg/l	94%	-0,83
F	2,55	0,26	µg/l	90%	-1,31
G	2,34		µg/l	83%	-2,33
H	1,29 *		µg/l	46%	-7,43
I	2,73	0,11	µg/l	97%	-0,44
J	2,85	0,57	µg/l	101%	0,15
K			µg/l		
L	2,90	0,067	µg/l	103%	0,39
M			µg/l		
N	2,63	0,45	µg/l	93%	-0,92
O	2,37	1	µg/l	84%	-2,19
P	2,90	0,232	µg/l	103%	0,39
Q	2,63	0,5	µg/l	93%	-0,92
R	2,69	0,40	µg/l	95%	-0,63
S	3,09	0,62	µg/l	110%	1,31
T	2,92	0,31	µg/l	104%	0,49
U	2,74	0,09	µg/l	97%	-0,39
V			µg/l		
W			µg/l		
X	2,52	0,38	µg/l	89%	-1,46



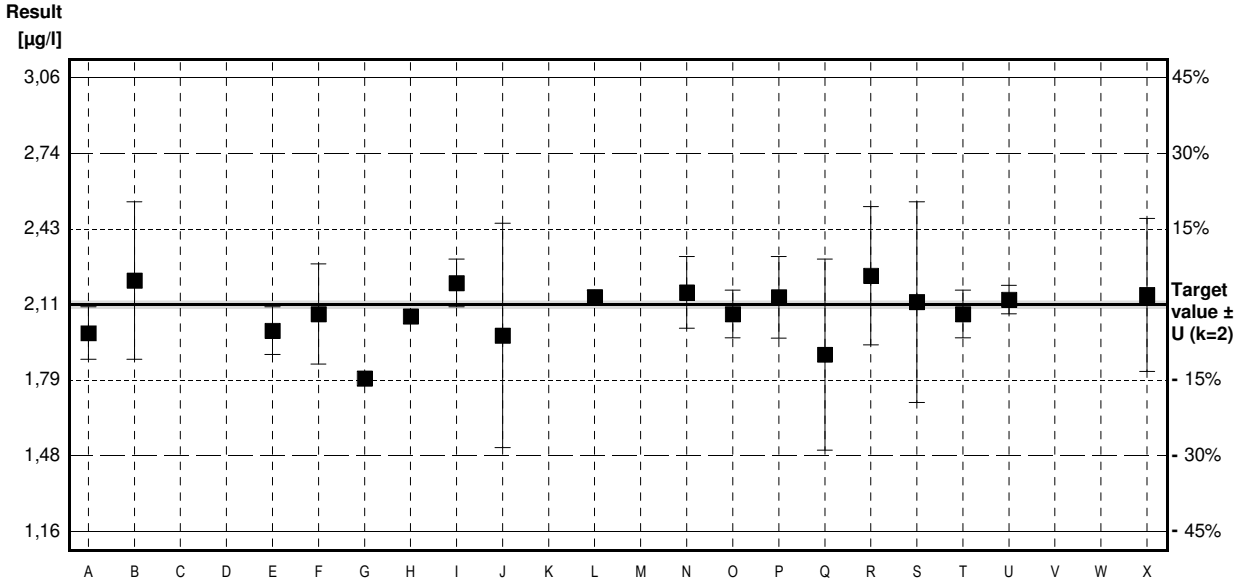


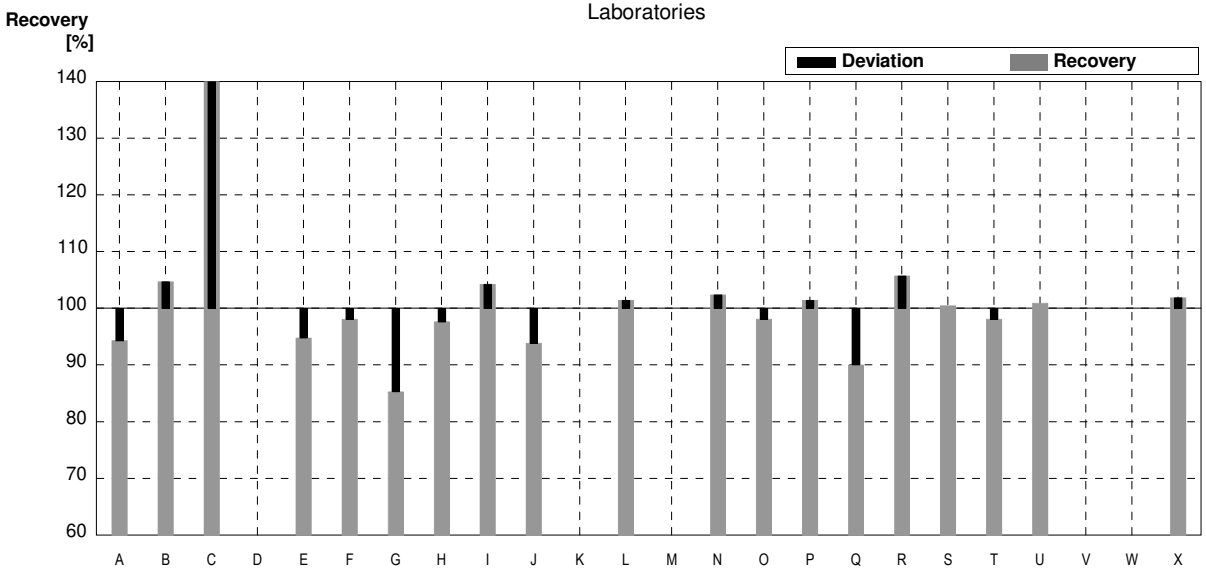
	All results	Outliers excl.	Unit
Mean ± CI(99%)	2,63 ± 0,25	2,71 ± 0,14	µg/l
Recov. ± CI(99%)	93,4 ± 8,9	96,1 ± 4,9	%
SD between labs	0,38	0,20	µg/l
RSD between labs	14,4	7,4	%
n for calculation	19	18	

Sample M149A
Parameter Cadmium

Target value	± U (k=2)	2,11 µg/l	±	0,02 µg/l
IFA result	± U (k=2)	2,14 µg/l	±	0,15 µg/l
Stability test	± U (k=2)	2,09 µg/l	±	0,15 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	1,99	0,11	µg/l	94%	-0,92
B	2,21	0,33	µg/l	105%	0,76
C	3,26 *	0,20	µg/l	155%	8,79
D			µg/l		
E	2,00	0,1	µg/l	95%	-0,84
F	2,07	0,21	µg/l	98%	-0,31
G	1,80 *		µg/l	85%	-2,37
H	2,06		µg/l	98%	-0,38
I	2,20	0,1	µg/l	104%	0,69
J	1,98	0,47	µg/l	94%	-0,99
K			µg/l		
L	2,14	0,030	µg/l	101%	0,23
M			µg/l		
N	2,16	0,15	µg/l	102%	0,38
O	2,07	0,1	µg/l	98%	-0,31
P	2,14	0,171	µg/l	101%	0,23
Q	1,90	0,4	µg/l	90%	-1,61
R	2,23	0,29	µg/l	106%	0,92
S	2,12	0,42	µg/l	100%	0,08
T	2,07	0,10	µg/l	98%	-0,31
U	2,13	0,06	µg/l	101%	0,15
V			µg/l		
W			µg/l		
X	2,15	0,32	µg/l	102%	0,31



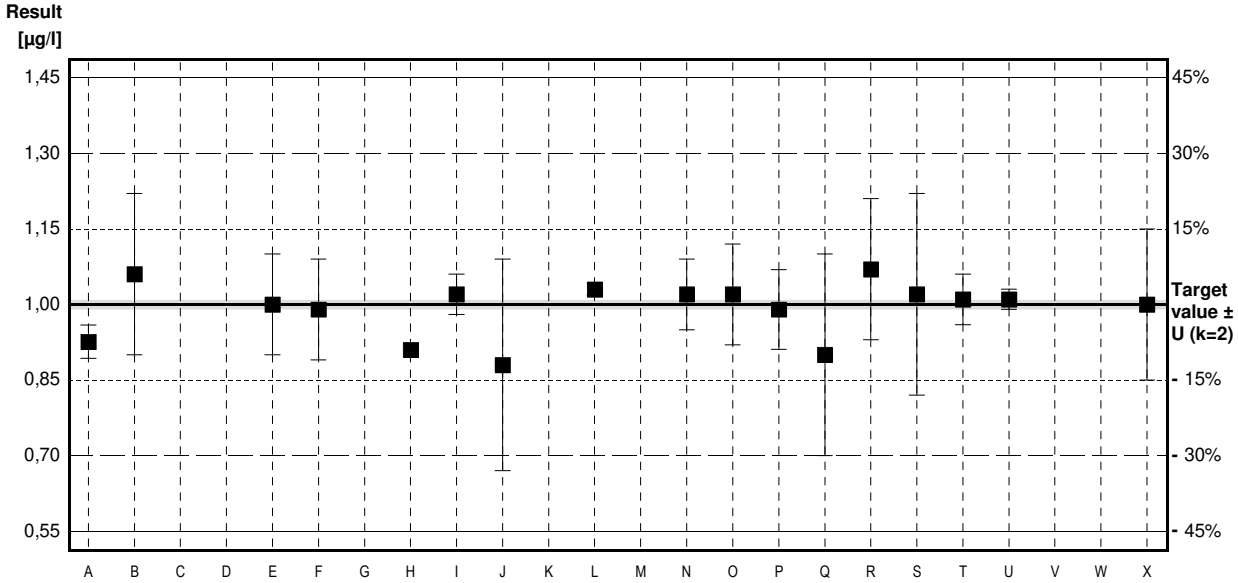


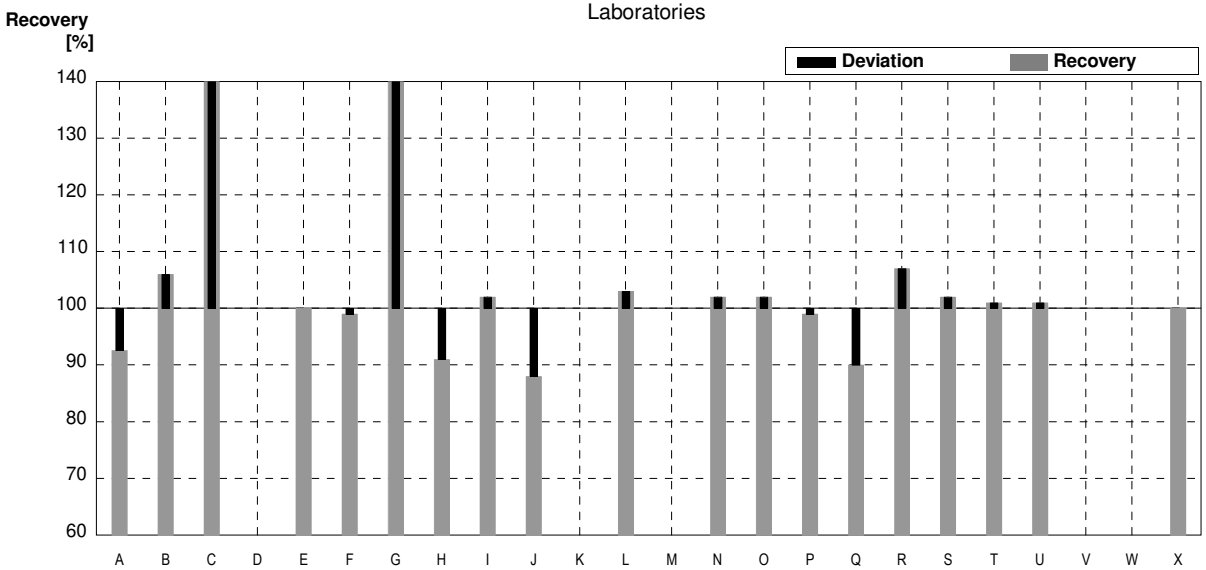
	All results	Outliers excl.	Unit
Mean ± CI(99%)	2,14 ± 0,19	2,10 ± 0,06	µg/l
Recov. ± CI(99%)	101,5 ± 9,1	99,3 ± 3,0	%
SD between labs	0,29	0,09	µg/l
RSD between labs	13,6	4,3	%
n for calculation	19	17	

Sample M149B
Parameter Cadmium

Target value	± U (k=2)	1,00 µg/l	±	0,01 µg/l
IFA result	± U (k=2)	1,04 µg/l	±	0,07 µg/l
Stability test	± U (k=2)	1,01 µg/l	±	0,07 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	0,926	0,033	µg/l	93%	-1,19
B	1,06	0,16	µg/l	106%	0,97
C	1,64 *	0,51	µg/l	164%	10,32
D			µg/l		
E	1,00	0,1	µg/l	100%	0,00
F	0,99	0,10	µg/l	99%	-0,16
G	1,48 *		µg/l	148%	7,74
H	0,91 *		µg/l	91%	-1,45
I	1,02	0,04	µg/l	102%	0,32
J	0,88 *	0,21	µg/l	88%	-1,94
K			µg/l		
L	1,03	0,012	µg/l	103%	0,48
M			µg/l		
N	1,02	0,07	µg/l	102%	0,32
O	1,02	0,1	µg/l	102%	0,32
P	0,99	0,0792	µg/l	99%	-0,16
Q	0,90 *	0,2	µg/l	90%	-1,61
R	1,07	0,14	µg/l	107%	1,13
S	1,02	0,20	µg/l	102%	0,32
T	1,01	0,05	µg/l	101%	0,16
U	1,01	0,02	µg/l	101%	0,16
V			µg/l		
W			µg/l		
X	1,00	0,15	µg/l	100%	0,00



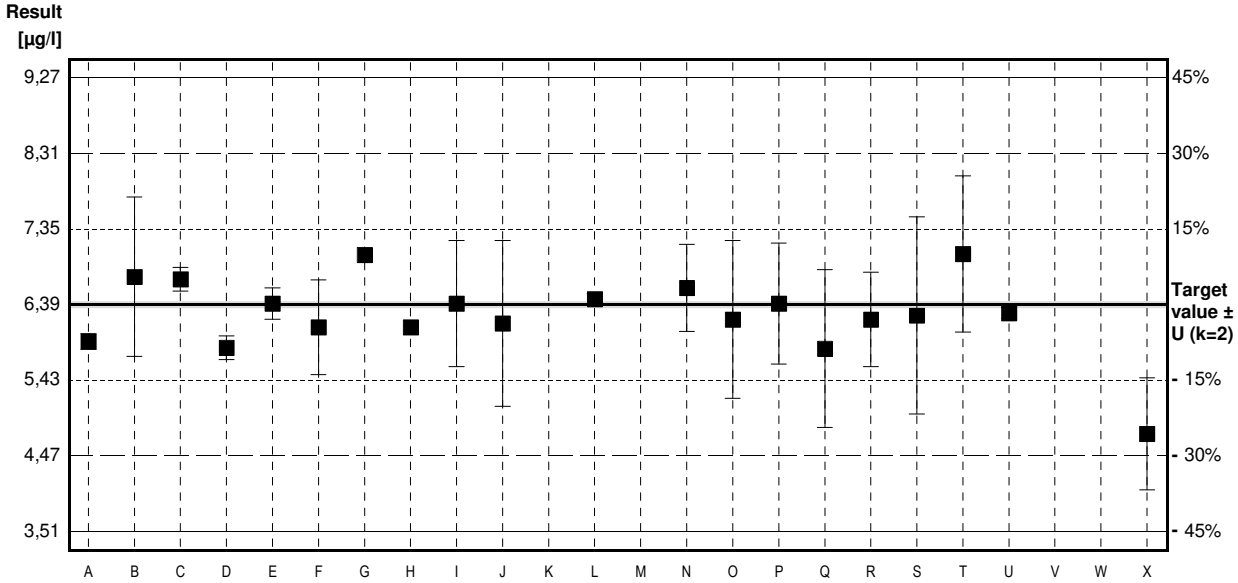


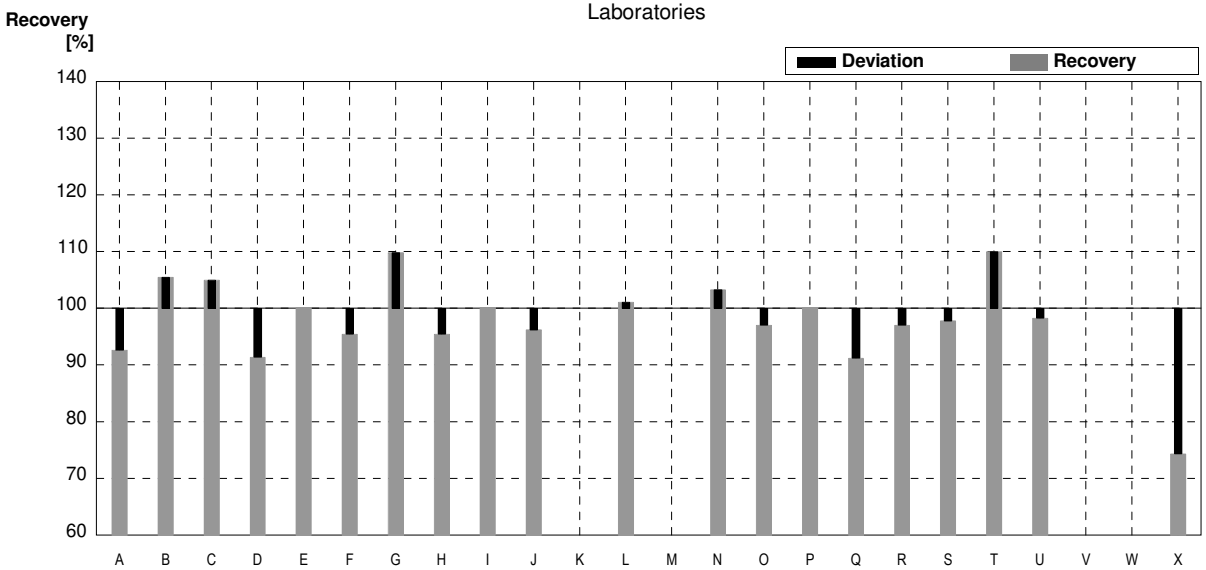
	All results	Outliers excl.	Unit
Mean ± CI(99%)	1,05 ± 0,12	1,01 ± 0,03	µg/l
Recov. ± CI(99%)	105,1 ± 12,5	101,2 ± 2,7	%
SD between labs	0,19	0,03	µg/l
RSD between labs	17,9	3,3	%
n for calculation	19	14	

Sample M149A
Parameter Chromium

Target value	± U (k=2)	6,39 µg/l	±	0,04 µg/l
IFA result	± U (k=2)	6,55 µg/l	±	0,33 µg/l
Stability test	± U (k=2)	6,15 µg/l	±	0,31 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	5,92	0,10	µg/l	93%	-1,10
B	6,74	1,01	µg/l	105%	0,82
C	6,71	0,15	µg/l	105%	0,75
D	5,84	0,15	µg/l	91%	-1,28
E	6,40	0,2	µg/l	100%	0,02
F	6,1	0,6	µg/l	95%	-0,68
G	7,02		µg/l	110%	1,47
H	6,1		µg/l	95%	-0,68
I	6,4	0,8	µg/l	100%	0,02
J	6,15	1,05	µg/l	96%	-0,56
K			µg/l		
L	6,46	0,070	µg/l	101%	0,16
M			µg/l		
N	6,60	0,55	µg/l	103%	0,49
O	6,2	1	µg/l	97%	-0,44
P	6,40	0,768	µg/l	100%	0,02
Q	5,83	1	µg/l	91%	-1,31
R	6,2	0,6	µg/l	97%	-0,44
S	6,25	1,25	µg/l	98%	-0,33
T	7,03	0,99	µg/l	110%	1,49
U	6,28	0,07	µg/l	98%	-0,26
V			µg/l		
W			µg/l		
X	4,75 *	0,71	µg/l	74%	-3,83



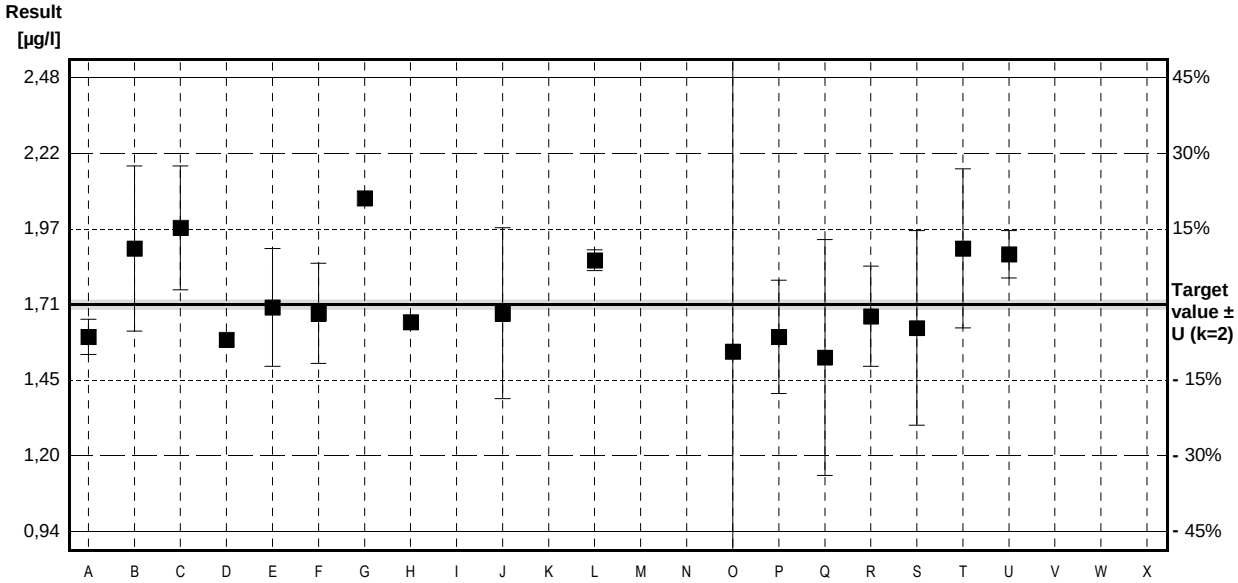


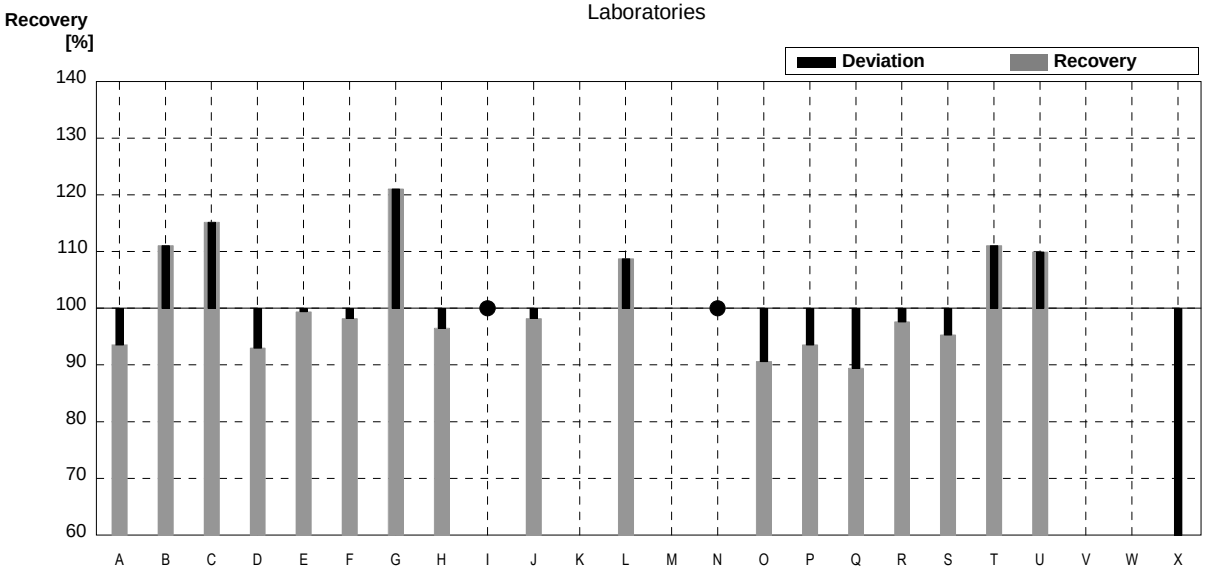
	All results	Outliers excl.	Unit
Mean ± CI(99%)	6,27 ± 0,32	6,35 ± 0,23	µg/l
Recov. ± CI(99%)	98,1 ± 4,9	99,4 ± 3,6	%
SD between labs	0,49	0,35	µg/l
RSD between labs	7,9	5,5	%
n for calculation	20	19	

Sample M149B
Parameter Chromium

Target value	± U (k=2)	1,71 µg/l	±	0,02 µg/l
IFA result	± U (k=2)	1,80 µg/l	±	0,09 µg/l
Stability test	± U (k=2)	1,83 µg/l	±	0,09 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	1,60	0,06	µg/l	94%	-0,96
B	1,90	0,28	µg/l	111%	1,66
C	1,97	0,21	µg/l	115%	2,27
D	1,59	0,02	µg/l	93%	-1,05
E	1,70	0,2	µg/l	99%	-0,09
F	1,68	0,17	µg/l	98%	-0,26
G	2,07		µg/l	121%	3,14
H	1,65		µg/l	96%	-0,52
I	<5		µg/l	•	
J	1,68	0,29	µg/l	98%	-0,26
K			µg/l		
L	1,86	0,035	µg/l	109%	1,31
M			µg/l		
N	<5,0		µg/l	•	
O	1,55	1	µg/l	91%	-1,40
P	1,60	0,192	µg/l	94%	-0,96
Q	1,53	0,4	µg/l	89%	-1,57
R	1,67	0,17	µg/l	98%	-0,35
S	1,63	0,33	µg/l	95%	-0,70
T	1,90	0,27	µg/l	111%	1,66
U	1,88	0,08	µg/l	110%	1,48
V			µg/l		
W			µg/l		
X	0,54 *	0,08	µg/l	32%	-10,21





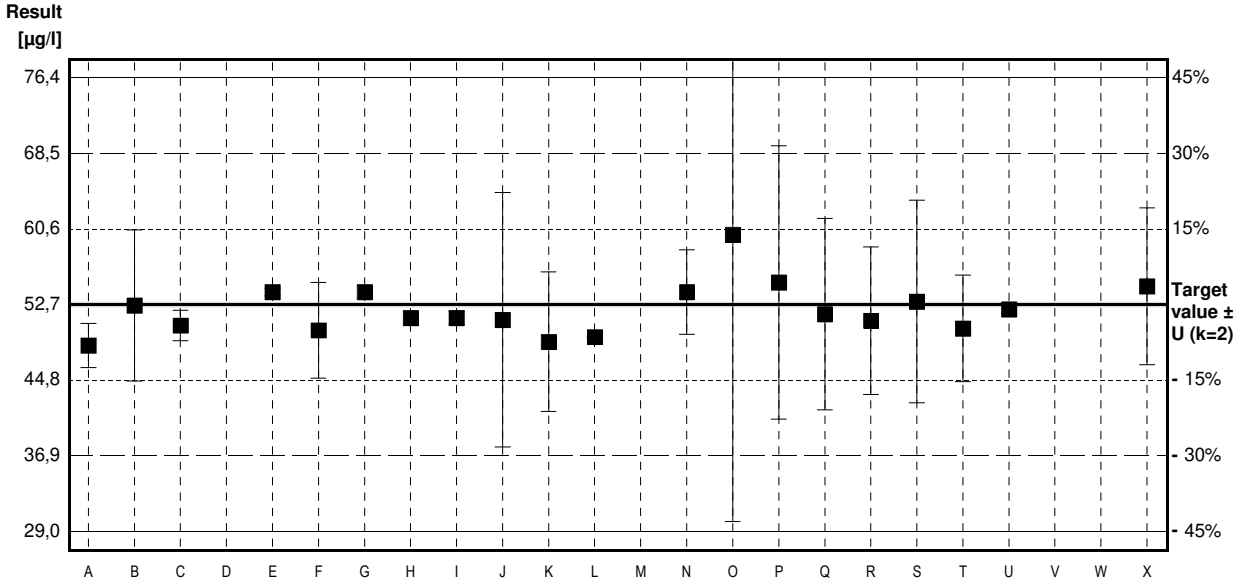
	All results	Outliers excl.	Unit
Mean ± CI(99%)	1,67 ± 0,22	1,73 ± 0,12	µg/l
Recov. ± CI(99%)	97,5 ± 12,9	101,3 ± 6,7	%
SD between labs	0,32	0,16	µg/l
RSD between labs	19,3	9,4	%
n for calculation	18	17	

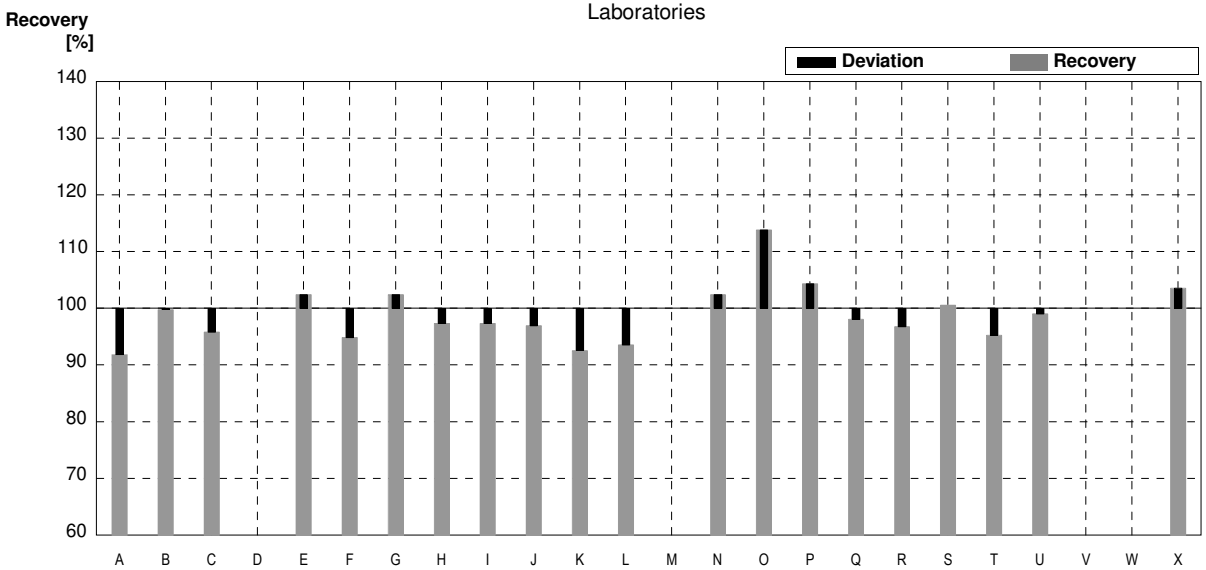
Sample M149A

Parameter Iron

Target value	± U (k=2)	52,7 µg/l	±	0,3 µg/l
IFA result	± U (k=2)	55,4 µg/l	±	5,5 µg/l
Stability test	± U (k=2)	53,3 µg/l	±	5,3 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	48,4	2,3	µg/l	92%	-1,10
B	52,6	7,89	µg/l	100%	-0,03
C	50,5	1,6	µg/l	96%	-0,56
D			µg/l		
E	54	0,4	µg/l	102%	0,33
F	50	5,0	µg/l	95%	-0,69
G	54		µg/l	102%	0,33
H	51,3		µg/l	97%	-0,36
I	51,3	0,7	µg/l	97%	-0,36
J	51,10	13,29	µg/l	97%	-0,41
K	48,8	7,3	µg/l	93%	-1,00
L	49,3	0,058	µg/l	94%	-0,87
M			µg/l		
N	54,0	4,43	µg/l	102%	0,33
O	60 *	30	µg/l	114%	1,87
P	55,00	14,30	µg/l	104%	0,59
Q	51,7	10	µg/l	98%	-0,26
R	51	7,7	µg/l	97%	-0,44
S	53,0	10,6	µg/l	101%	0,08
T	50,2	5,57	µg/l	95%	-0,64
U	52,2	0,41	µg/l	99%	-0,13
V			µg/l		
W			µg/l		
X	54,6	8,19	µg/l	104%	0,49



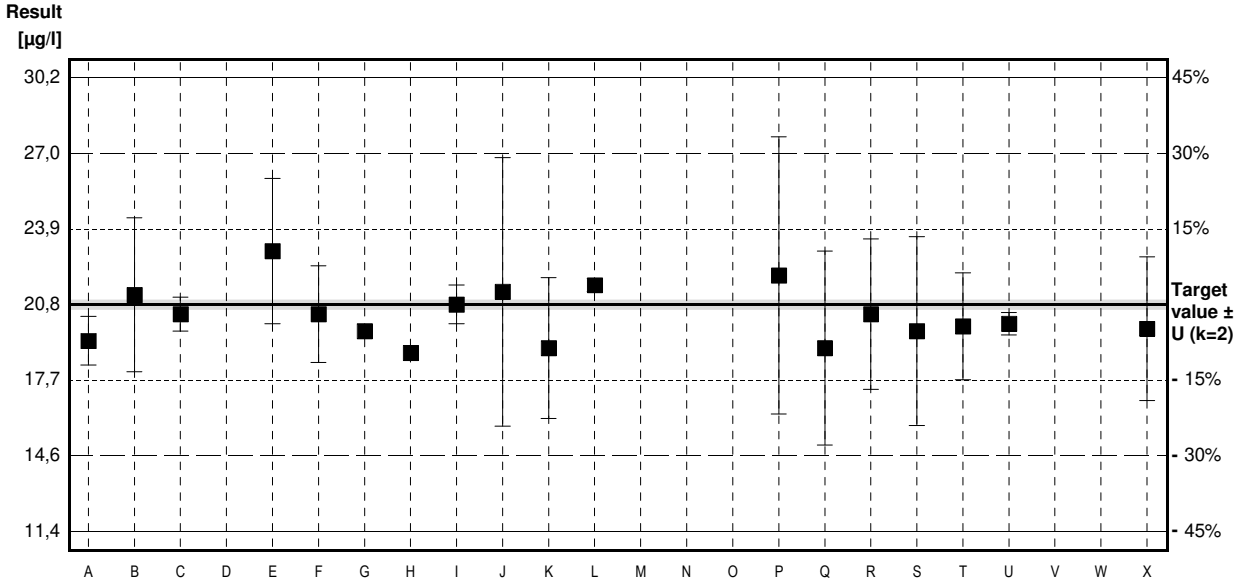


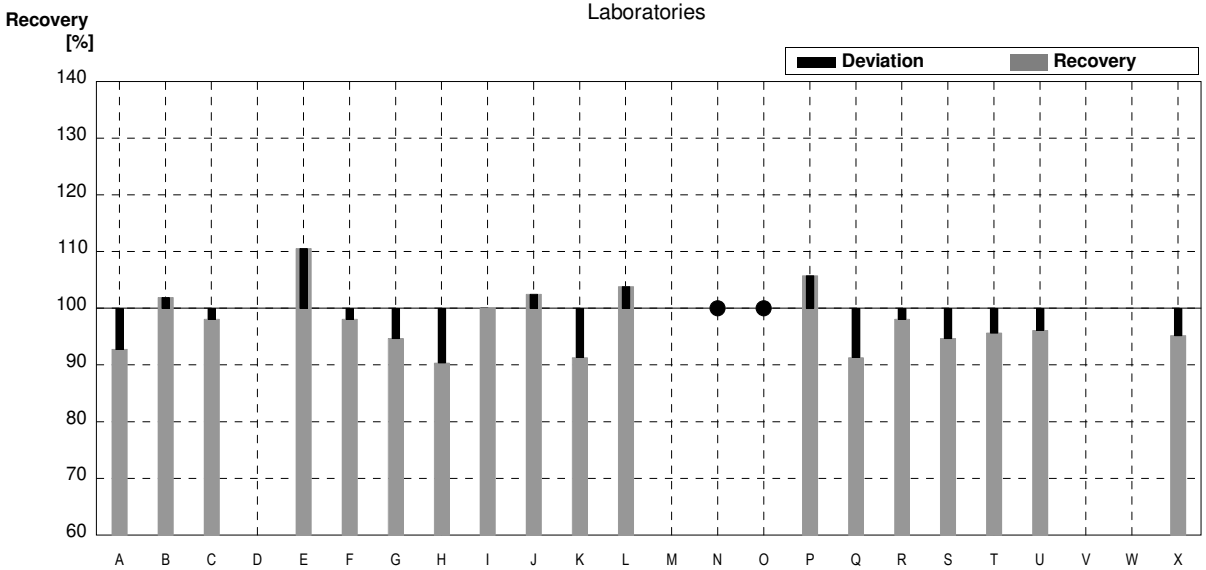
	All results	Outliers excl.	Unit
Mean ± CI(99%)	52,2 ± 1,7	51,7 ± 1,3	µg/l
Recov. ± CI(99%)	99,0 ± 3,2	98,2 ± 2,5	%
SD between labs	2,7	2,0	µg/l
RSD between labs	5,1	3,8	%
n for calculation	20	19	

Sample M149B
Parameter Iron

Target value	± U (k=2)	20,8 µg/l	±	0,2 µg/l
IFA result	± U (k=2)	21,6 µg/l	±	2,2 µg/l
Stability test	± U (k=2)	20,9 µg/l	±	2,1 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	19,3	1,0	µg/l	93%	-0,97
B	21,2	3,18	µg/l	102%	0,26
C	20,4	0,7	µg/l	98%	-0,26
D			µg/l		
E	23,0	3	µg/l	111%	1,43
F	20,4	2,0	µg/l	98%	-0,26
G	19,7		µg/l	95%	-0,71
H	18,8		µg/l	90%	-1,30
I	20,8	0,8	µg/l	100%	0,00
J	21,32	5,54	µg/l	103%	0,34
K	19,0	2,9	µg/l	91%	-1,17
L	21,6	0,265	µg/l	104%	0,52
M			µg/l		
N	<30		µg/l	•	
O	<50		µg/l	•	
P	22,00	5,72	µg/l	106%	0,78
Q	19,0	4	µg/l	91%	-1,17
R	20,4	3,1	µg/l	98%	-0,26
S	19,7	3,9	µg/l	95%	-0,71
T	19,9	2,21	µg/l	96%	-0,58
U	20,0	0,46	µg/l	96%	-0,52
V			µg/l		
W			µg/l		
X	19,8	2,97	µg/l	95%	-0,65



