

# Test Group Summary Report

## C02C Total Metals in Water

### October 2023

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**Issued: November 27, 2023**

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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 is 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.
$\pm u$ :	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 – *Conformity assessment- General requirements for the competence of proficiency testing providers*, 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.PTCCanada.org](http://www.PTCCanada.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:

$$z - Score = \frac{(x - \bar{X})}{SDPA} \quad \text{where: } x = \text{participant result};$$

$\bar{X}$  = the Assigned Value;  
SDPA = the Standard Deviation for Proficiency Assessment.

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.

$$RSZ = \frac{\sum z}{\sqrt{N}} \quad \text{where } z = \text{the } z\text{-score}$$

$N$  = the number of samples

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

$RSZ \geq -2$ and $\leq 2$	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.

### 4.5 BOX-AND-WHISKER PLOTS

Box-and-Whisker plots are another way to display the distribution of the data. The box denotes the first and third quartile and the whiskers are the 5<sup>th</sup> and 95<sup>th</sup> percentile.

### 4.6 HISTORIC COMPARISON PLOT

The Historic Comparison Plot is a plot of robust mean against robust standard deviation for the previous ten PT rounds as well as the current PT round. This plot can be used to identify possible changes in the sample formulation.

## ALUMINUM

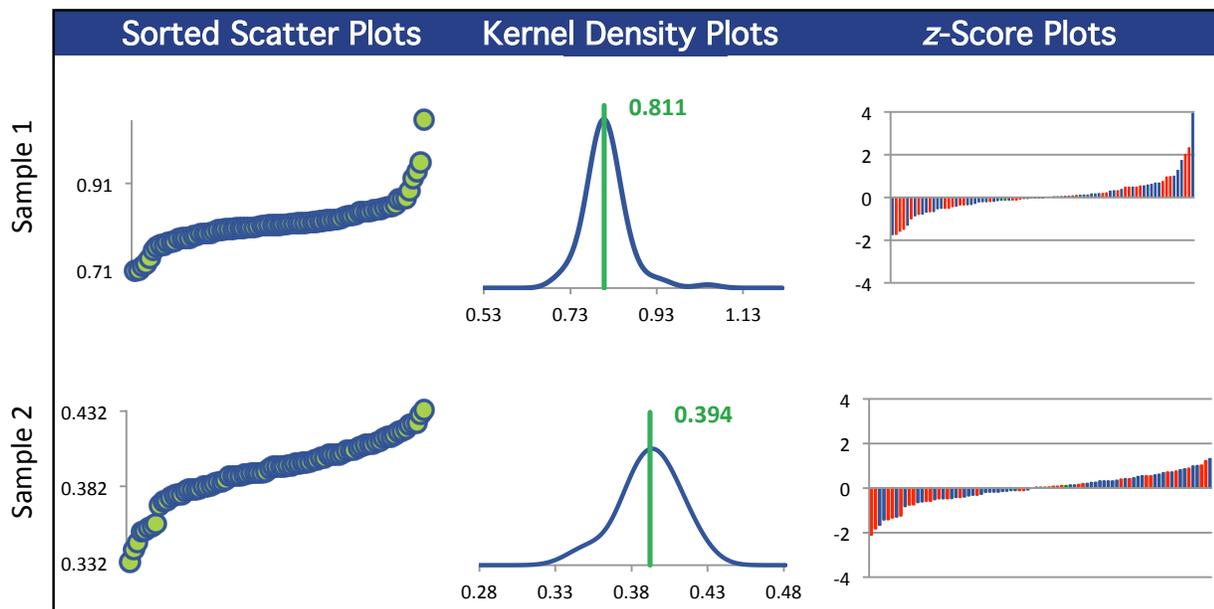
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	81	81	81	81
Median mg/L	0.810	0.395	1.46	0.875
Robust Mean mg/L	0.811	0.394	1.46	0.874
U mg/L	0.00478	0.00257	0.00943	0.00533
Robust Standard Deviation mg/L	0.0344	0.0185	0.0679	0.0384
Regression Standard Deviation mg/L	0.0608	0.0295	0.109	0.0656
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0608	0.0295	0.109	0.0656
Outliers	1	1	1	1
z >3.0	1	0	0	2
2< z <3	2	1	1	0

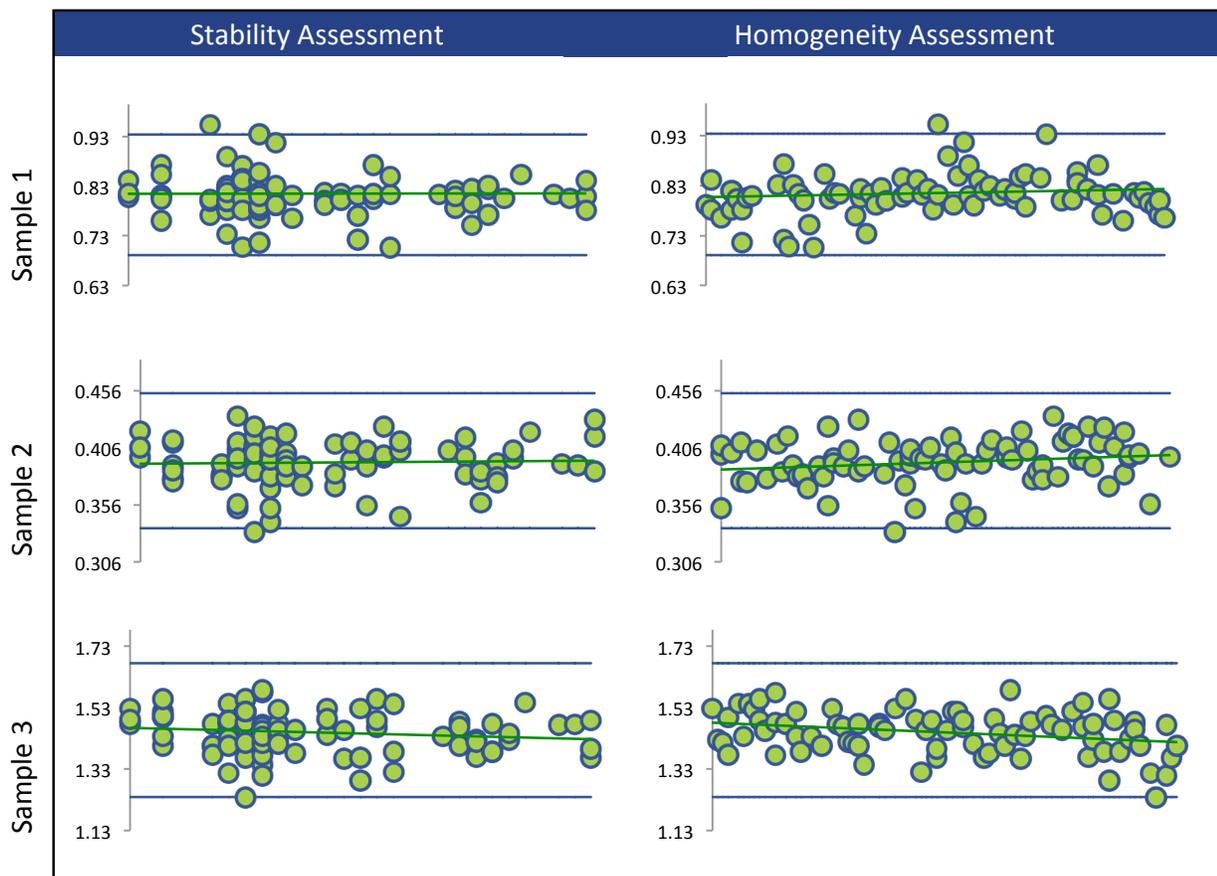
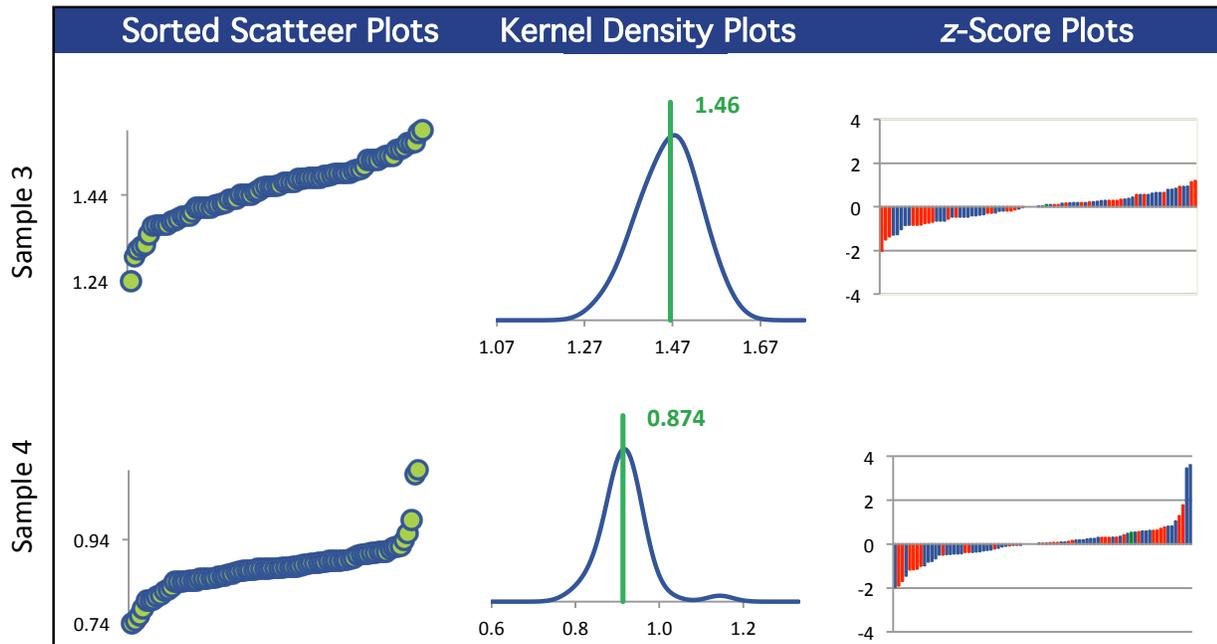
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	48	48	48	48
ICP/OES (Red)	32	32	32	32
AA (Green)	1	1	1	1

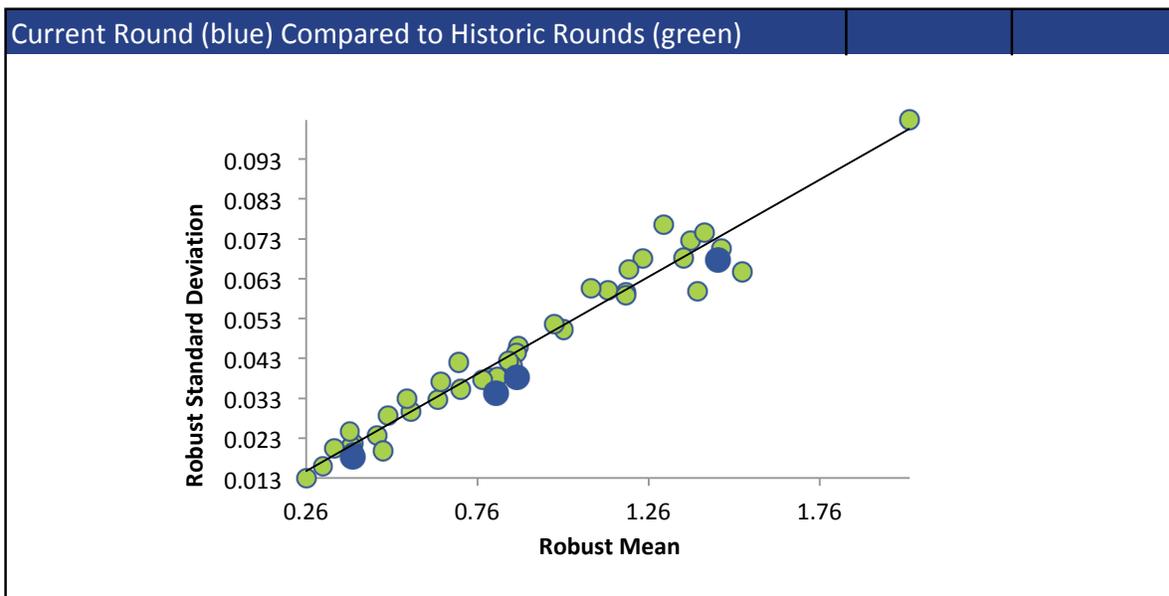
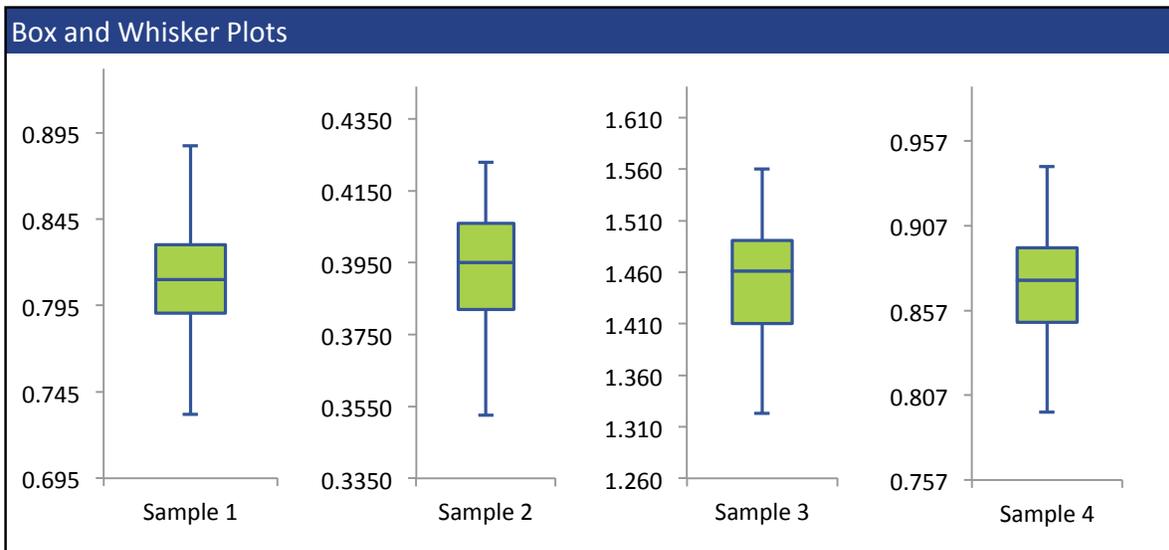
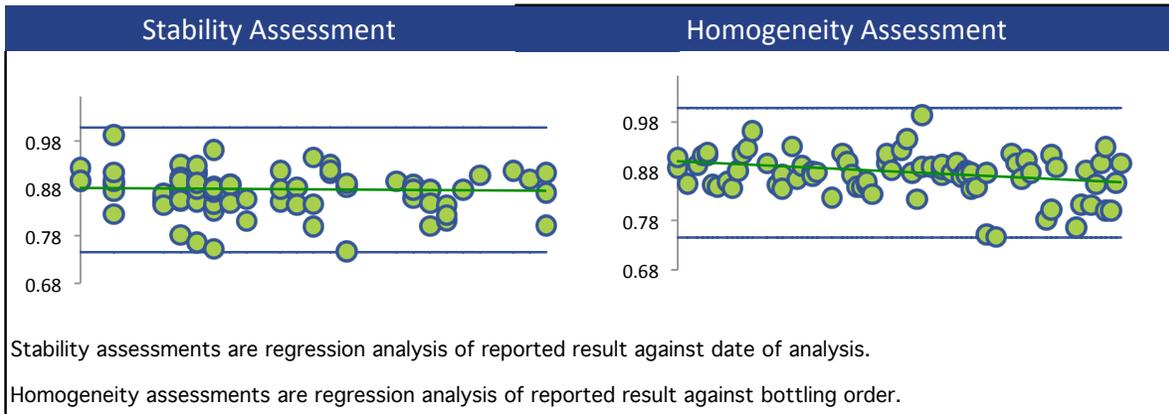
All summary stats and the plots below are based on the data excluding any flagged outliers



# ALUMINUM



# ALUMINUM



## ANTIMONY

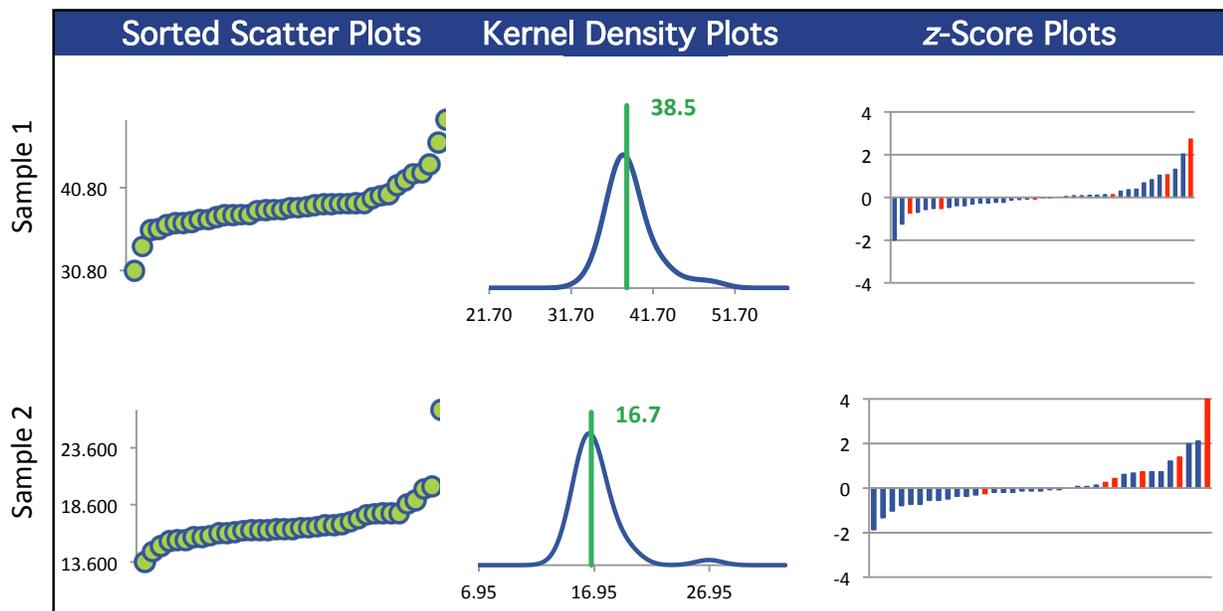
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	39	37	41	41
Median mg/L	38.4	16.5	73.9	70.5
Robust Mean mg/L	38.5	16.7	74.1	70.6
U mg/L	0.432	0.255	0.841	0.754
Robust Standard Deviation mg/L	2.16	1.24	4.31	3.86
Regression Standard Deviation mg/L	3.85	1.67	7.41	7.06
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	3.85	1.67	7.41	7.06
Outliers	0	0	0	0
z >3.0	0	1	0	0
2< z <3	2	1	0	0

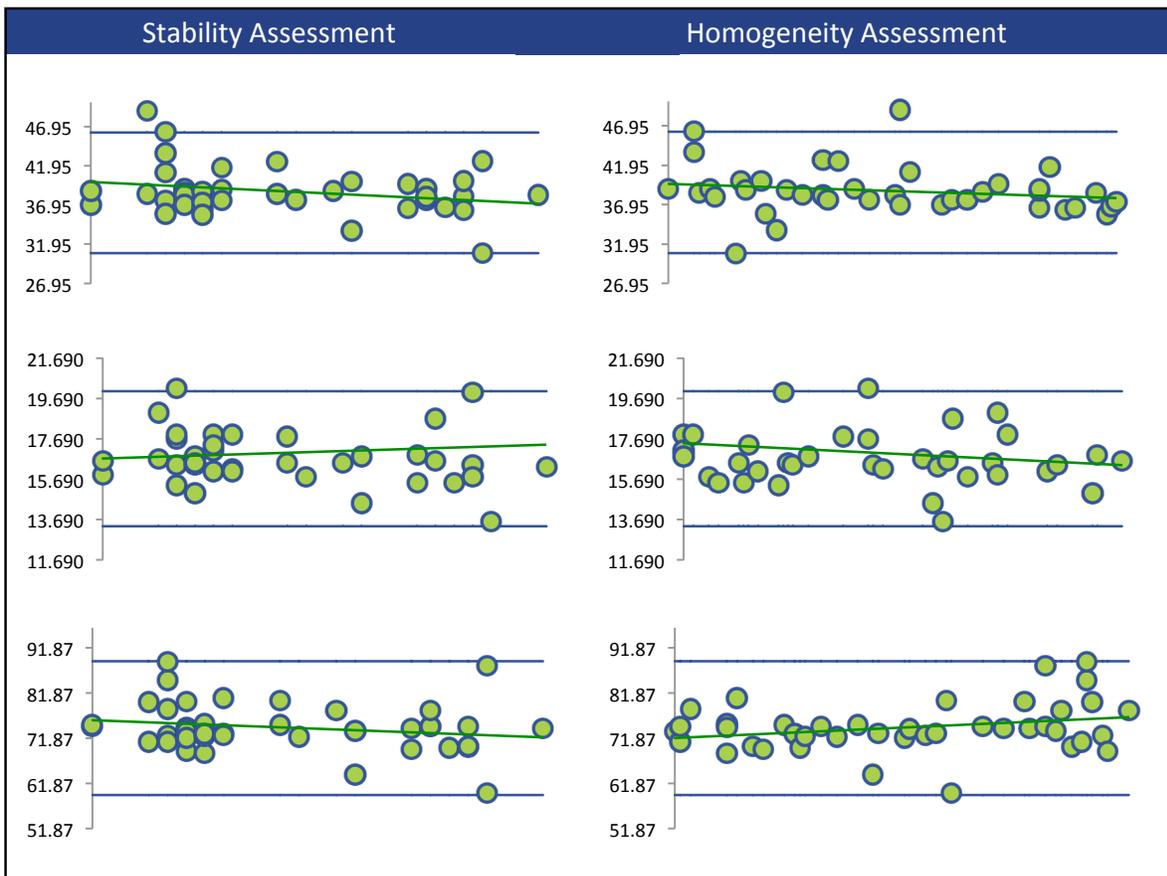
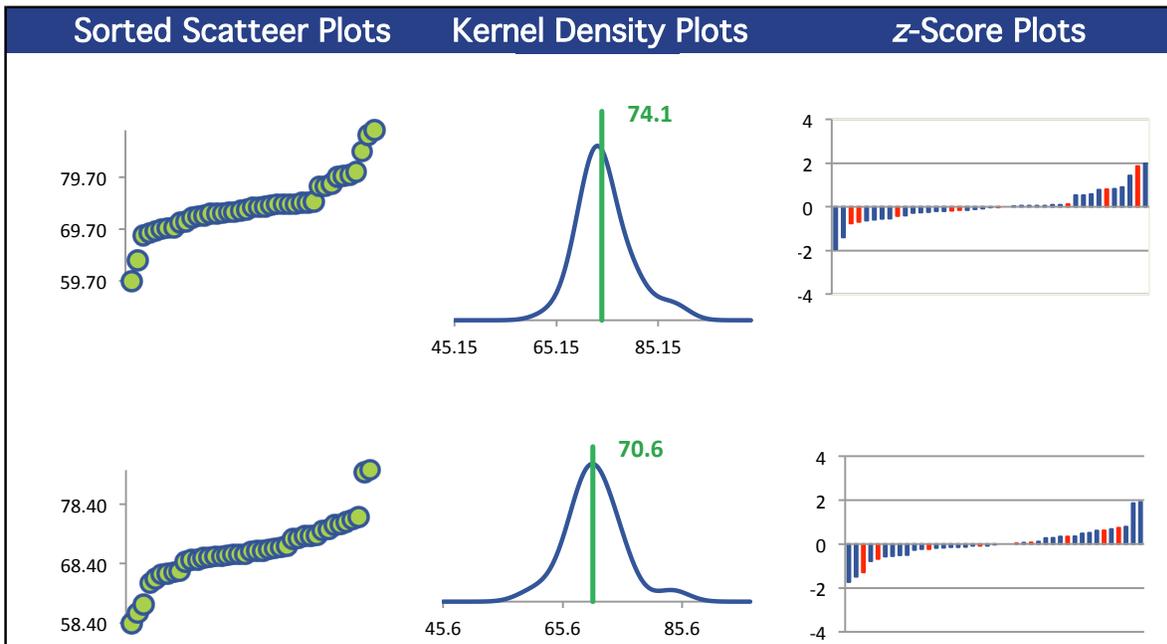
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	32	31	32	32
ICP/OES (Red)	7	6	9	9

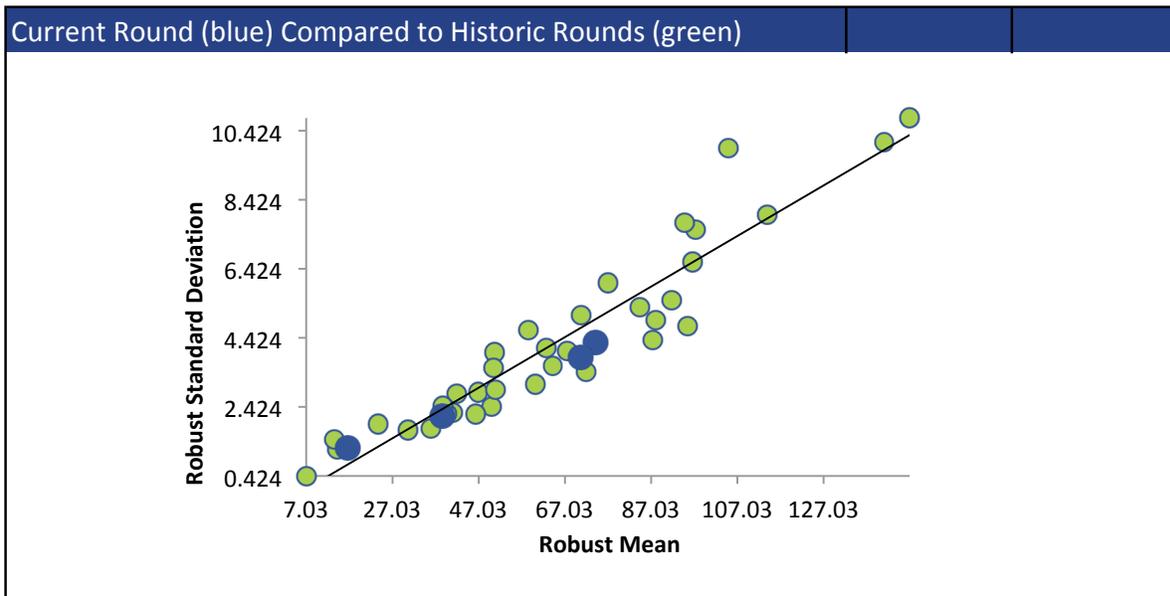
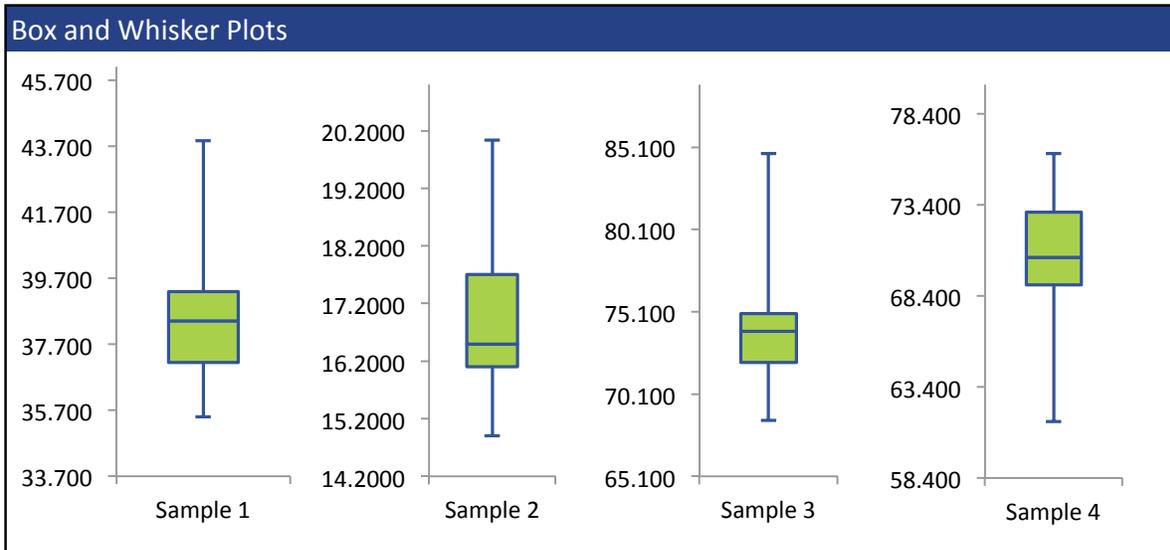
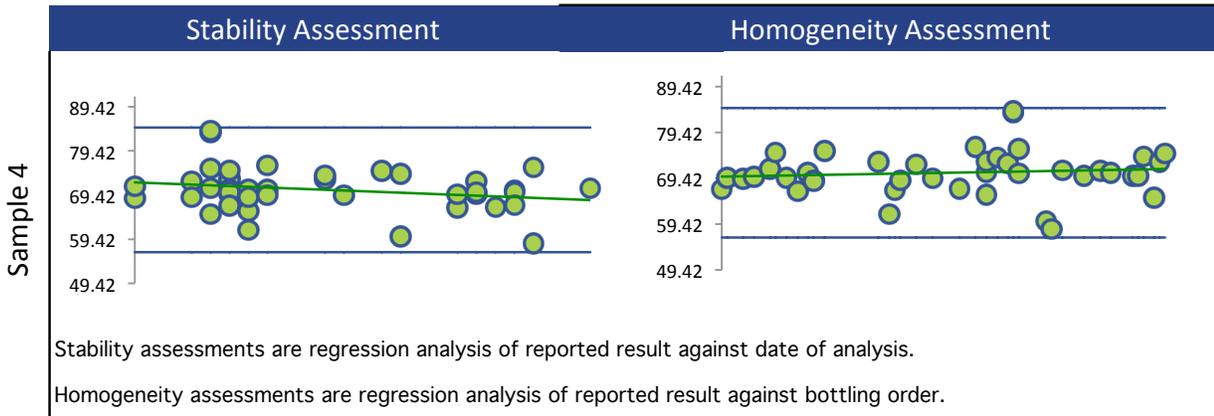
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# ANTIMONY



# ANTIMONY



## ARSENIC

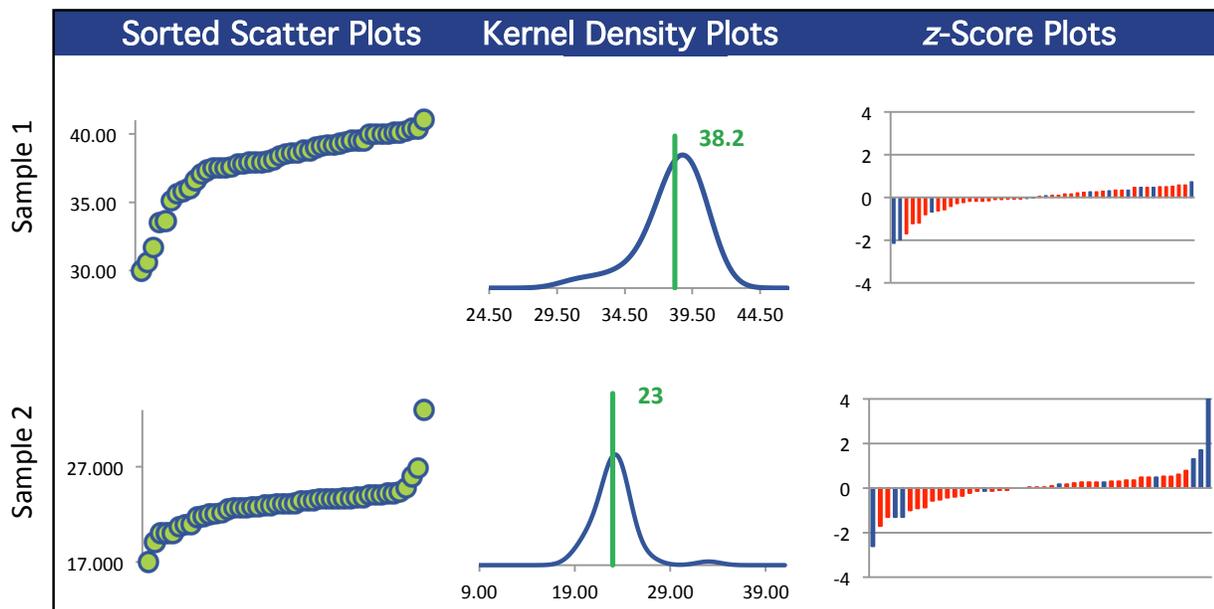
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	48	46	48	48
Median mg/L	38.5	23.1	84.8	75.3
Robust Mean mg/L	38.2	23.0	84.5	74.9
U mg/L	0.332	0.267	0.792	0.814
Robust Standard Deviation mg/L	1.84	1.45	4.39	4.51
Regression Standard Deviation mg/L	3.82	2.30	8.45	7.49
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	3.82	2.30	8.45	7.49
Outliers	0	0	0	0
z >3.0	0	1	0	0
2< z <3	1	1	1	1

