

Test Group Summary Report

C17 Metals in Soil

January 2021 PT Round (Shipped in March)

Issued: April 23, 2021

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1.0 The Proficiency Testing Report

The Proficiency Testing Report consists of two parts.

- *PTC Proficiency Testing Report*: This report contains participant-specific data and other confidential information. This report is emailed to participants at the end of the PT round.
- *Test Group Summary Report*: A Test Group Summary Report is created for each quantified test group at the end of the PT round. These reports contain more detailed information on the round than are found in the participant-specific PTC Proficiency Testing Report. These reports do not contain any confidential information and are made available on the PTC web site.

2.0 Definitions

The participant-specific PTC Proficiency Testing Report contains some terms that new participants may not be familiar with.

<i>Code:</i>	The registration code that is unique to each analyte that a participant is registered for.
<i>App:</i>	If a participant is accredited by CALA, this three-digit number is the appendix number that the accredited method is assigned to.
<i>N:</i>	The number of participants results that were used to calculate the summary statistics. This excludes qualified data (e.g., <) and any results that were flagged as outliers.
<i>Assigned:</i>	The Assigned Value is the robust mean of the reported results, outliers excluded. This is often referred to as the “target” value.
<i>$\pm U$:</i>	The uncertainty of the assigned value.
<i>Reported:</i>	The result reported by the participant.
<i>s:</i>	The Standard Deviation of Proficiency Assessment (SDPA). This value is used to determine the acceptance limits for the PT evaluation.
<i>z-Score:</i>	A value assigned to each reported result that is a measure of the degree to which it deviates from the Assigned Value.
<i>Score:</i>	The composite score of the four results reported for each analyte. It is normalized to a score out of 100.
<i>Bias:</i>	A flag assigned if bias is detected using the re-scaled z-score procedure.

3.0 Scoring System

Participant performance is evaluated for each proficiency testing sample by a quantitative method that is consistent with ISO/IEC 17043:2010 *Conformity assessment – General requirements for proficiency testing*, the *International Harmonized Protocol for Proficiency Testing of (Chemical) Analytical Laboratories* (2006), and ISO 13528:2015 *Statistical methods for use in proficiency testing by interlaboratory comparisons*.

The following is a brief description of the evaluation procedure used by PTC. The detailed evaluation procedure is described in PROC09 – PT Evaluation *Procedure*, which is available on the PTC website www.PTCanada.org).

3.1 HOMOGENEITY AND STABILITY ASSESSMENT

Homogeneity and stability are assessed using participant data. Regression analysis is performed on reported result against order of sample production (Homogeneity) and reported result against date of analysis (Stability). If the slope is significantly different than zero for either then the Standard Deviation of Proficiency Assessment (s) is increased to minimize the impact.

3.2 THE Z SCORE

A "z-score" is calculated for each reported result as follows:

$$z - Score = \frac{(x - \bar{X})}{SDPA} \quad \text{where: } \begin{array}{l} x = \text{participant result;} \\ \bar{X} = \text{the Assigned Value;} \\ SDPA = \text{the Standard Deviation for Proficiency Assessment.} \end{array}$$

The assigned value \bar{X} is generally estimated from the inter-laboratory Robust mean after outliers due to obvious gross errors (e.g., reported in wrong units) have been removed.

The Standard Deviation for Proficiency Assessment, s, is determined as follows:

- The inter-laboratory Robust standard deviation ($Stdev_{rob}$) is calculated using reported results, obvious outliers removed;
- The regression equation standard deviation ($Stdev_{reg}$) is estimated from regression equations derived from previous studies (see PROC11– *PT Regression Equations* for details);
- The SDPA is the higher of $Stdev_{rob}$ and $Stdev_{reg}$;
- When a laboratory reports its detection limit, s will be estimated using a pooled variance procedure that uses both the inter-laboratory data and the reported detection limit.

3.2 COMPOSITE (PT) SCORE

Since each PT round involves four or two separate samples of distinct concentration for each test, it is necessary to calculate a composite PT score for each test to determine overall performance. The composite score is calculated by first averaging the absolute z-scores for the four results and then calculating a final score as $100 + (-15 \times \text{avg } |z|)$.

Acceptable PT Scores equal or exceed 70.

3.3 IDENTIFYING BIAS

The proficiency testing report provides flags for bias. These are determined using the re-scaled z-score procedure.

$$RSZ = \frac{\sum z}{\sqrt{N}}$$

where z = the z -score
 N = the number of samples

Flags are assigned for each test group/parameter combination as follows:

$RSZ \geq -2$ and ≤ 2	no flag assigned
$RSZ > 2$	H (High)
$RSZ > 3$	VH (Very High)
$RSZ < -2$	L (LOW)
$RSZ < -3$	VL (Very Low)

3.4 DEVIATIONS FROM EVALUATION PROCEDURE

Other than changes to the Standard Deviation of Proficiency Assessment due to homogeneity or stability flags, any deviation from the published evaluation procedure is described on the cover page(s) of the final *PTC Proficiency Testing Report*.

4.0 PT Round Specific Data Summary

The following pages provide more detailed information about the PT round indicated in the cover page of this report than is found in the participant-specific PTC Proficiency Testing Report. The graphical representations and the statistical summaries are based upon the data after outliers have been removed.

4.1 SUMMARY STATISTICS

In addition to some of the statistics found in the customer reports, this table includes additional summary statistics such as Median, different measures of dispersion, the number of outliers removed, the number of results in the Questionable range ($|z|$ between 2 and 3) and the Unacceptable range ($z > 3$), and whether a data set was flagged for Homogeneity or Stability. This section also includes sorted scatter plots of the data for each sample.

4.2 z - SCORE PLOTS

The z -scores for each sample are ranked in increasing order and plotted. When the data is normally distributed, the plot should show a slight sigmoidal curve, with an equal number of points above zero as below. Each bar in these plots is colour-coded to indicate the analytical method used by the participant.

4.3 KERNEL DENSITY PLOTS

Kernel density plots are generated for each data set. These plots are a graphical way to represent the overall data distribution and are used to visualize possible deviations from normality and unimodality.

4.4 STABILITY AND HOMOGENEITY PLOTS

Plots of reported result against analysis date, and reported result against order of bottling are displayed, along with the regression line. These regression analyses are used to determine if the SDPA should be adjusted due to homogeneity or stability.

ALUMINUM

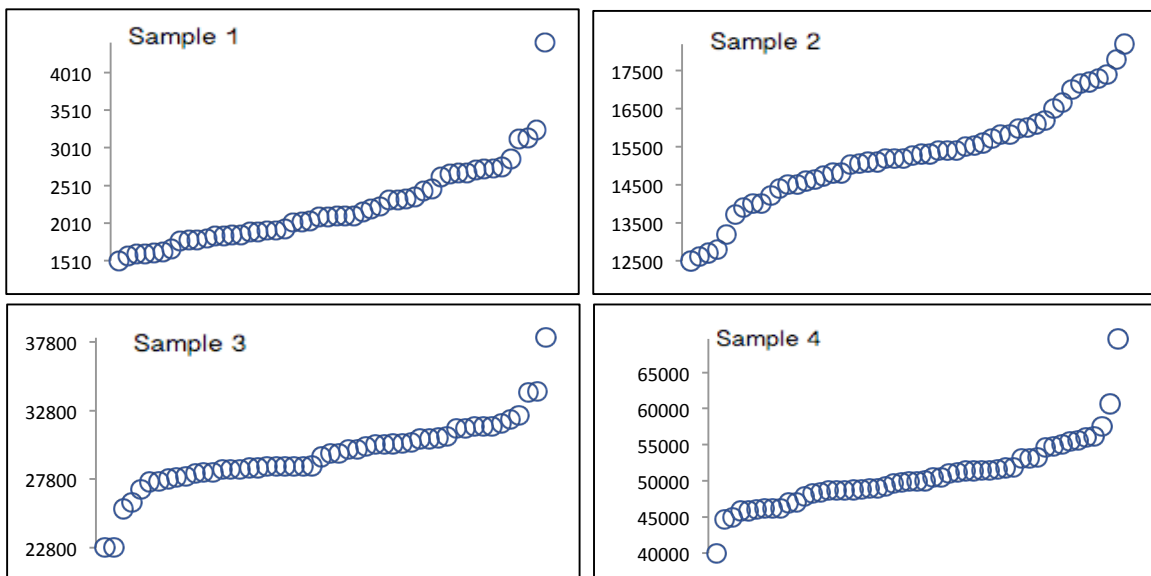
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	50	50	50	51
Median	2100	15200	29600	49900
Robust Mean	2170	15300	29600	50300
U	85	228	348	676
Robust Standard Deviation	481	1290	1970	3860
Regression Standard Deviation	685	2400	4270	7000
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	685	2400	4270	7000
Outliers	1	1	1	0
$ z > 3.0$	1	0	0	0
$2 < z < 3$	0	0	0	1

Methods Used

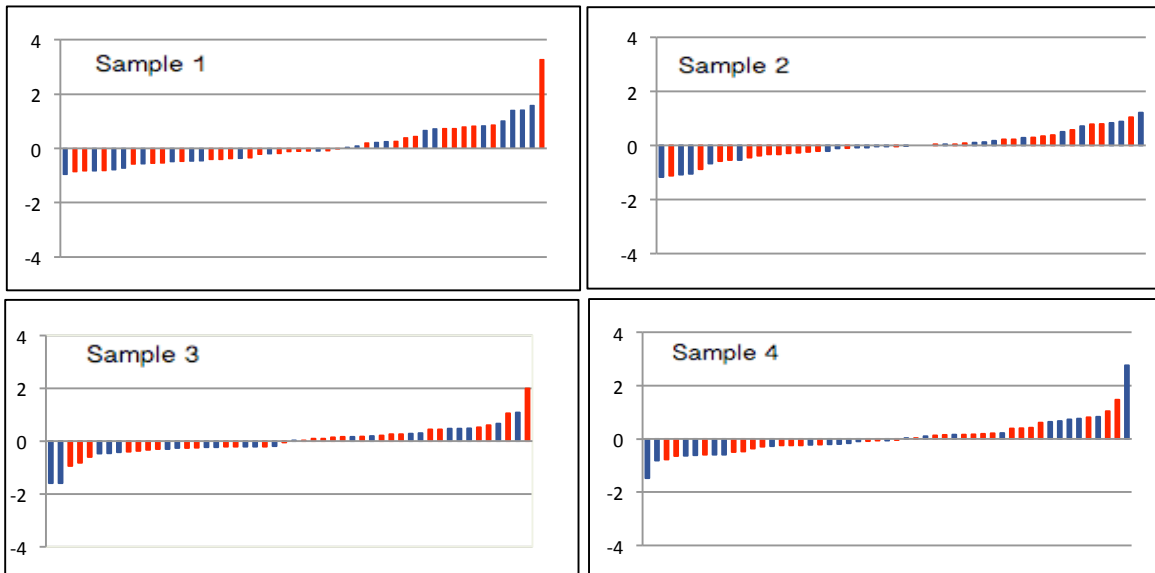
Method	C17-1	C17-2	C17-3	C17-4
ICP/OES	22	22	22	23
ICP/MS	28	28	28	28

All summary stats and the plots below are based on the data excluding any flagged outliers

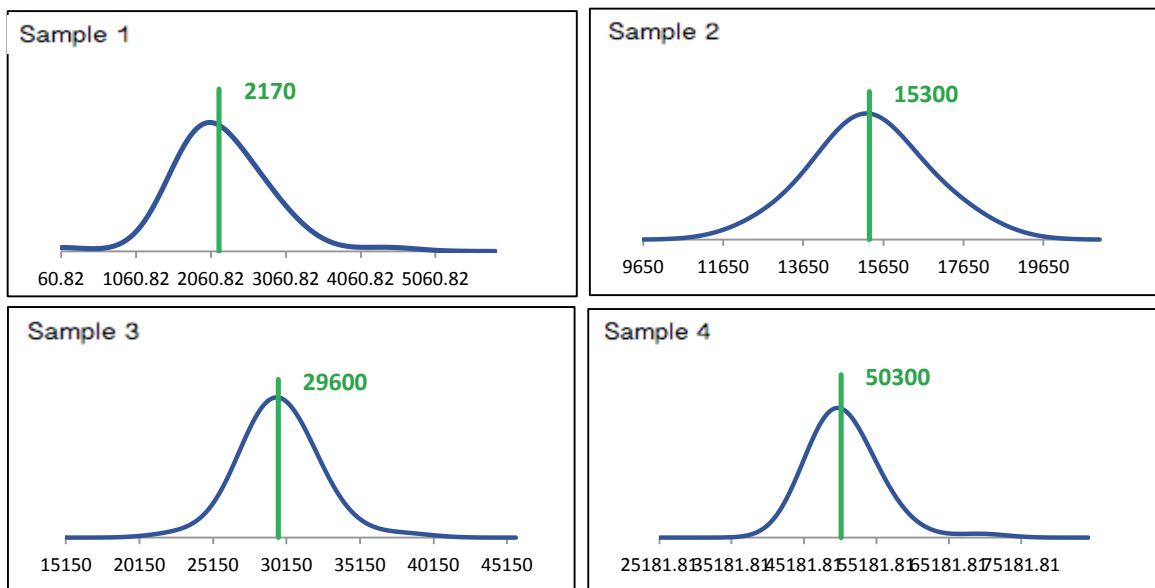


ALUMINUM

z-Score Plots

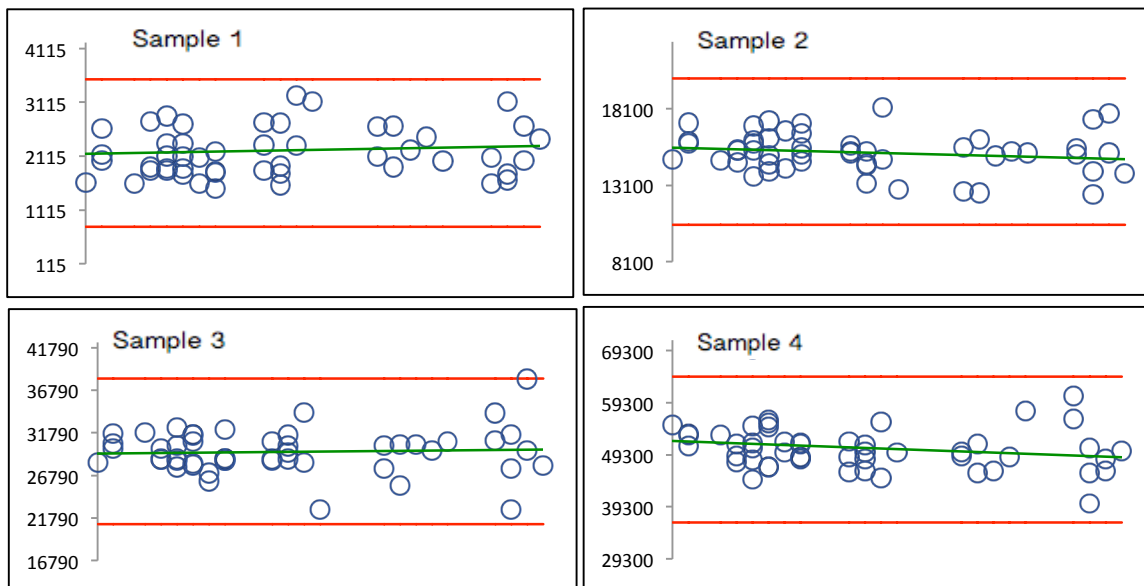


Kernel Density Plots



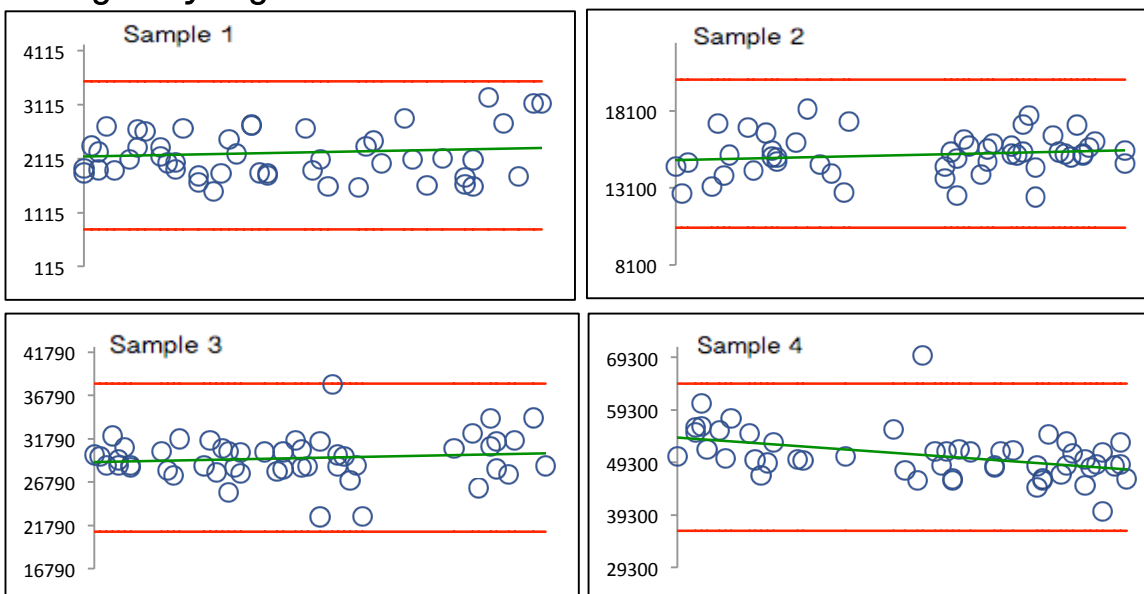
ALUMINUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

ANTIMONY

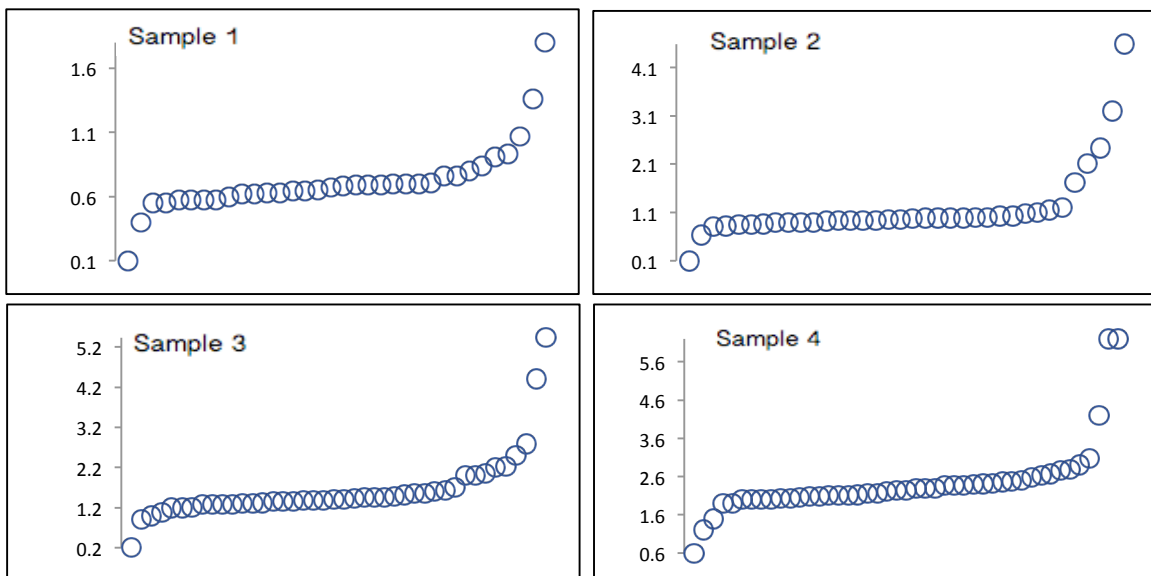
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	34	36	42	45
Median	0.675	0.965	1.41	2.24
Robust Mean	0.680	0.983	1.49	2.29
U	0.027	0.031	0.073	0.067
Robust Standard Deviation	0.127	0.150	0.378	0.361
Regression Standard Deviation	0.390	0.563	0.857	1.31
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.390	0.563	0.857	1.31
Outliers	0	0	0	0
$ z > 3.0$	0	2	2	0
$2 < z < 3$	1	1	0	2

Methods Used

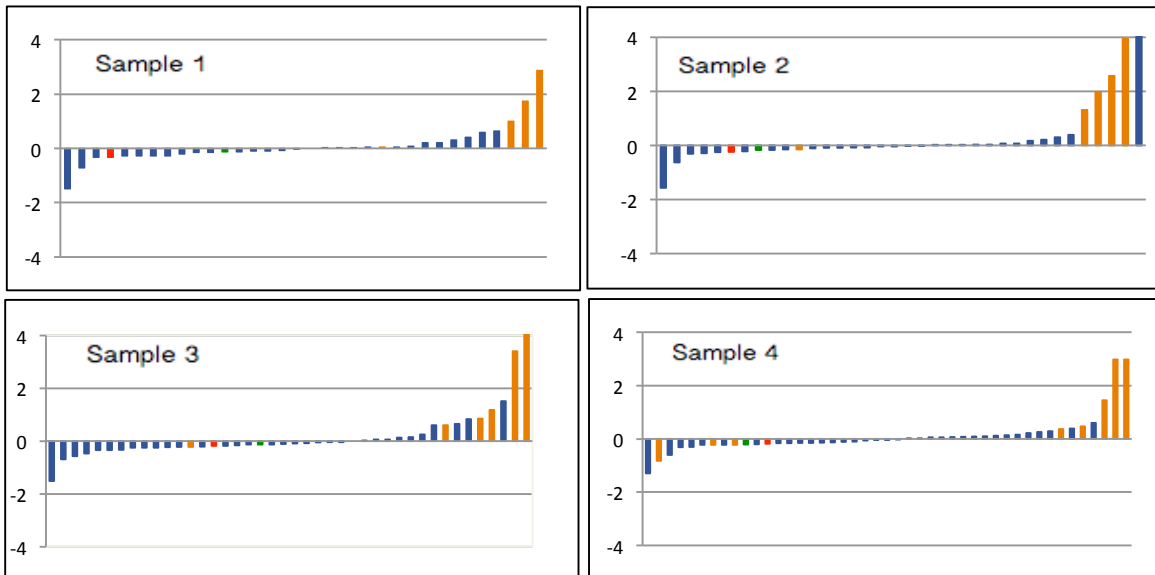
Method	C17-1	C17-2	C17-3	C17-4
ICP/MS	28	29	34	35
ICPHY	1	1	1	1
AAHY	1	1	1	1
ICP/OES	4	5	6	8

All summary stats and the plots below are based on the data excluding any flagged outliers

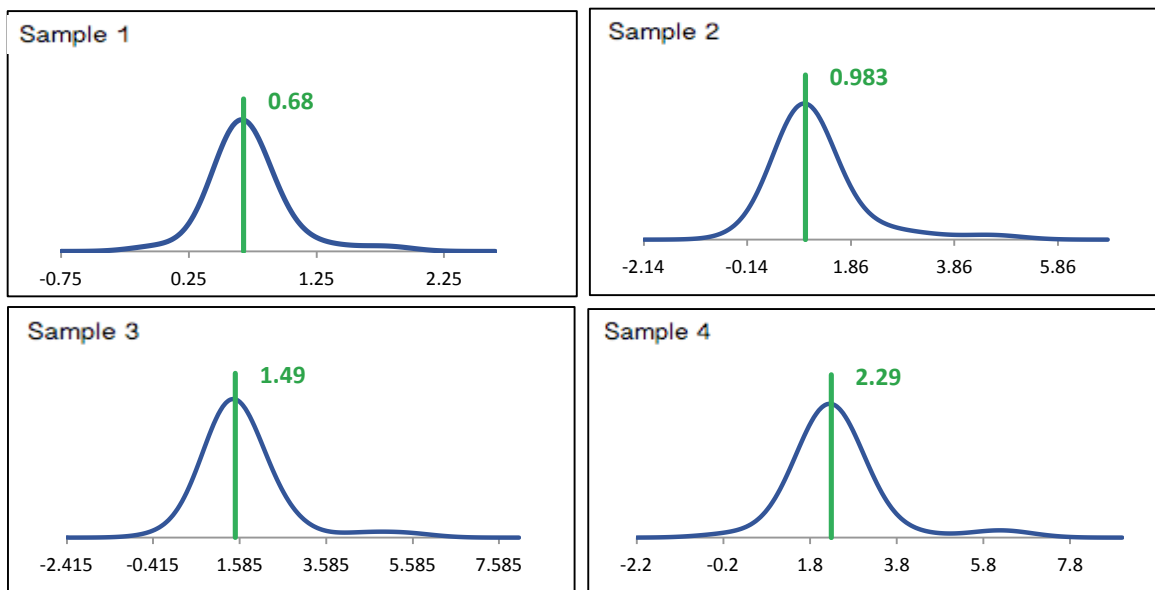


ANTIMONY

z-Score Plots

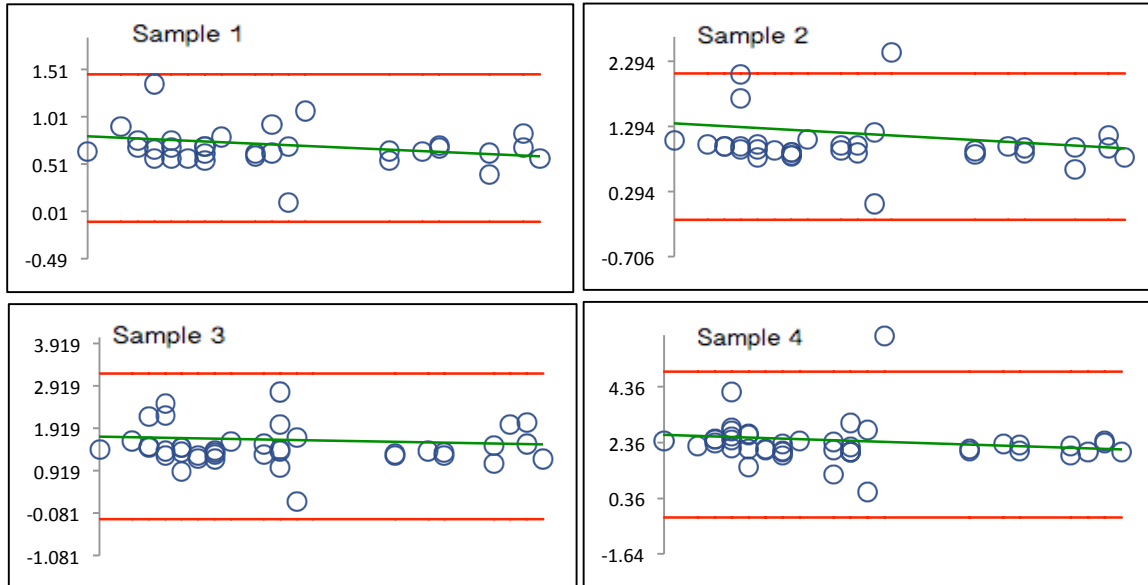


Kernel Density Plots



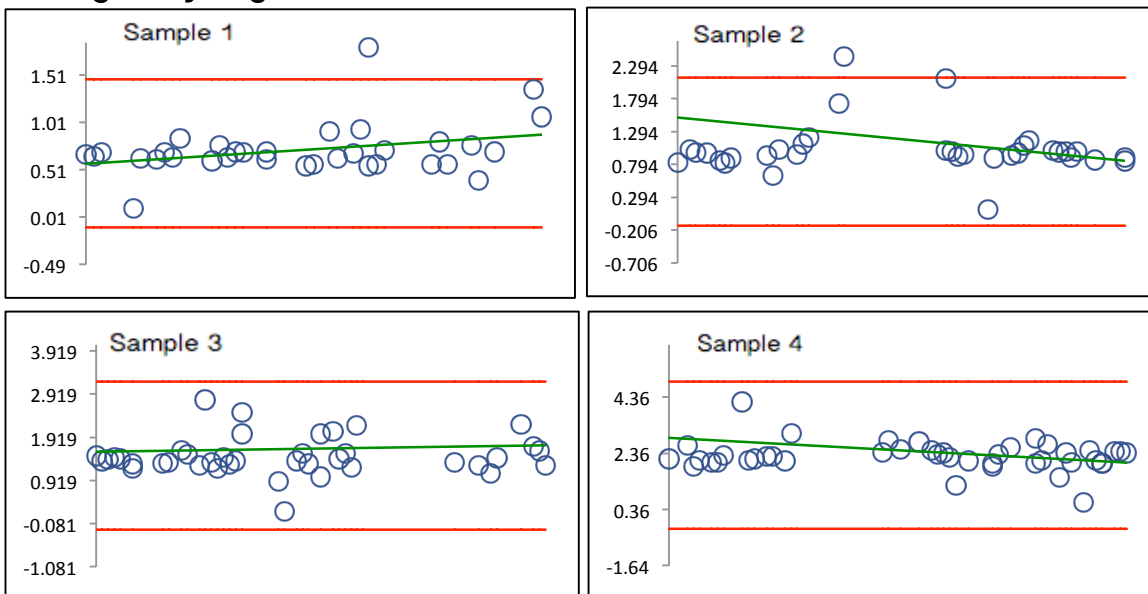
ANTIMONY

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

ARSENIC

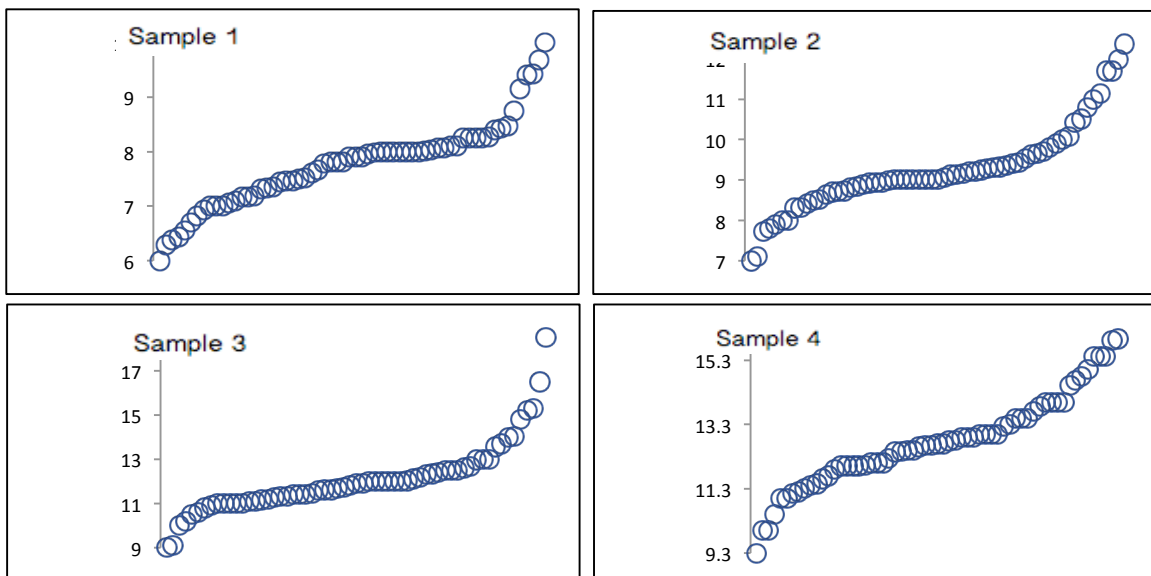
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	62	61	61	61
Median	7.90	9.02	11.9	12.7
Robust Mean	7.74	9.16	11.9	12.8
U	0.110	0.136	0.178	0.224
Robust Standard Deviation	0.694	0.843	1.10	1.39
Regression Standard Deviation	1.48	1.64	1.94	2.04
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	1.48	1.64	1.94	2.04
Outliers	0	0	0	1
$ z > 3.0$	0	0	1	0
$2 < z < 3$	0	0	1	0