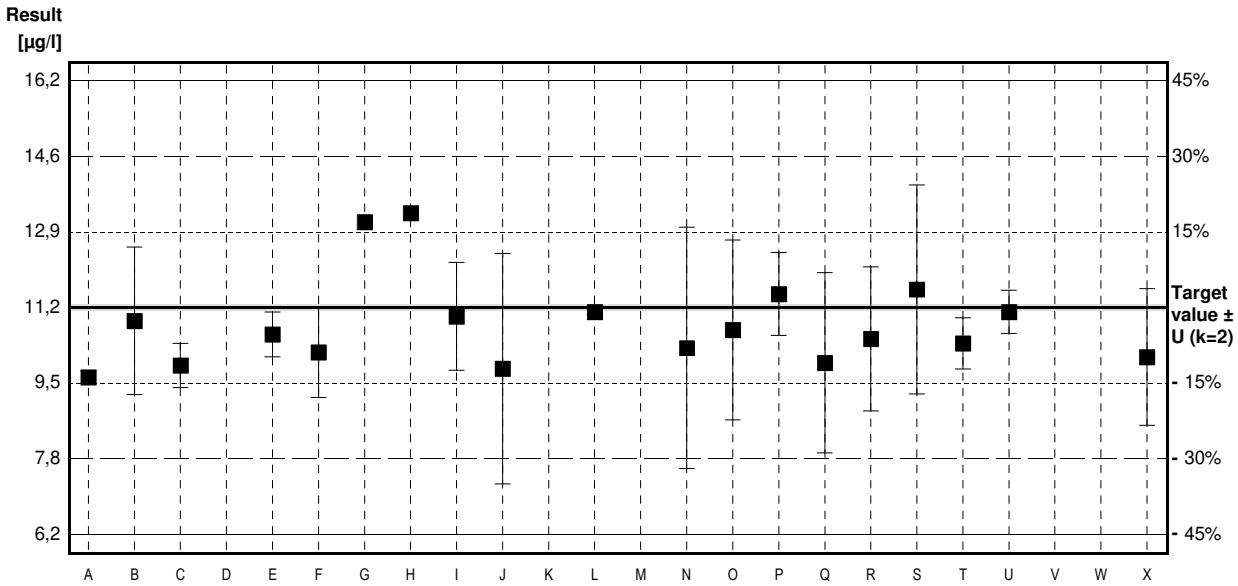


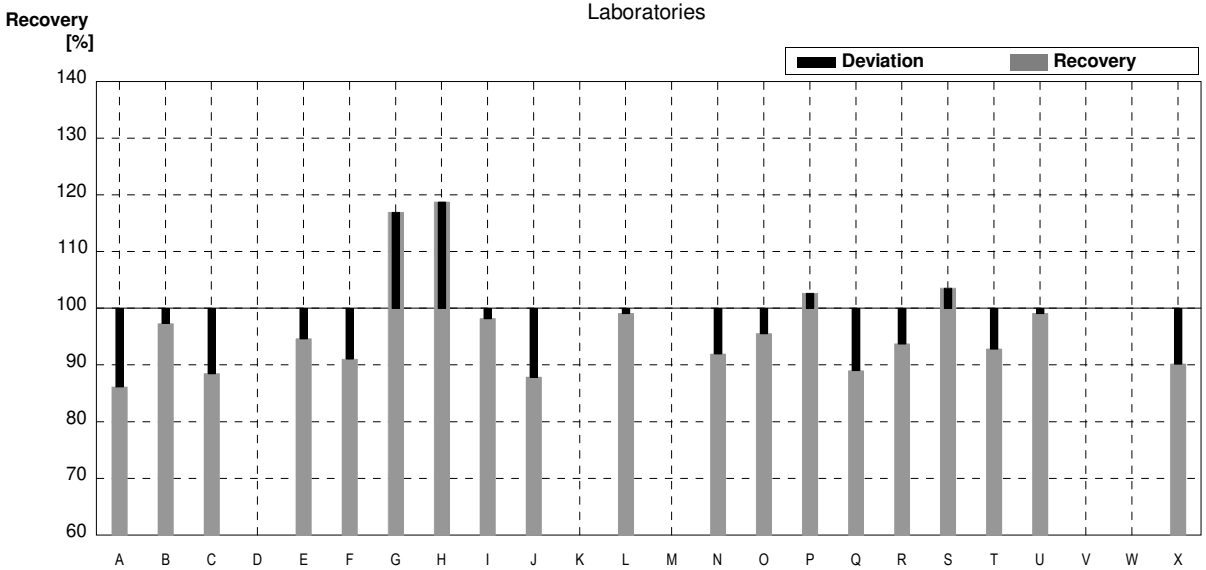
	All results	Outliers excl.	Unit
Mean ± CI(99%)	20,4 ± 0,8	20,4 ± 0,8	µg/l
Recov. ± CI(99%)	97,8 ± 3,7	97,8 ± 3,7	%
SD between labs	1,1	1,1	µg/l
RSD between labs	5,6	5,6	%
n for calculation	18	18	

Sample M149A
Parameter Copper

Target value	± U (k=2)	11,2 µg/l	±	0,1 µg/l
IFA result	± U (k=2)	11,8 µg/l	±	1,1 µg/l
Stability test	± U (k=2)	10,8 µg/l	±	1,0 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	9,65	0,14	µg/l	86%	-1,54
B	10,9	1,64	µg/l	97%	-0,30
C	9,91	0,49	µg/l	88%	-1,28
D			µg/l		
E	10,6	0,5	µg/l	95%	-0,60
F	10,2	1,0	µg/l	91%	-0,99
G	13,1 *		µg/l	117%	1,88
H	13,3 *		µg/l	119%	2,08
I	11,0	1,2	µg/l	98%	-0,20
J	9,84	2,56	µg/l	88%	-1,35
K			µg/l		
L	11,1	0,058	µg/l	99%	-0,10
M			µg/l		
N	10,3	2,68	µg/l	92%	-0,89
O	10,7	2	µg/l	96%	-0,50
P	11,50	0,92	µg/l	103%	0,30
Q	9,97	2	µg/l	89%	-1,22
R	10,5	1,6	µg/l	94%	-0,69
S	11,6	2,32	µg/l	104%	0,40
T	10,4	0,57	µg/l	93%	-0,79
U	11,1	0,48	µg/l	99%	-0,10
V			µg/l		
W			µg/l		
X	10,1	1,52	µg/l	90%	-1,09



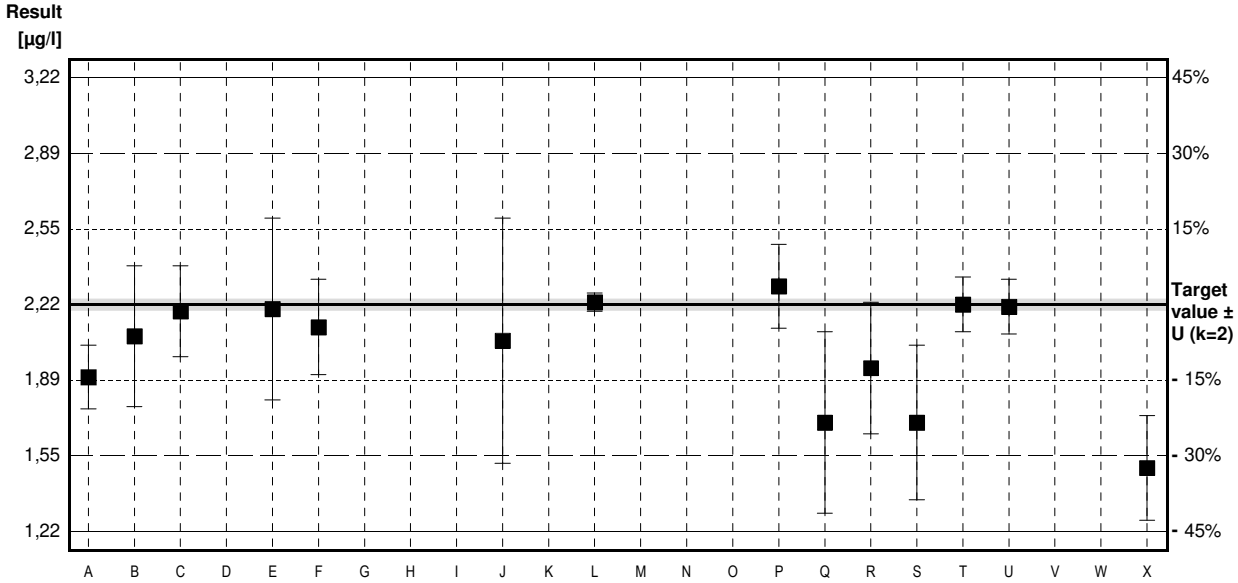


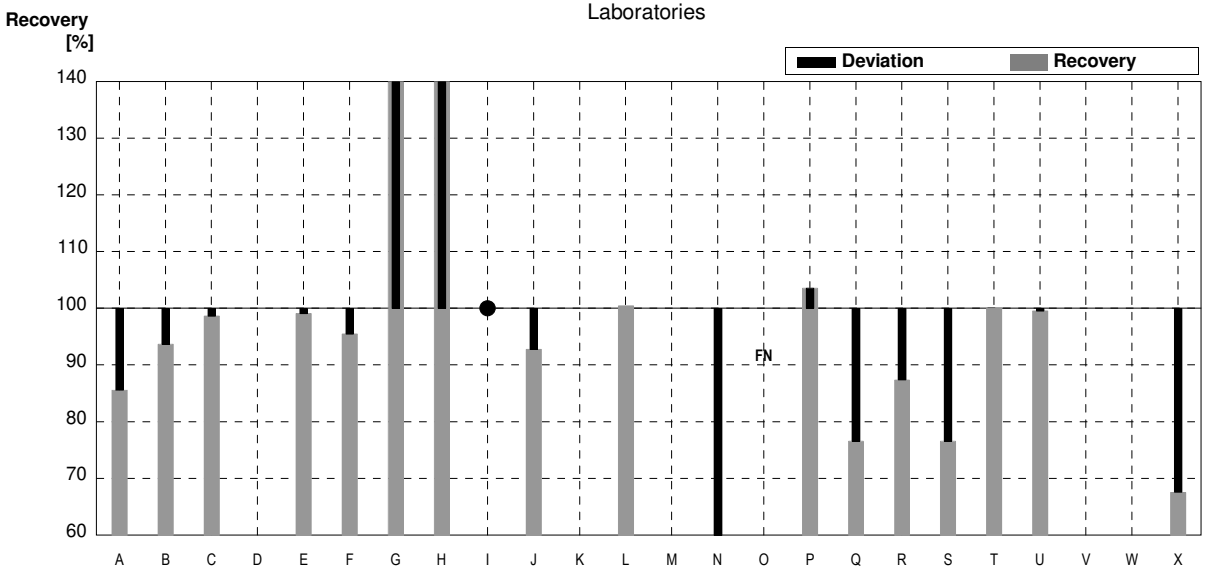
	All results	Outliers excl.	Unit
Mean ± CI(99%)	10,8 ± 0,7	10,6 ± 0,4	µg/l
Recov. ± CI(99%)	96,7 ± 5,9	94,2 ± 3,7	%
SD between labs	1,0	0,6	µg/l
RSD between labs	9,2	5,5	%
n for calculation	19	17	

Sample M149B
Parameter Copper

Target value	± U (k=2)	2,22 µg/l	±	0,03 µg/l
IFA result	± U (k=2)	2,30 µg/l	±	0,21 µg/l
Stability test	± U (k=2)	2,13 µg/l	±	0,19 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	1,90	0,14	µg/l	86%	-1,60
B	2,08	0,31	µg/l	94%	-0,70
C	2,19	0,20	µg/l	99%	-0,15
D			µg/l		
E	2,20	0,4	µg/l	99%	-0,10
F	2,12	0,21	µg/l	95%	-0,50
G	3,98 *		µg/l	179%	8,81
H	3,64 *		µg/l	164%	7,11
I	<5		µg/l	•	
J	2,06	0,54	µg/l	93%	-0,80
K			µg/l		
L	2,23	0,040	µg/l	100%	0,05
M			µg/l		
N	0,766 *	0,20	µg/l	35%	-7,28
O	<2		µg/l	FN	
P	2,30	0,184	µg/l	104%	0,40
Q	1,70	0,4	µg/l	77%	-2,60
R	1,94	0,29	µg/l	87%	-1,40
S	1,70	0,34	µg/l	77%	-2,60
T	2,22	0,12	µg/l	100%	0,00
U	2,21	0,12	µg/l	100%	-0,05
V			µg/l		
W			µg/l		
X	1,50	0,23	µg/l	68%	-3,60



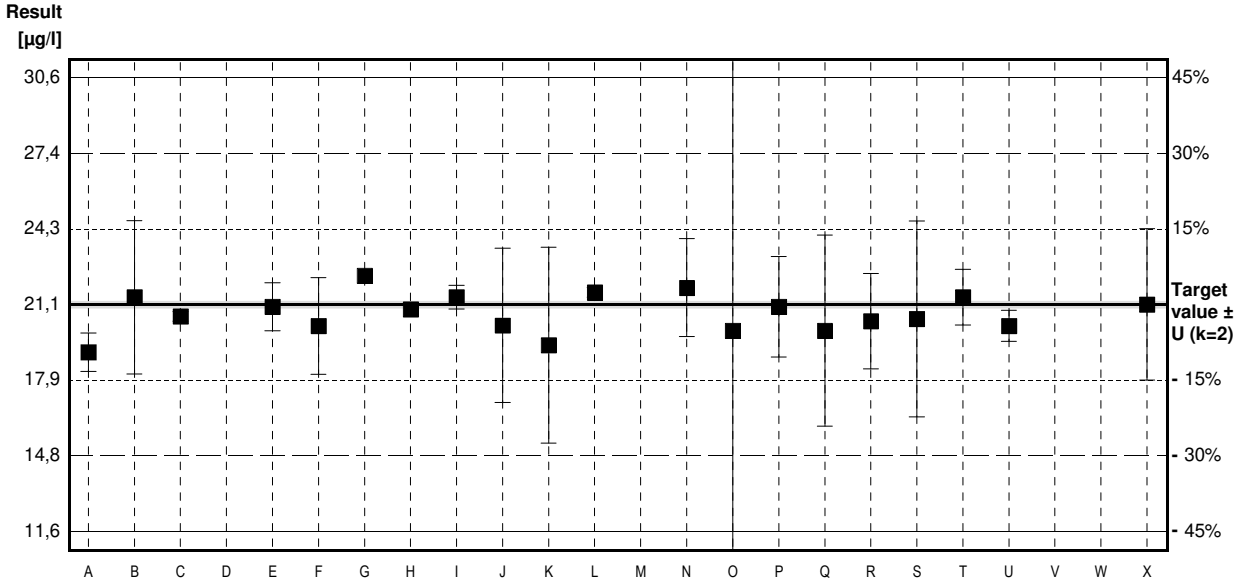


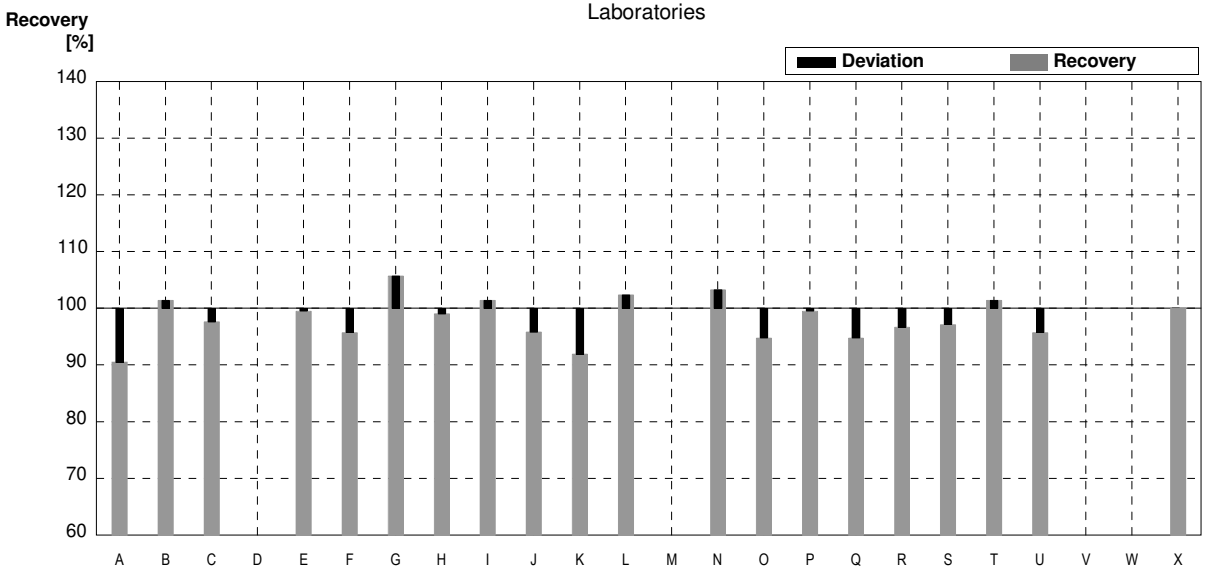
	All results	Outliers excl.	Unit
Mean ± CI(99%)	2,16 ± 0,52	2,03 ± 0,20	µg/l
Recov. ± CI(99%)	97,3 ± 23,2	91,2 ± 8,8	%
SD between labs	0,73	0,24	µg/l
RSD between labs	33,7	12,0	%
n for calculation	17	14	

Sample M149A
Parameter Manganese

Target value	± U (k=2)	21,1 µg/l	±	0,1 µg/l
IFA result	± U (k=2)	22,1 µg/l	±	2,0 µg/l
Stability test	± U (k=2)	21,9 µg/l	±	2,0 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	19,1	0,8	µg/l	91%	-1,58
B	21,4	3,21	µg/l	101%	0,24
C	20,6	0,2	µg/l	98%	-0,39
D			µg/l		
E	21,0	1	µg/l	100%	-0,08
F	20,2	2,02	µg/l	96%	-0,71
G	22,3		µg/l	106%	0,95
H	20,9		µg/l	99%	-0,16
I	21,4	0,5	µg/l	101%	0,24
J	20,22	3,23	µg/l	96%	-0,70
K	19,4	4,1	µg/l	92%	-1,34
L	21,6	0,200	µg/l	102%	0,39
M			µg/l		
N	21,8	2,05	µg/l	103%	0,55
O	20,0	15	µg/l	95%	-0,87
P	21,00	2,10	µg/l	100%	-0,08
Q	20,0	4	µg/l	95%	-0,87
R	20,4	2,0	µg/l	97%	-0,55
S	20,5	4,10	µg/l	97%	-0,47
T	21,4	1,17	µg/l	101%	0,24
U	20,2	0,65	µg/l	96%	-0,71
V			µg/l		
W			µg/l		
X	21,1	3,17	µg/l	100%	0,00



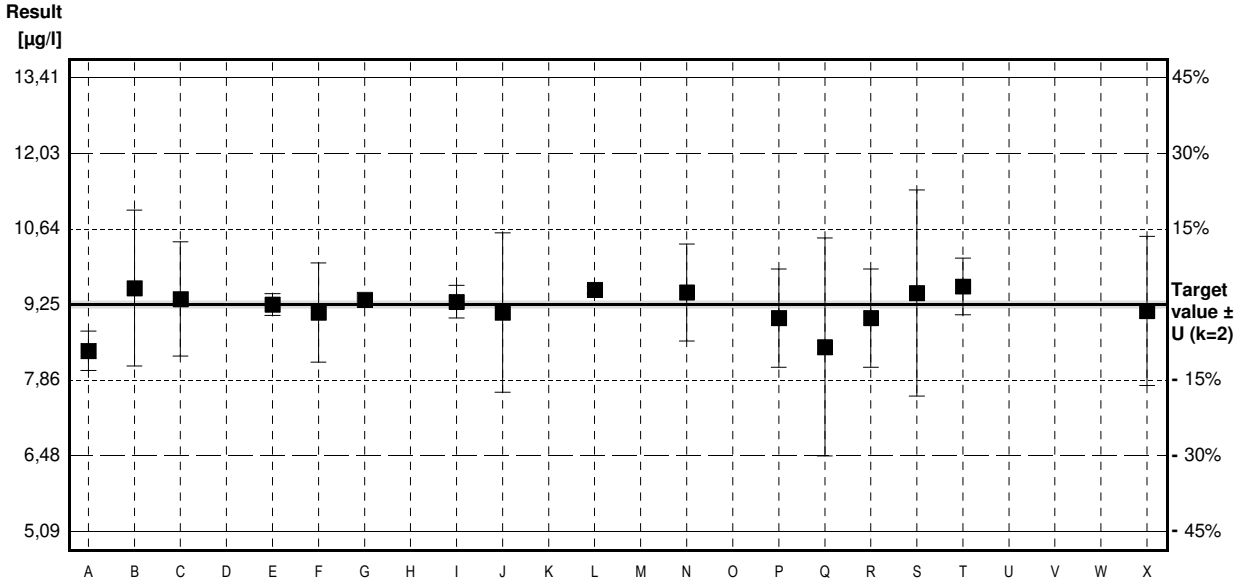


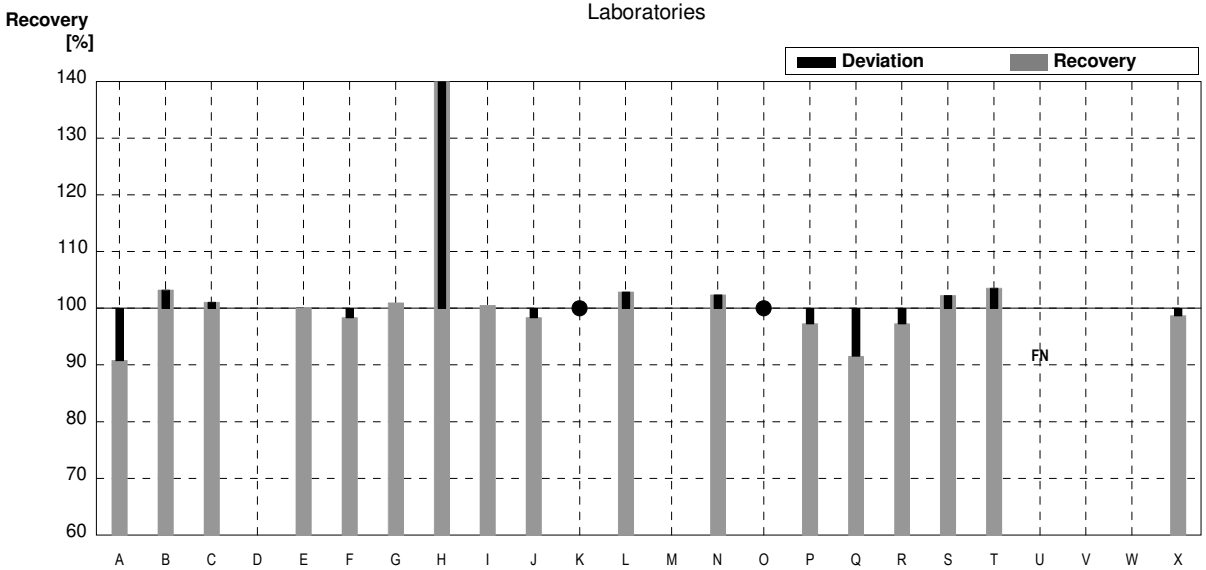
	All results	Outliers excl.	Unit
Mean ± CI(99%)	20,7 ± 0,5	20,7 ± 0,5	µg/l
Recov. ± CI(99%)	98,2 ± 2,5	98,2 ± 2,5	%
SD between labs	0,8	0,8	µg/l
RSD between labs	3,9	3,9	%
n for calculation	20	20	

Sample M149B
Parameter Manganese

Target value	± U (k=2)	9,25 µg/l	±	0,07 µg/l
IFA result	± U (k=2)	9,94 µg/l	±	0,89 µg/l
Stability test	± U (k=2)	9,47 µg/l	±	0,85 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	8,40	0,36	µg/l	91%	-1,53
B	9,55	1,43	µg/l	103%	0,54
C	9,35	1,05	µg/l	101%	0,18
D			µg/l		
E	9,25	0,2	µg/l	100%	0,00
F	9,1	0,91	µg/l	98%	-0,27
G	9,34		µg/l	101%	0,16
H	92,6 *		µg/l	1001%	150,18
I	9,3	0,3	µg/l	101%	0,09
J	9,10	1,46	µg/l	98%	-0,27
K	<10	2	µg/l	•	
L	9,52	0,065	µg/l	103%	0,49
M			µg/l		
N	9,47	0,89	µg/l	102%	0,40
O	<20		µg/l	•	
P	9,00	0,90	µg/l	97%	-0,45
Q	8,47	2	µg/l	92%	-1,41
R	9,0	0,9	µg/l	97%	-0,45
S	9,46	1,89	µg/l	102%	0,38
T	9,58	0,52	µg/l	104%	0,59
U	<0,010		µg/l	FN	
V			µg/l		
W			µg/l		
X	9,13	1,37	µg/l	99%	-0,22



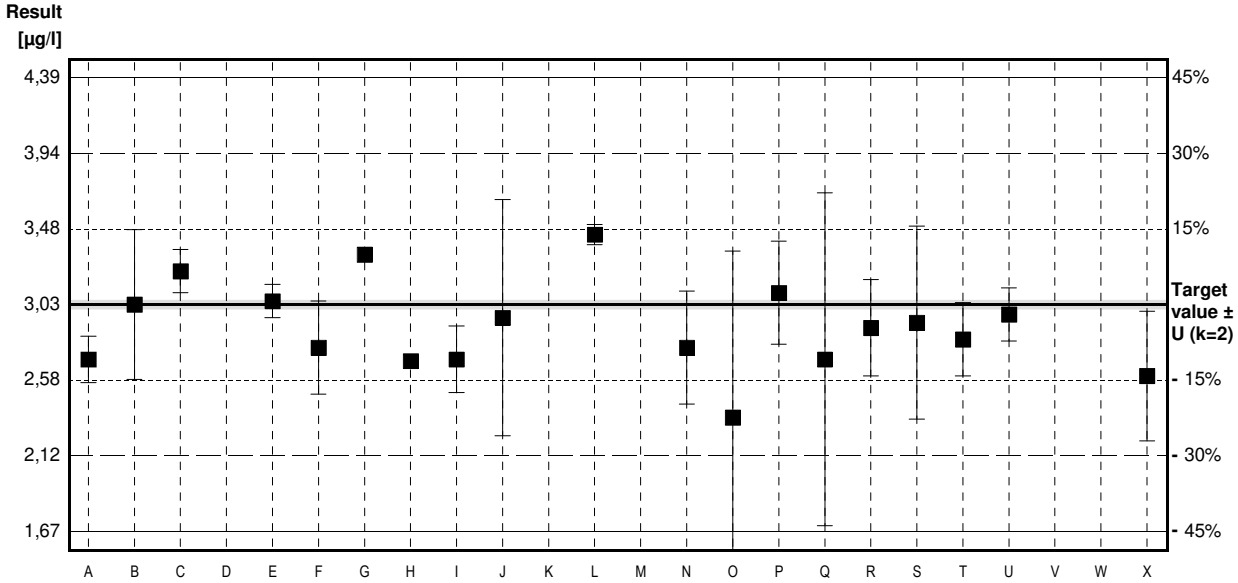


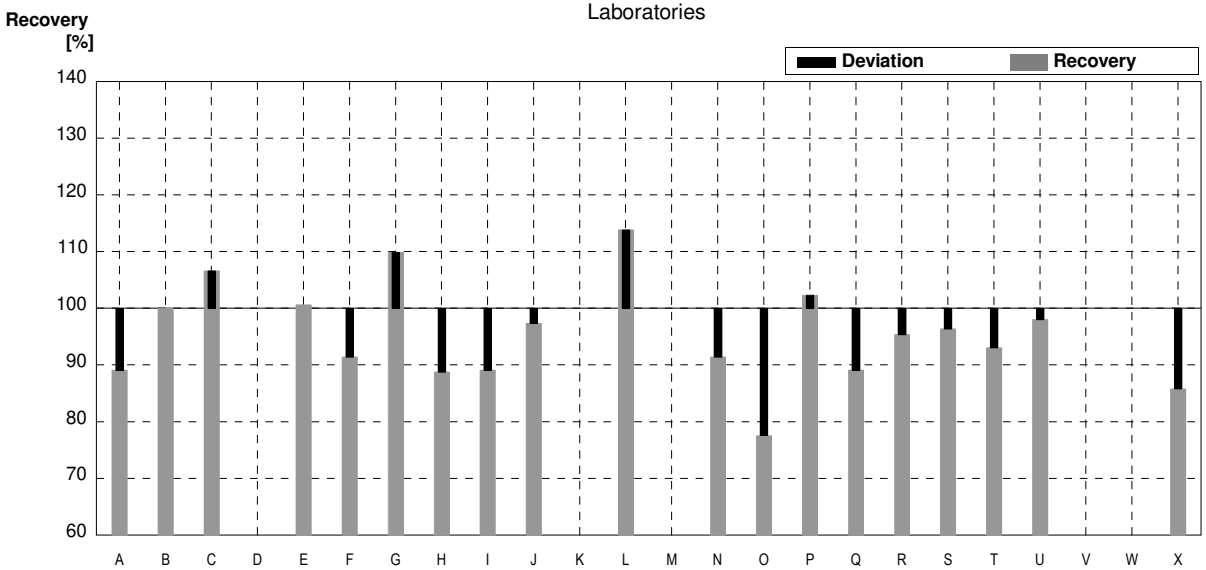
	All results	Outliers excl.	Unit
Mean ± CI(99%)	14,10 ± 14,33	9,19 ± 0,26	µg/l
Recov. ± CI(99%)	152,4 ± 154,9	99,3 ± 2,8	%
SD between labs	20,23	0,35	µg/l
RSD between labs	143,5	3,8	%
n for calculation	17	16	

Sample M149A
Parameter Nickel

Target value	± U (k=2)	3,03 µg/l	±	0,03 µg/l
IFA result	± U (k=2)	3,04 µg/l	±	0,27 µg/l
Stability test	± U (k=2)	3,11 µg/l	±	0,28 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	2,70	0,14	µg/l	89%	-1,27
B	3,03	0,45	µg/l	100%	0,00
C	3,23	0,13	µg/l	107%	0,77
D			µg/l		
E	3,05	0,1	µg/l	101%	0,08
F	2,77	0,28	µg/l	91%	-1,00
G	3,33		µg/l	110%	1,15
H	2,69		µg/l	89%	-1,30
I	2,70	0,2	µg/l	89%	-1,27
J	2,95	0,71	µg/l	97%	-0,31
K			µg/l		
L	3,45	0,060	µg/l	114%	1,61
M			µg/l		
N	2,77	0,34	µg/l	91%	-1,00
O	2,35	1	µg/l	78%	-2,61
P	3,10	0,31	µg/l	102%	0,27
Q	2,70	1	µg/l	89%	-1,27
R	2,89	0,29	µg/l	95%	-0,54
S	2,92	0,58	µg/l	96%	-0,42
T	2,82	0,22	µg/l	93%	-0,81
U	2,97	0,16	µg/l	98%	-0,23
V			µg/l		
W			µg/l		
X	2,60	0,39	µg/l	86%	-1,65



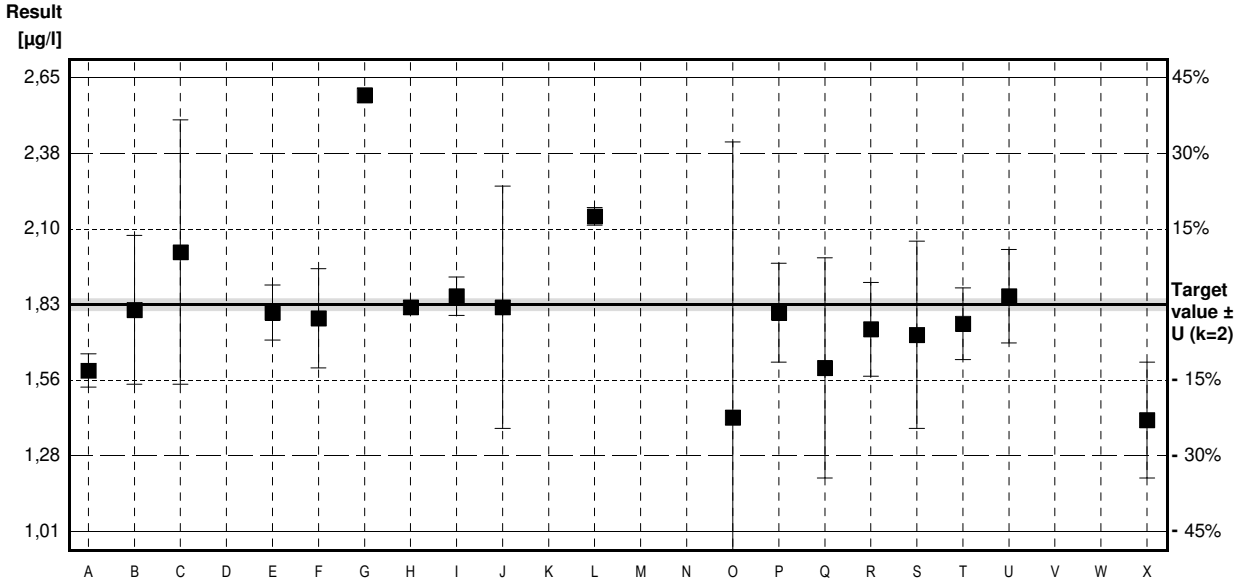


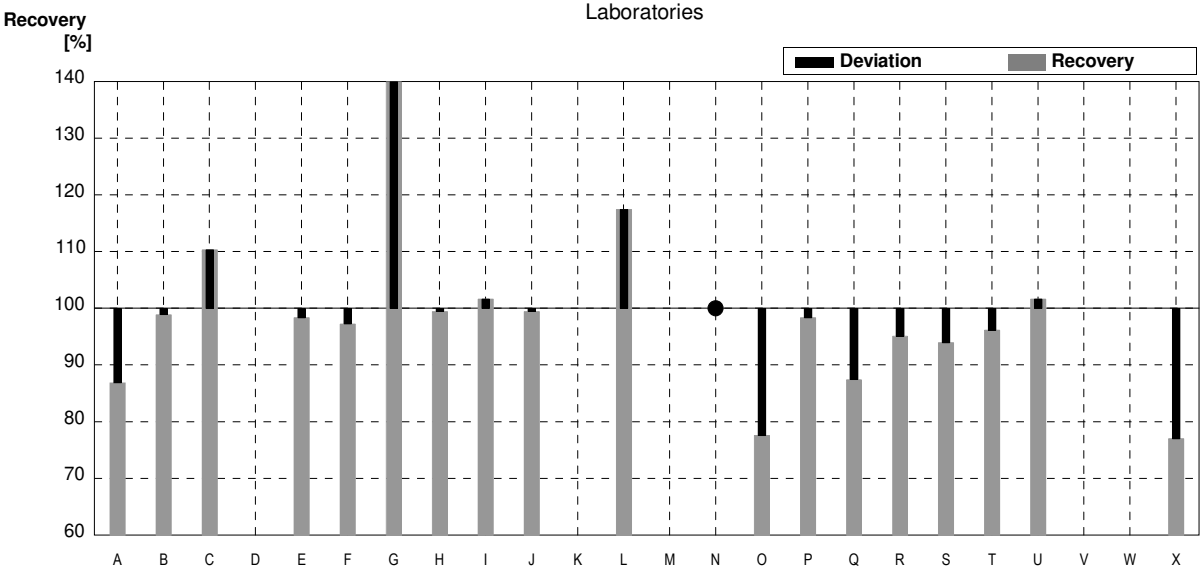
	All results	Outliers excl.	Unit
Mean ± CI(99%)	2,90 ± 0,18	2,90 ± 0,18	µg/l
Recov. ± CI(99%)	95,6 ± 5,8	95,6 ± 5,8	%
SD between labs	0,27	0,27	µg/l
RSD between labs	9,2	9,2	%
n for calculation	19	19	

Sample M149B
Parameter Nickel

Target value	± U (k=2)	1,83 µg/l	±	0,02 µg/l
IFA result	± U (k=2)	1,93 µg/l	±	0,17 µg/l
Stability test	± U (k=2)	1,78 µg/l	±	0,16 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	1,59	0,06	µg/l	87%	-1,52
B	1,81	0,27	µg/l	99%	-0,13
C	2,02	0,48	µg/l	110%	1,21
D			µg/l		
E	1,80	0,1	µg/l	98%	-0,19
F	1,78	0,18	µg/l	97%	-0,32
G	2,59 *		µg/l	142%	4,83
H	1,82		µg/l	99%	-0,06
I	1,86	0,07	µg/l	102%	0,19
J	1,82	0,44	µg/l	99%	-0,06
K			µg/l		
L	2,15 *	0,032	µg/l	117%	2,03
M			µg/l		
N	<2,0		µg/l	•	
O	1,42 *	1	µg/l	78%	-2,61
P	1,80	0,18	µg/l	98%	-0,19
Q	1,60	0,4	µg/l	87%	-1,46
R	1,74	0,17	µg/l	95%	-0,57
S	1,72	0,34	µg/l	94%	-0,70
T	1,76	0,13	µg/l	96%	-0,44
U	1,86	0,17	µg/l	102%	0,19
V			µg/l		
W			µg/l		
X	1,41 *	0,21	µg/l	77%	-2,67



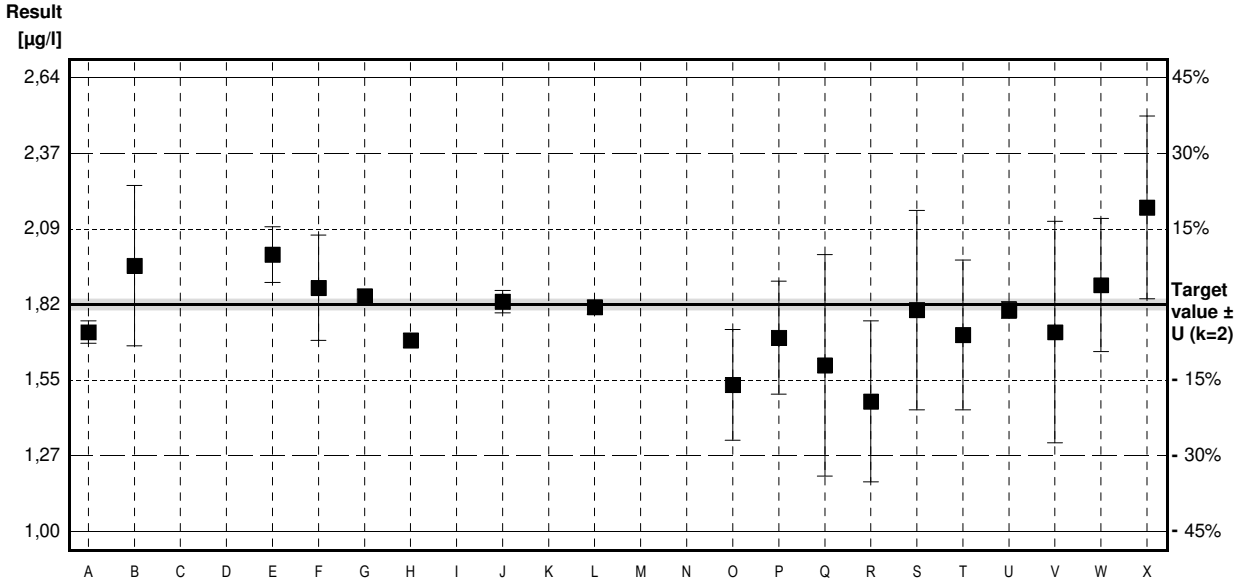


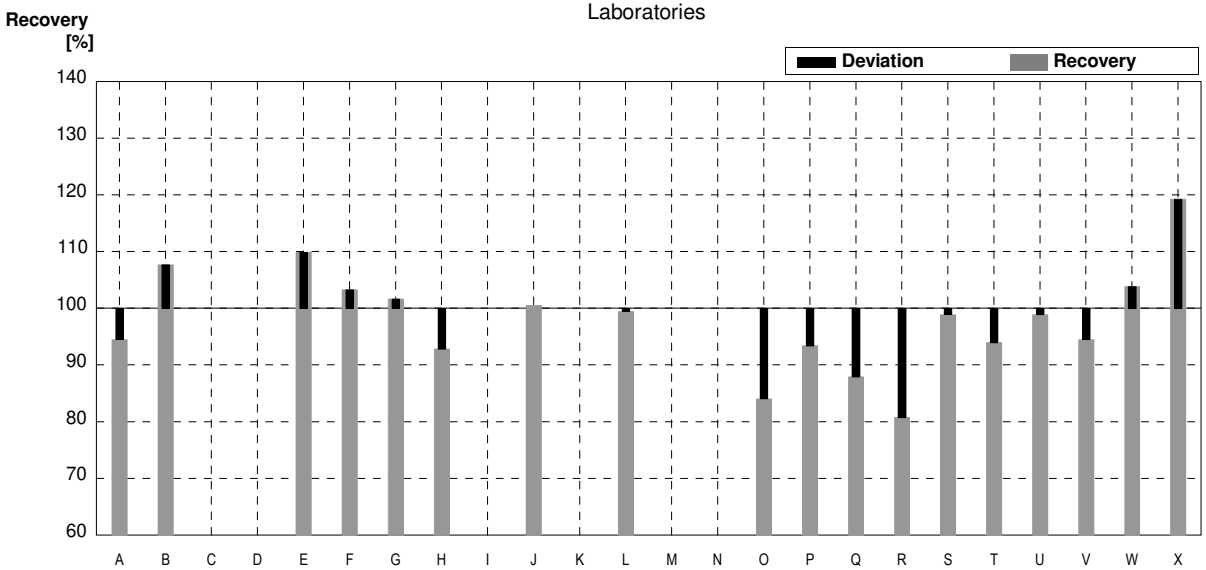
	All results	Outliers excl.	Unit
Mean ± CI(99%)	1,81 ± 0,18	1,78 ± 0,09	µg/l
Recov. ± CI(99%)	98,8 ± 9,9	97,5 ± 4,7	%
SD between labs	0,27	0,11	µg/l
RSD between labs	14,7	6,0	%
n for calculation	18	14	