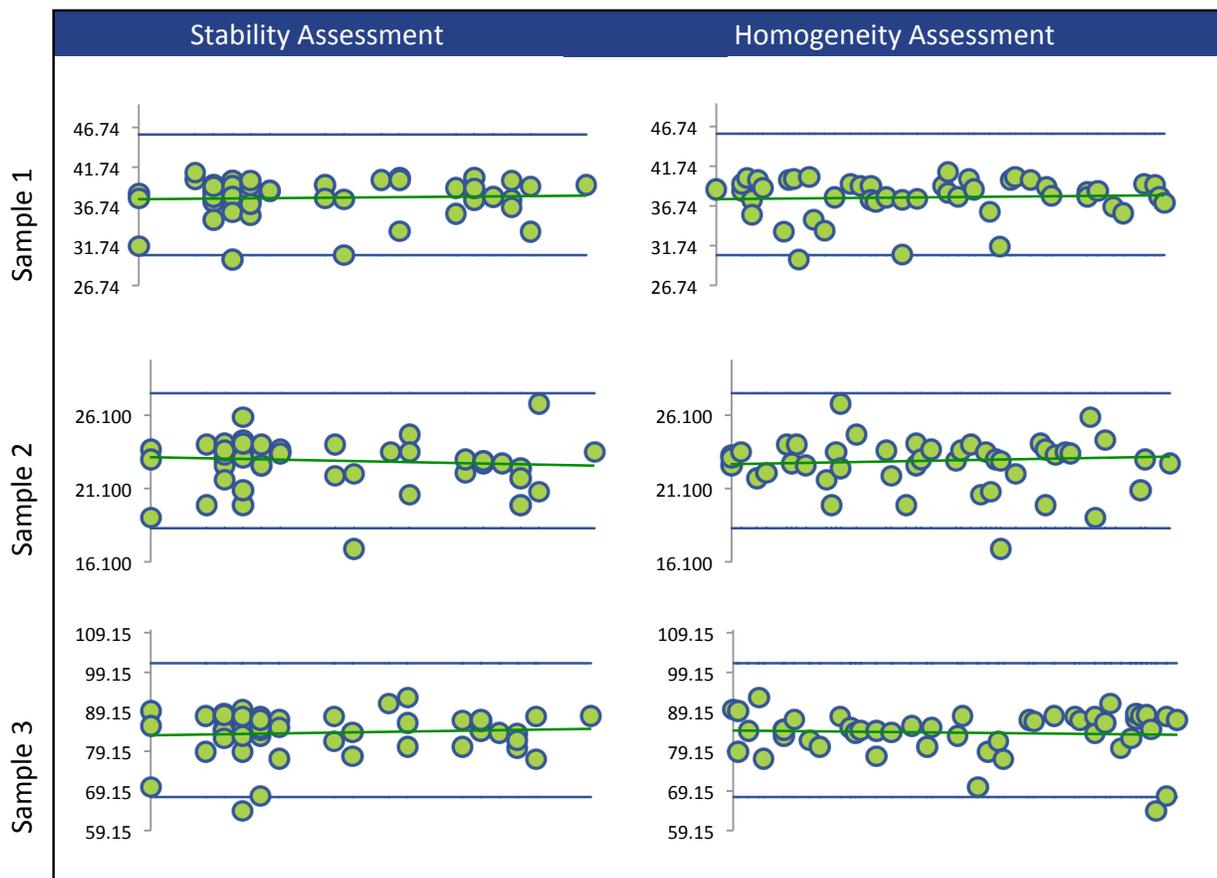
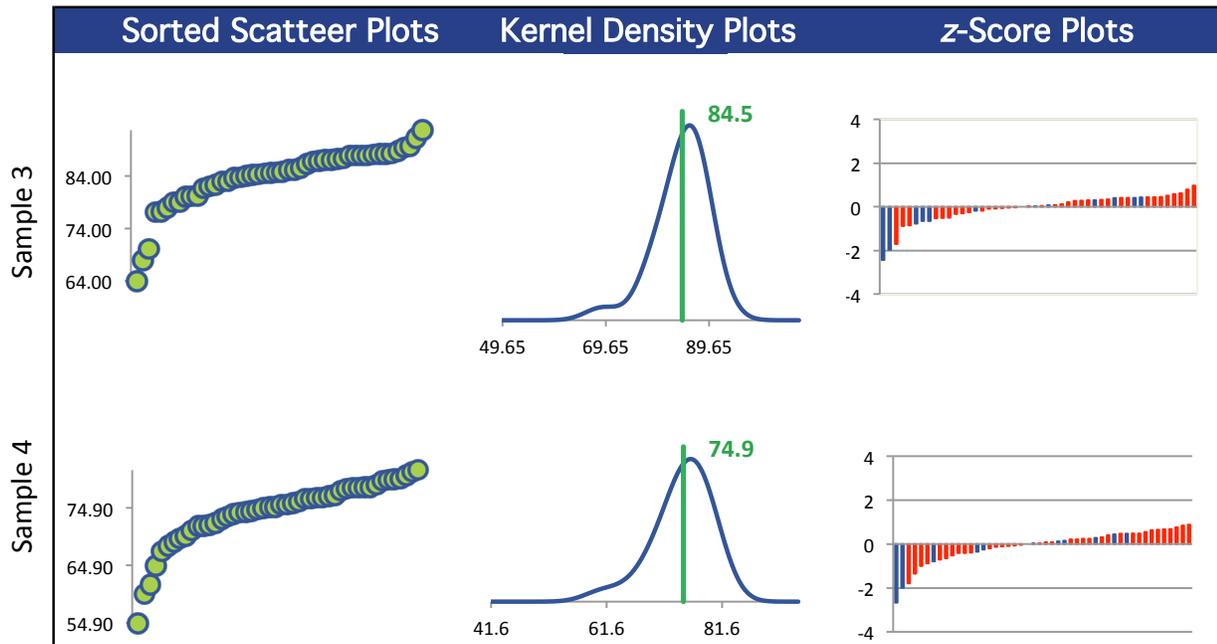
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES (Blue)	12	10	12	12
ICP/MS (Red)	36	36	36	36

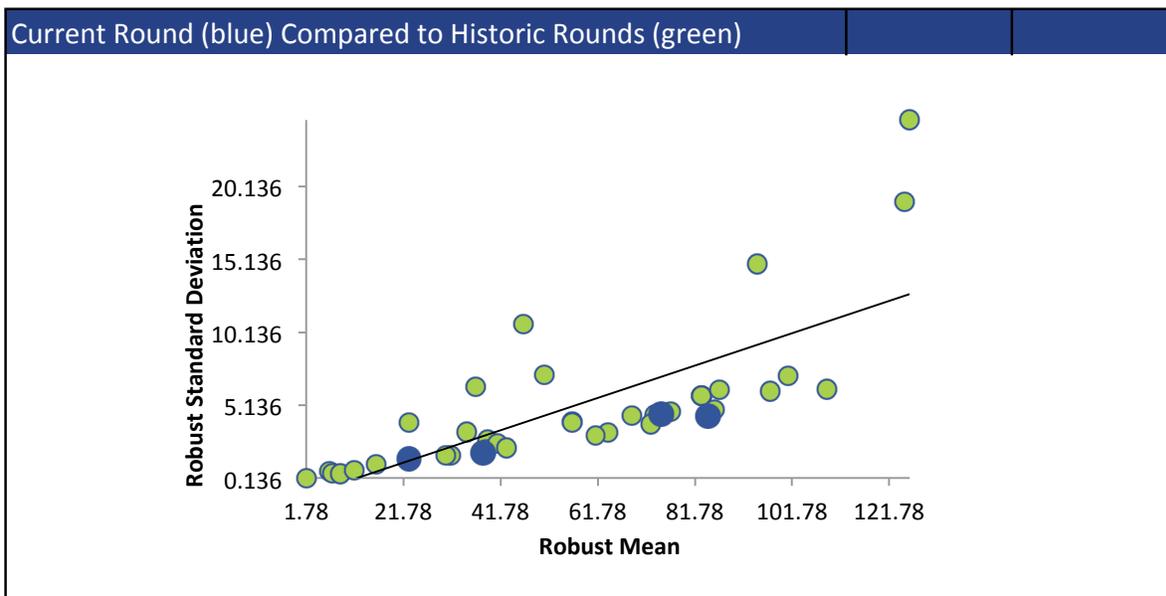
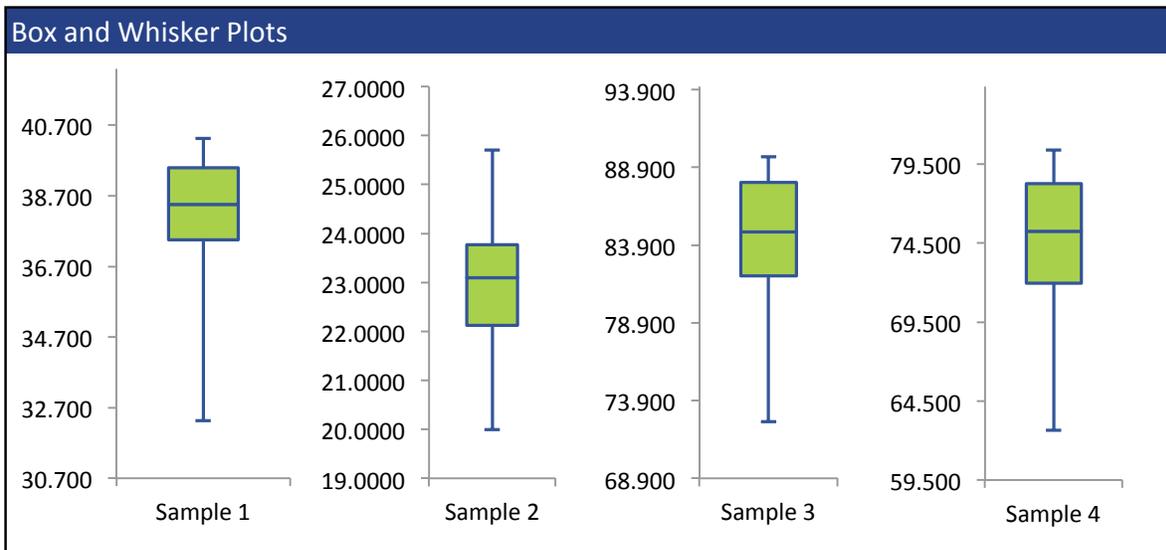
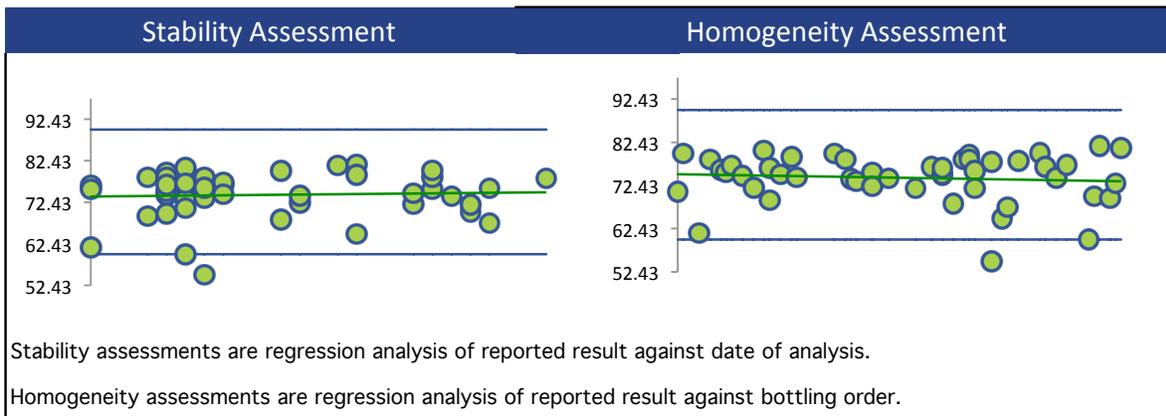
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# ARSENIC



# ARSENIC



## BARIUM

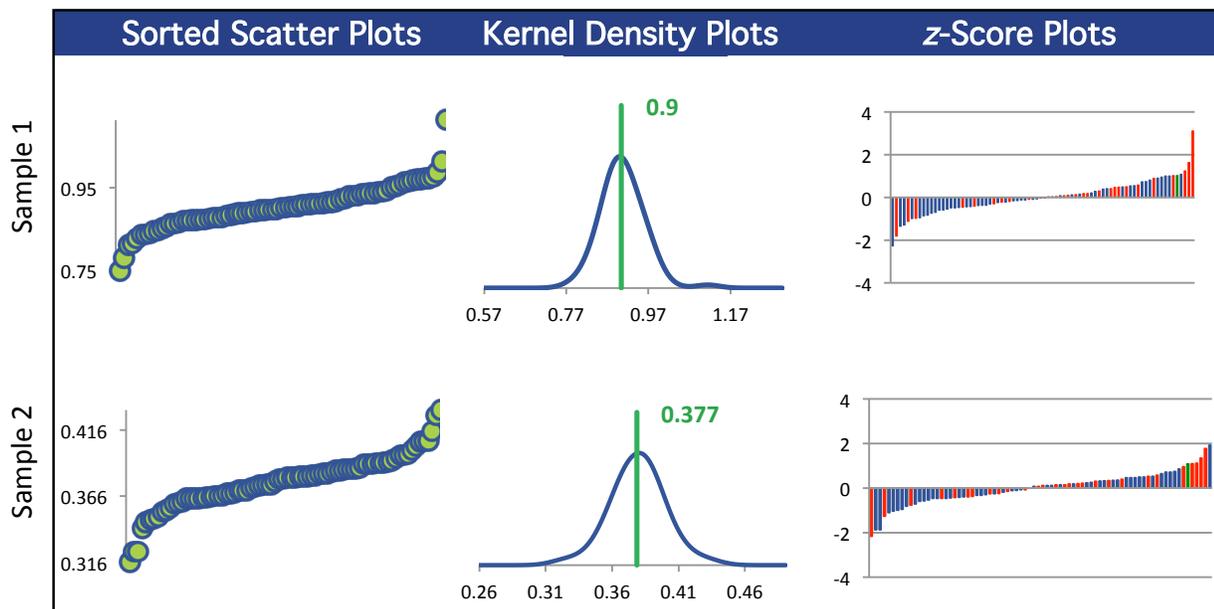
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	78	78	78	78
Median mg/L	0.899	0.380	1.20	0.911
Robust Mean mg/L	0.900	0.377	1.19	0.911
U mg/L	0.00674	0.00258	0.00858	0.00706
Robust Standard Deviation mg/L	0.0476	0.0182	0.0606	0.0499
Regression Standard Deviation mg/L	0.0675	0.0283	0.0894	0.0683
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0675	0.0283	0.0894	0.0683
Outliers	1	1	1	1
z >3.0	1	0	0	0
2< z <3	1	1	2	1

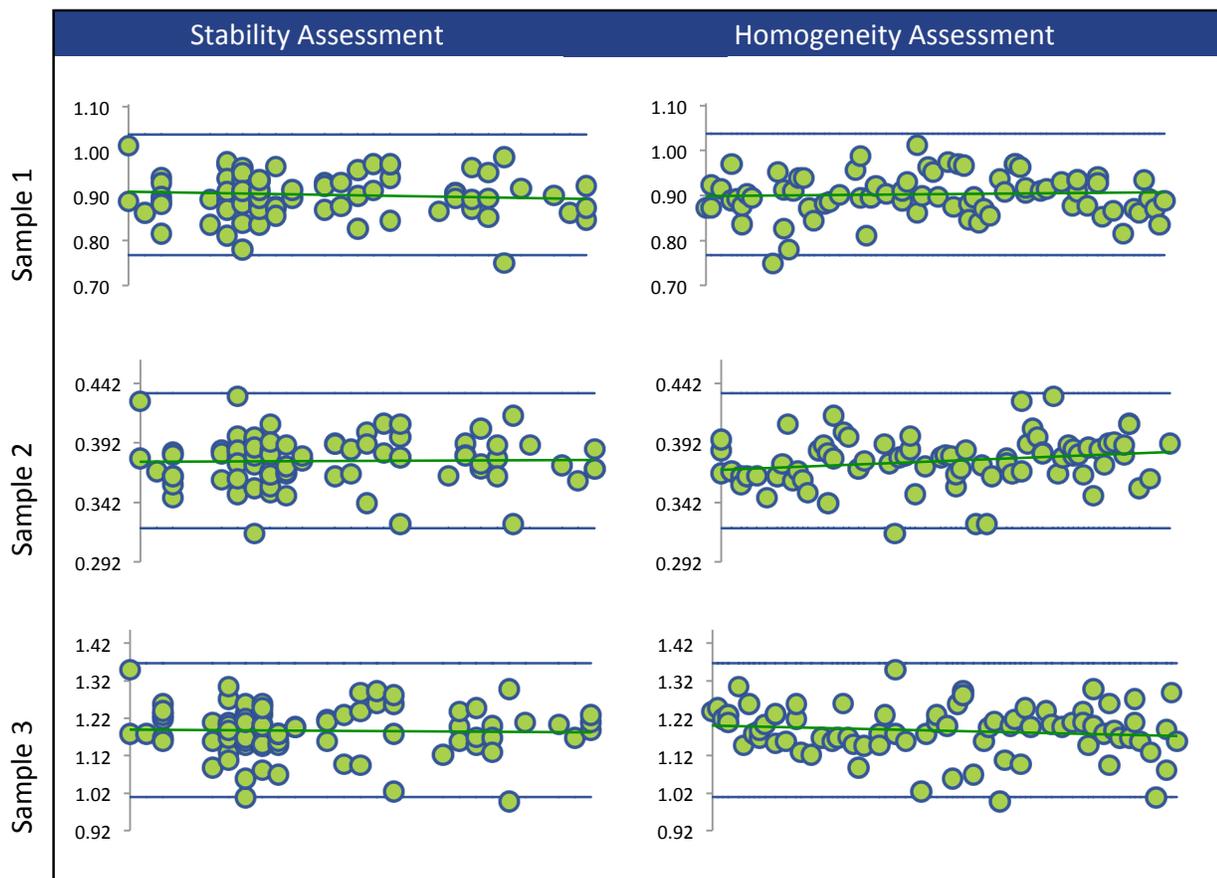
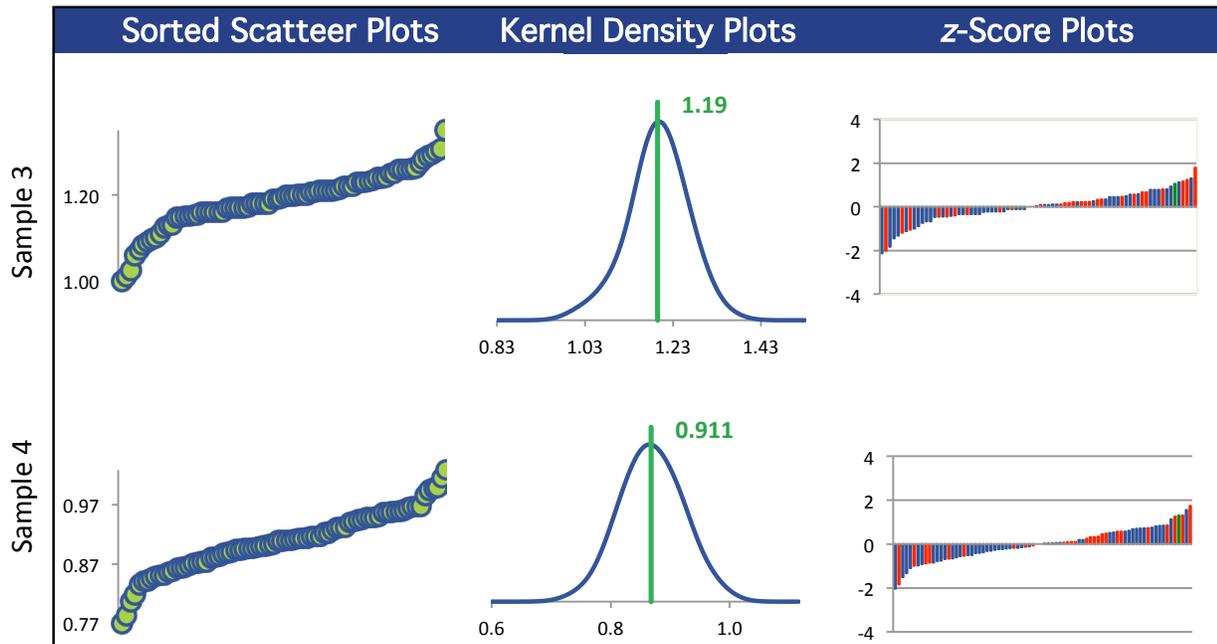
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	49	49	49	49
ICP/OES (Red)	28	28	28	28
AA (Green)	1	1	1	1

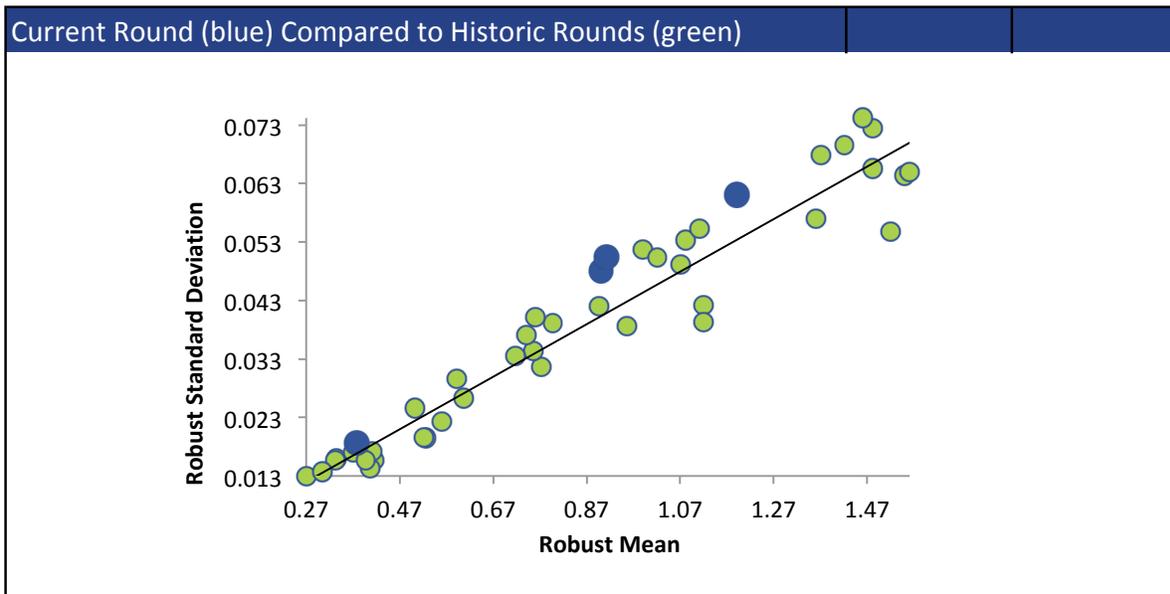
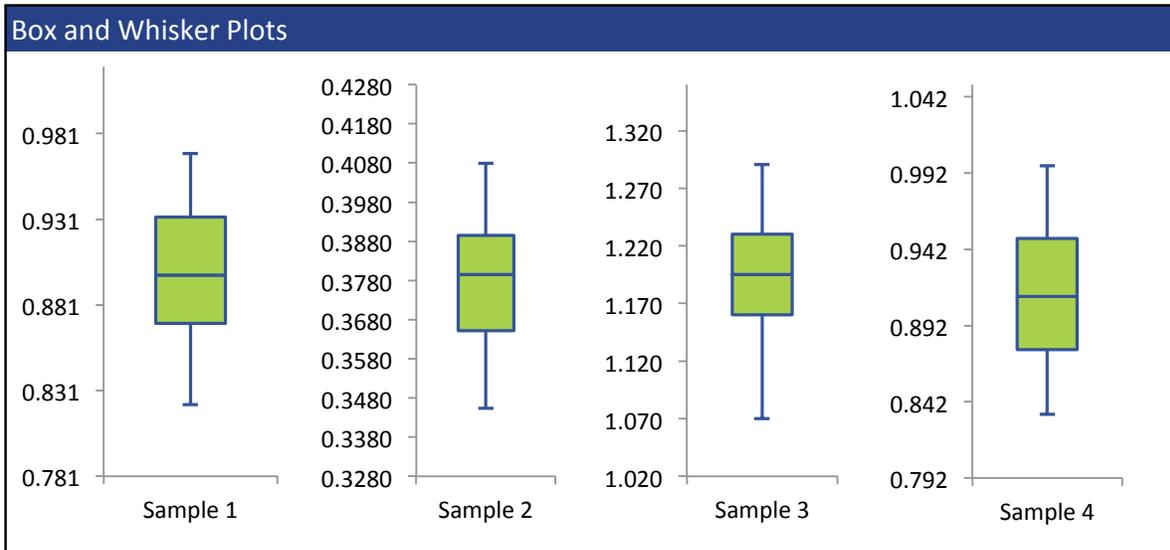
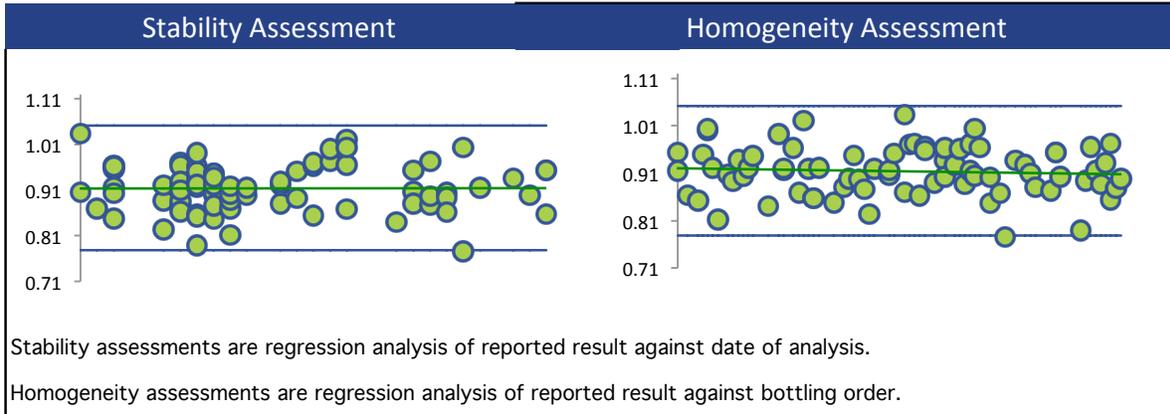
All summary stats and the plots below are based on the data excluding any flagged outliers



# BARIUM



BARIUM



## BERYLLIUM

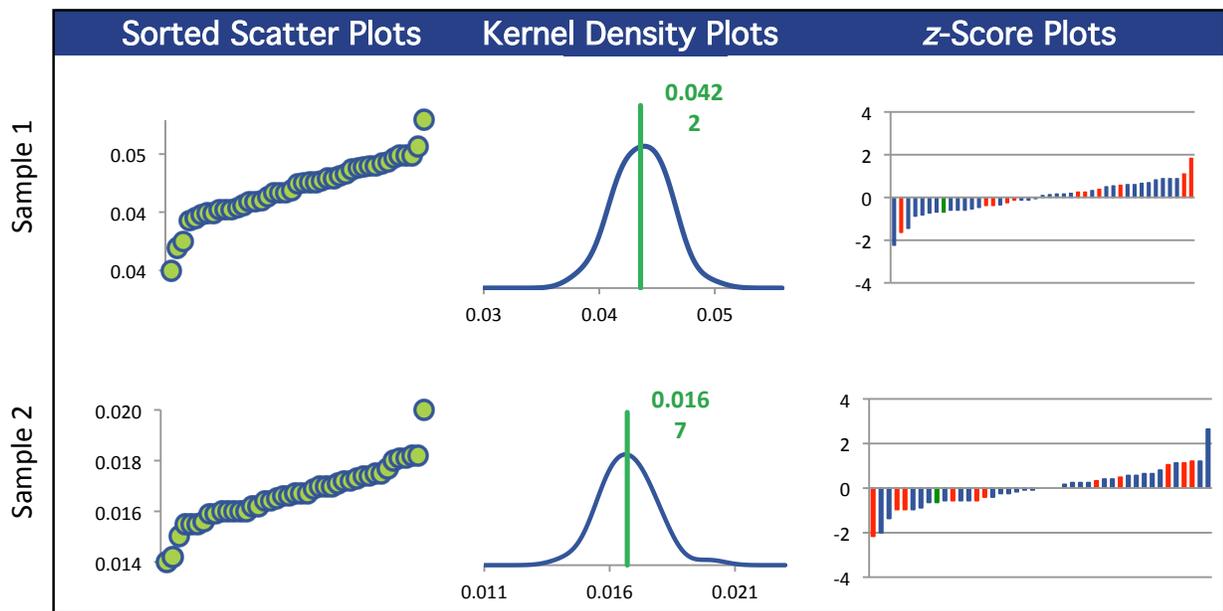
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	43	43	43	43
Median mg/L	0.0425	0.0167	0.0822	0.0472
Robust Mean mg/L	0.0422	0.0167	0.0823	0.0467
U mg/L	0.000435	0.000194	0.000736	0.000515
Robust Standard Deviation mg/L	0.00228	0.00102	0.00386	0.00270
Regression Standard Deviation mg/L	0.00317	0.00125	0.00617	0.00350
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.00317	0.00125	0.00617	0.00350
Outliers	1	1	1	1
z >3.0	0	0	0	0
2< z <3	1	2	1	1

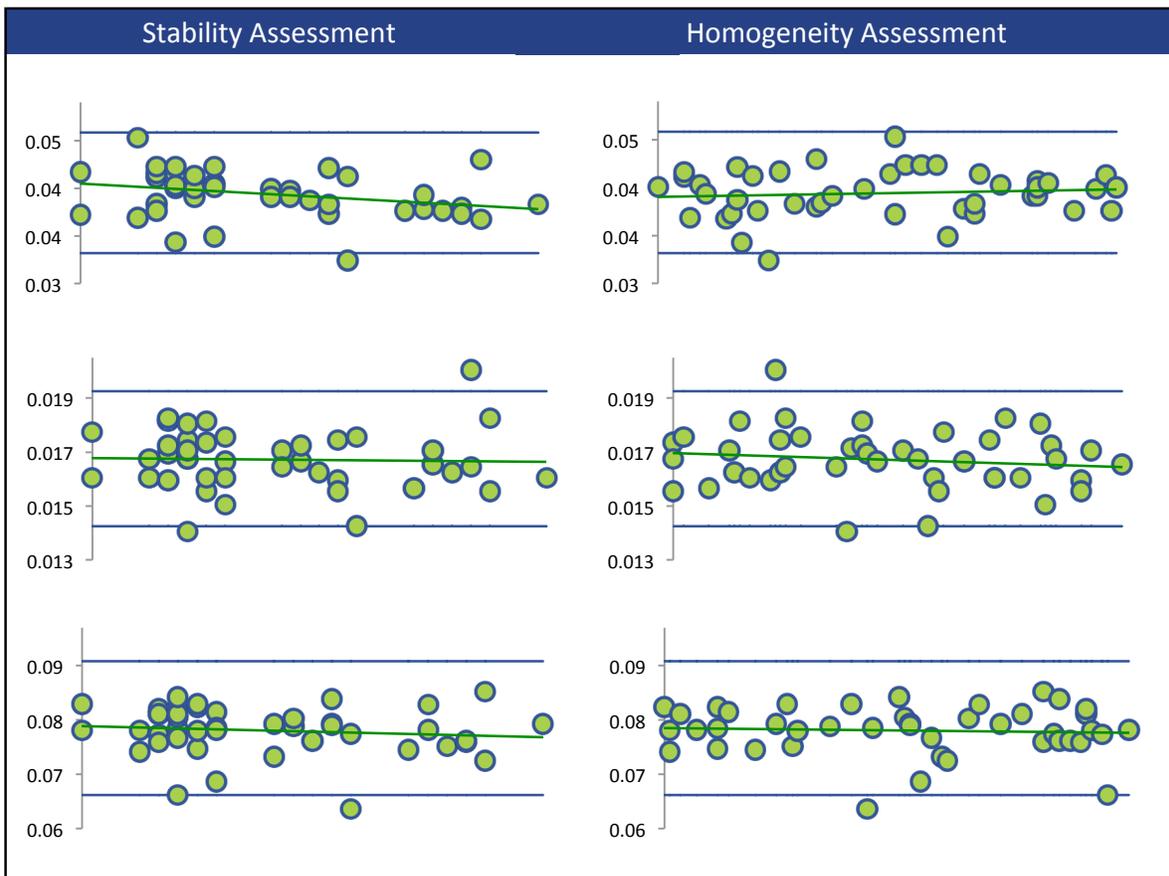
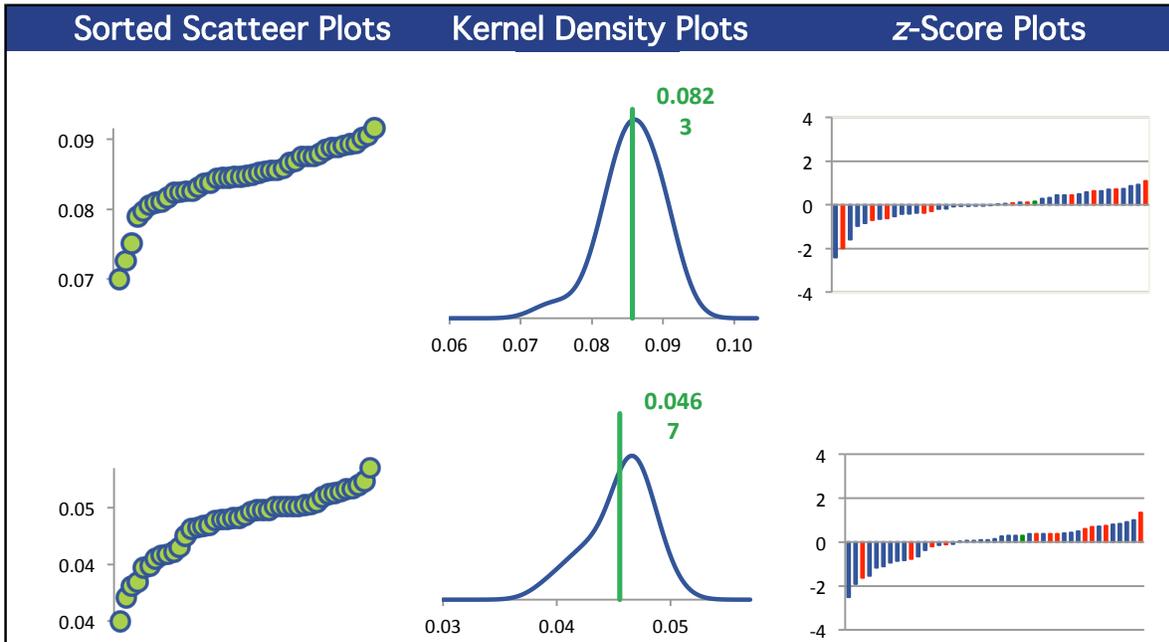
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	31	31	31	31
ICP/OES (Red)	11	11	11	11
AA (Green)	1	1	1	1

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



# BERYLLIUM





## BORON

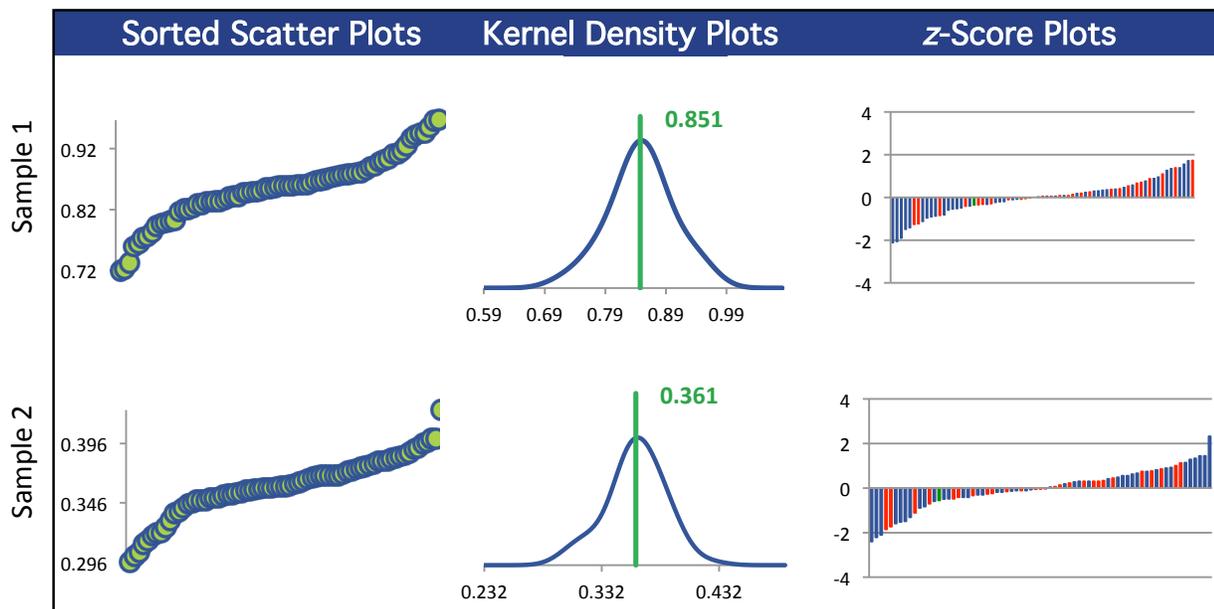
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	71	71	71	71
Median mg/L	0.855	0.360	1.32	1.23
Robust Mean mg/L	0.851	0.361	1.31	1.23
U mg/L	0.00755	0.00341	0.0130	0.0130
Robust Standard Deviation mg/L	0.0509	0.0230	0.0875	0.0873
Regression Standard Deviation mg/L	0.0638	0.0271	0.0984	0.0926
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0638	0.0271	0.0984	0.0926
Outliers	1	1	1	1
z >3.0	0	0	0	0
2< z <3	2	4	3	3