Methods Used

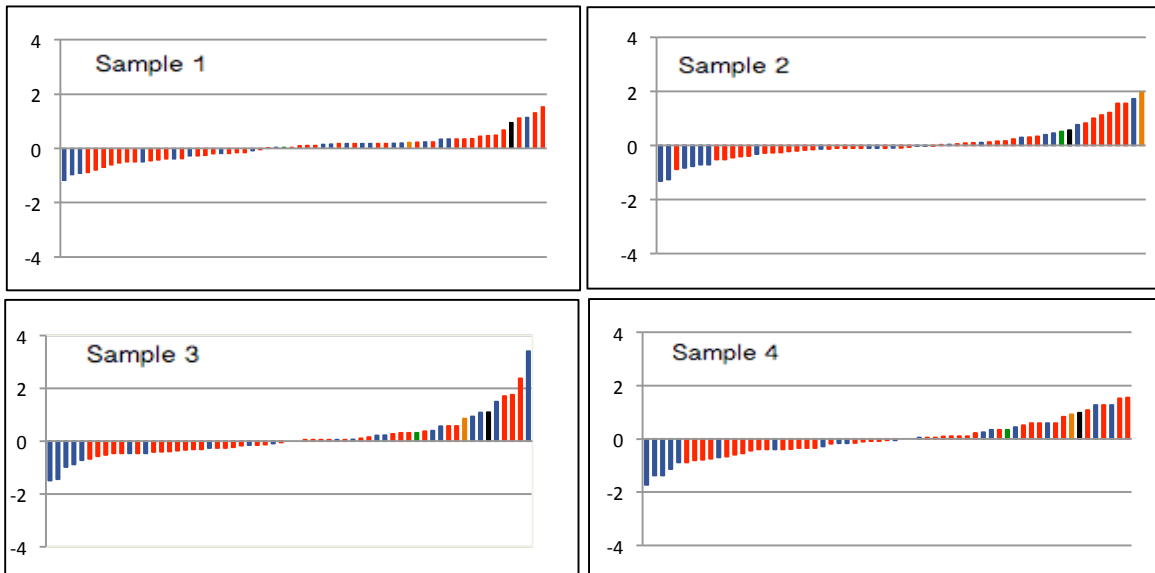
Method	C17-1	C17-2	C17-3	C17-4
ICP/OES	20	20	20	19
ICP/MS	39	38	38	39
ICPHY	1	1	1	1
PYRO-AA	1	1	1	1
AAHY	1	1	1	1

All summary stats and the plots below are based on the data excluding any flagged outliers

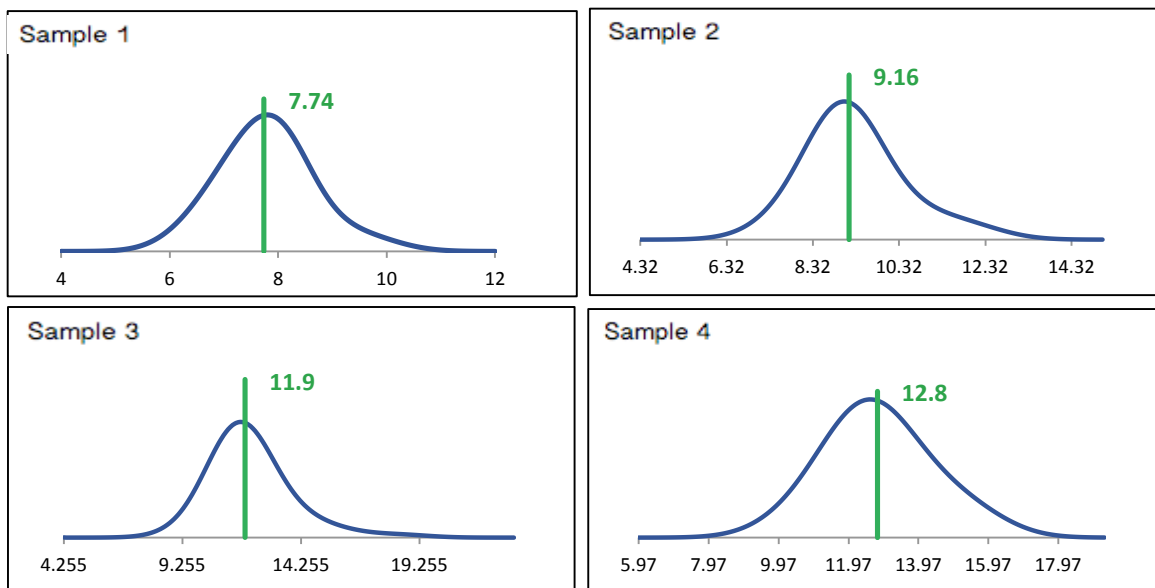


ARSENIC

z-Score Plots

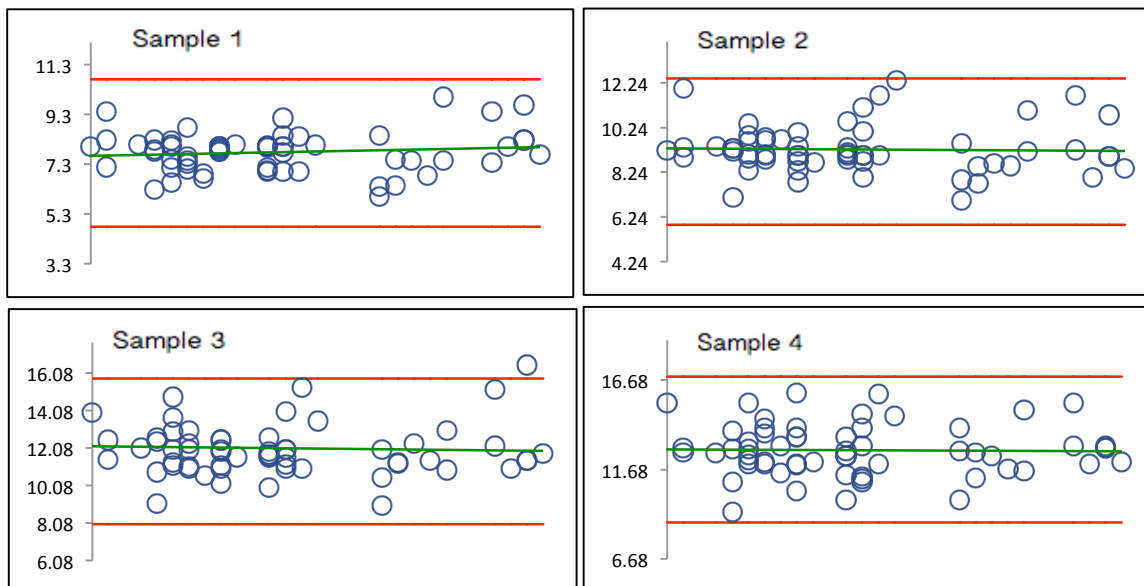


Kernel Density Plots



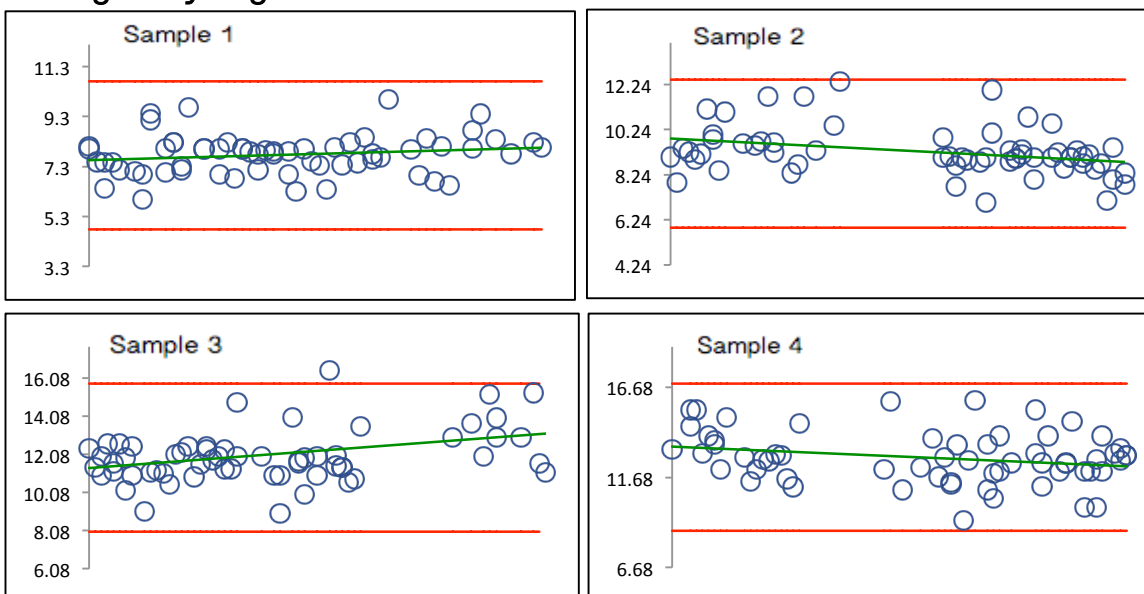
ARSENIC

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

BARIUM

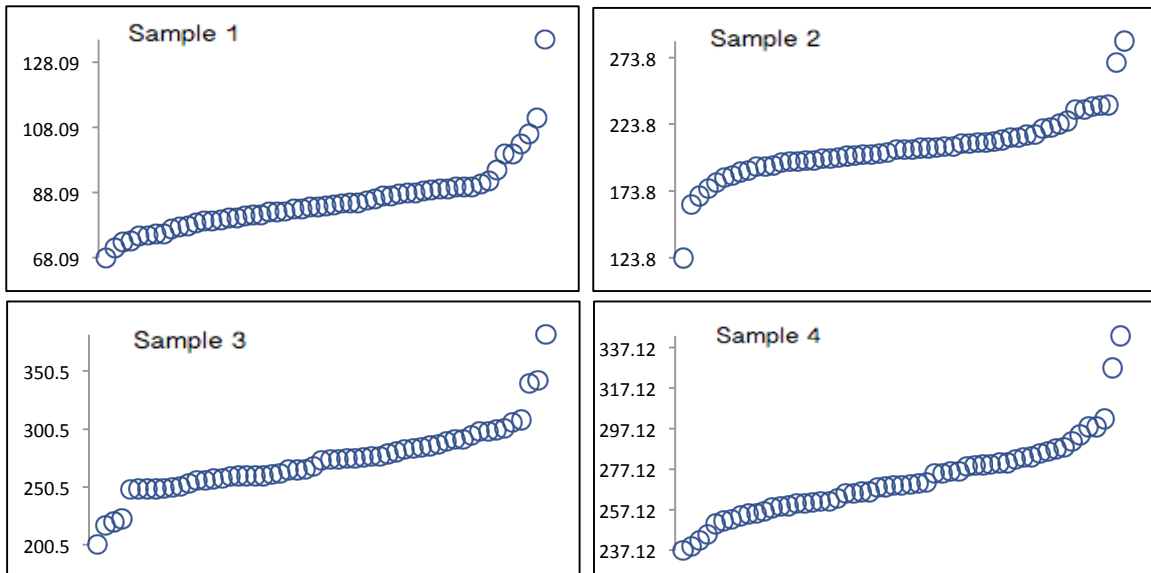
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	55	55	55	55
Median	84.0	205	273	269
Robust Mean	84.3	205	272	271
U	1.27	2.87	3.89	2.85
Robust Standard Deviation	7.51	17.0	23.1	16.9
Regression Standard Deviation	7.92	16.3	20.9	20.8
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	7.92	17.0	23.1	20.8
Outliers	0	0	0	0
$ z > 3.0$	2	3	3	1
$2 < z < 3$	3	2	4	1

Methods Used

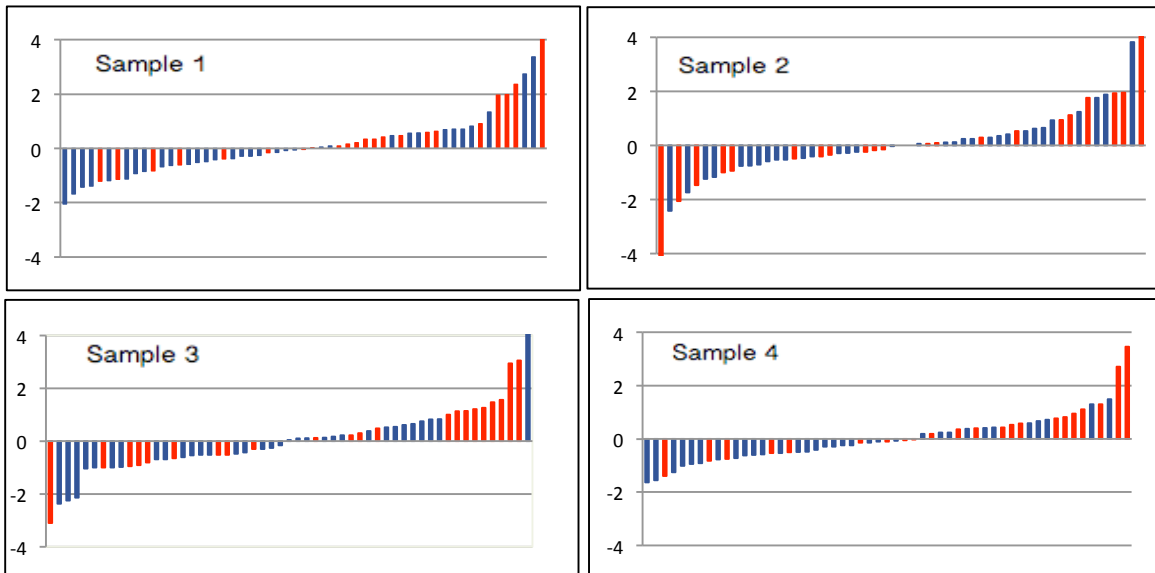
Method	C17-1	C17-2	C17-3	C17-4
ICP/MS	33	33	33	33
ICP/OES	22	22	22	22

All summary stats and the plots below are based on the data excluding any flagged outliers

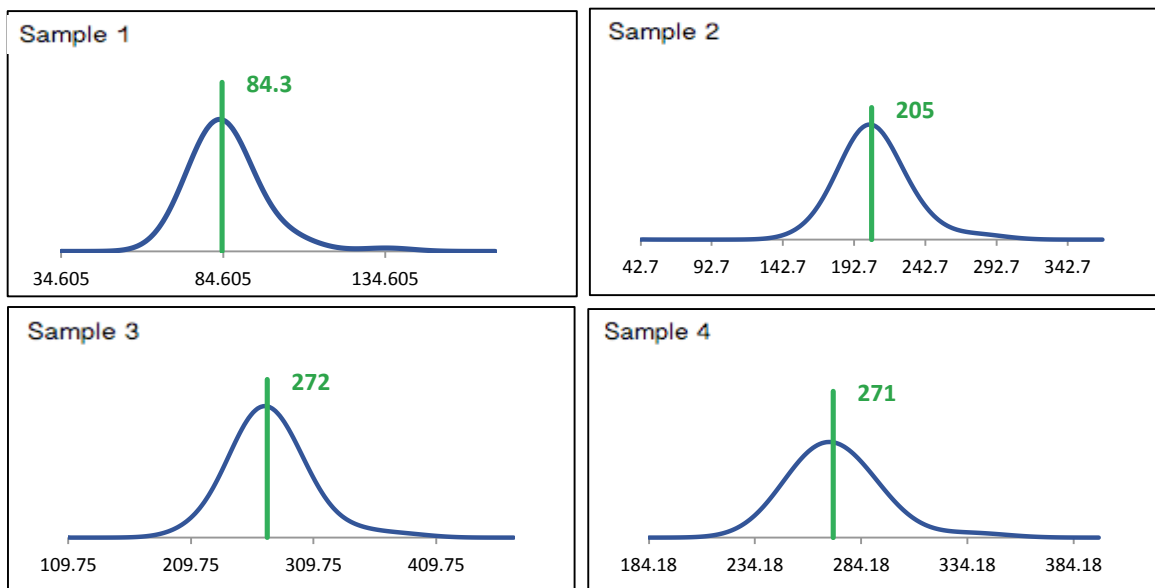


BARIUM

z-Score Plots

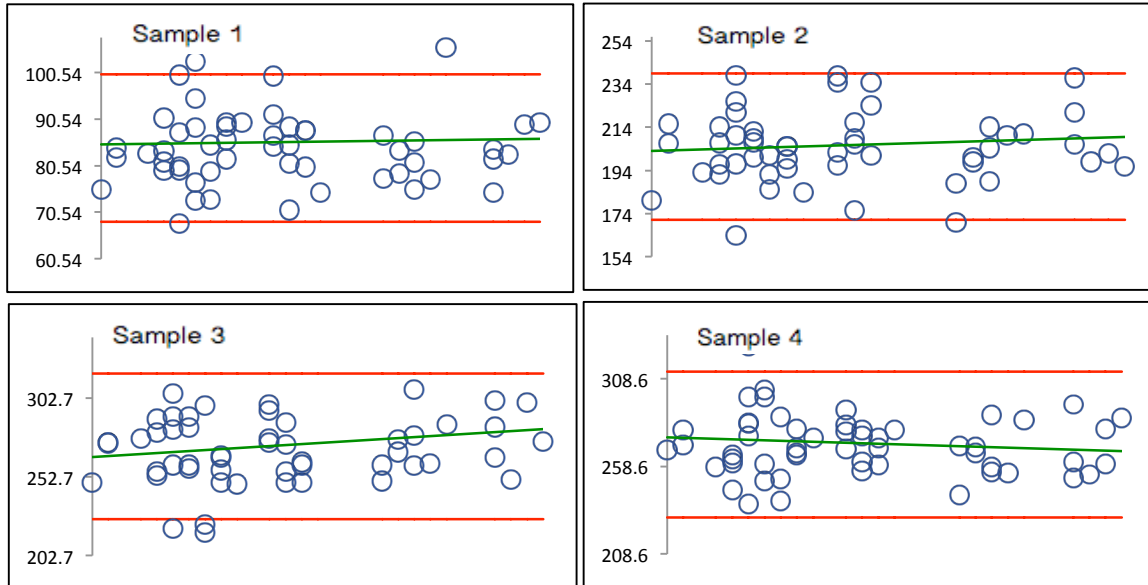


Kernel Density Plots



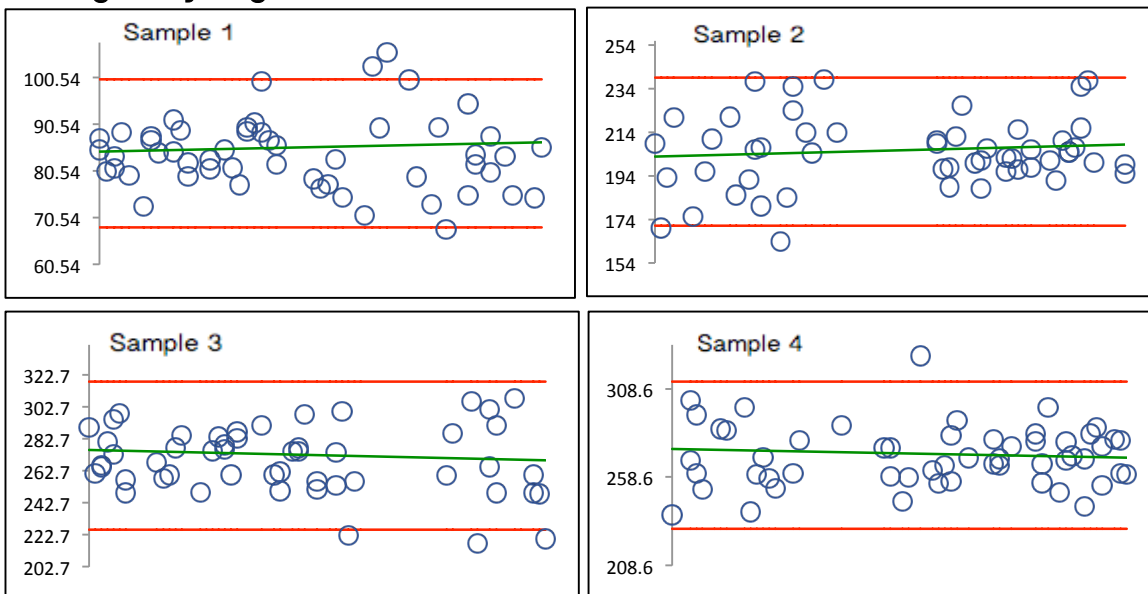
BARIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

BERYLLIUM

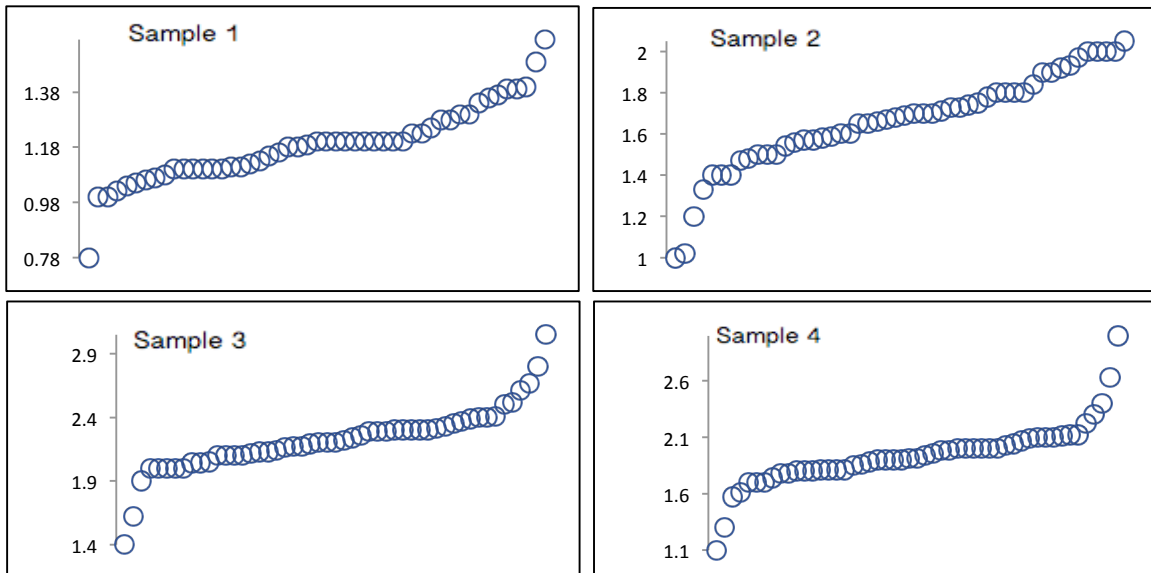
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	49	50	51	51
Median	1.20	1.69	2.20	1.91
Robust Mean	1.18	1.68	2.22	1.93
U	0.023	0.040	0.034	0.033
Robust Standard Deviation	0.127	0.223	0.190	0.188
Regression Standard Deviation	0.201	0.266	0.338	0.300
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.201	0.266	0.338	0.300
Outliers	0	0	0	0
$ z > 3.0$	0	0	0	1
$2 < z < 3$	0	2	2	3

Methods Used

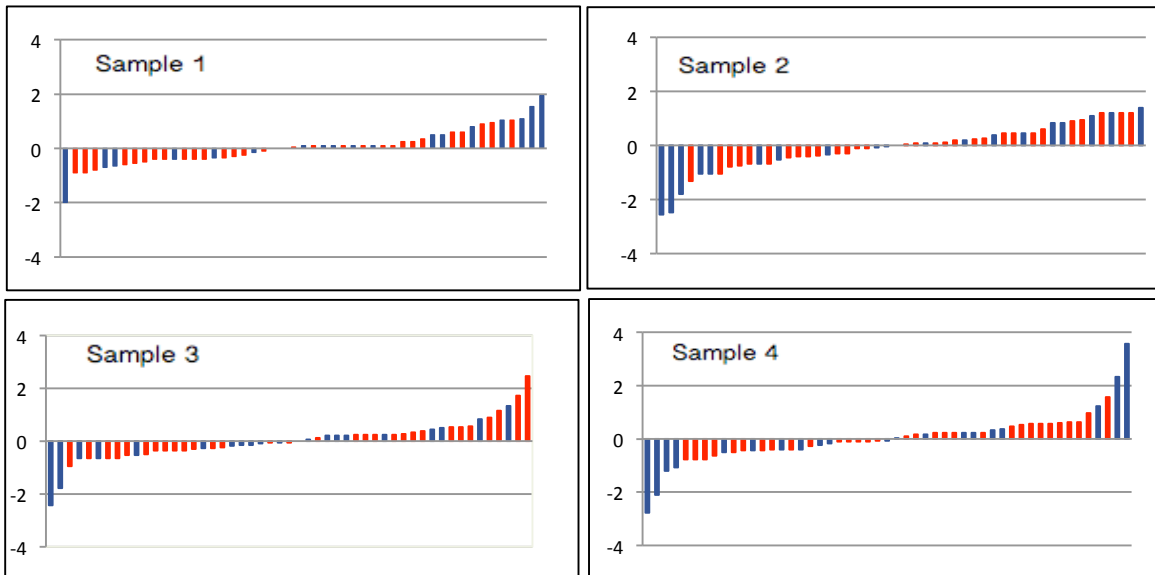
Method	C17-1	C17-2	C17-3	C17-4
ICP/OES	19	20	20	20
ICP/MS	30	30	31	31

All summary stats and the plots below are based on the data excluding any flagged outliers

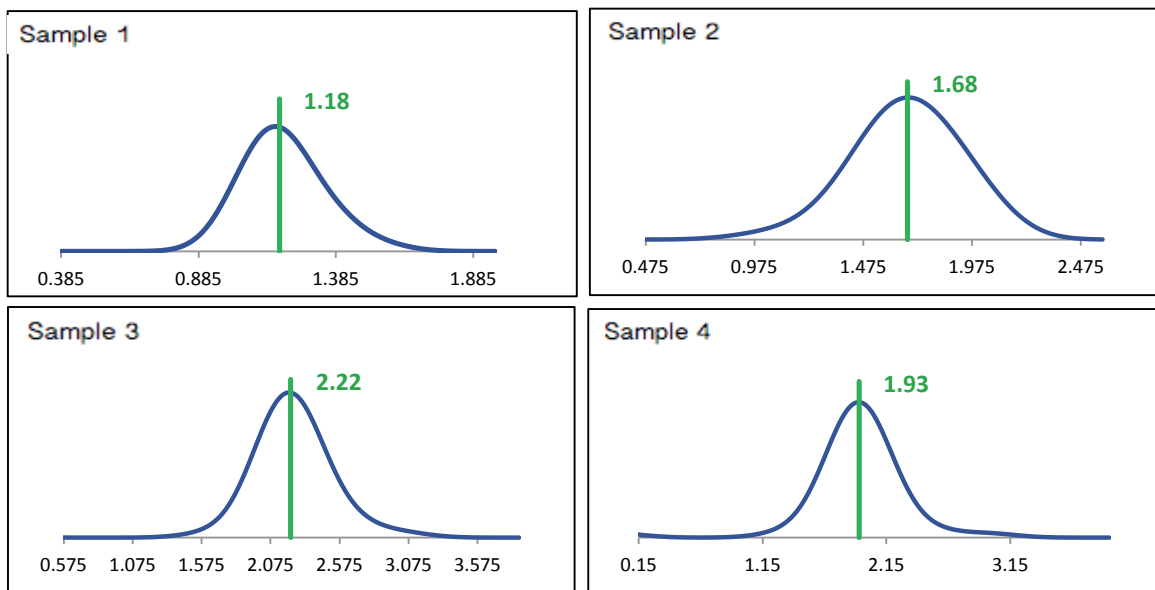


BERYLLIUM

z-Score Plots

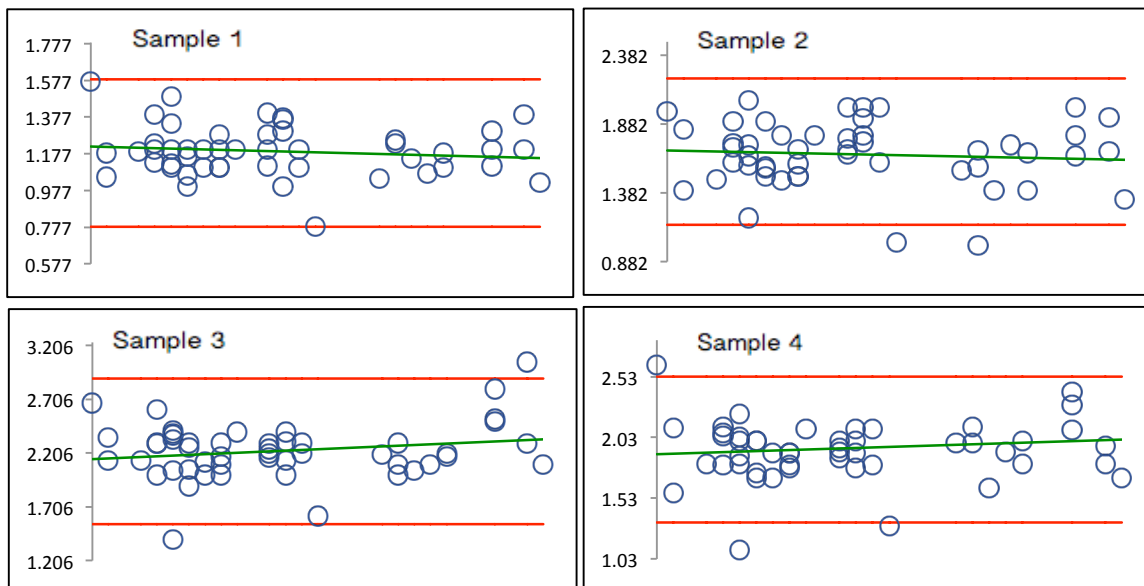


Kernel Density Plots



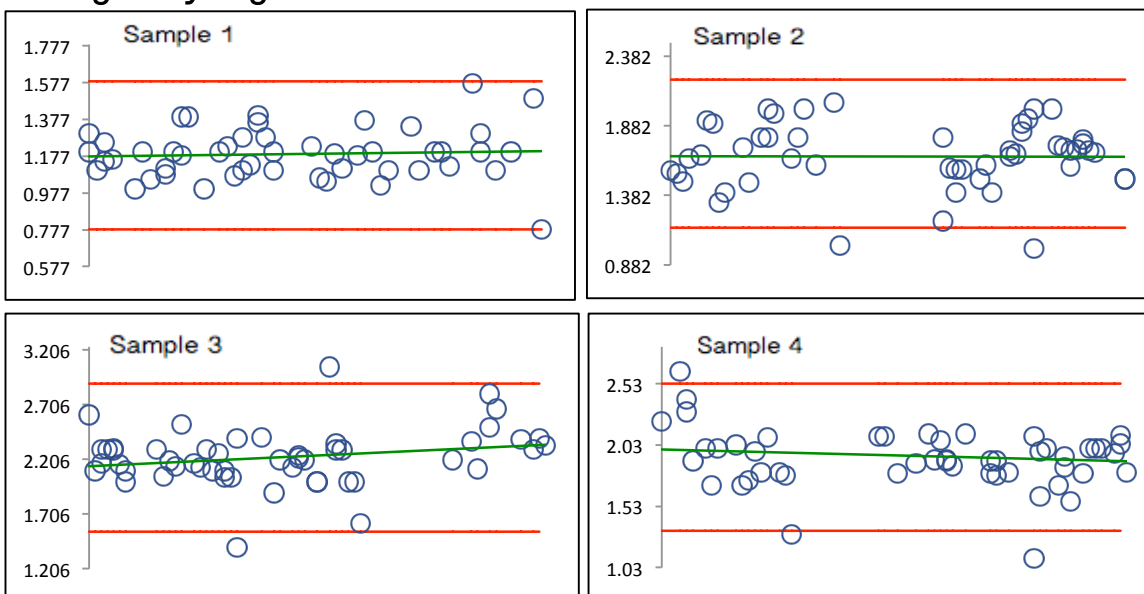
BERYLLIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