Sample M149A
Parameter Mercury

Target value ± U (k=2)	1,82	µg/l	±	0,02	µg/l
IFA result ± U (k=2)	1,87	µg/l	±	0,19	µg/l
Stability test ± U (k=2)	1,87	µg/l	±	0,19	µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	1,72	0,04	µg/l	95%	-0,50
B	1,96	0,29	µg/l	108%	0,70
C			µg/l		
D			µg/l		
E	2,00	0,1	µg/l	110%	0,90
F	1,88	0,19	µg/l	103%	0,30
G	1,85		µg/l	102%	0,15
H	1,69		µg/l	93%	-0,65
I			µg/l		
J	1,83	0,04	µg/l	101%	0,05
K			µg/l		
L	1,81	0,025	µg/l	99%	-0,05
M			µg/l		
N			µg/l		
O	1,53	0,2	µg/l	84%	-1,45
P	1,70	0,204	µg/l	93%	-0,60
Q	1,60	0,4	µg/l	88%	-1,10
R	1,47	0,29	µg/l	81%	-1,75
S	1,80	0,36	µg/l	99%	-0,10
T	1,71	0,27	µg/l	94%	-0,55
U	1,80	0,03	µg/l	99%	-0,10
V	1,72	0,4	µg/l	95%	-0,50
W	1,89	0,24	µg/l	104%	0,35
X	2,17	0,33	µg/l	119%	1,75



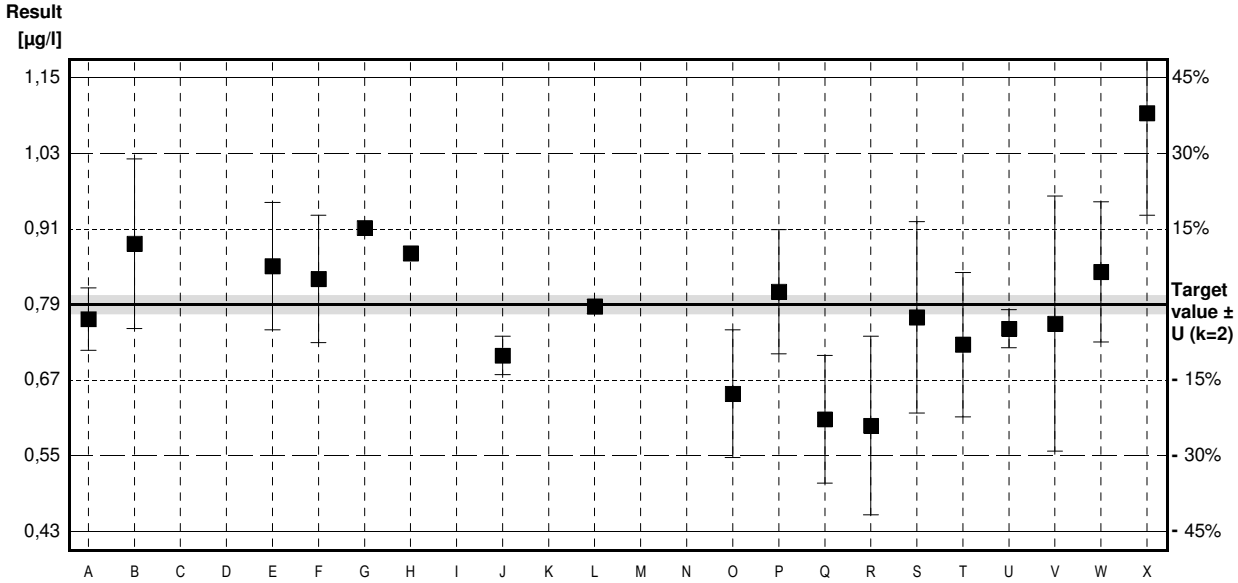


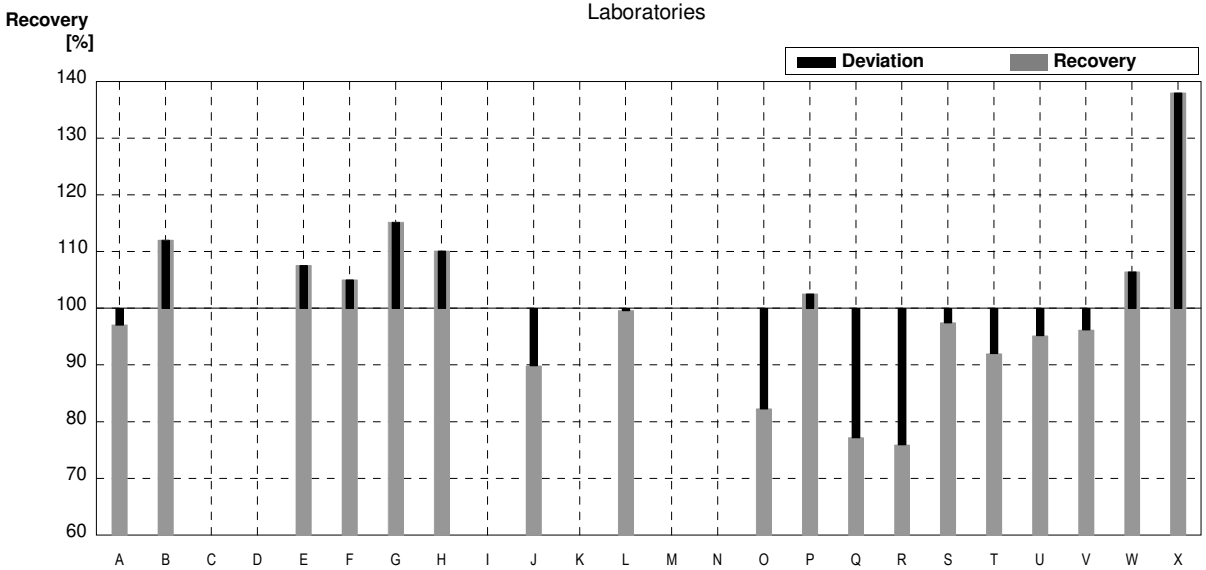
	All results	Outliers excl.	Unit
Mean ± CI(99%)	1,79 ± 0,12	1,79 ± 0,12	µg/l
Recov. ± CI(99%)	98,1 ± 6,3	98,1 ± 6,3	%
SD between labs	0,17	0,17	µg/l
RSD between labs	9,4	9,4	%
n for calculation	18	18	

Sample M149B
Parameter Mercury

Target value	± U (k=2)	0,79 µg/l	±	0,01 µg/l
IFA result	± U (k=2)	0,79 µg/l	±	0,08 µg/l
Stability test	± U (k=2)	0,76 µg/l	±	0,08 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	0,767	0,049	µg/l	97%	-0,26
B	0,885	0,133	µg/l	112%	1,09
C			µg/l		
D			µg/l		
E	0,85	0,1	µg/l	108%	0,69
F	0,83	0,10	µg/l	105%	0,46
G	0,91		µg/l	115%	1,38
H	0,87		µg/l	110%	0,92
I			µg/l		
J	0,71	0,03	µg/l	90%	-0,92
K			µg/l		
L	0,787	0,011	µg/l	100%	-0,03
M			µg/l		
N			µg/l		
O	0,65	0,1	µg/l	82%	-1,61
P	0,81	0,0972	µg/l	103%	0,23
Q	0,61	0,1	µg/l	77%	-2,07
R	0,60	0,14	µg/l	76%	-2,19
S	0,77	0,15	µg/l	97%	-0,23
T	0,727	0,113	µg/l	92%	-0,72
U	0,752	0,030	µg/l	95%	-0,44
V	0,76	0,2	µg/l	96%	-0,35
W	0,841	0,11	µg/l	106%	0,59
X	1,09 *	0,16	µg/l	138%	3,45



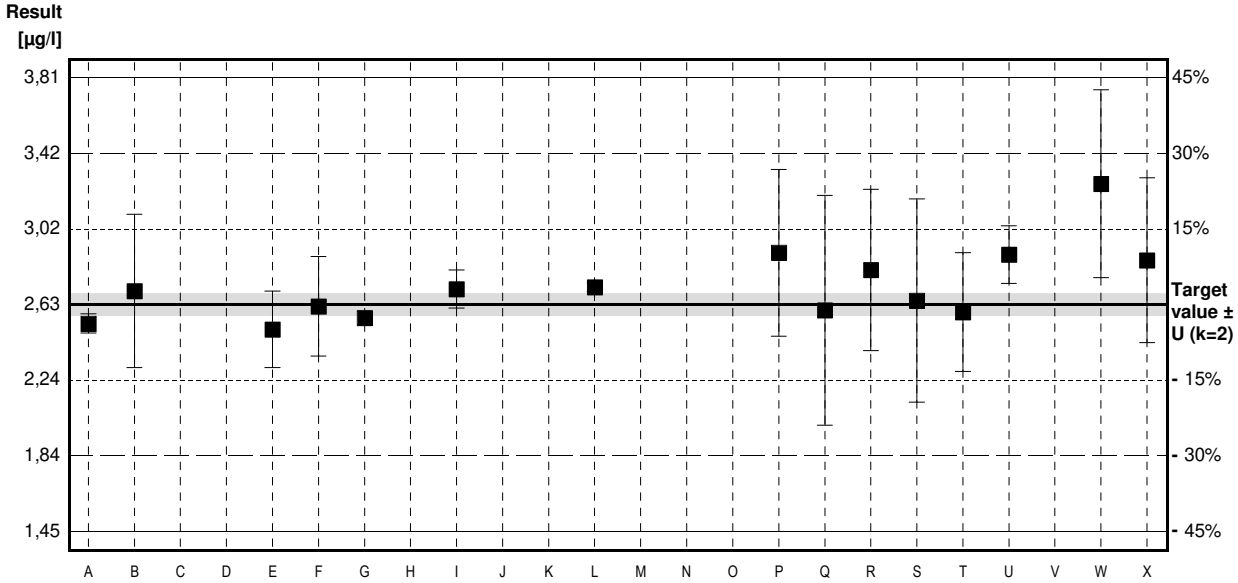


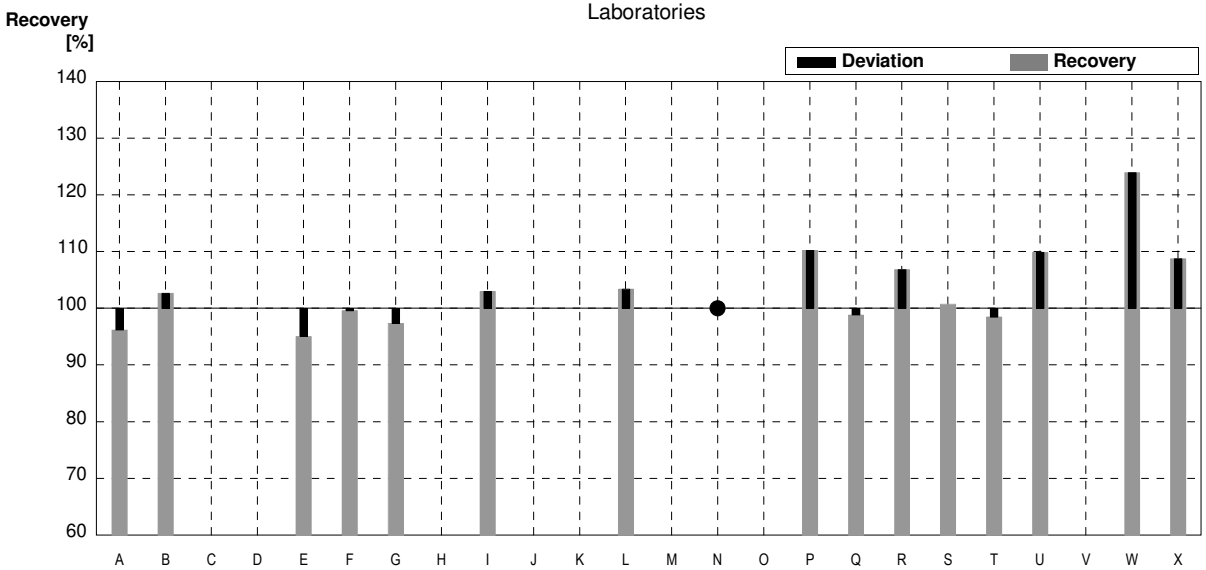
	All results	Outliers excl.	Unit
Mean ± CI(99%)	0,79 ± 0,08	0,77 ± 0,06	µg/l
Recov. ± CI(99%)	100,0 ± 10,1	97,8 ± 8,2	%
SD between labs	0,12	0,09	µg/l
RSD between labs	14,7	11,9	%
n for calculation	18	17	

Sample M149A
Parameter Selenium

Target value	± U (k=2)	2,63 µg/l	±	0,06 µg/l
IFA result	± U (k=2)	2,65 µg/l	±	0,37 µg/l
Stability test	± U (k=2)	2,67 µg/l	±	0,37 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	2,53	0,05	µg/l	96%	-0,32
B	2,70	0,40	µg/l	103%	0,22
C			µg/l		
D			µg/l		
E	2,50	0,2	µg/l	95%	-0,41
F	2,62	0,26	µg/l	100%	-0,03
G	2,56		µg/l	97%	-0,22
H			µg/l		
I	2,71	0,1	µg/l	103%	0,25
J			µg/l		
K			µg/l		
L	2,72	0,023	µg/l	103%	0,29
M			µg/l		
N	<5,0		µg/l	•	
O			µg/l		
P	2,90	0,435	µg/l	110%	0,86
Q	2,60	0,6	µg/l	99%	-0,10
R	2,81	0,42	µg/l	107%	0,57
S	2,65	0,53	µg/l	101%	0,06
T	2,59	0,31	µg/l	98%	-0,13
U	2,89	0,15	µg/l	110%	0,82
V			µg/l		
W	3,26 *	0,49	µg/l	124%	2,00
X	2,86	0,43	µg/l	109%	0,73



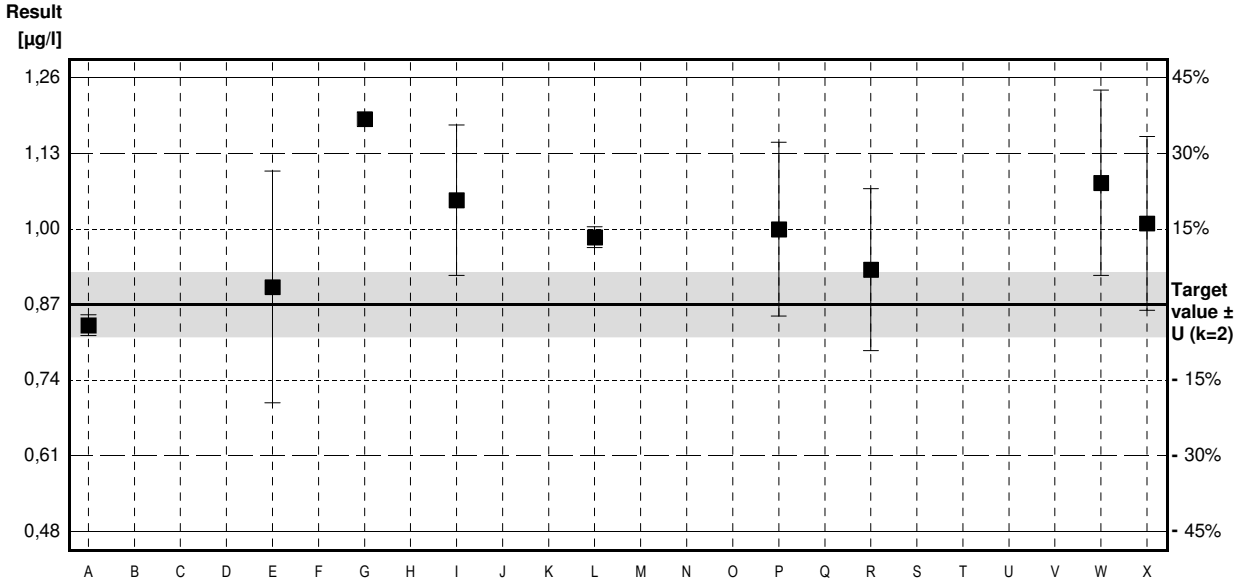


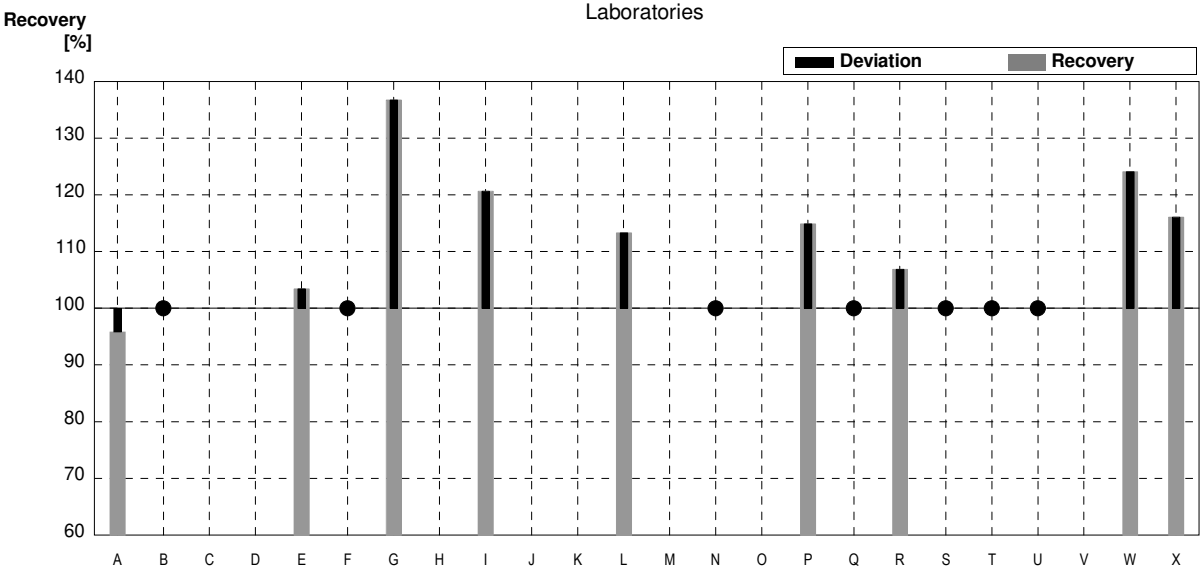
	All results	Outliers excl.	Unit
Mean ± CI(99%)	2,73 ± 0,15	2,69 ± 0,11	µg/l
Recov. ± CI(99%)	103,7 ± 5,7	102,2 ± 4,1	%
SD between labs	0,20	0,13	µg/l
RSD between labs	7,2	5,0	%
n for calculation	15	14	

Sample M149B
Parameter Selenium

Target value	± U (k=2)	0,87 µg/l	±	0,06 µg/l
IFA result	± U (k=2)	0,82 µg/l	±	0,11 µg/l
Stability test	± U (k=2)	0,92 µg/l	±	0,13 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	0,834	0,018	µg/l	96%	-0,34
B	<1		µg/l	•	
C			µg/l		
D			µg/l		
E	0,90	0,2	µg/l	103%	0,29
F	<1,0		µg/l	•	
G	1,19		µg/l	137%	3,07
H			µg/l		
I	1,05	0,13	µg/l	121%	1,72
J			µg/l		
K			µg/l		
L	0,986	0,018	µg/l	113%	1,11
M			µg/l		
N	<5,0		µg/l	•	
O			µg/l		
P	1,00	0,15	µg/l	115%	1,25
Q	<1		µg/l	•	
R	0,93	0,14	µg/l	107%	0,57
S	<2,0		µg/l	•	
T	<1,00		µg/l	•	
U	<1,00		µg/l	•	
V			µg/l		
W	1,08	0,16	µg/l	124%	2,01
X	1,01	0,15	µg/l	116%	1,34



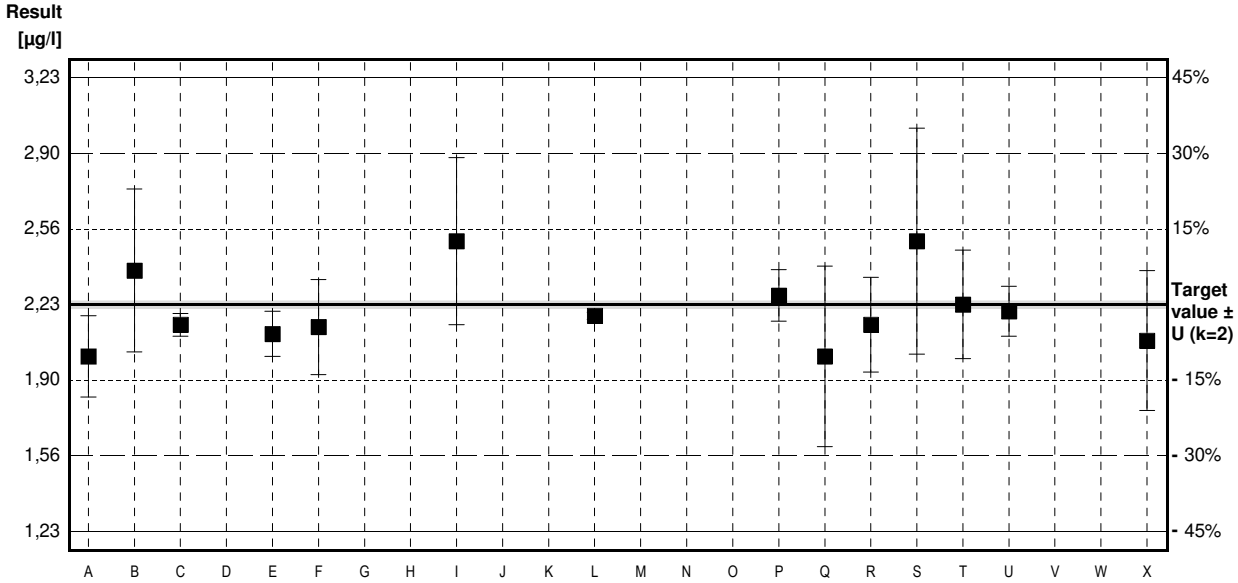


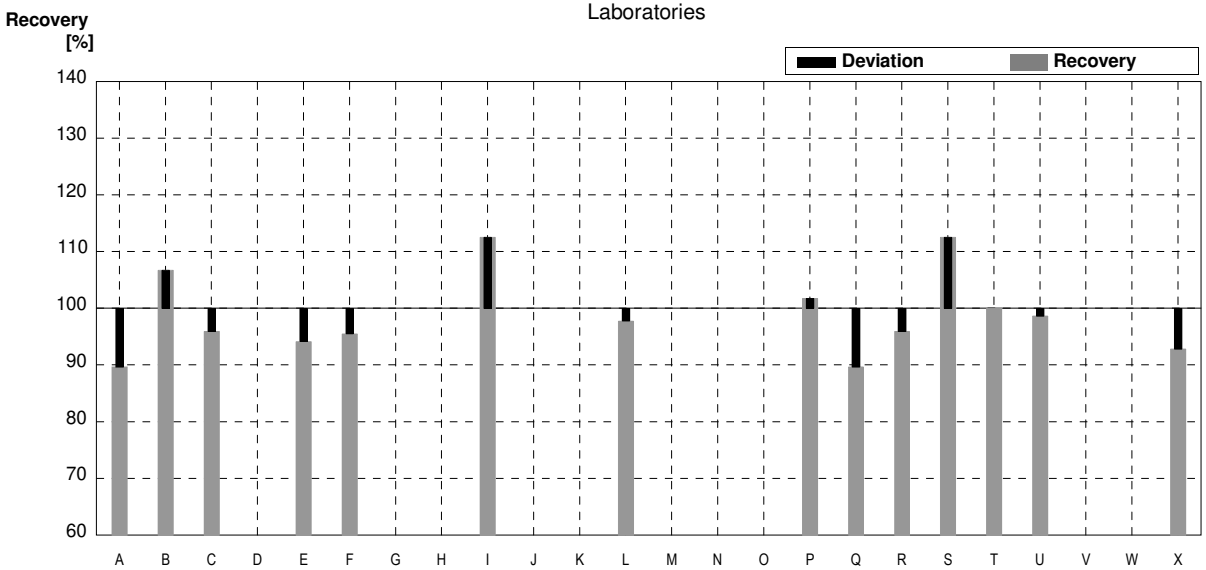
	All results	Outliers excl.	Unit
Mean ± CI(99%)	1,00 ± 0,12	1,00 ± 0,12	µg/l
Recov. ± CI(99%)	114,7 ± 13,5	114,7 ± 13,5	%
SD between labs	0,10	0,10	µg/l
RSD between labs	10,5	10,5	%
n for calculation	9	9	

Sample M149A
Parameter Uranium

Target value	± U (k=2)	2,23 µg/l	±	0,02 µg/l
IFA result	± U (k=2)	2,14 µg/l	±	0,21 µg/l
Stability test	± U (k=2)	2,20 µg/l	±	0,22 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	2,00	0,18	µg/l	90%	-1,75
B	2,38	0,36	µg/l	107%	1,14
C	2,14	0,05	µg/l	96%	-0,68
D			µg/l		
E	2,10	0,1	µg/l	94%	-0,99
F	2,13	0,21	µg/l	96%	-0,76
G			µg/l		
H			µg/l		
I	2,51	0,37	µg/l	113%	2,13
J			µg/l		
K			µg/l		
L	2,18	0,015	µg/l	98%	-0,38
M			µg/l		
N			µg/l		
O			µg/l		
P	2,27	0,114	µg/l	102%	0,30
Q	2,00	0,4	µg/l	90%	-1,75
R	2,14	0,21	µg/l	96%	-0,68
S	2,51	0,50	µg/l	113%	2,13
T	2,23	0,24	µg/l	100%	0,00
U	2,20	0,11	µg/l	99%	-0,23
V			µg/l		
W			µg/l		
X	2,07	0,31	µg/l	93%	-1,22



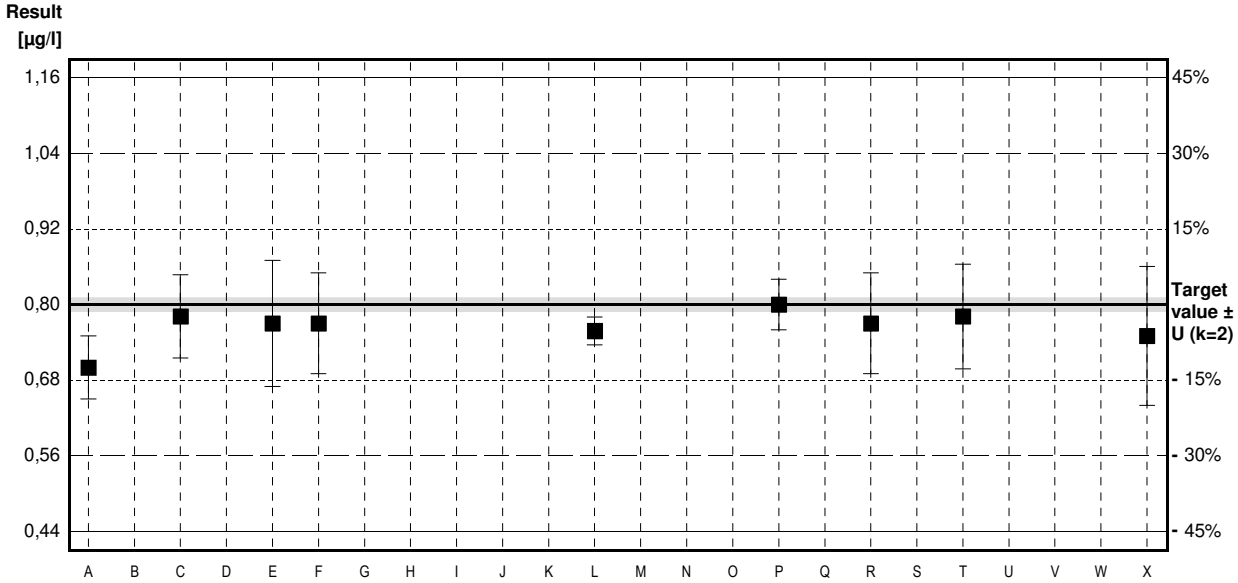


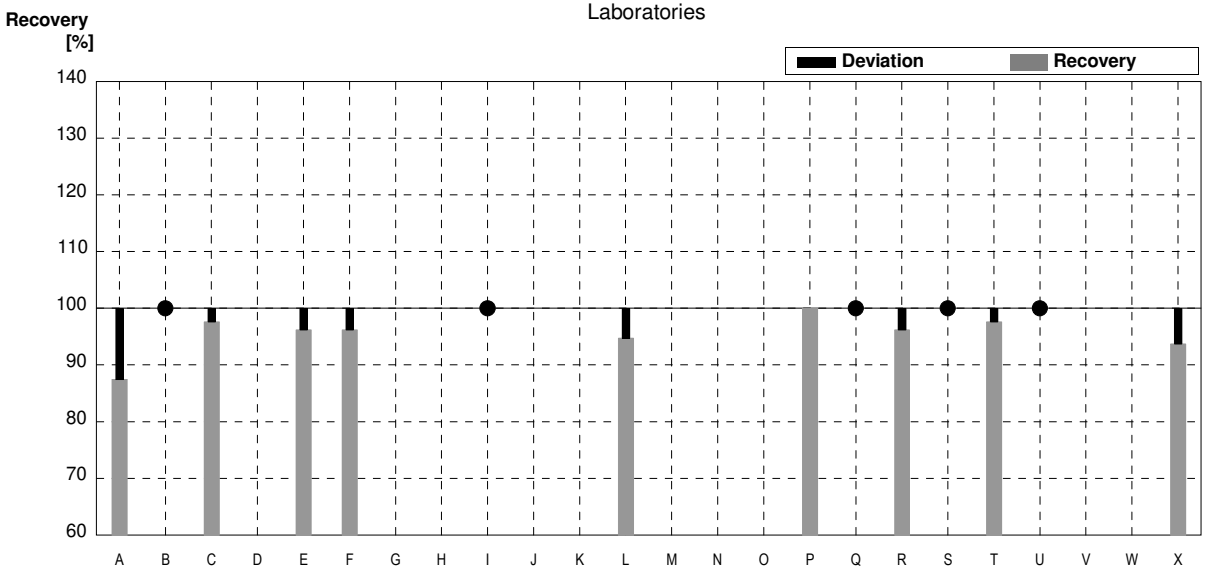
	All results	Outliers excl.	Unit
Mean ± CI(99%)	2,20 ± 0,13	2,20 ± 0,13	µg/l
Recov. ± CI(99%)	98,8 ± 5,9	98,8 ± 5,9	%
SD between labs	0,16	0,16	µg/l
RSD between labs	7,4	7,4	%
n for calculation	14	14	

Sample M149B
Parameter Uranium

Target value	± U (k=2)	0,80 µg/l	±	0,01 µg/l
IFA result	± U (k=2)	0,76 µg/l	±	0,08 µg/l
Stability test	± U (k=2)	0,80 µg/l	±	0,08 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	0,70 *	0,05	µg/l	88%	-2,12
B	<1		µg/l	•	
C	0,781	0,066	µg/l	98%	-0,40
D			µg/l		
E	0,77	0,1	µg/l	96%	-0,64
F	0,77	0,08	µg/l	96%	-0,64
G			µg/l		
H			µg/l		
I	<2		µg/l	•	
J			µg/l		
K			µg/l		
L	0,758	0,022	µg/l	95%	-0,89
M			µg/l		
N			µg/l		
O			µg/l		
P	0,80	0,04	µg/l	100%	0,00
Q	<1		µg/l	•	
R	0,77	0,08	µg/l	96%	-0,64
S	<1,0		µg/l	•	
T	0,781	0,083	µg/l	98%	-0,40
U	<1,00		µg/l	•	
V			µg/l		
W			µg/l		
X	0,75	0,11	µg/l	94%	-1,06



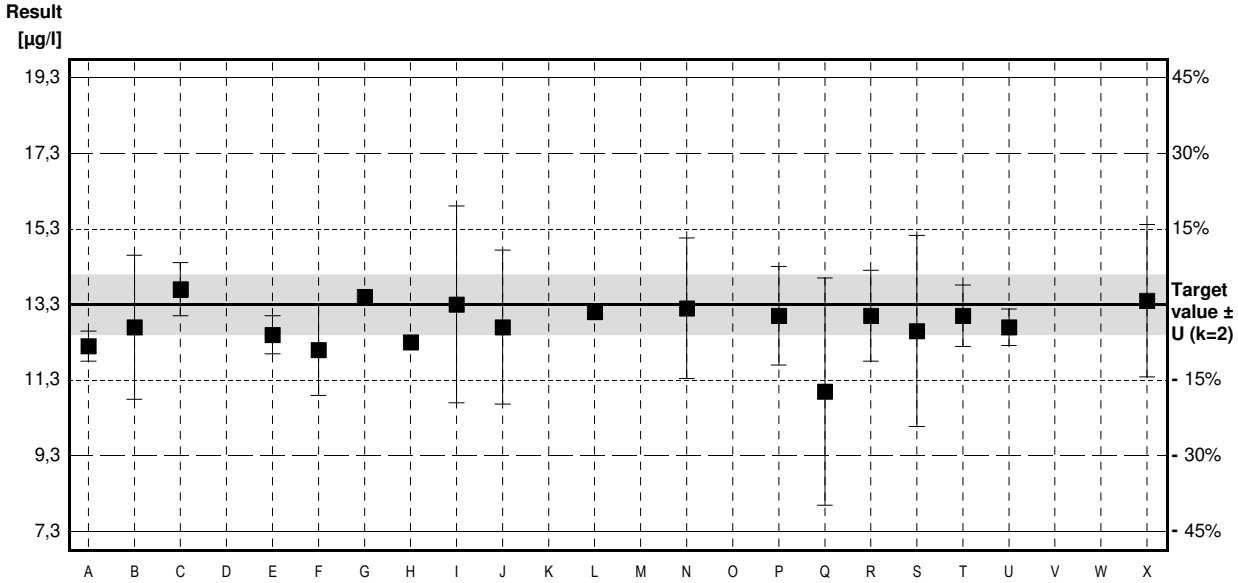


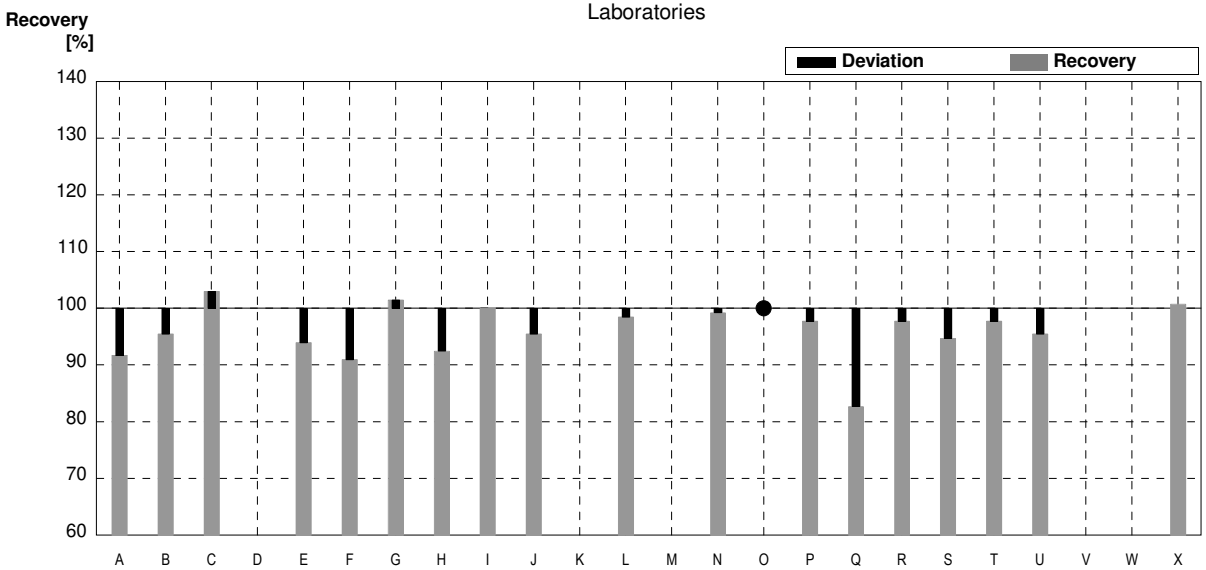
	All results	Outliers excl.	Unit
Mean ± CI(99%)	0,76 ± 0,03	0,77 ± 0,02	µg/l
Recov. ± CI(99%)	95,6 ± 3,9	96,6 ± 2,4	%
SD between labs	0,03	0,02	µg/l
RSD between labs	3,7	2,0	%
n for calculation	9	8	

Sample M149A
Parameter Zinc

Target value	± U (k=2)	13,3 µg/l	±	0,8 µg/l
IFA result	± U (k=2)	14,9 µg/l	±	3,0 µg/l
Stability test	± U (k=2)	13,1 µg/l	±	2,6 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	12,2	0,4	µg/l	92%	-0,92
B	12,7	1,90	µg/l	95%	-0,50
C	13,7	0,7	µg/l	103%	0,33
D			µg/l		
E	12,5	0,5	µg/l	94%	-0,67
F	12,1	1,2	µg/l	91%	-1,00
G	13,5		µg/l	102%	0,17
H	12,3		µg/l	92%	-0,84
I	13,3	2,6	µg/l	100%	0,00
J	12,70	2,03	µg/l	95%	-0,50
K			µg/l		
L	13,1	0,200	µg/l	98%	-0,17
M			µg/l		
N	13,2	1,85	µg/l	99%	-0,08
O	<20		µg/l	•	
P	13,00	1,30	µg/l	98%	-0,25
Q	11,0 *	3	µg/l	83%	-1,92
R	13,0	1,2	µg/l	98%	-0,25
S	12,6	2,52	µg/l	95%	-0,58
T	13,0	0,81	µg/l	98%	-0,25
U	12,7	0,48	µg/l	95%	-0,50
V			µg/l		
W			µg/l		
X	13,4	2,01	µg/l	101%	0,08