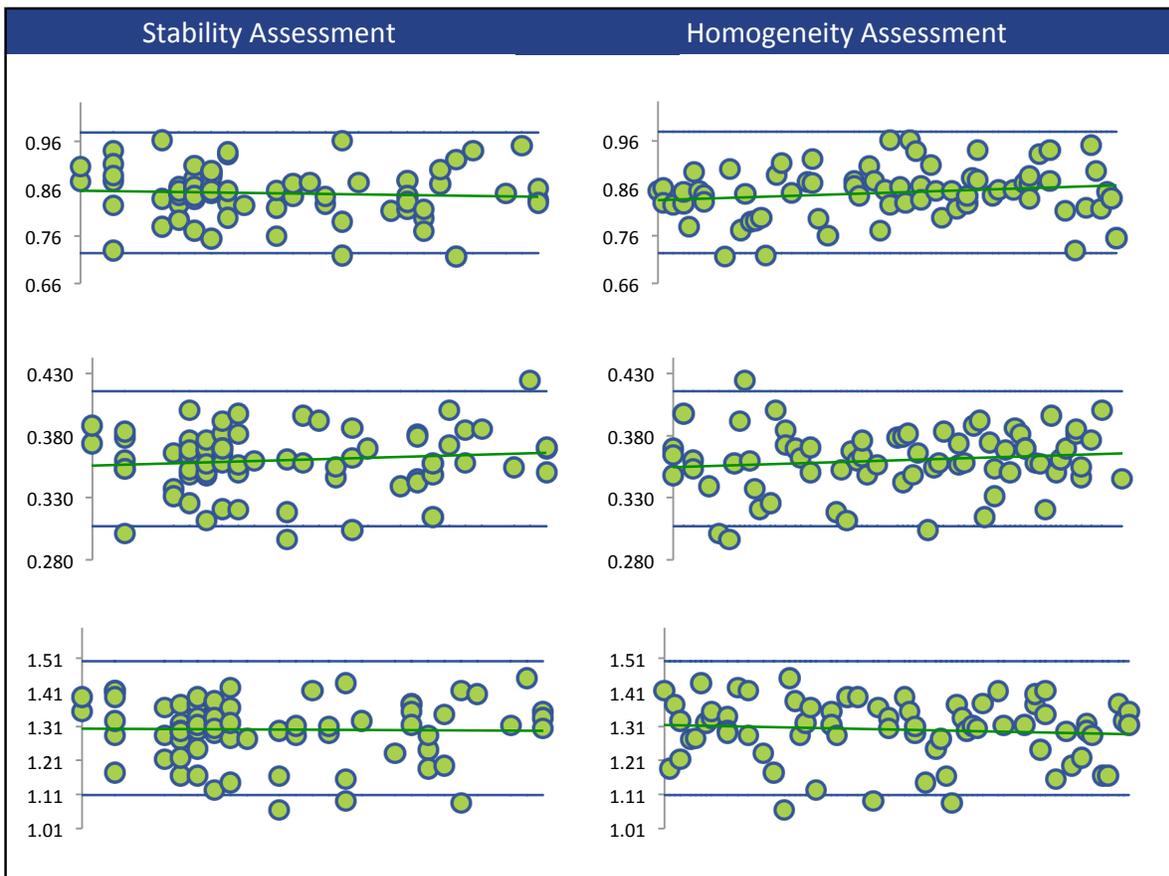
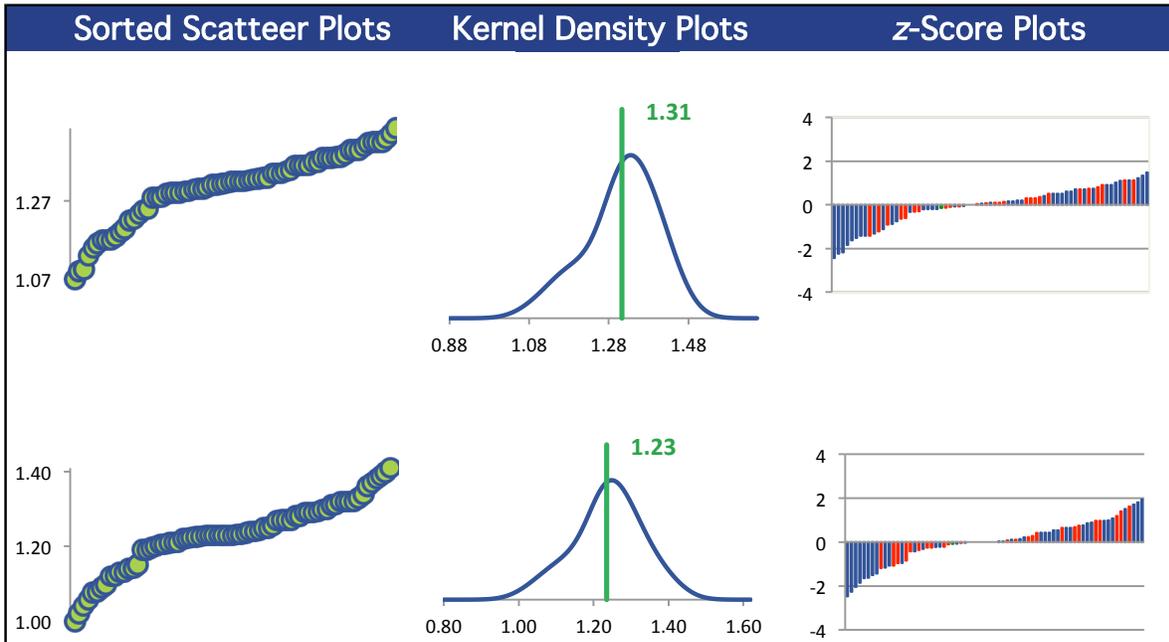
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	43	43	43	43
ICP/OES (Red)	27	27	27	27
AA (Green)	1	1	1	1

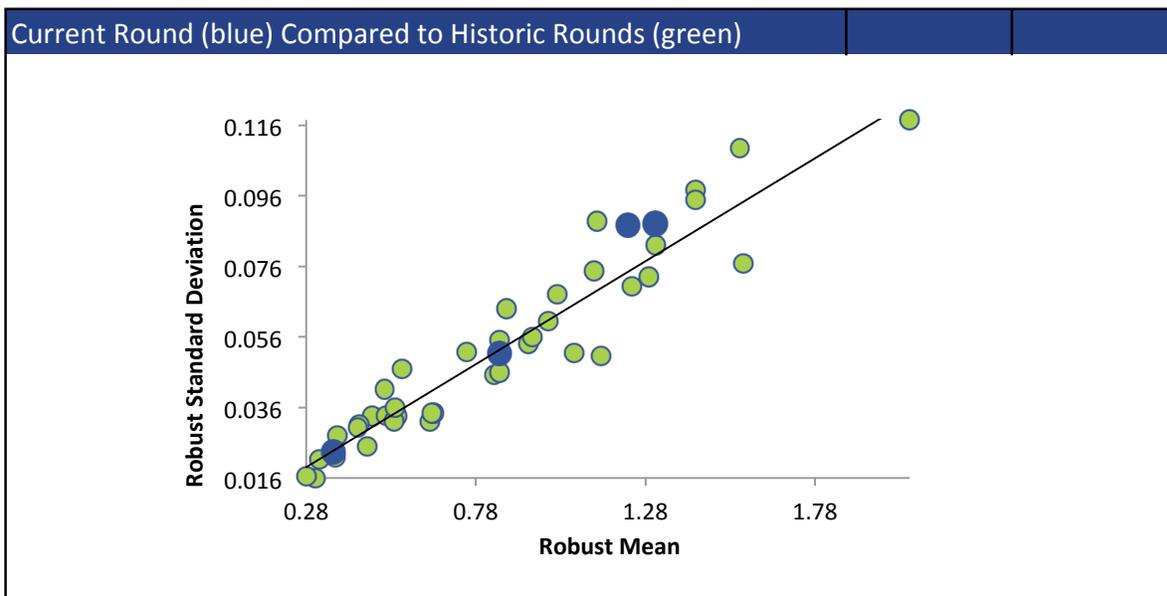
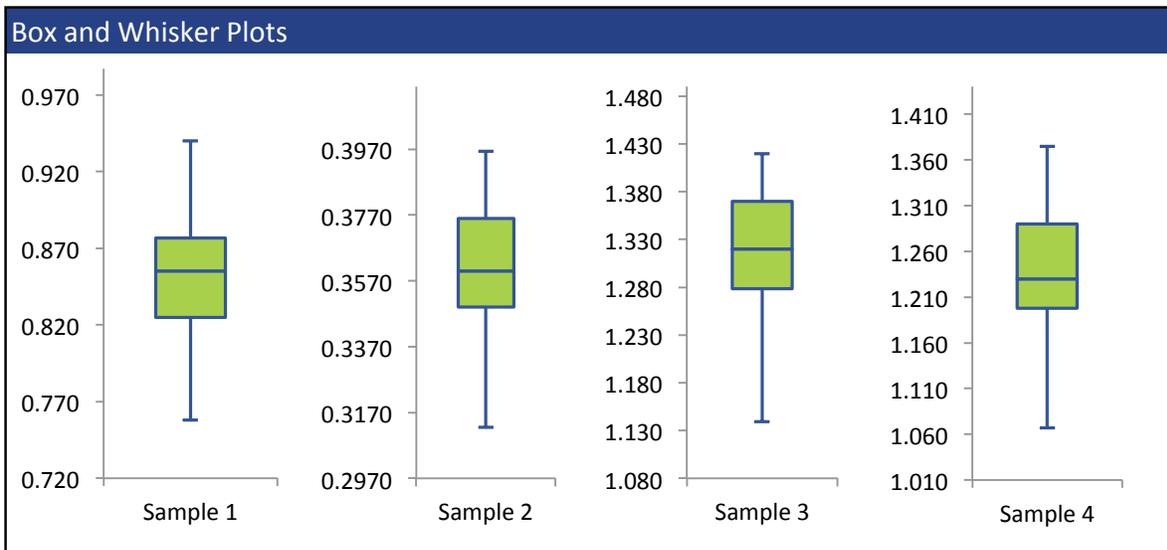
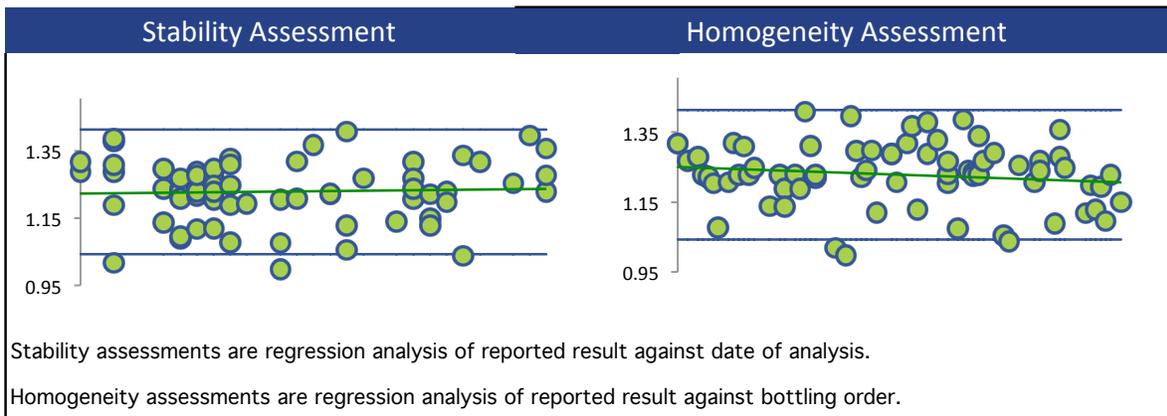
All summary stats and the plots below are based on the data excluding any flagged outliers



# BORON



# BORON



## CADMIUM

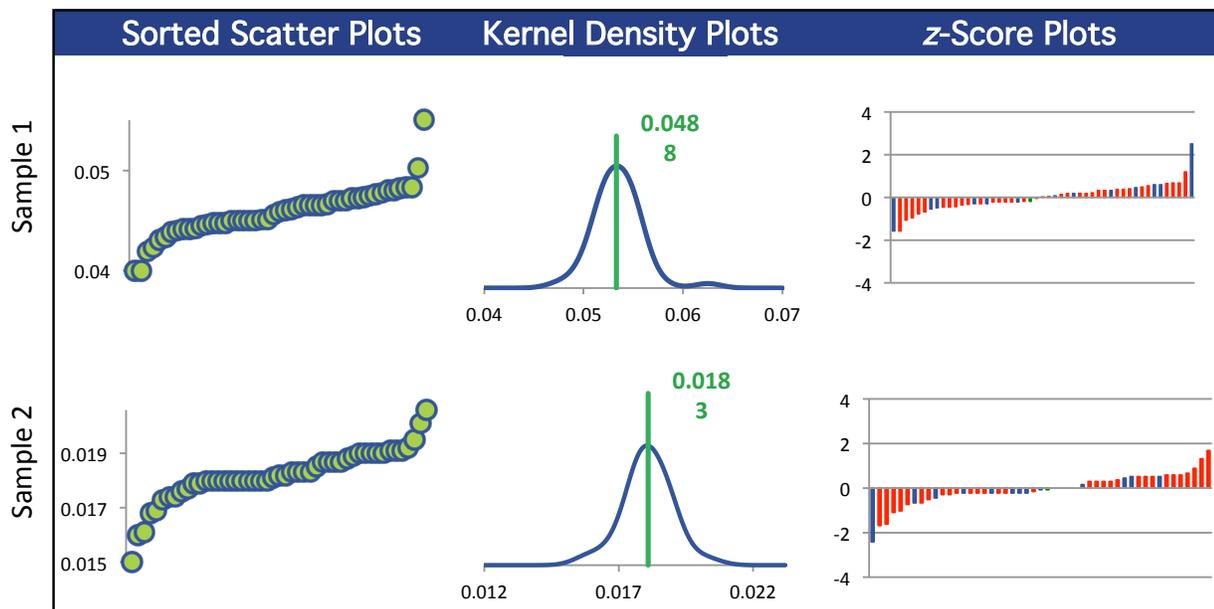
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	49	49	48	49
Median mg/L	0.0489	0.0182	0.0965	0.0666
Robust Mean mg/L	0.0488	0.0183	0.0963	0.0664
U mg/L	0.000352	0.000137	0.000655	0.000541
Robust Standard Deviation mg/L	0.00197	0.000768	0.00363	0.00303
Regression Standard Deviation mg/L	0.00366	0.00137	0.00723	0.00498
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.00366	0.00137	0.00723	0.00498
Outliers	1	1	2	1
z >3.0	0	0	0	0
2< z <3	1	1	0	0

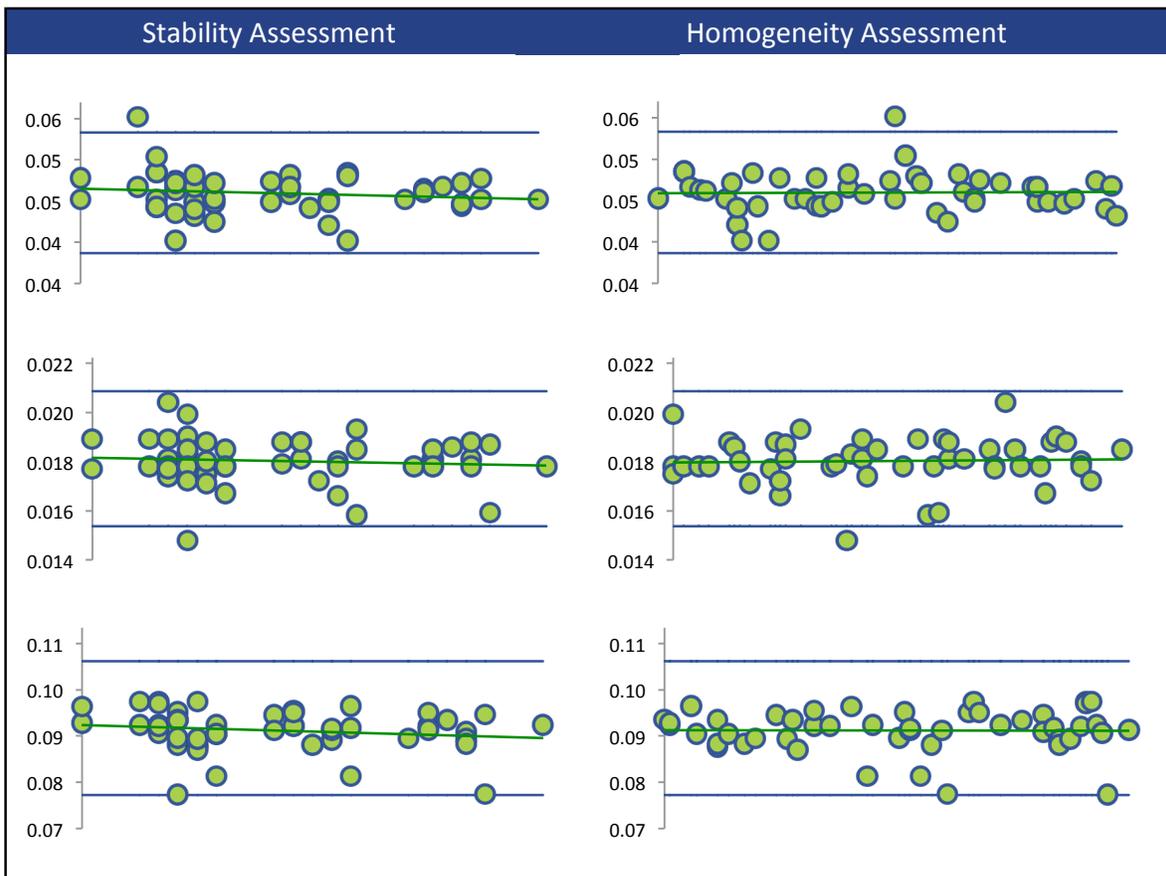
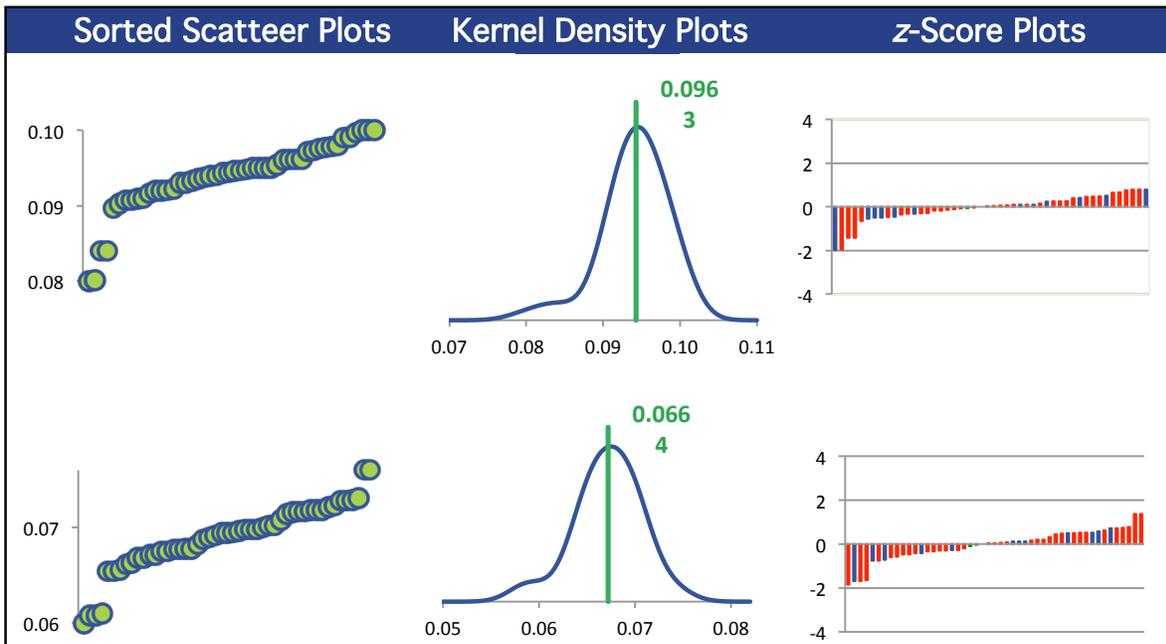
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES (Blue)	13	13	13	13
ICP/MS (Red)	35	35	34	35
AA (Green)	1	1	1	1

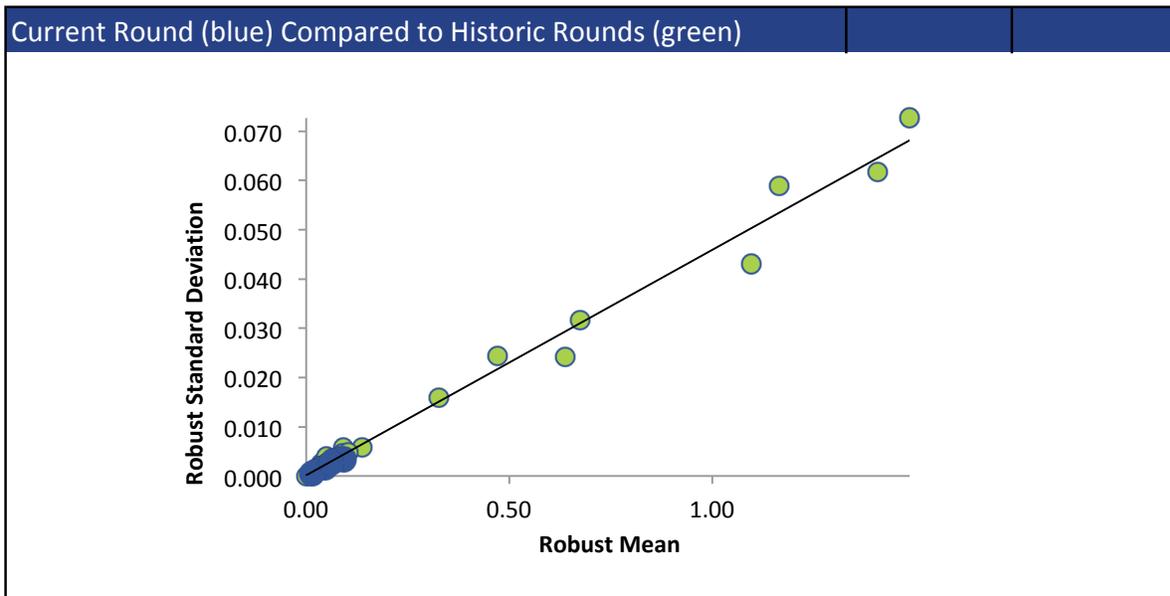
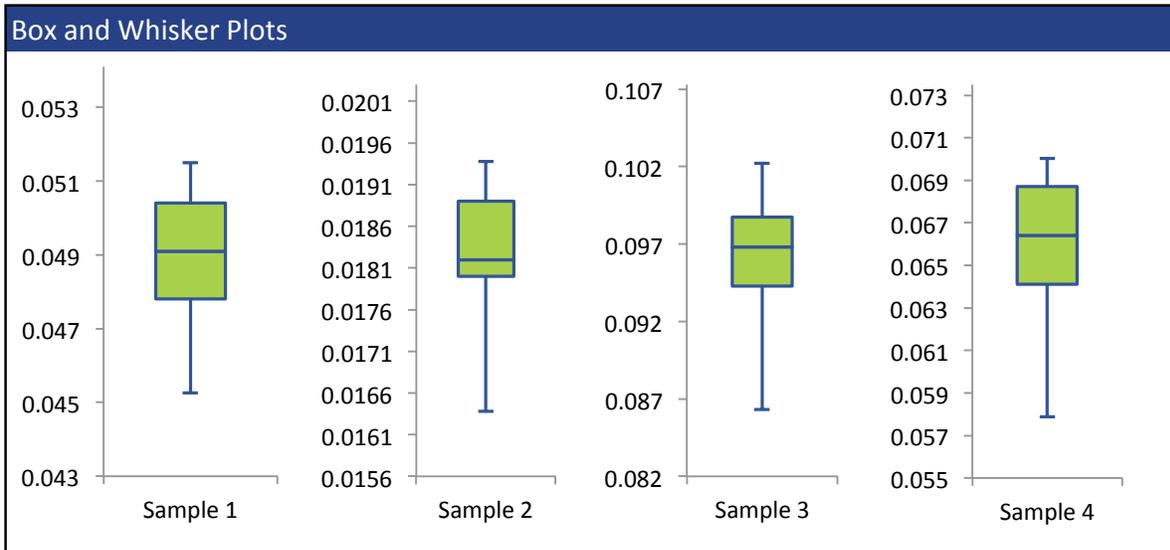
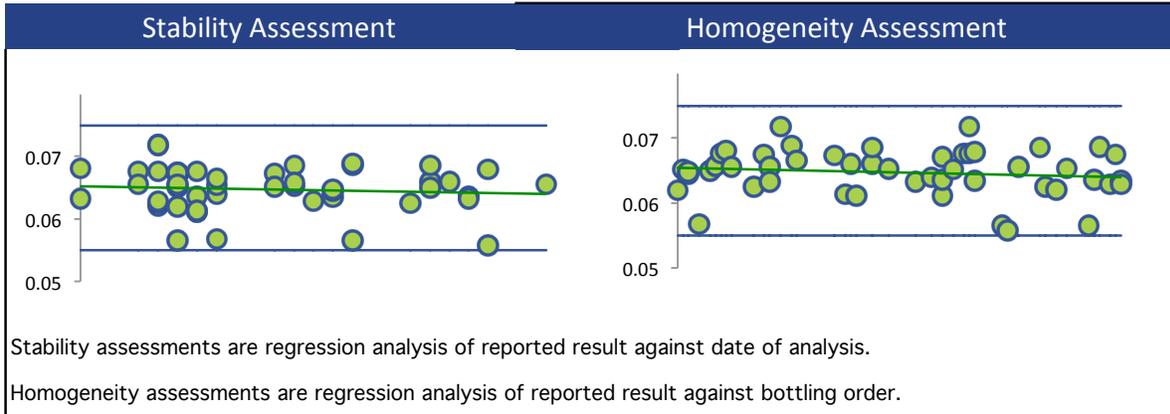
All summary stats and the plots below are based on the data excluding any flagged outliers



# CADMIUM



# CADMIUM



## CHROMIUM

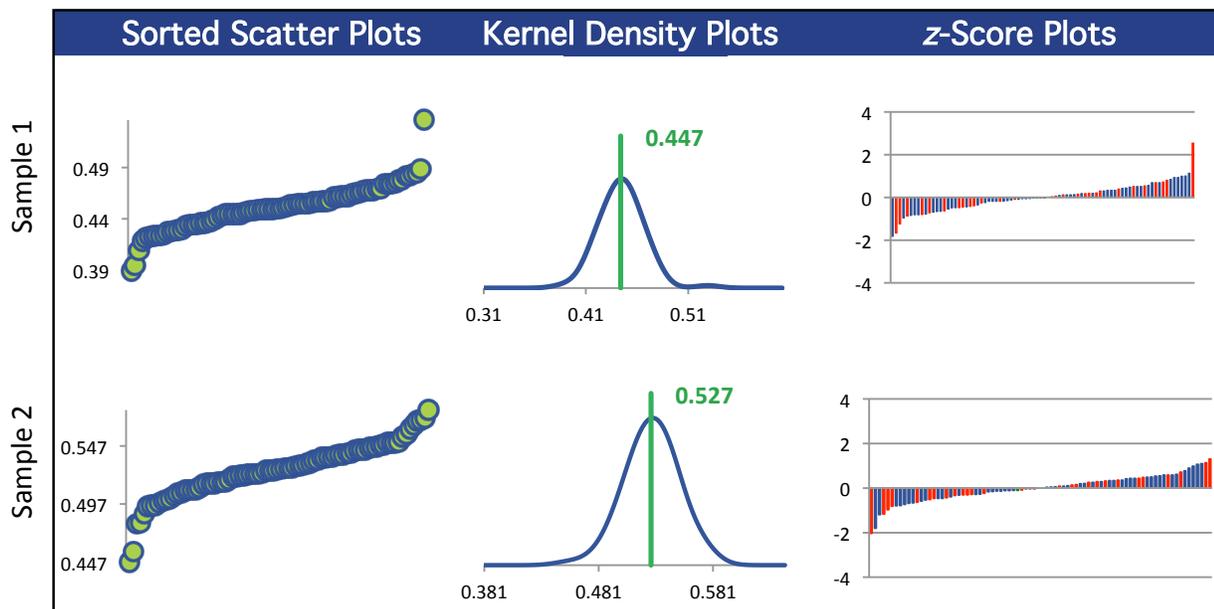
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	82	82	82	82
Median mg/L	0.446	0.527	1.24	0.886
Robust Mean mg/L	0.447	0.527	1.23	0.882
U mg/L	0.00277	0.00304	0.00745	0.00555
Robust Standard Deviation mg/L	0.0201	0.0220	0.0540	0.0402
Regression Standard Deviation mg/L	0.0335	0.0395	0.0925	0.0662
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0335	0.0395	0.0925	0.0662
Outliers	1	1	1	1
z >3.0	0	0	0	0
2< z <3	1	1	1	0

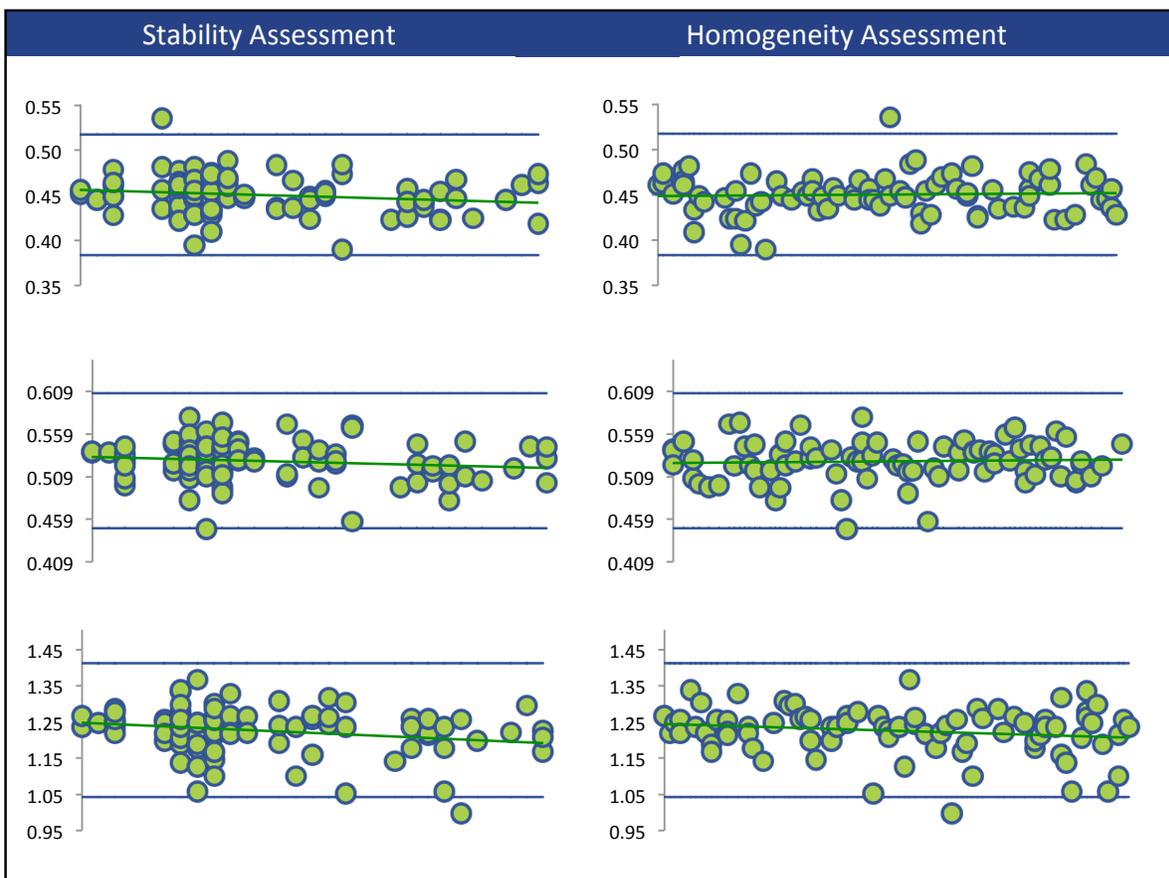
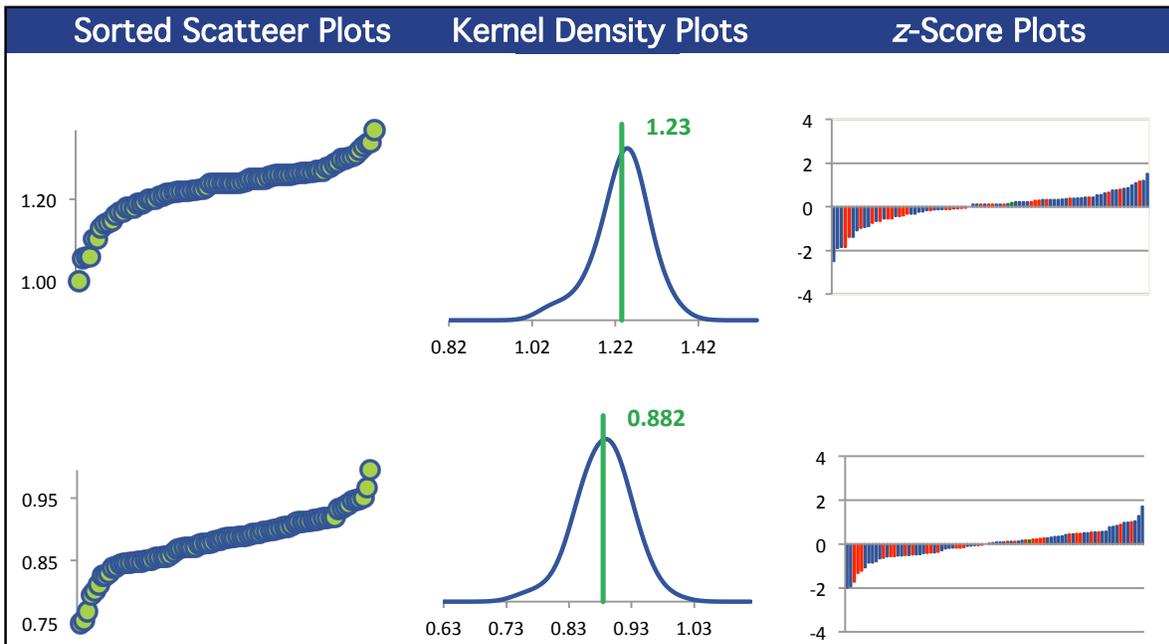
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	51	51	51	51
ICP/OES (Red)	30	30	30	30
AA (Green)	1	1	1	1