BORON

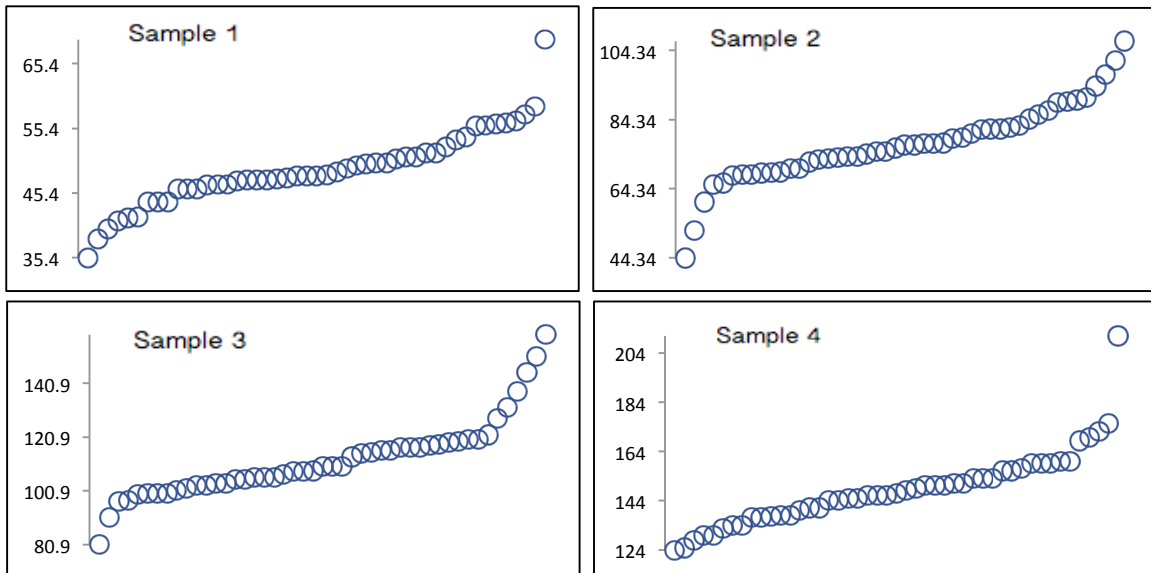
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	47	47	47	47
Median	48.0	77.0	110	147
Robust Mean	48.9	77.2	111	147
U	0.977	1.80	2.05	2.38
Robust Standard Deviation	5.36	9.79	11.1	12.9
Regression Standard Deviation	21.4	33.8	48.6	64.5
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	21.4	33.8	48.6	64.5
Outliers	0	0	0	0
$ z > 3.0$	0	0	0	0
$2 < z < 3$	0	0	0	0

Methods Used

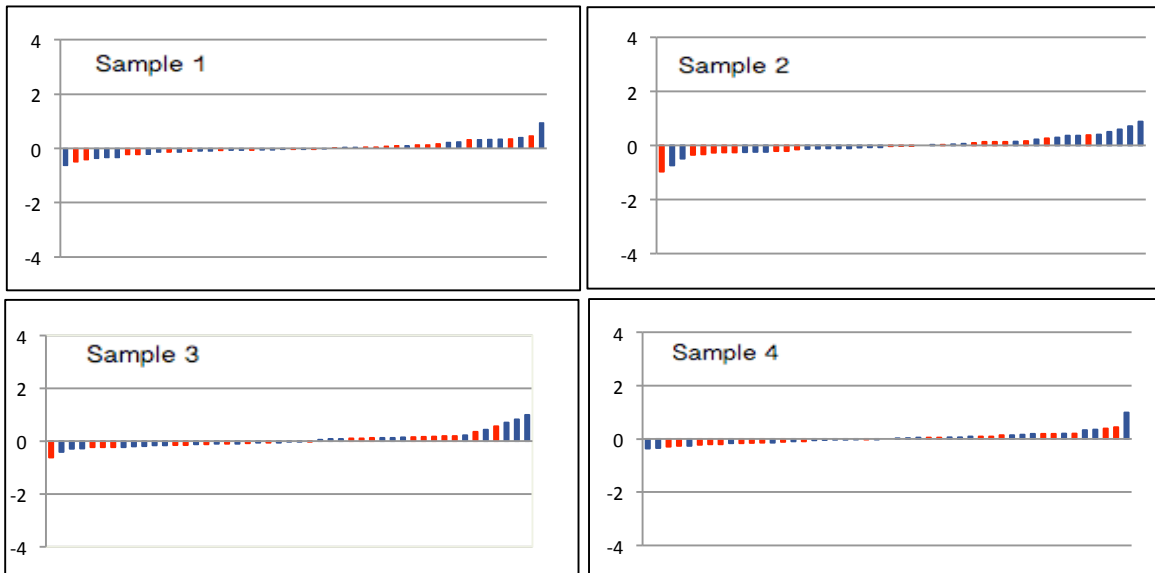
Method	C17-1	C17-2	C17-3	C17-4
ICP/MS	26	26	26	26
ICP/OES	21	21	21	21

All summary stats and the plots below are based on the data excluding any flagged outliers

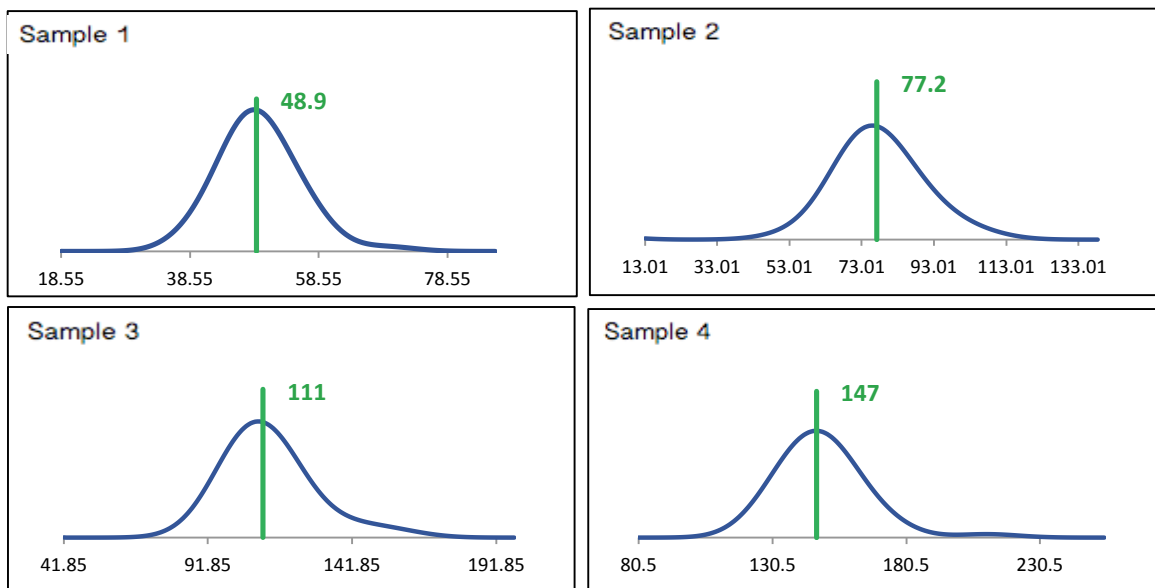


BORON

z-Score Plots

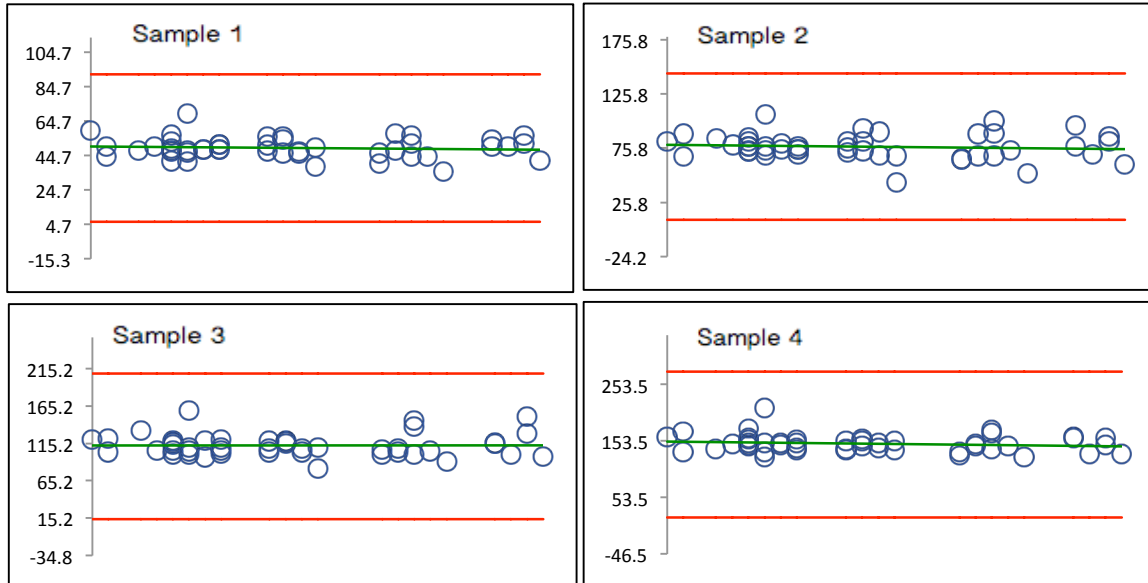


Kernel Density Plots



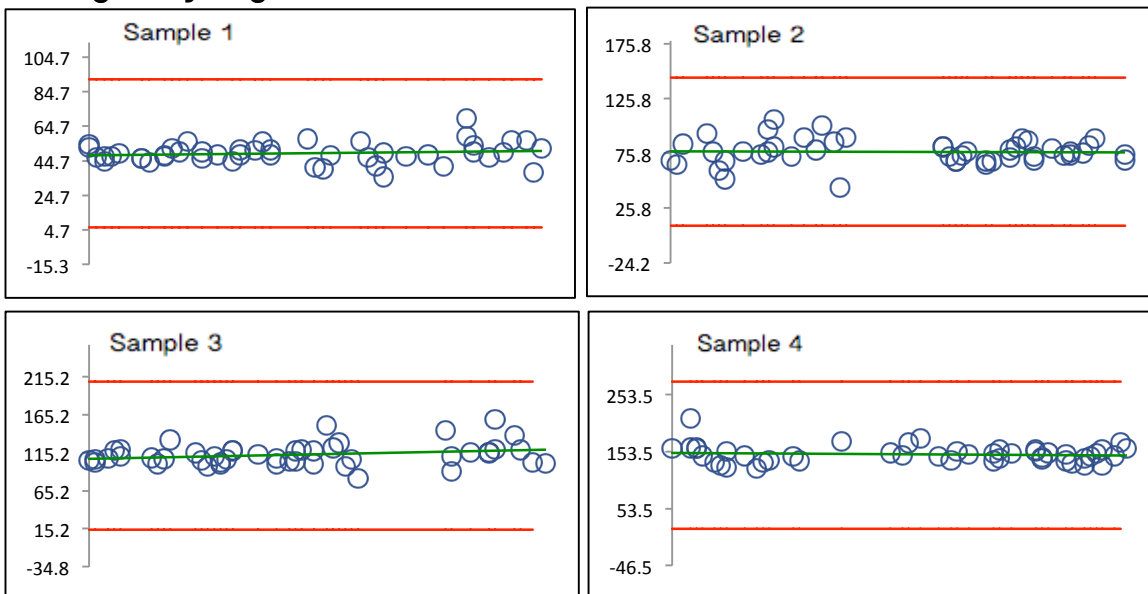
BORON

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

CADMIUM

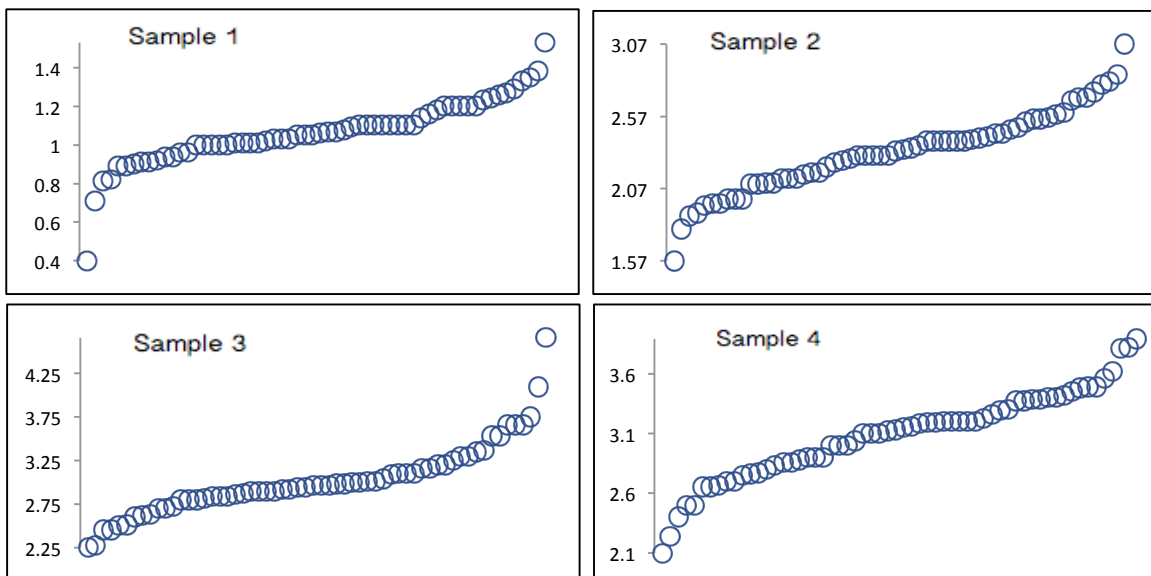
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	60	60	60	60
Median	1.06	2.34	2.97	3.14
Robust Mean	1.07	2.32	2.99	3.09
U	0.023	0.05	0.05	0.06
Robust Standard Deviation	0.142	0.279	0.336	0.359
Regression Standard Deviation	0.245	0.354	0.412	0.421
Stability Flag			Stability	
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.245	0.354	0.437	0.421
Outliers	0	0	0	0
$ z > 3.0$	0	0	1	0
$2 < z < 3$	1	2	1	2

Methods Used

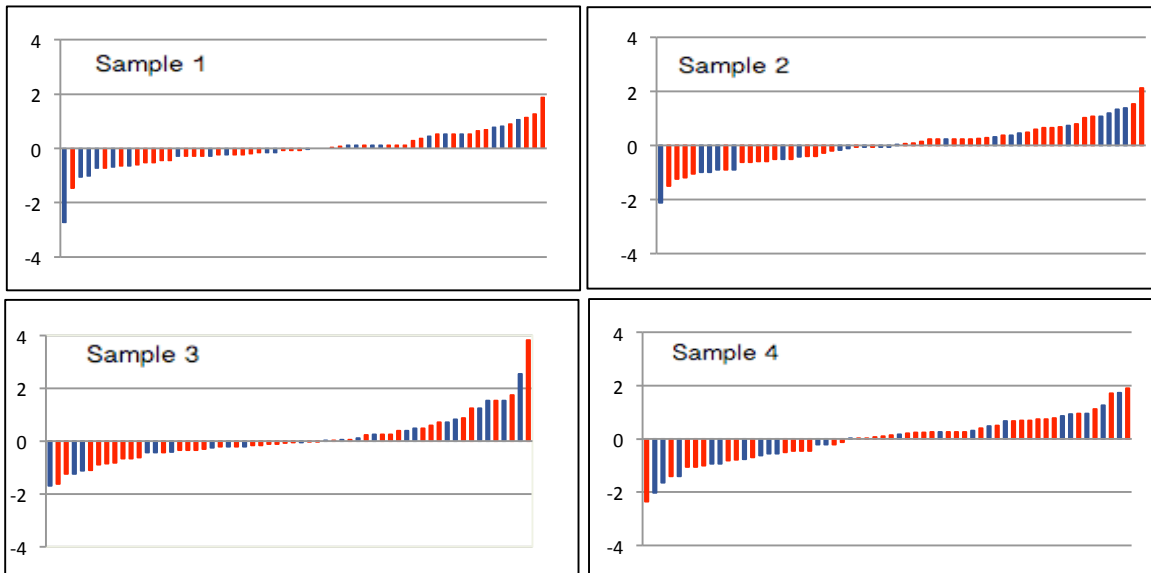
Method	C17-1	C17-2	C17-3	C17-4
ICP/OES	22	22	22	22
ICP/MS	38	38	38	38

All summary stats and the plots below are based on the data excluding any flagged outliers

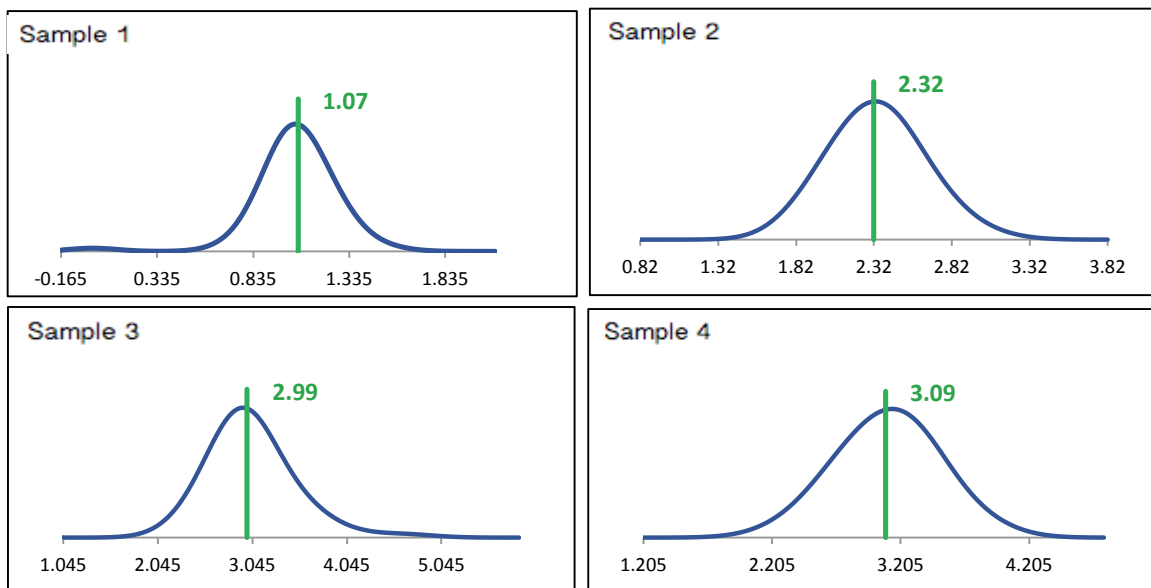


CADMIUM

z-Score Plots

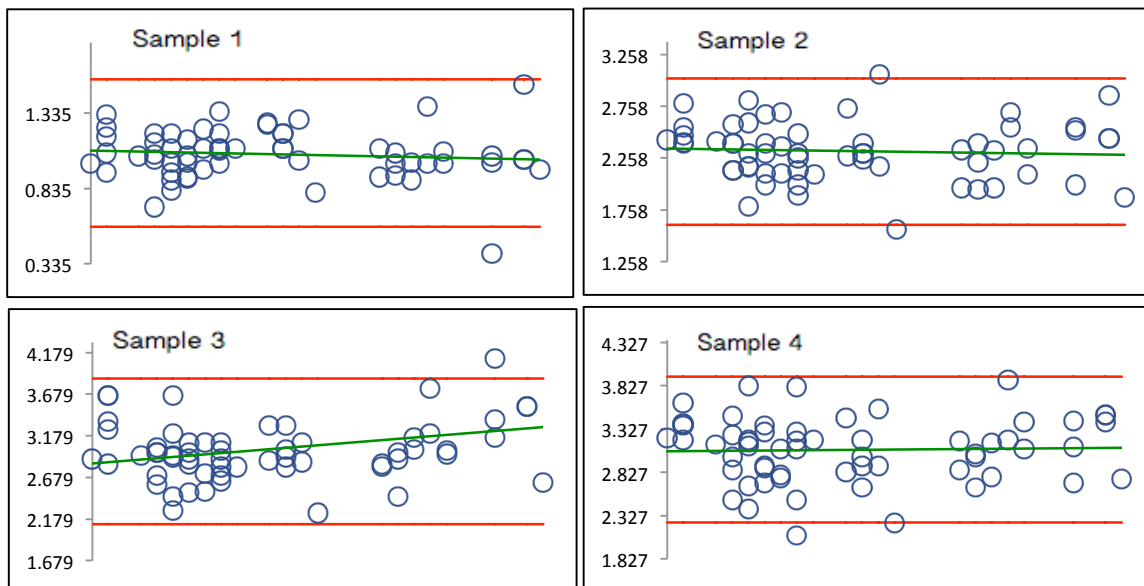


Kernel Density Plots



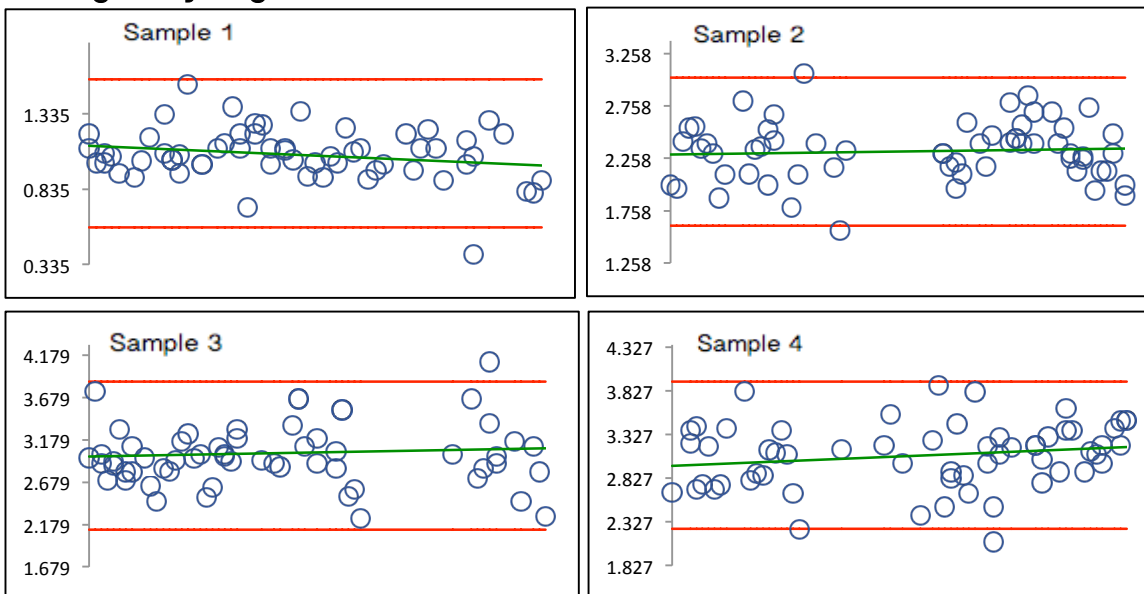
CADMIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

CHROMIUM

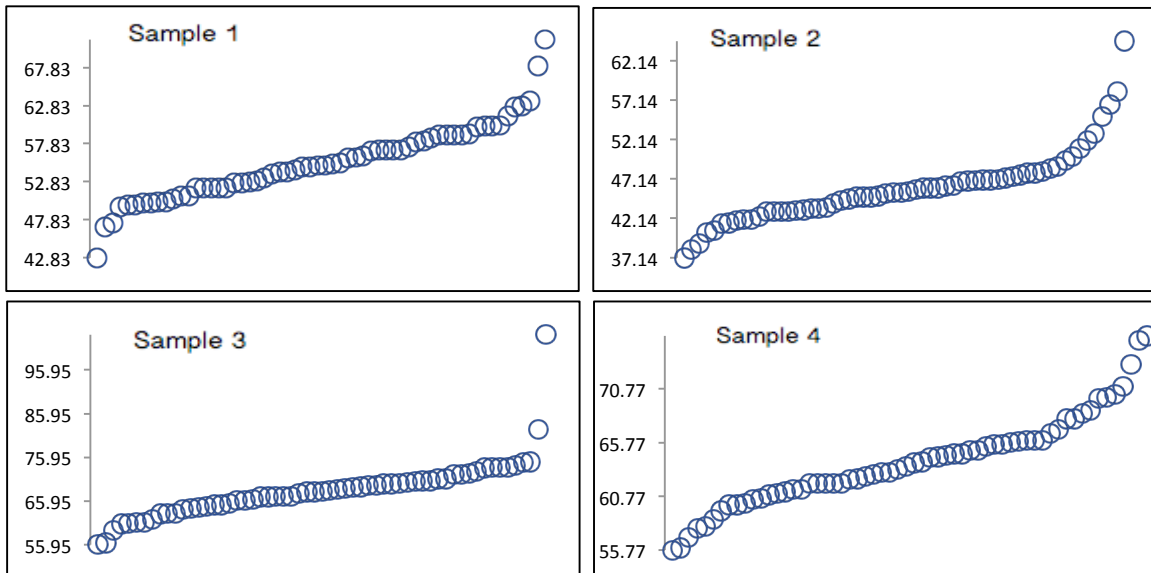
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	60	60	59	60
Median	55.0	45.5	68.1	63.7
Robust Mean	55.2	45.5	67.9	63.8
U	0.744	0.57	0.79	0.66
Robust Standard Deviation	4.61	3.49	4.84	4.03
Regression Standard Deviation	5.73	4.99	6.70	6.39
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	5.73	4.99	6.70	6.39
Outliers	0	0	1	0
$ z > 3.0$	0	1	1	0
$2 < z < 3$	3	2	1	0

Methods Used

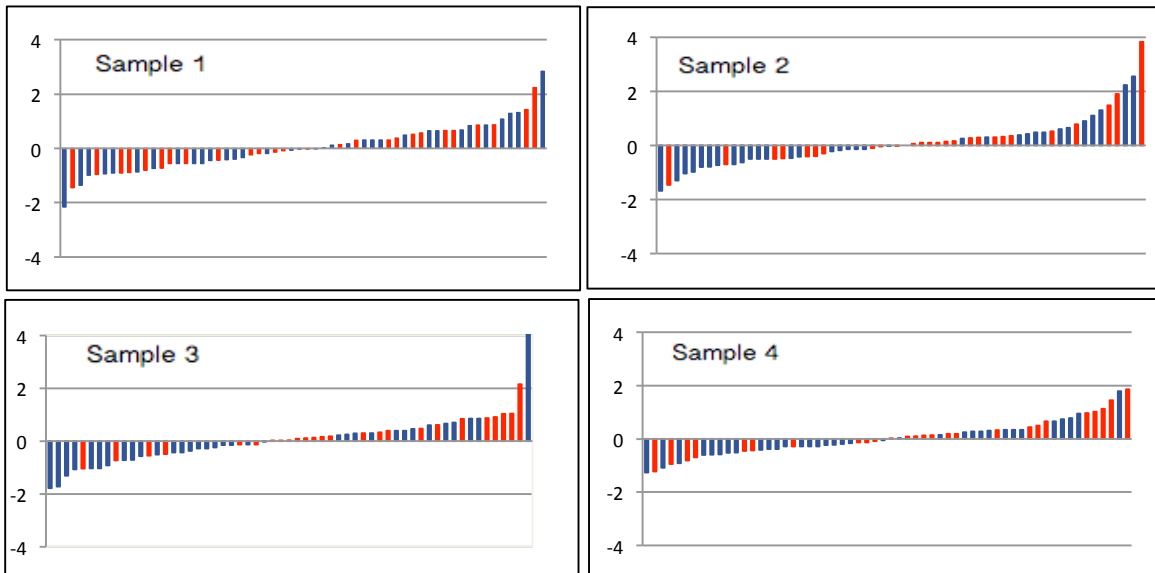
Method	C17-1	C17-2	C17-3	C17-4
ICP/MS	34	34	34	34
ICP/OES	26	26	25	26

All summary stats and the plots below are based on the data excluding any flagged outliers