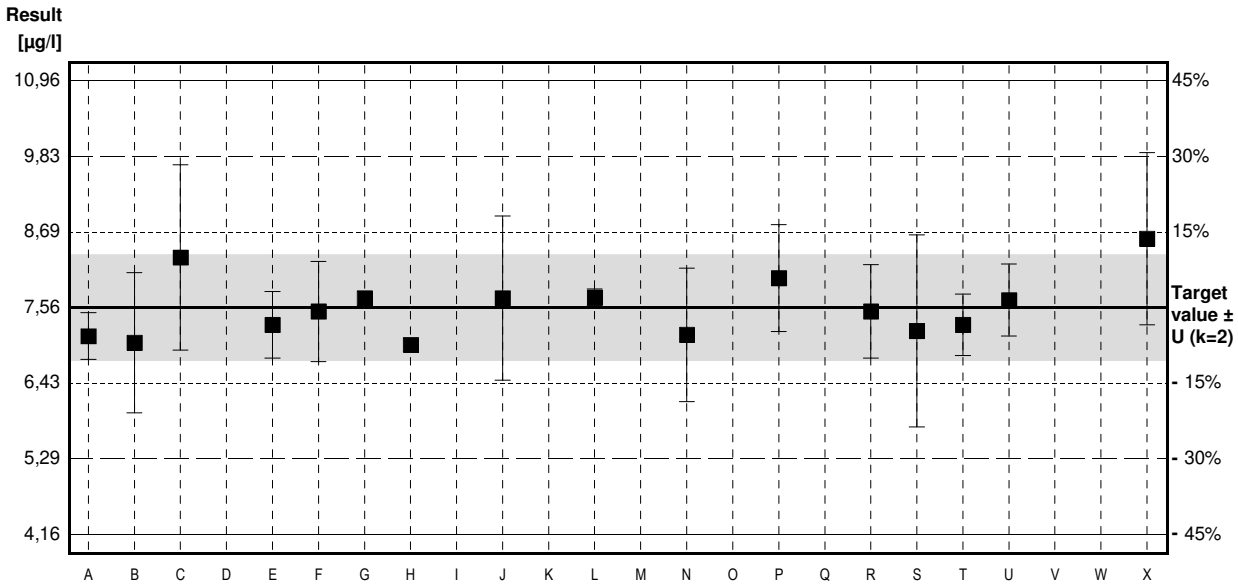


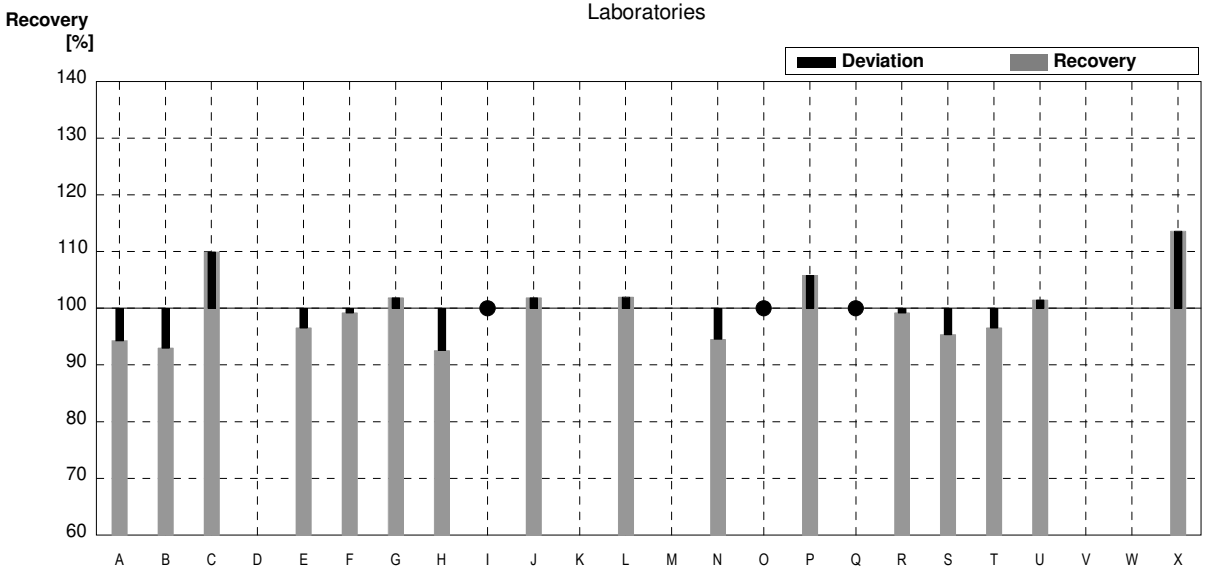
	All results	Outliers excl.	Unit
Mean ± CI(99%)	12,8 ± 0,4	12,9 ± 0,3	µg/l
Recov. ± CI(99%)	96,1 ± 3,2	96,9 ± 2,5	%
SD between labs	0,6	0,5	µg/l
RSD between labs	4,9	3,6	%
n for calculation	18	17	

Sample M149B
Parameter Zinc

Target value ± U (k=2)	7,56 µg/l	±	0,79 µg/l
IFA result ± U (k=2)	8,53 µg/l	±	1,71 µg/l
Stability test ± U (k=2)	8,11 µg/l	±	1,62 µg/l

Lab Code	Result	±	Unit	Recovery	z-Score
A	7,13	0,35	µg/l	94%	-0,63
B	7,03	1,05	µg/l	93%	-0,78
C	8,31	1,39	µg/l	110%	1,10
D			µg/l		
E	7,30	0,5	µg/l	97%	-0,38
F	7,5	0,75	µg/l	99%	-0,09
G	7,7		µg/l	102%	0,21
H	7,0		µg/l	93%	-0,82
I	<10		µg/l	•	
J	7,70	1,23	µg/l	102%	0,21
K			µg/l		
L	7,71	0,125	µg/l	102%	0,22
M			µg/l		
N	7,15	1,00	µg/l	95%	-0,60
O	<20		µg/l	•	
P	8,00	0,80	µg/l	106%	0,65
Q	<10		µg/l	•	
R	7,5	0,7	µg/l	99%	-0,09
S	7,21	1,44	µg/l	95%	-0,51
T	7,30	0,46	µg/l	97%	-0,38
U	7,67	0,54	µg/l	101%	0,16
V			µg/l		
W			µg/l		
X	8,59	1,29	µg/l	114%	1,51





	All results	Outliers excl.	Unit
Mean ± CI(99%)	7,55 ± 0,34	7,55 ± 0,34	µg/l
Recov. ± CI(99%)	99,9 ± 4,4	99,9 ± 4,4	%
SD between labs	0,45	0,45	µg/l
RSD between labs	6,0	6,0	%
n for calculation	16	16	

Illustration of Results
Laboratory Oriented Part

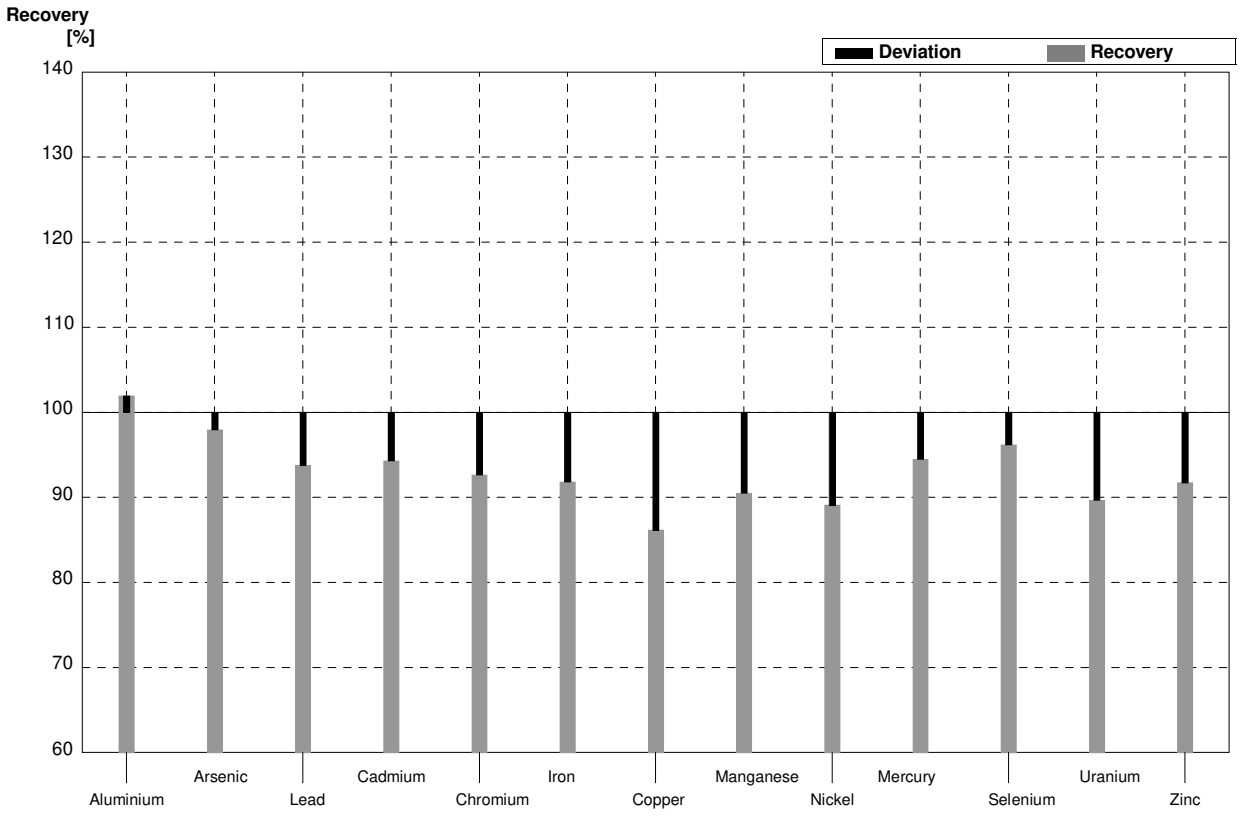
Round M149
Metals

Sample Dispatch: 18 November 2019

TULLN

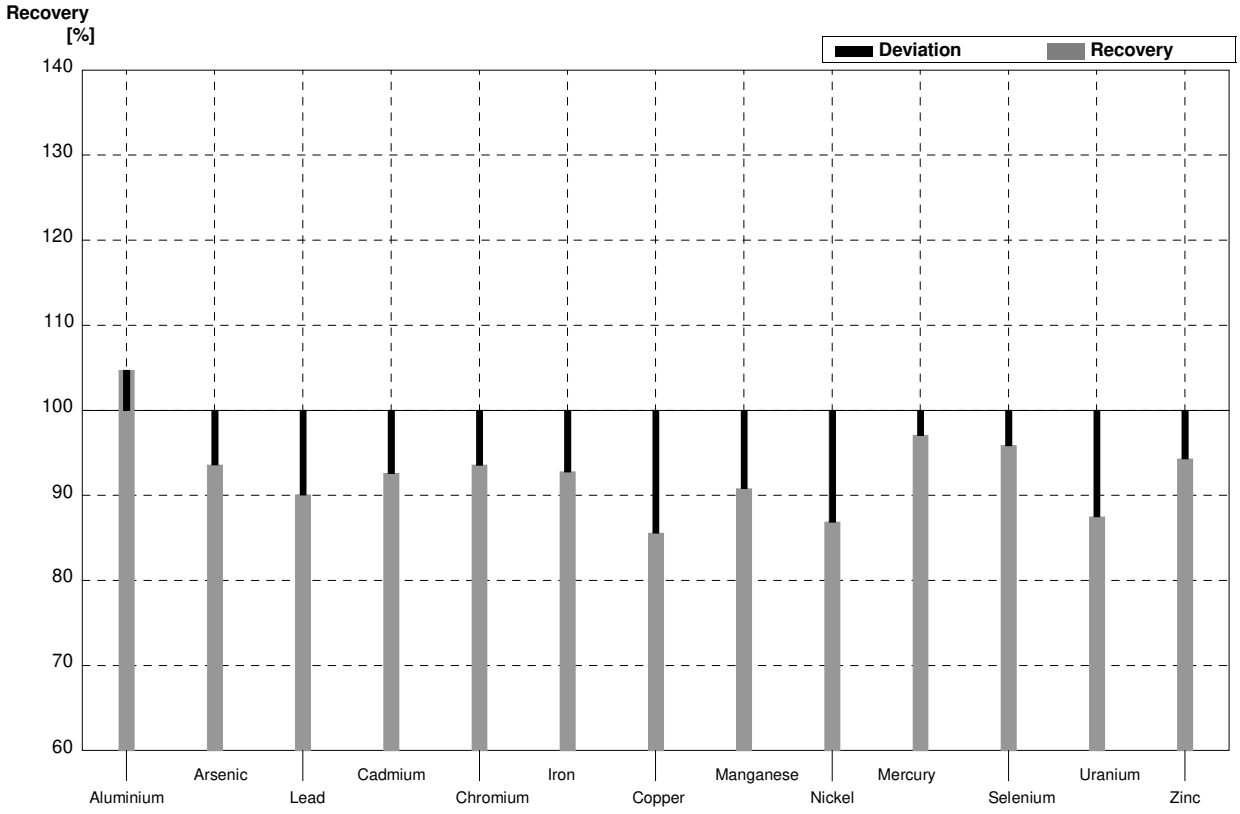
Sample M149A
Laboratory A

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	73,7	3,0	µg/l	102%
Arsenic	6,38	0,04	6,25	0,26	µg/l	98%
Lead	8,03	0,10	7,53	0,42	µg/l	94%
Cadmium	2,11	0,02	1,99	0,11	µg/l	94%
Chromium	6,39	0,04	5,92	0,10	µg/l	93%
Iron	52,7	0,3	48,4	2,3	µg/l	92%
Copper	11,2	0,1	9,65	0,14	µg/l	86%
Manganese	21,1	0,1	19,1	0,8	µg/l	91%
Nickel	3,03	0,03	2,70	0,14	µg/l	89%
Mercury	1,82	0,02	1,72	0,04	µg/l	95%
Selenium	2,63	0,06	2,53	0,05	µg/l	96%
Uranium	2,23	0,02	2,00	0,18	µg/l	90%
Zinc	13,3	0,8	12,2	0,4	µg/l	92%



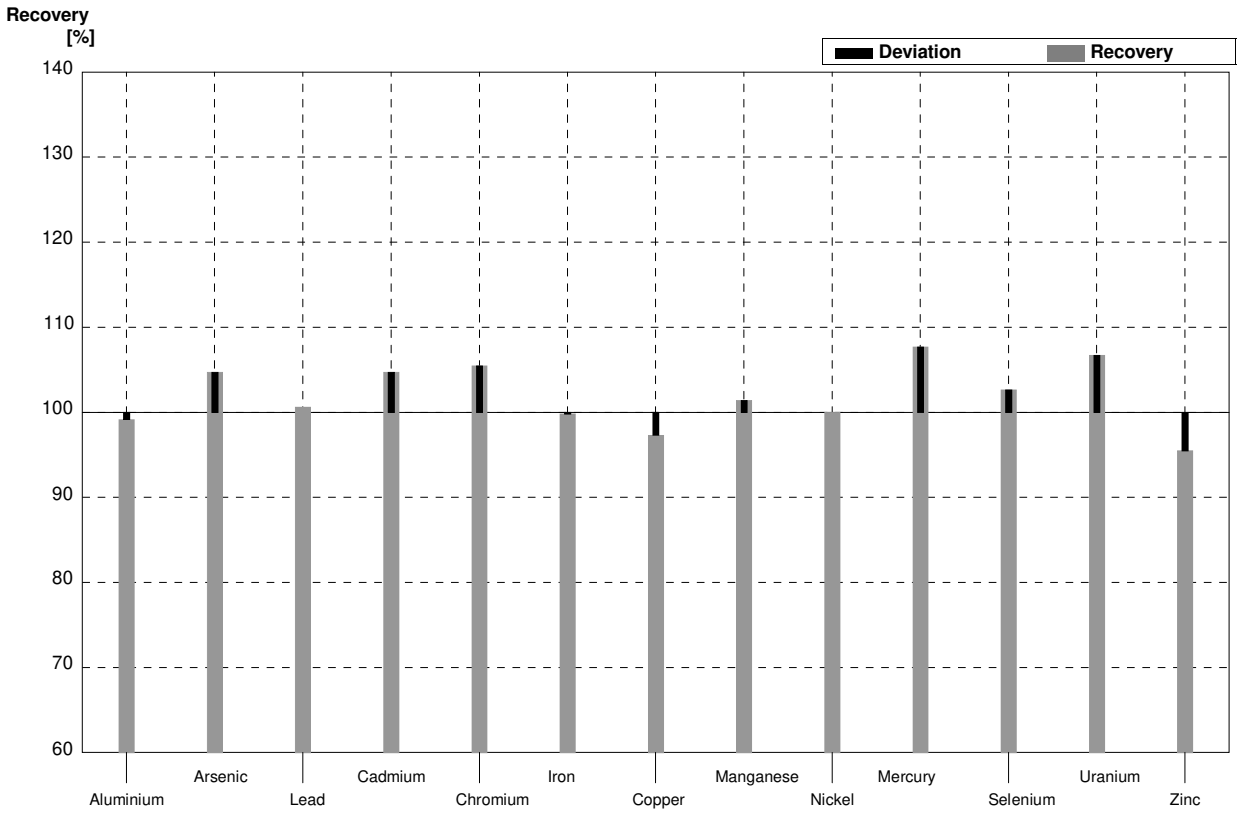
Sample M149B
Laboratory A

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	42,2	0,7	µg/l	105%
Arsenic	1,87	0,02	1,75	0,07	µg/l	94%
Lead	2,82	0,02	2,54	0,14	µg/l	90%
Cadmium	1,00	0,01	0,926	0,033	µg/l	93%
Chromium	1,71	0,02	1,60	0,06	µg/l	94%
Iron	20,8	0,2	19,3	1,0	µg/l	93%
Copper	2,22	0,03	1,90	0,14	µg/l	86%
Manganese	9,25	0,07	8,40	0,36	µg/l	91%
Nickel	1,83	0,02	1,59	0,06	µg/l	87%
Mercury	0,79	0,01	0,767	0,049	µg/l	97%
Selenium	0,87	0,06	0,834	0,018	µg/l	96%
Uranium	0,80	0,01	0,70	0,05	µg/l	88%
Zinc	7,56	0,79	7,13	0,35	µg/l	94%



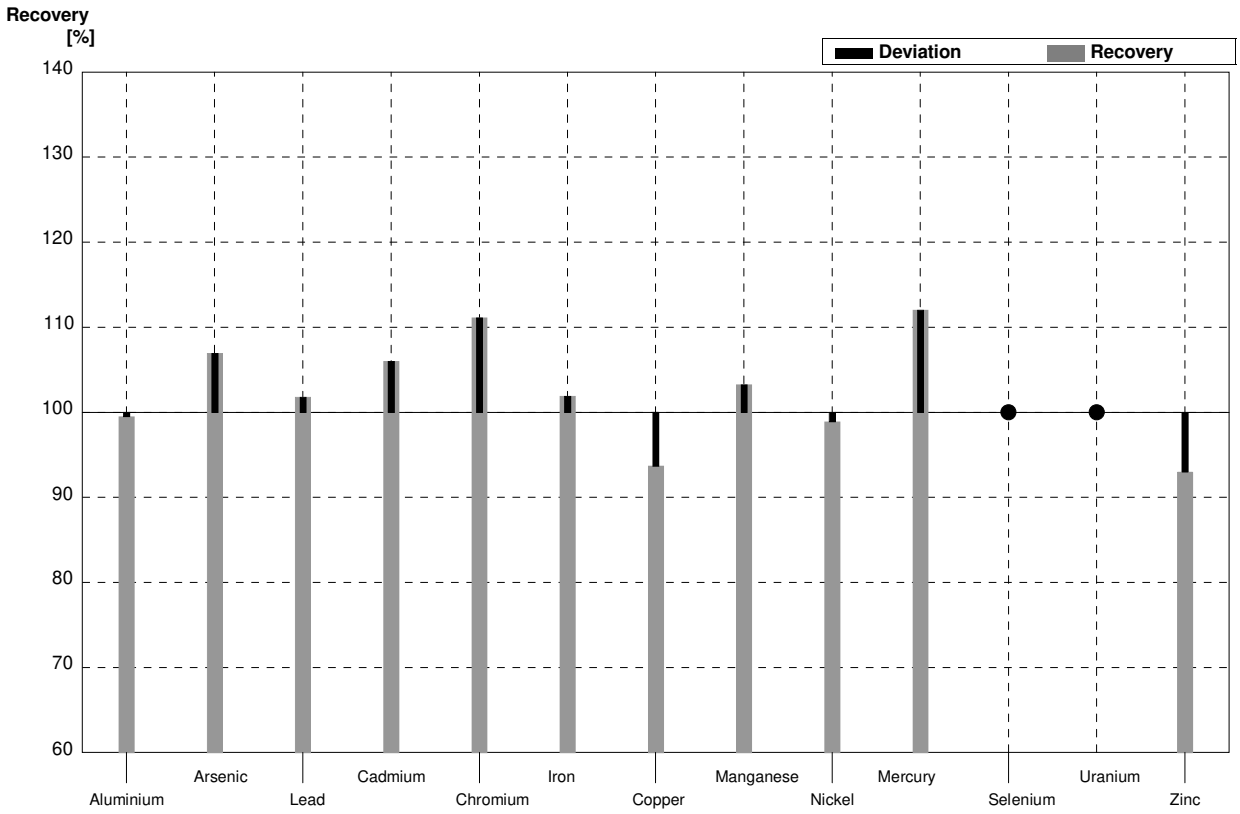
Sample M149A
Laboratory B

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	71,7	10,8	µg/l	99%
Arsenic	6,38	0,04	6,68	1,00	µg/l	105%
Lead	8,03	0,10	8,08	1,21	µg/l	101%
Cadmium	2,11	0,02	2,21	0,33	µg/l	105%
Chromium	6,39	0,04	6,74	1,01	µg/l	105%
Iron	52,7	0,3	52,6	7,89	µg/l	100%
Copper	11,2	0,1	10,9	1,64	µg/l	97%
Manganese	21,1	0,1	21,4	3,21	µg/l	101%
Nickel	3,03	0,03	3,03	0,45	µg/l	100%
Mercury	1,82	0,02	1,96	0,29	µg/l	108%
Selenium	2,63	0,06	2,70	0,40	µg/l	103%
Uranium	2,23	0,02	2,38	0,36	µg/l	107%
Zinc	13,3	0,8	12,7	1,90	µg/l	95%



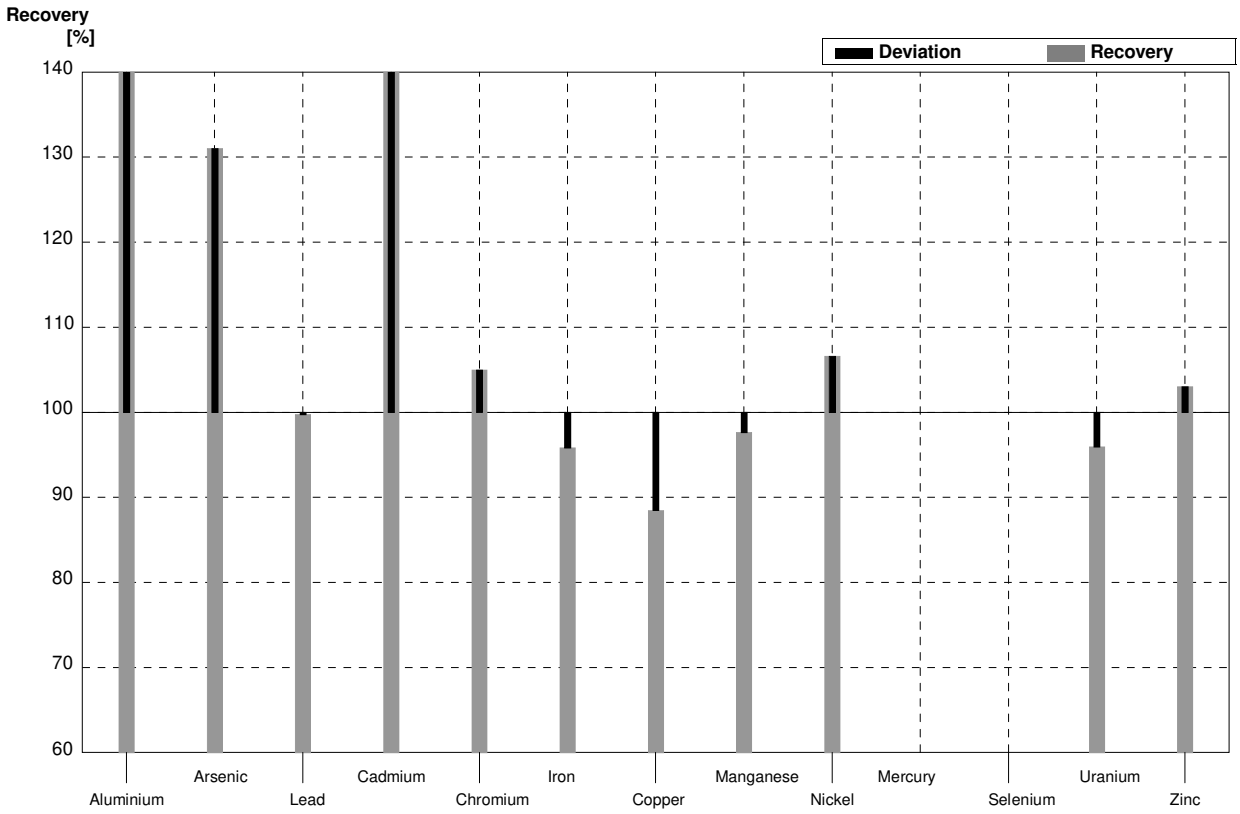
Sample M149B
Laboratory B

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	40,1	6,02	µg/l	100%
Arsenic	1,87	0,02	2,00	0,30	µg/l	107%
Lead	2,82	0,02	2,87	0,43	µg/l	102%
Cadmium	1,00	0,01	1,06	0,16	µg/l	106%
Chromium	1,71	0,02	1,90	0,28	µg/l	111%
Iron	20,8	0,2	21,2	3,18	µg/l	102%
Copper	2,22	0,03	2,08	0,31	µg/l	94%
Manganese	9,25	0,07	9,55	1,43	µg/l	103%
Nickel	1,83	0,02	1,81	0,27	µg/l	99%
Mercury	0,79	0,01	0,885	0,133	µg/l	112%
Selenium	0,87	0,06	<1		µg/l	•
Uranium	0,80	0,01	<1		µg/l	•
Zinc	7,56	0,79	7,03	1,05	µg/l	93%



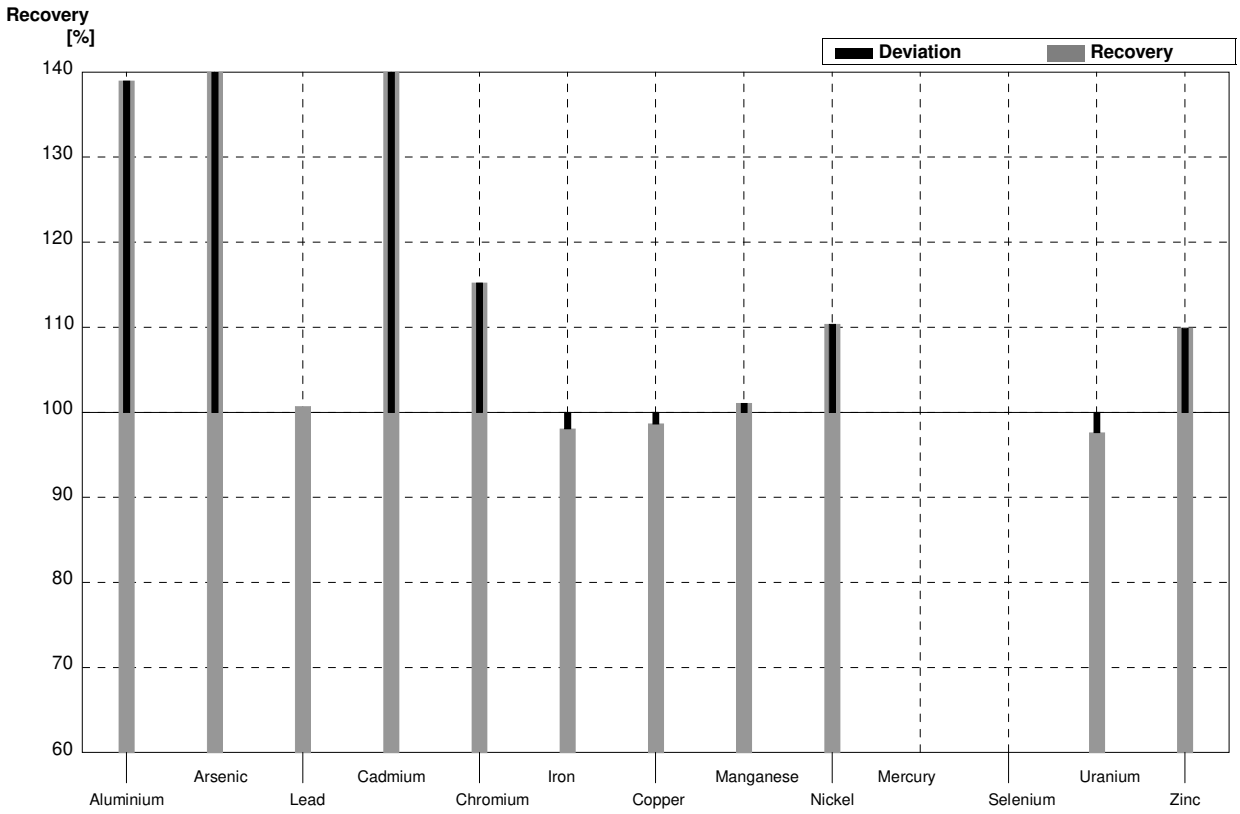
Sample M149A
Laboratory C

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	102	3	µg/l	141%
Arsenic	6,38	0,04	8,36	0,27	µg/l	131%
Lead	8,03	0,10	8,01	0,28	µg/l	100%
Cadmium	2,11	0,02	3,26	0,20	µg/l	155%
Chromium	6,39	0,04	6,71	0,15	µg/l	105%
Iron	52,7	0,3	50,5	1,6	µg/l	96%
Copper	11,2	0,1	9,91	0,49	µg/l	88%
Manganese	21,1	0,1	20,6	0,2	µg/l	98%
Nickel	3,03	0,03	3,23	0,13	µg/l	107%
Mercury	1,82	0,02			µg/l	
Selenium	2,63	0,06			µg/l	
Uranium	2,23	0,02	2,14	0,05	µg/l	96%
Zinc	13,3	0,8	13,7	0,7	µg/l	103%



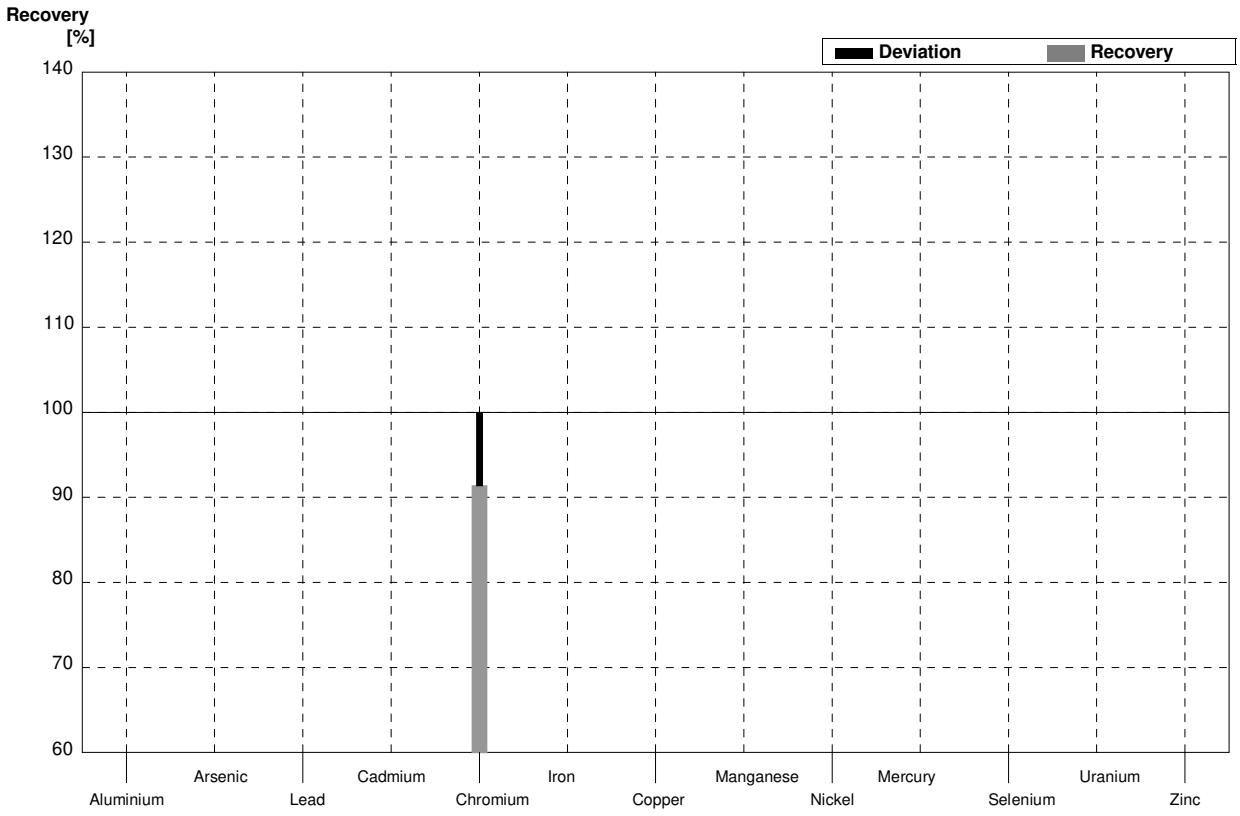
Sample M149B
Laboratory C

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	56,0	5,6	µg/l	139%
Arsenic	1,87	0,02	3,27	0,92	µg/l	175%
Lead	2,82	0,02	2,84	0,32	µg/l	101%
Cadmium	1,00	0,01	1,64	0,51	µg/l	164%
Chromium	1,71	0,02	1,97	0,21	µg/l	115%
Iron	20,8	0,2	20,4	0,7	µg/l	98%
Copper	2,22	0,03	2,19	0,20	µg/l	99%
Manganese	9,25	0,07	9,35	1,05	µg/l	101%
Nickel	1,83	0,02	2,02	0,48	µg/l	110%
Mercury	0,79	0,01			µg/l	
Selenium	0,87	0,06			µg/l	
Uranium	0,80	0,01	0,781	0,066	µg/l	98%
Zinc	7,56	0,79	8,31	1,39	µg/l	110%



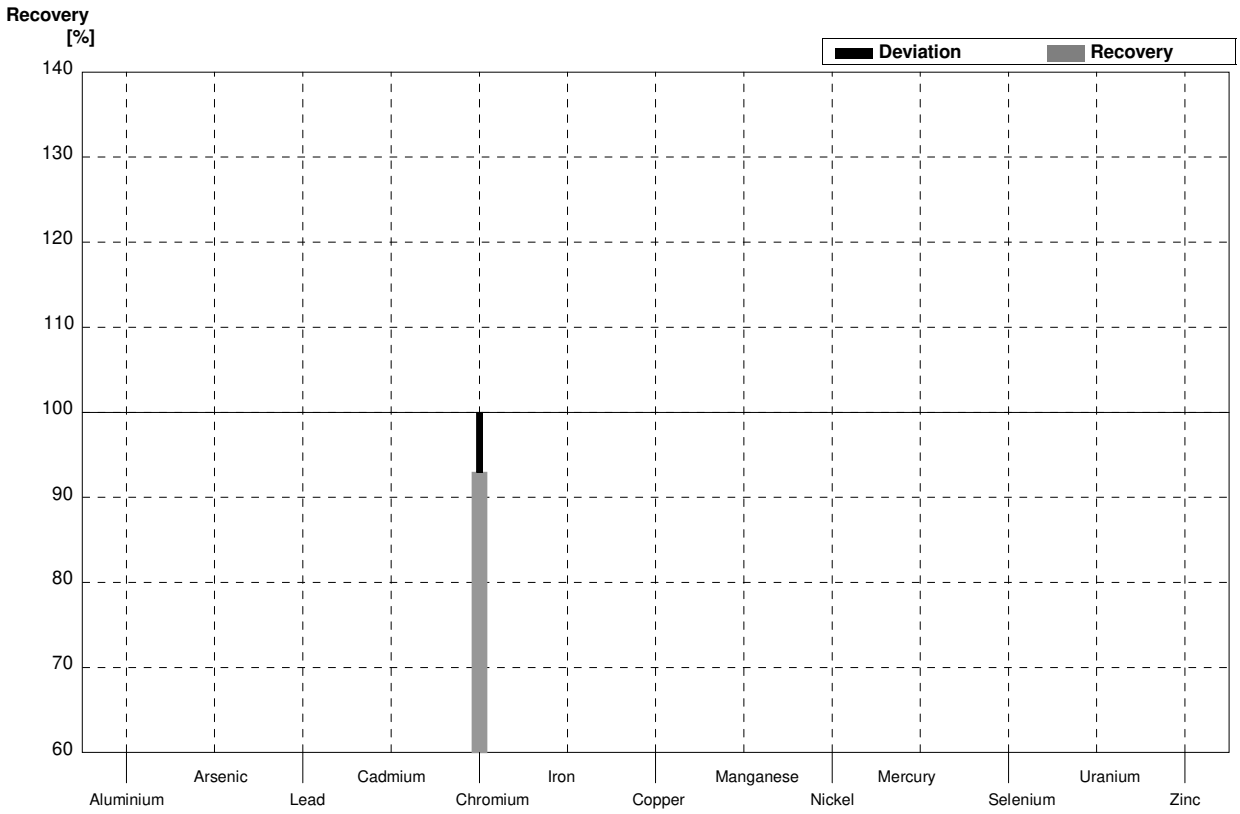
Sample M149A
Laboratory D

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4			µg/l	
Arsenic	6,38	0,04			µg/l	
Lead	8,03	0,10			µg/l	
Cadmium	2,11	0,02			µg/l	
Chromium	6,39	0,04	5,84	0,15	µg/l	91%
Iron	52,7	0,3			µg/l	
Copper	11,2	0,1			µg/l	
Manganese	21,1	0,1			µg/l	
Nickel	3,03	0,03			µg/l	
Mercury	1,82	0,02			µg/l	
Selenium	2,63	0,06			µg/l	
Uranium	2,23	0,02			µg/l	
Zinc	13,3	0,8			µg/l	