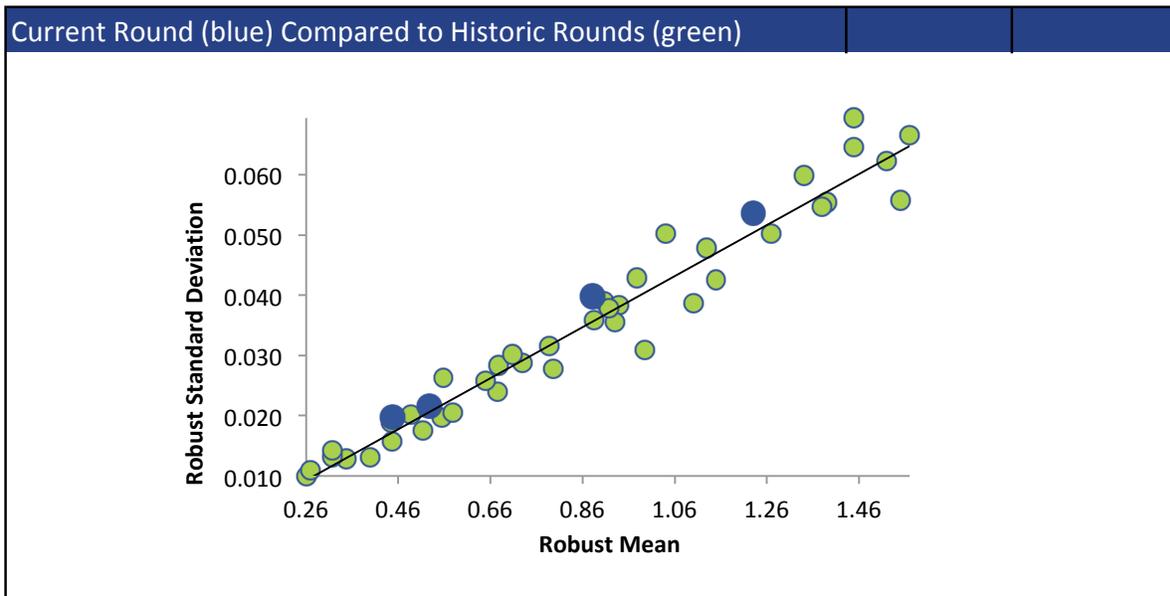
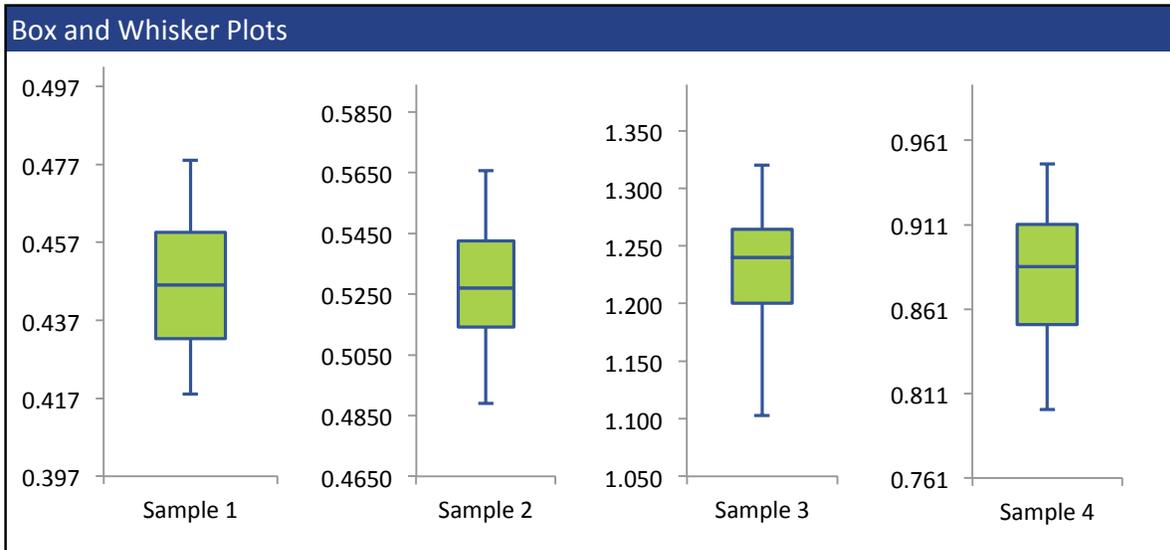
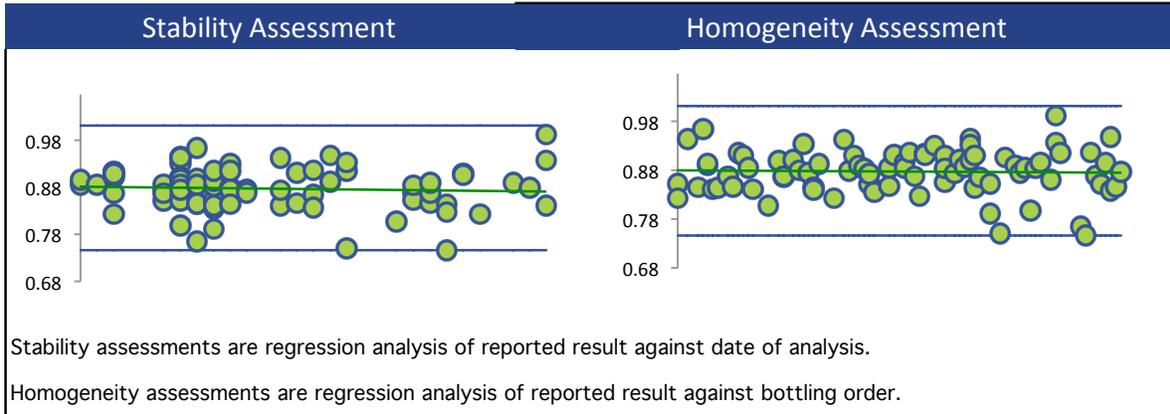
All summary stats and the plots below are based on the data excluding any flagged outliers



# CHROMIUM



# CHROMIUM



## COBALT

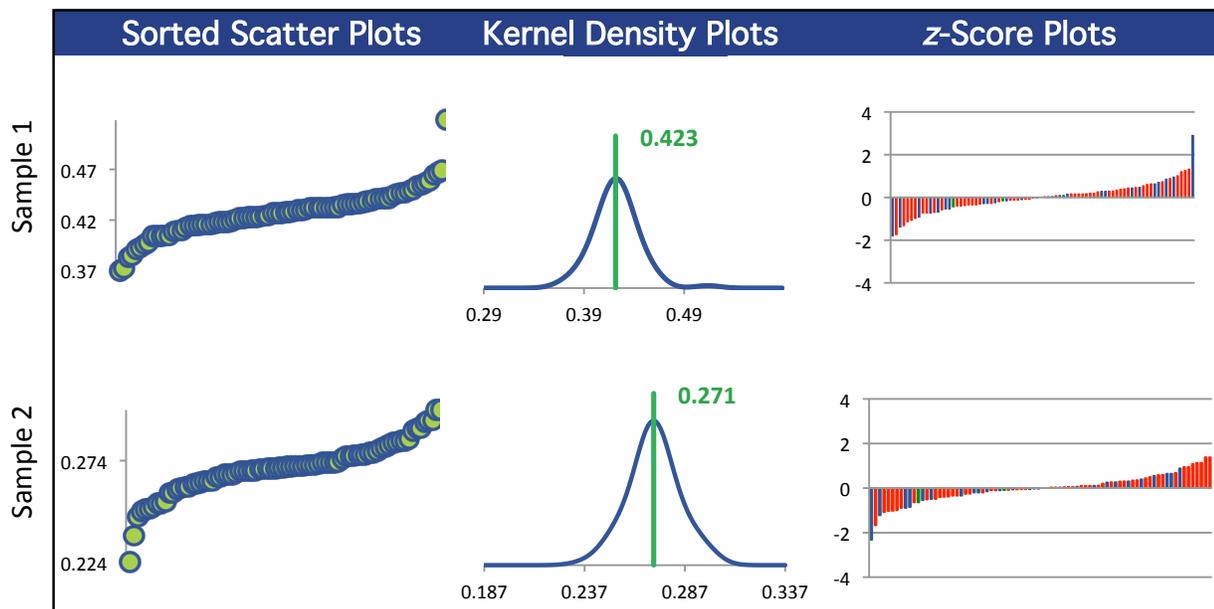
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	80	80	80	80
Median mg/L	0.423	0.271	1.41	1.22
Robust Mean mg/L	0.423	0.271	1.41	1.22
U mg/L	0.00268	0.00161	0.00938	0.00893
Robust Standard Deviation mg/L	0.0192	0.0115	0.0671	0.0639
Regression Standard Deviation mg/L	0.0317	0.0203	0.106	0.0918
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0317	0.0203	0.106	0.0918
Outliers	1	1	1	1
z >3.0	0	0	0	0
2< z <3	1	1	2	1

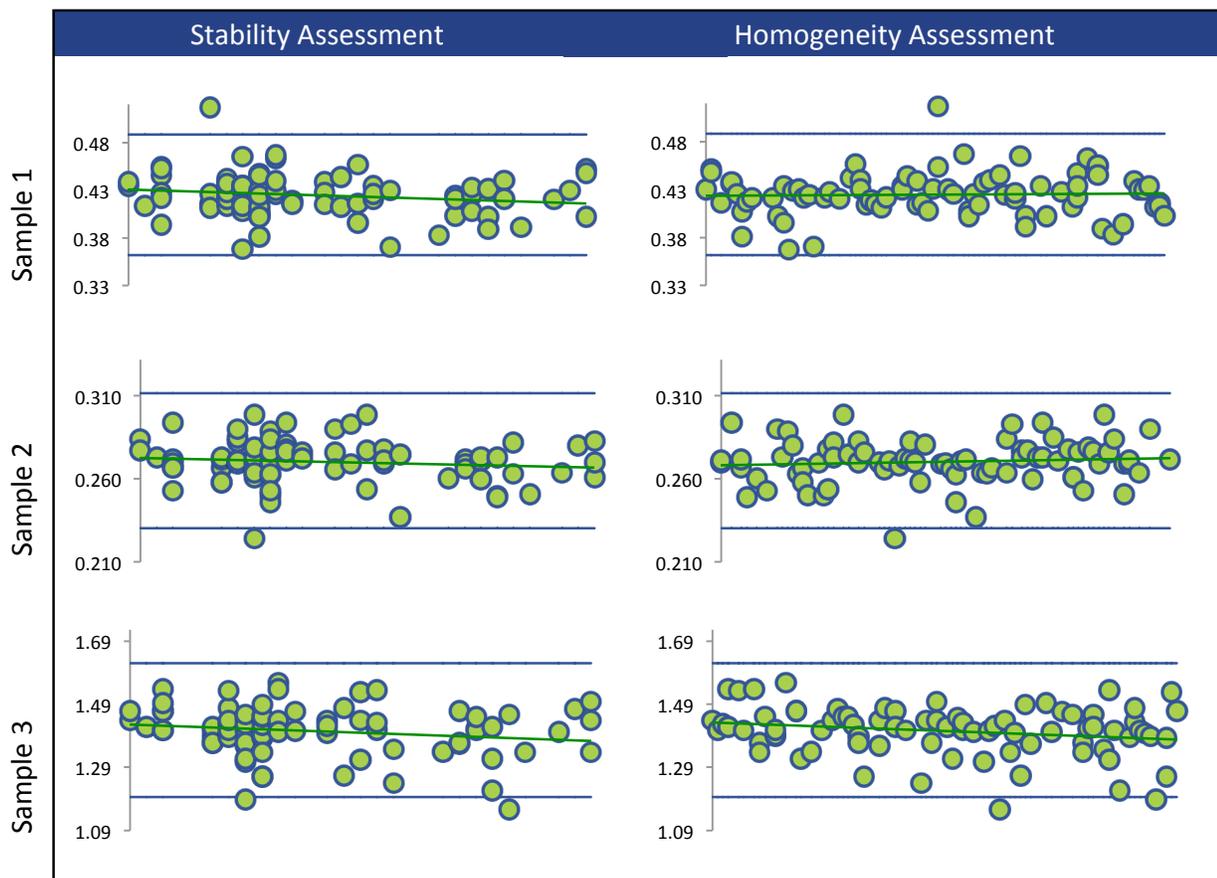
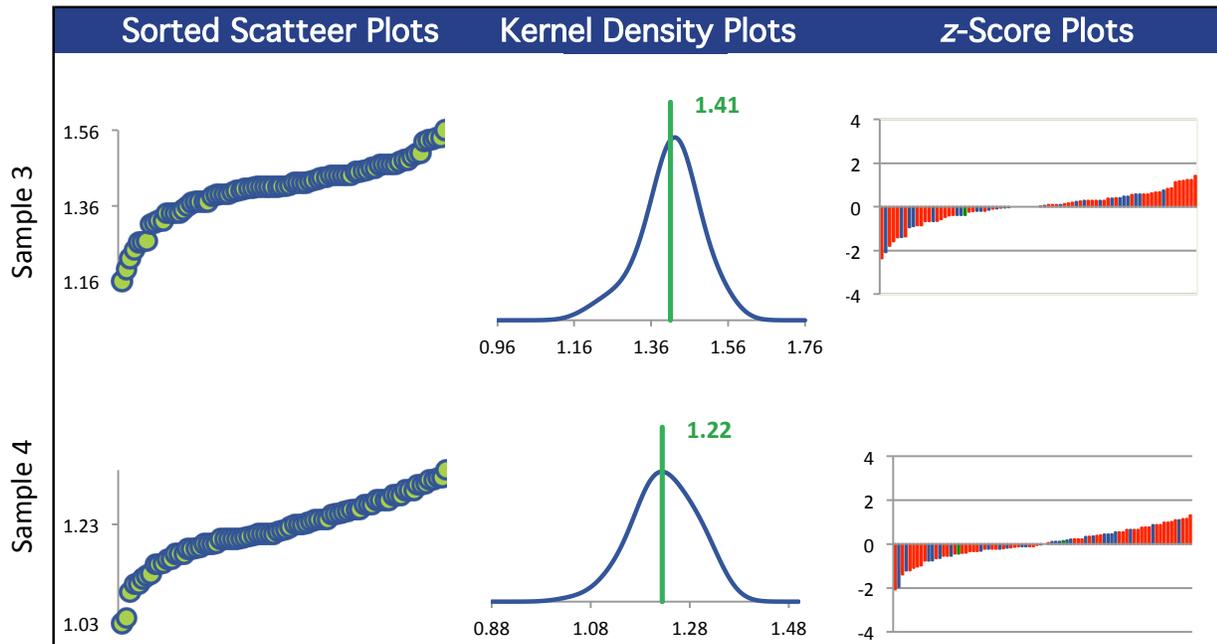
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES (Blue)	28	28	28	28
ICP/MS (Red)	50	50	50	50
AA (Green)	2	2	2	2

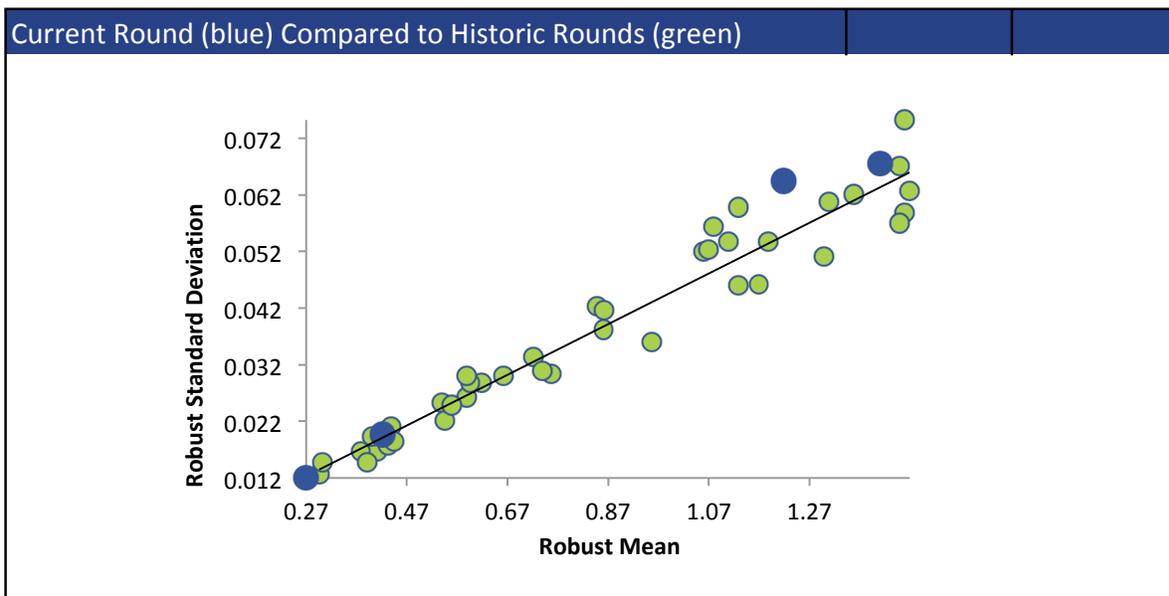
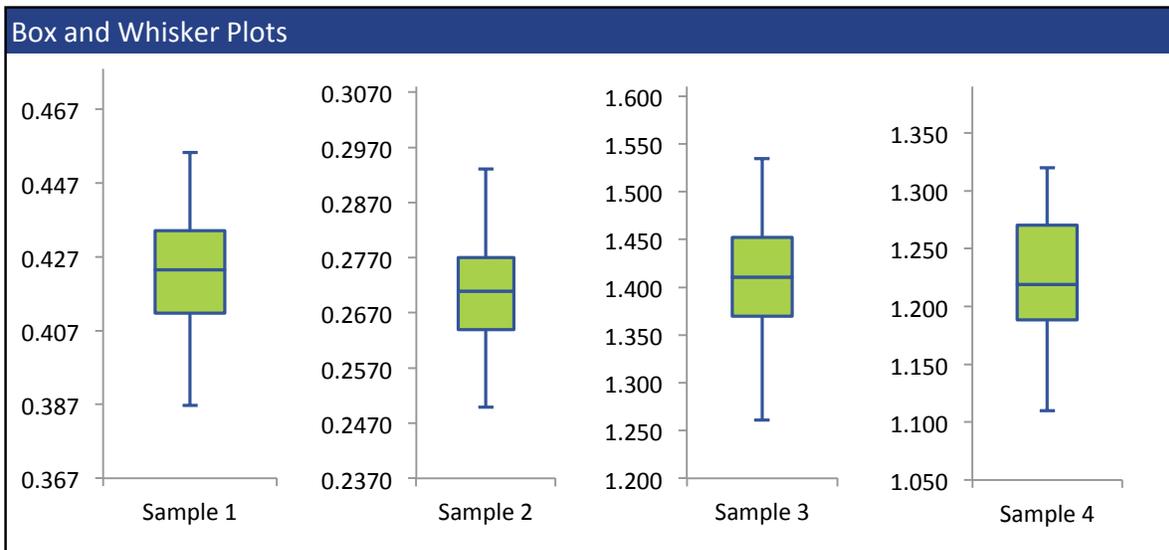
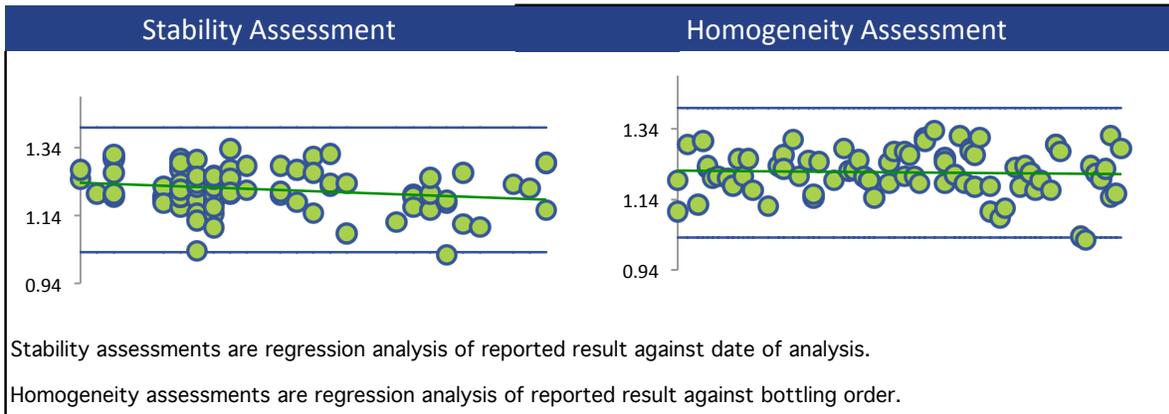
All summary stats and the plots below are based on the data excluding any flagged outliers



# COBALT



# COBALT



## COPPER

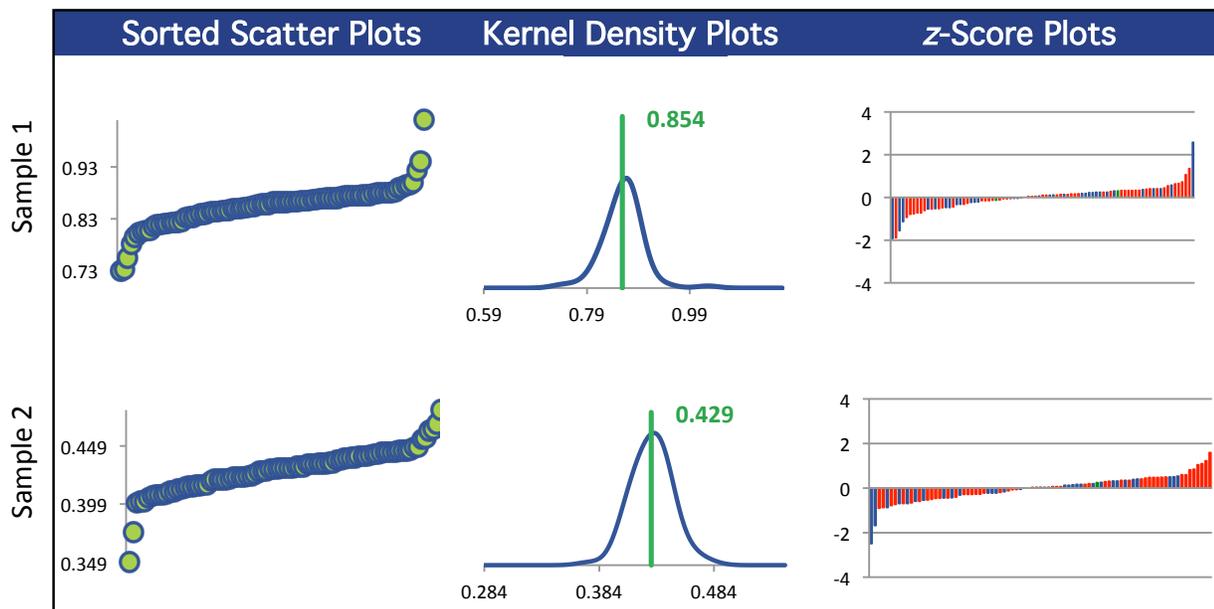
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	85	85	85	85
Median mg/L	0.861	0.430	1.48	0.769
Robust Mean mg/L	0.854	0.429	1.47	0.768
U mg/L	0.00392	0.00224	0.00748	0.00428
Robust Standard Deviation mg/L	0.0289	0.0165	0.0552	0.0316
Regression Standard Deviation mg/L	0.0641	0.0321	0.110	0.0576
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0641	0.0321	0.110	0.0576
Outliers	1	1	1	1
z >3.0	0	0	0	0
2< z <3	1	1	0	1

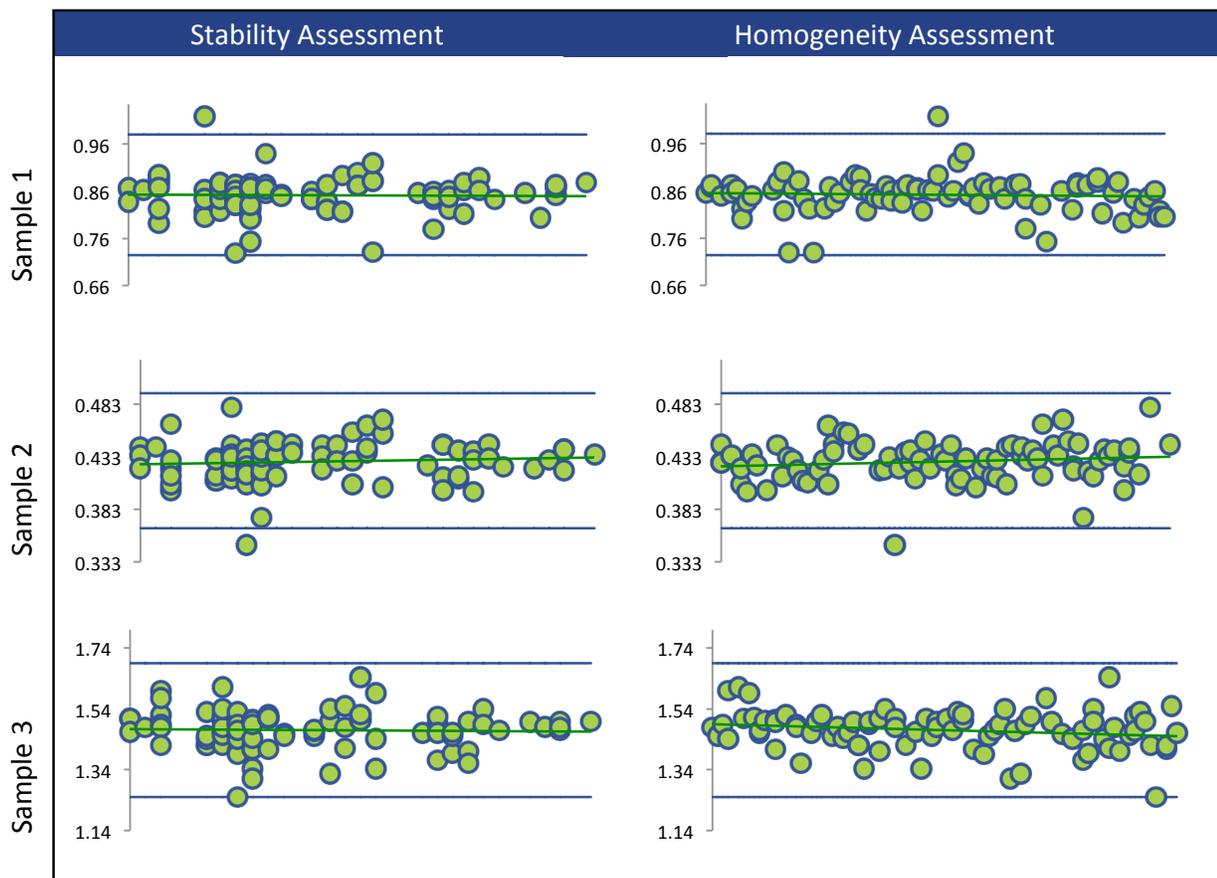
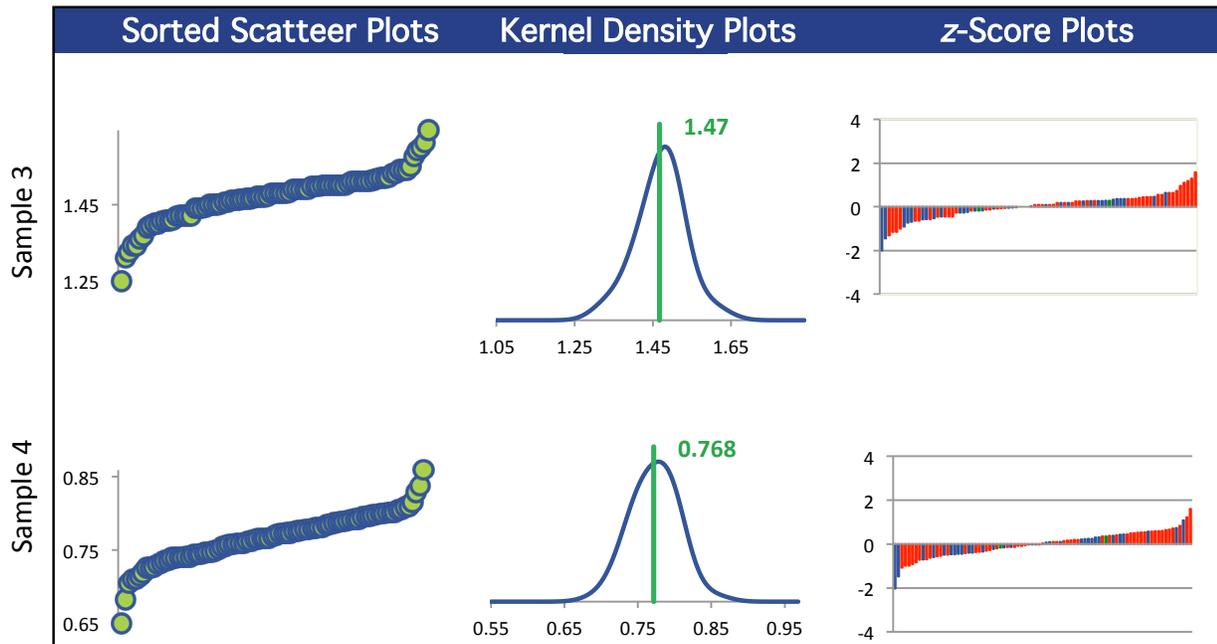
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES (Blue)	31	31	31	31
ICP/MS (Red)	52	52	52	52
AA (Green)	2	2	2	2

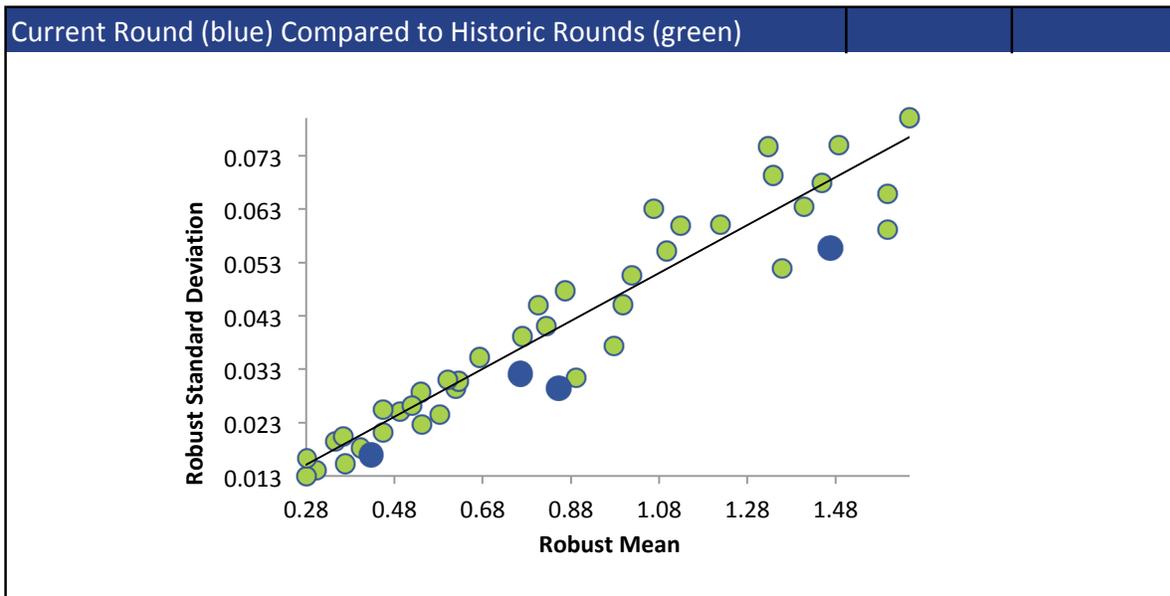
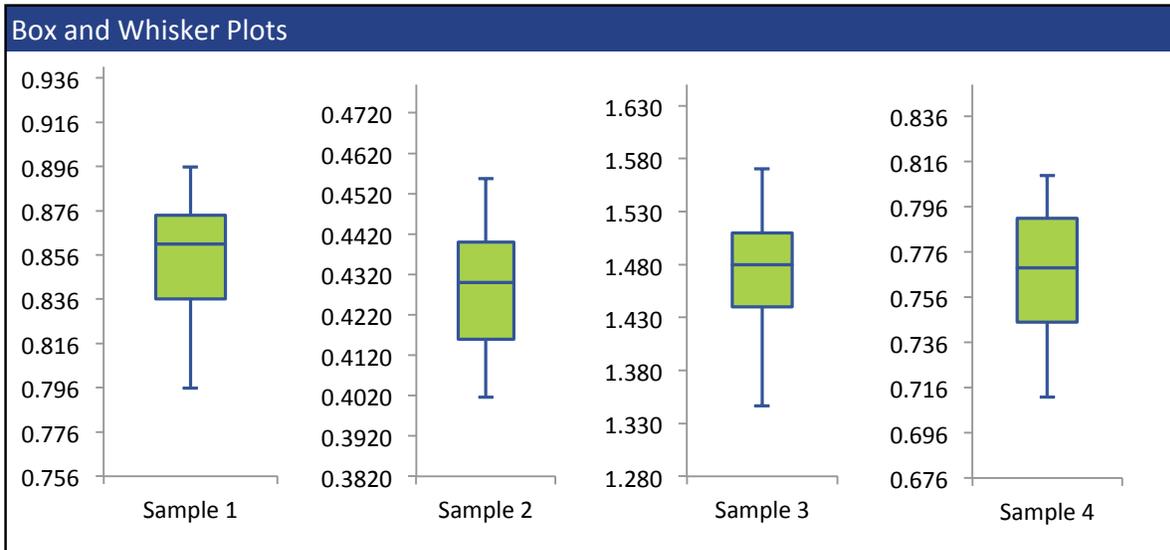
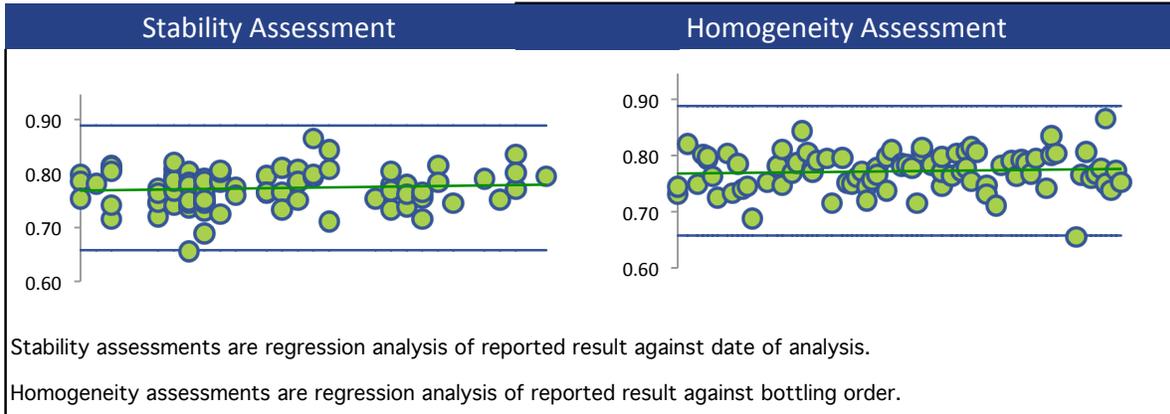
All summary stats and the plots below are based on the data excluding any flagged outliers