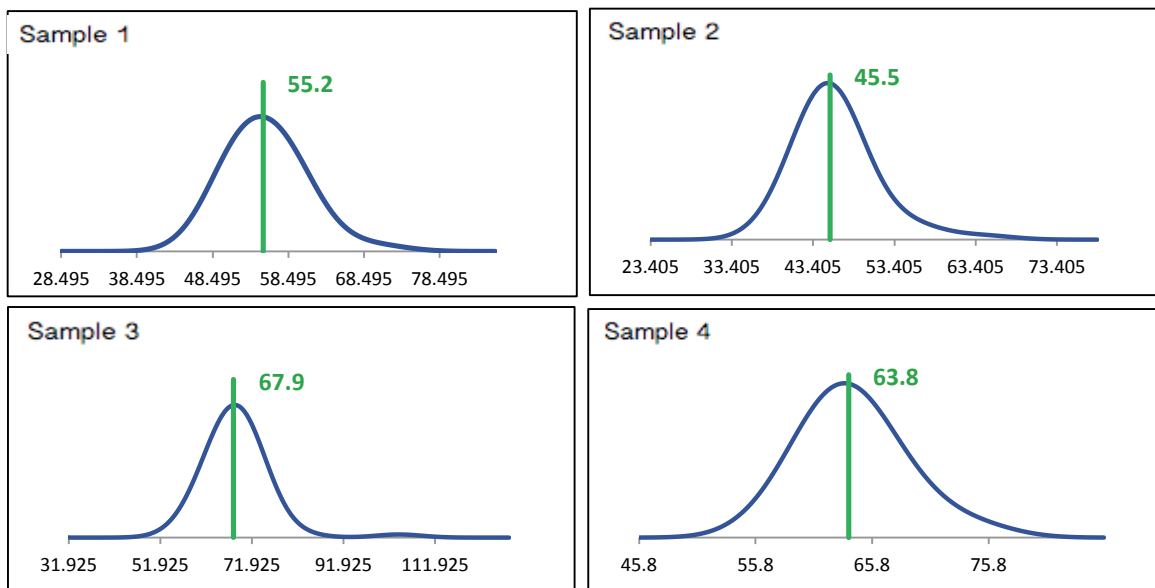


CHROMIUM

z-Score Plots

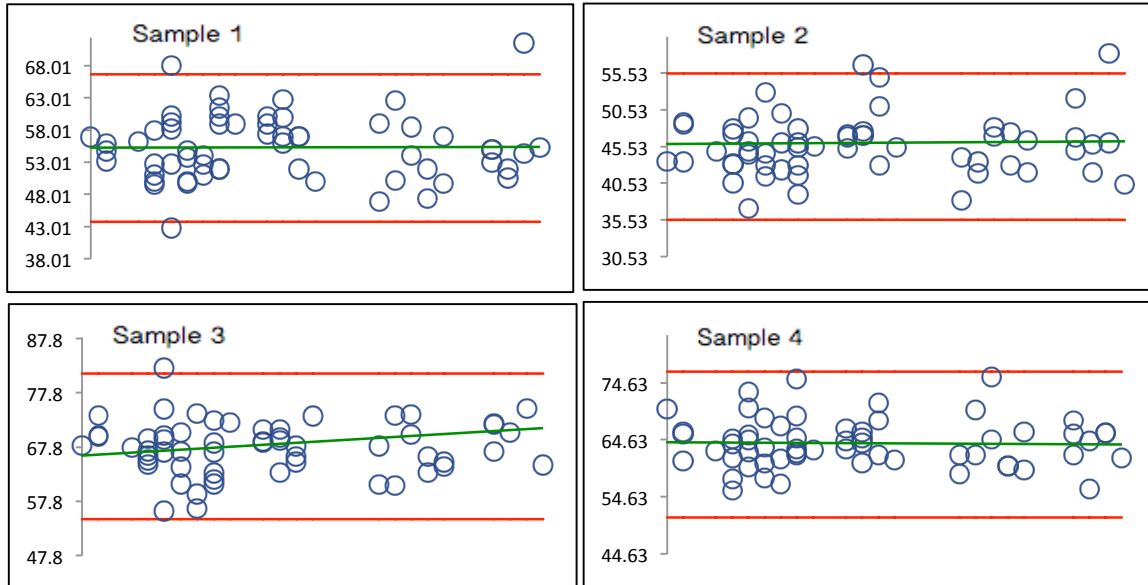


Kernel Density Plots



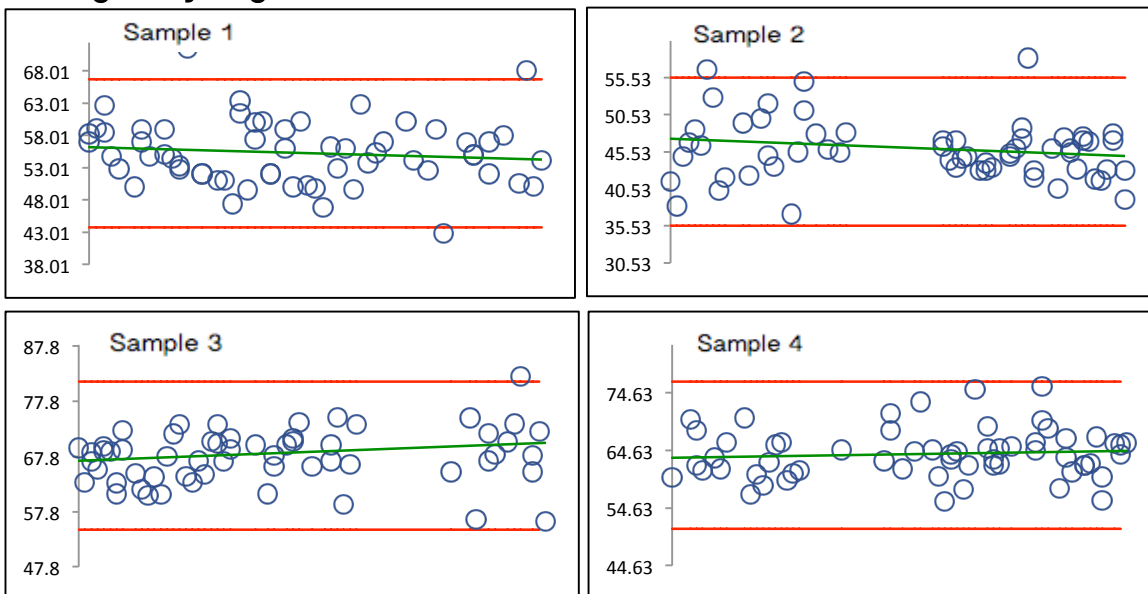
CHROMIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

COBALT

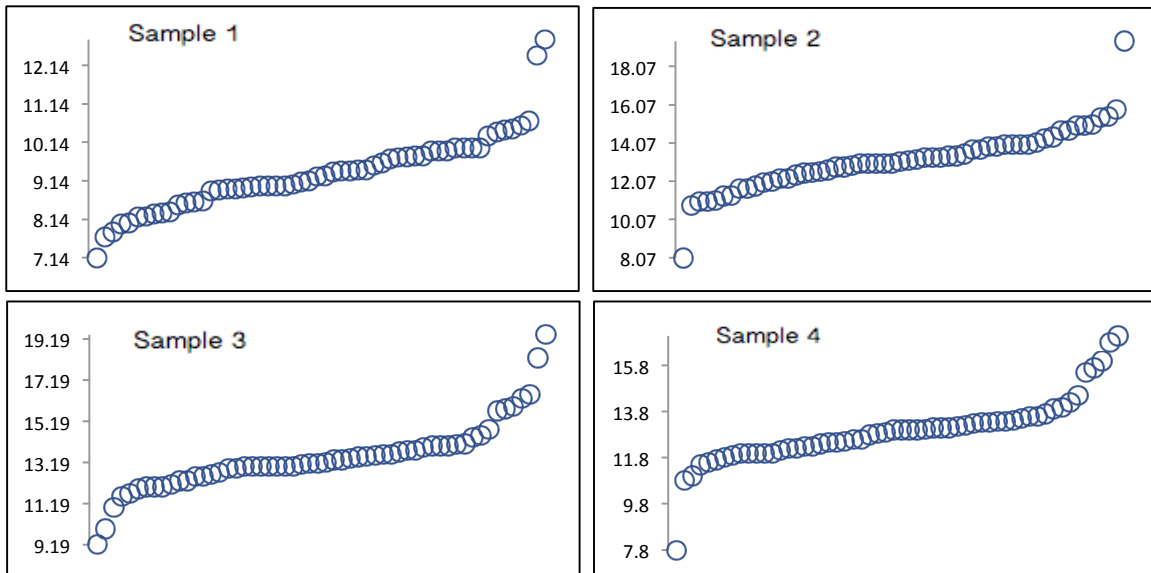
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	56	56	56	56
Median	9.26	13.1	13.2	13.0
Robust Mean	9.28	13.2	13.3	12.9
U	0.148	0.23	0.20	0.17
Robust Standard Deviation	0.887	1.39	1.18	0.99
Regression Standard Deviation	0.907	1.29	1.30	1.26
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.907	1.39	1.30	1.26
Outliers	0	0	0	0
$ z > 3.0$	2	2	3	3
$2 < z < 3$	1	0	3	3

Methods Used

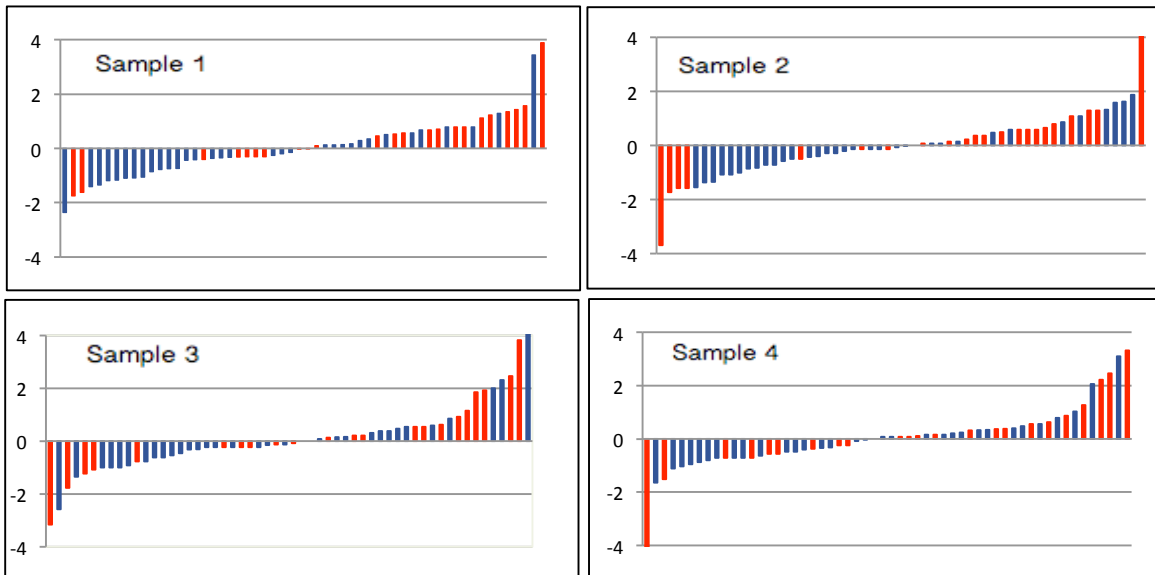
Method	C17-1	C17-2	C17-3	C17-4
ICP/MS	33	33	33	33
ICP/OES	23	23	23	23

All summary stats and the plots below are based on the data excluding any flagged outliers

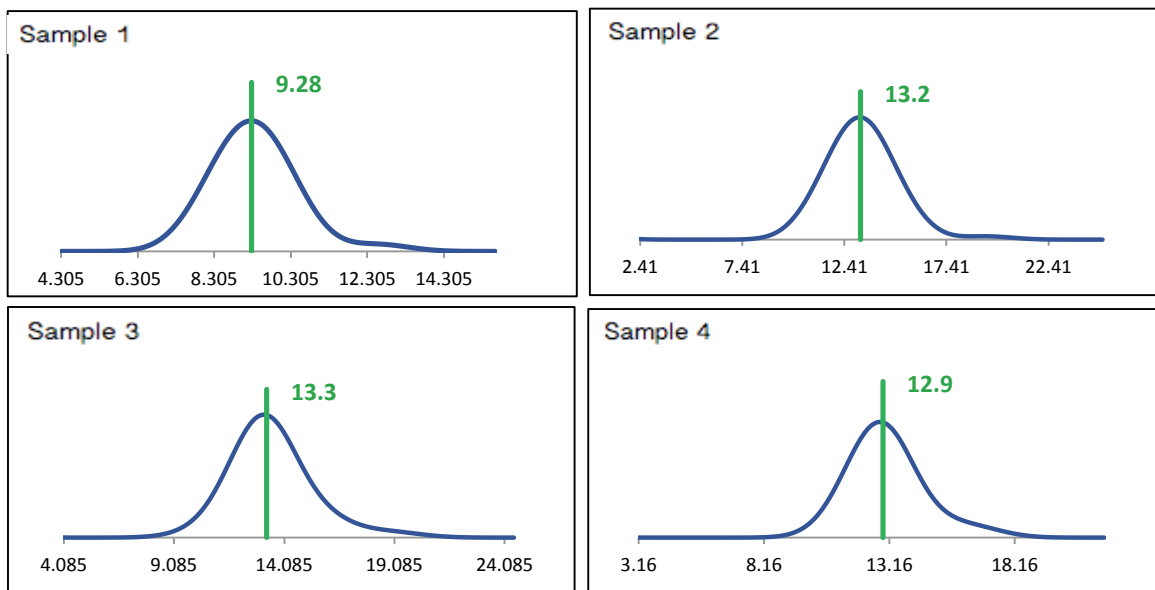


COBALT

z-Score Plots

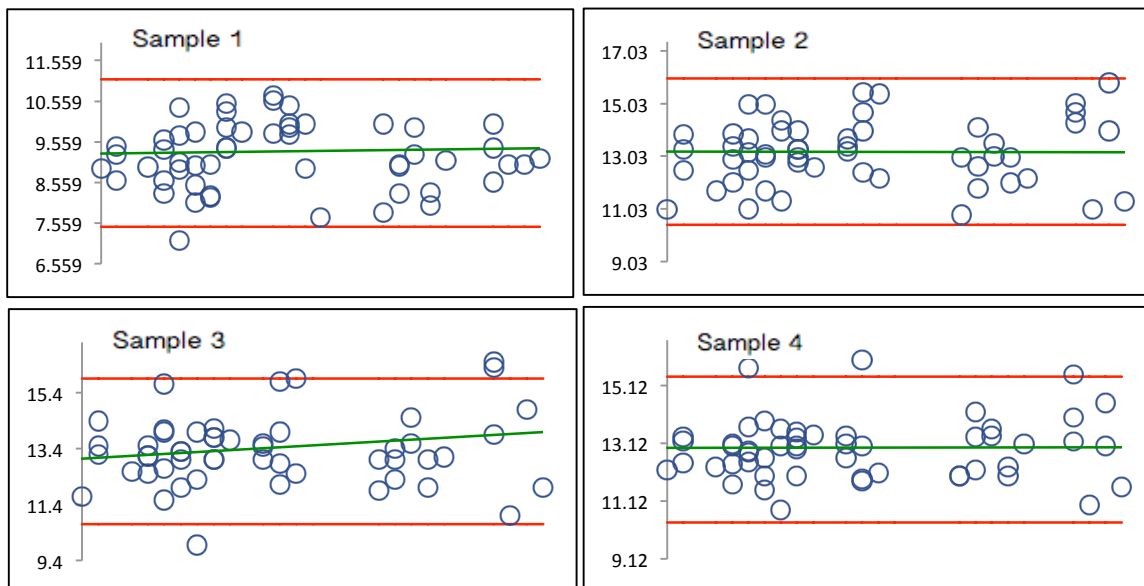


Kernel Density Plots



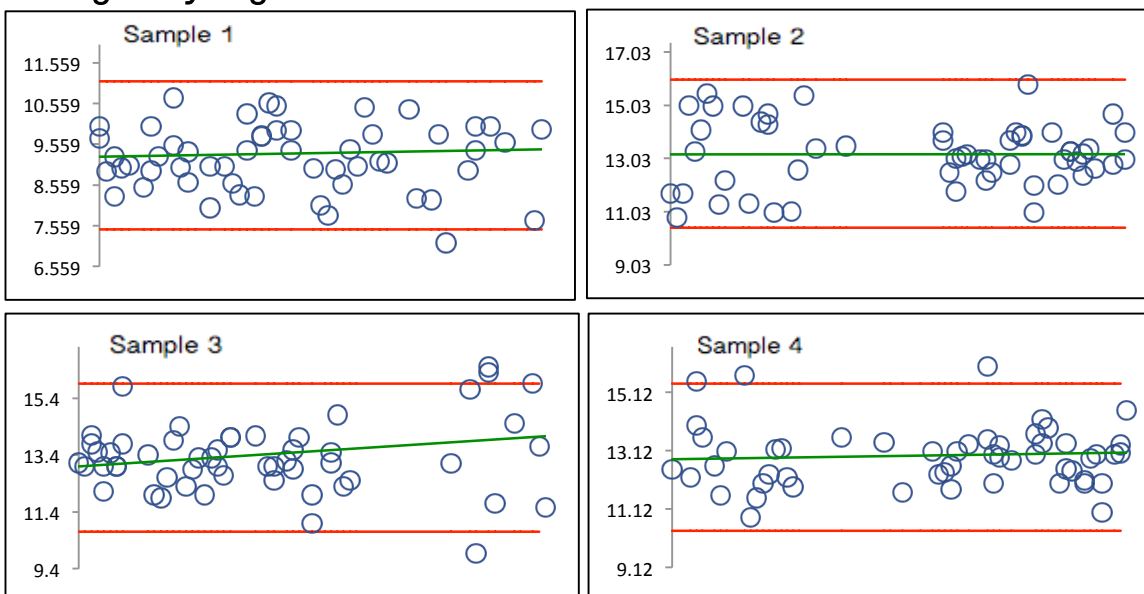
COBALT

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

COPPER

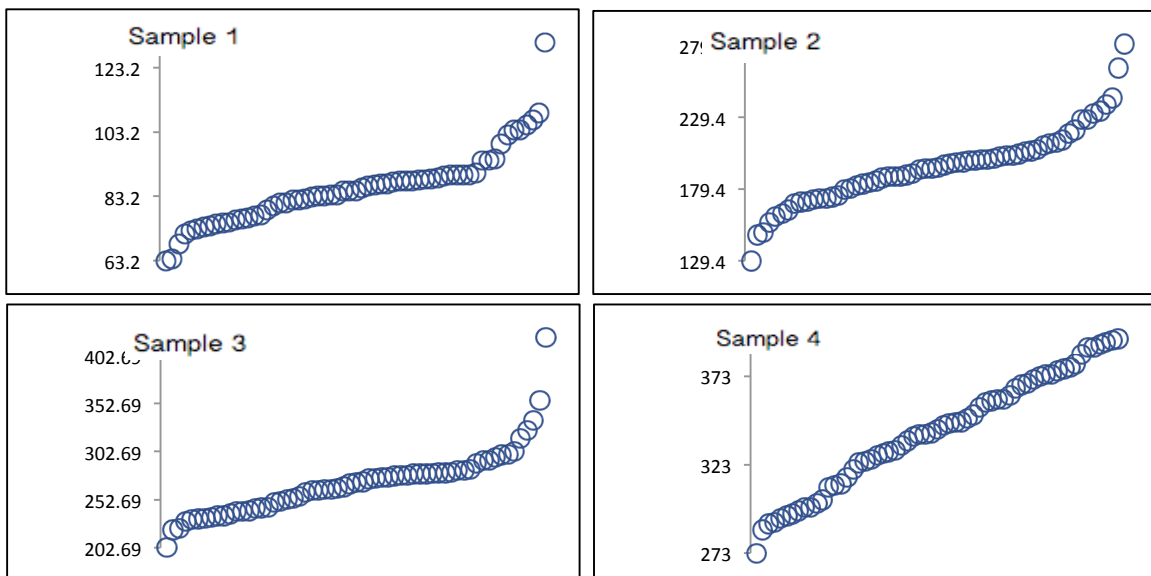
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	61	61	61	61
Median	85.0	194	270	343
Robust Mean	84.9	194	267	342
U	1.54	3.81	4.47	5.86
Robust Standard Deviation	9.64	23.8	27.9	36.6
Regression Standard Deviation	7.10	16.2	22.3	28.6
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	9.64	23.8	27.9	36.6
Outliers	0	0	0	0
$ z > 3.0$	1	1	2	0
$2 < z < 3$	5	3	3	0

Methods Used

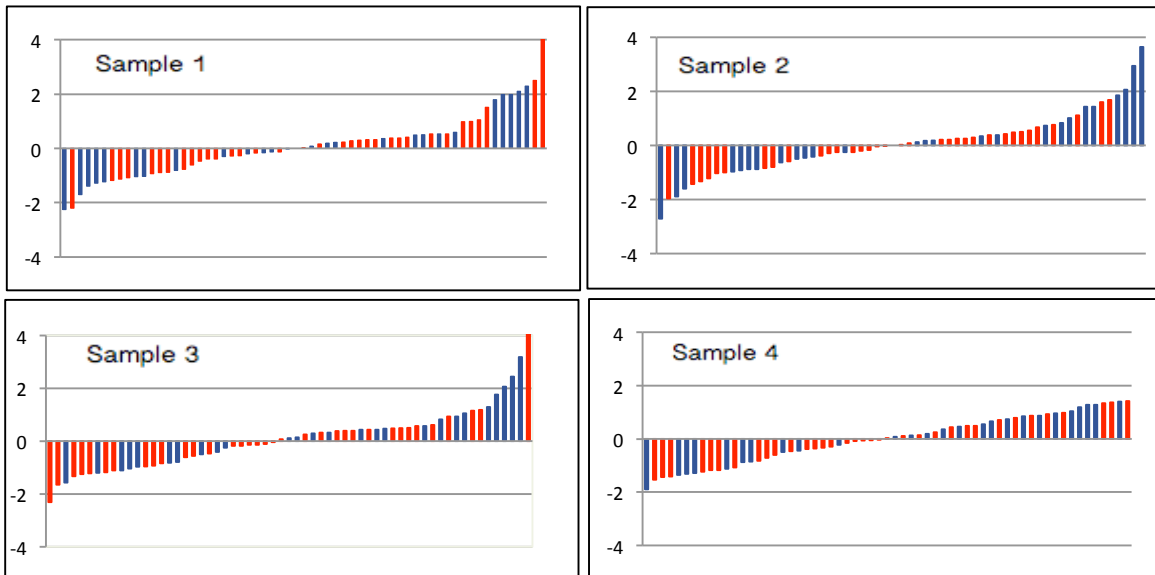
Method	C17-1	C17-2	C17-3	C17-4
ICP/OES	26	26	26	26
ICP/MS	35	35	35	35

All summary stats and the plots below are based on the data excluding any flagged outliers

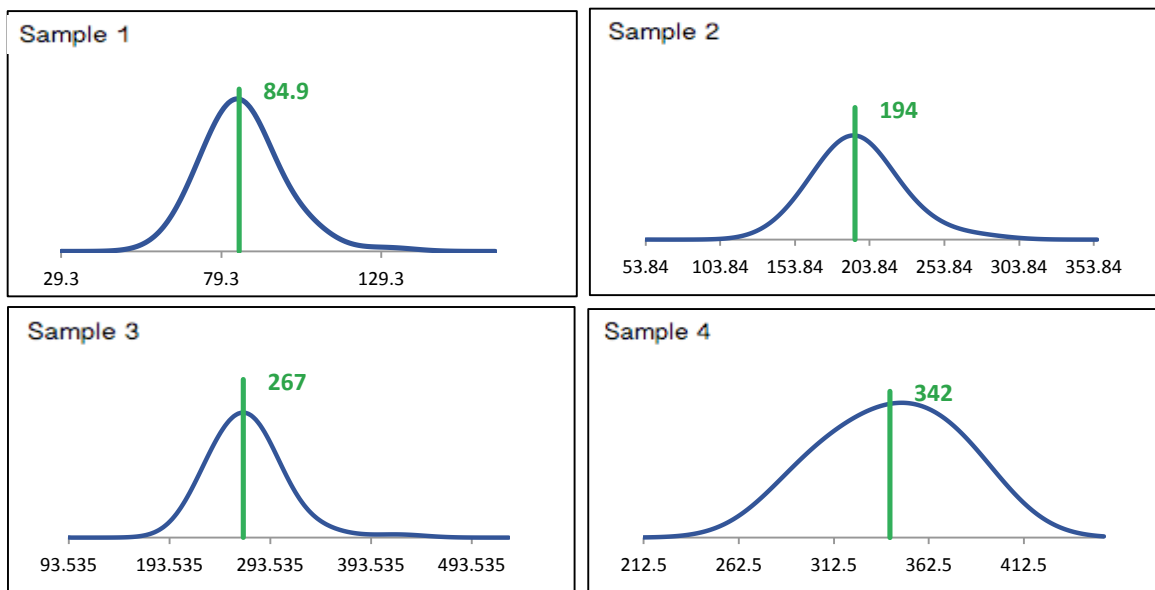


COPPER

z-Score Plots

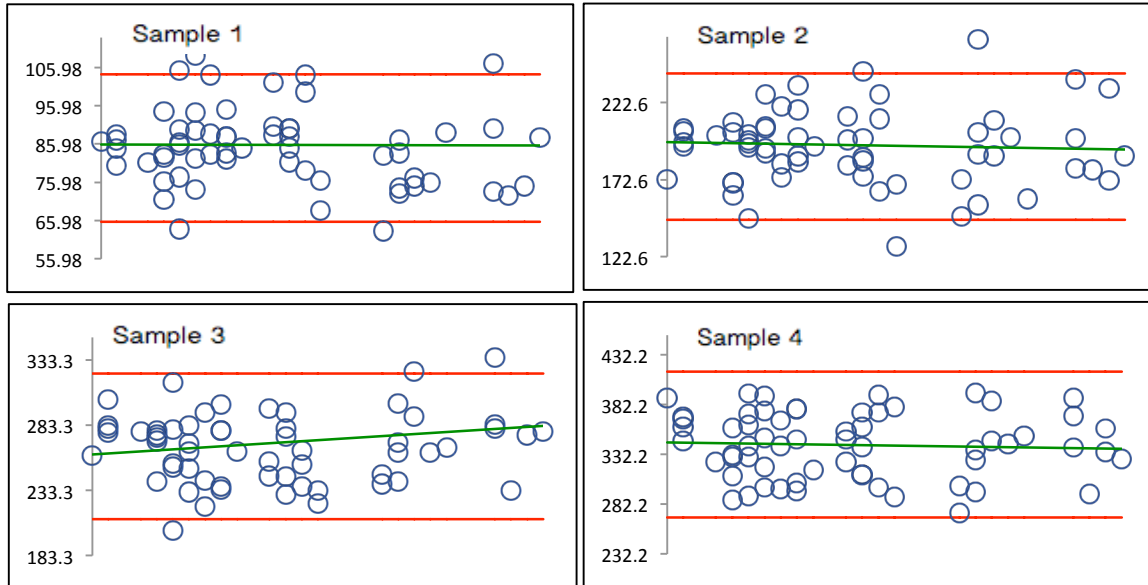


Kernel Density Plots



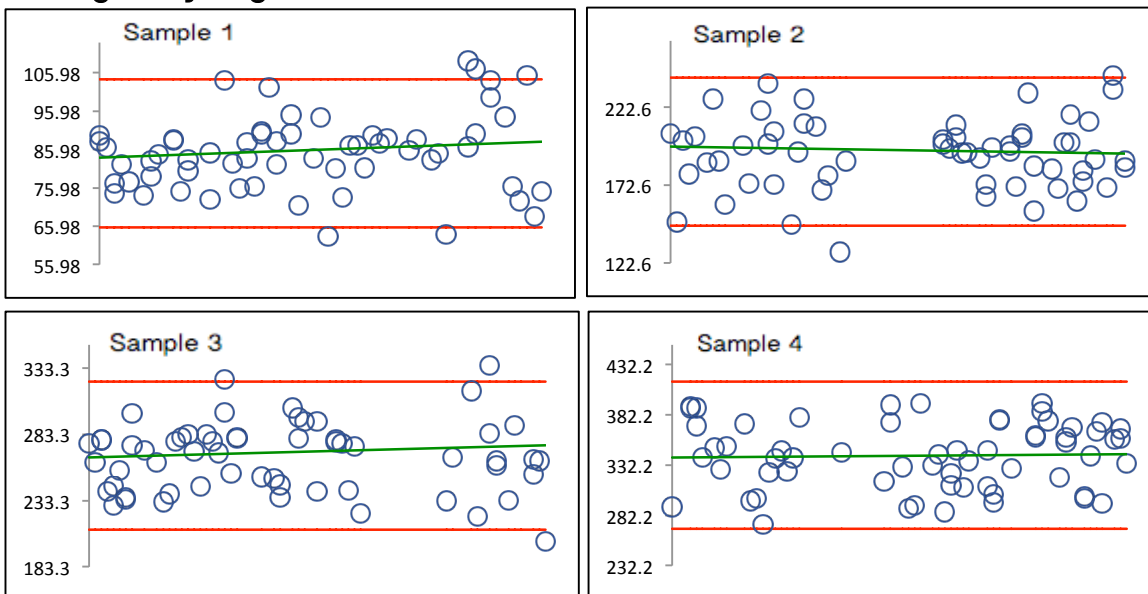
COPPER

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

IRON

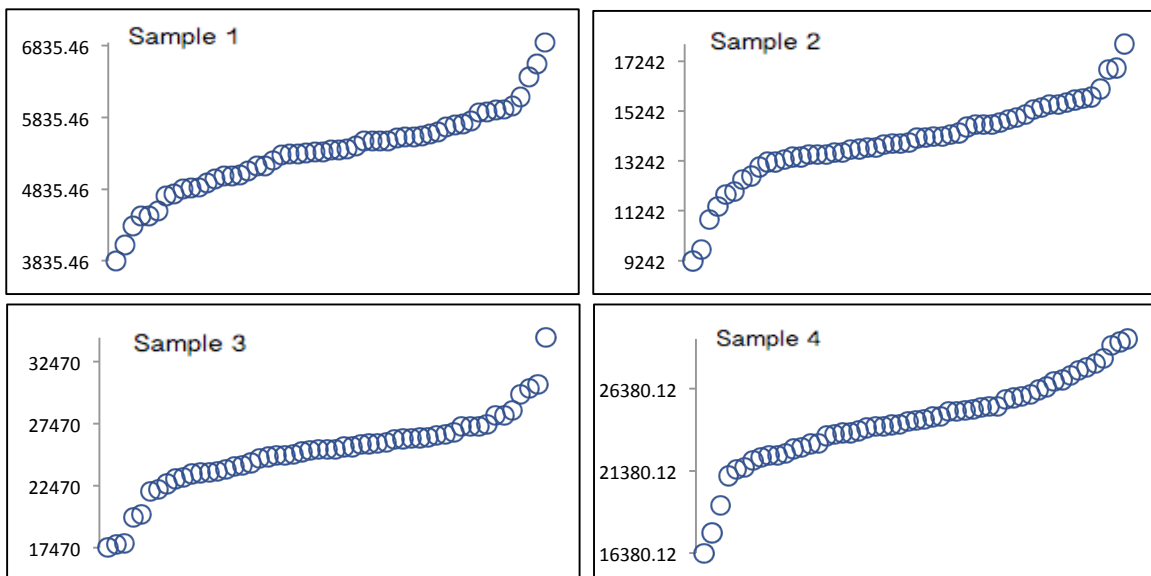
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	53	53	53	53
Median	5380	14000	25400	24400
Robust Mean	5340	14100	25200	24500
U	91	232	405	403
Robust Standard Deviation	529	1350	2360	2350
Regression Standard Deviation	488	1290	2300	2240
Stability Flag	Stability	Stability		
Homogeneity Flag				
Standard Deviation Used (SDPA)	627	1640	2360	2350
Outliers	0	0	0	0
$ z > 3.0$	0	0	4	1
$2 < z < 3$	3	3	4	3