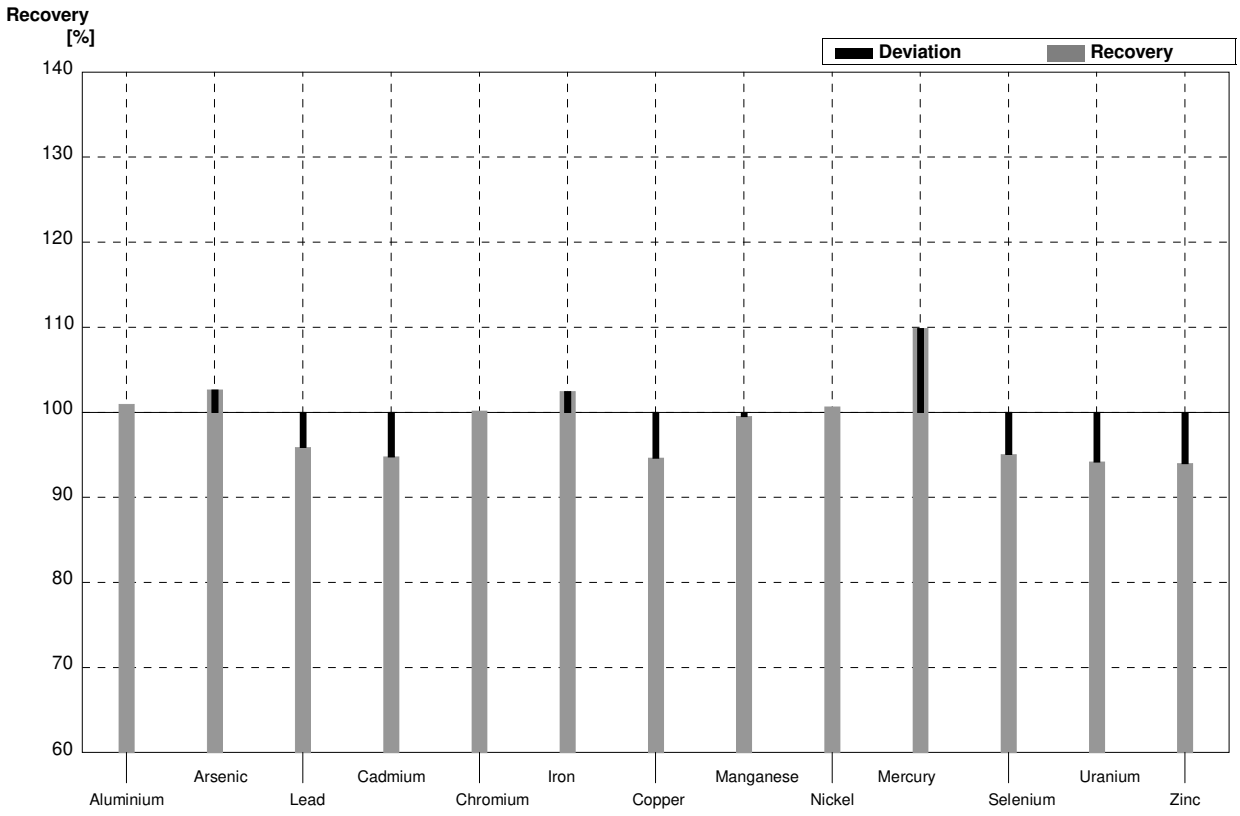
Sample M149B
Laboratory D

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3			µg/l	
Arsenic	1,87	0,02			µg/l	
Lead	2,82	0,02			µg/l	
Cadmium	1,00	0,01			µg/l	
Chromium	1,71	0,02	1,59	0,02	µg/l	93%
Iron	20,8	0,2			µg/l	
Copper	2,22	0,03			µg/l	
Manganese	9,25	0,07			µg/l	
Nickel	1,83	0,02			µg/l	
Mercury	0,79	0,01			µg/l	
Selenium	0,87	0,06			µg/l	
Uranium	0,80	0,01			µg/l	
Zinc	7,56	0,79			µg/l	



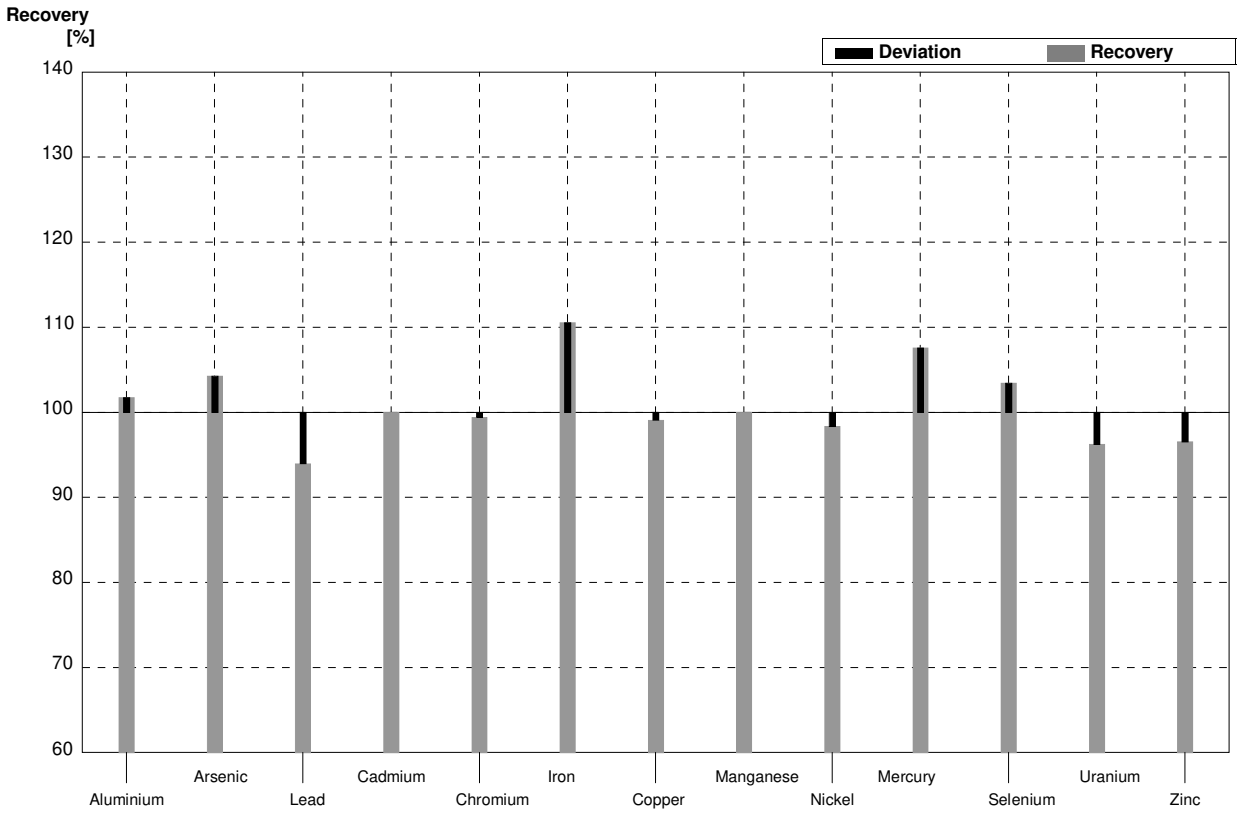
Sample M149A
Laboratory E

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	73	5	µg/l	101%
Arsenic	6,38	0,04	6,55	0,1	µg/l	103%
Lead	8,03	0,10	7,70	0,1	µg/l	96%
Cadmium	2,11	0,02	2,00	0,1	µg/l	95%
Chromium	6,39	0,04	6,40	0,2	µg/l	100%
Iron	52,7	0,3	54	0,4	µg/l	102%
Copper	11,2	0,1	10,6	0,5	µg/l	95%
Manganese	21,1	0,1	21,0	1	µg/l	100%
Nickel	3,03	0,03	3,05	0,1	µg/l	101%
Mercury	1,82	0,02	2,00	0,1	µg/l	110%
Selenium	2,63	0,06	2,50	0,2	µg/l	95%
Uranium	2,23	0,02	2,10	0,1	µg/l	94%
Zinc	13,3	0,8	12,5	0,5	µg/l	94%



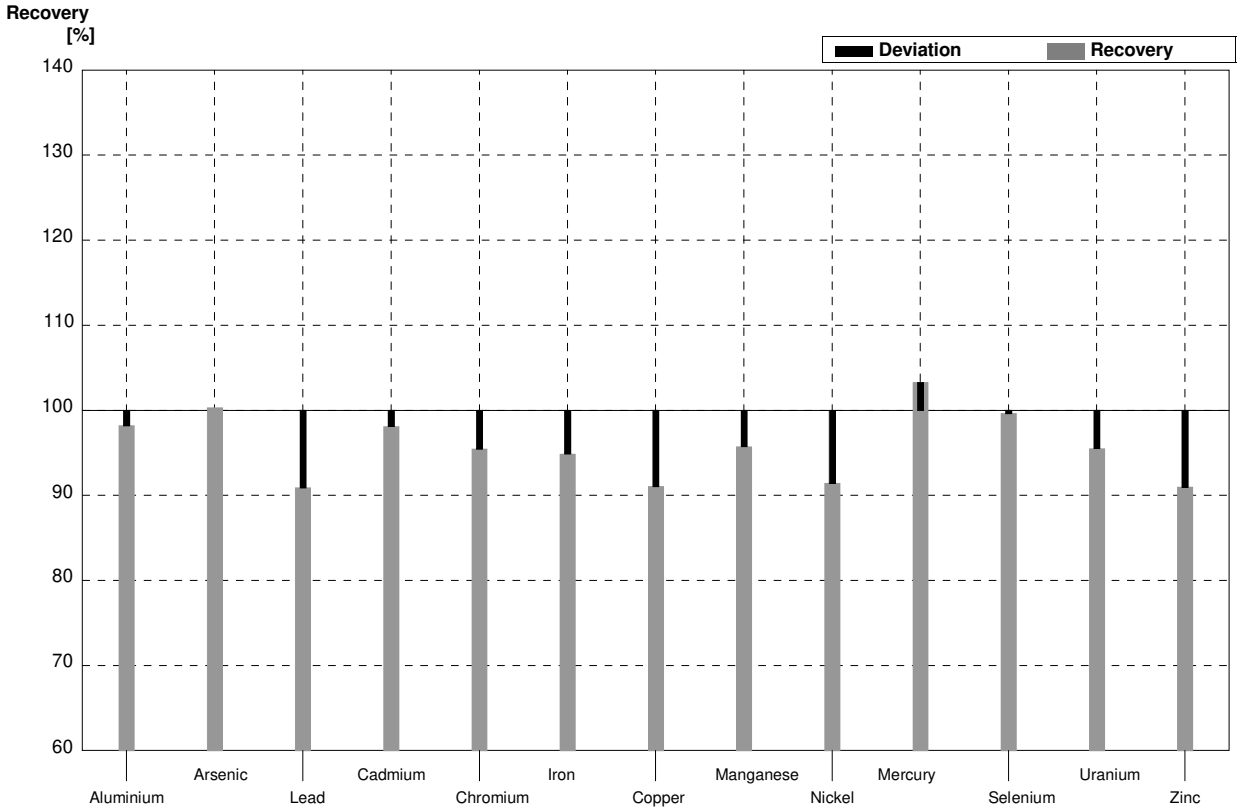
Sample M149B
Laboratory E

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	41,0	3	µg/l	102%
Arsenic	1,87	0,02	1,95	0,1	µg/l	104%
Lead	2,82	0,02	2,65	0,1	µg/l	94%
Cadmium	1,00	0,01	1,00	0,1	µg/l	100%
Chromium	1,71	0,02	1,70	0,2	µg/l	99%
Iron	20,8	0,2	23,0	3	µg/l	111%
Copper	2,22	0,03	2,20	0,4	µg/l	99%
Manganese	9,25	0,07	9,25	0,2	µg/l	100%
Nickel	1,83	0,02	1,80	0,1	µg/l	98%
Mercury	0,79	0,01	0,85	0,1	µg/l	108%
Selenium	0,87	0,06	0,90	0,2	µg/l	103%
Uranium	0,80	0,01	0,77	0,1	µg/l	96%
Zinc	7,56	0,79	7,30	0,5	µg/l	97%



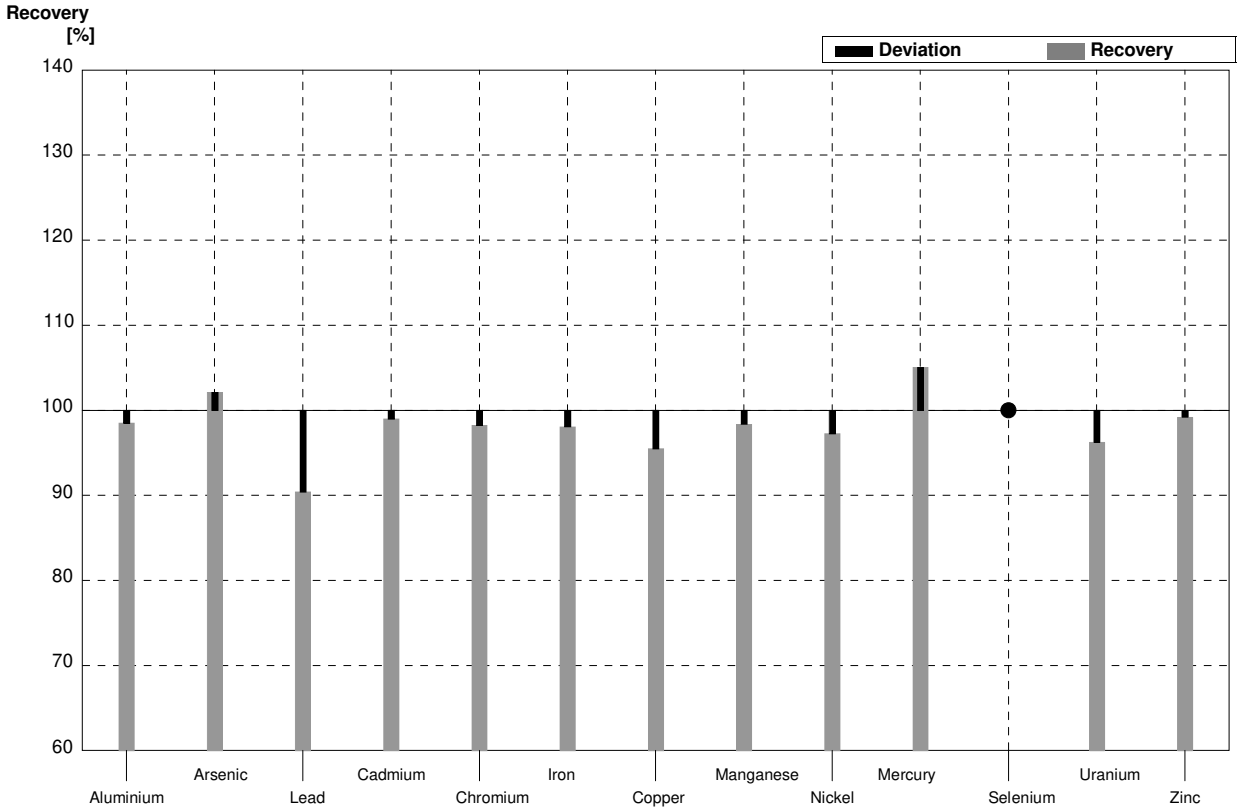
Sample M149A
Laboratory F

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	71	7,1	µg/l	98%
Arsenic	6,38	0,04	6,4	0,6	µg/l	100%
Lead	8,03	0,10	7,3	0,7	µg/l	91%
Cadmium	2,11	0,02	2,07	0,21	µg/l	98%
Chromium	6,39	0,04	6,1	0,6	µg/l	95%
Iron	52,7	0,3	50	5,0	µg/l	95%
Copper	11,2	0,1	10,2	1,0	µg/l	91%
Manganese	21,1	0,1	20,2	2,02	µg/l	96%
Nickel	3,03	0,03	2,77	0,28	µg/l	91%
Mercury	1,82	0,02	1,88	0,19	µg/l	103%
Selenium	2,63	0,06	2,62	0,26	µg/l	100%
Uranium	2,23	0,02	2,13	0,21	µg/l	96%
Zinc	13,3	0,8	12,1	1,2	µg/l	91%



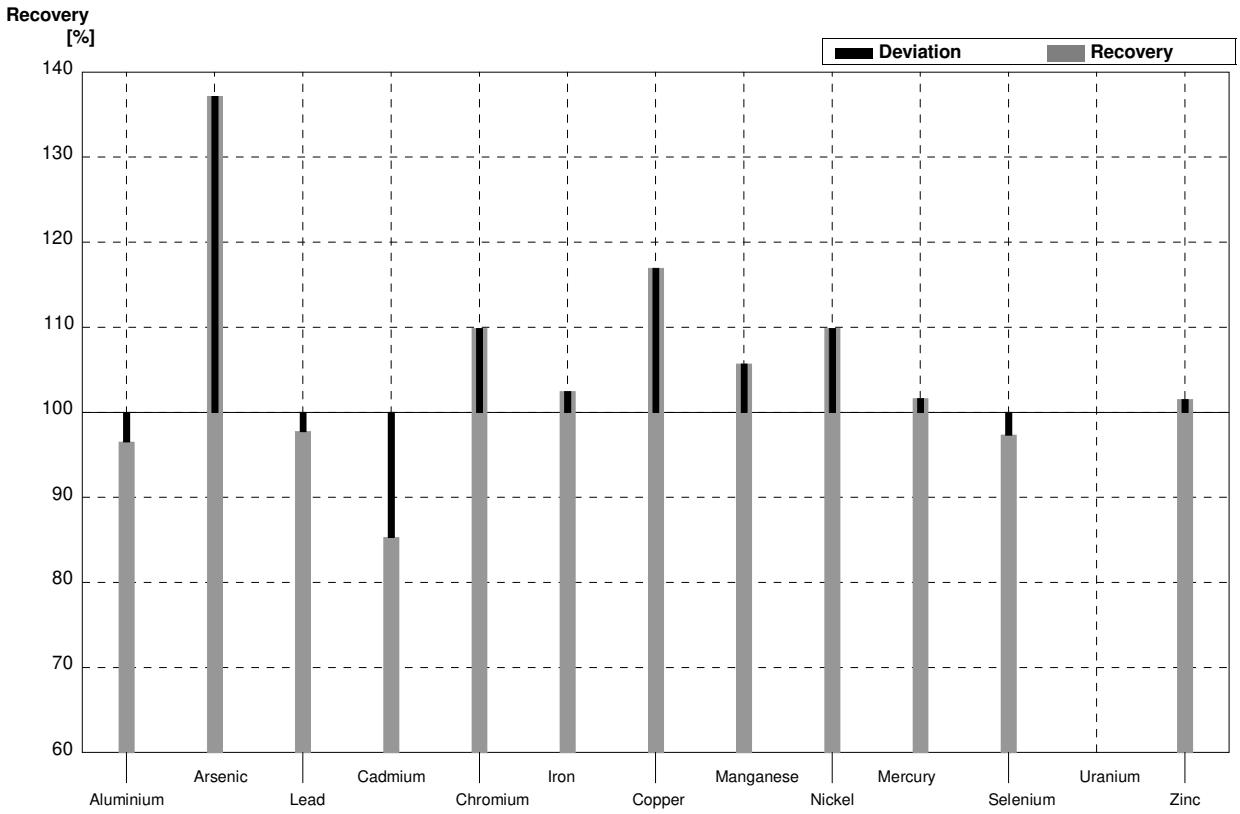
Sample M149B
Laboratory F

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	39,7	4,0	µg/l	99%
Arsenic	1,87	0,02	1,91	0,19	µg/l	102%
Lead	2,82	0,02	2,55	0,26	µg/l	90%
Cadmium	1,00	0,01	0,99	0,10	µg/l	99%
Chromium	1,71	0,02	1,68	0,17	µg/l	98%
Iron	20,8	0,2	20,4	2,0	µg/l	98%
Copper	2,22	0,03	2,12	0,21	µg/l	95%
Manganese	9,25	0,07	9,1	0,91	µg/l	98%
Nickel	1,83	0,02	1,78	0,18	µg/l	97%
Mercury	0,79	0,01	0,83	0,10	µg/l	105%
Selenium	0,87	0,06	<1,0		µg/l	•
Uranium	0,80	0,01	0,77	0,08	µg/l	96%
Zinc	7,56	0,79	7,5	0,75	µg/l	99%



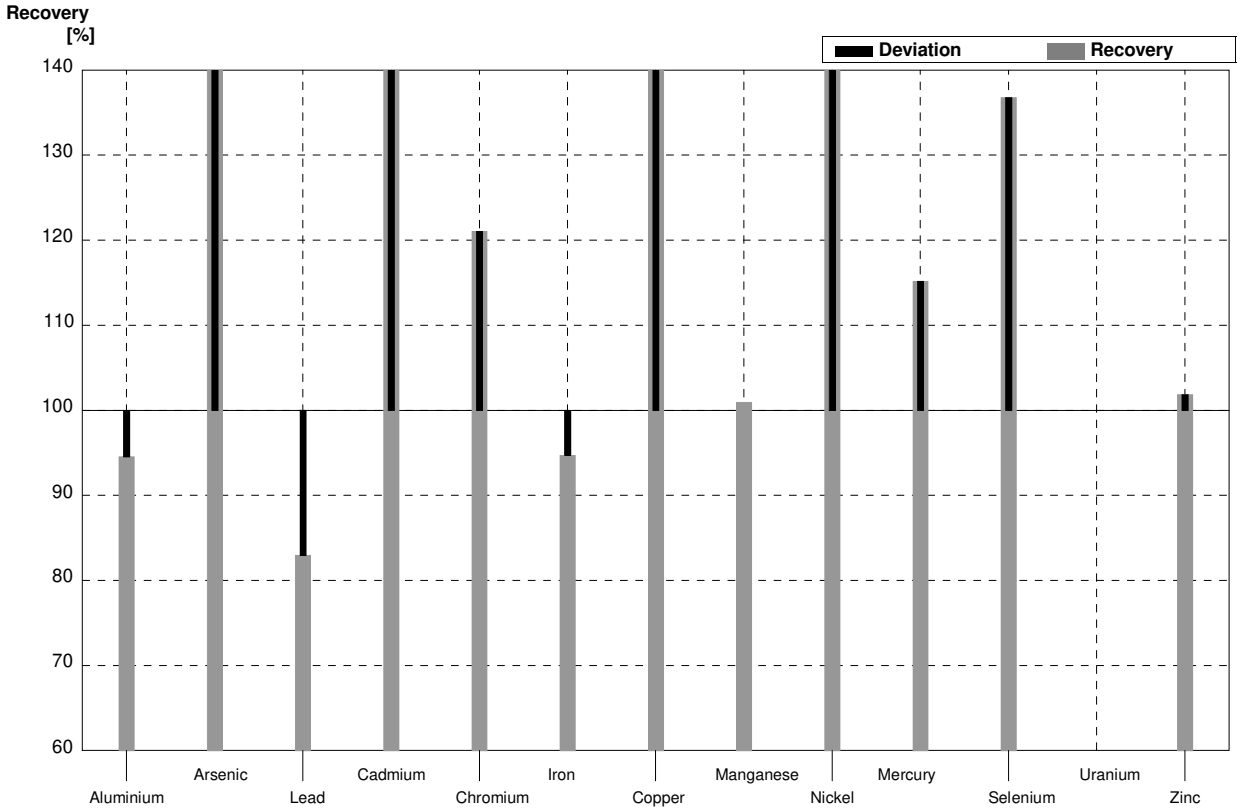
Sample M149A
Laboratory G

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	69,8		µg/l	97%
Arsenic	6,38	0,04	8,75		µg/l	137%
Lead	8,03	0,10	7,85		µg/l	98%
Cadmium	2,11	0,02	1,80		µg/l	85%
Chromium	6,39	0,04	7,02		µg/l	110%
Iron	52,7	0,3	54		µg/l	102%
Copper	11,2	0,1	13,1		µg/l	117%
Manganese	21,1	0,1	22,3		µg/l	106%
Nickel	3,03	0,03	3,33		µg/l	110%
Mercury	1,82	0,02	1,85		µg/l	102%
Selenium	2,63	0,06	2,56		µg/l	97%
Uranium	2,23	0,02			µg/l	
Zinc	13,3	0,8	13,5		µg/l	102%



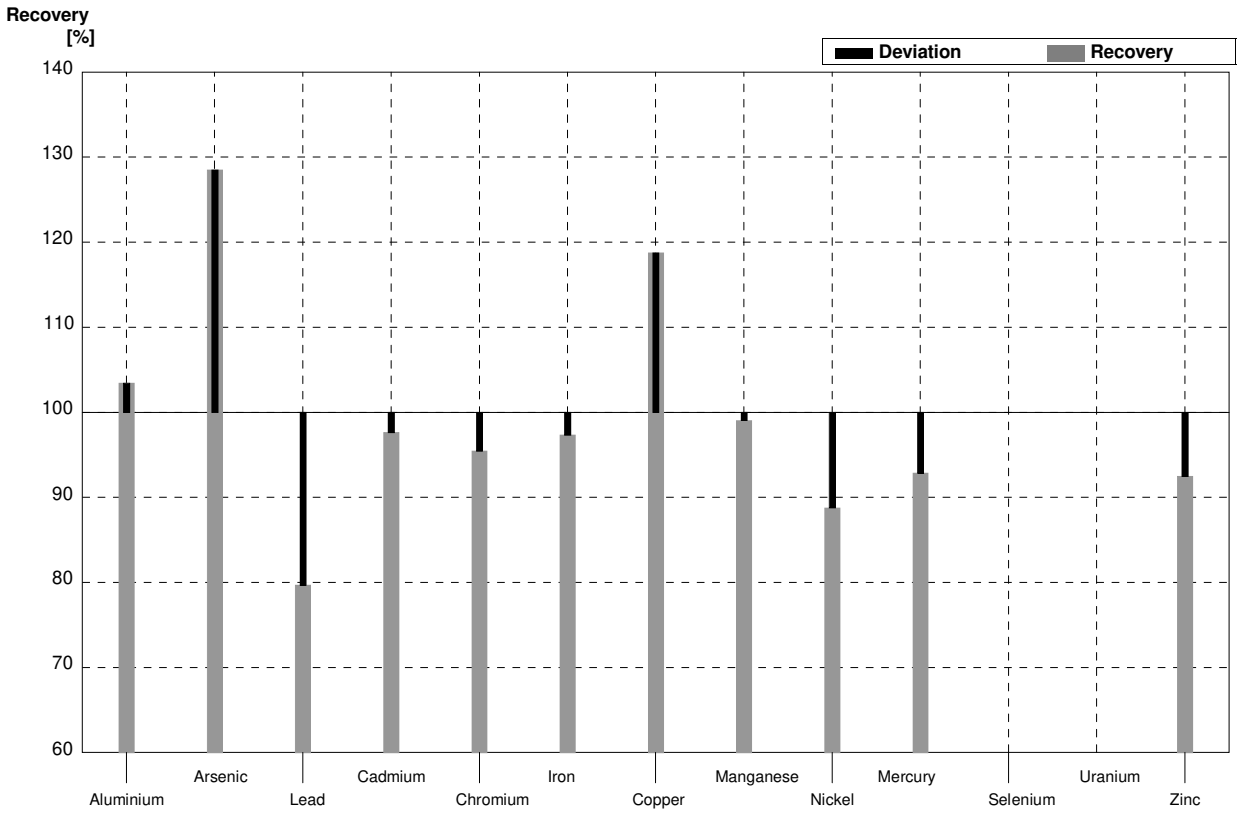
Sample M149B
Laboratory G

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	38,1		µg/l	95%
Arsenic	1,87	0,02	3,32		µg/l	178%
Lead	2,82	0,02	2,34		µg/l	83%
Cadmium	1,00	0,01	1,48		µg/l	148%
Chromium	1,71	0,02	2,07		µg/l	121%
Iron	20,8	0,2	19,7		µg/l	95%
Copper	2,22	0,03	3,98		µg/l	179%
Manganese	9,25	0,07	9,34		µg/l	101%
Nickel	1,83	0,02	2,59		µg/l	142%
Mercury	0,79	0,01	0,91		µg/l	115%
Selenium	0,87	0,06	1,19		µg/l	137%
Uranium	0,80	0,01			µg/l	
Zinc	7,56	0,79	7,7		µg/l	102%



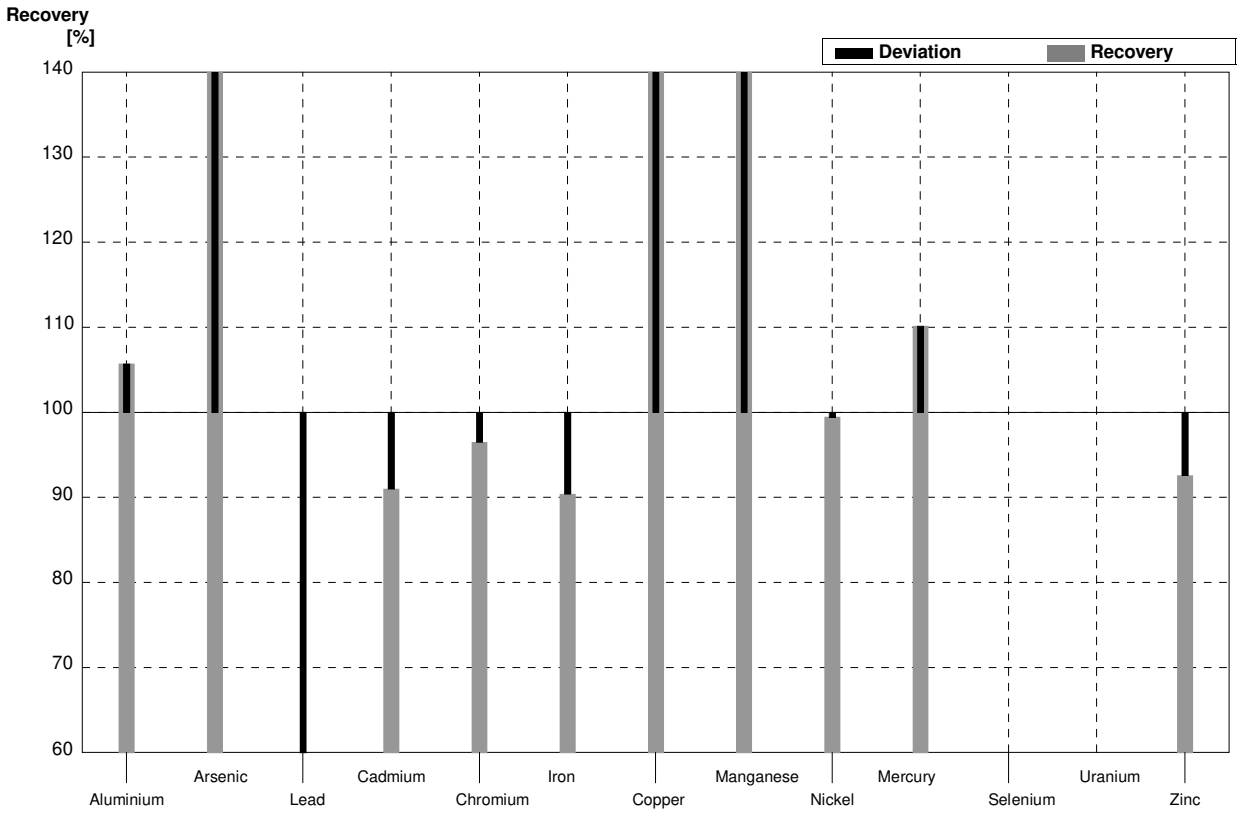
Sample M149A
Laboratory H

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	74,8		µg/l	103%
Arsenic	6,38	0,04	8,2		µg/l	129%
Lead	8,03	0,10	6,4		µg/l	80%
Cadmium	2,11	0,02	2,06		µg/l	98%
Chromium	6,39	0,04	6,1		µg/l	95%
Iron	52,7	0,3	51,3		µg/l	97%
Copper	11,2	0,1	13,3		µg/l	119%
Manganese	21,1	0,1	20,9		µg/l	99%
Nickel	3,03	0,03	2,69		µg/l	89%
Mercury	1,82	0,02	1,69		µg/l	93%
Selenium	2,63	0,06			µg/l	
Uranium	2,23	0,02			µg/l	
Zinc	13,3	0,8	12,3		µg/l	92%



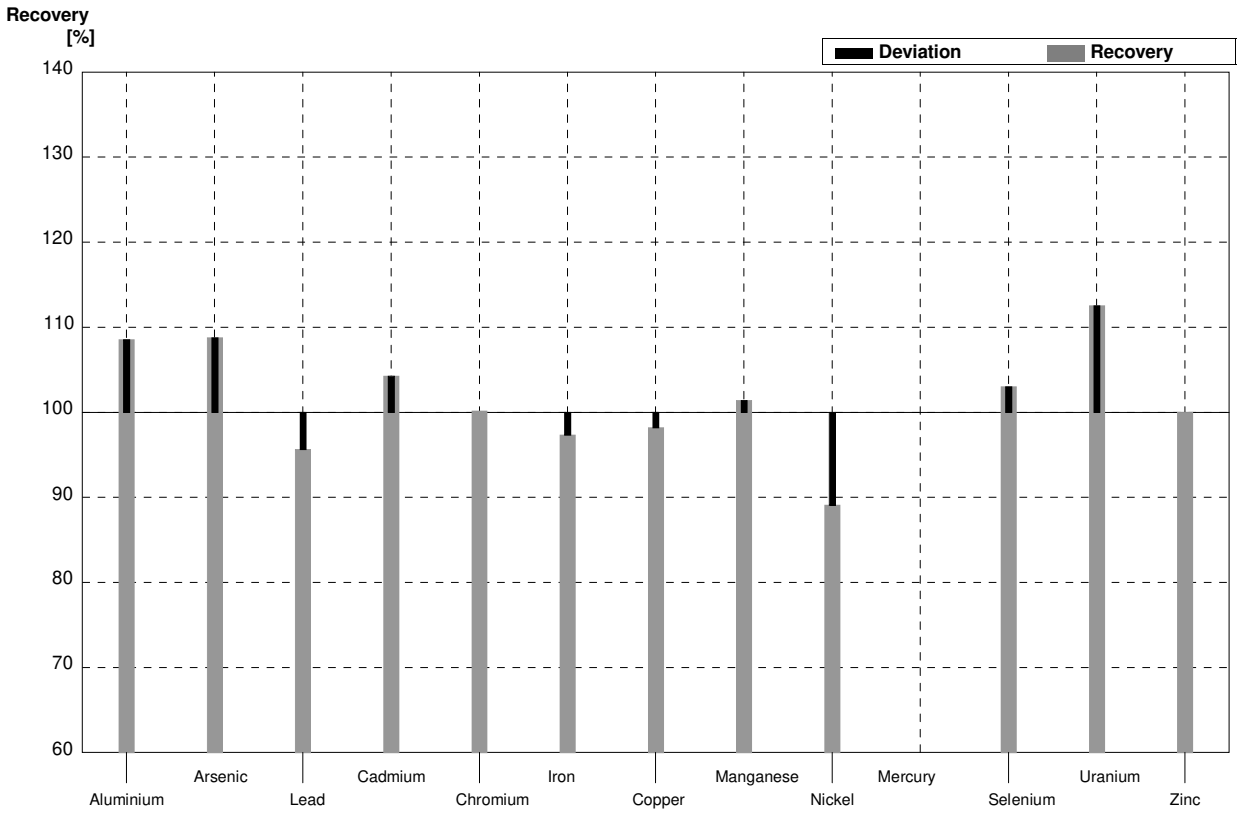
Sample M149B
Laboratory H

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	42,6		µg/l	106%
Arsenic	1,87	0,02	3,35		µg/l	179%
Lead	2,82	0,02	1,29		µg/l	46%
Cadmium	1,00	0,01	0,91		µg/l	91%
Chromium	1,71	0,02	1,65		µg/l	96%
Iron	20,8	0,2	18,8		µg/l	90%
Copper	2,22	0,03	3,64		µg/l	164%
Manganese	9,25	0,07	92,6		µg/l	1001%
Nickel	1,83	0,02	1,82		µg/l	99%
Mercury	0,79	0,01	0,87		µg/l	110%
Selenium	0,87	0,06			µg/l	
Uranium	0,80	0,01			µg/l	
Zinc	7,56	0,79	7,0		µg/l	93%



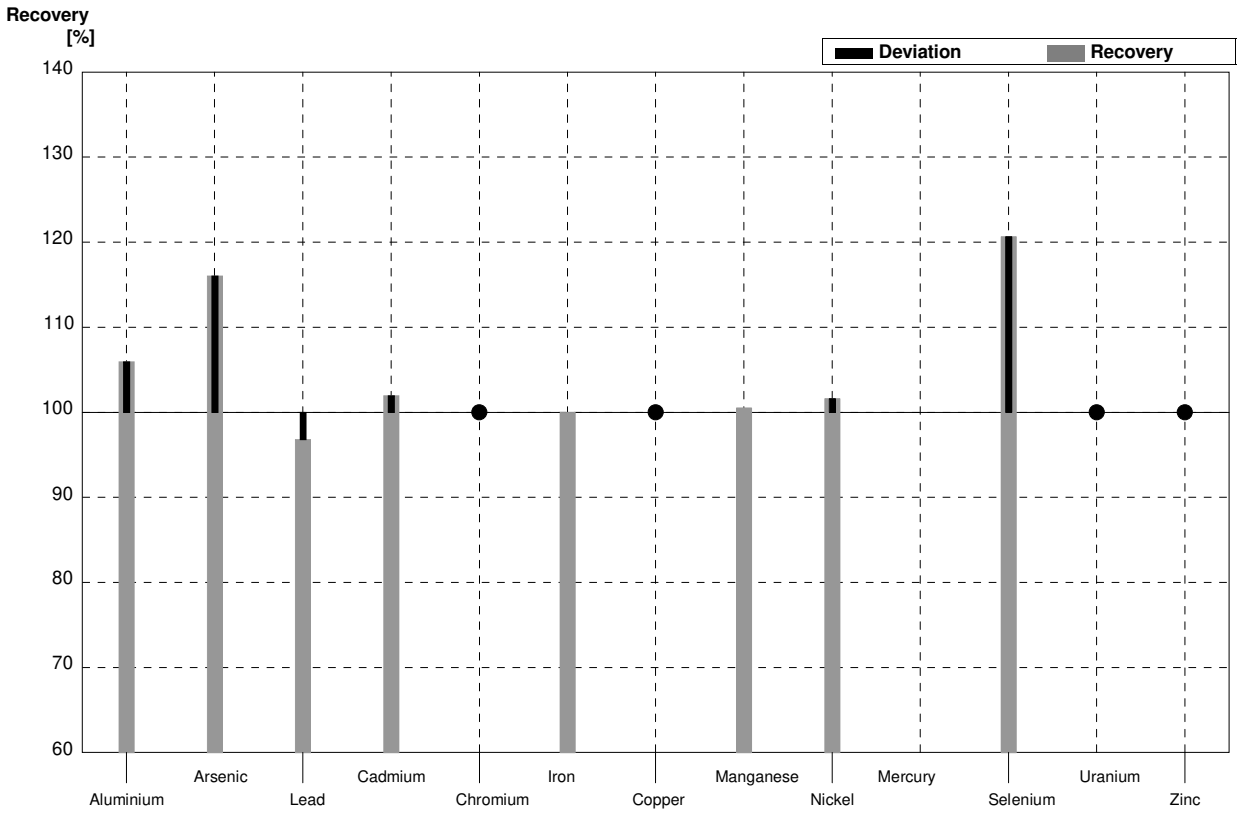
Sample M149A
Laboratory I

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	78,5	2,9	µg/l	109%
Arsenic	6,38	0,04	6,94	0,18	µg/l	109%
Lead	8,03	0,10	7,68	0,12	µg/l	96%
Cadmium	2,11	0,02	2,20	0,1	µg/l	104%
Chromium	6,39	0,04	6,4	0,8	µg/l	100%
Iron	52,7	0,3	51,3	0,7	µg/l	97%
Copper	11,2	0,1	11,0	1,2	µg/l	98%
Manganese	21,1	0,1	21,4	0,5	µg/l	101%
Nickel	3,03	0,03	2,70	0,2	µg/l	89%
Mercury	1,82	0,02			µg/l	
Selenium	2,63	0,06	2,71	0,1	µg/l	103%
Uranium	2,23	0,02	2,51	0,37	µg/l	113%
Zinc	13,3	0,8	13,3	2,6	µg/l	100%