# COPPER



# COPPER



## IRON

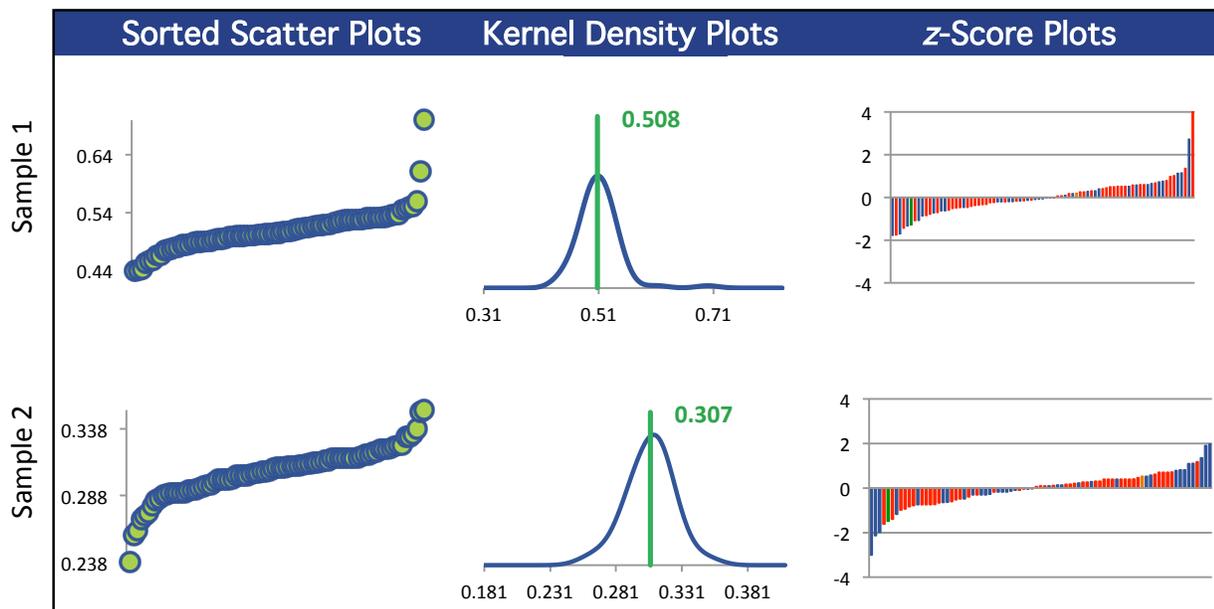
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	81	81	81	80
Median mg/L	0.505	0.309	1.20	1.03
Robust Mean mg/L	0.508	0.307	1.19	1.02
U mg/L	0.00367	0.00224	0.00839	0.00643
Robust Standard Deviation mg/L	0.0264	0.0161	0.0604	0.0460
Regression Standard Deviation mg/L	0.0381	0.0230	0.0895	0.0768
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0381	0.0230	0.0895	0.0768
Outliers	1	1	1	2
z >3.0	1	0	0	0
2< z <3	1	2	1	0

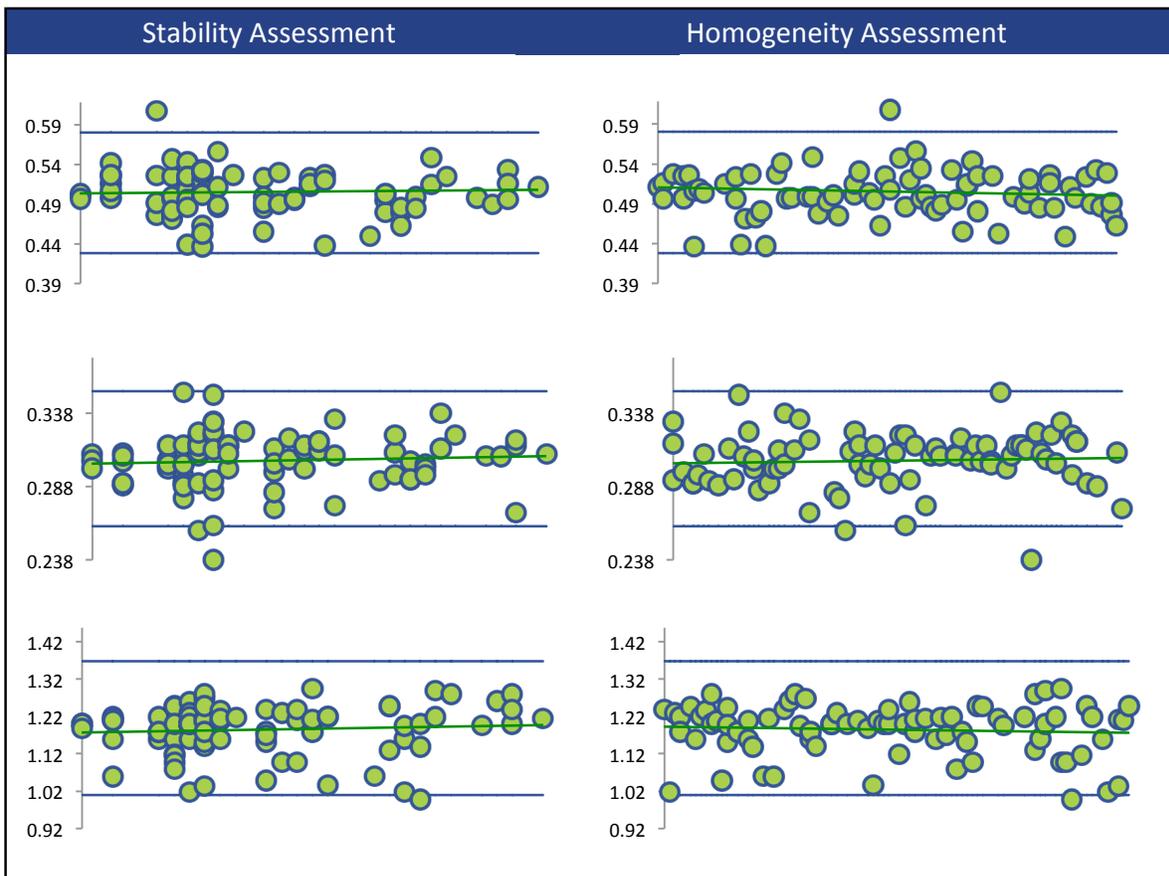
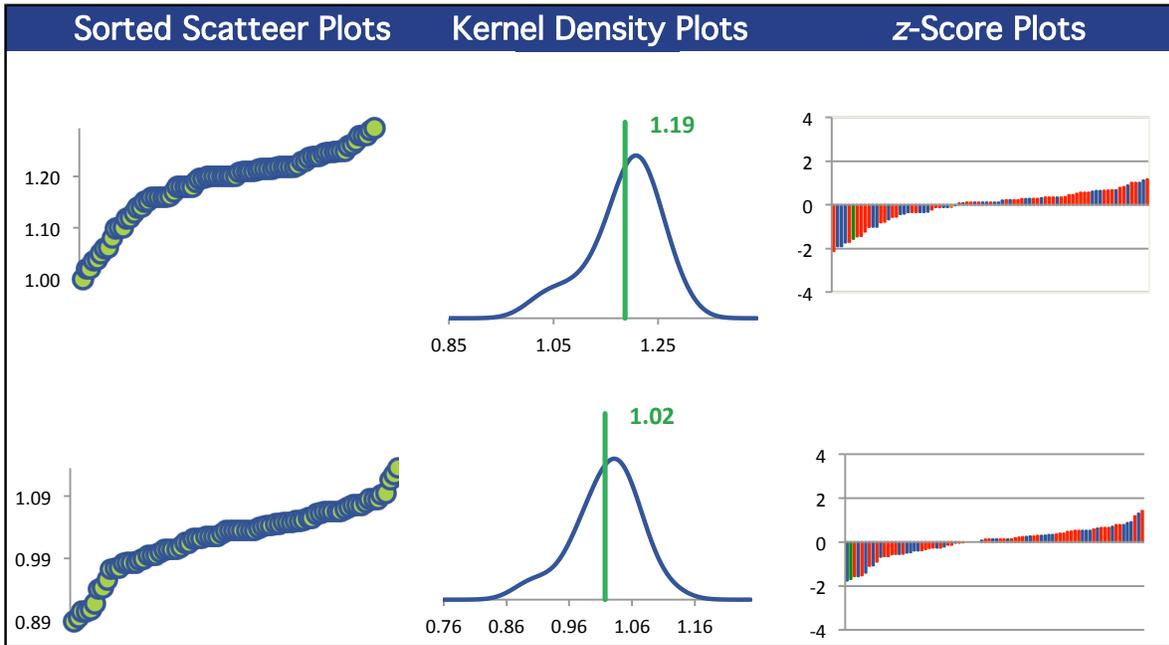
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES (Blue)	34	34	34	34
ICP/MS (Red)	45	45	45	44
COLOR (Green)	1	1	1	1
AA (Orange)	1	1	1	1

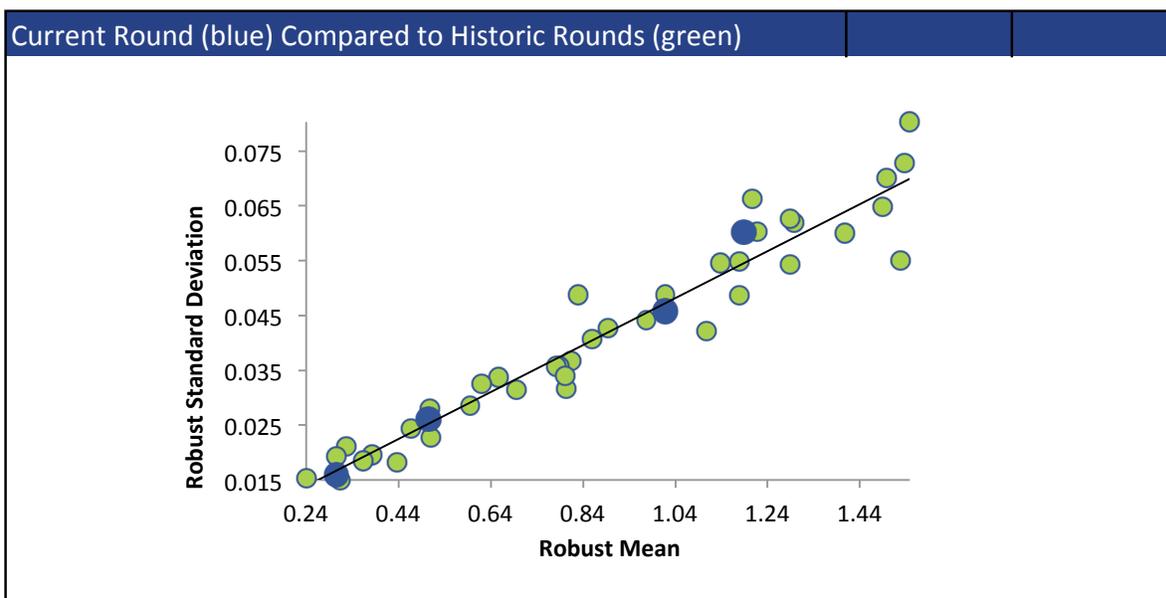
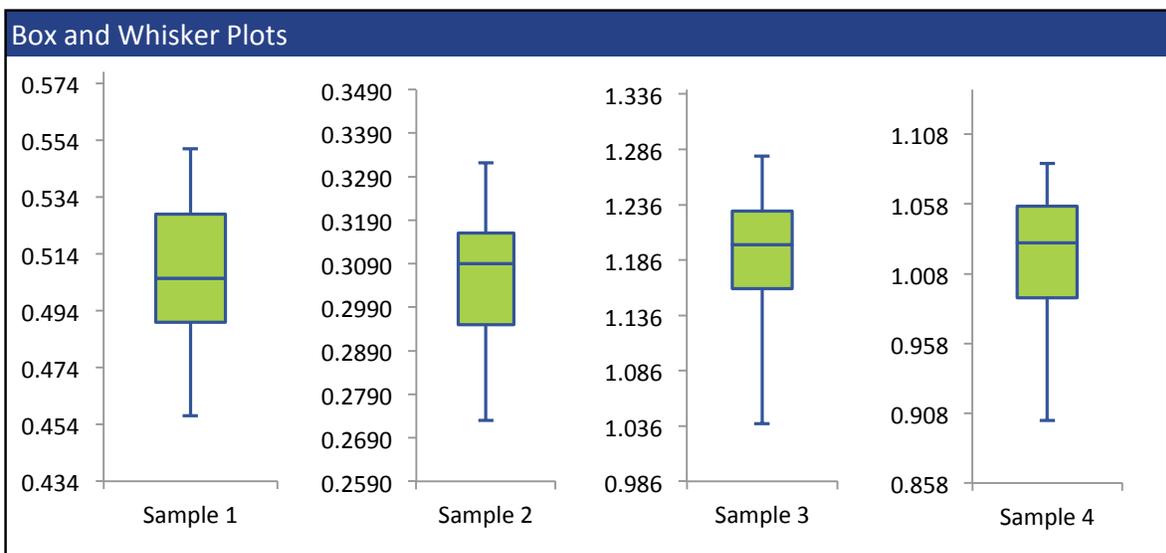
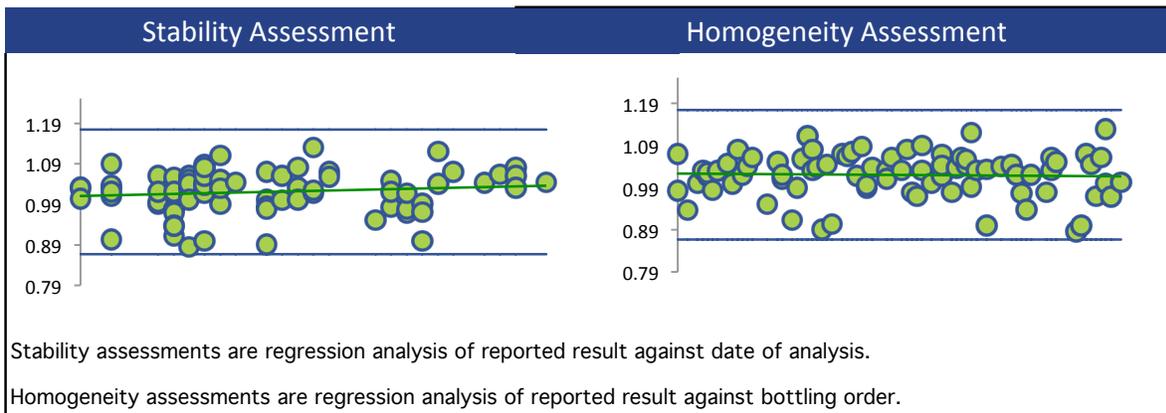
All summary stats and the plots below are based on the data excluding any flagged outliers



# IRON



# IRON



## LEAD

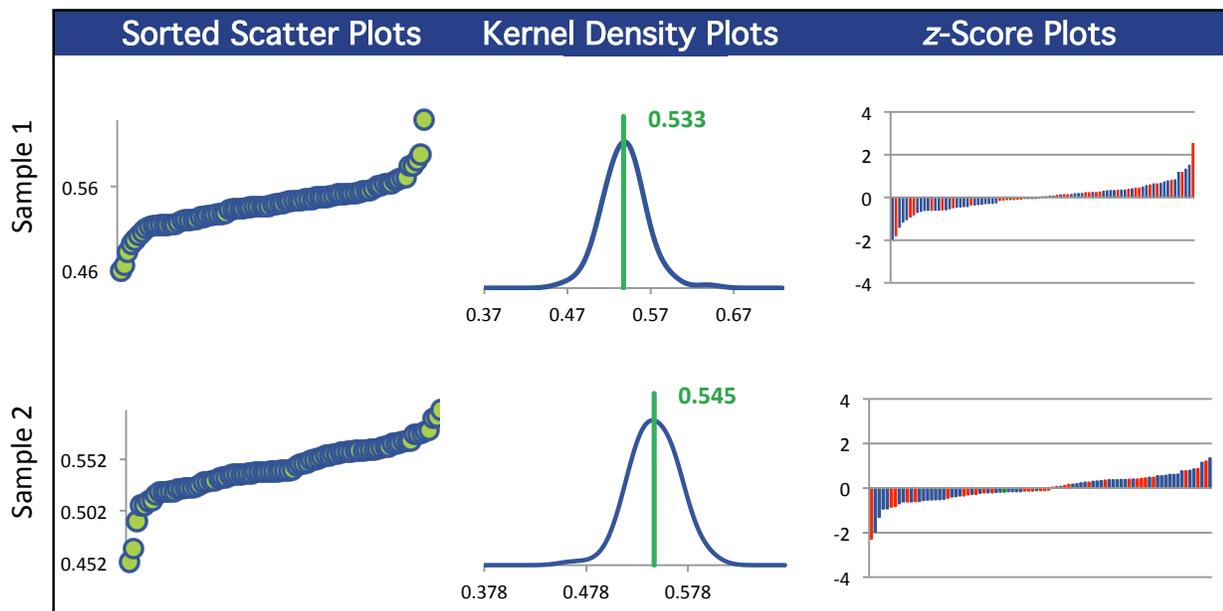
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	85	85	85	85
Median mg/L	0.534	0.541	1.53	0.899
Robust Mean mg/L	0.533	0.545	1.53	0.897
U mg/L	0.00301	0.00304	0.00889	0.00472
Robust Standard Deviation mg/L	0.0222	0.0224	0.0656	0.0348
Regression Standard Deviation mg/L	0.0400	0.0408	0.114	0.0673
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0400	0.0408	0.114	0.0673
Outliers	1	1	1	1
z >3.0	0	0	0	0
2< z <3	1	1	2	0

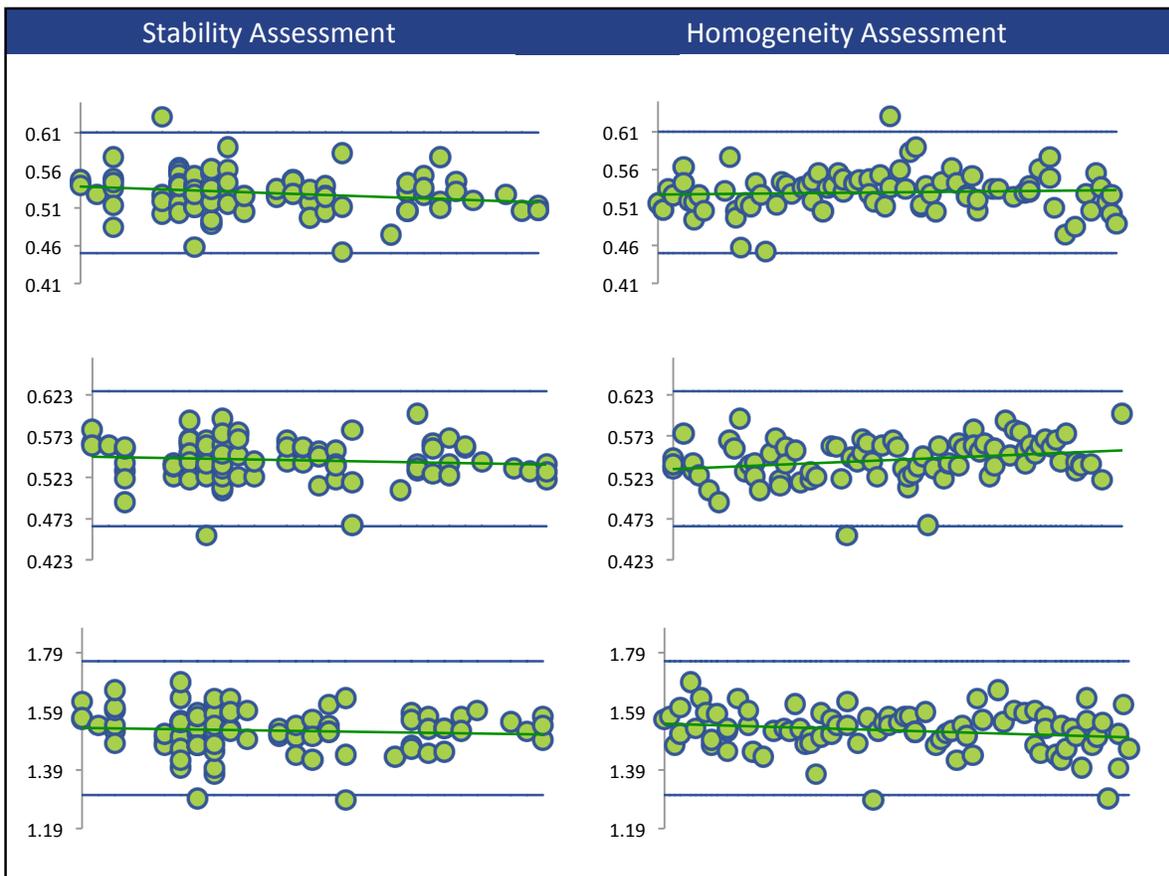
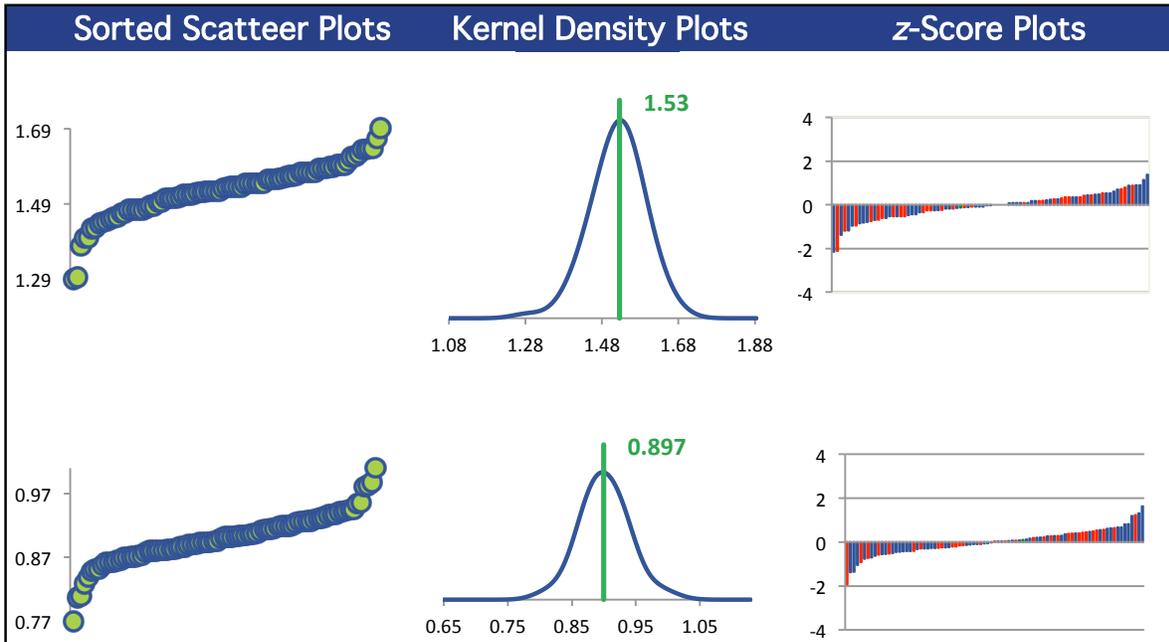
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	53	53	53	53
ICP/OES (Red)	31	31	31	31
AA (Green)	1	1	1	1

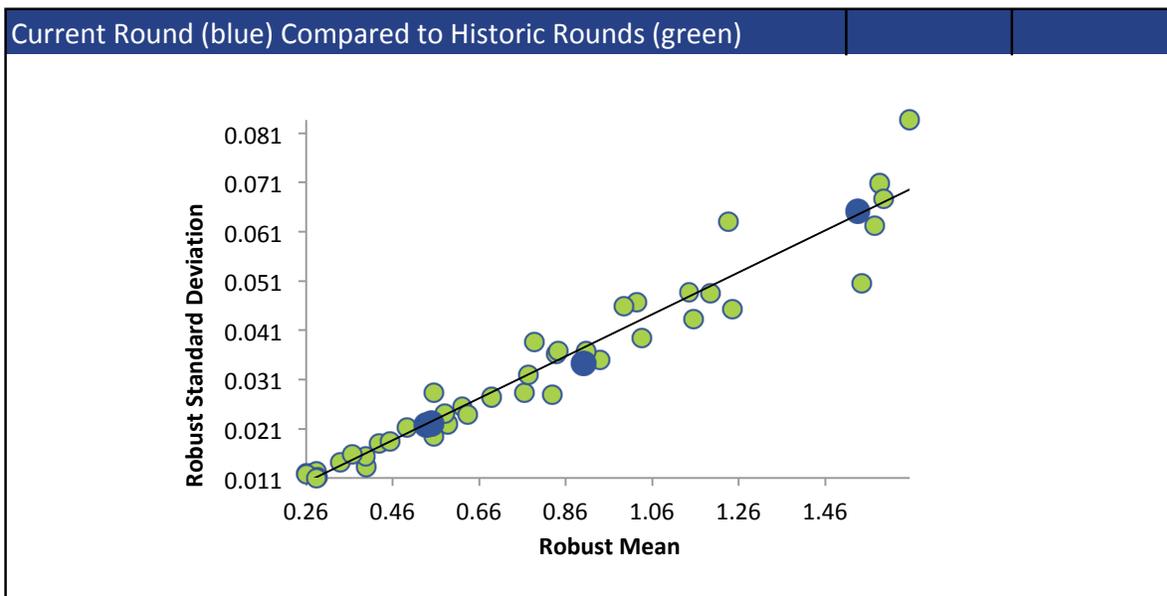
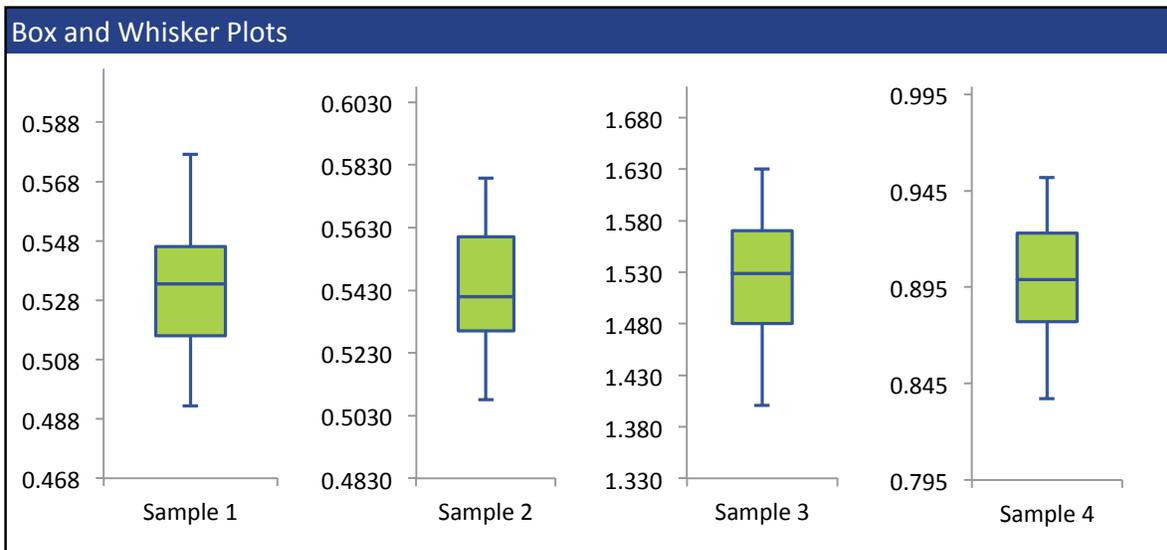
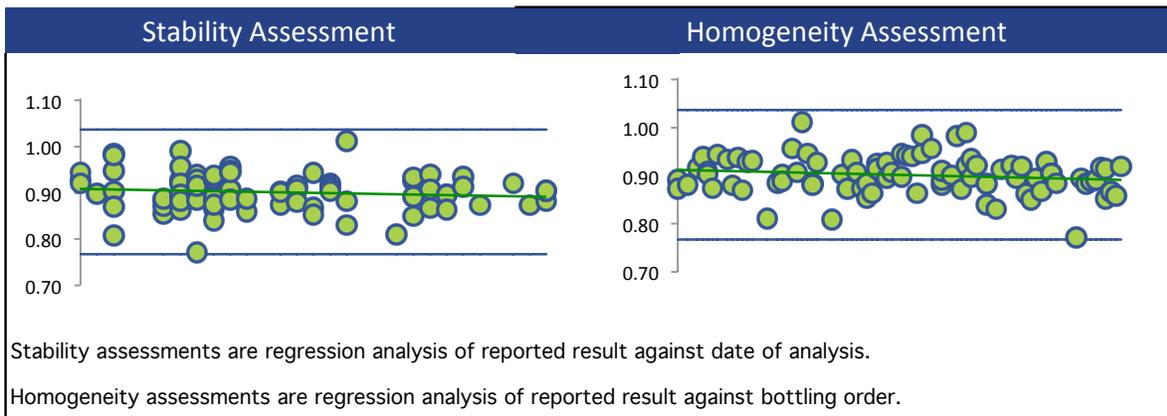
All summary stats and the plots below are based on the data excluding any flagged outliers



# LEAD



# LEAD



## MANGANESE

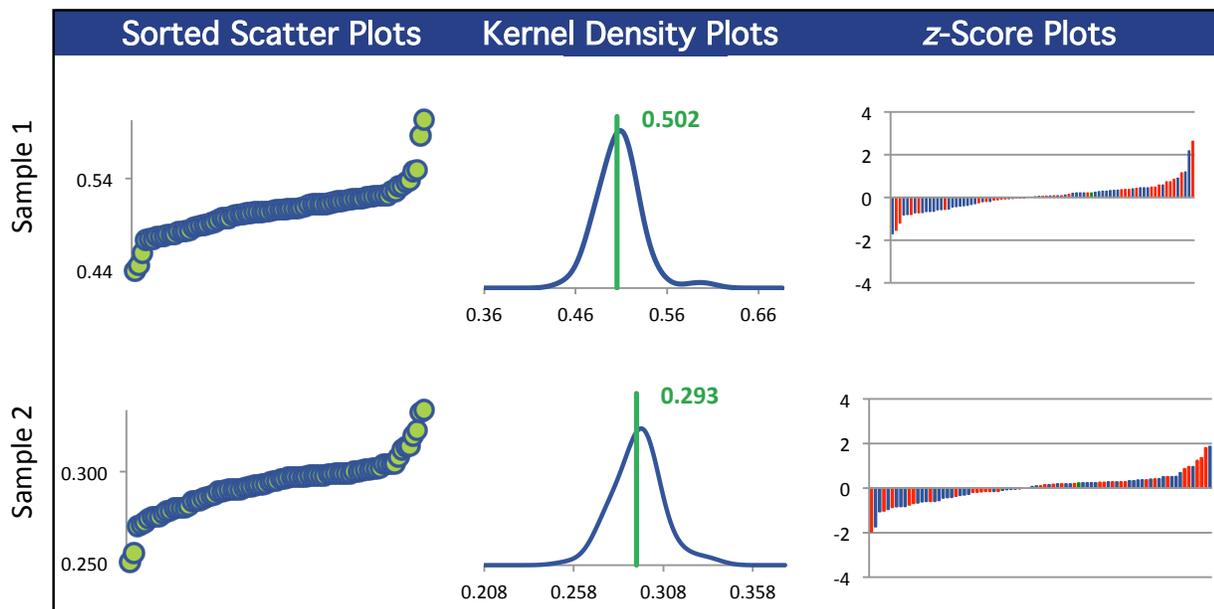
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	81	81	81	81
Median mg/L	0.504	0.295	1.47	1.01
Robust Mean mg/L	0.502	0.293	1.46	1.01
U mg/L	0.00276	0.00167	0.00839	0.00610
Robust Standard Deviation mg/L	0.0199	0.0120	0.0604	0.0439
Regression Standard Deviation mg/L	0.0377	0.0220	0.110	0.0756
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0377	0.0220	0.110	0.0756
Outliers	1	1	1	1
z >3.0	0	0	0	0
2< z <3	2	0	0	0

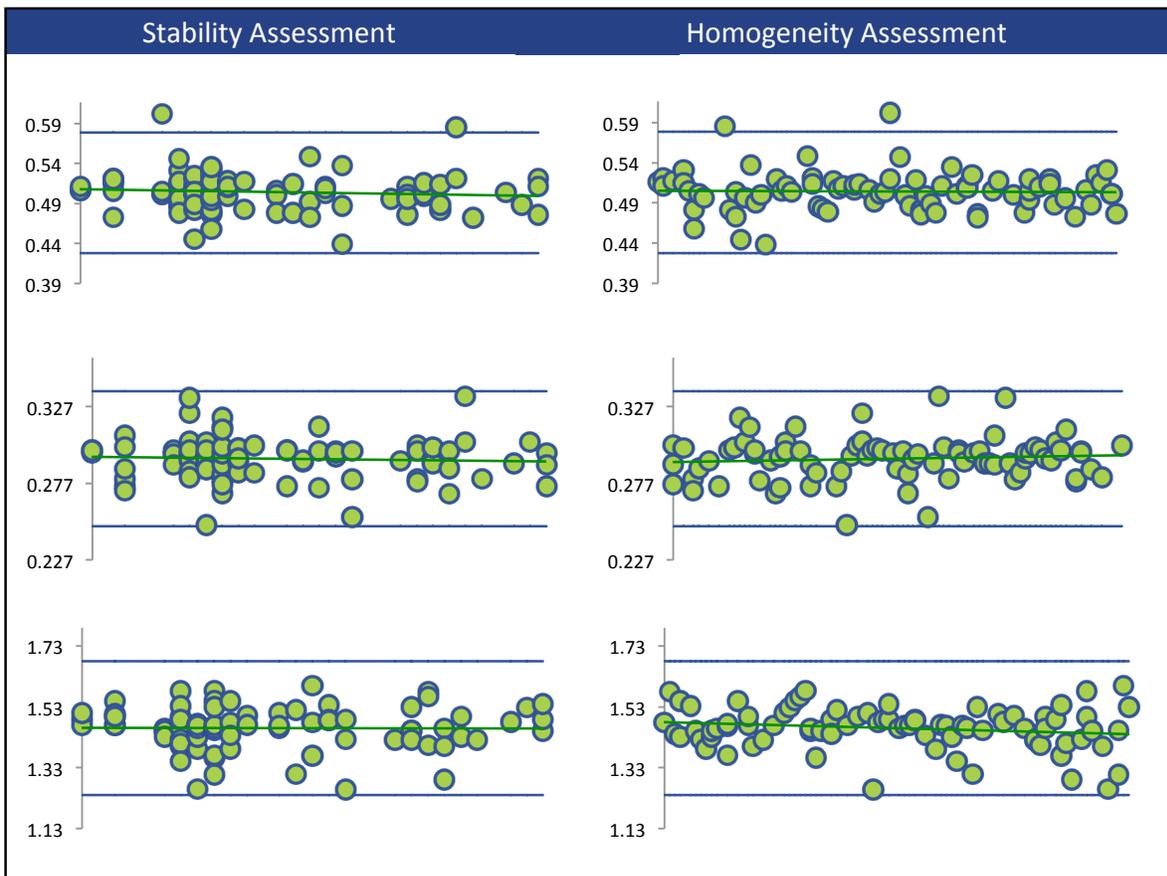
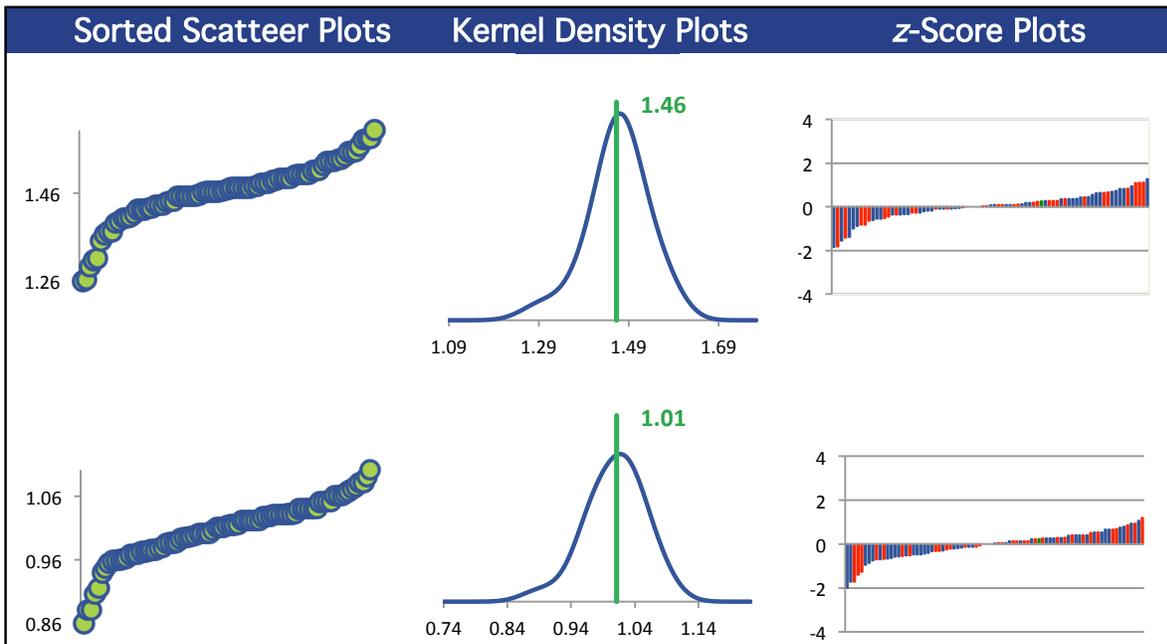
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	47	47	47	47
ICP/OES (Red)	33	33	33	33
AA (Green)	1	1	1	1