Methods Used

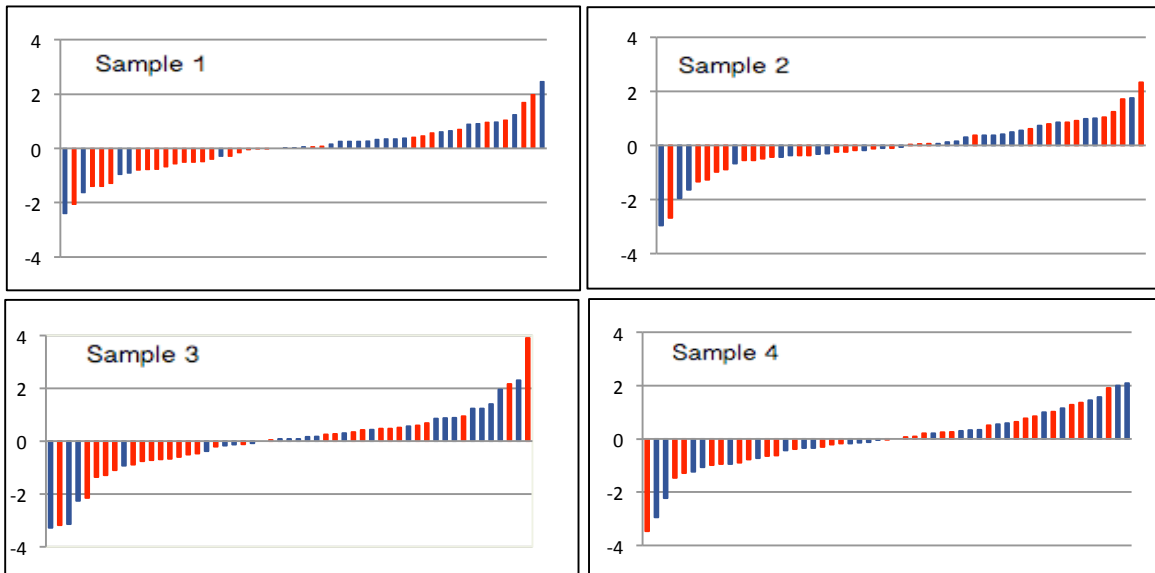
Method	C17-1	C17-2	C17-3	C17-4
ICP/OES	25	25	25	25
ICP/MS	28	28	28	28

All summary stats and the plots below are based on the data excluding any flagged outliers

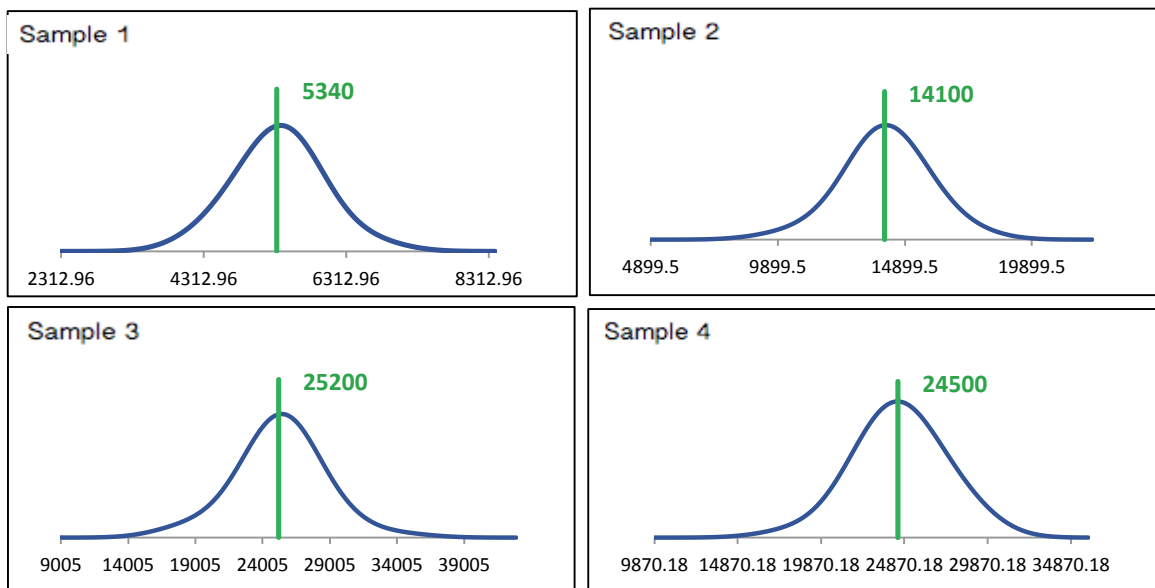


IRON

z-Score Plots

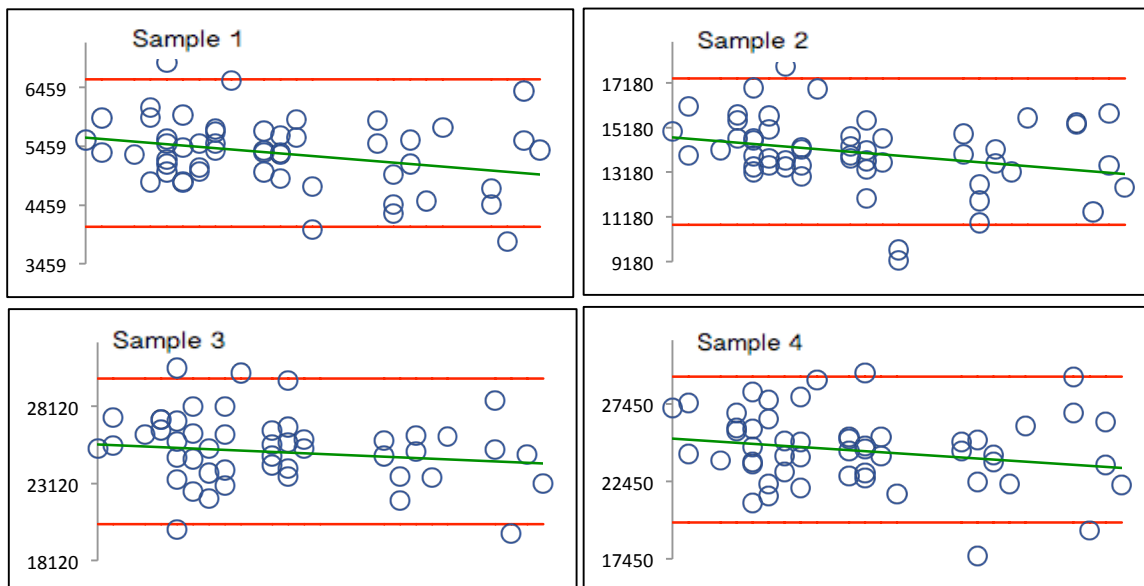


Kernel Density Plots



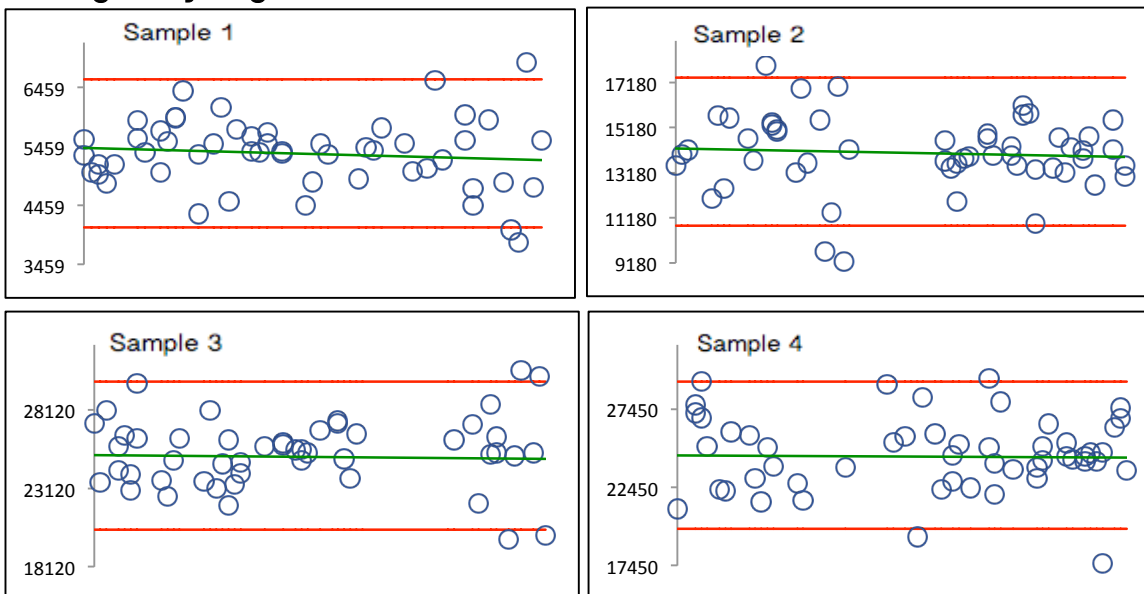
IRON

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

LEAD

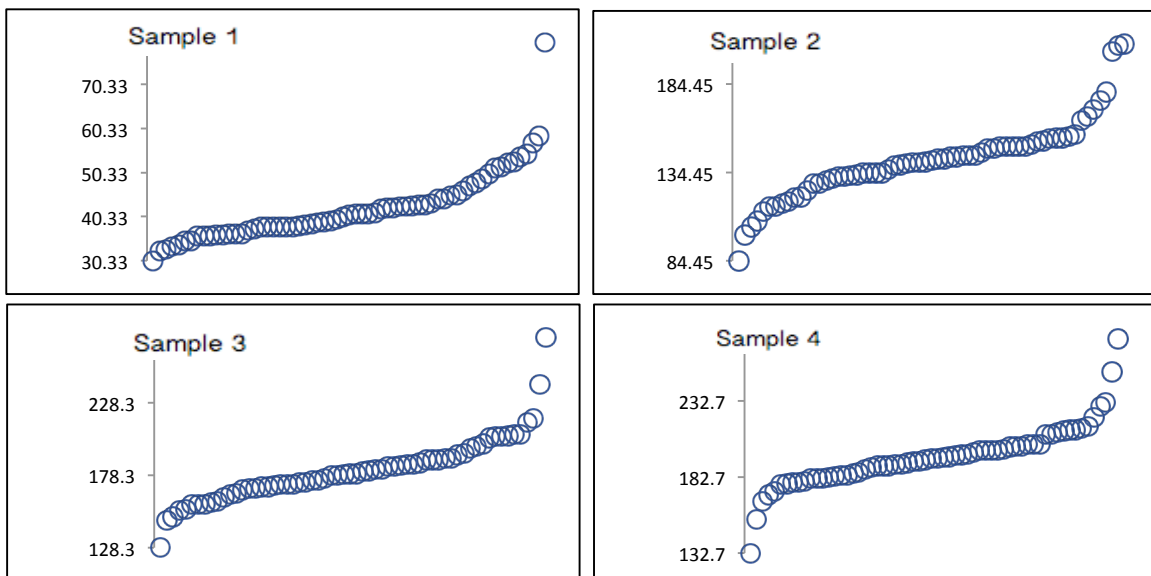
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	63	63	62	62
Median	40.6	141	179	195
Robust Mean	41.3	140	180	195
U	1.0	2.8	3.0	2.4
Robust Standard Deviation	6.28	17.9	18.7	15.4
Regression Standard Deviation	4.76	12.1	15.1	16.2
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	6.28	17.9	18.7	16.2
Outliers	0	0	1	1
$ z > 3.0$	1	4	2	3
$2 < z < 3$	3	3	1	3

Methods Used

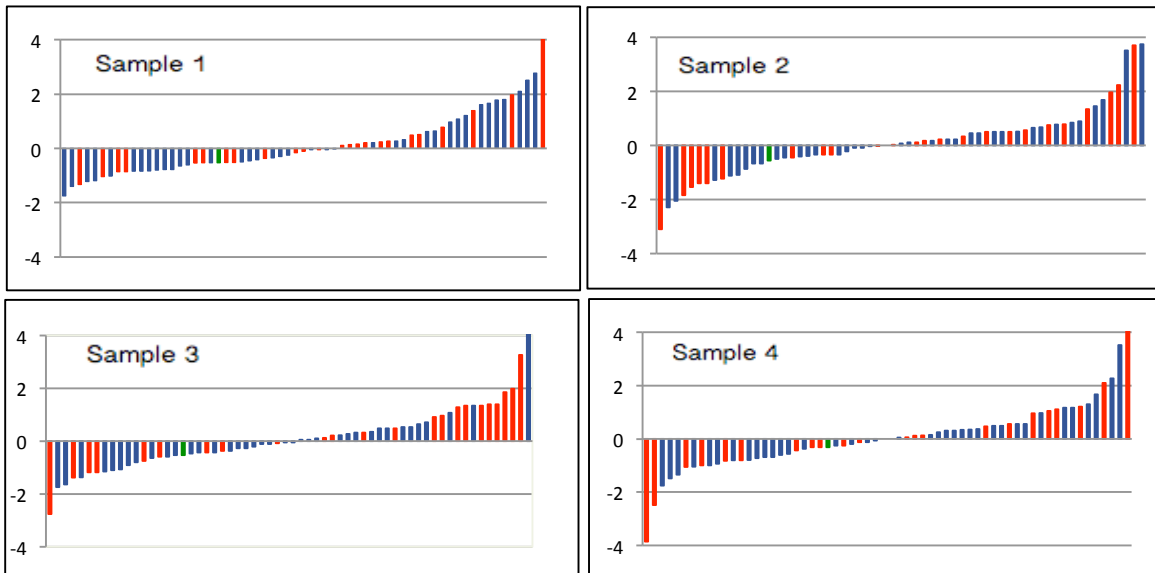
Method	C17-1	C17-2	C17-3	C17-4
ICP/MS	38	38	38	38
ICP/OES	24	24	23	23
AA	1	1	1	1

All summary stats and the plots below are based on the data excluding any flagged outliers

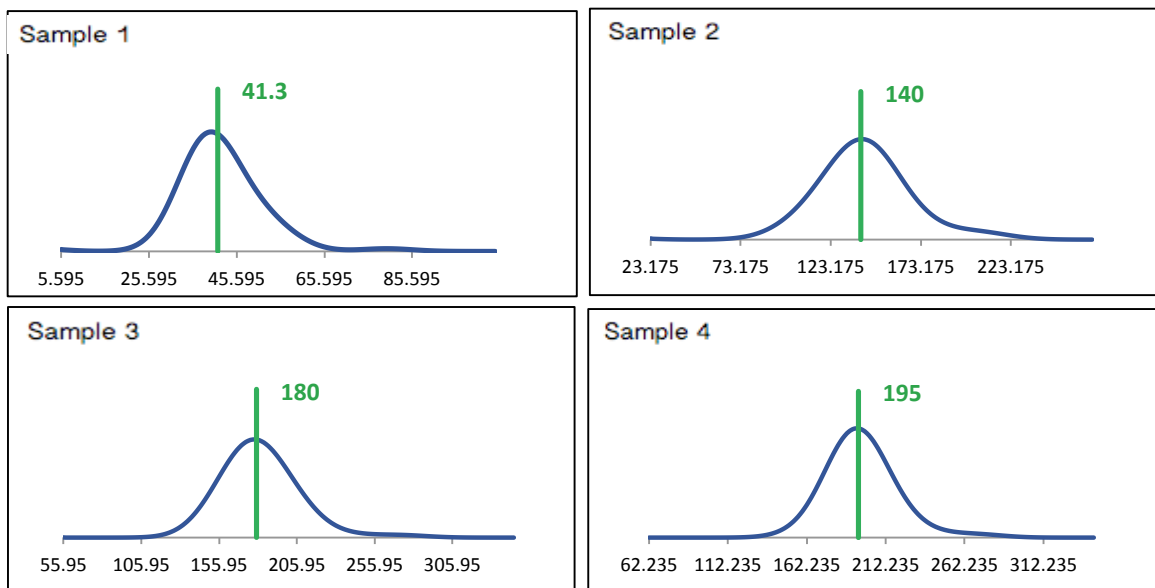


LEAD

z-Score Plots

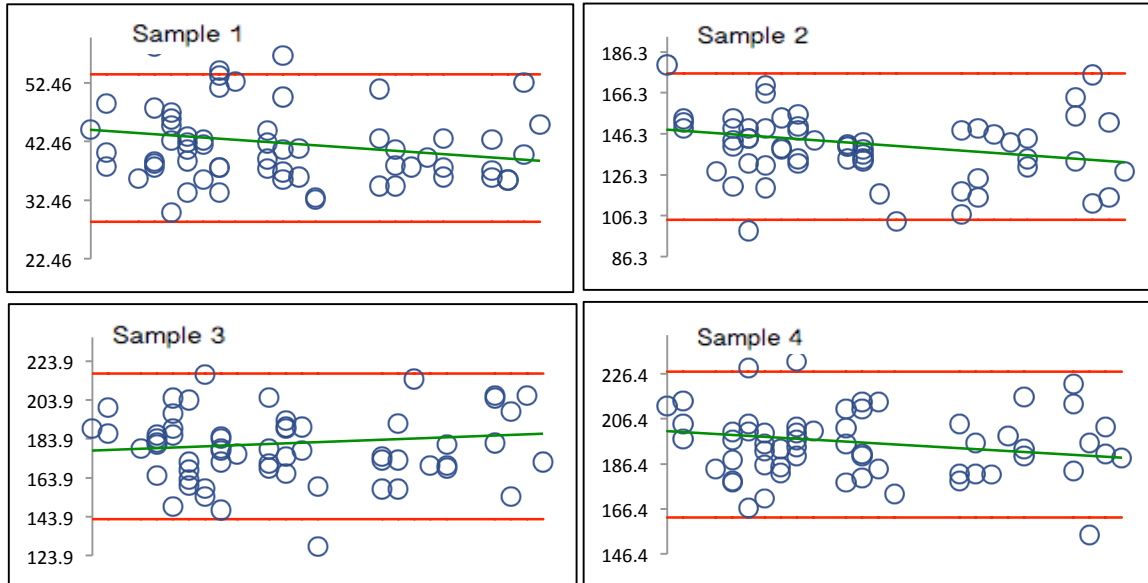


Kernel Density Plots



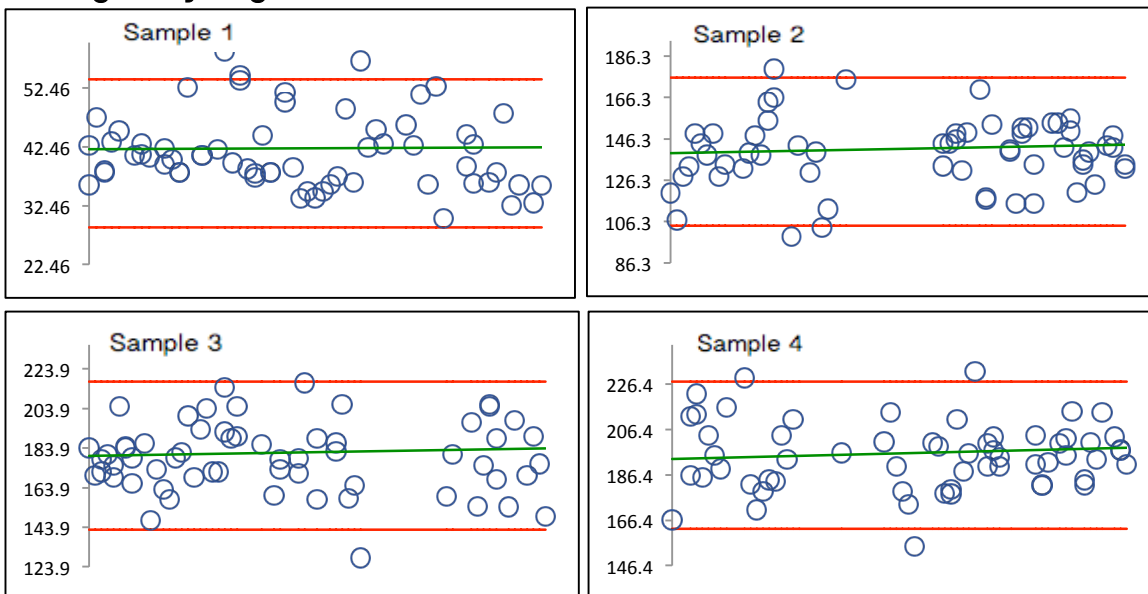
LEAD

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

MANGANESE

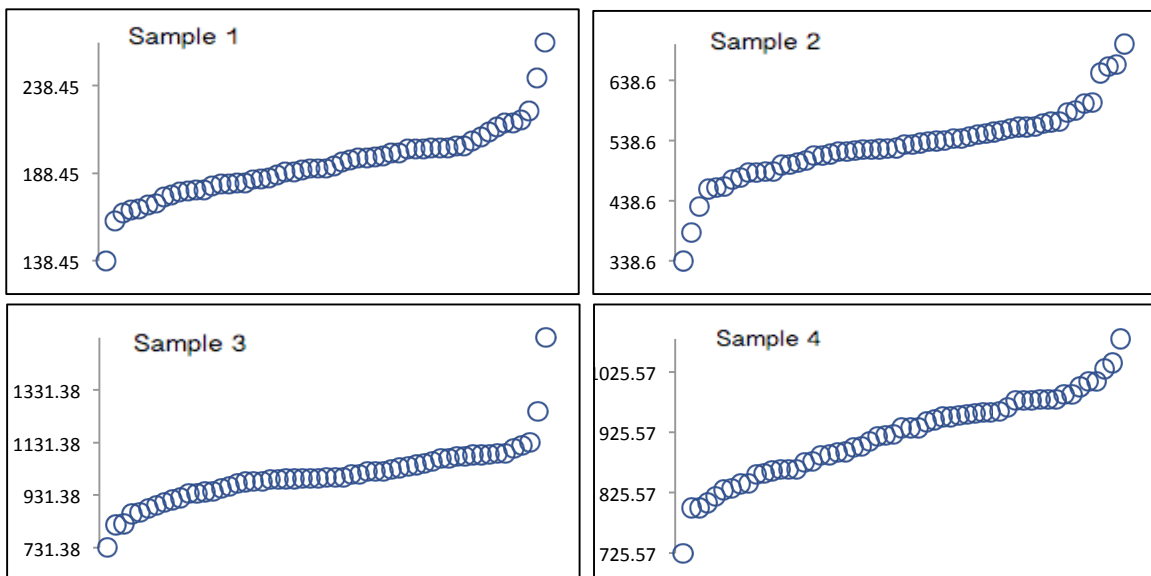
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	55	55	55	55
Median	191	531	997	932
Robust Mean	192	530	1000	920
U	2.9	8.1	14.1	12.1
Robust Standard Deviation	17.4	47.9	83.5	71.7
Regression Standard Deviation	14.1	38.9	73.5	67.5
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	17.4	47.9	83.5	71.7
Outliers	0	0	0	0
$ z > 3.0$	2	3	2	0
$2 < z < 3$	1	4	3	2

Methods Used

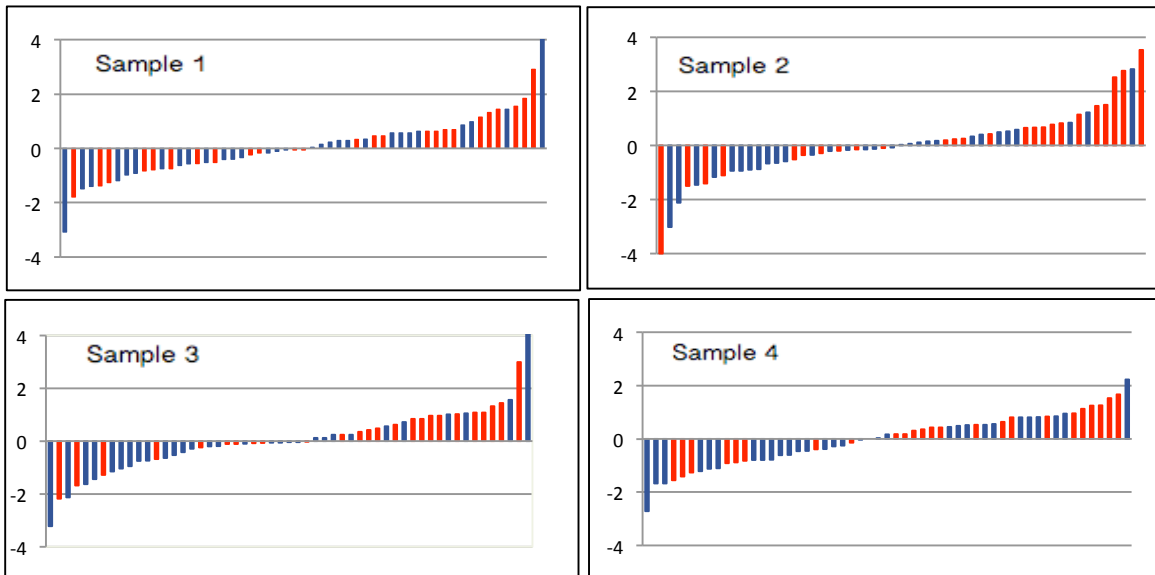
Method	C17-1	C17-2	C17-3	C17-4
ICP/MS	30	30	30	30
ICP/OES	25	25	25	25

All summary stats and the plots below are based on the data excluding any flagged outliers

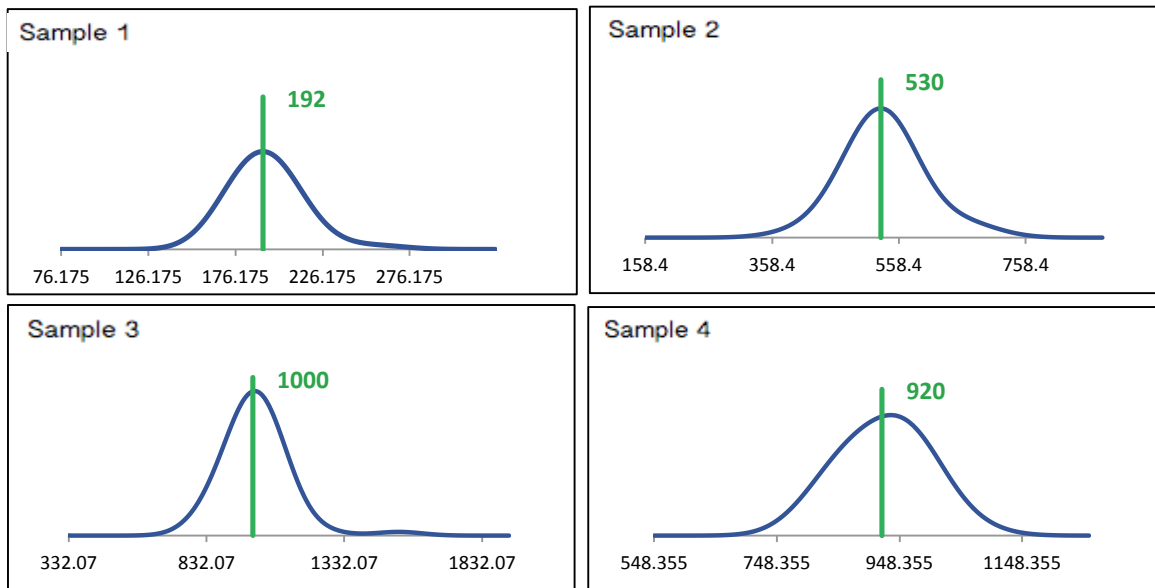


MANGANESE

z-Score Plots

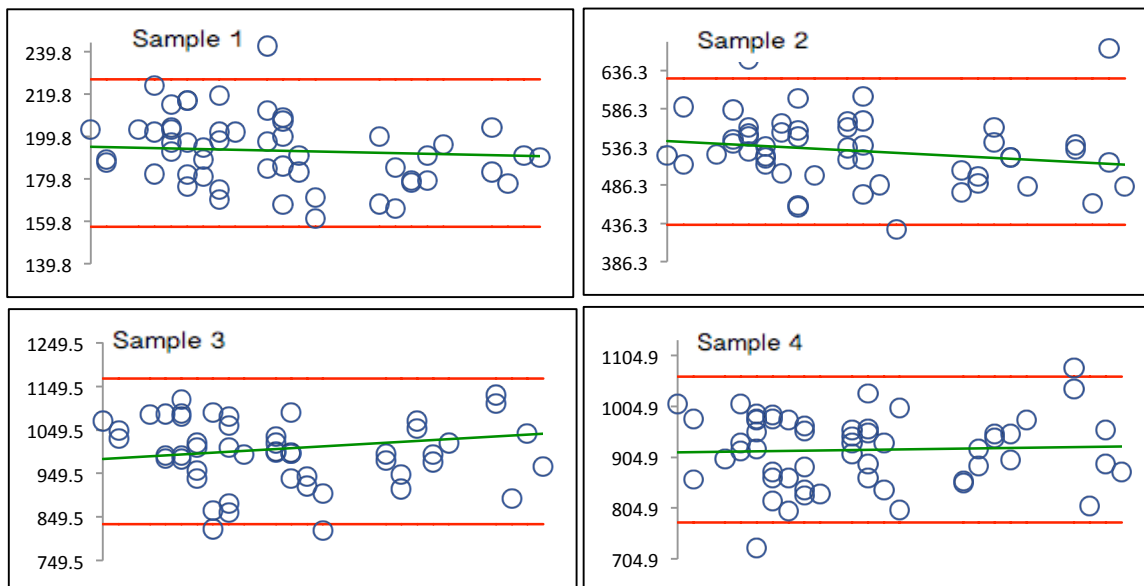


Kernel Density Plots



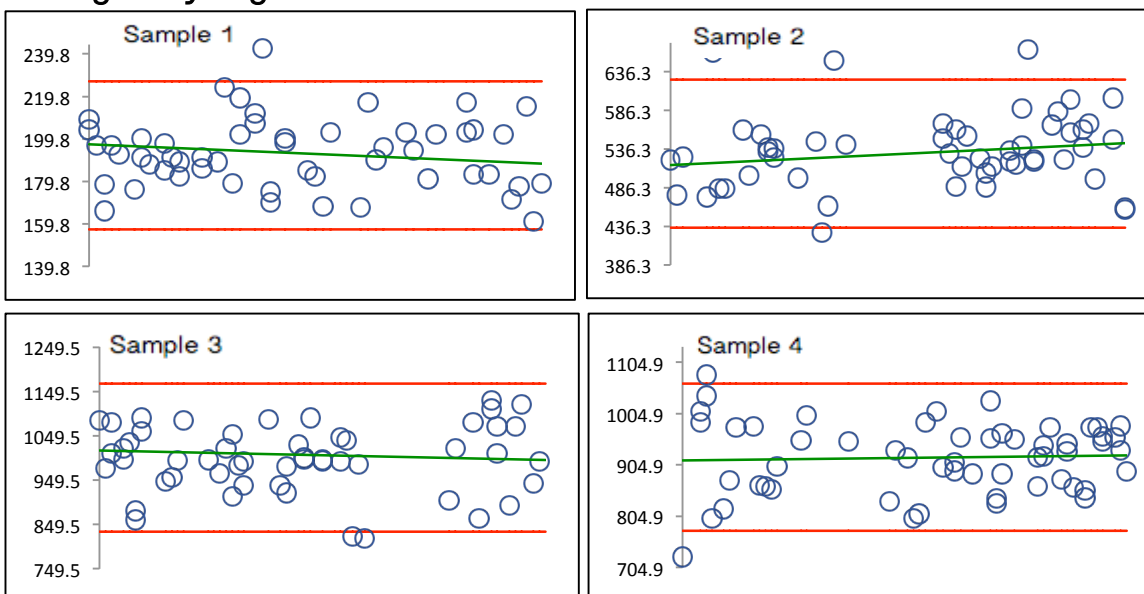
MANGANESE

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

MERCURY

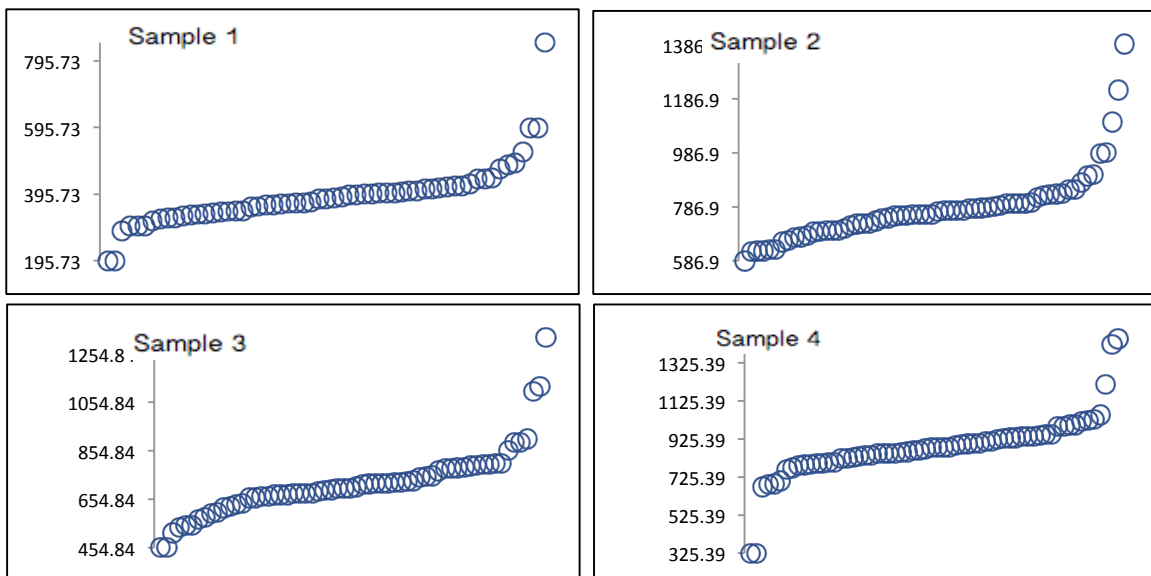
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	59	62	62	62
Median	382	766	703	879
Robust Mean	380	763	708	879
U	9.5	13.9	15.9	15.8
Robust Standard Deviation	58.3	87.5	100	99.7
Regression Standard Deviation	97.0	195	181	224
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	97.0	195	181	224
Outliers	2	2	2	2
$ z > 3.0$	1	1	1	0
$2 < z < 3$	2	1	2	4