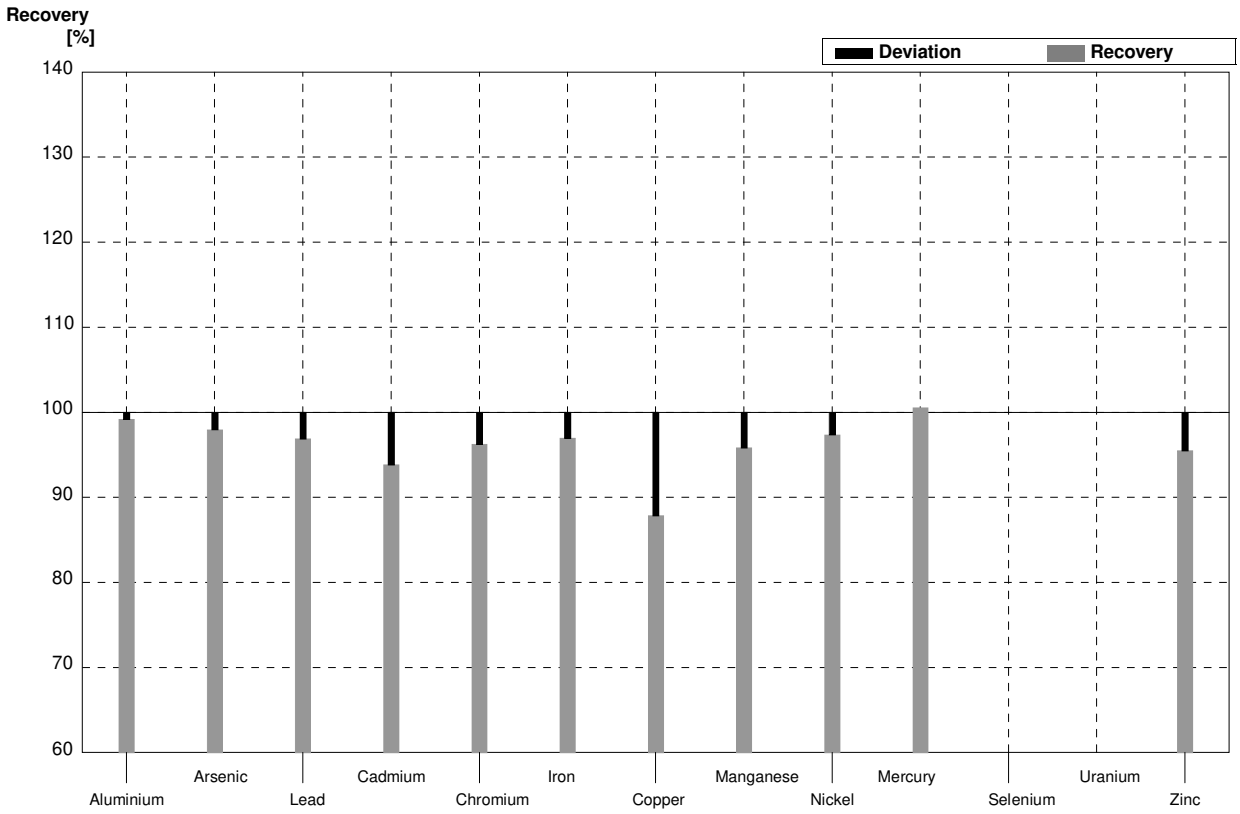
Sample M149B
Laboratory I

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	42,7	1,2	µg/l	106%
Arsenic	1,87	0,02	2,17	0,21	µg/l	116%
Lead	2,82	0,02	2,73	0,11	µg/l	97%
Cadmium	1,00	0,01	1,02	0,04	µg/l	102%
Chromium	1,71	0,02	<5		µg/l	•
Iron	20,8	0,2	20,8	0,8	µg/l	100%
Copper	2,22	0,03	<5		µg/l	•
Manganese	9,25	0,07	9,3	0,3	µg/l	101%
Nickel	1,83	0,02	1,86	0,07	µg/l	102%
Mercury	0,79	0,01			µg/l	
Selenium	0,87	0,06	1,05	0,13	µg/l	121%
Uranium	0,80	0,01	<2		µg/l	•
Zinc	7,56	0,79	<10		µg/l	•



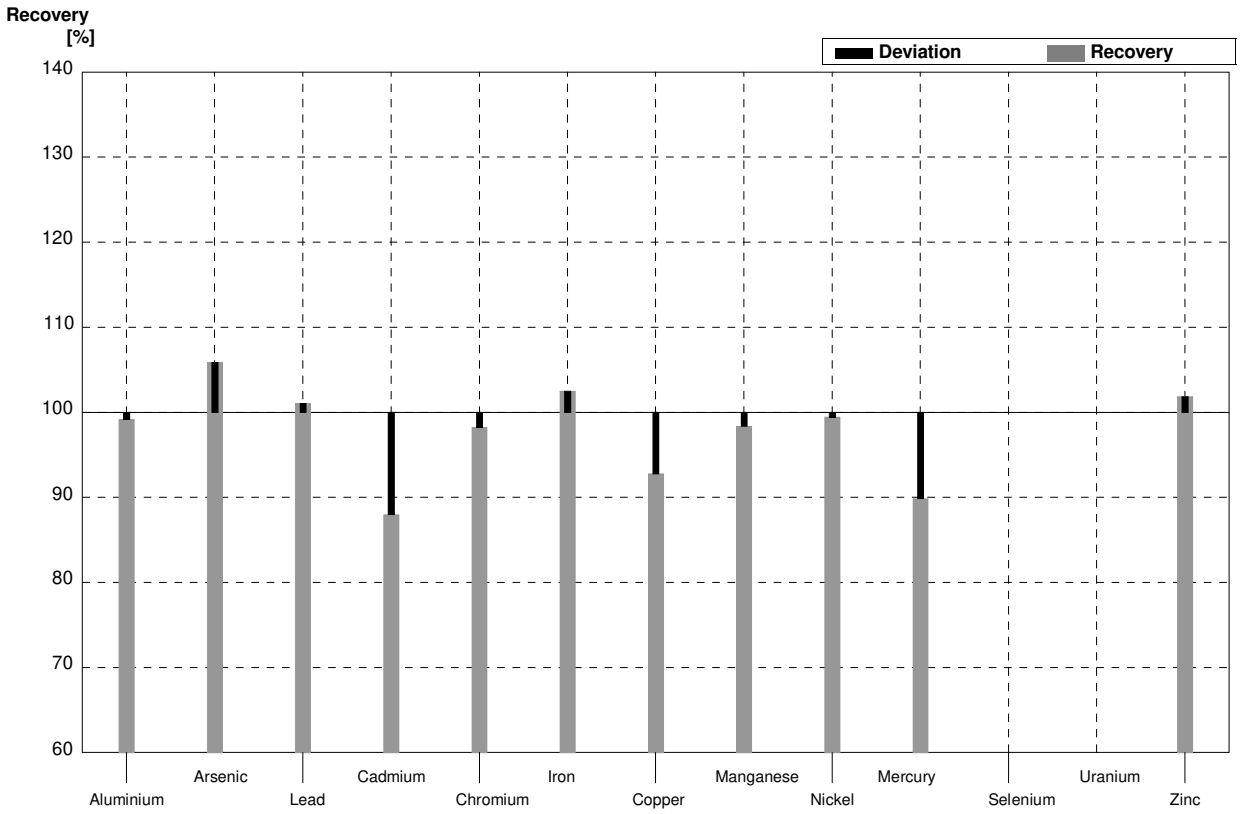
Sample M149A
Laboratory J

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	71,71	14,34	µg/l	99%
Arsenic	6,38	0,04	6,25	1,44	µg/l	98%
Lead	8,03	0,10	7,78	1,79	µg/l	97%
Cadmium	2,11	0,02	1,98	0,47	µg/l	94%
Chromium	6,39	0,04	6,15	1,05	µg/l	96%
Iron	52,7	0,3	51,10	13,29	µg/l	97%
Copper	11,2	0,1	9,84	2,56	µg/l	88%
Manganese	21,1	0,1	20,22	3,23	µg/l	96%
Nickel	3,03	0,03	2,95	0,71	µg/l	97%
Mercury	1,82	0,02	1,83	0,04	µg/l	101%
Selenium	2,63	0,06			µg/l	
Uranium	2,23	0,02			µg/l	
Zinc	13,3	0,8	12,70	2,03	µg/l	95%



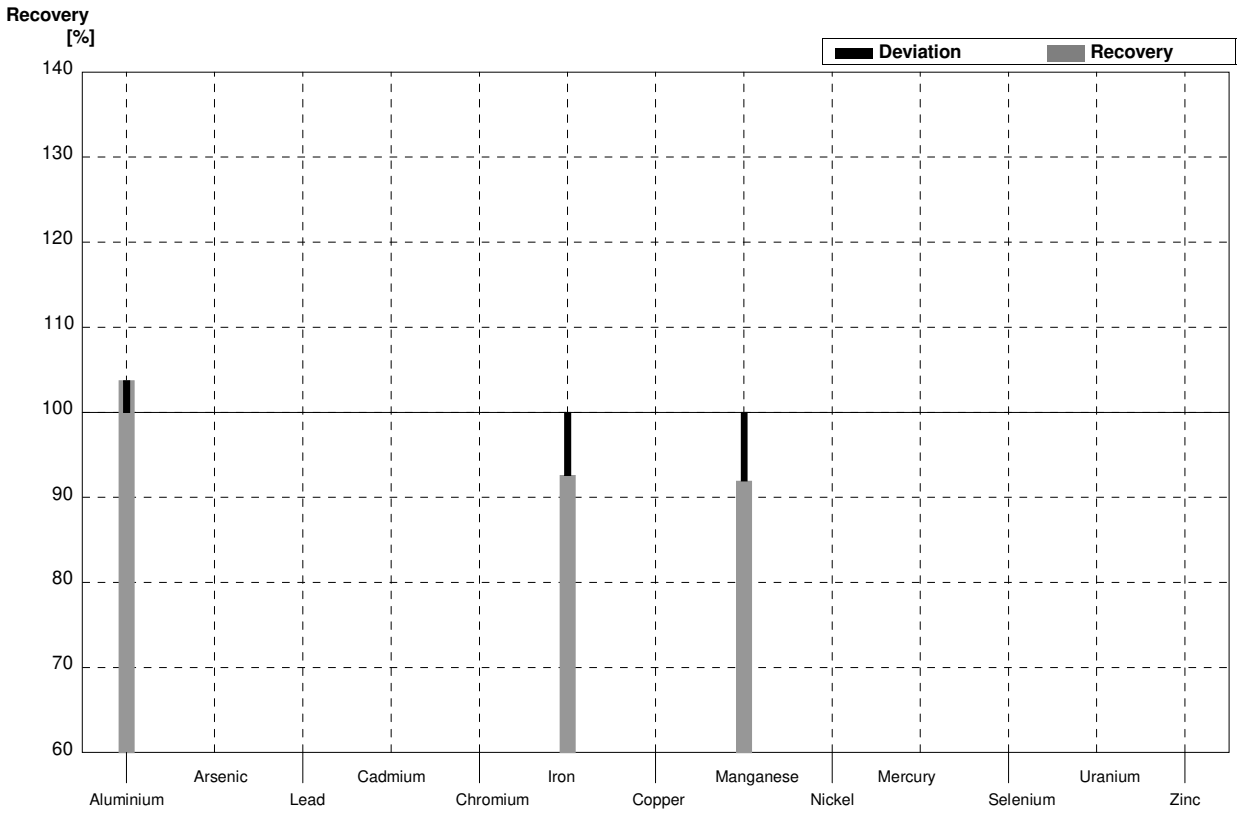
Sample M149B
Laboratory J

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	39,97	7,99	µg/l	99%
Arsenic	1,87	0,02	1,98	0,40	µg/l	106%
Lead	2,82	0,02	2,85	0,57	µg/l	101%
Cadmium	1,00	0,01	0,88	0,21	µg/l	88%
Chromium	1,71	0,02	1,68	0,29	µg/l	98%
Iron	20,8	0,2	21,32	5,54	µg/l	103%
Copper	2,22	0,03	2,06	0,54	µg/l	93%
Manganese	9,25	0,07	9,10	1,46	µg/l	98%
Nickel	1,83	0,02	1,82	0,44	µg/l	99%
Mercury	0,79	0,01	0,71	0,03	µg/l	90%
Selenium	0,87	0,06			µg/l	
Uranium	0,80	0,01			µg/l	
Zinc	7,56	0,79	7,70	1,23	µg/l	102%



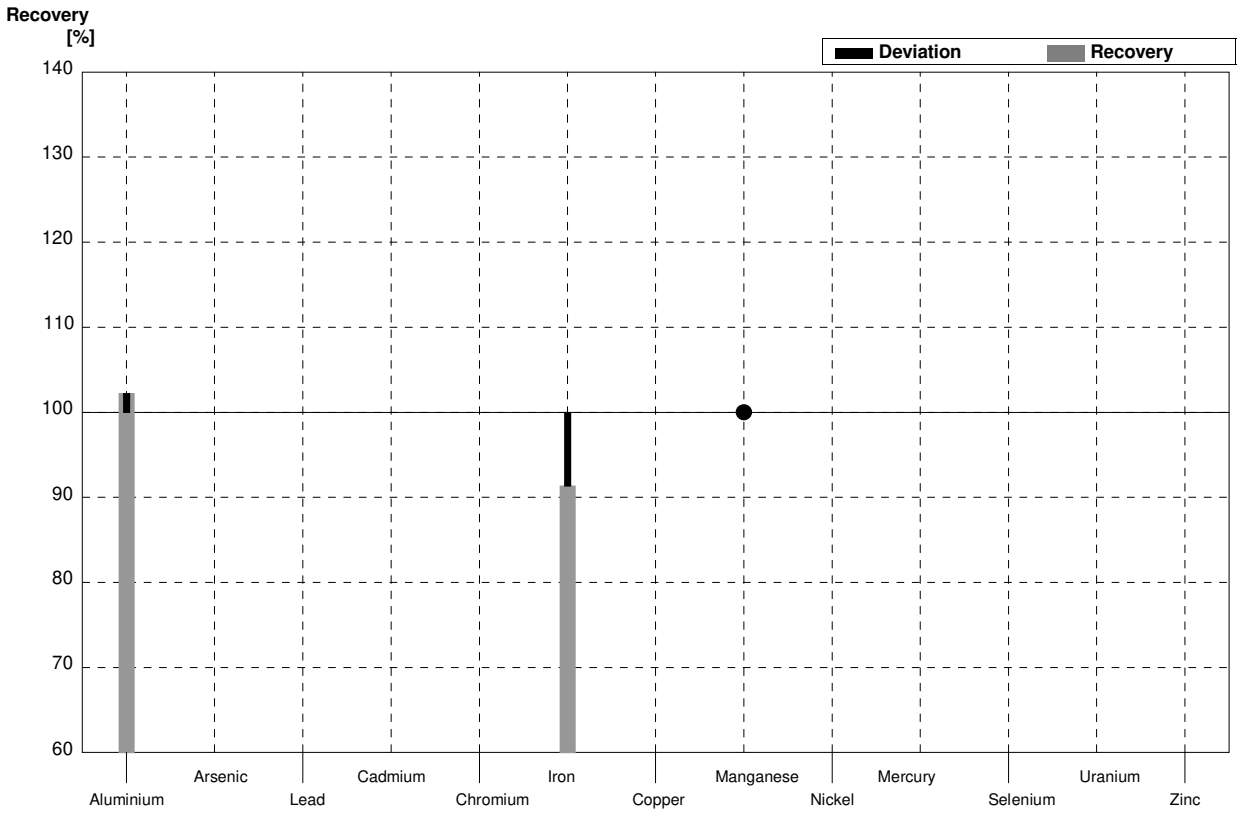
Sample M149A
Laboratory K

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	75	20	µg/l	104%
Arsenic	6,38	0,04			µg/l	
Lead	8,03	0,10			µg/l	
Cadmium	2,11	0,02			µg/l	
Chromium	6,39	0,04			µg/l	
Iron	52,7	0,3	48,8	7,3	µg/l	93%
Copper	11,2	0,1			µg/l	
Manganese	21,1	0,1	19,4	4,1	µg/l	92%
Nickel	3,03	0,03			µg/l	
Mercury	1,82	0,02			µg/l	
Selenium	2,63	0,06			µg/l	
Uranium	2,23	0,02			µg/l	
Zinc	13,3	0,8			µg/l	



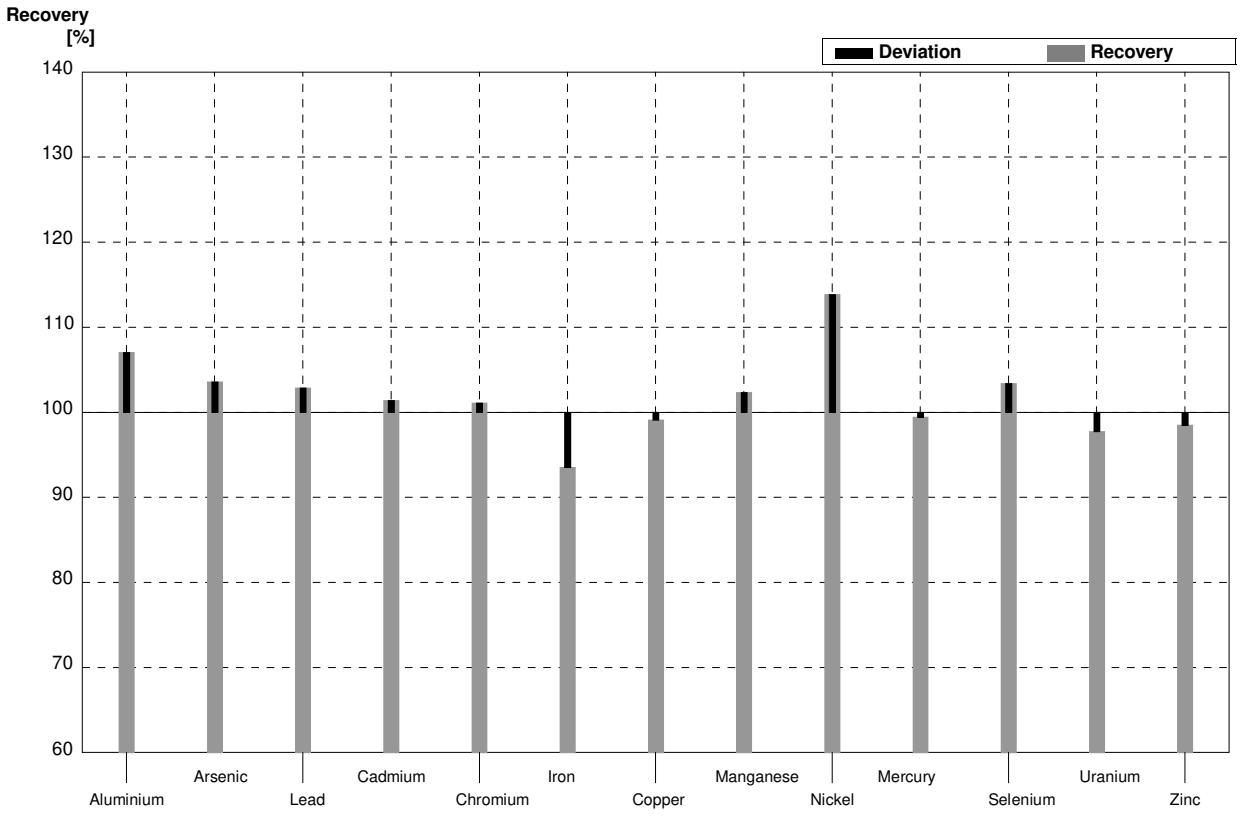
Sample M149B
Laboratory K

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	41,2	11,1	µg/l	102%
Arsenic	1,87	0,02			µg/l	
Lead	2,82	0,02			µg/l	
Cadmium	1,00	0,01			µg/l	
Chromium	1,71	0,02			µg/l	
Iron	20,8	0,2	19,0	2,9	µg/l	91%
Copper	2,22	0,03			µg/l	
Manganese	9,25	0,07	<10	2	µg/l	•
Nickel	1,83	0,02			µg/l	
Mercury	0,79	0,01			µg/l	
Selenium	0,87	0,06			µg/l	
Uranium	0,80	0,01			µg/l	
Zinc	7,56	0,79			µg/l	



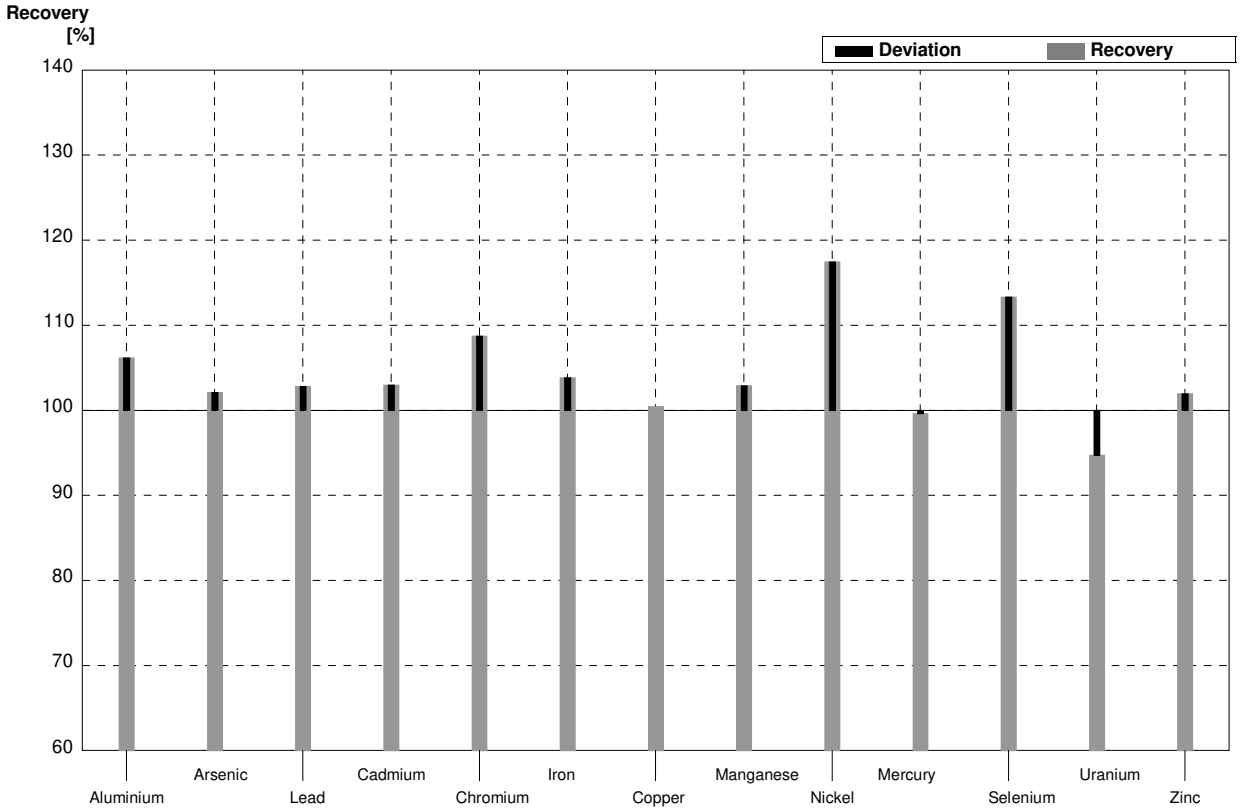
Sample M149A
Laboratory L

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	77,4	3,09	µg/l	107%
Arsenic	6,38	0,04	6,61	0,060	µg/l	104%
Lead	8,03	0,10	8,26	0,110	µg/l	103%
Cadmium	2,11	0,02	2,14	0,030	µg/l	101%
Chromium	6,39	0,04	6,46	0,070	µg/l	101%
Iron	52,7	0,3	49,3	0,058	µg/l	94%
Copper	11,2	0,1	11,1	0,058	µg/l	99%
Manganese	21,1	0,1	21,6	0,200	µg/l	102%
Nickel	3,03	0,03	3,45	0,060	µg/l	114%
Mercury	1,82	0,02	1,81	0,025	µg/l	99%
Selenium	2,63	0,06	2,72	0,023	µg/l	103%
Uranium	2,23	0,02	2,18	0,015	µg/l	98%
Zinc	13,3	0,8	13,1	0,200	µg/l	98%



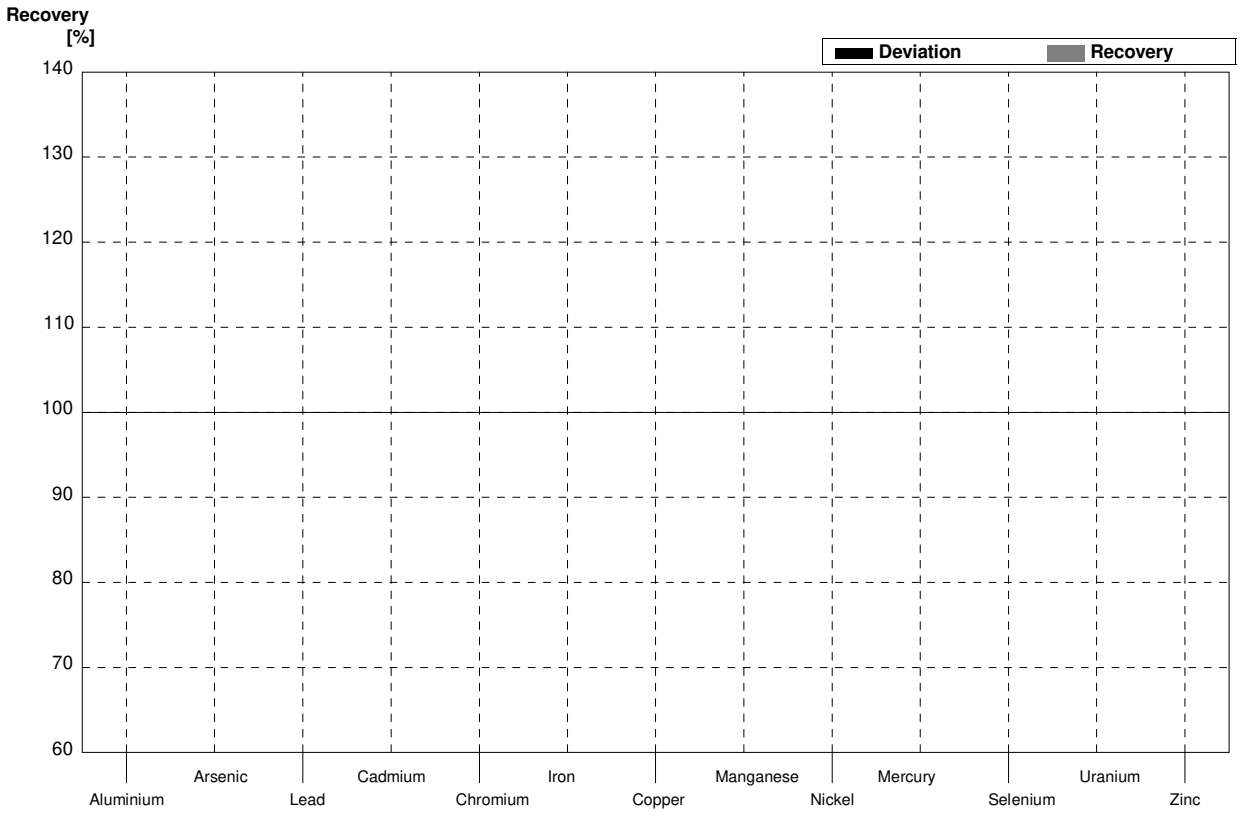
Sample M149B
Laboratory L

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	42,8	1,25	µg/l	106%
Arsenic	1,87	0,02	1,91	0,072	µg/l	102%
Lead	2,82	0,02	2,90	0,067	µg/l	103%
Cadmium	1,00	0,01	1,03	0,012	µg/l	103%
Chromium	1,71	0,02	1,86	0,035	µg/l	109%
Iron	20,8	0,2	21,6	0,265	µg/l	104%
Copper	2,22	0,03	2,23	0,040	µg/l	100%
Manganese	9,25	0,07	9,52	0,065	µg/l	103%
Nickel	1,83	0,02	2,15	0,032	µg/l	117%
Mercury	0,79	0,01	0,787	0,011	µg/l	100%
Selenium	0,87	0,06	0,986	0,018	µg/l	113%
Uranium	0,80	0,01	0,758	0,022	µg/l	95%
Zinc	7,56	0,79	7,71	0,125	µg/l	102%



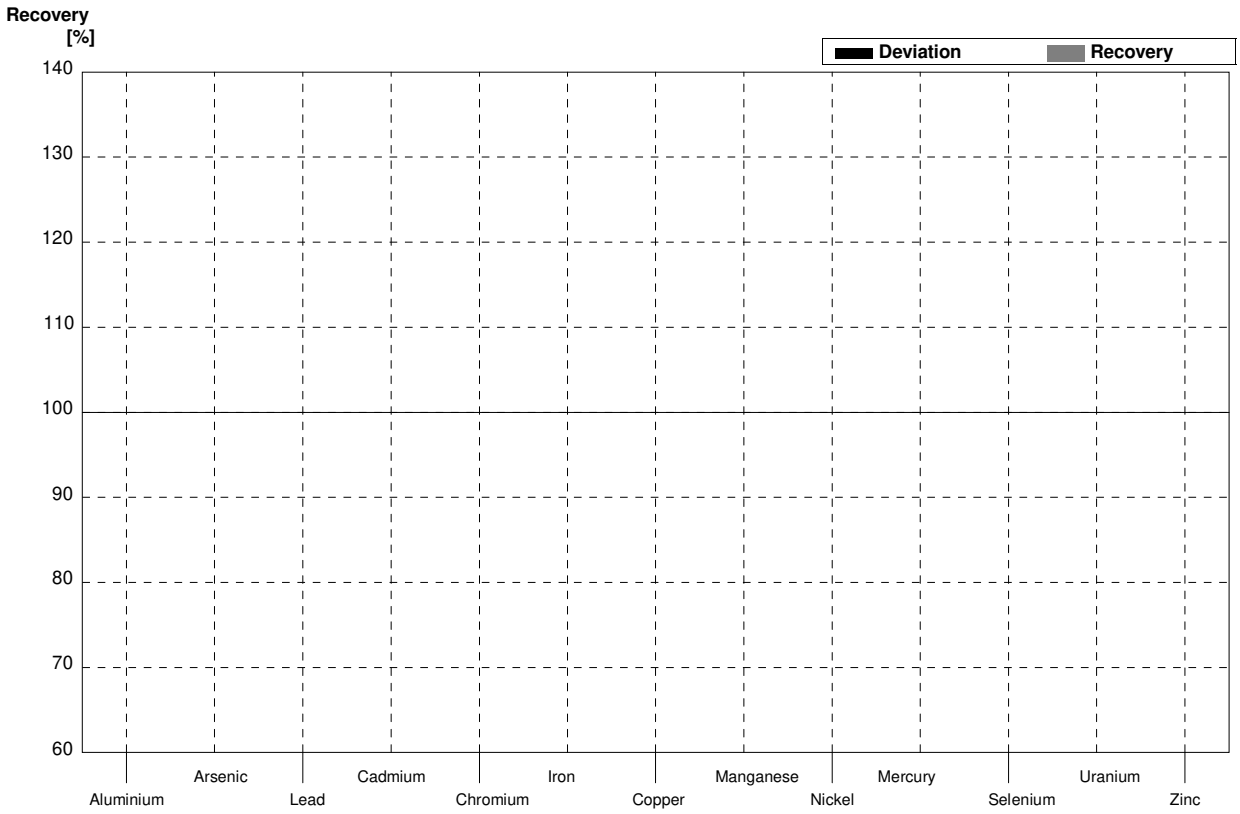
Sample M149A
Laboratory M

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4			µg/l	
Arsenic	6,38	0,04			µg/l	
Lead	8,03	0,10			µg/l	
Cadmium	2,11	0,02			µg/l	
Chromium	6,39	0,04			µg/l	
Iron	52,7	0,3			µg/l	
Copper	11,2	0,1			µg/l	
Manganese	21,1	0,1			µg/l	
Nickel	3,03	0,03			µg/l	
Mercury	1,82	0,02			µg/l	
Selenium	2,63	0,06			µg/l	
Uranium	2,23	0,02			µg/l	
Zinc	13,3	0,8			µg/l	



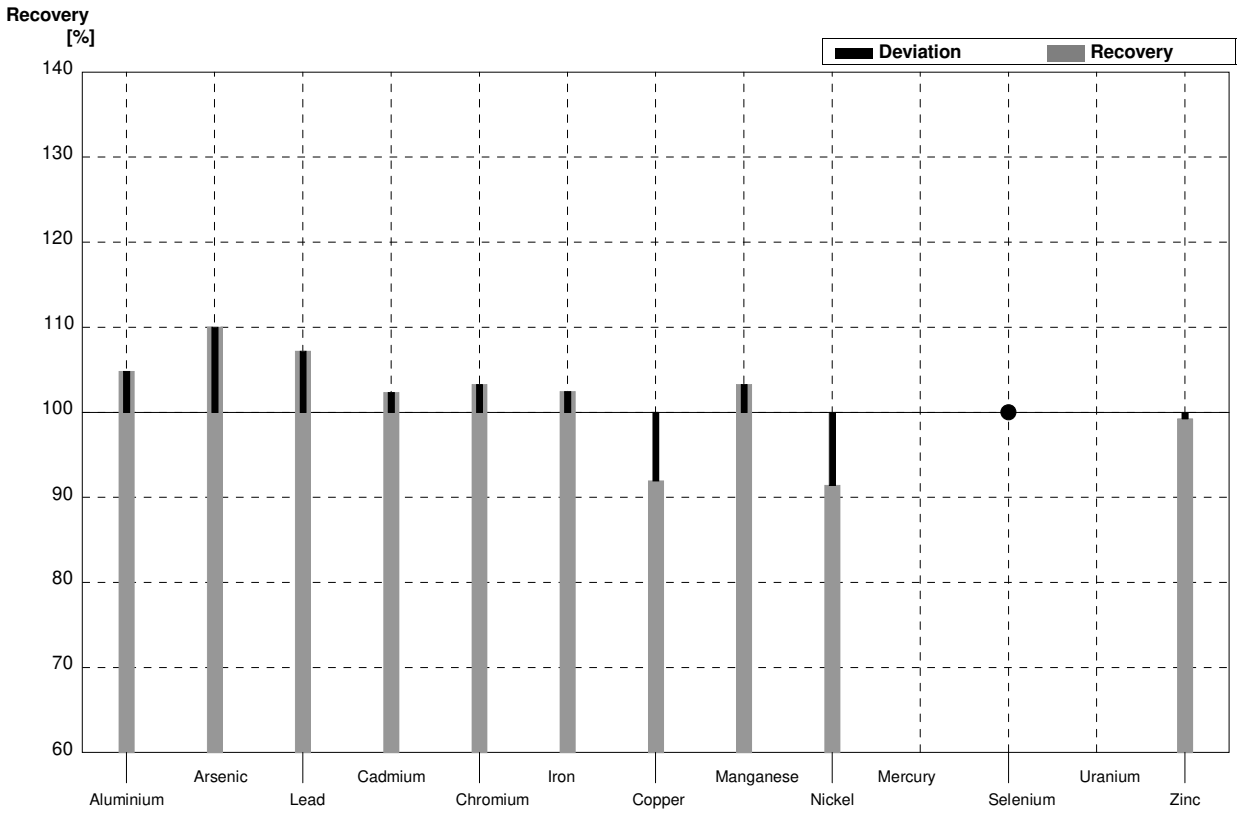
Sample M149B
Laboratory M

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3			µg/l	
Arsenic	1,87	0,02			µg/l	
Lead	2,82	0,02			µg/l	
Cadmium	1,00	0,01			µg/l	
Chromium	1,71	0,02			µg/l	
Iron	20,8	0,2			µg/l	
Copper	2,22	0,03			µg/l	
Manganese	9,25	0,07			µg/l	
Nickel	1,83	0,02			µg/l	
Mercury	0,79	0,01			µg/l	
Selenium	0,87	0,06			µg/l	
Uranium	0,80	0,01			µg/l	
Zinc	7,56	0,79			µg/l	



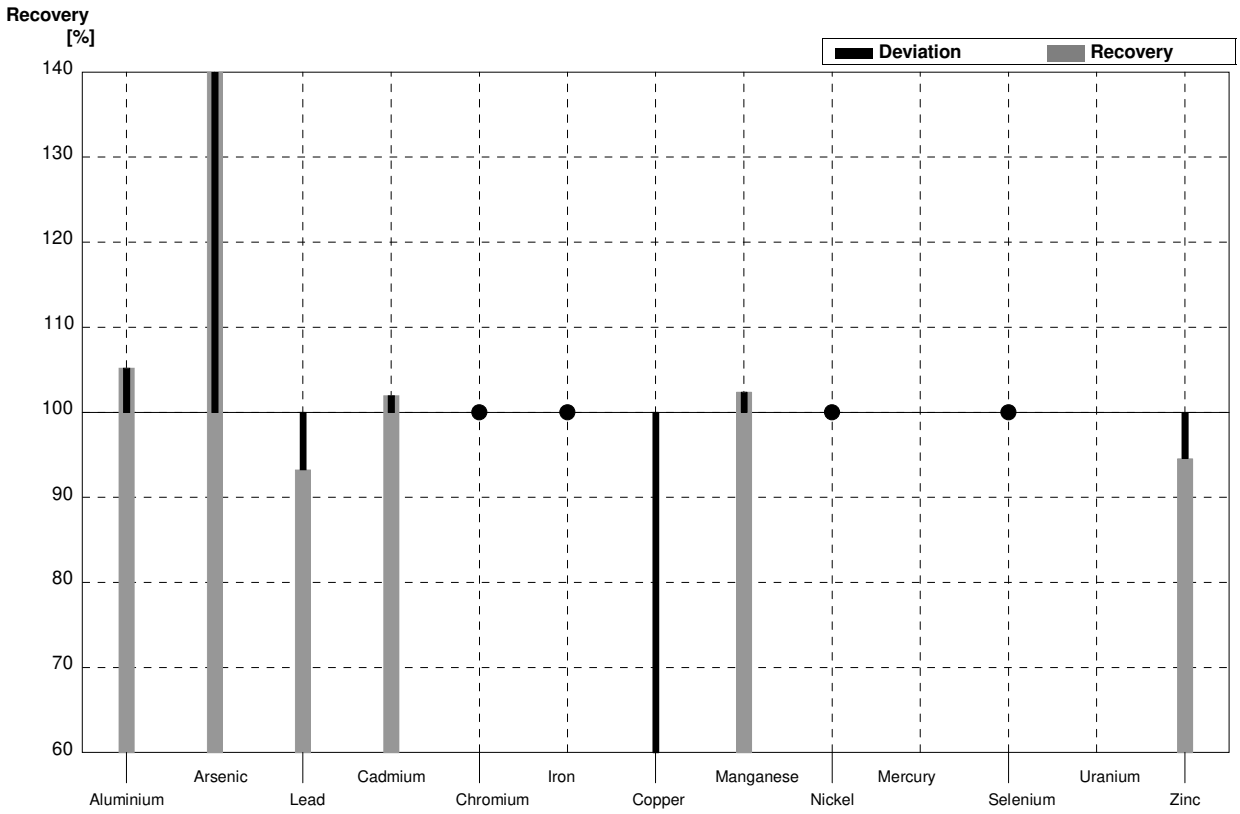
Sample M149A
Laboratory N

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	75,8	11,67	µg/l	105%
Arsenic	6,38	0,04	7,02	1,05	µg/l	110%
Lead	8,03	0,10	8,61	1,47	µg/l	107%
Cadmium	2,11	0,02	2,16	0,15	µg/l	102%
Chromium	6,39	0,04	6,60	0,55	µg/l	103%
Iron	52,7	0,3	54,0	4,43	µg/l	102%
Copper	11,2	0,1	10,3	2,68	µg/l	92%
Manganese	21,1	0,1	21,8	2,05	µg/l	103%
Nickel	3,03	0,03	2,77	0,34	µg/l	91%
Mercury	1,82	0,02			µg/l	
Selenium	2,63	0,06	<5,0		µg/l	•
Uranium	2,23	0,02			µg/l	
Zinc	13,3	0,8	13,2	1,85	µg/l	99%