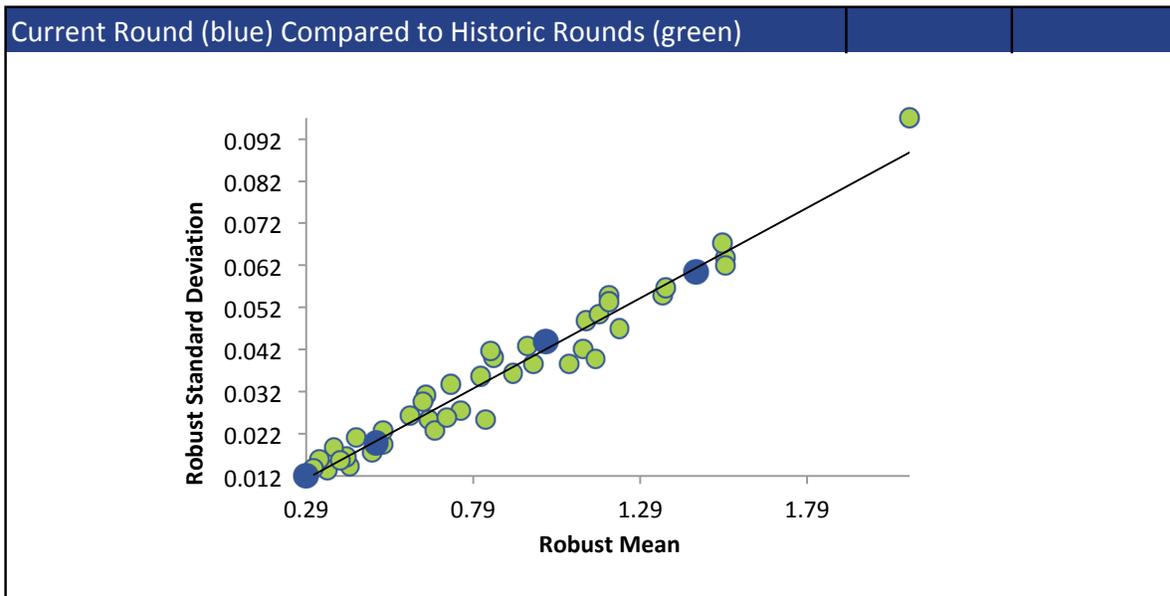
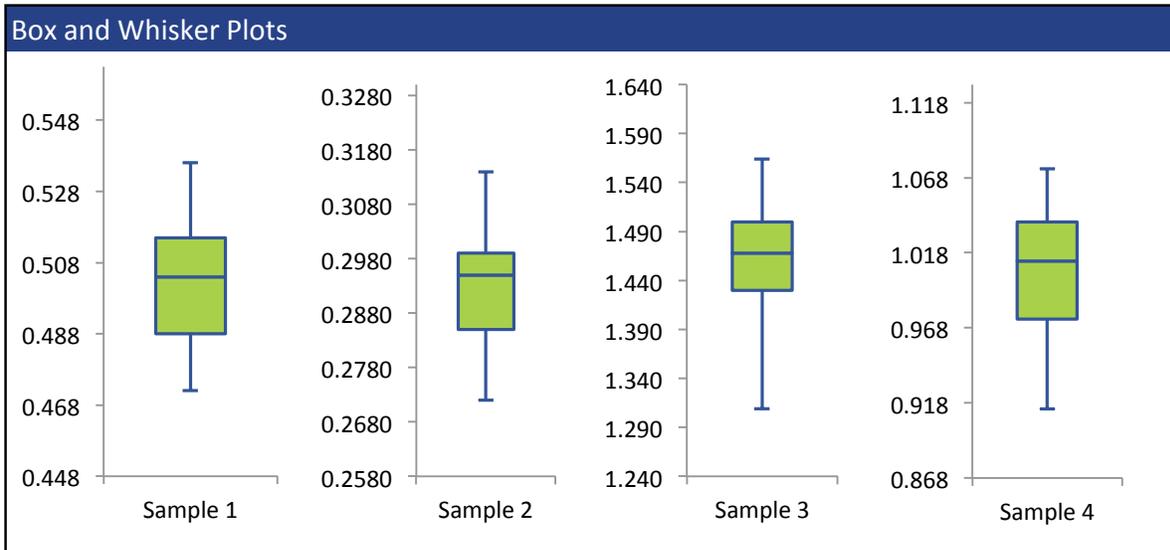
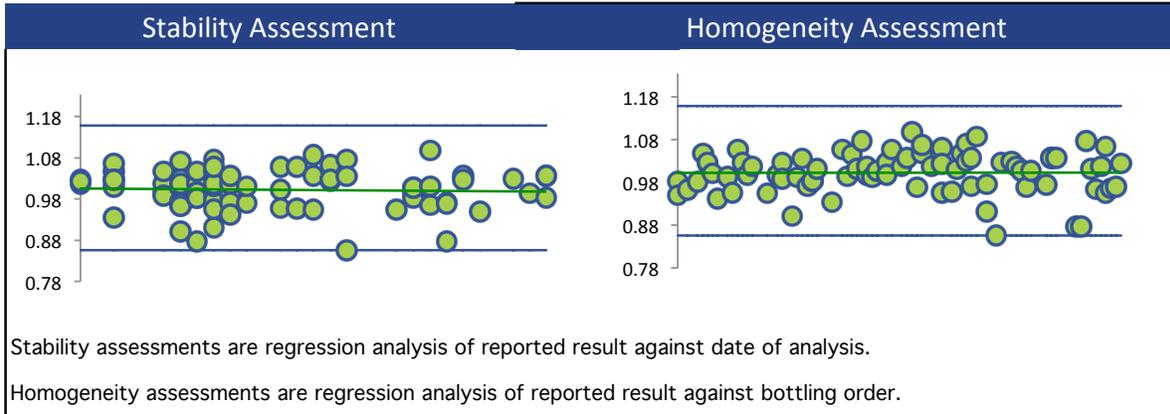
All summary stats and the plots below are based on the data excluding any flagged outliers



# MANGANESE



# MANGANESE



## MOLYBDENUM

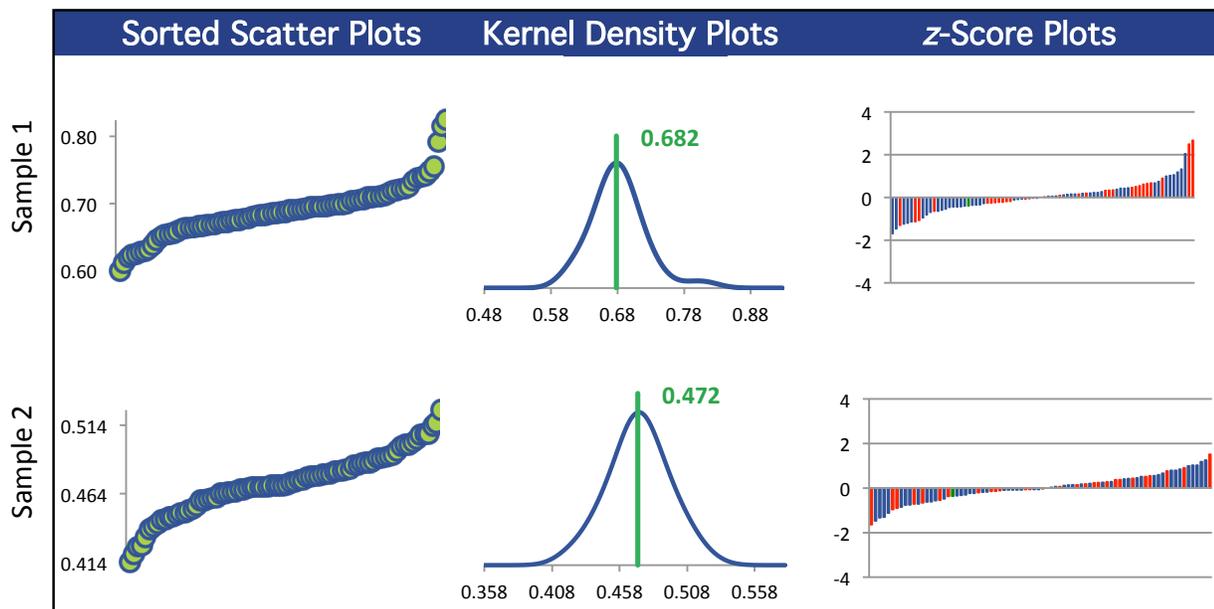
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	80	80	80	80
Median mg/L	0.682	0.471	1.20	1.09
Robust Mean mg/L	0.682	0.472	1.21	1.08
U mg/L	0.00470	0.00307	0.00805	0.00676
Robust Standard Deviation mg/L	0.0336	0.0220	0.0576	0.0484
Regression Standard Deviation mg/L	0.0511	0.0354	0.0904	0.0811
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0511	0.0354	0.0904	0.0811
Outliers	1	1	1	1
z >3.0	0	0	0	0
2< z <3	3	0	1	1

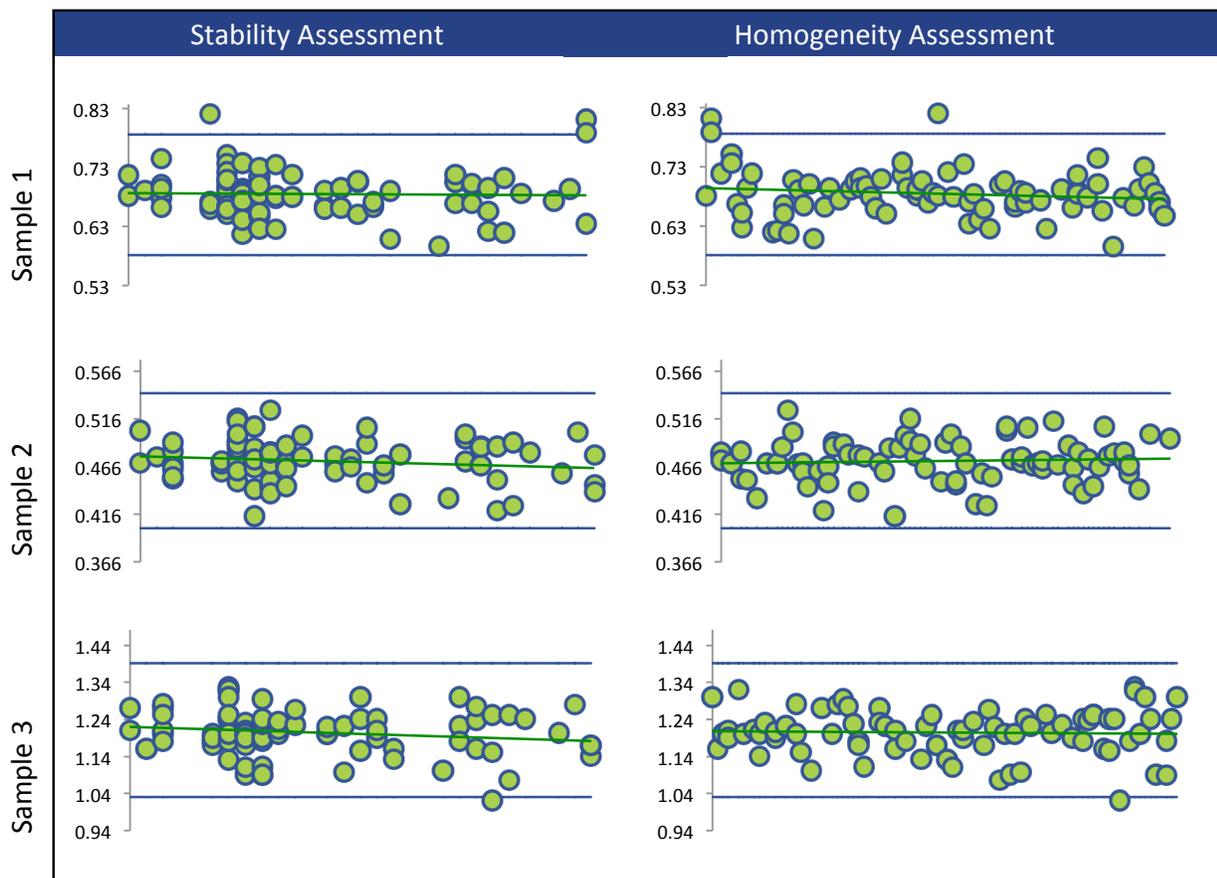
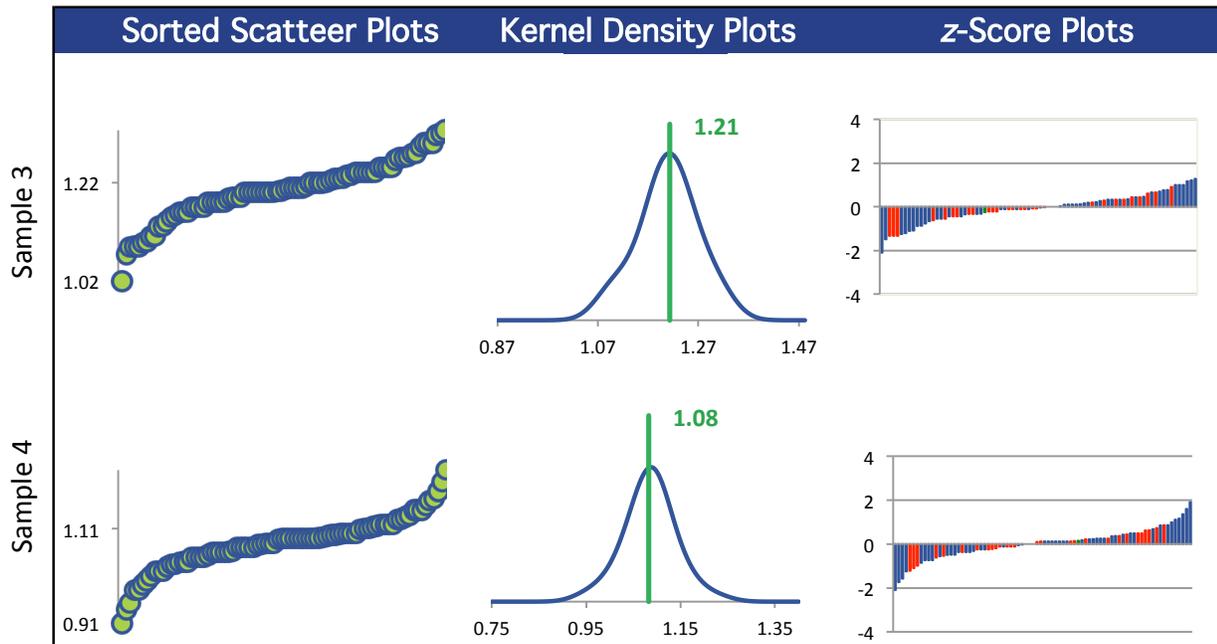
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	50	50	50	50
ICP/OES (Red)	29	29	29	29
AA (Green)	1	1	1	1

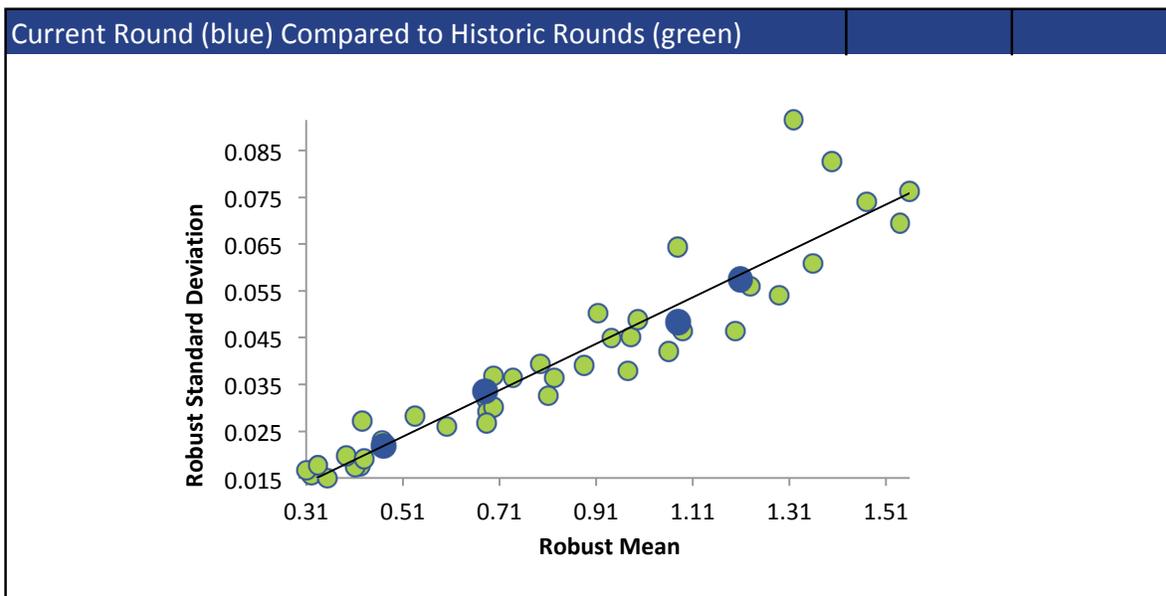
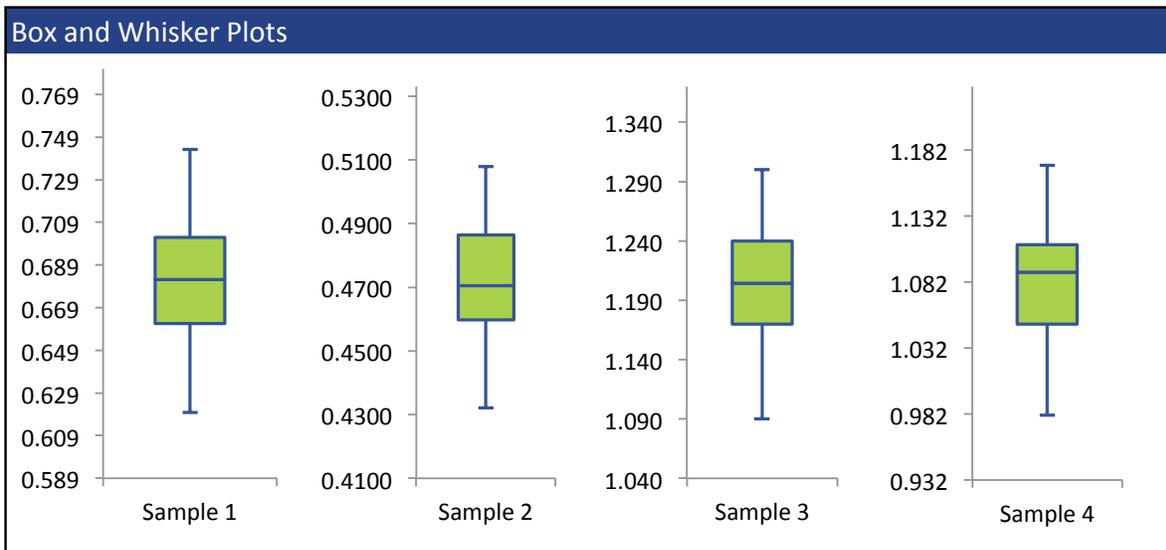
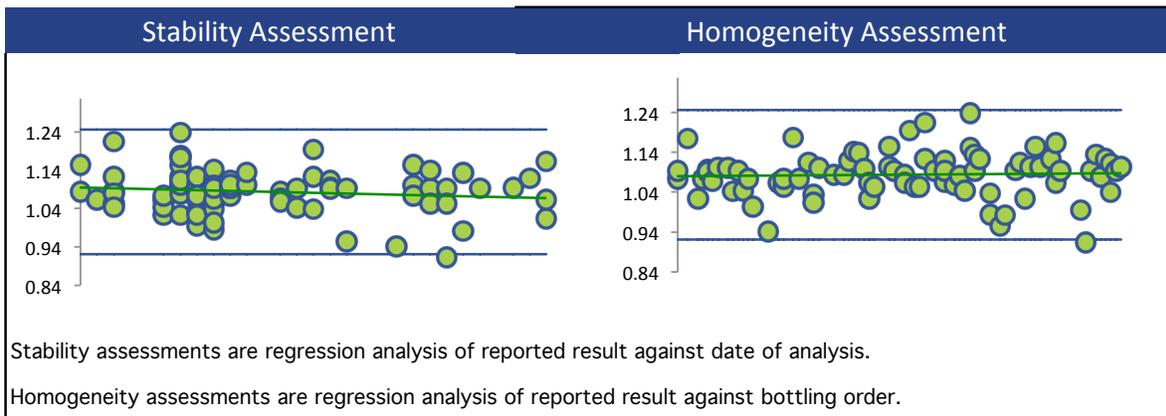
All summary stats and the plots below are based on the data excluding any flagged outliers



# MOLYBDENUM



# MOLYBDENUM



## NICKEL

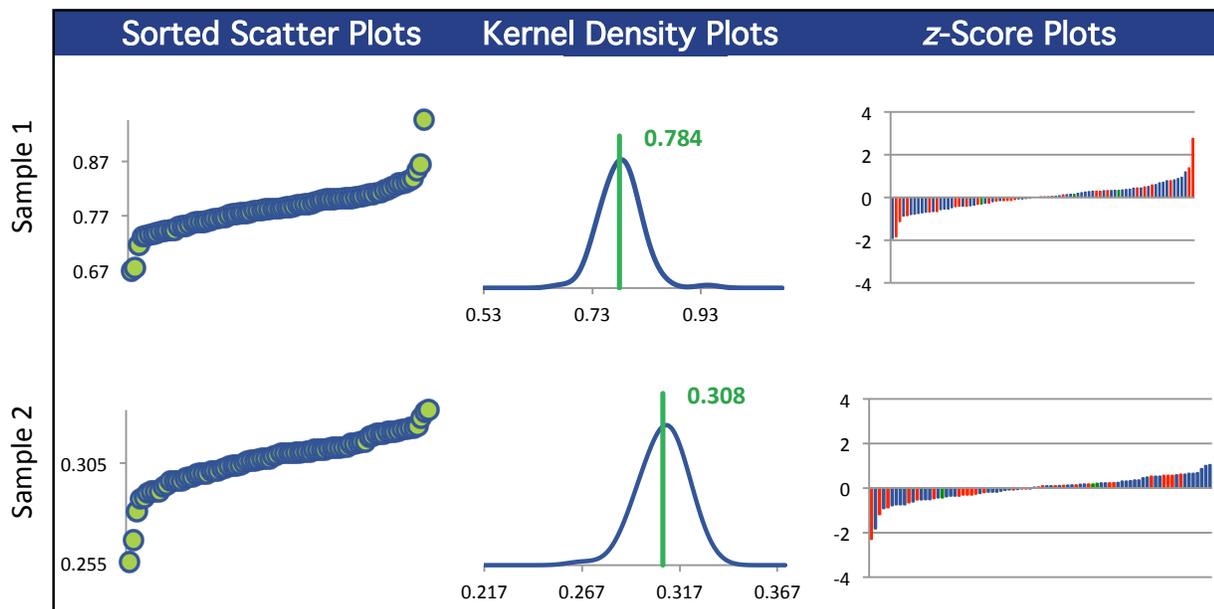
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	82	82	82	82
Median mg/L	0.785	0.310	1.47	0.778
Robust Mean mg/L	0.784	0.308	1.46	0.776
U mg/L	0.00458	0.00160	0.00835	0.00497
Robust Standard Deviation mg/L	0.0332	0.0116	0.0605	0.0360
Regression Standard Deviation mg/L	0.0588	0.0231	0.109	0.0582
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0588	0.0231	0.109	0.0582
Outliers	1	1	1	1
z >3.0	0	0	0	0
2< z <3	1	1	1	1

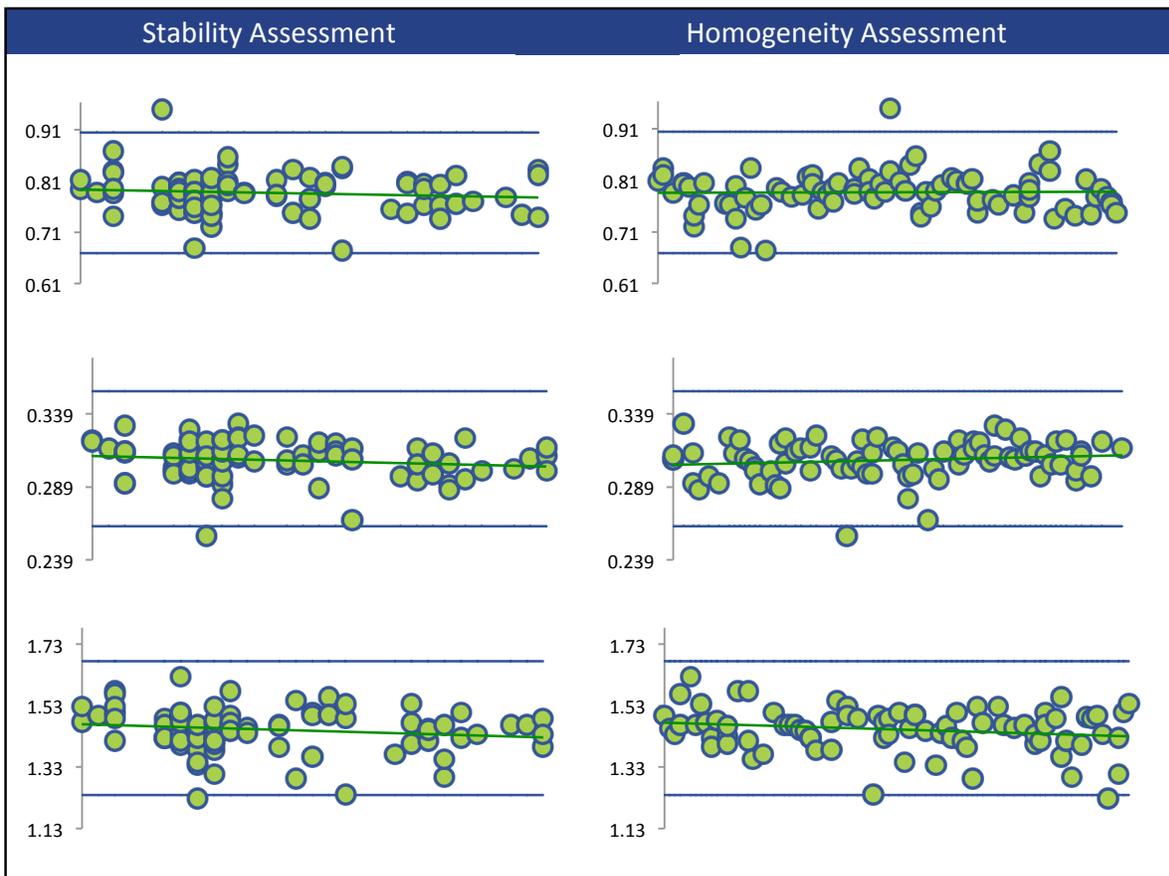
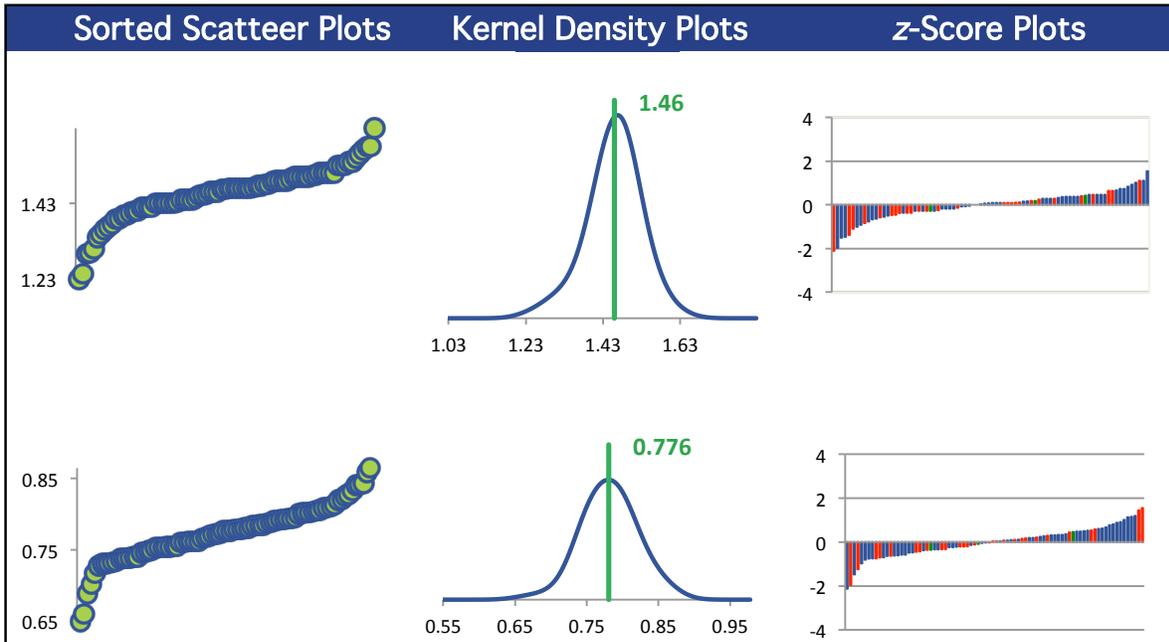
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	51	51	51	51
ICP/OES (Red)	28	28	28	28
AA (Green)	3	3	3	3

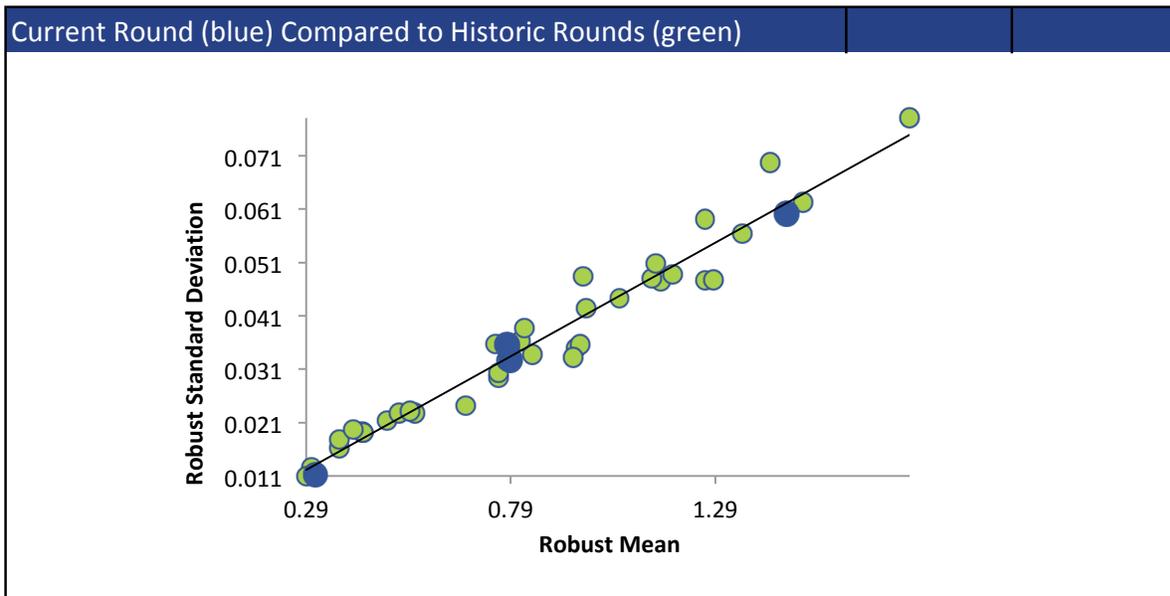
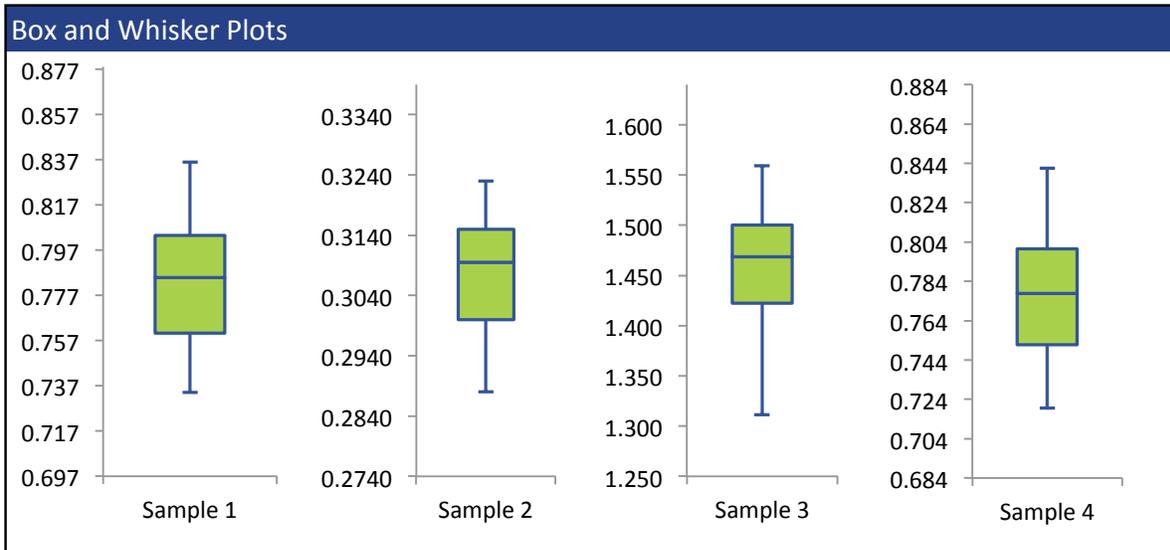
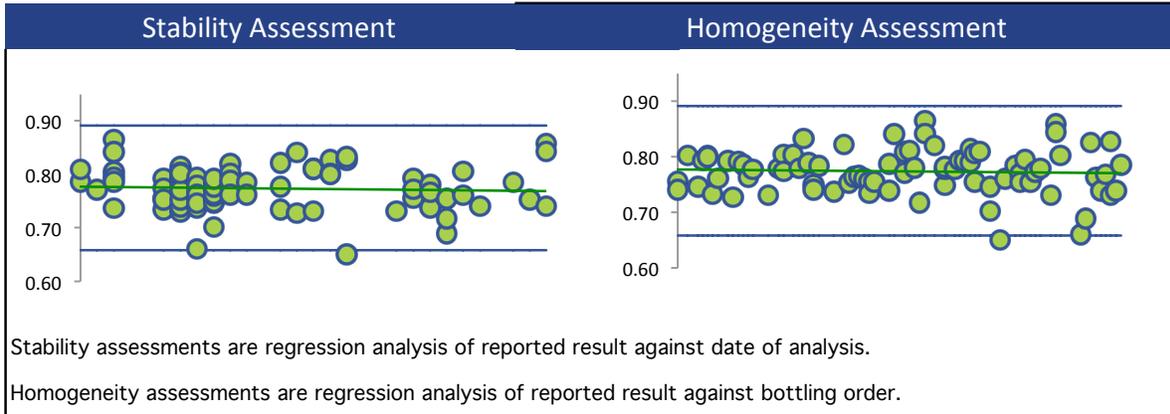
All summary stats and the plots below are based on the data excluding any flagged outliers