Methods Used

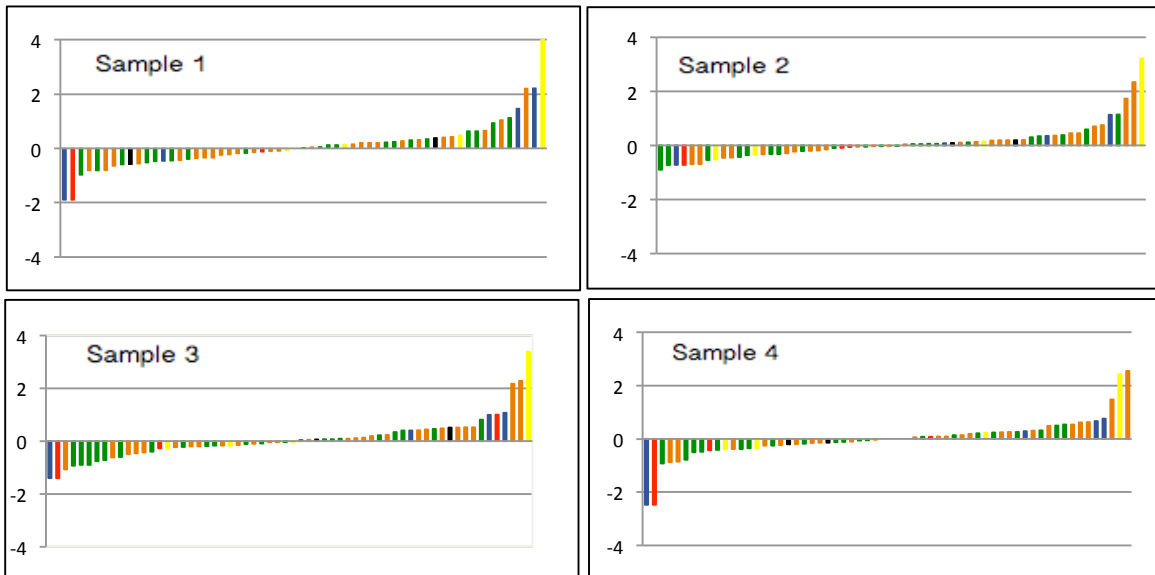
Method	C17-1	C17-2	C17-3	C17-4
PYRO-AA	4	4	4	4
ICP/OES	2	3	3	3
ICP/MS	20	22	22	22
CVAP	27	27	27	27
CVAFS	2	2	2	2
AF	4	4	4	4

All summary stats and the plots below are based on the data excluding any flagged outliers

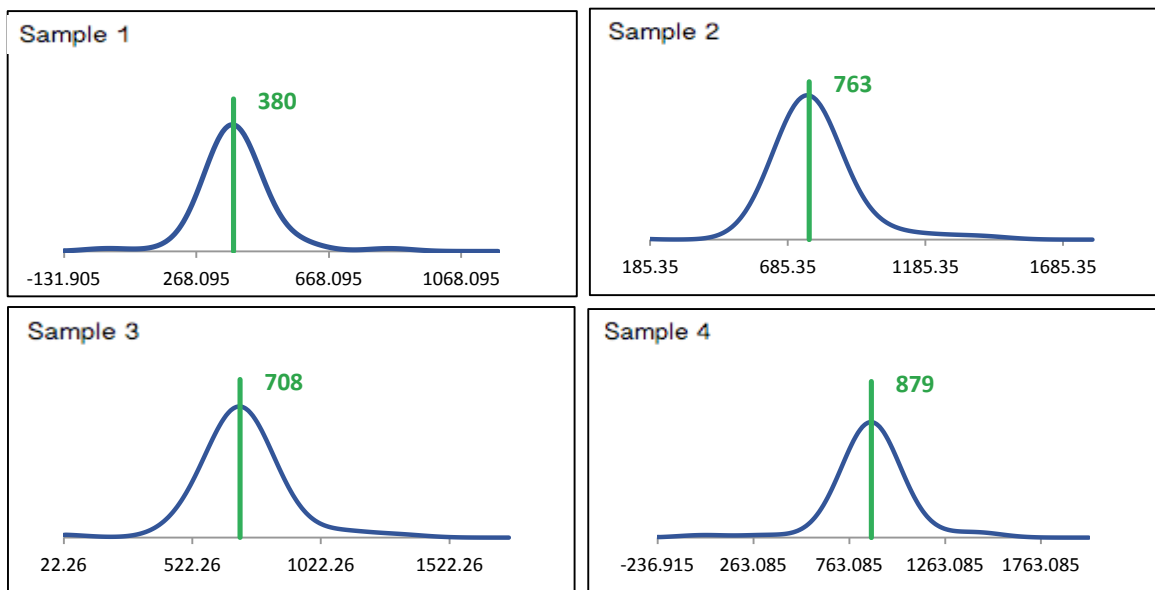


MERCURY

z-Score Plots

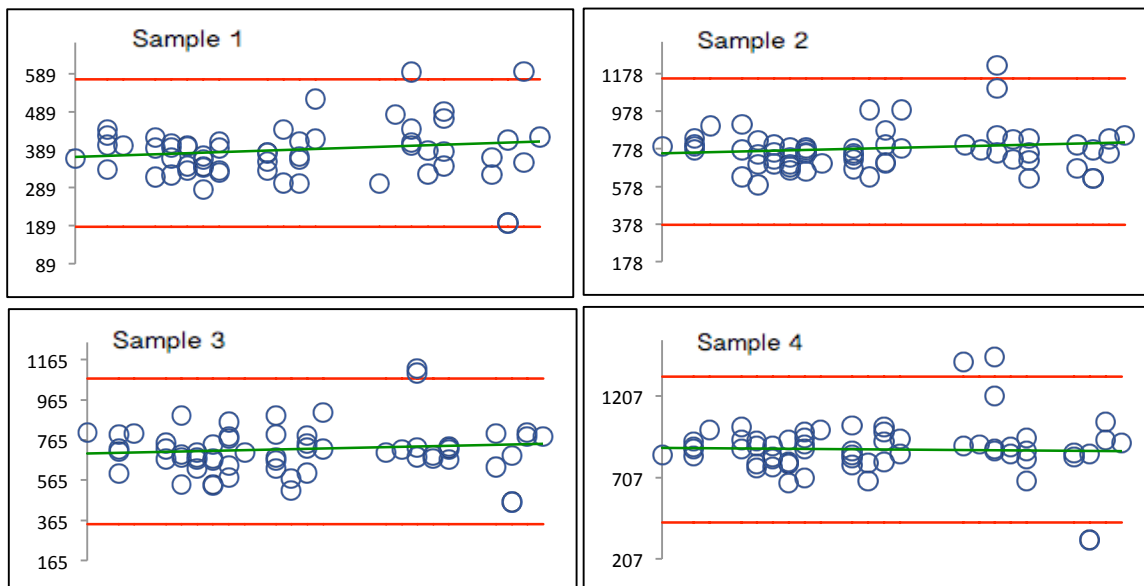


Kernel Density Plots



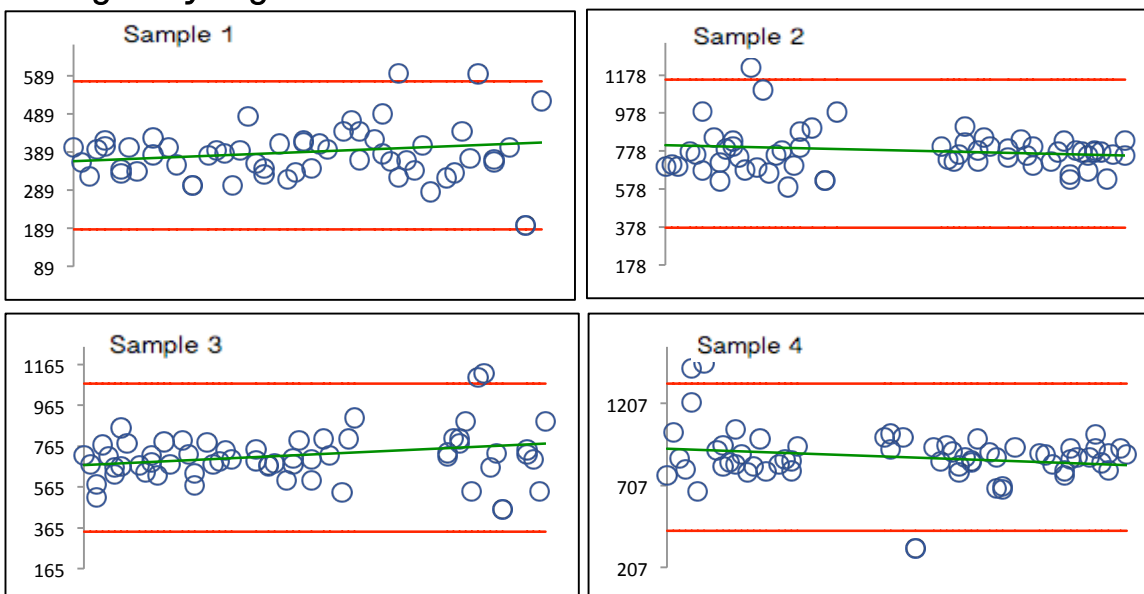
MERCURY

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

NICKEL

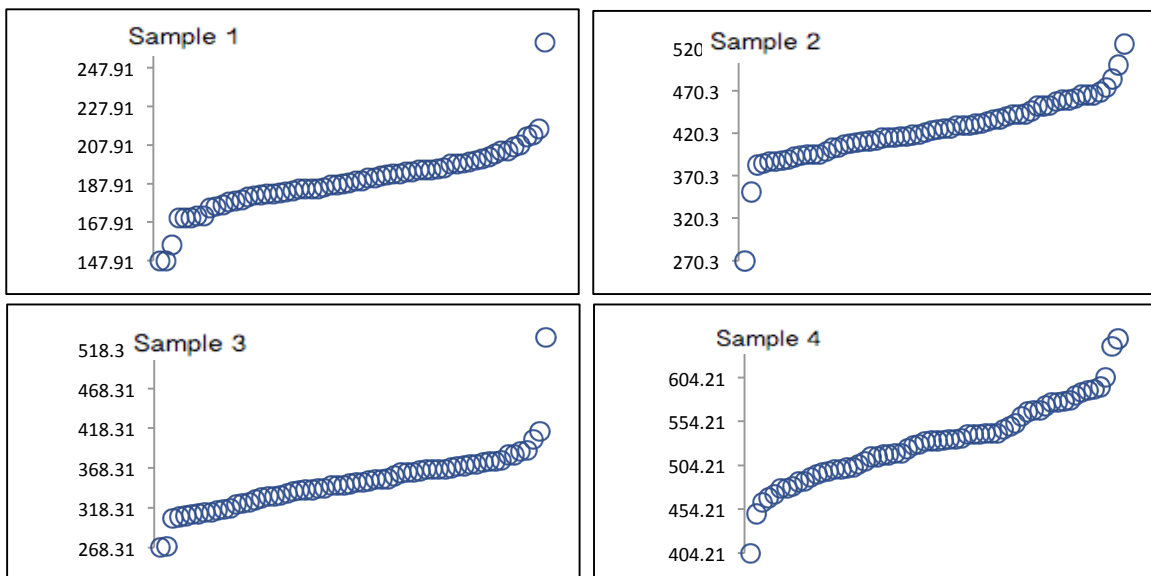
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	62	62	62	62
Median	189	424	349	532
Robust Mean	189	425	348	530
U	2.1	5.0	4.7	7.0
Robust Standard Deviation	13.1	31.2	29.6	43.7
Regression Standard Deviation	19.5	43.8	35.9	54.6
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	19.5	43.8	35.9	54.6
Outliers	0	0	0	0
$ z > 3.0$	1	1	1	0
$2 < z < 3$	2	1	2	3

Methods Used

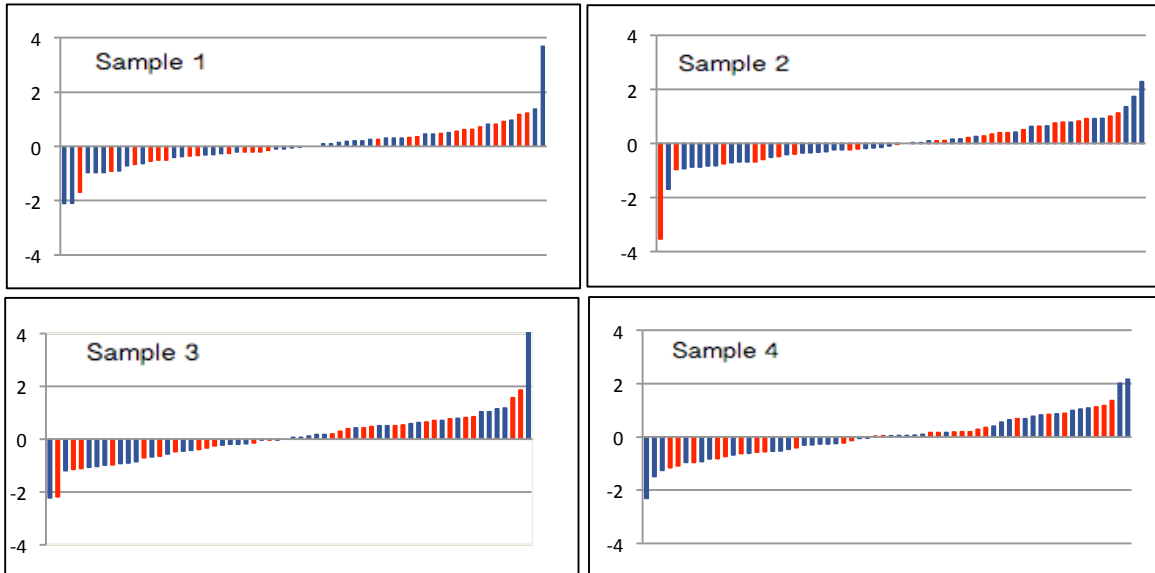
Method	C17-1	C17-2	C17-3	C17-4
ICP/MS	36	36	36	36
ICP/OES	26	26	26	26

All summary stats and the plots below are based on the data excluding any flagged outliers

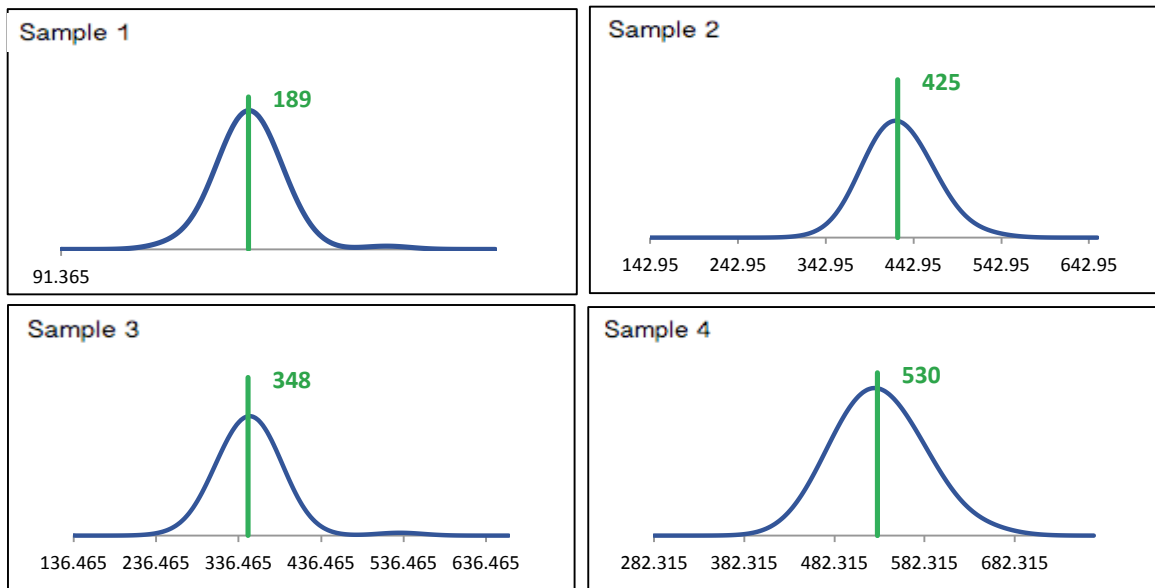


NICKEL

z-Score Plots

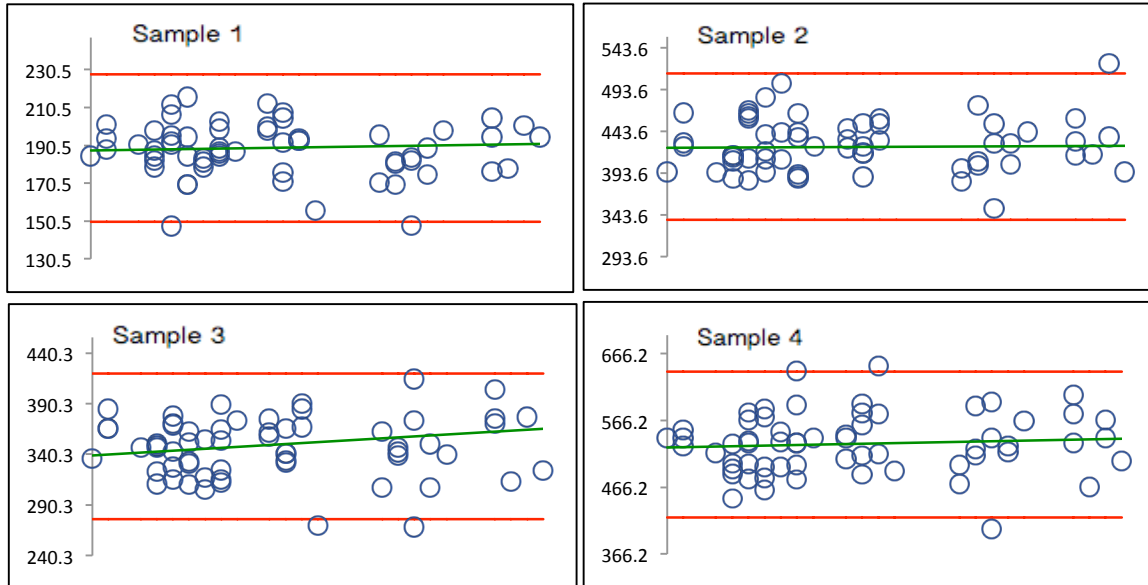


Kernel Density Plots



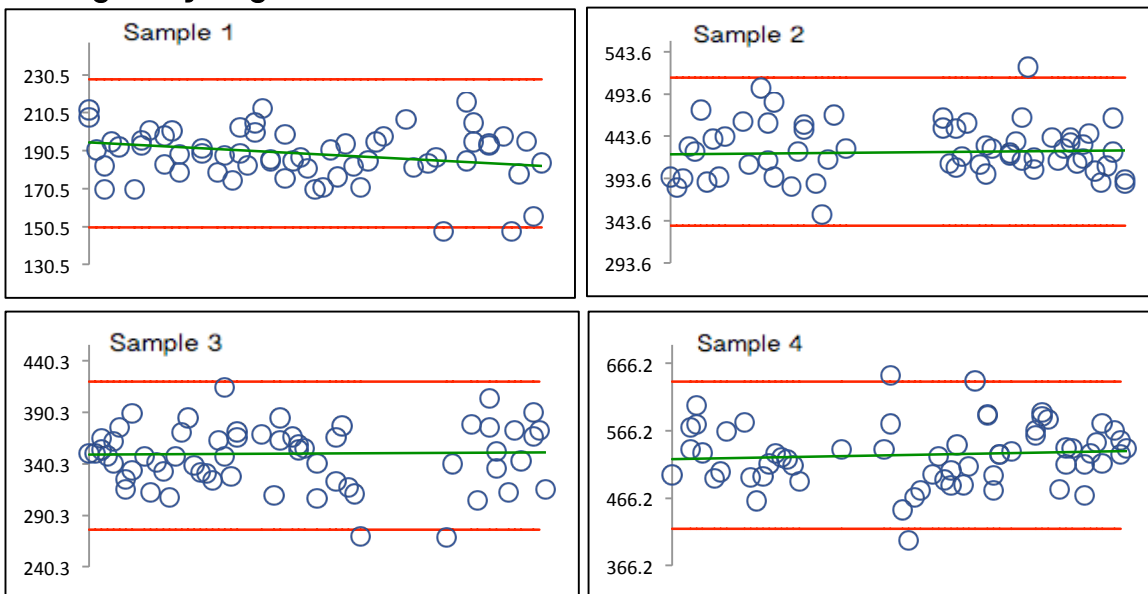
NICKEL

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

STRONTIUM

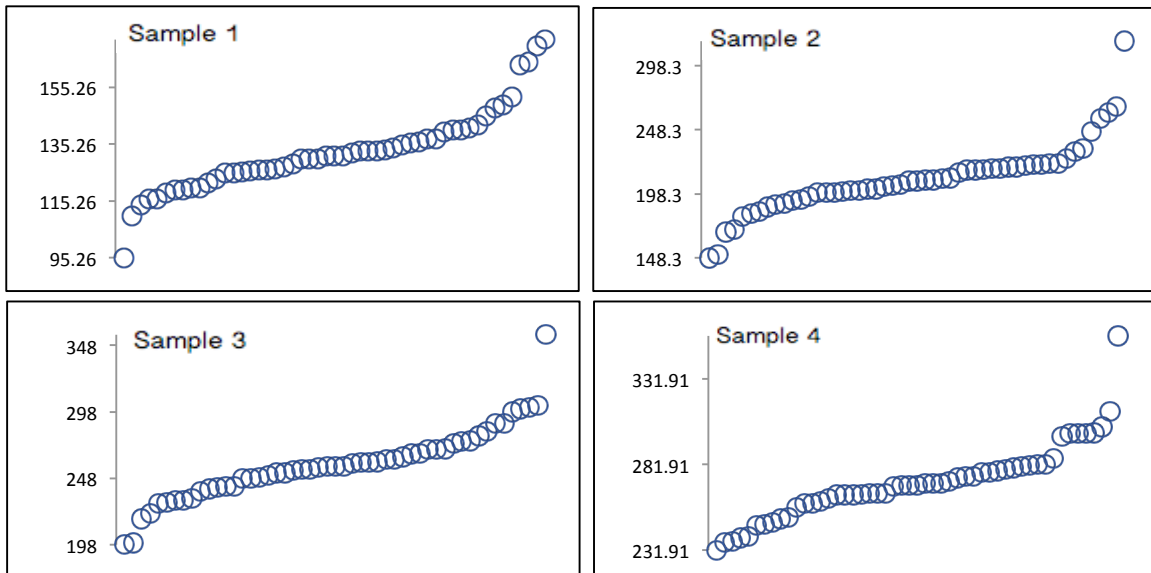
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	51	51	51	51
Median	131	208	257	270
Robust Mean	131	208	258	270
U	2.1	3.4	4.1	3.6
Robust Standard Deviation	11.9	19.6	23.5	20.4
Regression Standard Deviation	11.9	18.6	22.9	24.0
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	11.9	19.6	23.5	24.0
Outliers	0	0	0	0
$ z > 3.0$	2	3	1	1
$2 < z < 3$	3	4	2	0

Methods Used

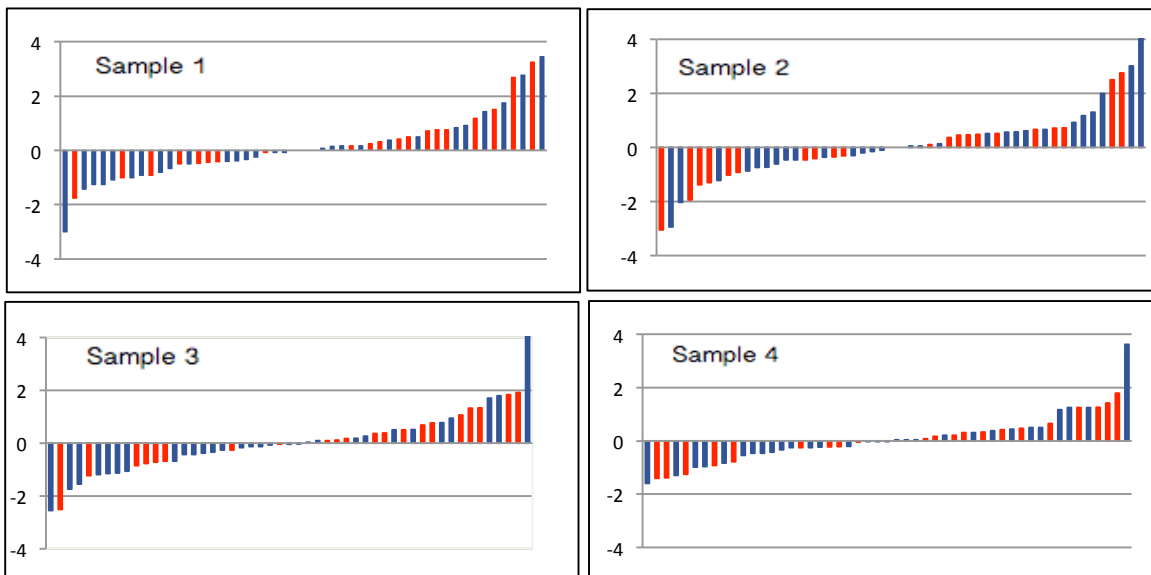
Method	C17-1	C17-2	C17-3	C17-4
ICP/MS	30	30	30	30
ICP/OES	21	21	21	21

All summary stats and the plots below are based on the data excluding any flagged outliers