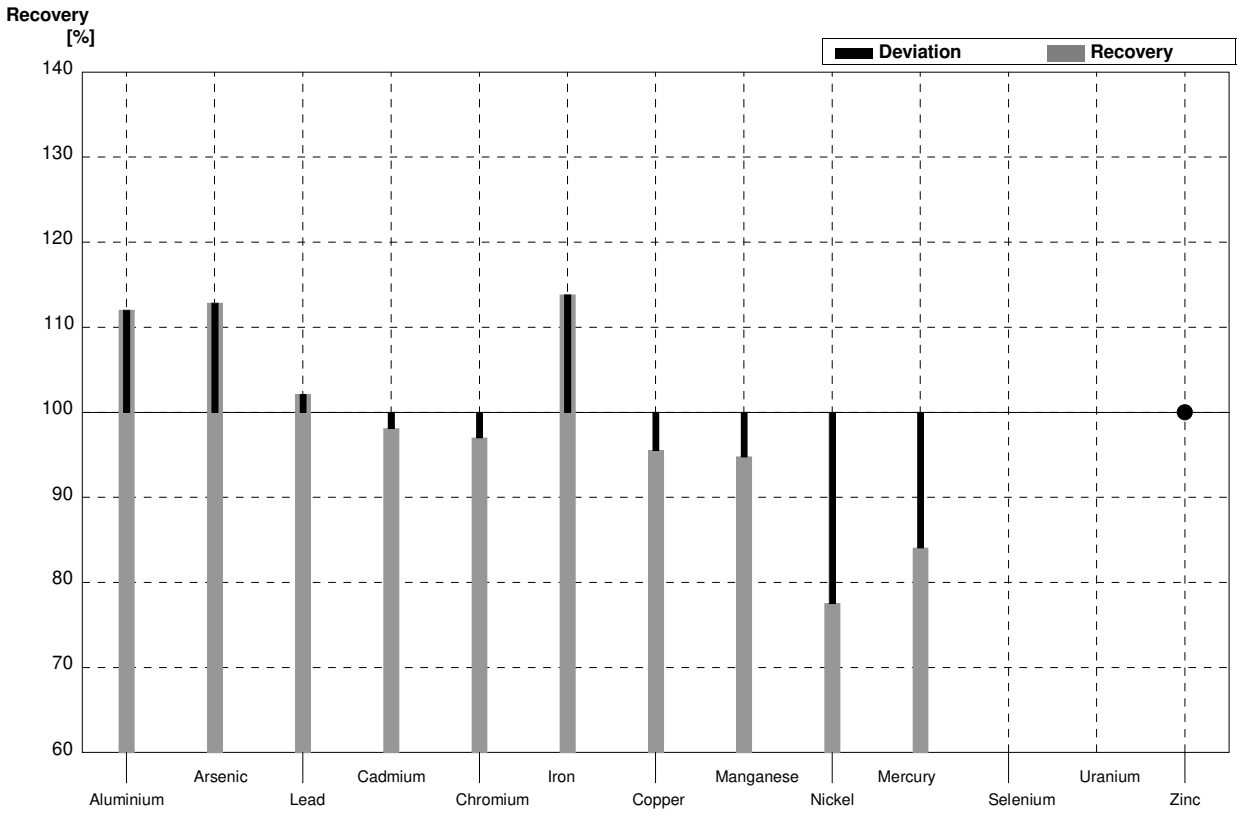
Sample M149B
Laboratory N

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	42,4	6,53	µg/l	105%
Arsenic	1,87	0,02	2,69	0,40	µg/l	144%
Lead	2,82	0,02	2,63	0,45	µg/l	93%
Cadmium	1,00	0,01	1,02	0,07	µg/l	102%
Chromium	1,71	0,02	<5,0		µg/l	•
Iron	20,8	0,2	<30		µg/l	•
Copper	2,22	0,03	0,766	0,20	µg/l	35%
Manganese	9,25	0,07	9,47	0,89	µg/l	102%
Nickel	1,83	0,02	<2,0		µg/l	•
Mercury	0,79	0,01			µg/l	
Selenium	0,87	0,06	<5,0		µg/l	•
Uranium	0,80	0,01			µg/l	
Zinc	7,56	0,79	7,15	1,00	µg/l	95%



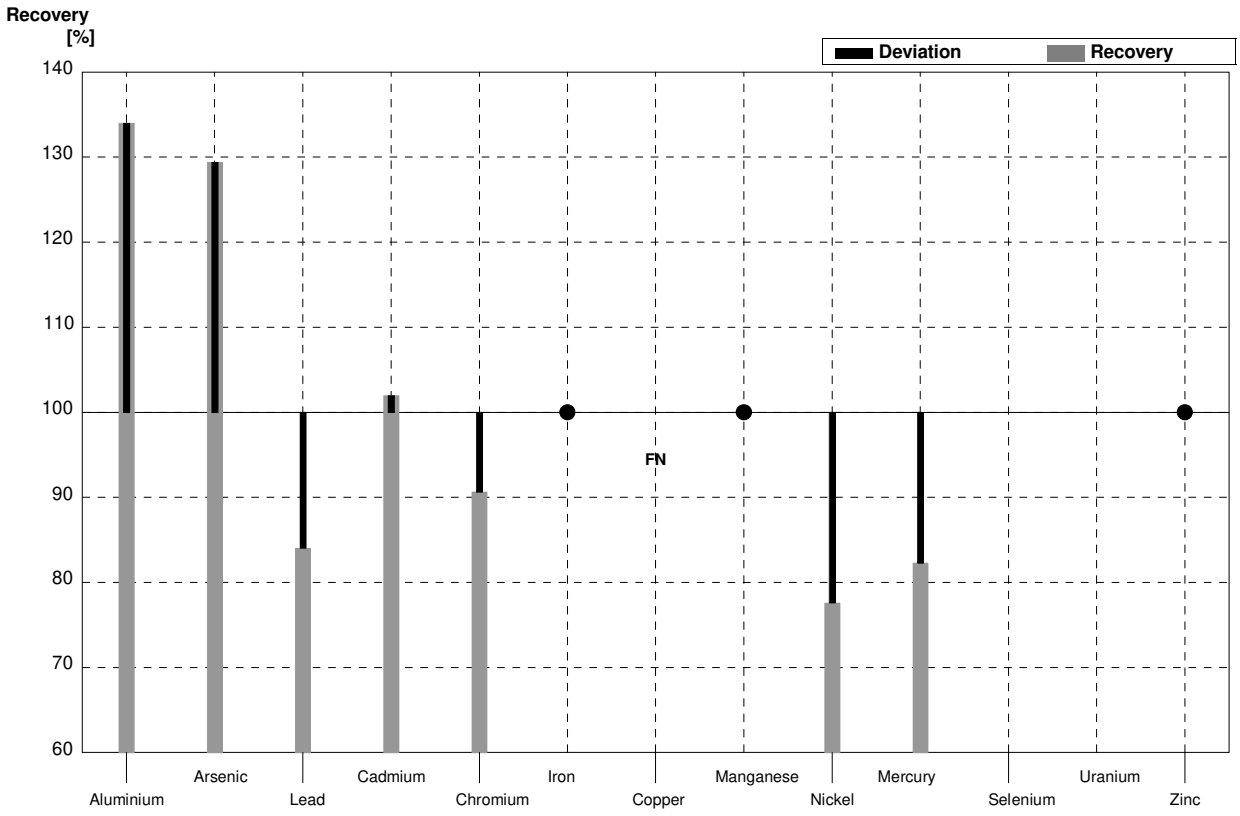
Sample M149A
Laboratory O

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	81	10	µg/l	112%
Arsenic	6,38	0,04	7,2	1	µg/l	113%
Lead	8,03	0,10	8,2	1	µg/l	102%
Cadmium	2,11	0,02	2,07	0,1	µg/l	98%
Chromium	6,39	0,04	6,2	1	µg/l	97%
Iron	52,7	0,3	60	30	µg/l	114%
Copper	11,2	0,1	10,7	2	µg/l	96%
Manganese	21,1	0,1	20,0	15	µg/l	95%
Nickel	3,03	0,03	2,35	1	µg/l	78%
Mercury	1,82	0,02	1,53	0,2	µg/l	84%
Selenium	2,63	0,06			µg/l	
Uranium	2,23	0,02			µg/l	
Zinc	13,3	0,8	<20		µg/l	•



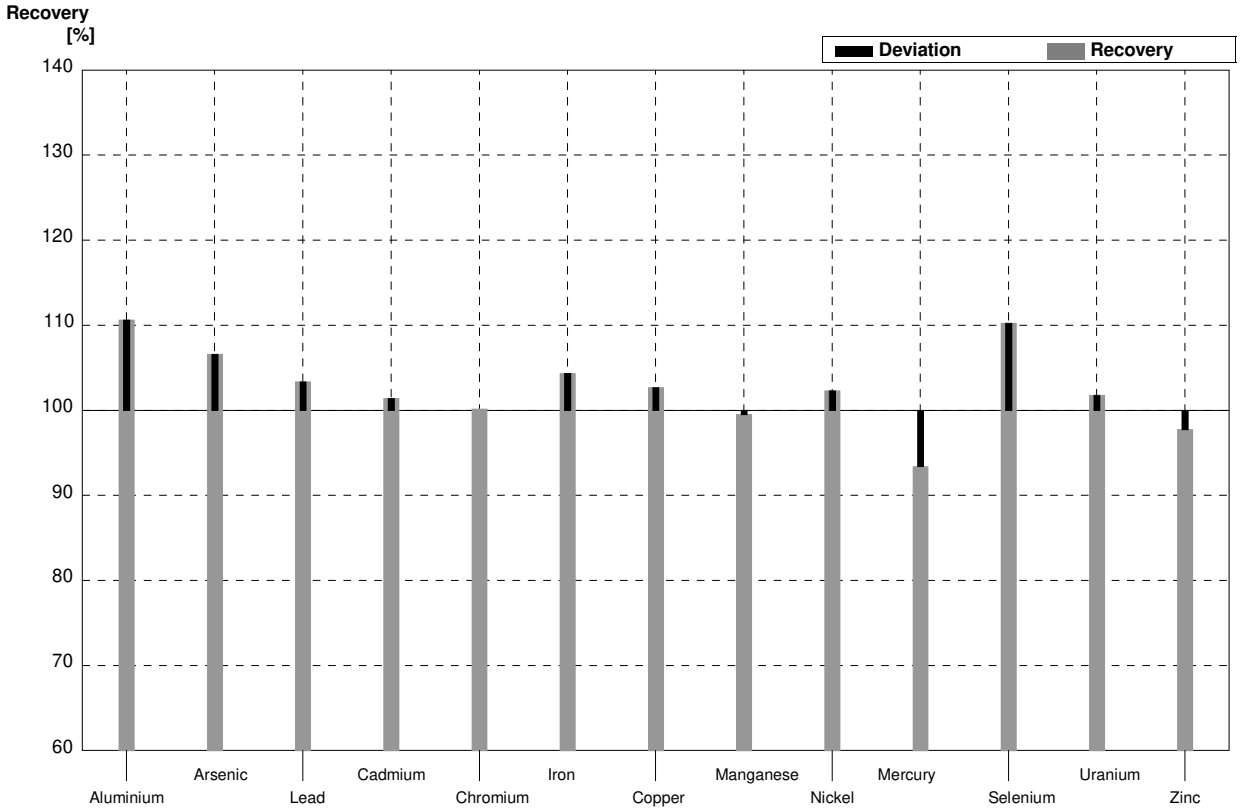
Sample M149B
Laboratory O

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	54	10	µg/l	134%
Arsenic	1,87	0,02	2,42	1	µg/l	129%
Lead	2,82	0,02	2,37	1	µg/l	84%
Cadmium	1,00	0,01	1,02	0,1	µg/l	102%
Chromium	1,71	0,02	1,55	1	µg/l	91%
Iron	20,8	0,2	<50		µg/l	•
Copper	2,22	0,03	<2		µg/l	FN
Manganese	9,25	0,07	<20		µg/l	•
Nickel	1,83	0,02	1,42	1	µg/l	78%
Mercury	0,79	0,01	0,65	0,1	µg/l	82%
Selenium	0,87	0,06			µg/l	
Uranium	0,80	0,01			µg/l	
Zinc	7,56	0,79	<20		µg/l	•



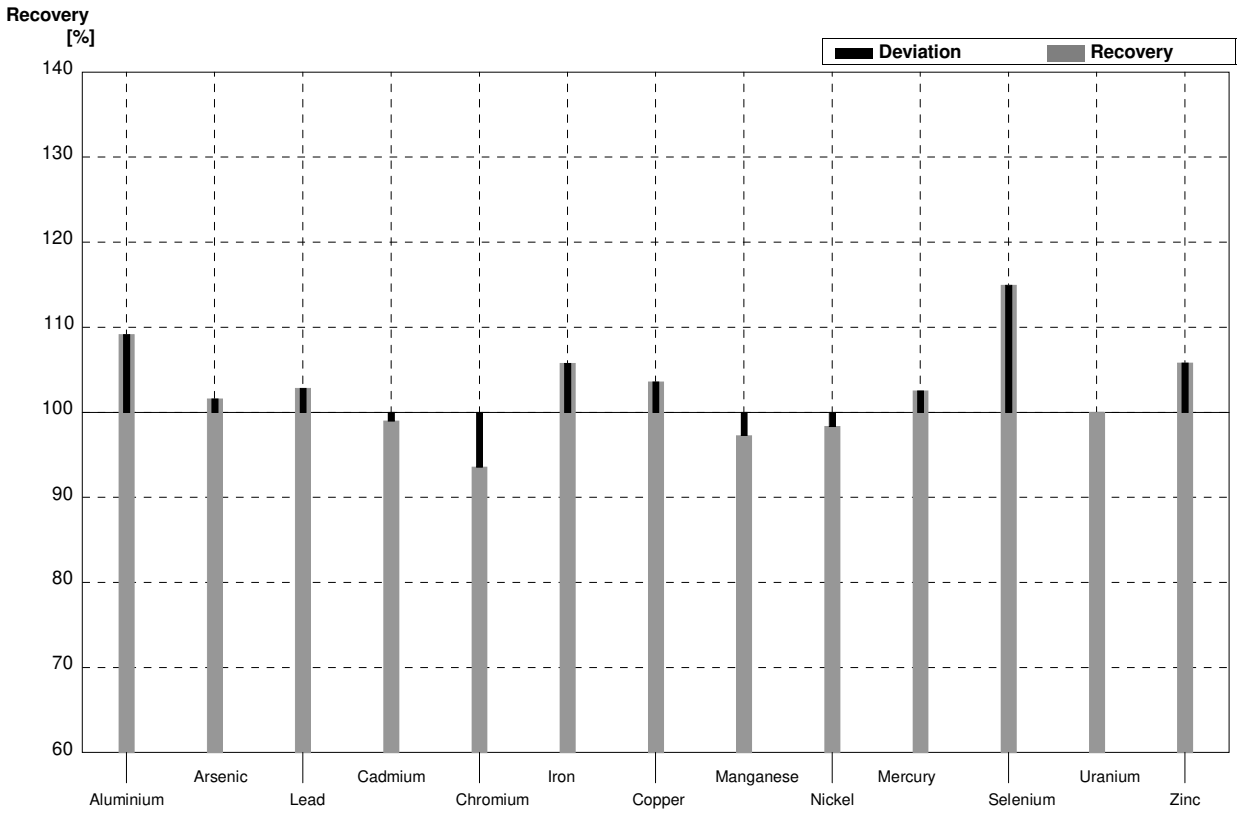
Sample M149A
Laboratory P

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	80,00	8,00	µg/l	111%
Arsenic	6,38	0,04	6,80	0,816	µg/l	107%
Lead	8,03	0,10	8,30	0,664	µg/l	103%
Cadmium	2,11	0,02	2,14	0,171	µg/l	101%
Chromium	6,39	0,04	6,40	0,768	µg/l	100%
Iron	52,7	0,3	55,00	14,30	µg/l	104%
Copper	11,2	0,1	11,50	0,92	µg/l	103%
Manganese	21,1	0,1	21,00	2,10	µg/l	100%
Nickel	3,03	0,03	3,10	0,31	µg/l	102%
Mercury	1,82	0,02	1,70	0,204	µg/l	93%
Selenium	2,63	0,06	2,90	0,435	µg/l	110%
Uranium	2,23	0,02	2,27	0,114	µg/l	102%
Zinc	13,3	0,8	13,00	1,30	µg/l	98%



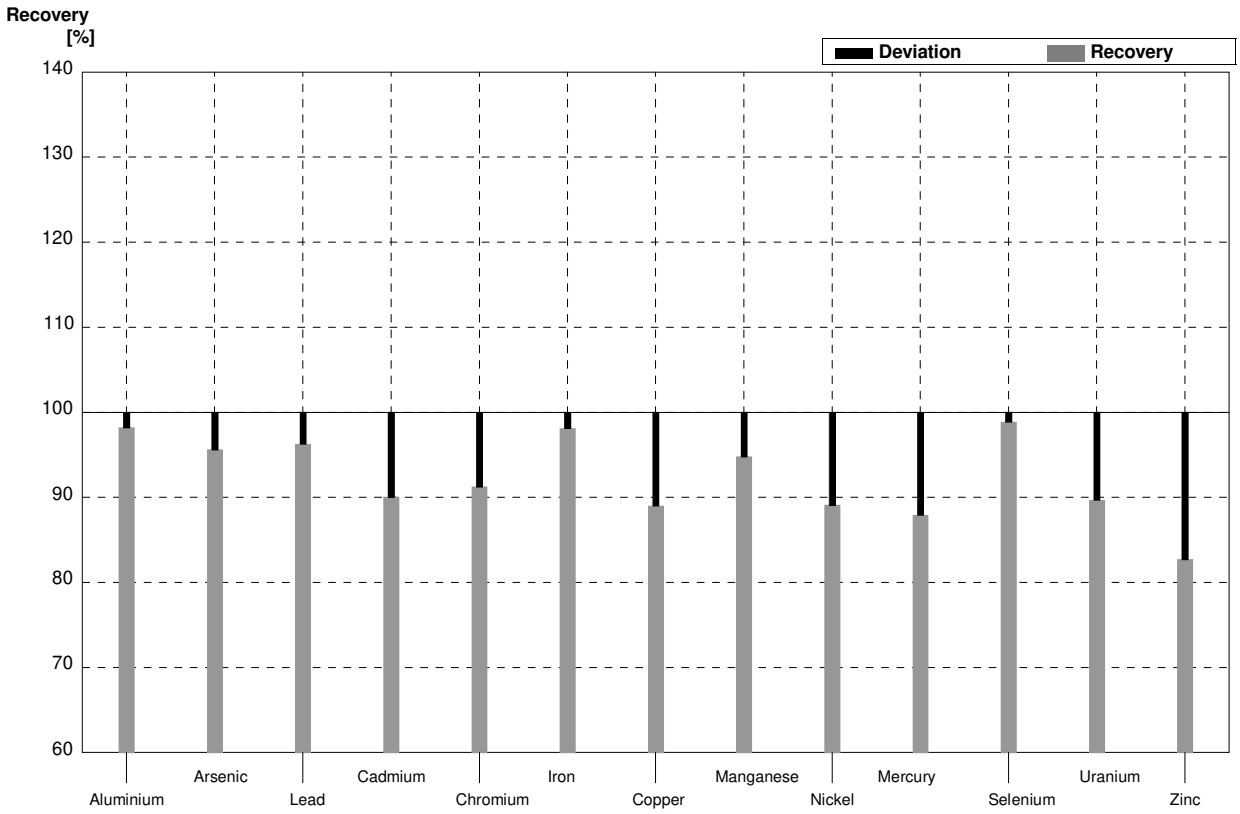
Sample M149B
Laboratory P

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	44,00	4,40	µg/l	109%
Arsenic	1,87	0,02	1,90	0,228	µg/l	102%
Lead	2,82	0,02	2,90	0,232	µg/l	103%
Cadmium	1,00	0,01	0,99	0,0792	µg/l	99%
Chromium	1,71	0,02	1,60	0,192	µg/l	94%
Iron	20,8	0,2	22,00	5,72	µg/l	106%
Copper	2,22	0,03	2,30	0,184	µg/l	104%
Manganese	9,25	0,07	9,00	0,90	µg/l	97%
Nickel	1,83	0,02	1,80	0,18	µg/l	98%
Mercury	0,79	0,01	0,81	0,0972	µg/l	103%
Selenium	0,87	0,06	1,00	0,15	µg/l	115%
Uranium	0,80	0,01	0,80	0,04	µg/l	100%
Zinc	7,56	0,79	8,00	0,80	µg/l	106%



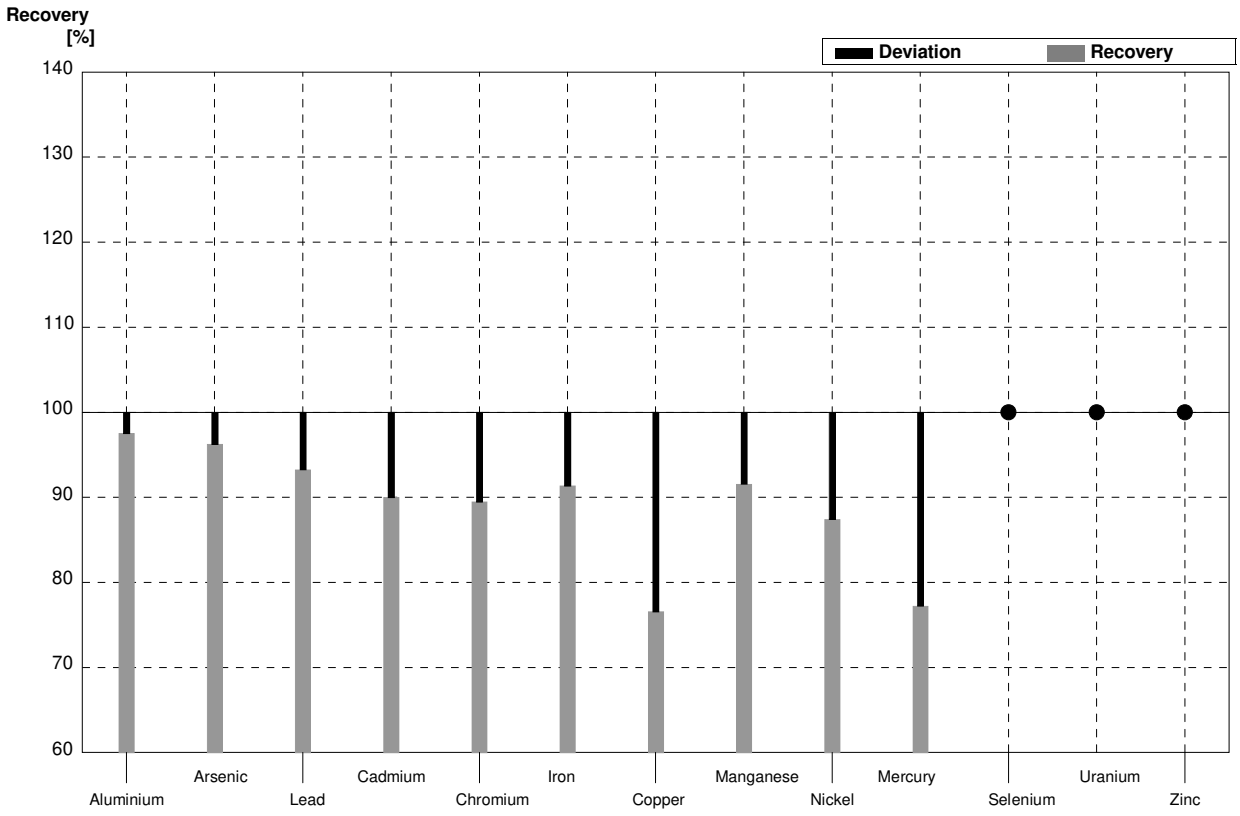
Sample M149A
Laboratory Q

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	71,0	15	µg/l	98%
Arsenic	6,38	0,04	6,10	2	µg/l	96%
Lead	8,03	0,10	7,73	2	µg/l	96%
Cadmium	2,11	0,02	1,90	0,4	µg/l	90%
Chromium	6,39	0,04	5,83	1	µg/l	91%
Iron	52,7	0,3	51,7	10	µg/l	98%
Copper	11,2	0,1	9,97	2	µg/l	89%
Manganese	21,1	0,1	20,0	4	µg/l	95%
Nickel	3,03	0,03	2,70	1	µg/l	89%
Mercury	1,82	0,02	1,60	0,4	µg/l	88%
Selenium	2,63	0,06	2,60	0,6	µg/l	99%
Uranium	2,23	0,02	2,00	0,4	µg/l	90%
Zinc	13,3	0,8	11,0	3	µg/l	83%



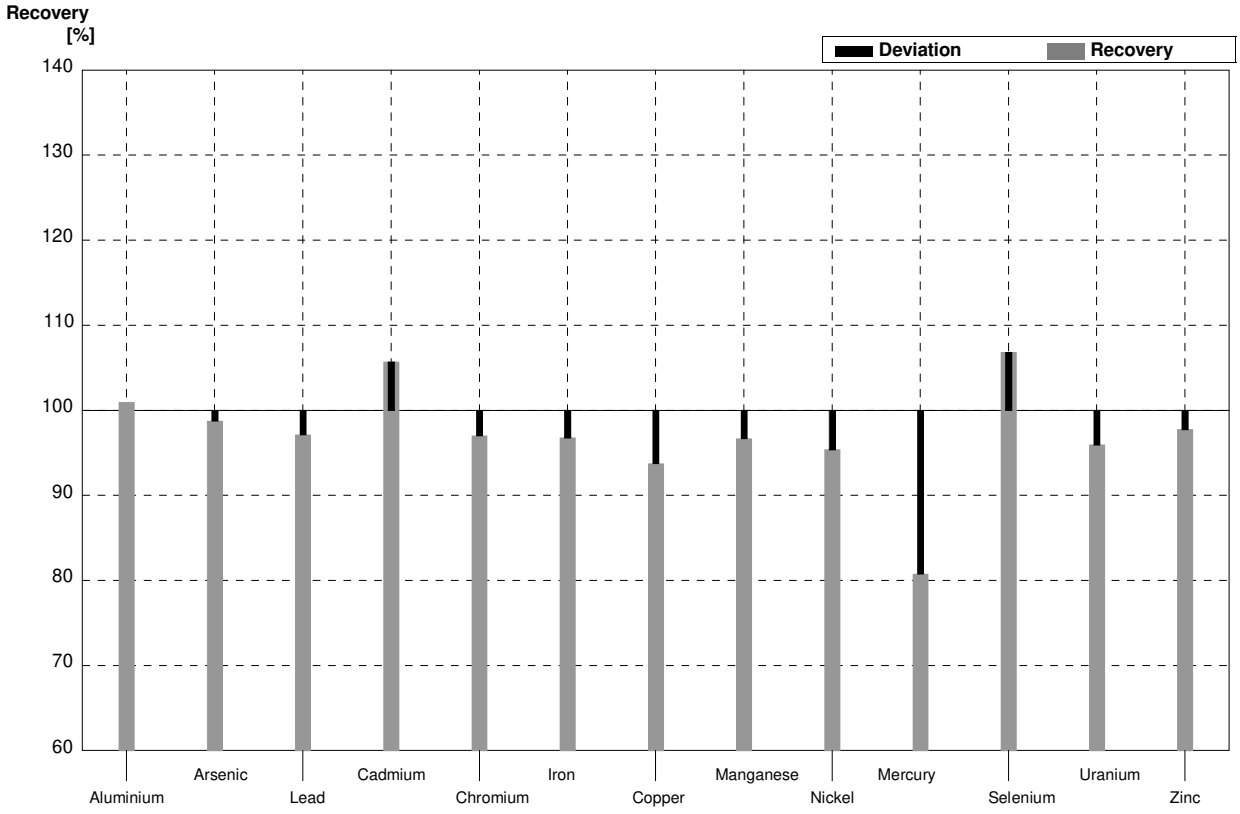
Sample M149B
Laboratory Q

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	39,3	8	µg/l	98%
Arsenic	1,87	0,02	1,80	0,4	µg/l	96%
Lead	2,82	0,02	2,63	0,5	µg/l	93%
Cadmium	1,00	0,01	0,90	0,2	µg/l	90%
Chromium	1,71	0,02	1,53	0,4	µg/l	89%
Iron	20,8	0,2	19,0	4	µg/l	91%
Copper	2,22	0,03	1,70	0,4	µg/l	77%
Manganese	9,25	0,07	8,47	2	µg/l	92%
Nickel	1,83	0,02	1,60	0,4	µg/l	87%
Mercury	0,79	0,01	0,61	0,1	µg/l	77%
Selenium	0,87	0,06	<1		µg/l	•
Uranium	0,80	0,01	<1		µg/l	•
Zinc	7,56	0,79	<10		µg/l	•



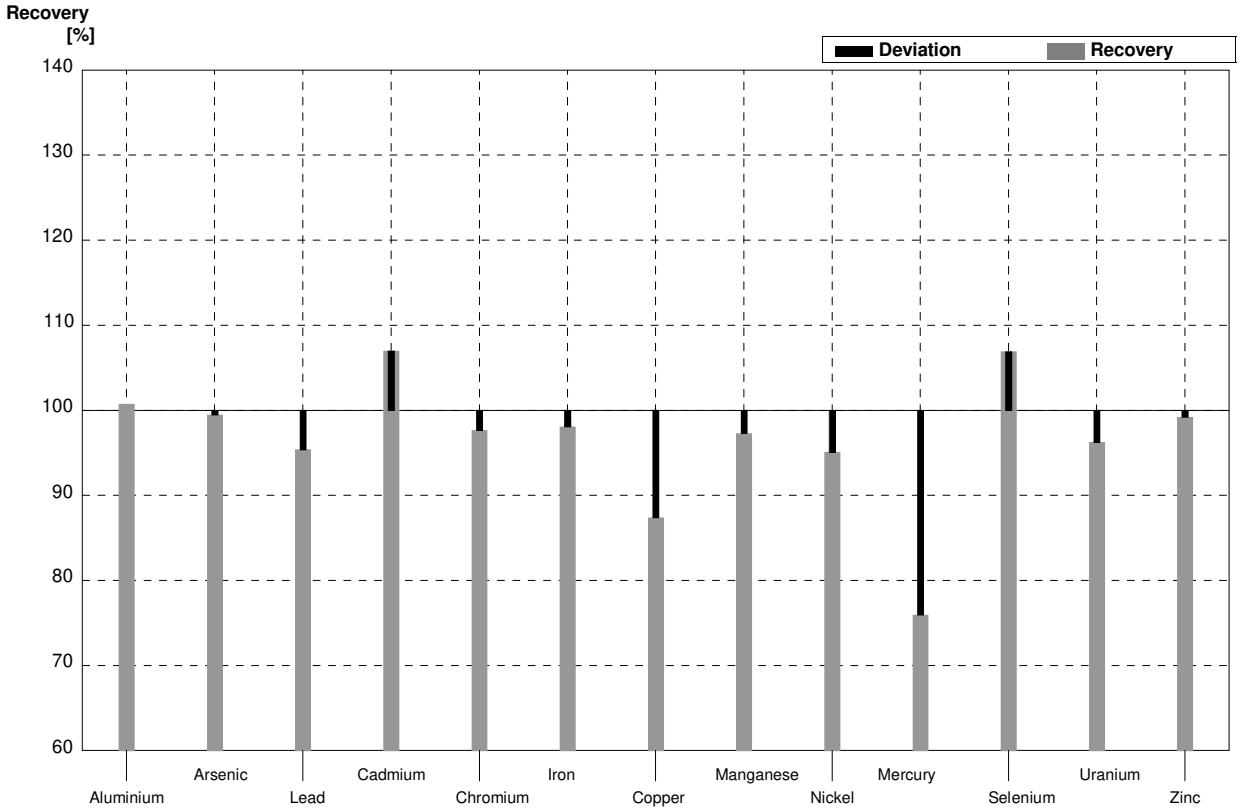
Sample M149A
Laboratory R

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	73	11	µg/l	101%
Arsenic	6,38	0,04	6,3	1,3	µg/l	99%
Lead	8,03	0,10	7,8	1,2	µg/l	97%
Cadmium	2,11	0,02	2,23	0,29	µg/l	106%
Chromium	6,39	0,04	6,2	0,6	µg/l	97%
Iron	52,7	0,3	51	7,7	µg/l	97%
Copper	11,2	0,1	10,5	1,6	µg/l	94%
Manganese	21,1	0,1	20,4	2,0	µg/l	97%
Nickel	3,03	0,03	2,89	0,29	µg/l	95%
Mercury	1,82	0,02	1,47	0,29	µg/l	81%
Selenium	2,63	0,06	2,81	0,42	µg/l	107%
Uranium	2,23	0,02	2,14	0,21	µg/l	96%
Zinc	13,3	0,8	13,0	1,2	µg/l	98%



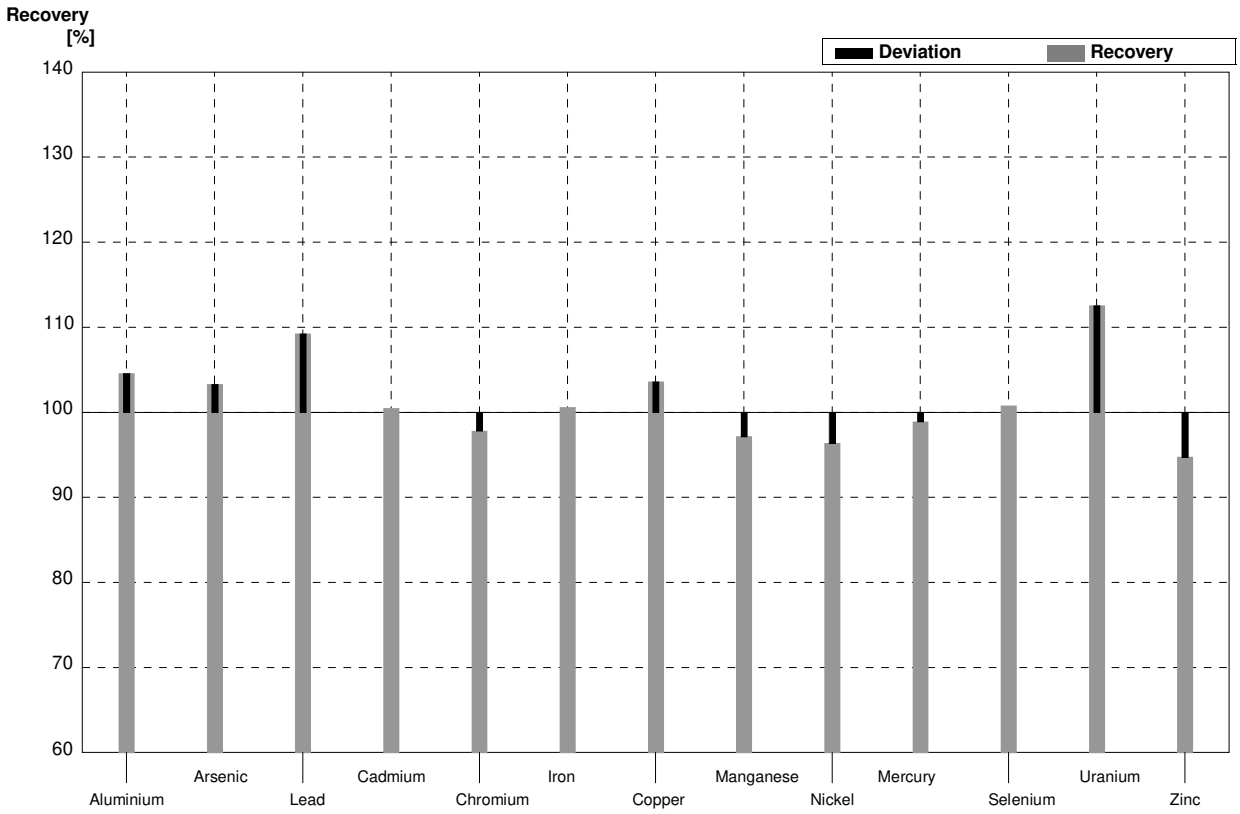
Sample M149B
Laboratory R

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	40,6	6,1	µg/l	101%
Arsenic	1,87	0,02	1,86	0,37	µg/l	99%
Lead	2,82	0,02	2,69	0,40	µg/l	95%
Cadmium	1,00	0,01	1,07	0,14	µg/l	107%
Chromium	1,71	0,02	1,67	0,17	µg/l	98%
Iron	20,8	0,2	20,4	3,1	µg/l	98%
Copper	2,22	0,03	1,94	0,29	µg/l	87%
Manganese	9,25	0,07	9,0	0,9	µg/l	97%
Nickel	1,83	0,02	1,74	0,17	µg/l	95%
Mercury	0,79	0,01	0,60	0,14	µg/l	76%
Selenium	0,87	0,06	0,93	0,14	µg/l	107%
Uranium	0,80	0,01	0,77	0,08	µg/l	96%
Zinc	7,56	0,79	7,5	0,7	µg/l	99%



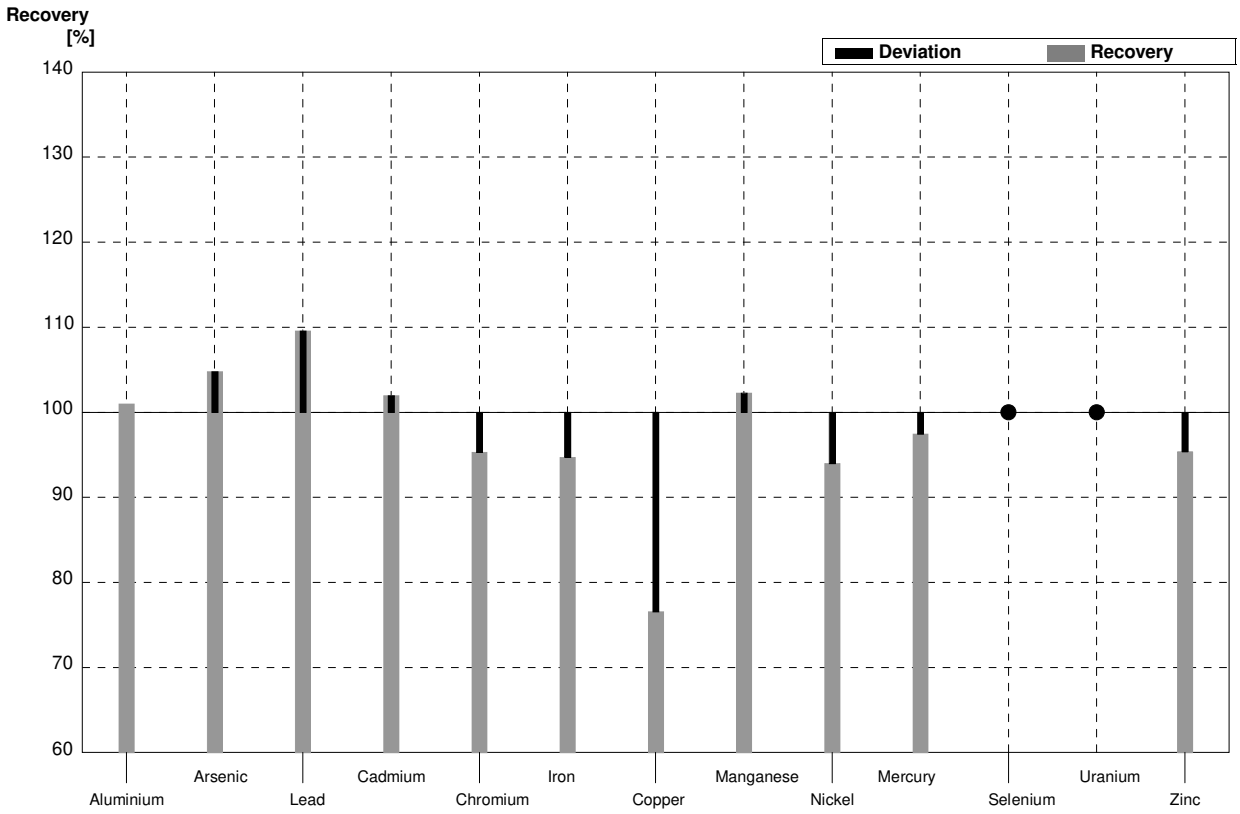
Sample M149A
Laboratory S

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	75,6	15,1	µg/l	105%
Arsenic	6,38	0,04	6,59	1,32	µg/l	103%
Lead	8,03	0,10	8,77	1,75	µg/l	109%
Cadmium	2,11	0,02	2,12	0,42	µg/l	100%
Chromium	6,39	0,04	6,25	1,25	µg/l	98%
Iron	52,7	0,3	53,0	10,6	µg/l	101%
Copper	11,2	0,1	11,6	2,32	µg/l	104%
Manganese	21,1	0,1	20,5	4,10	µg/l	97%
Nickel	3,03	0,03	2,92	0,58	µg/l	96%
Mercury	1,82	0,02	1,80	0,36	µg/l	99%
Selenium	2,63	0,06	2,65	0,53	µg/l	101%
Uranium	2,23	0,02	2,51	0,50	µg/l	113%
Zinc	13,3	0,8	12,6	2,52	µg/l	95%