# NICKEL



NICKEL



## SELENIUM

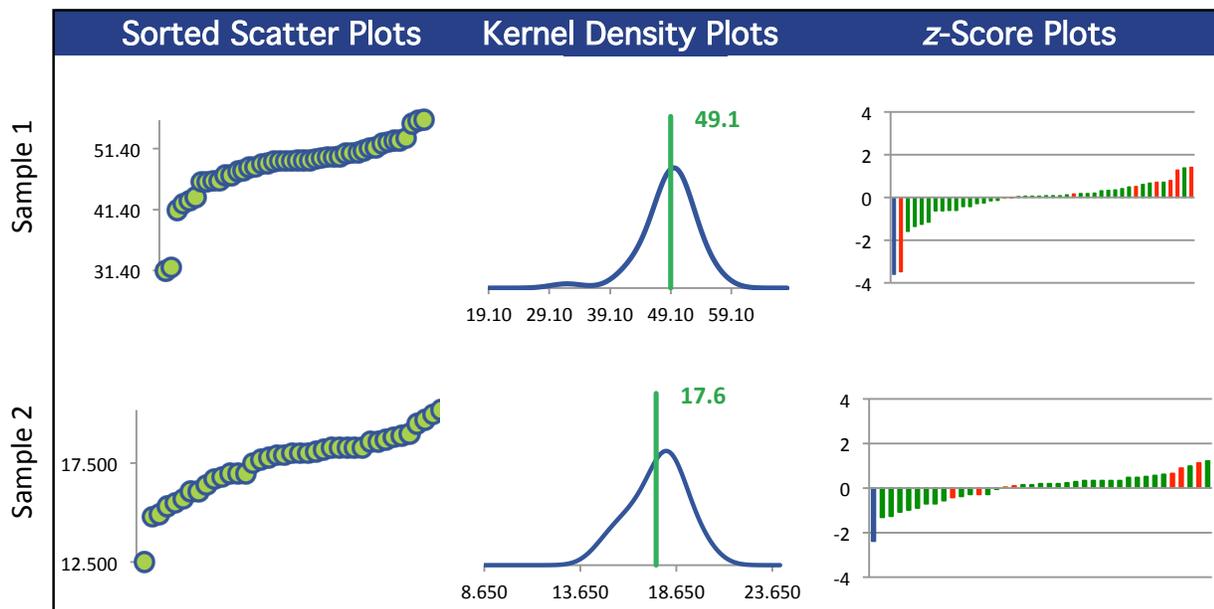
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	44	39	45	44
Median mg/L	49.5	18.0	83.8	57.6
Robust Mean mg/L	49.1	17.6	82.6	57.0
U mg/L	0.611	0.300	0.989	0.814
Robust Standard Deviation mg/L	3.24	1.50	5.31	4.32
Regression Standard Deviation mg/L	4.91	1.76	8.26	5.70
Stability Flag		Stability		
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	4.91	2.14	8.26	5.70
Outliers	0	0	0	0
z >3.0	2	0	1	1
2< z <3	0	1	0	0

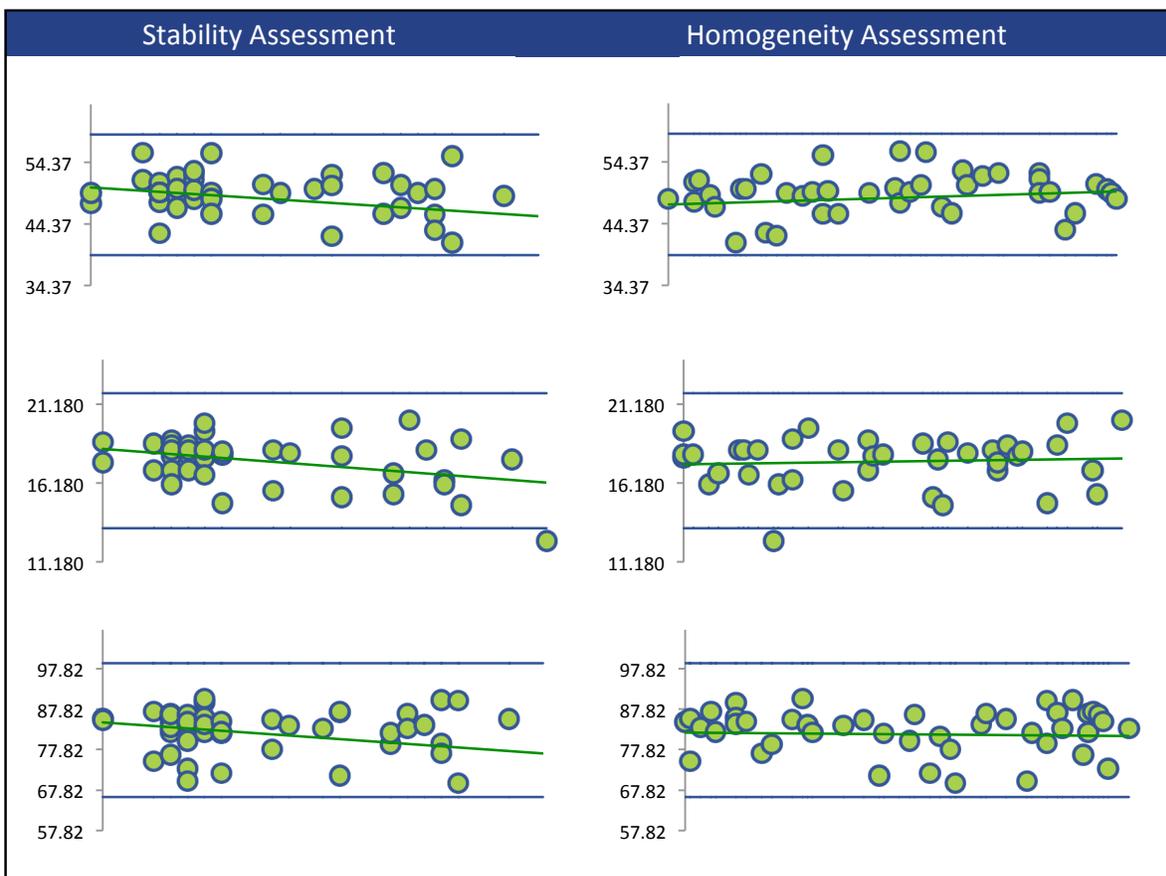
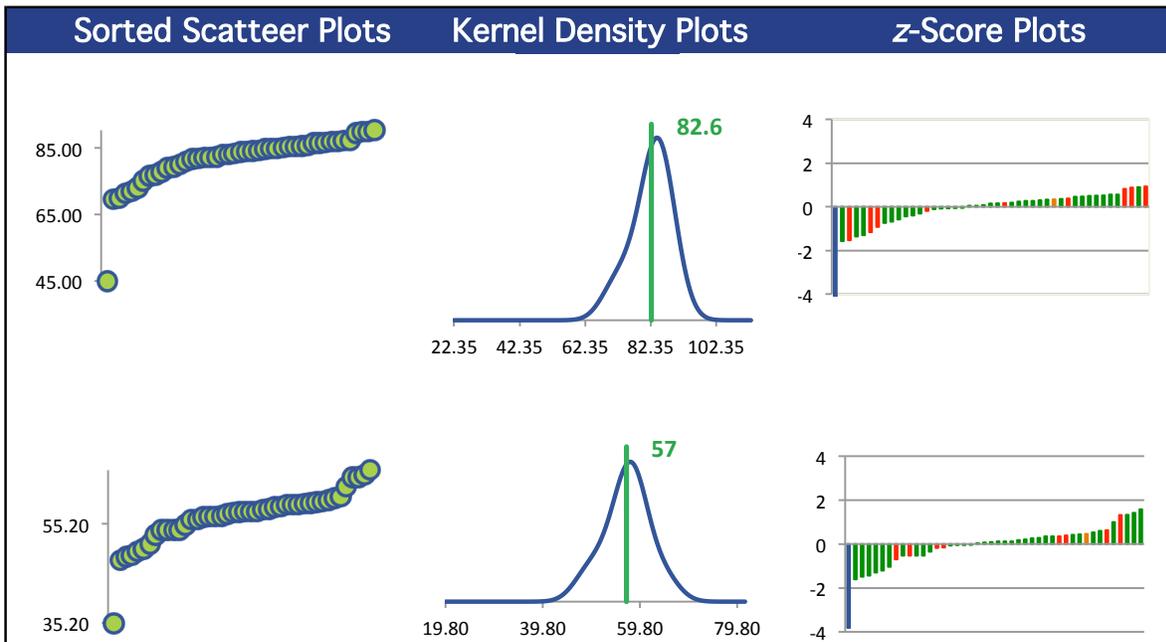
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
AFS (Blue)	1	1	1	1
ICP/OES (Red)	8	6	9	8
ICP/MS (Green)	34	31	34	34
CVAFS (Orange)	1	1	1	1

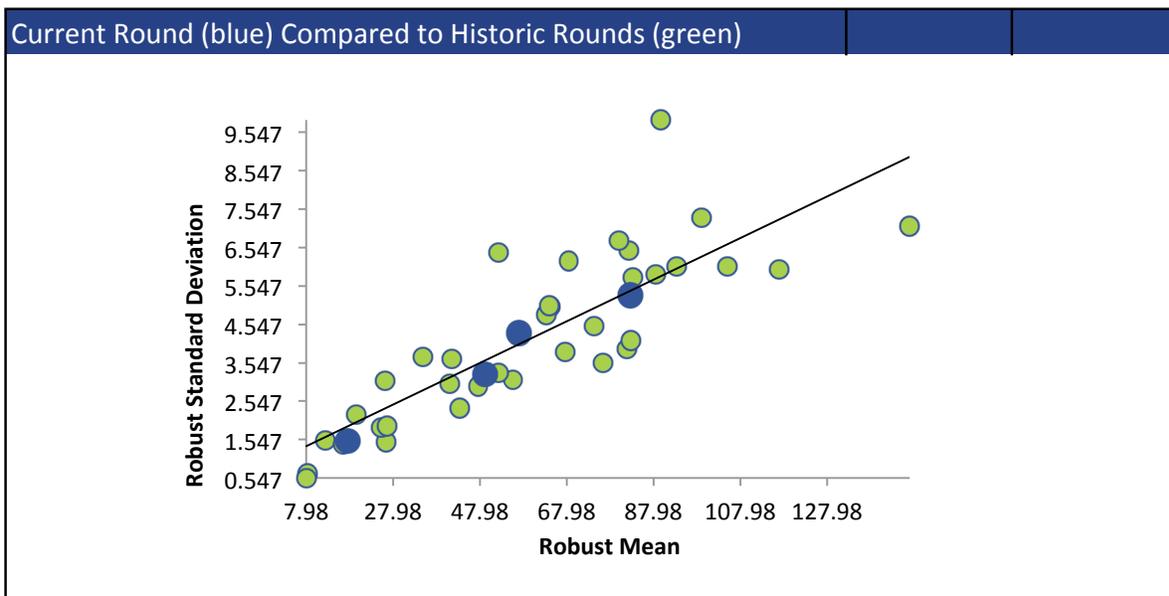
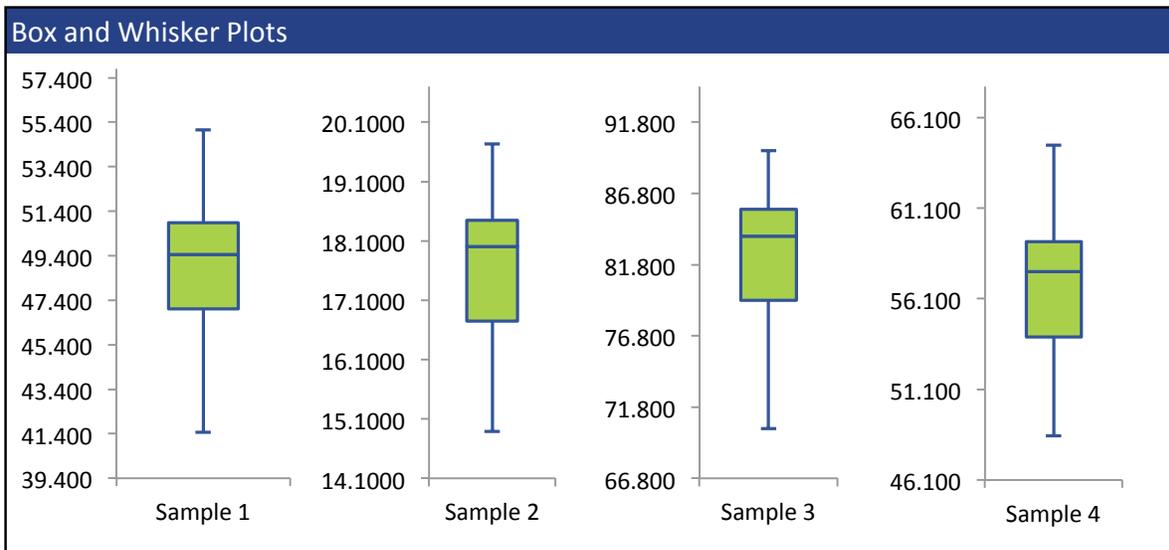
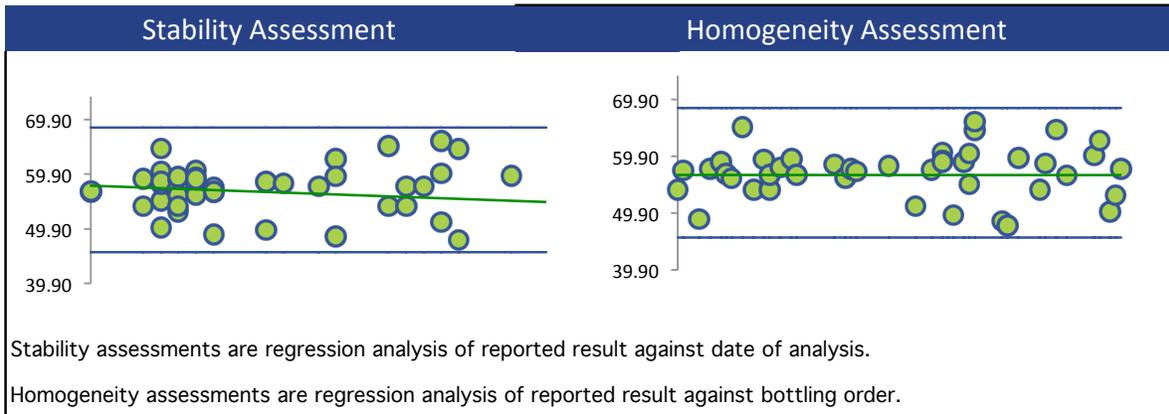
All summary stats and the plots below are based on the data excluding any flagged outliers



# SELENIUM



# SELENIUM



## SILVER

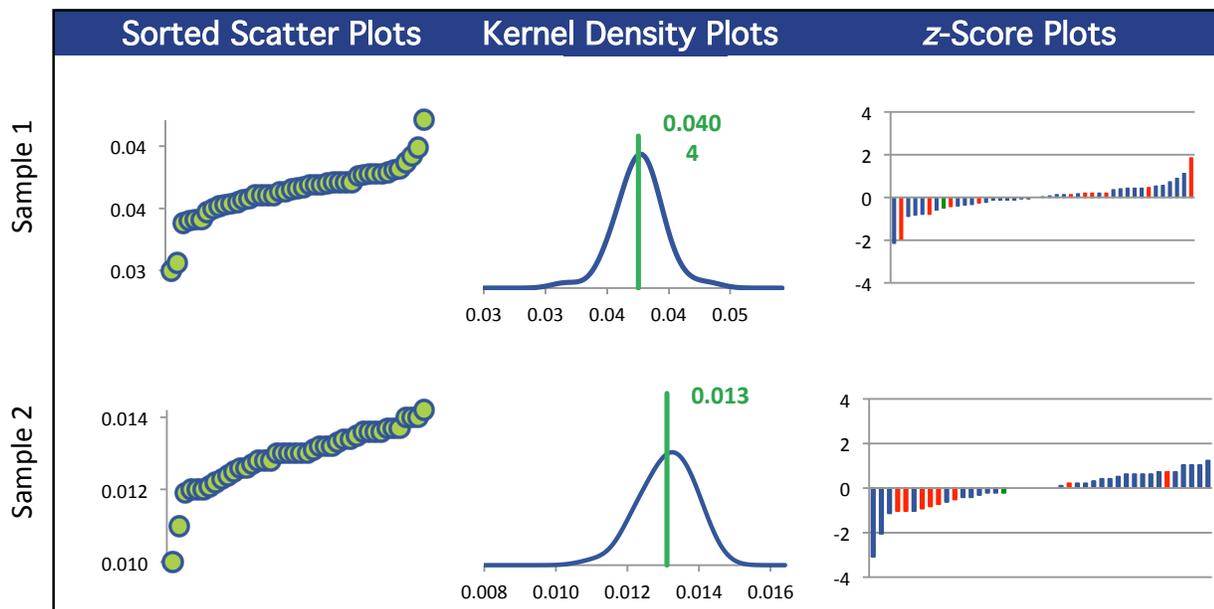
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	43	42	44	44
Median mg/L	0.0405	0.0130	0.0897	0.0720
Robust Mean mg/L	0.0404	0.0130	0.0898	0.0720
U mg/L	0.000316	0.000144	0.000759	0.000643
Robust Standard Deviation mg/L	0.00166	0.000747	0.00403	0.00341
Regression Standard Deviation mg/L	0.00303	0.000974	0.00674	0.00540
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.00303	0.000974	0.00674	0.00540
Outliers	1	1	1	1
z >3.0	0	1	0	0
2< z <3	1	1	0	0

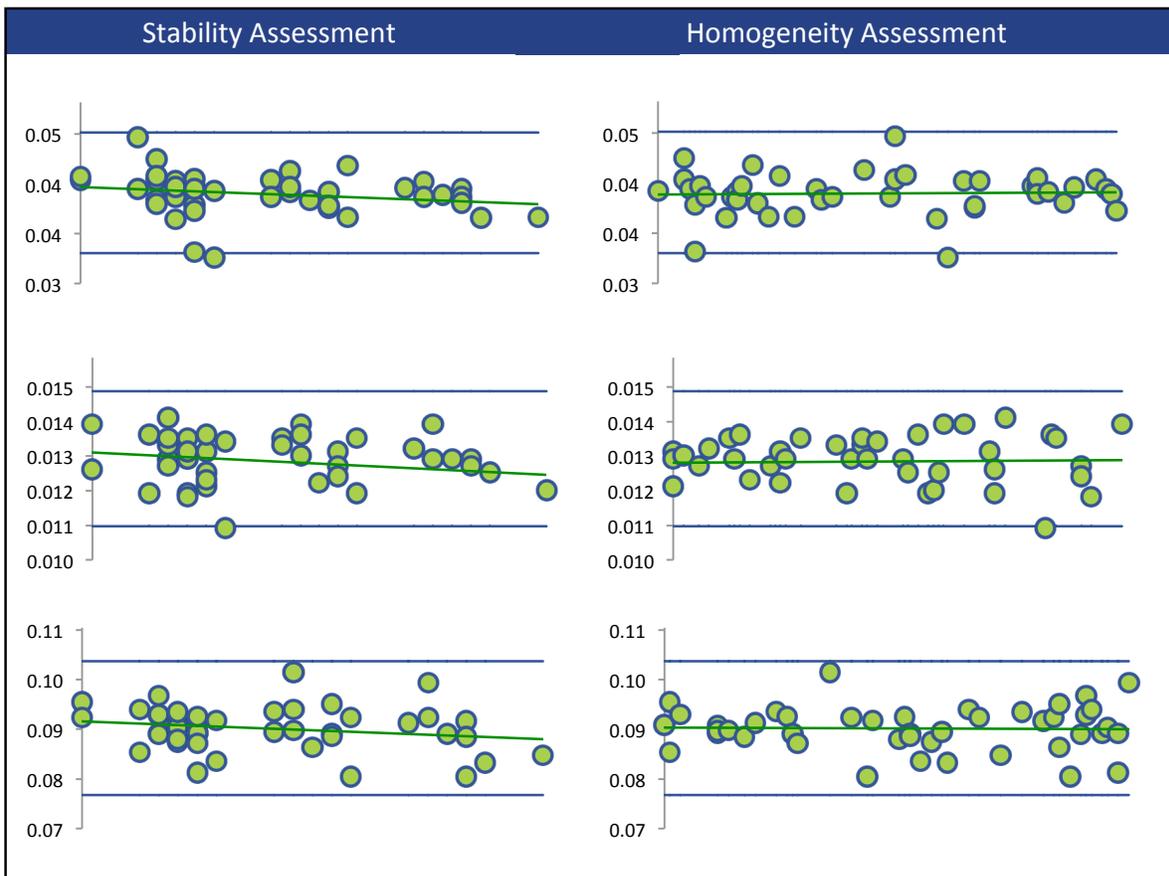
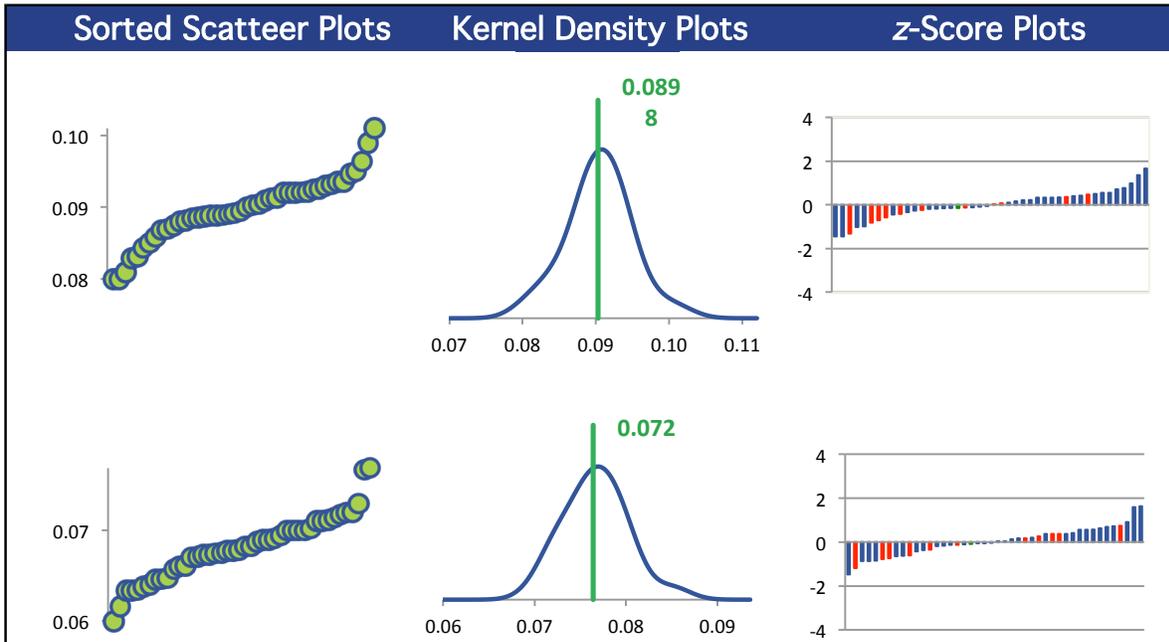
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	32	32	32	32
ICP/OES (Red)	10	9	11	11
AA (Green)	1	1	1	1

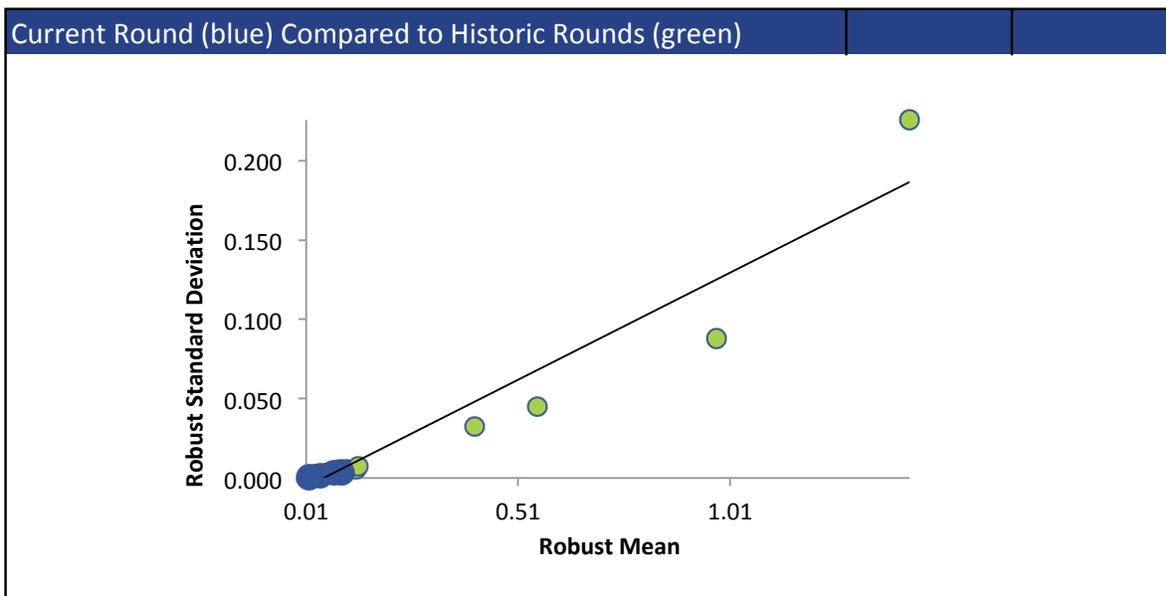
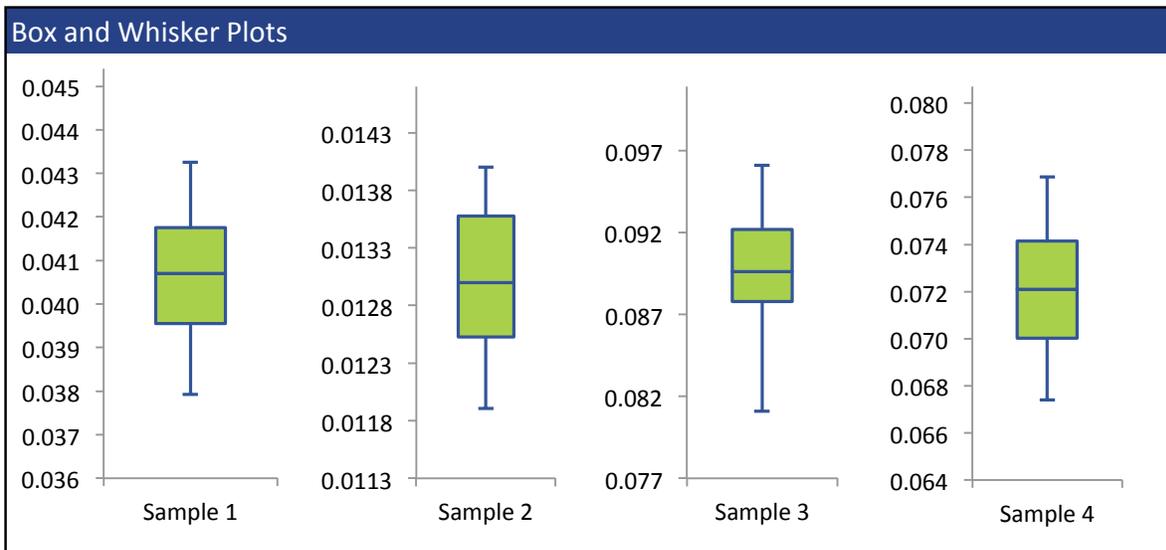
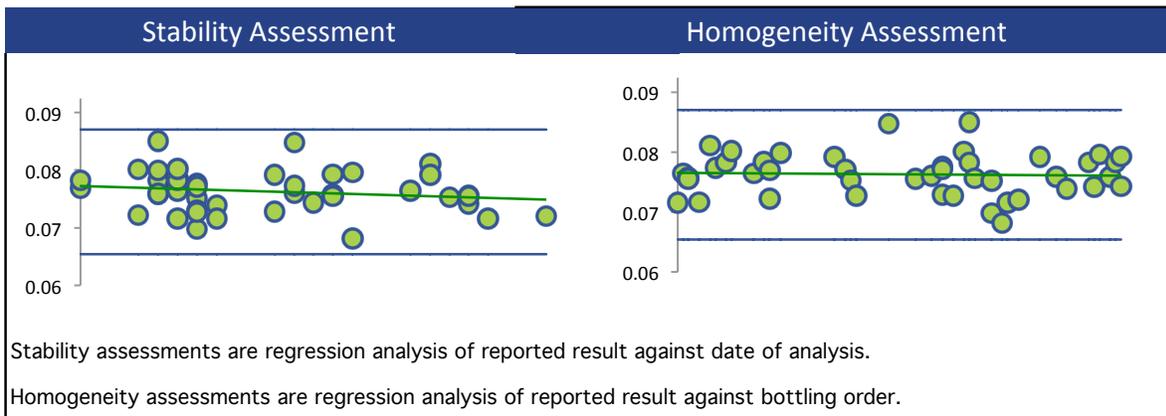
All summary stats and the plots below are based on the data excluding any flagged outliers



# SILVER



# SILVER



## STRONTIUM

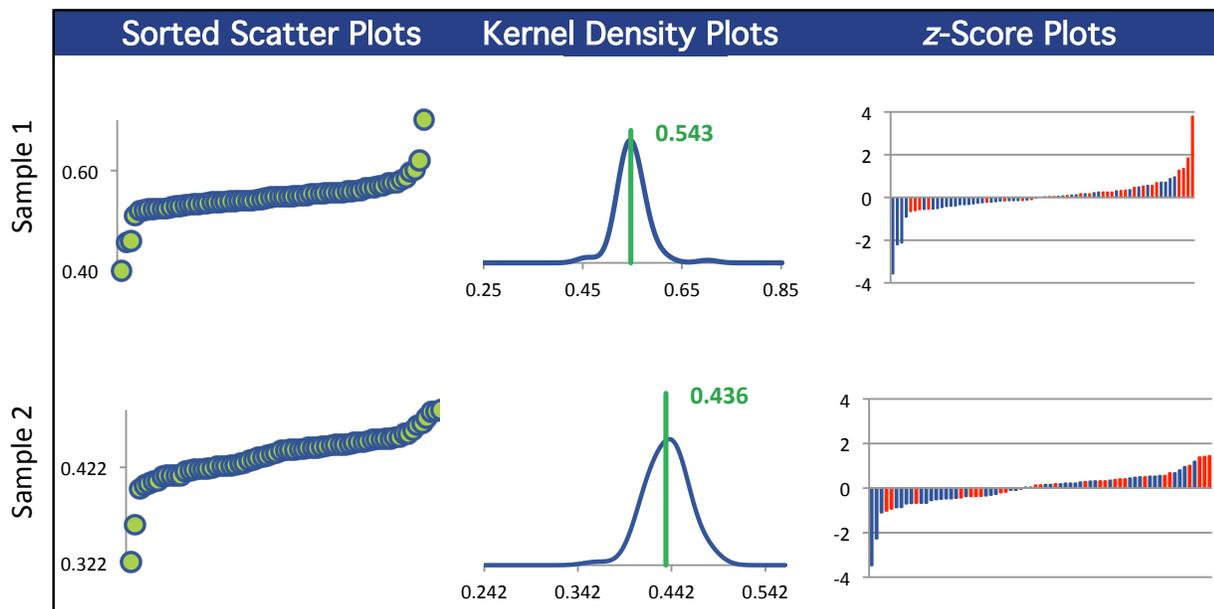
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	68	69	69	69
Median mg/L	0.544	0.440	1.41	0.953
Robust Mean mg/L	0.543	0.436	1.40	0.952
U mg/L	0.00314	0.00311	0.0104	0.00724
Robust Standard Deviation mg/L	0.0207	0.0207	0.0688	0.0481
Regression Standard Deviation mg/L	0.0408	0.0327	0.105	0.0714
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0408	0.0327	0.105	0.0714
Outliers	2	1	1	1
z >3.0	2	1	1	1
2< z <3	2	1	1	2