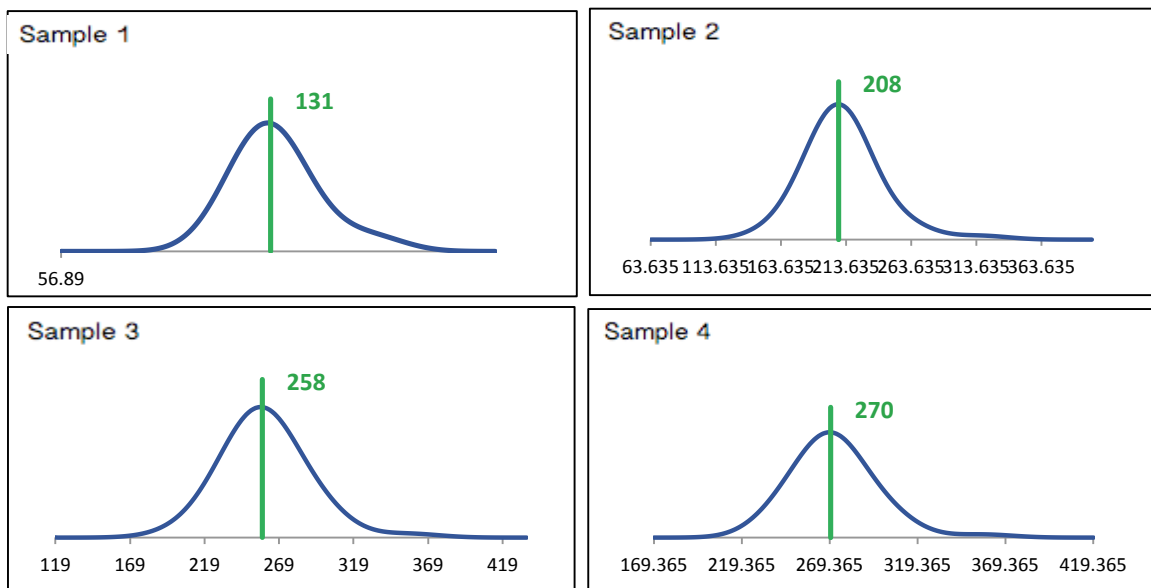


STRONTIUM

z-Score Plots

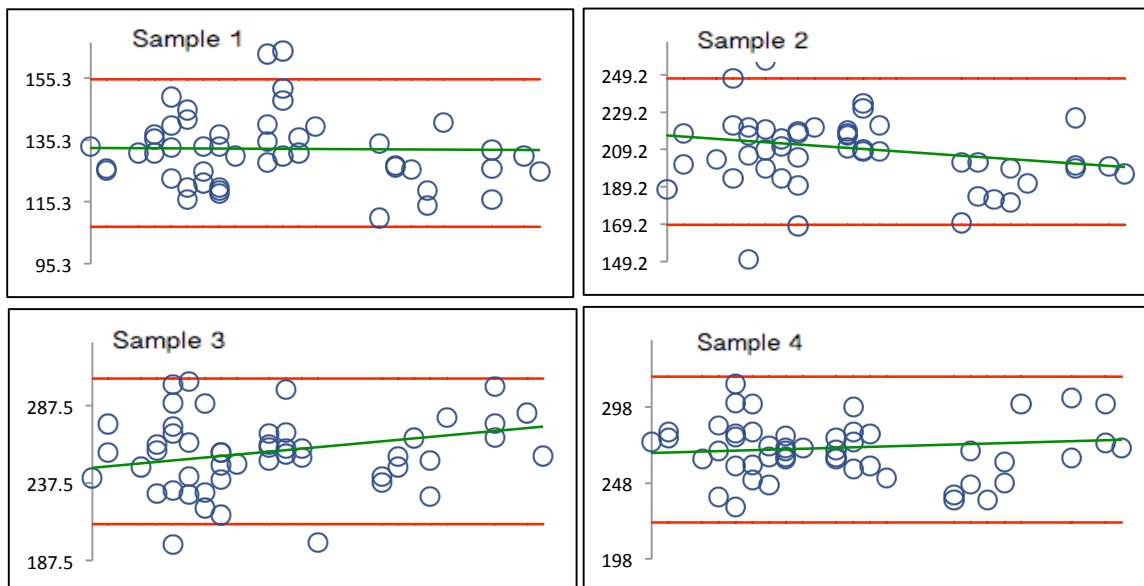


Kernel Density Plots



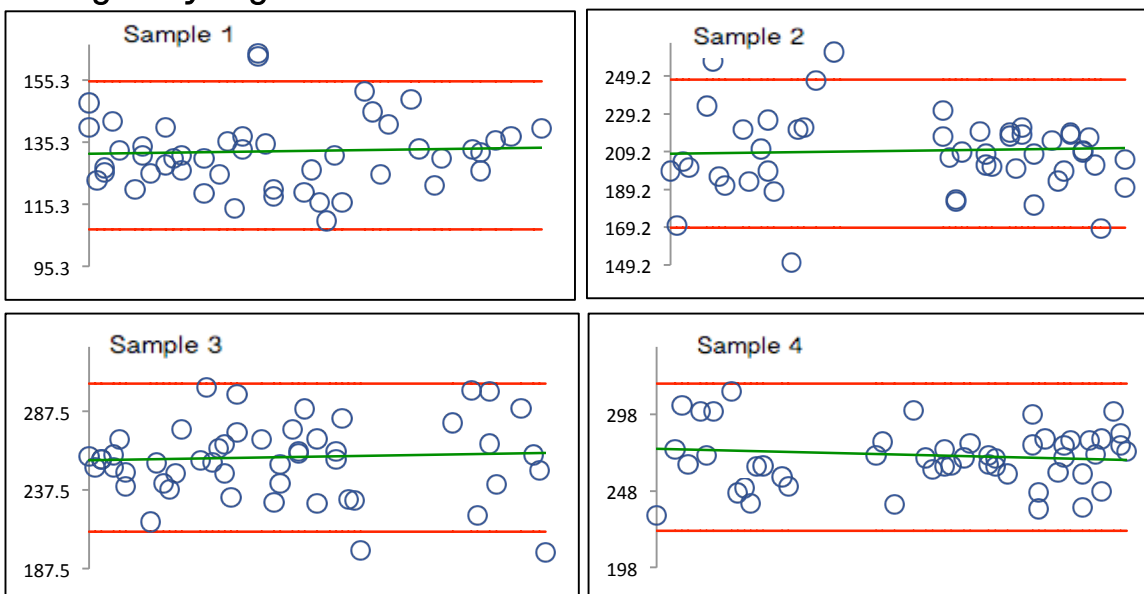
STRONTIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

TIN

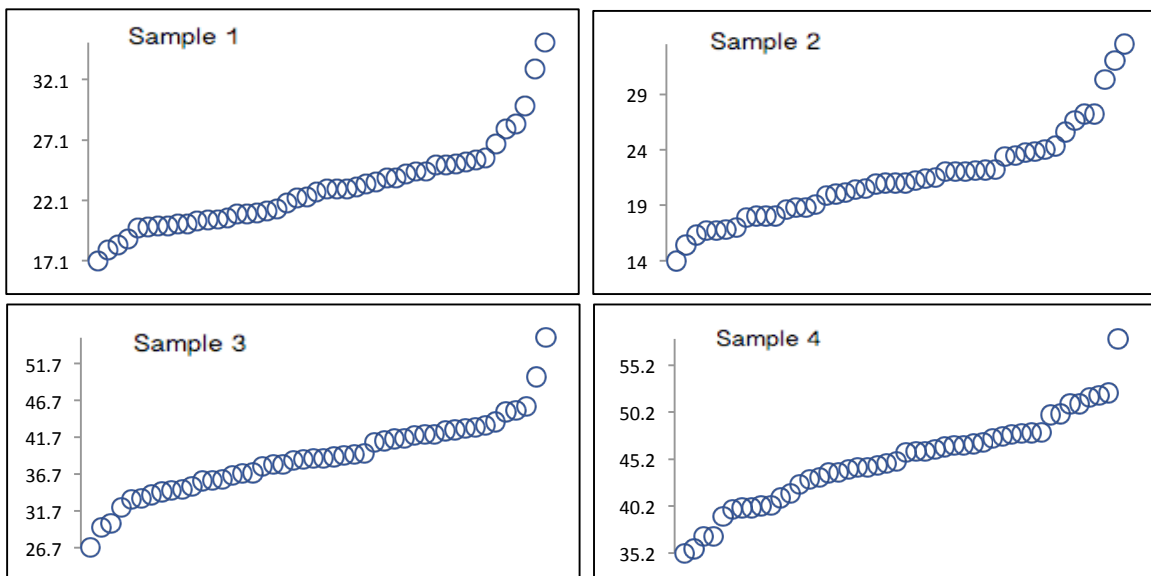
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	46	46	46	46
Median	22.9	21.0	38.8	45.5
Robust Mean	22.7	21.1	38.9	45.0
U	0.57	0.68	0.88	0.88
Robust Standard Deviation	3.07	3.70	4.75	4.76
Regression Standard Deviation	6.07	5.68	9.94	11.4
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	6.07	5.68	9.94	11.4
Outliers	0	0	0	0
$ z > 3.0$	0	0	0	0
$2 < z < 3$	1	1	0	0

Methods Used

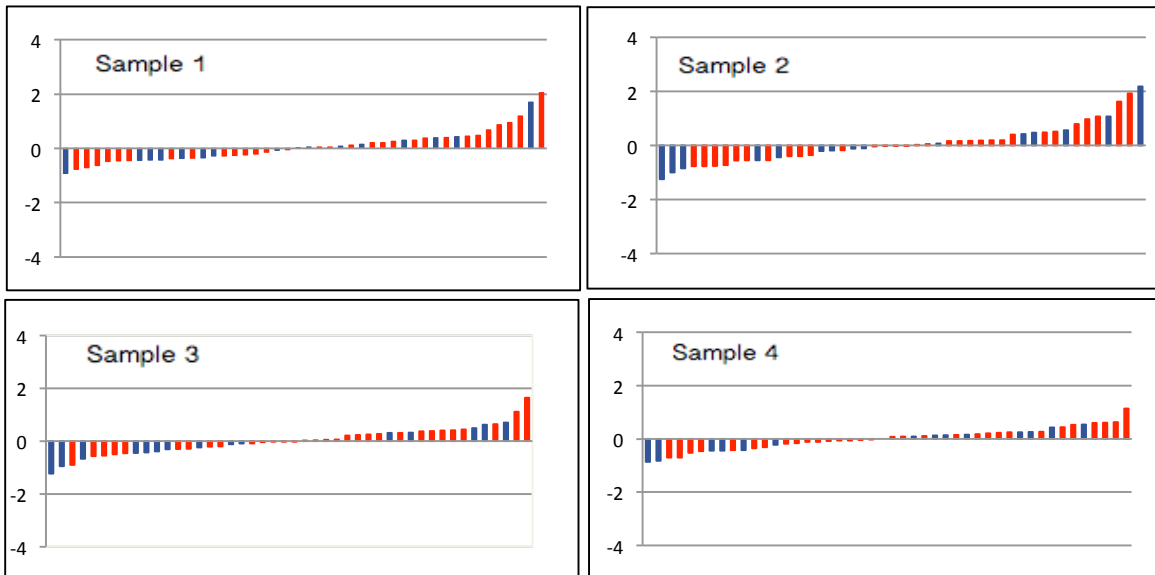
Method	C17-1	C17-2	C17-3	C17-4
ICP/OES	15	15	15	15
ICP/MS	31	31	31	31

All summary stats and the plots below are based on the data excluding any flagged outliers

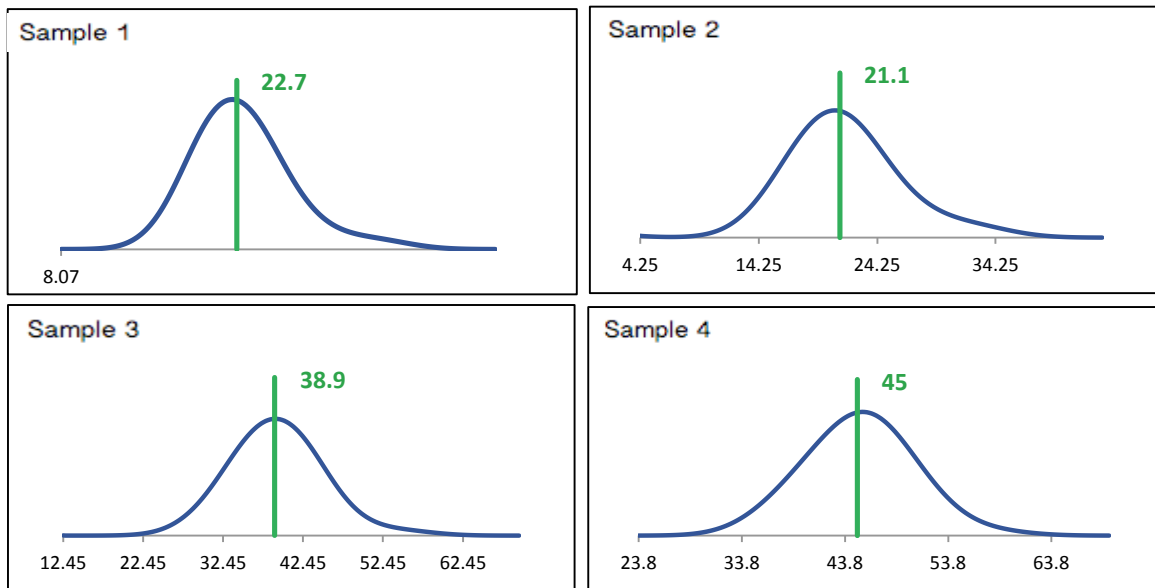


TIN

z-Score Plots

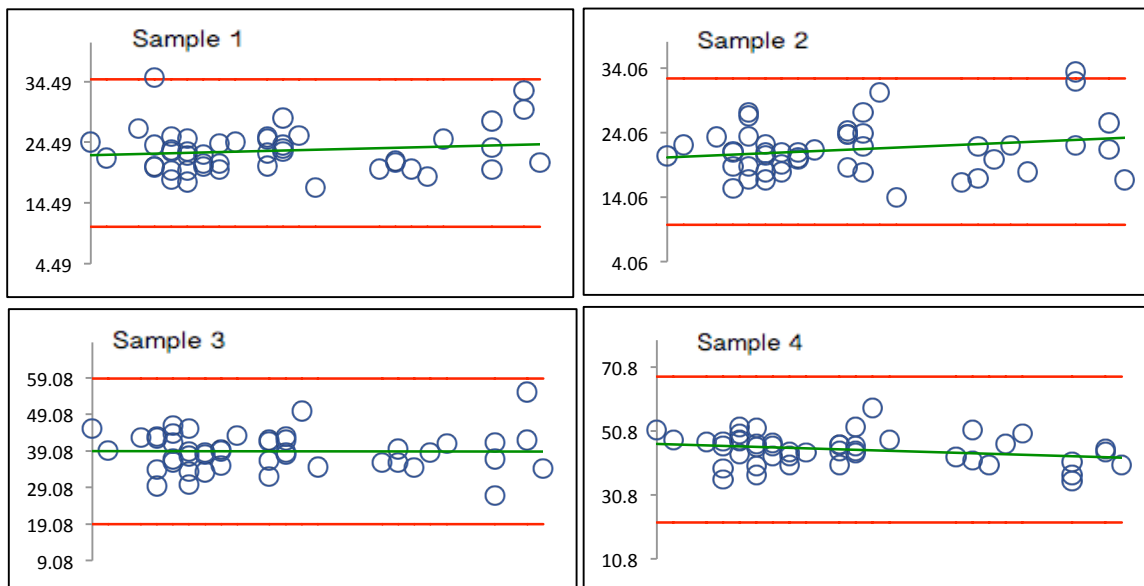


Kernel Density Plots



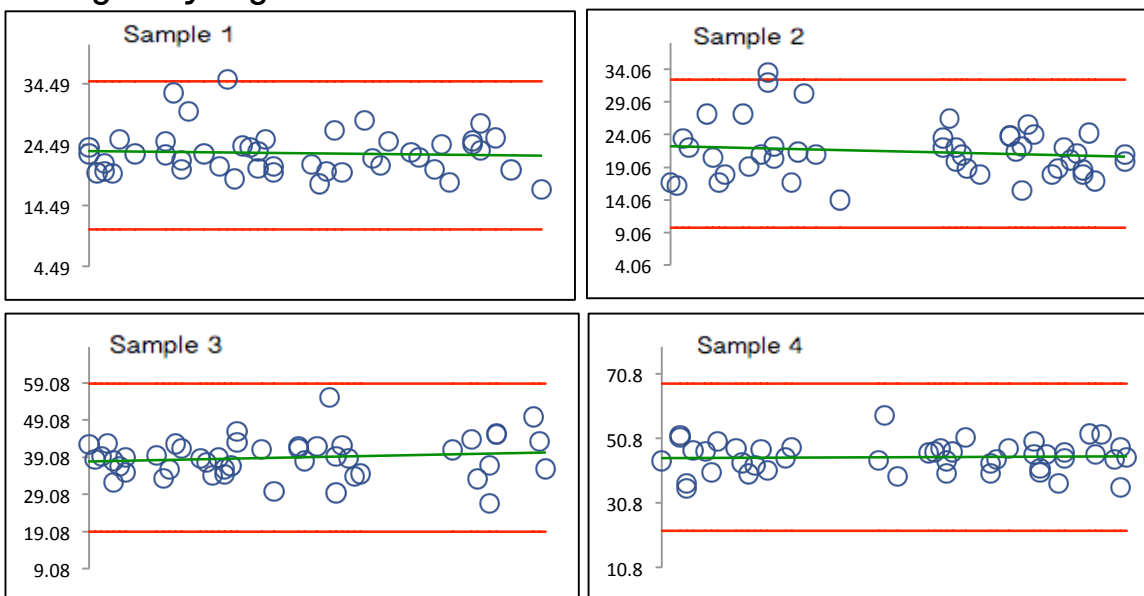
TIN

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

TITANIUM

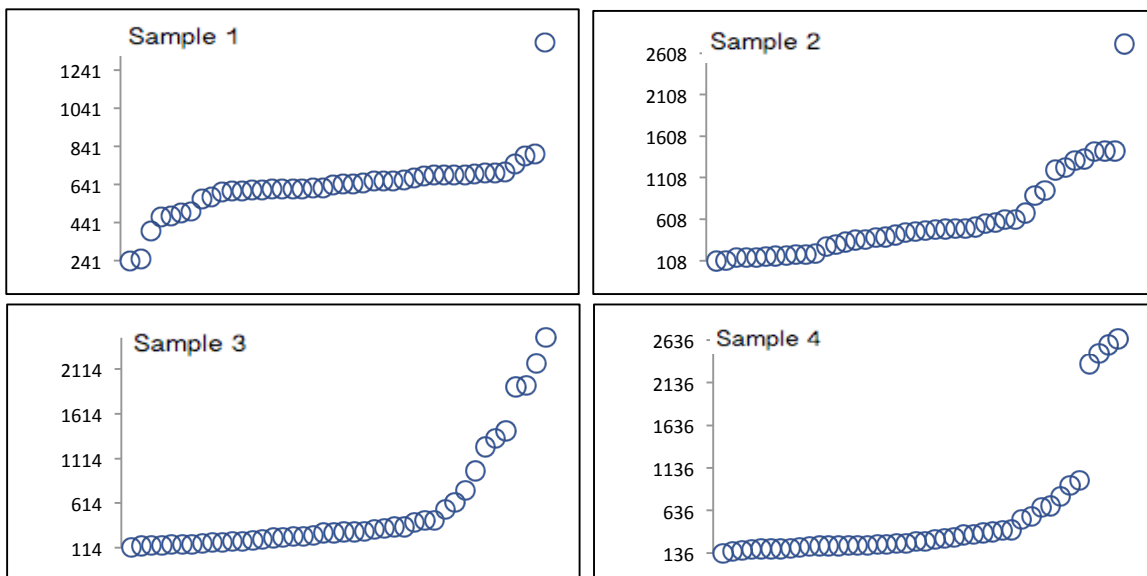
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	42	42	42	42
Median	639	463	287	271
Robust Mean	633	529	371	361
U	16.3	76.2	51.7	43.2
Robust Standard Deviation	84.3	395	268	224
Regression Standard Deviation	174	148	108	106
Stability Flag				
Homogeneity Flag			Homogeneity	Homogeneity
Standard Deviation Used (SDPA)	174	395	697	819
Outliers	0	0	0	0
$ z > 3.0$	1	1	1	0
$2 < z < 3$	2	4	3	4

Methods Used

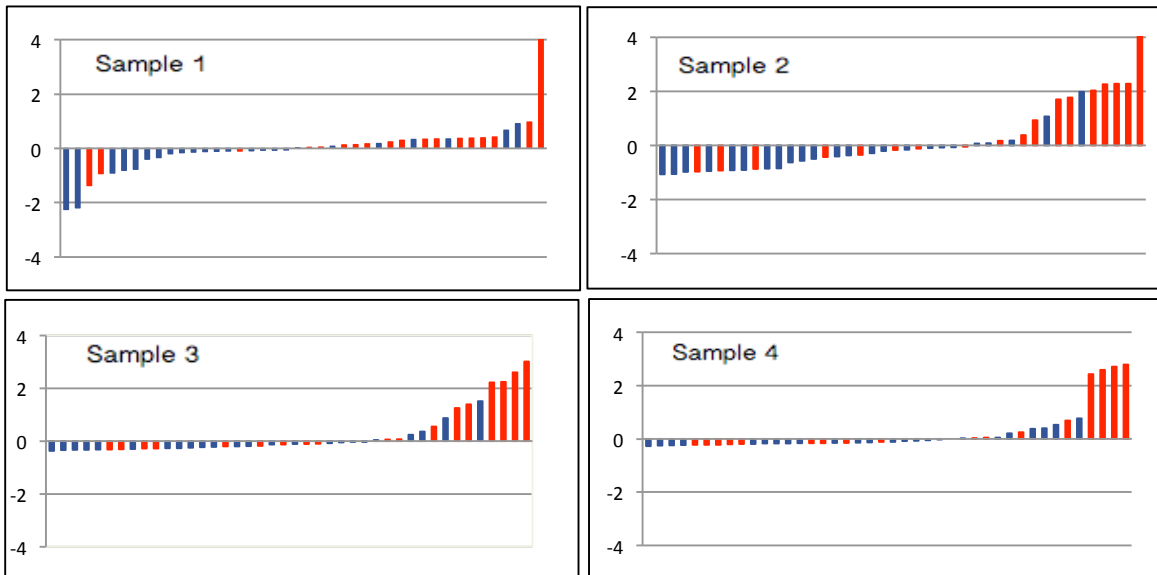
Method	C17-1	C17-2	C17-3	C17-4
ICP/MS	24	24	24	24
ICP/OES	18	18	18	18

All summary stats and the plots below are based on the data excluding any flagged outliers

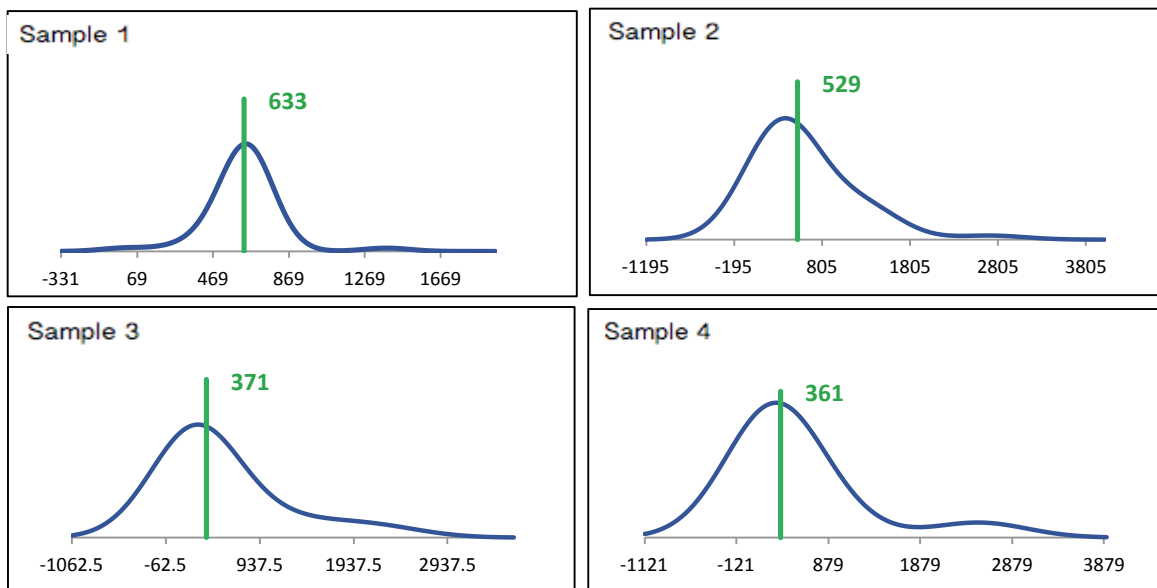


TITANIUM

z-Score Plots

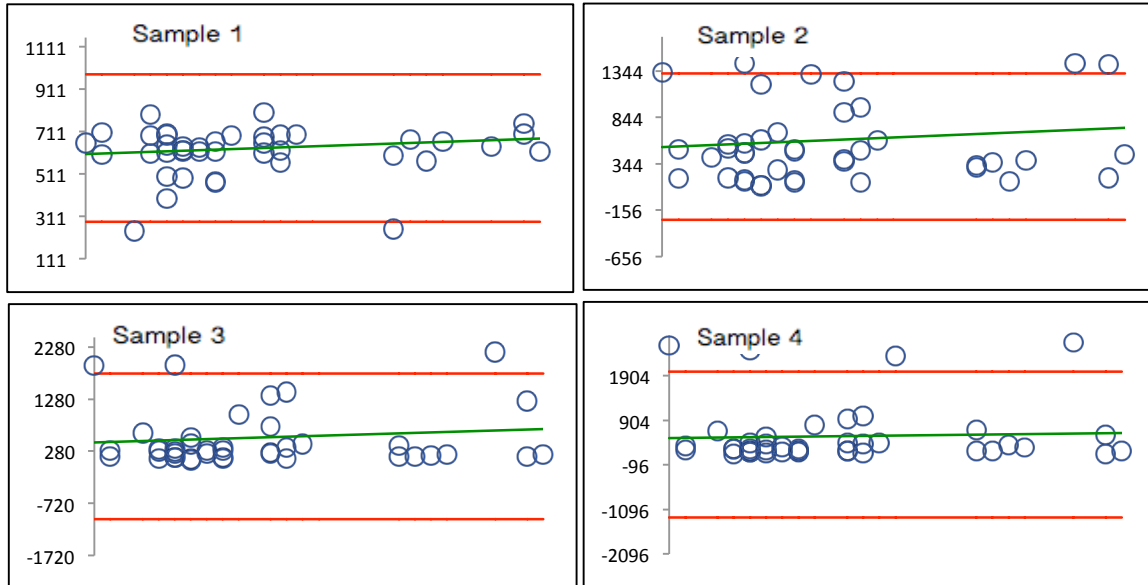


Kernel Density Plots



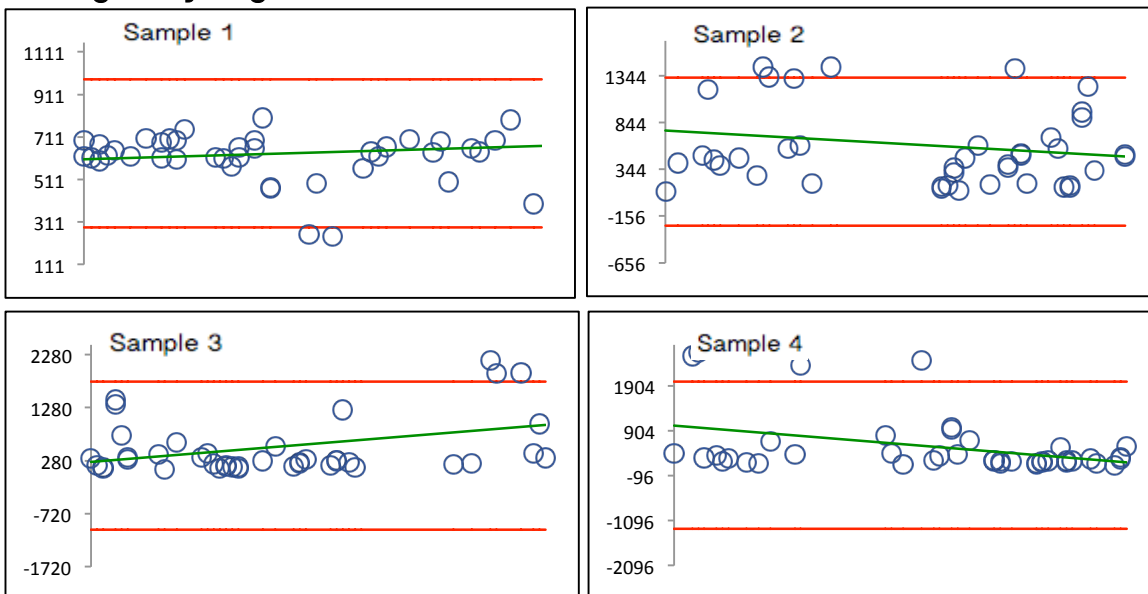
TITANIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

URANIUM

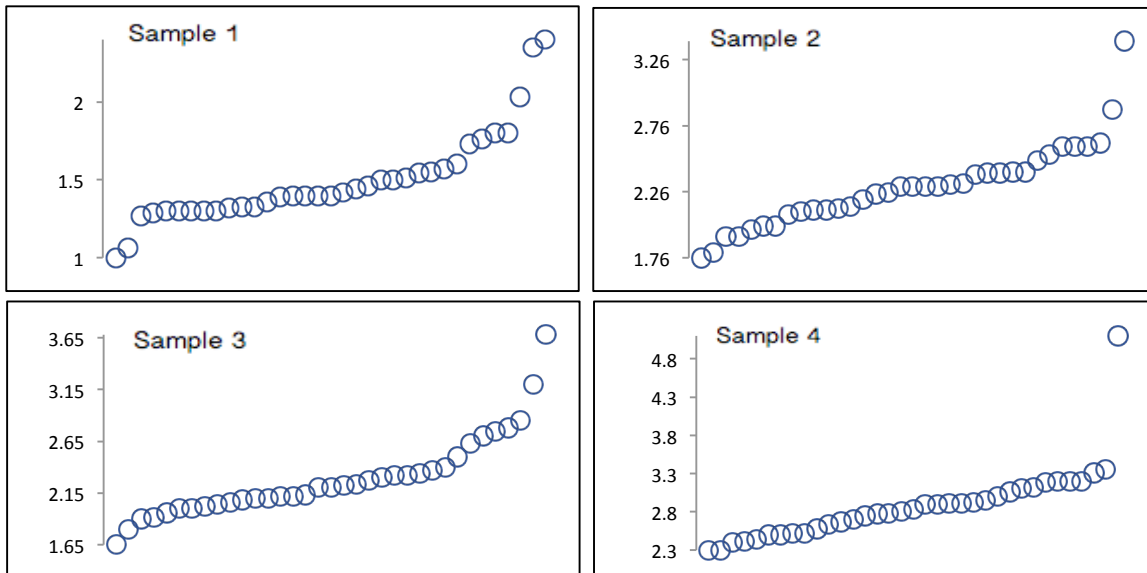
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	35	35	35	35
Median	1.40	2.30	2.20	2.83
Robust Mean	1.46	2.28	2.25	2.83
U	0.046	0.058	0.069	0.074
Robust Standard Deviation	0.216	0.273	0.327	0.350
Regression Standard Deviation	0.192	0.263	0.261	0.311
Stability Flag			Stability	
Homogeneity Flag				
Standard Deviation Used (SDPA)	0.216	0.273	0.479	0.350
Outliers	1	1	1	1
$ z > 3.0$	2	1	0	1
$2 < z < 3$	2	1	1	0