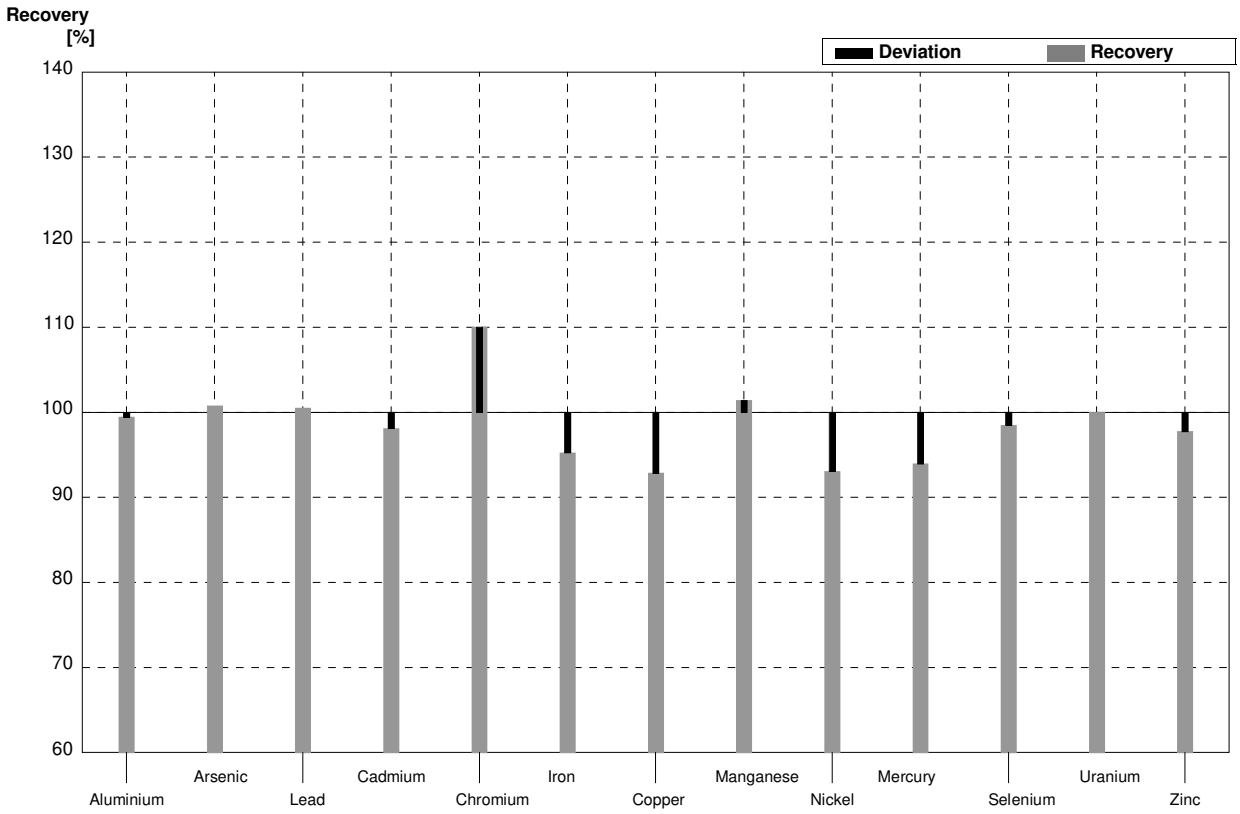
Sample M149B
Laboratory S

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	40,7	8,1	µg/l	101%
Arsenic	1,87	0,02	1,96	0,39	µg/l	105%
Lead	2,82	0,02	3,09	0,62	µg/l	110%
Cadmium	1,00	0,01	1,02	0,20	µg/l	102%
Chromium	1,71	0,02	1,63	0,33	µg/l	95%
Iron	20,8	0,2	19,7	3,9	µg/l	95%
Copper	2,22	0,03	1,70	0,34	µg/l	77%
Manganese	9,25	0,07	9,46	1,89	µg/l	102%
Nickel	1,83	0,02	1,72	0,34	µg/l	94%
Mercury	0,79	0,01	0,77	0,15	µg/l	97%
Selenium	0,87	0,06	<2,0		µg/l	•
Uranium	0,80	0,01	<1,0		µg/l	•
Zinc	7,56	0,79	7,21	1,44	µg/l	95%



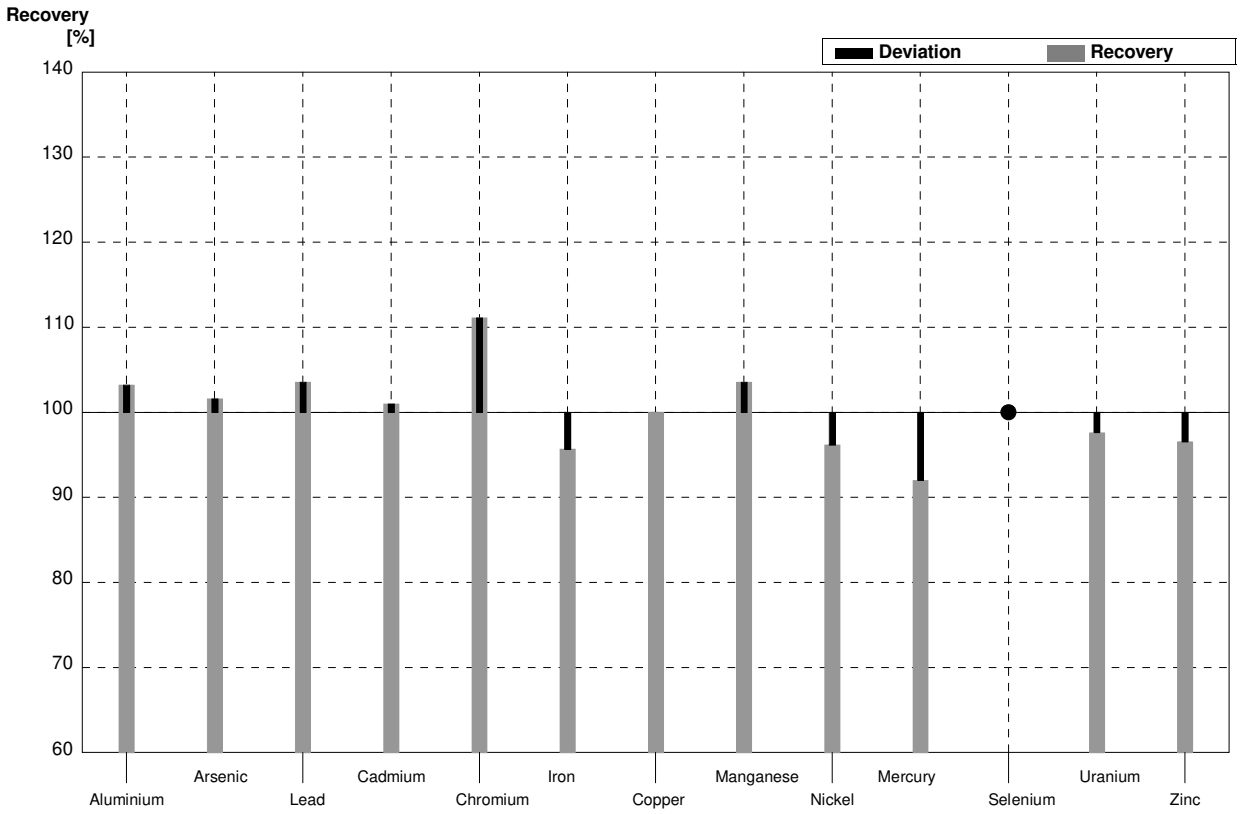
Sample M149A
Laboratory T

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	71,9	7,98	µg/l	99%
Arsenic	6,38	0,04	6,43	0,36	µg/l	101%
Lead	8,03	0,10	8,07	0,86	µg/l	100%
Cadmium	2,11	0,02	2,07	0,10	µg/l	98%
Chromium	6,39	0,04	7,03	0,99	µg/l	110%
Iron	52,7	0,3	50,2	5,57	µg/l	95%
Copper	11,2	0,1	10,4	0,57	µg/l	93%
Manganese	21,1	0,1	21,4	1,17	µg/l	101%
Nickel	3,03	0,03	2,82	0,22	µg/l	93%
Mercury	1,82	0,02	1,71	0,27	µg/l	94%
Selenium	2,63	0,06	2,59	0,31	µg/l	98%
Uranium	2,23	0,02	2,23	0,24	µg/l	100%
Zinc	13,3	0,8	13,0	0,81	µg/l	98%



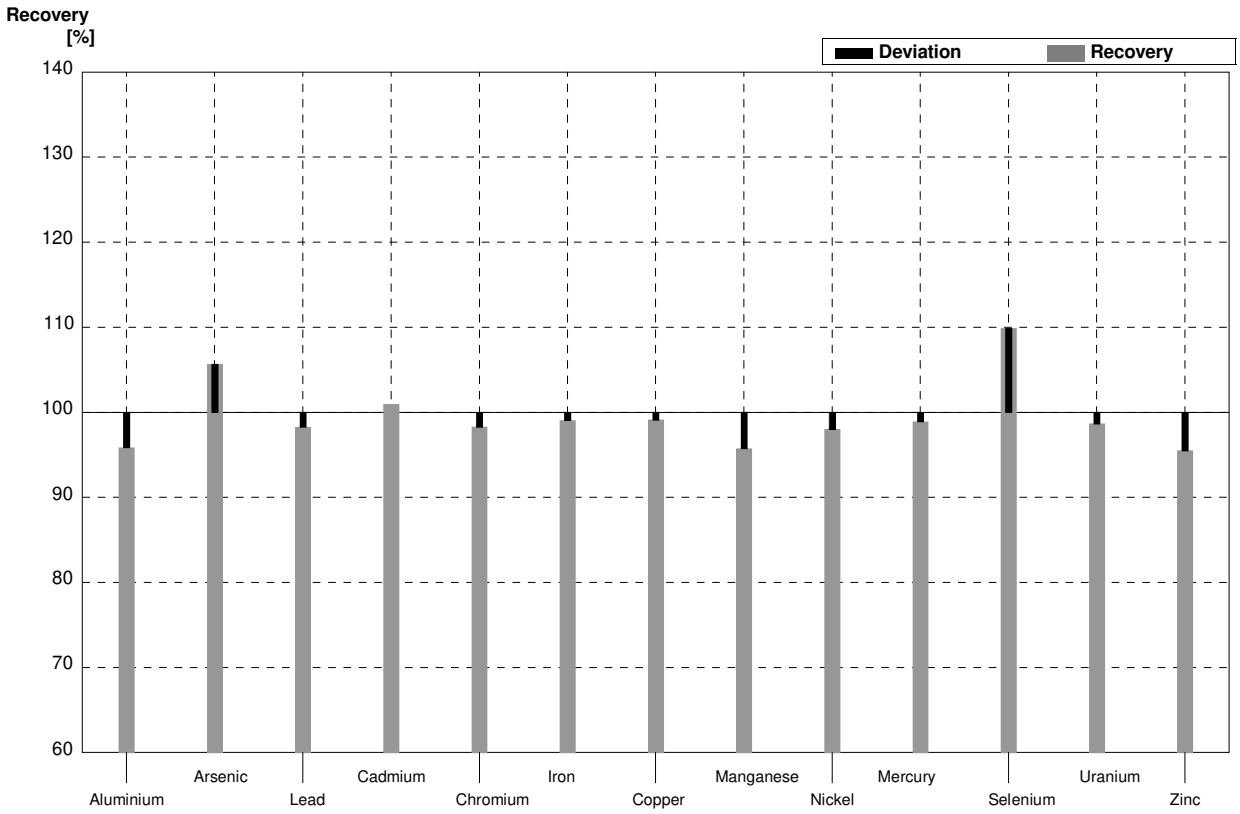
Sample M149B
Laboratory T

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	41,6	4,62	µg/l	103%
Arsenic	1,87	0,02	1,90	0,11	µg/l	102%
Lead	2,82	0,02	2,92	0,31	µg/l	104%
Cadmium	1,00	0,01	1,01	0,05	µg/l	101%
Chromium	1,71	0,02	1,90	0,27	µg/l	111%
Iron	20,8	0,2	19,9	2,21	µg/l	96%
Copper	2,22	0,03	2,22	0,12	µg/l	100%
Manganese	9,25	0,07	9,58	0,52	µg/l	104%
Nickel	1,83	0,02	1,76	0,13	µg/l	96%
Mercury	0,79	0,01	0,727	0,113	µg/l	92%
Selenium	0,87	0,06	<1,00		µg/l	•
Uranium	0,80	0,01	0,781	0,083	µg/l	98%
Zinc	7,56	0,79	7,30	0,46	µg/l	97%



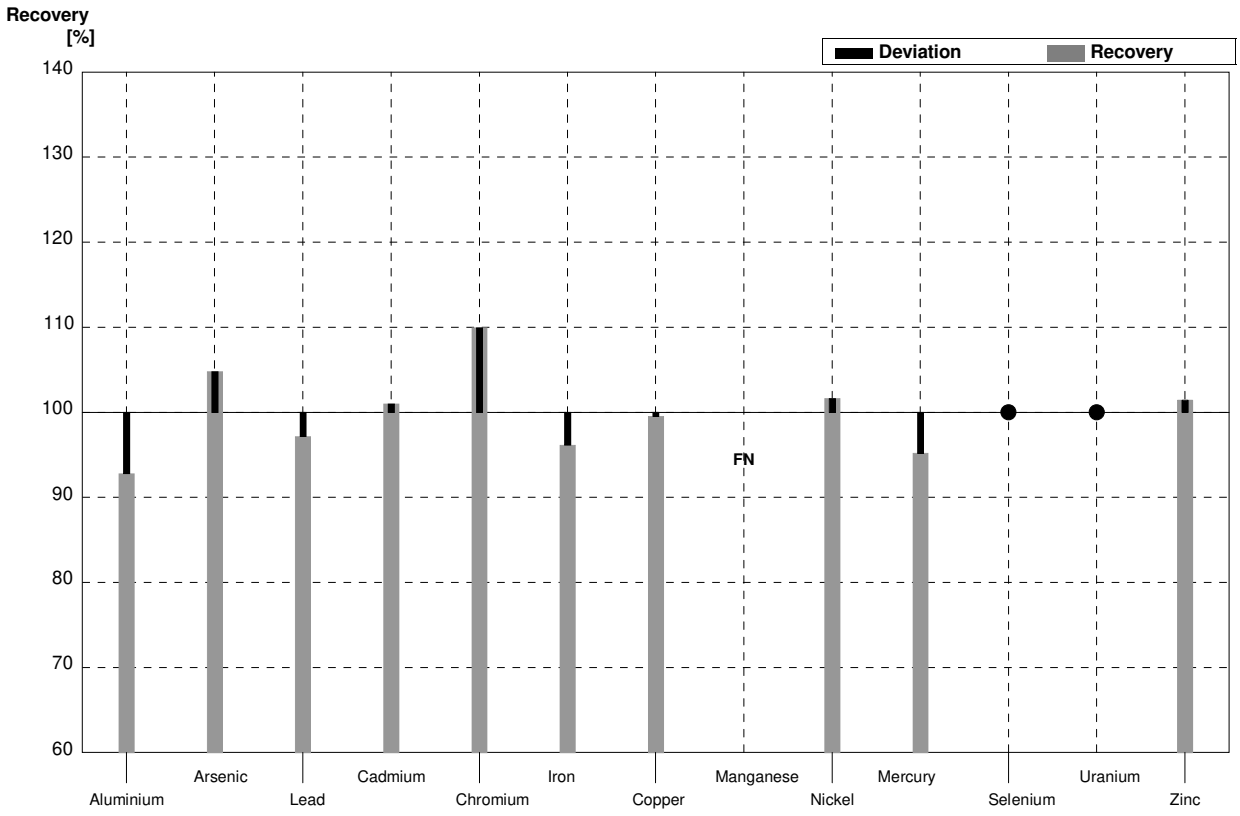
Sample M149A
Laboratory U

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	69,3	1,1	µg/l	96%
Arsenic	6,38	0,04	6,74	0,15	µg/l	106%
Lead	8,03	0,10	7,89	0,09	µg/l	98%
Cadmium	2,11	0,02	2,13	0,06	µg/l	101%
Chromium	6,39	0,04	6,28	0,07	µg/l	98%
Iron	52,7	0,3	52,2	0,41	µg/l	99%
Copper	11,2	0,1	11,1	0,48	µg/l	99%
Manganese	21,1	0,1	20,2	0,65	µg/l	96%
Nickel	3,03	0,03	2,97	0,16	µg/l	98%
Mercury	1,82	0,02	1,80	0,03	µg/l	99%
Selenium	2,63	0,06	2,89	0,15	µg/l	110%
Uranium	2,23	0,02	2,20	0,11	µg/l	99%
Zinc	13,3	0,8	12,7	0,48	µg/l	95%



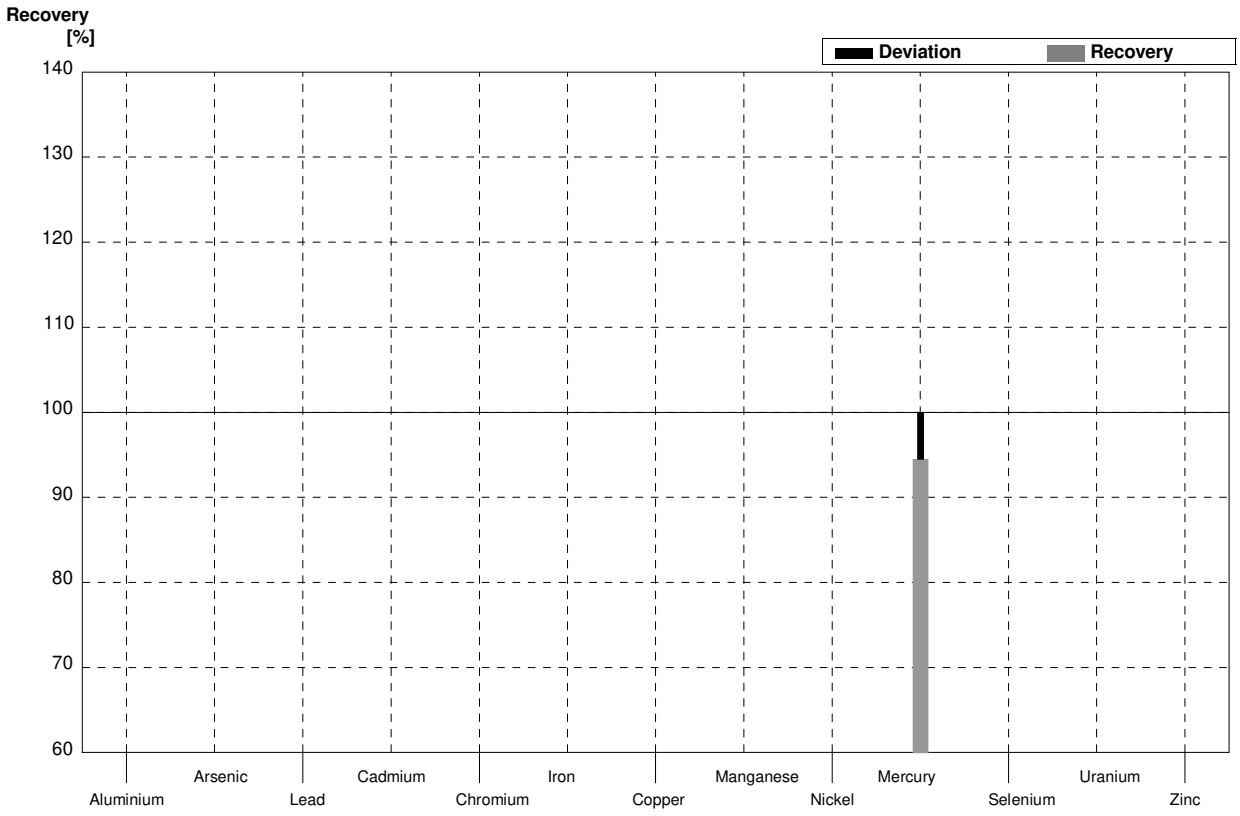
Sample M149B
Laboratory U

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	37,4	1,1	µg/l	93%
Arsenic	1,87	0,02	1,96	0,17	µg/l	105%
Lead	2,82	0,02	2,74	0,09	µg/l	97%
Cadmium	1,00	0,01	1,01	0,02	µg/l	101%
Chromium	1,71	0,02	1,88	0,08	µg/l	110%
Iron	20,8	0,2	20,0	0,46	µg/l	96%
Copper	2,22	0,03	2,21	0,12	µg/l	100%
Manganese	9,25	0,07	<0,010		µg/l	FN
Nickel	1,83	0,02	1,86	0,17	µg/l	102%
Mercury	0,79	0,01	0,752	0,030	µg/l	95%
Selenium	0,87	0,06	<1,00		µg/l	•
Uranium	0,80	0,01	<1,00		µg/l	•
Zinc	7,56	0,79	7,67	0,54	µg/l	101%



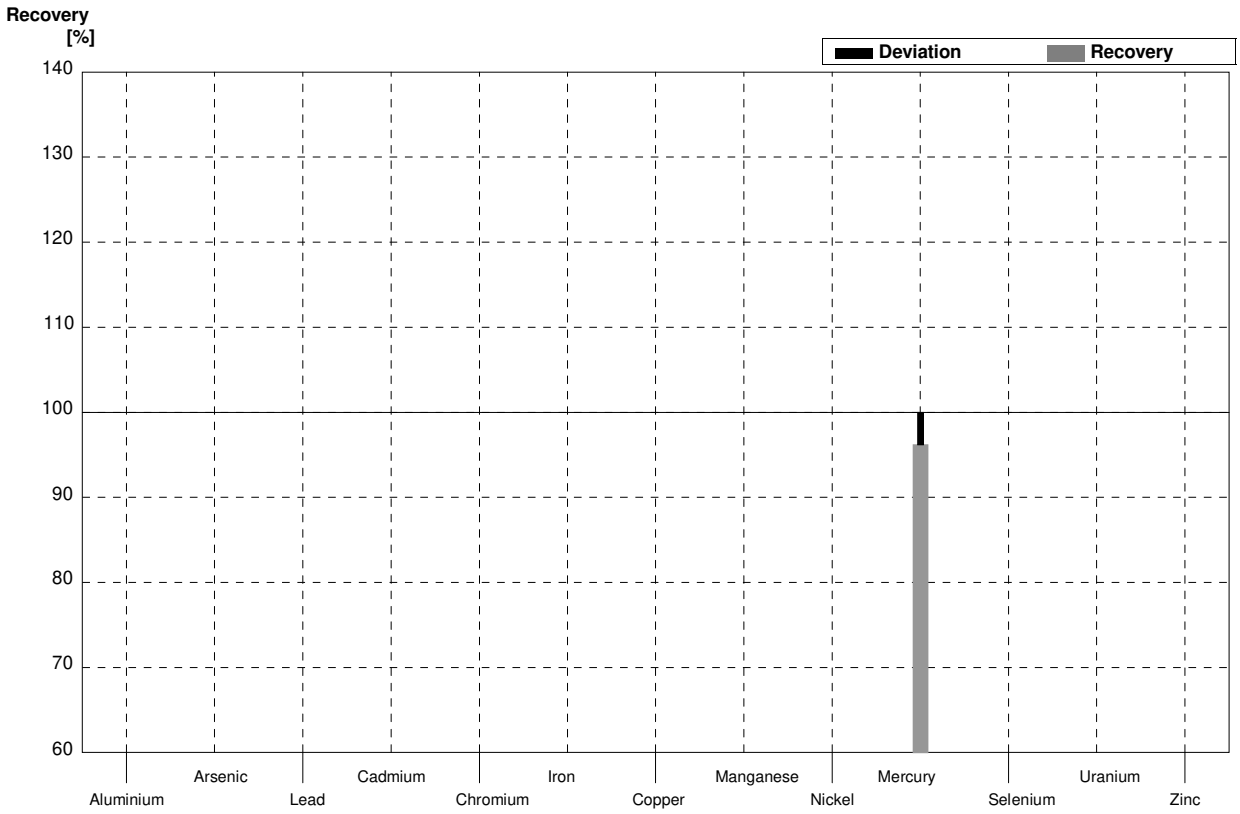
Sample M149A
Laboratory V

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4			µg/l	
Arsenic	6,38	0,04			µg/l	
Lead	8,03	0,10			µg/l	
Cadmium	2,11	0,02			µg/l	
Chromium	6,39	0,04			µg/l	
Iron	52,7	0,3			µg/l	
Copper	11,2	0,1			µg/l	
Manganese	21,1	0,1			µg/l	
Nickel	3,03	0,03			µg/l	
Mercury	1,82	0,02	1,72	0,4	µg/l	95%
Selenium	2,63	0,06			µg/l	
Uranium	2,23	0,02			µg/l	
Zinc	13,3	0,8			µg/l	



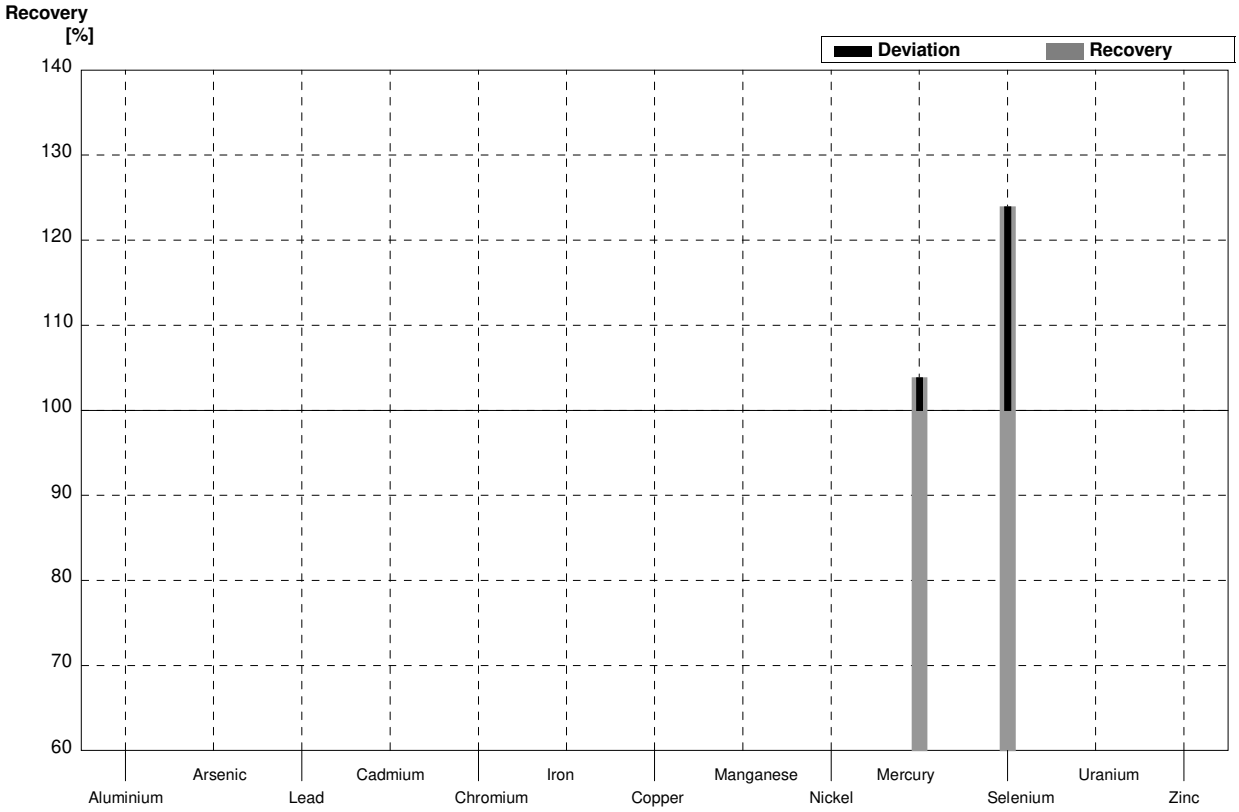
Sample M149B
Laboratory V

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3			µg/l	
Arsenic	1,87	0,02			µg/l	
Lead	2,82	0,02			µg/l	
Cadmium	1,00	0,01			µg/l	
Chromium	1,71	0,02			µg/l	
Iron	20,8	0,2			µg/l	
Copper	2,22	0,03			µg/l	
Manganese	9,25	0,07			µg/l	
Nickel	1,83	0,02			µg/l	
Mercury	0,79	0,01	0,76	0,2	µg/l	96%
Selenium	0,87	0,06			µg/l	
Uranium	0,80	0,01			µg/l	
Zinc	7,56	0,79			µg/l	



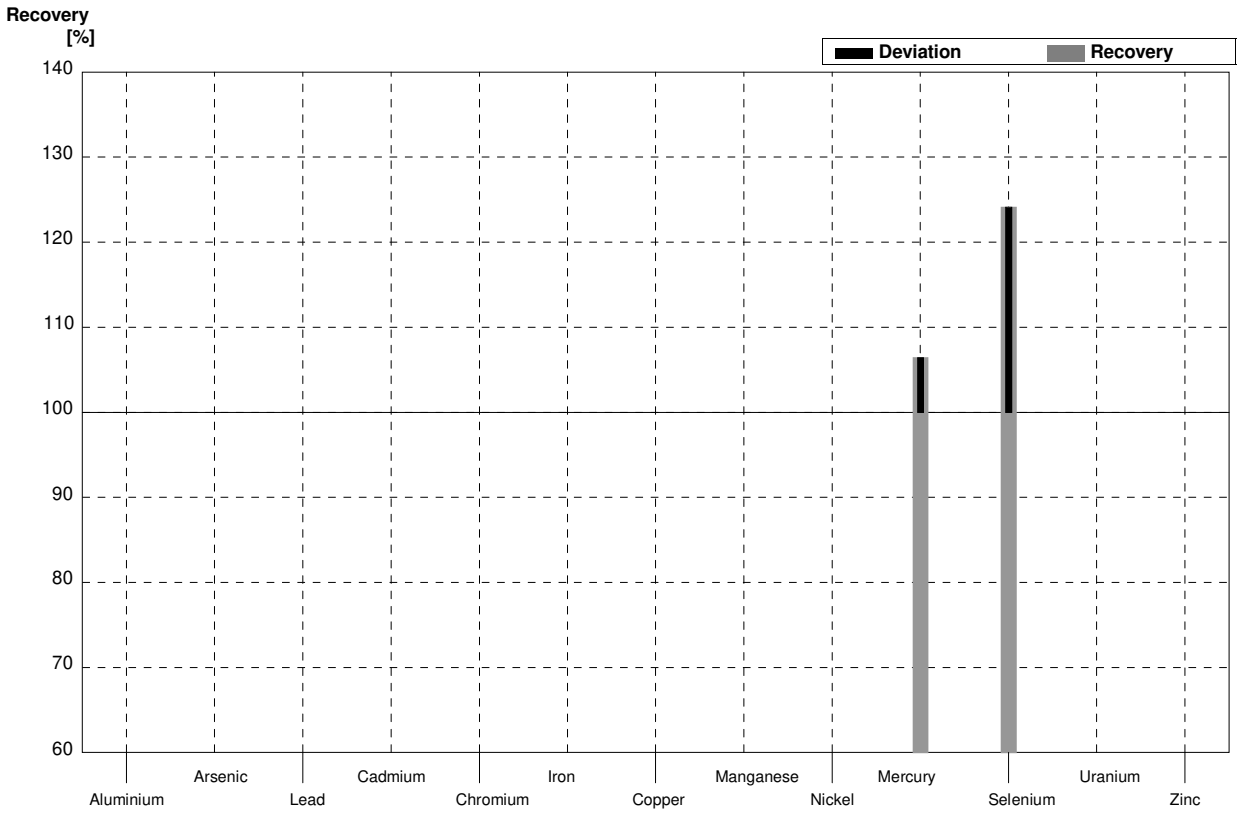
Sample M149A
Laboratory W

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4			µg/l	
Arsenic	6,38	0,04			µg/l	
Lead	8,03	0,10			µg/l	
Cadmium	2,11	0,02			µg/l	
Chromium	6,39	0,04			µg/l	
Iron	52,7	0,3			µg/l	
Copper	11,2	0,1			µg/l	
Manganese	21,1	0,1			µg/l	
Nickel	3,03	0,03			µg/l	
Mercury	1,82	0,02	1,89	0,24	µg/l	104%
Selenium	2,63	0,06	3,26	0,49	µg/l	124%
Uranium	2,23	0,02			µg/l	
Zinc	13,3	0,8			µg/l	



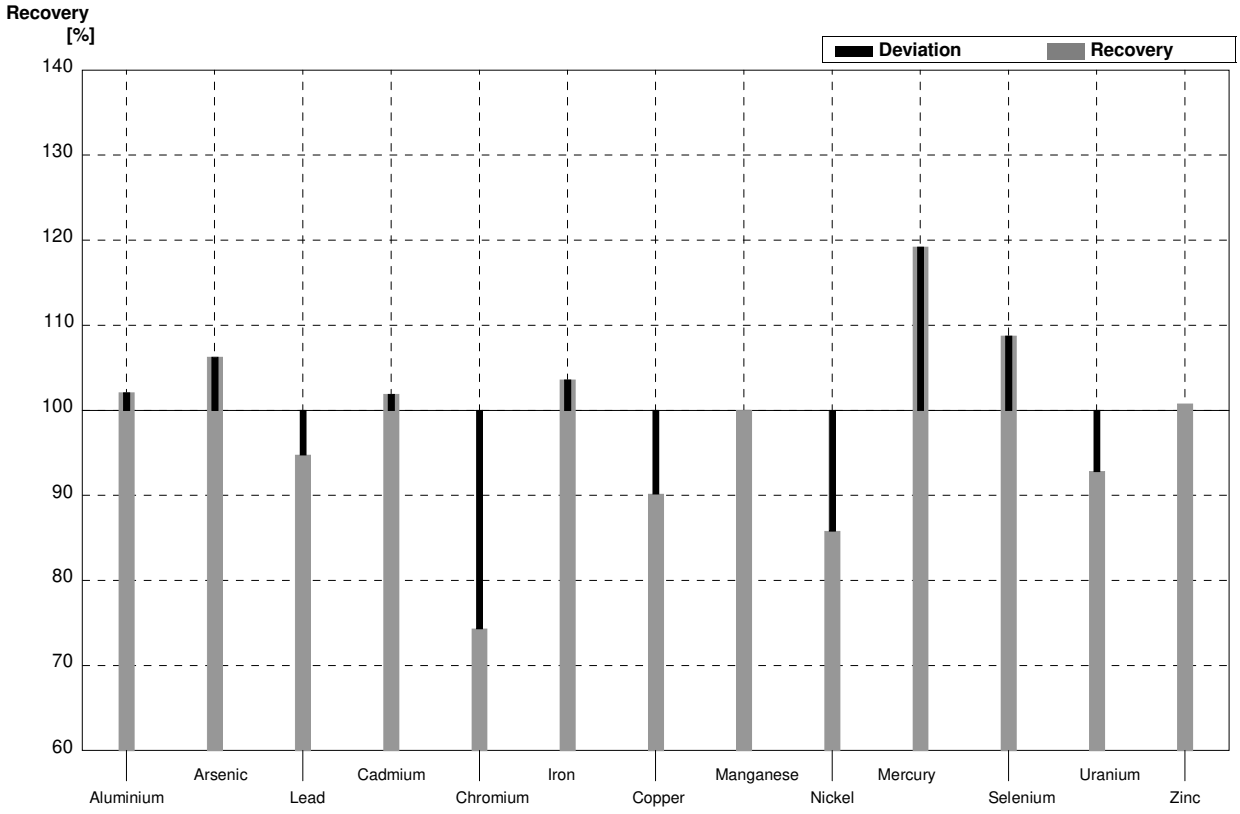
Sample M149B
Laboratory W

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3			µg/l	
Arsenic	1,87	0,02			µg/l	
Lead	2,82	0,02			µg/l	
Cadmium	1,00	0,01			µg/l	
Chromium	1,71	0,02			µg/l	
Iron	20,8	0,2			µg/l	
Copper	2,22	0,03			µg/l	
Manganese	9,25	0,07			µg/l	
Nickel	1,83	0,02			µg/l	
Mercury	0,79	0,01	0,841	0,11	µg/l	106%
Selenium	0,87	0,06	1,08	0,16	µg/l	124%
Uranium	0,80	0,01			µg/l	
Zinc	7,56	0,79			µg/l	



Sample M149A
Laboratory X

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	72,3	0,4	73,8	11,1	µg/l	102%
Arsenic	6,38	0,04	6,78	1,02	µg/l	106%
Lead	8,03	0,10	7,61	1,14	µg/l	95%
Cadmium	2,11	0,02	2,15	0,32	µg/l	102%
Chromium	6,39	0,04	4,75	0,71	µg/l	74%
Iron	52,7	0,3	54,6	8,19	µg/l	104%
Copper	11,2	0,1	10,1	1,52	µg/l	90%
Manganese	21,1	0,1	21,1	3,17	µg/l	100%
Nickel	3,03	0,03	2,60	0,39	µg/l	86%
Mercury	1,82	0,02	2,17	0,33	µg/l	119%
Selenium	2,63	0,06	2,86	0,43	µg/l	109%
Uranium	2,23	0,02	2,07	0,31	µg/l	93%
Zinc	13,3	0,8	13,4	2,01	µg/l	101%



Sample M149B
Laboratory X

Parameter	Target value	± U (k=2)	Result	±	Unit	Recovery
Aluminium	40,3	0,3	40,3	6,05	µg/l	100%
Arsenic	1,87	0,02	1,92	0,29	µg/l	103%
Lead	2,82	0,02	2,52	0,38	µg/l	89%
Cadmium	1,00	0,01	1,00	0,15	µg/l	100%
Chromium	1,71	0,02	0,54	0,08	µg/l	32%
Iron	20,8	0,2	19,8	2,97	µg/l	95%
Copper	2,22	0,03	1,50	0,23	µg/l	68%
Manganese	9,25	0,07	9,13	1,37	µg/l	99%
Nickel	1,83	0,02	1,41	0,21	µg/l	77%
Mercury	0,79	0,01	1,09	0,16	µg/l	138%
Selenium	0,87	0,06	1,01	0,15	µg/l	116%
Uranium	0,80	0,01	0,75	0,11	µg/l	94%
Zinc	7,56	0,79	8,59	1,29	µg/l	114%