Methods Used

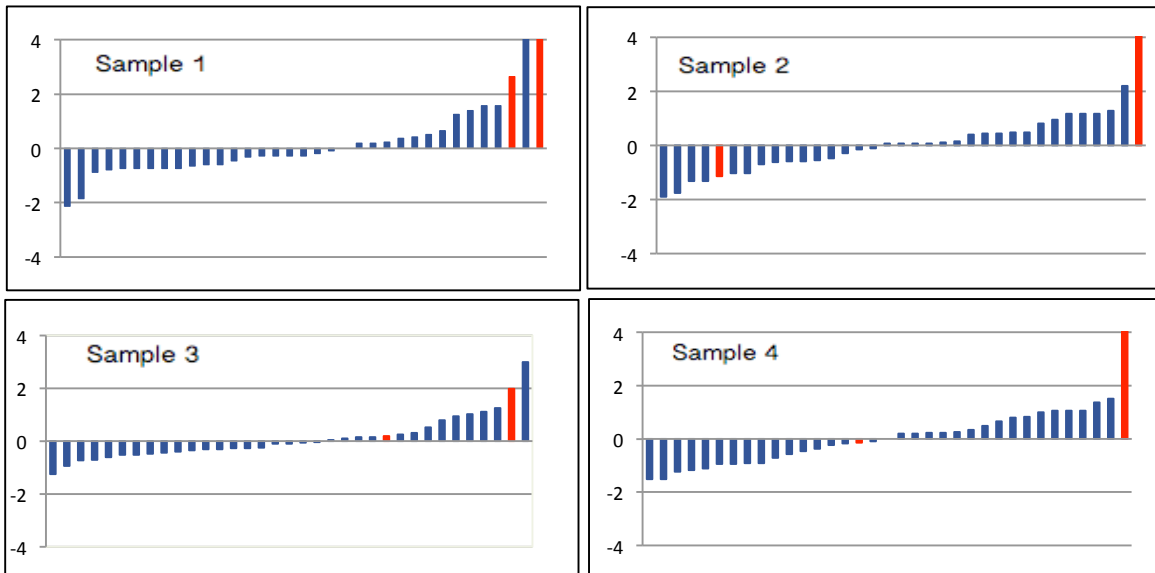
Method	C17-1	C17-2	C17-3	C17-4
ICP/MS	33	33	33	33
ICP/OES	2	2	2	2

All summary stats and the plots below are based on the data excluding any flagged outliers

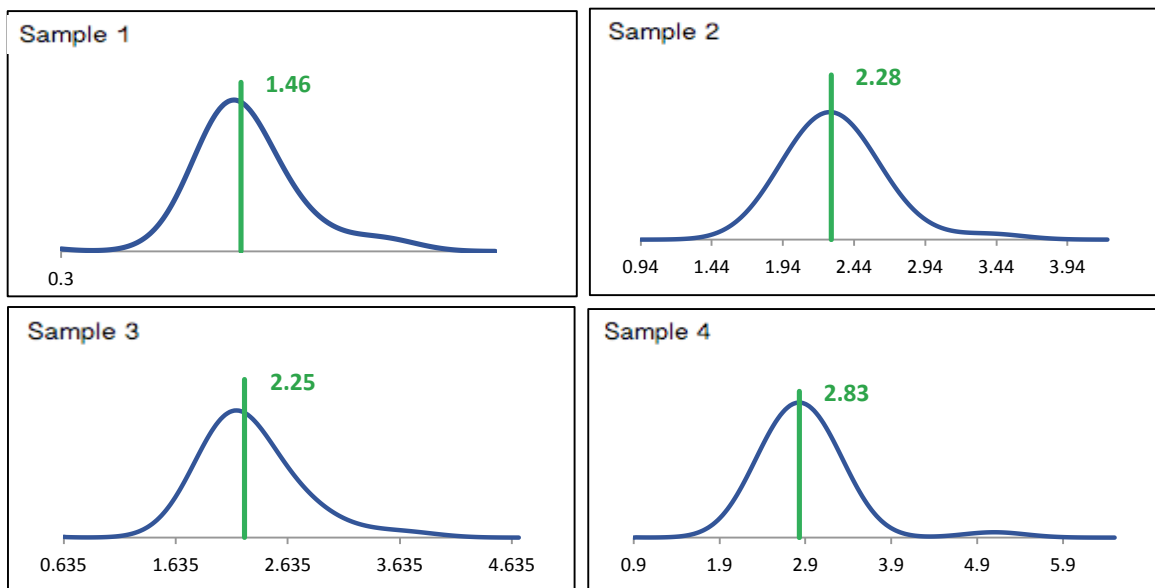


URANIUM

z-Score Plots

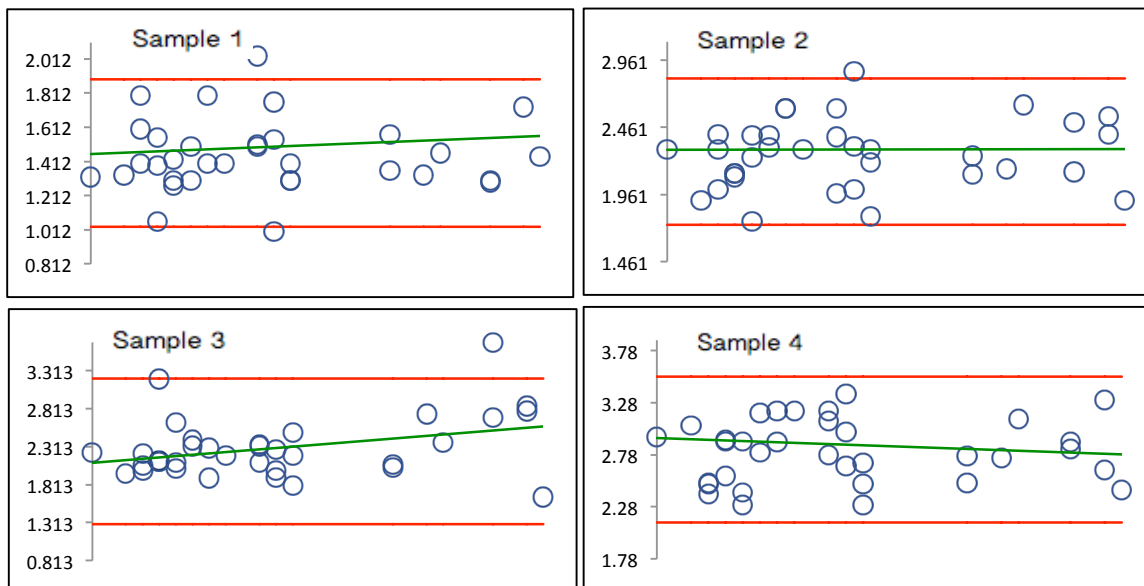


Kernel Density Plots



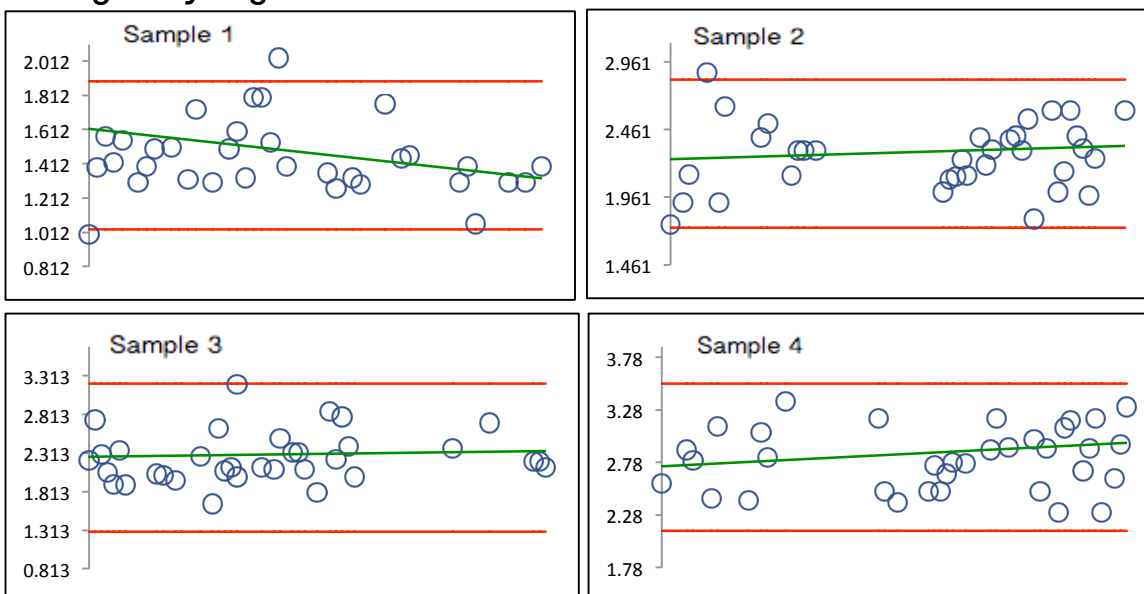
URANIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

VANADIUM

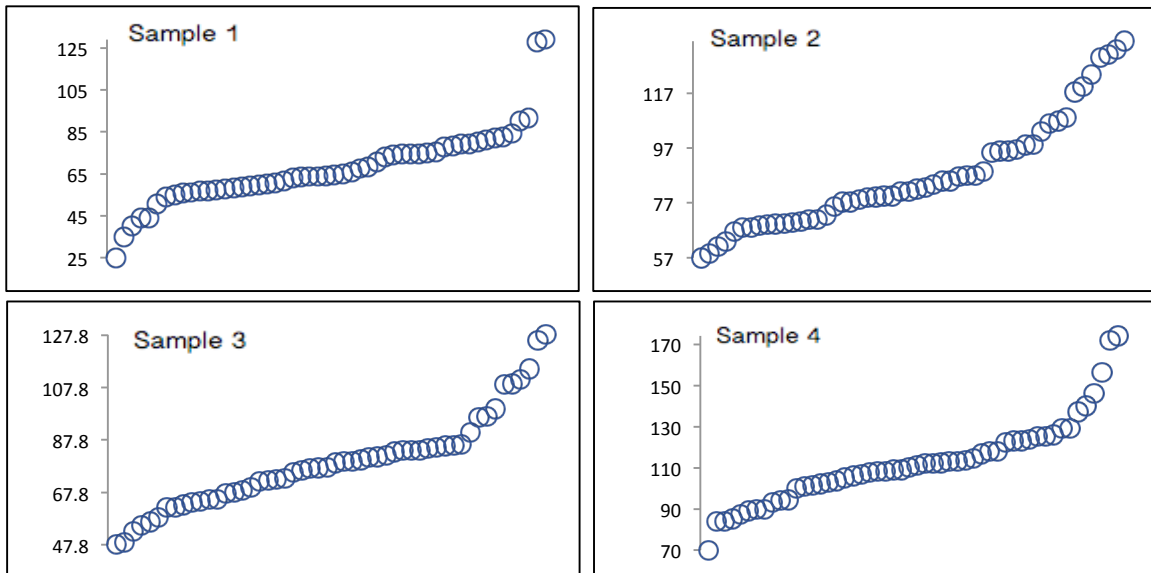
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	52	52	52	52
Median	64.2	81.6	78.2	111
Robust Mean	66.6	85.2	77.7	111
U	2.41	3.29	2.81	3.07
Robust Standard Deviation	13.9	19.0	16.2	17.7
Regression Standard Deviation	9.54	12.2	11.1	15.8
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	13.9	19.0	16.2	17.7
Outliers	0	0	0	0
$ z > 3.0$	2	0	1	2
$2 < z < 3$	2	5	3	2

Methods Used

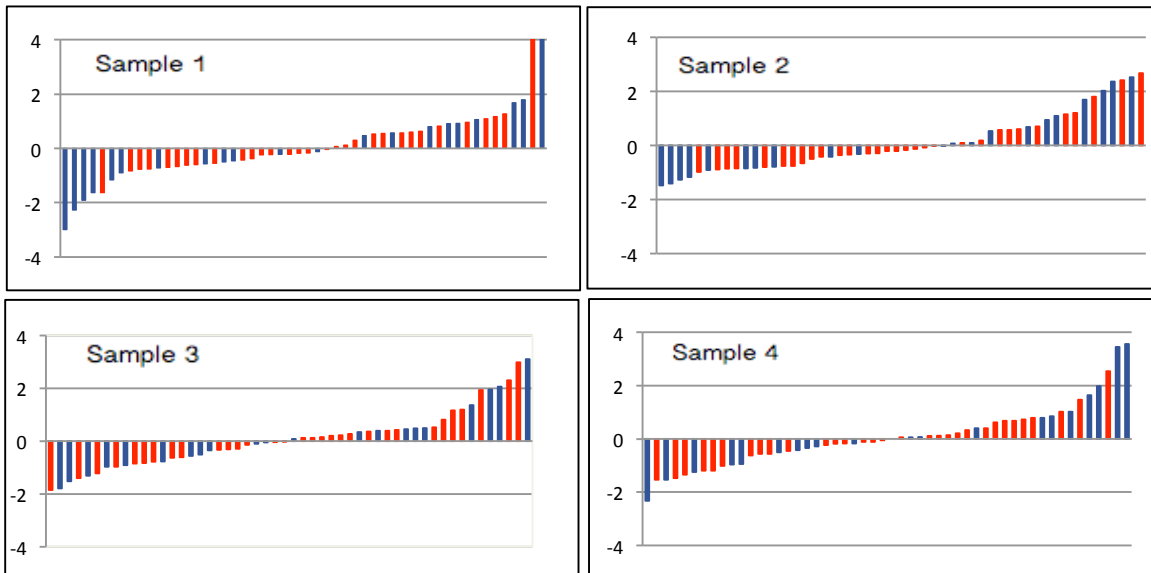
Method	C17-1	C17-2	C17-3	C17-4
ICP/OES	21	21	21	21
ICP/MS	31	31	31	31

All summary stats and the plots below are based on the data excluding any flagged outliers

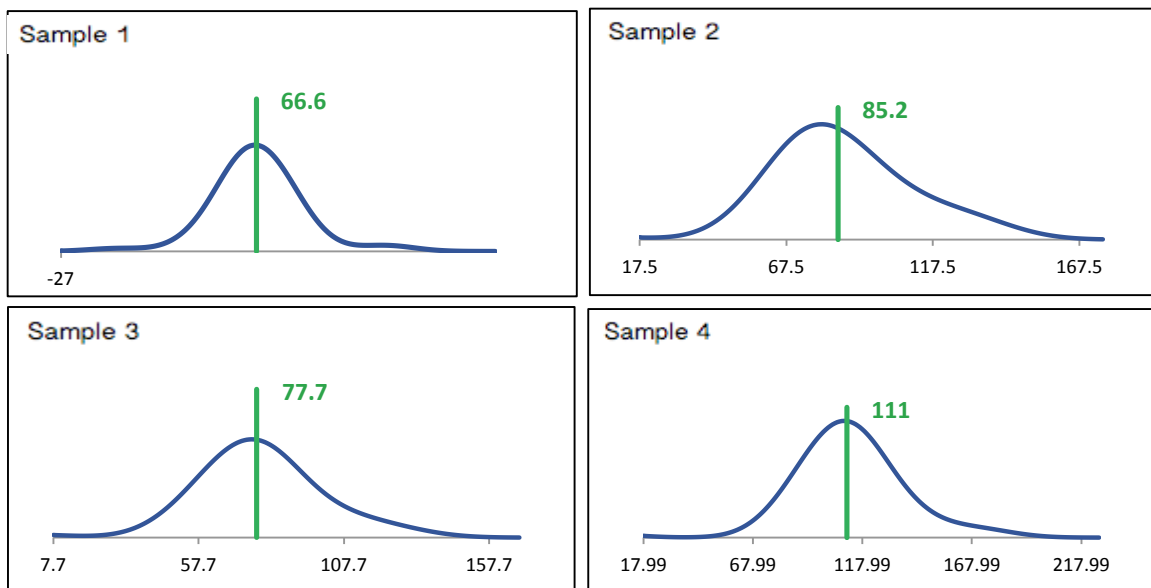


VANADIUM

z-Score Plots

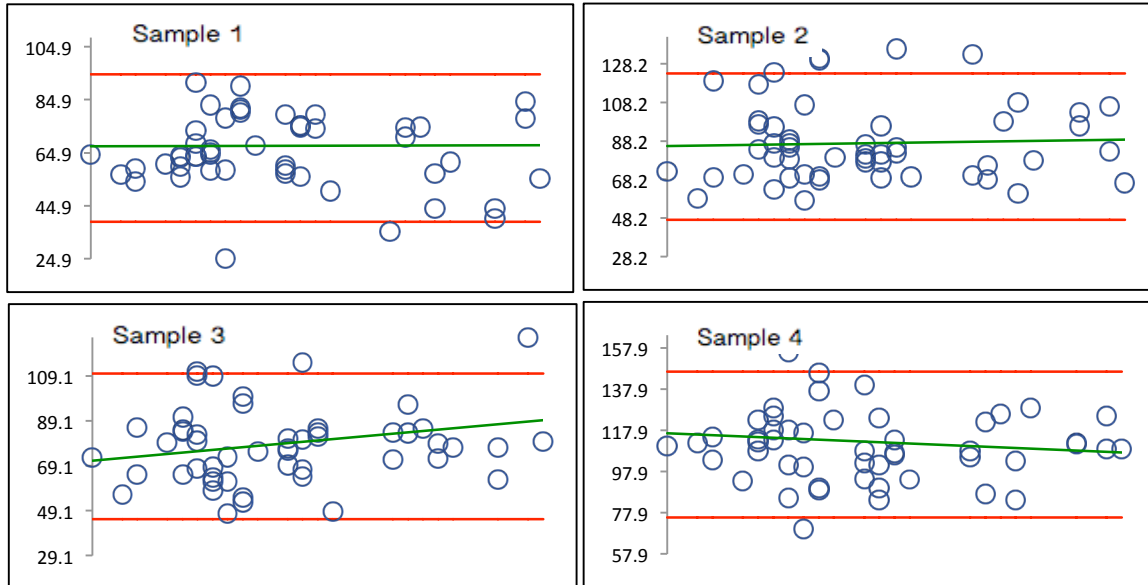


Kernel Density Plots



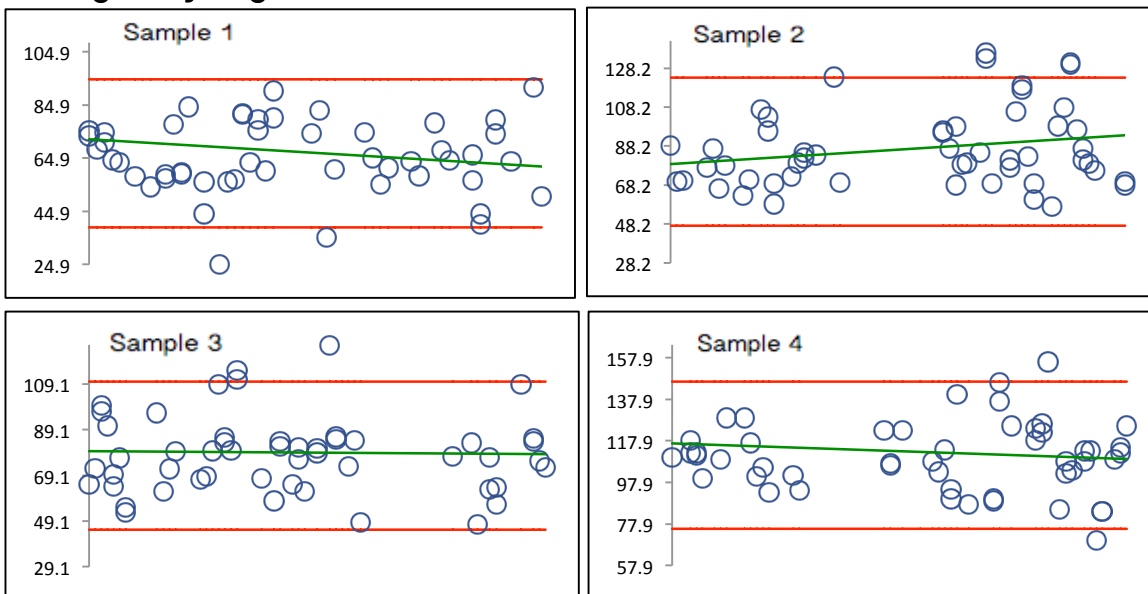
VANADIUM

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).

ZINC

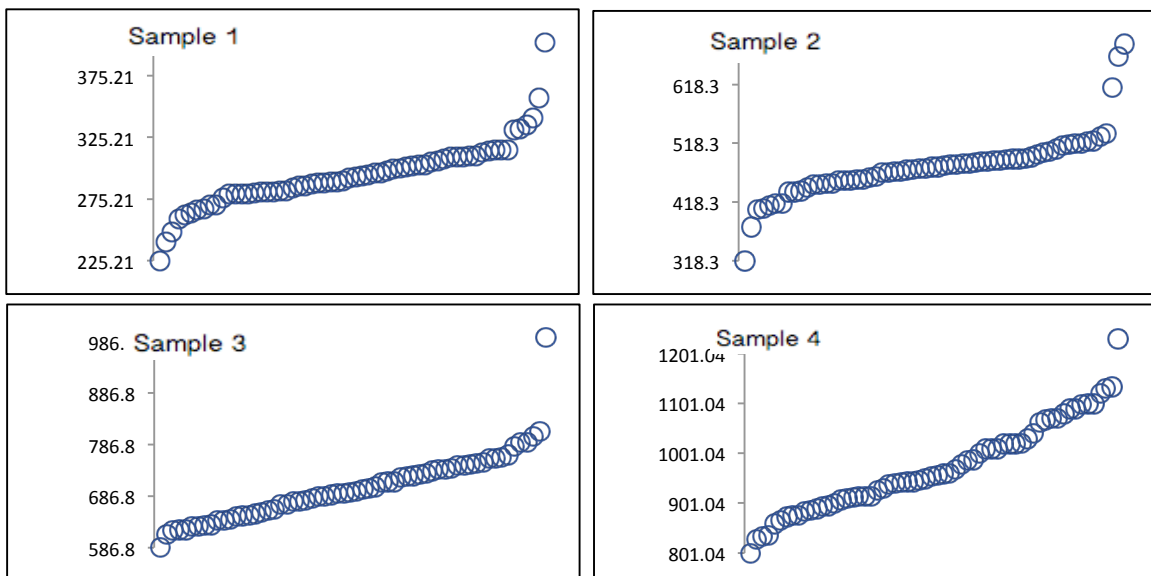
Summary Statistics

Statistic	C17-1	C17-2	C17-3	C17-4
N	62	62	62	62
Median	293	478	695	956
Robust Mean	293	476	699	971
U	3.4	5.8	9.5	15.1
Robust Standard Deviation	21.1	36.8	59.7	95.1
Regression Standard Deviation	23.7	38.4	56.2	77.9
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA)	23.7	38.4	59.7	95.1
Outliers	0	0	0	0
$ z > 3.0$	1	4	1	0
$2 < z < 3$	4	1	0	1

Methods Used

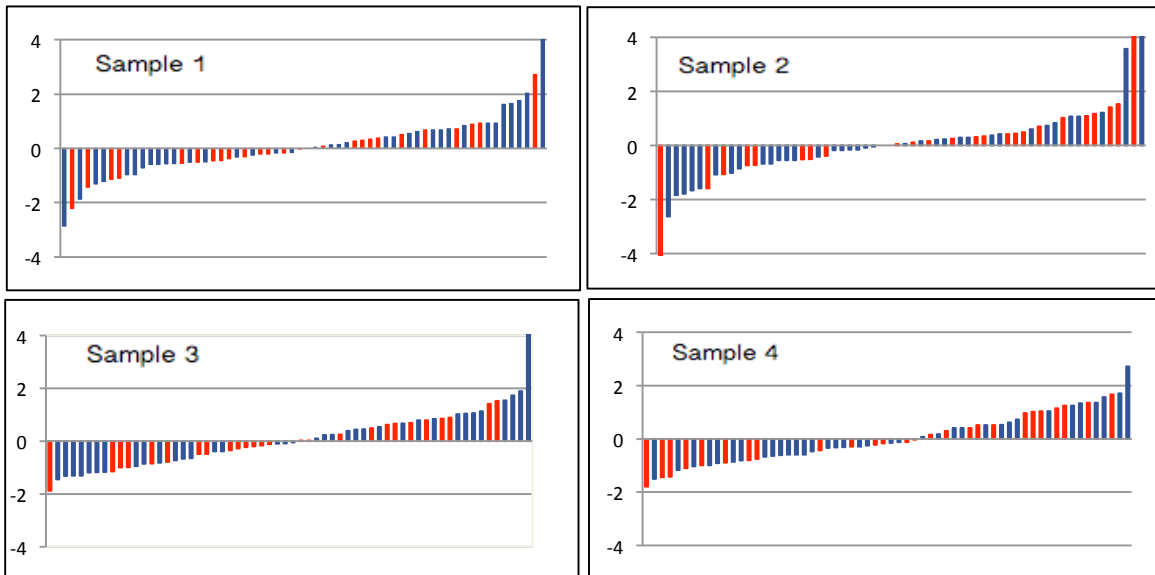
Method	C17-1	C17-2	C17-3	C17-4
ICP/MS	36	36	36	36
ICP/OES	26	26	26	26

All summary stats and the plots below are based on the data excluding any flagged outliers

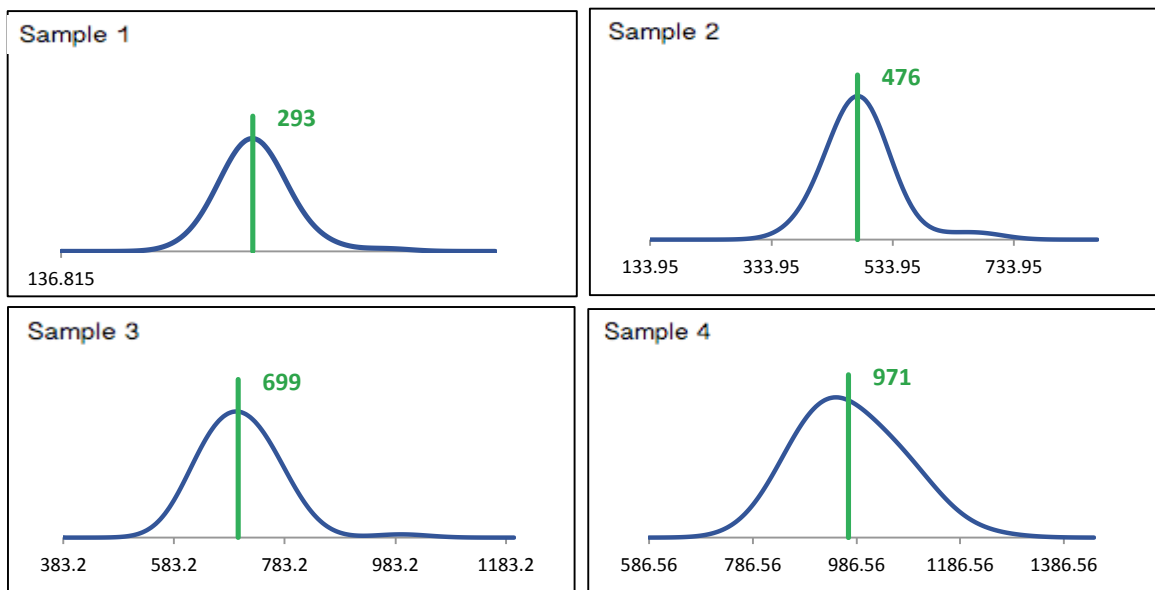


ZINC

z-Score Plots

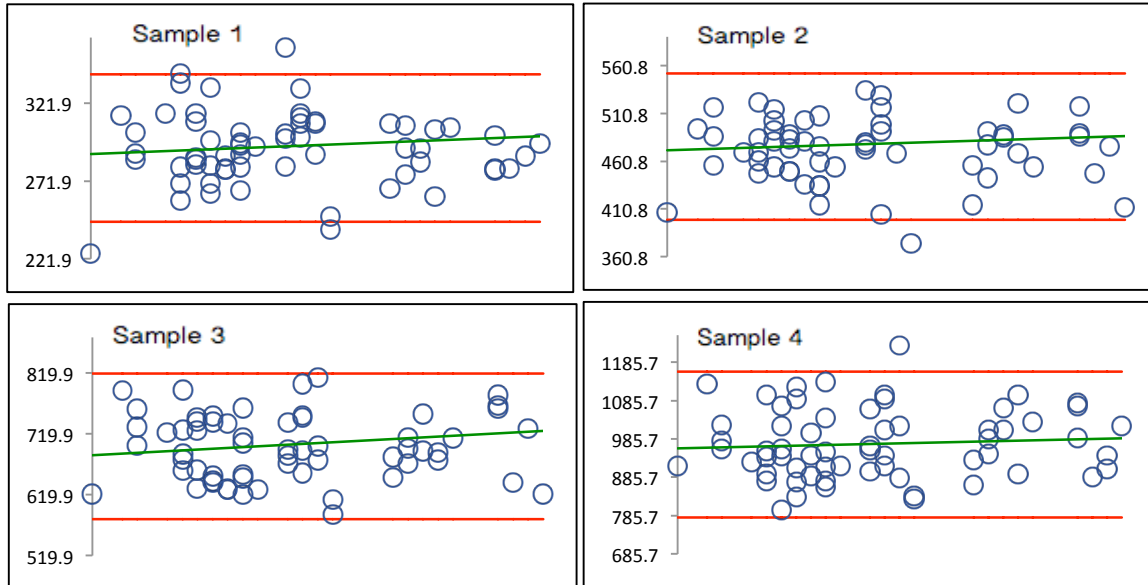


Kernel Density Plots



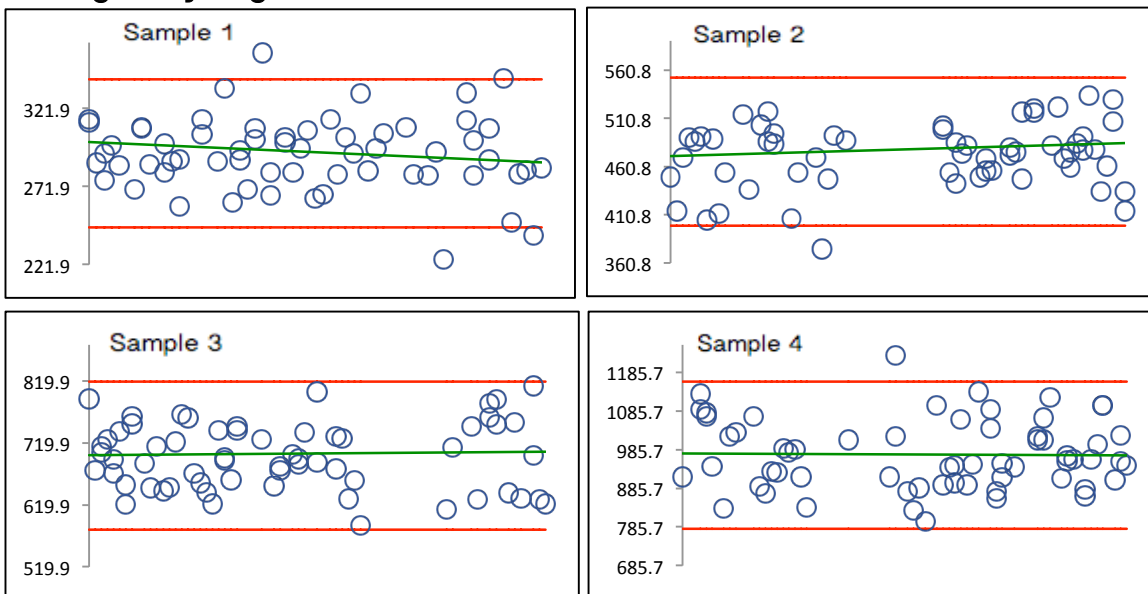
ZINC

Stability Regression



Reported results (Y-axis) plotted against reported analysis date (X-axis)

Homogeneity Regression



Reported results (Y-axis) plotted against bottling order (X-axis).