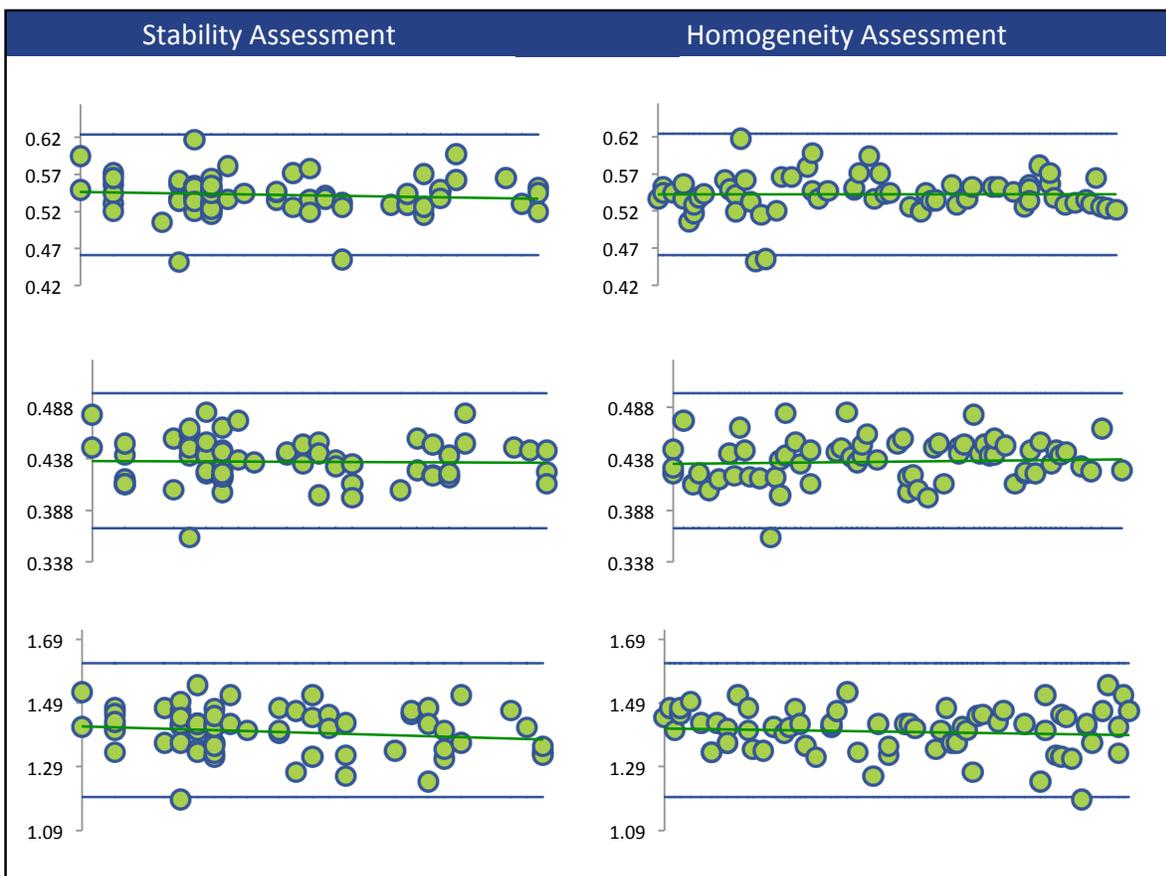
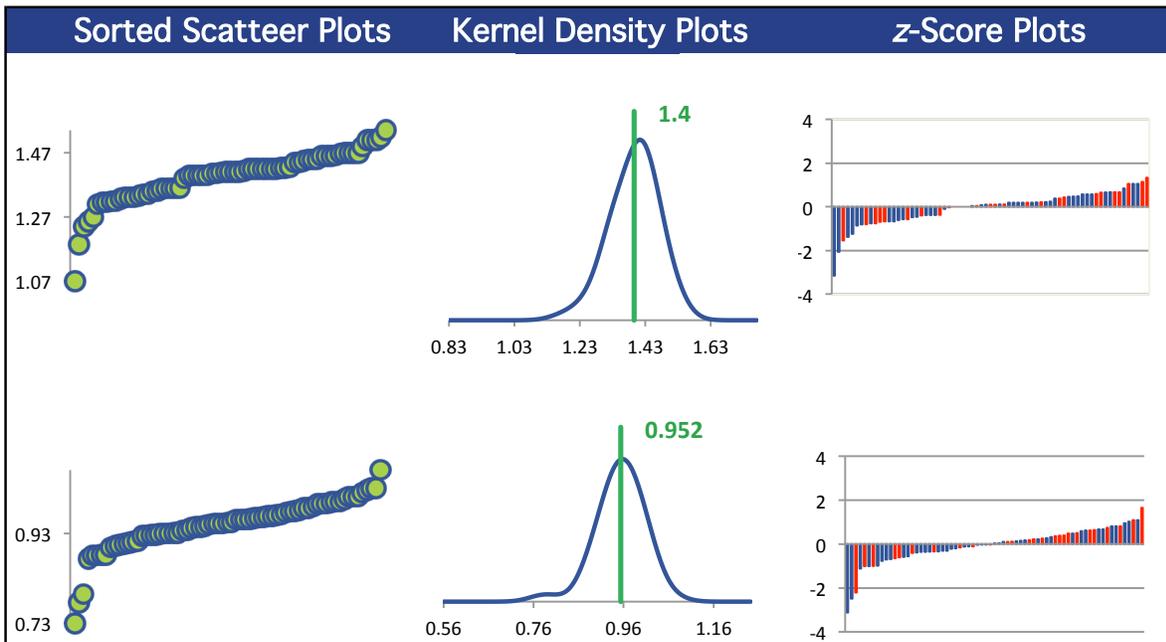
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	42	43	43	43
ICP/OES (Red)	26	26	26	26

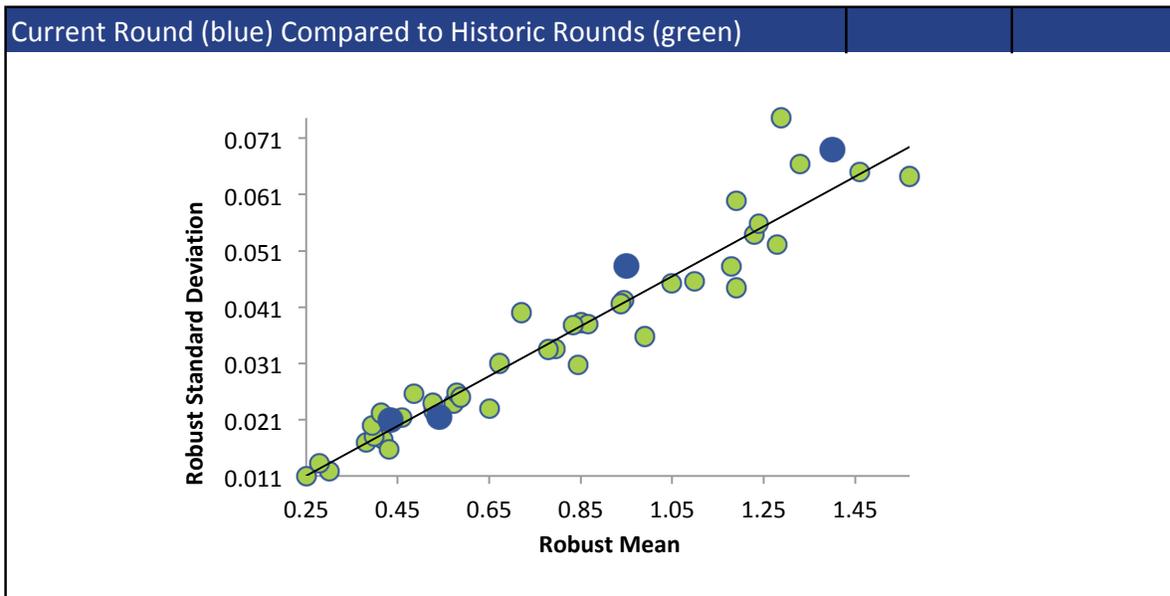
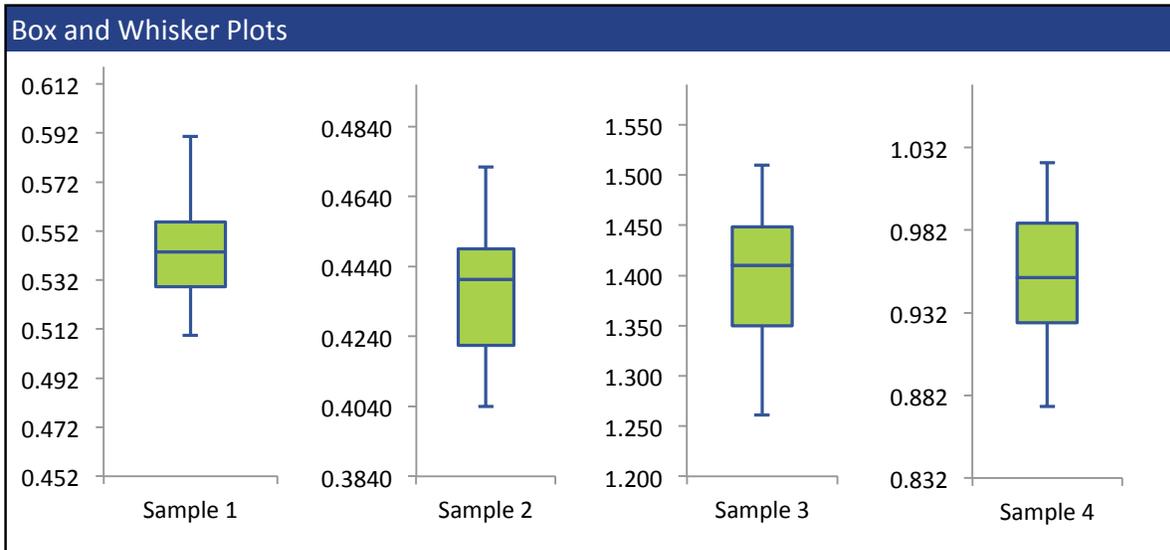
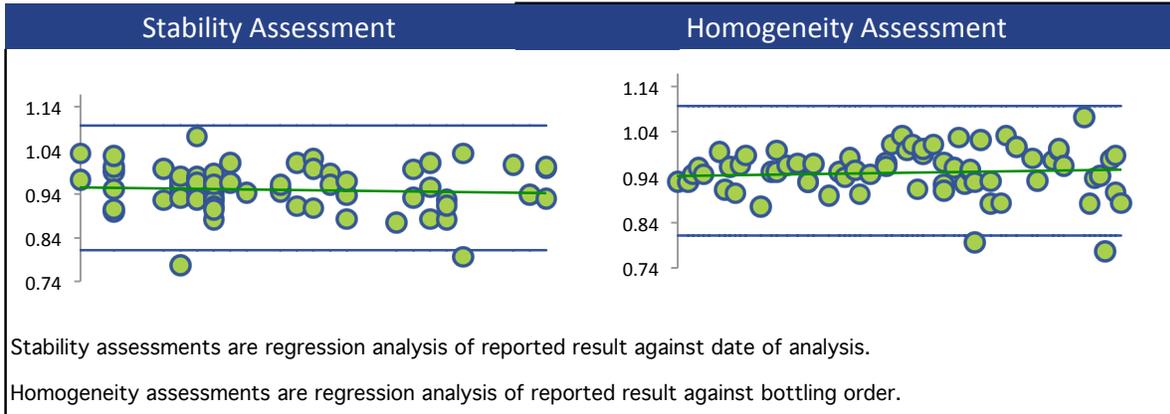
All summary stats and the plots below are based on the data excluding any flagged outliers



# STRONTIUM



# STRONTIUM



## THALLIUM

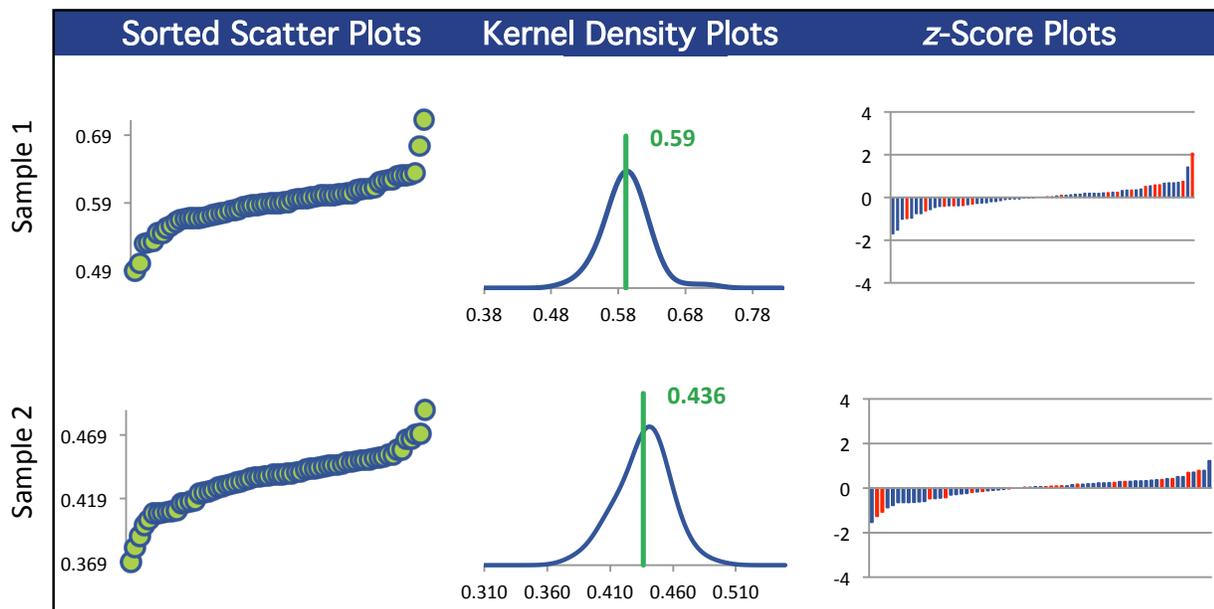
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	65	65	65	65
Median mg/L	0.590	0.438	1.37	1.05
Robust Mean mg/L	0.590	0.436	1.36	1.05
U mg/L	0.00450	0.00309	0.0100	0.00702
Robust Standard Deviation mg/L	0.0290	0.0199	0.0648	0.0453
Regression Standard Deviation mg/L	0.0590	0.0436	0.136	0.105
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0590	0.0436	0.136	0.105
Outliers	1	1	1	1
z >3.0	0	0	0	0
2< z <3	1	0	0	0

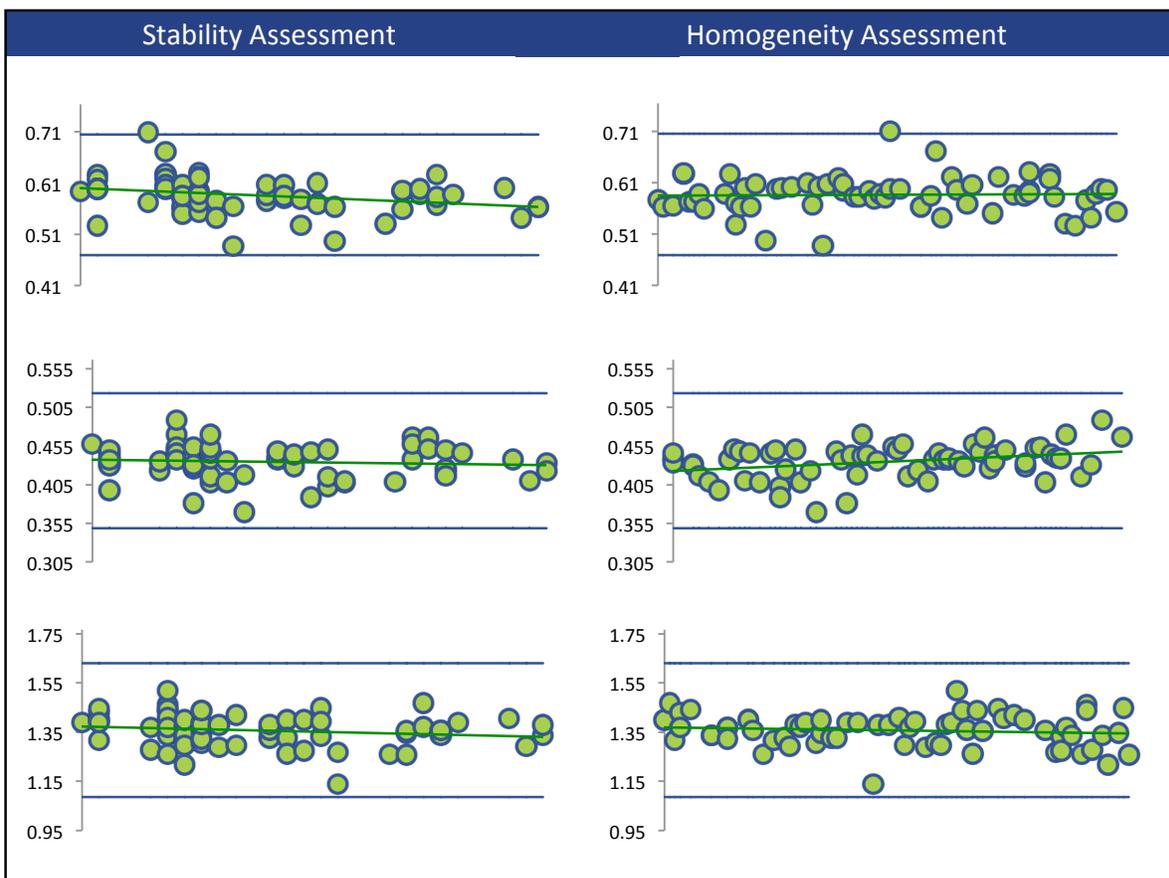
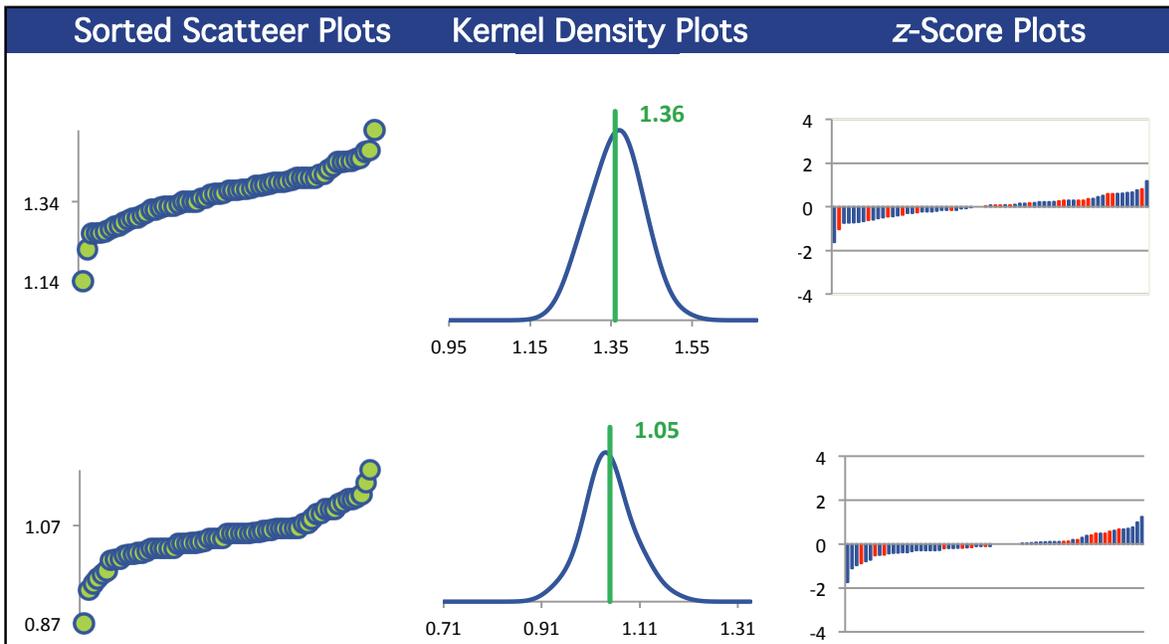
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	46	46	46	46
ICP/OES (Red)	19	19	19	19

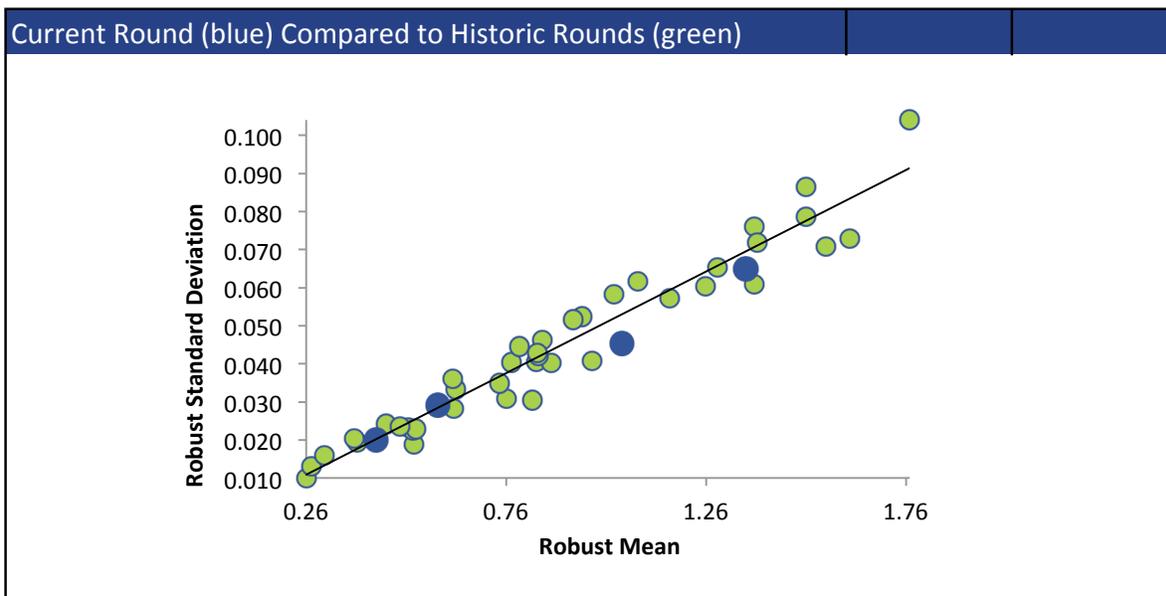
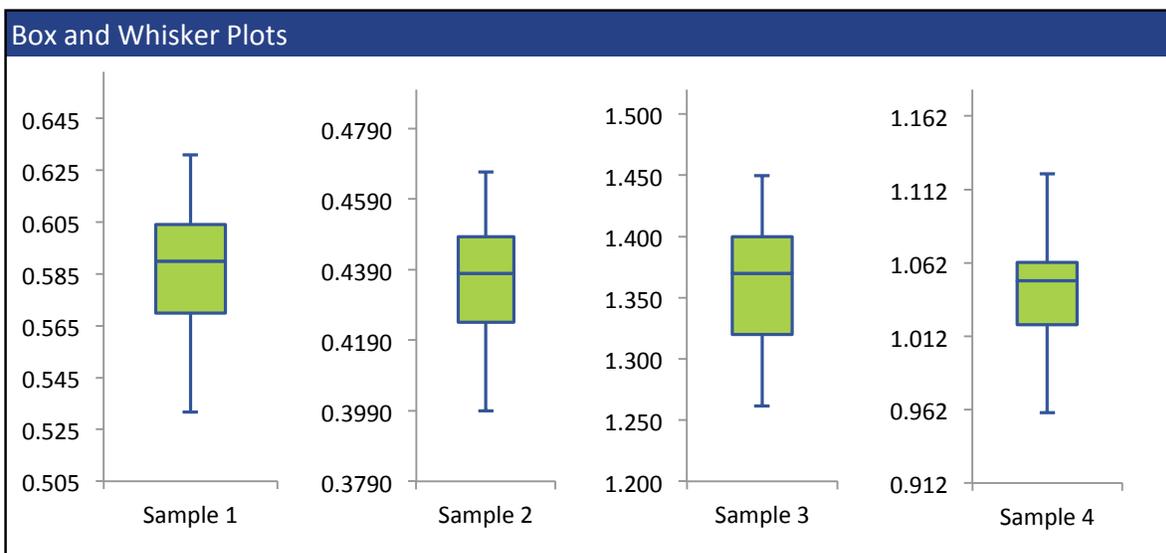
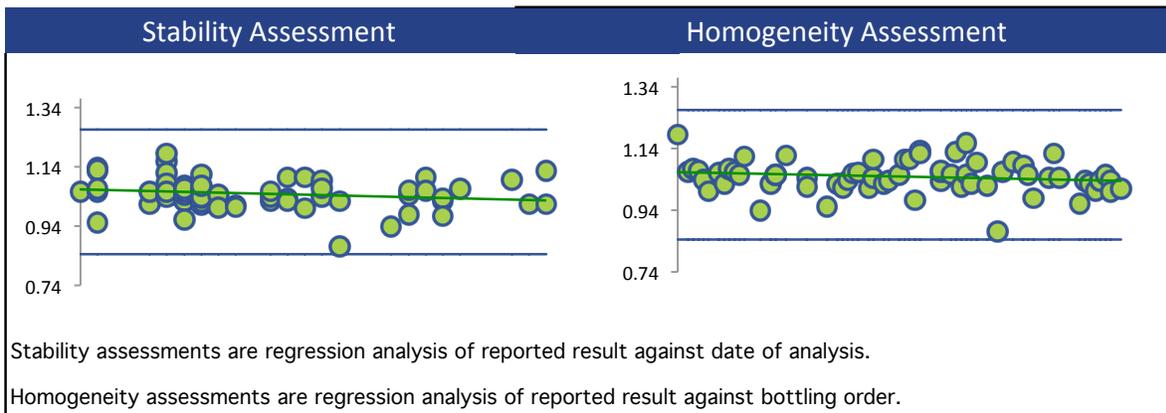
All summary stats and the plots below are based on the data excluding any flagged outliers



# THALLIUM



# THALLIUM



TIN

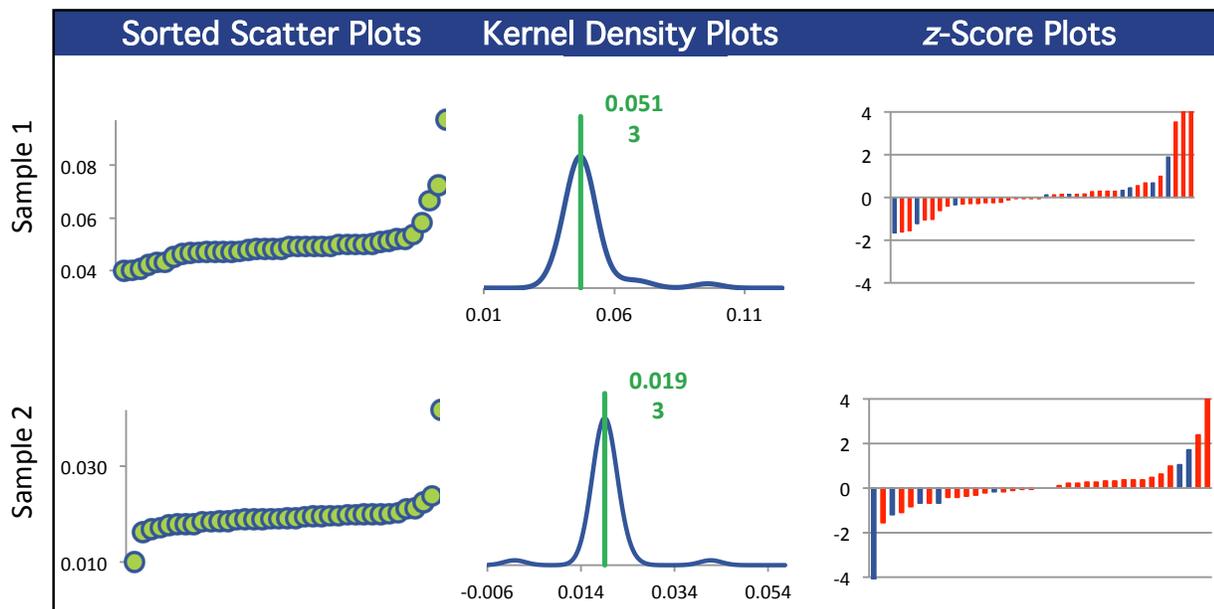
Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	40	37	40	40
Median mg/L	0.0515	0.0193	0.0690	0.0737
Robust Mean mg/L	0.0513	0.0193	0.0688	0.0734
U mg/L	0.000723	0.000282	0.000791	0.000913
Robust Standard Deviation mg/L	0.00366	0.00137	0.00400	0.00462
Regression Standard Deviation mg/L	0.00513	0.00193	0.00688	0.00734
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.00513	0.00193	0.00688	0.00734
Outliers	1	1	1	1
z >3.0	3	2	2	1
2< z <3	0	1	1	1

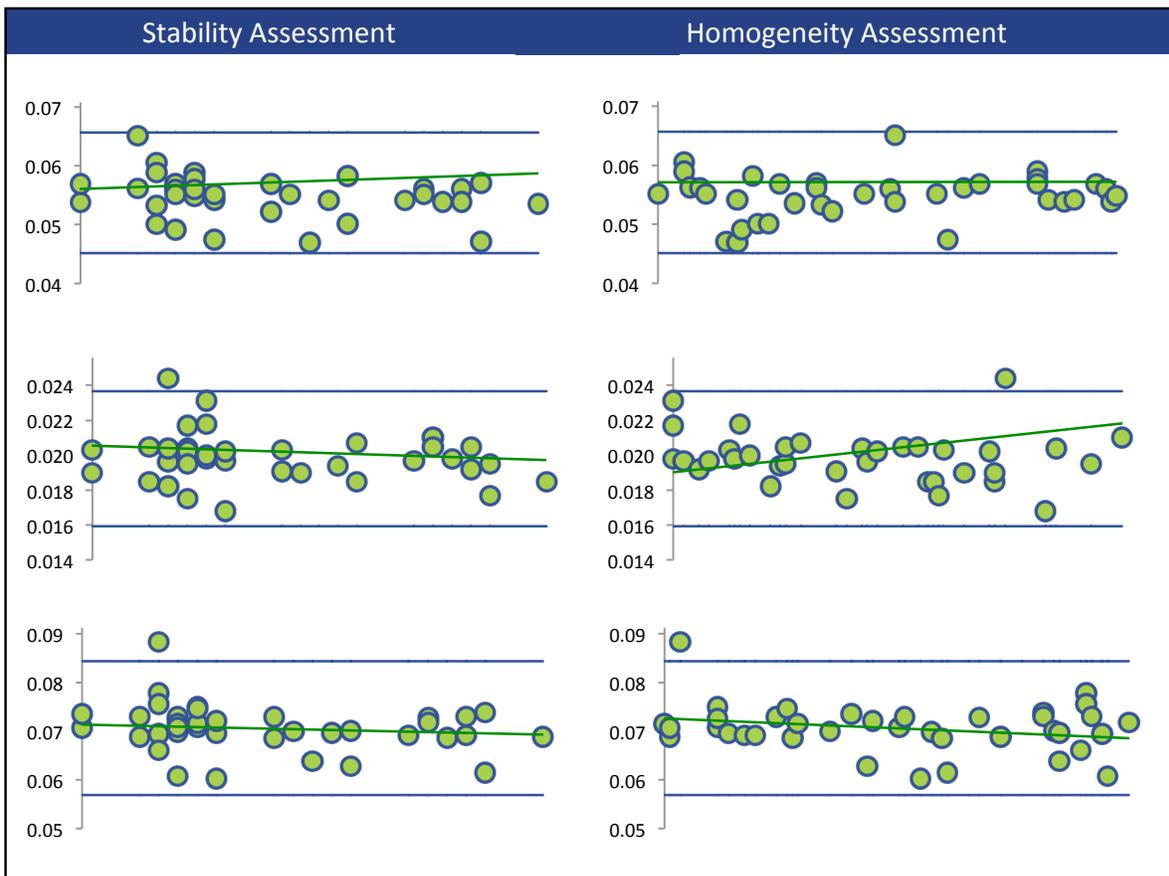
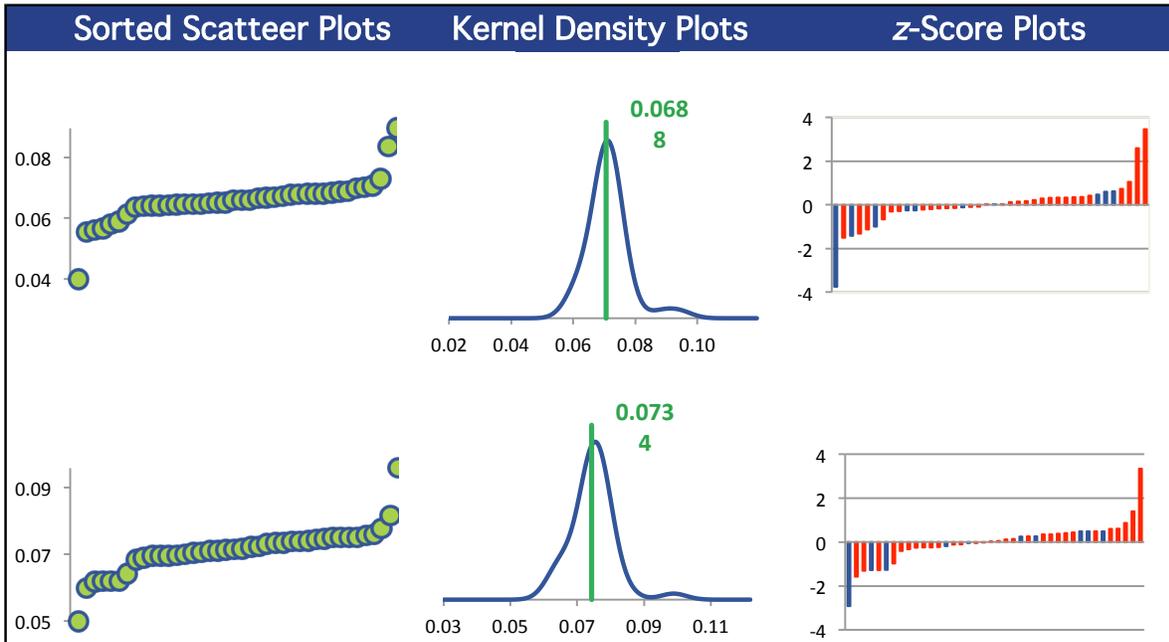
Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES (Blue)	9	8	10	10
ICP/MS (Red)	31	29	30	30

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



TIN





## TITANIUM

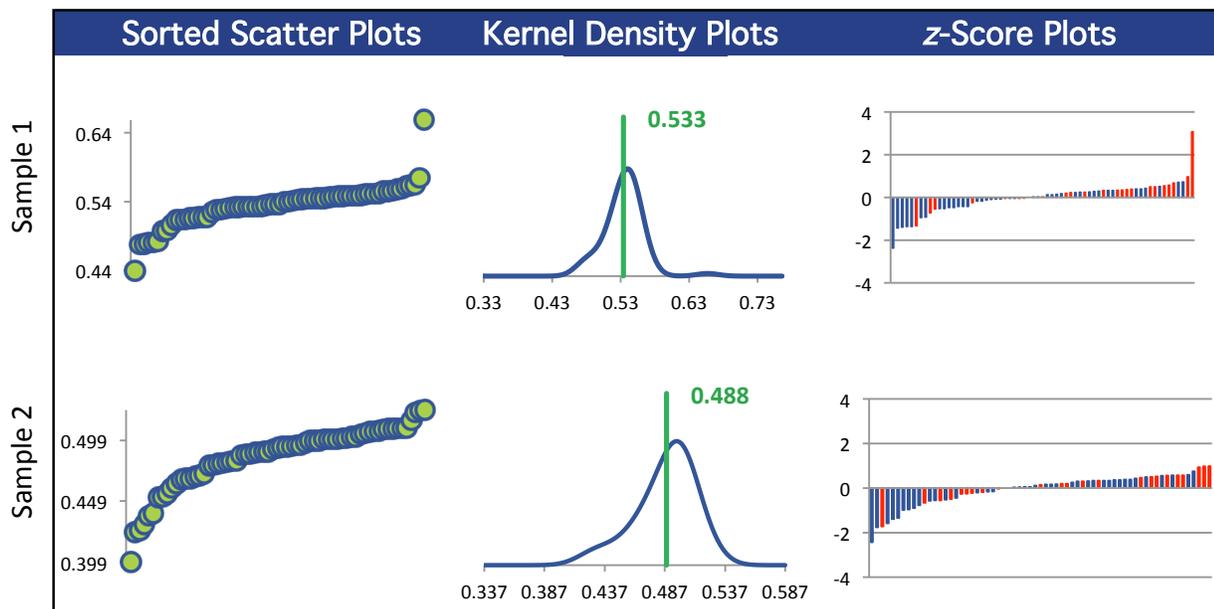
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	65	65	65	65
Median mg/L	0.534	0.493	1.42	0.744
Robust Mean mg/L	0.533	0.488	1.41	0.733
U mg/L	0.00321	0.00336	0.0104	0.00612
Robust Standard Deviation mg/L	0.0207	0.0217	0.0669	0.0395
Regression Standard Deviation mg/L	0.0400	0.0366	0.106	0.0550
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0400	0.0366	0.106	0.0550
Outliers	1	1	1	1
z >3.0	1	0	0	0
2< z <3	1	1	1	2

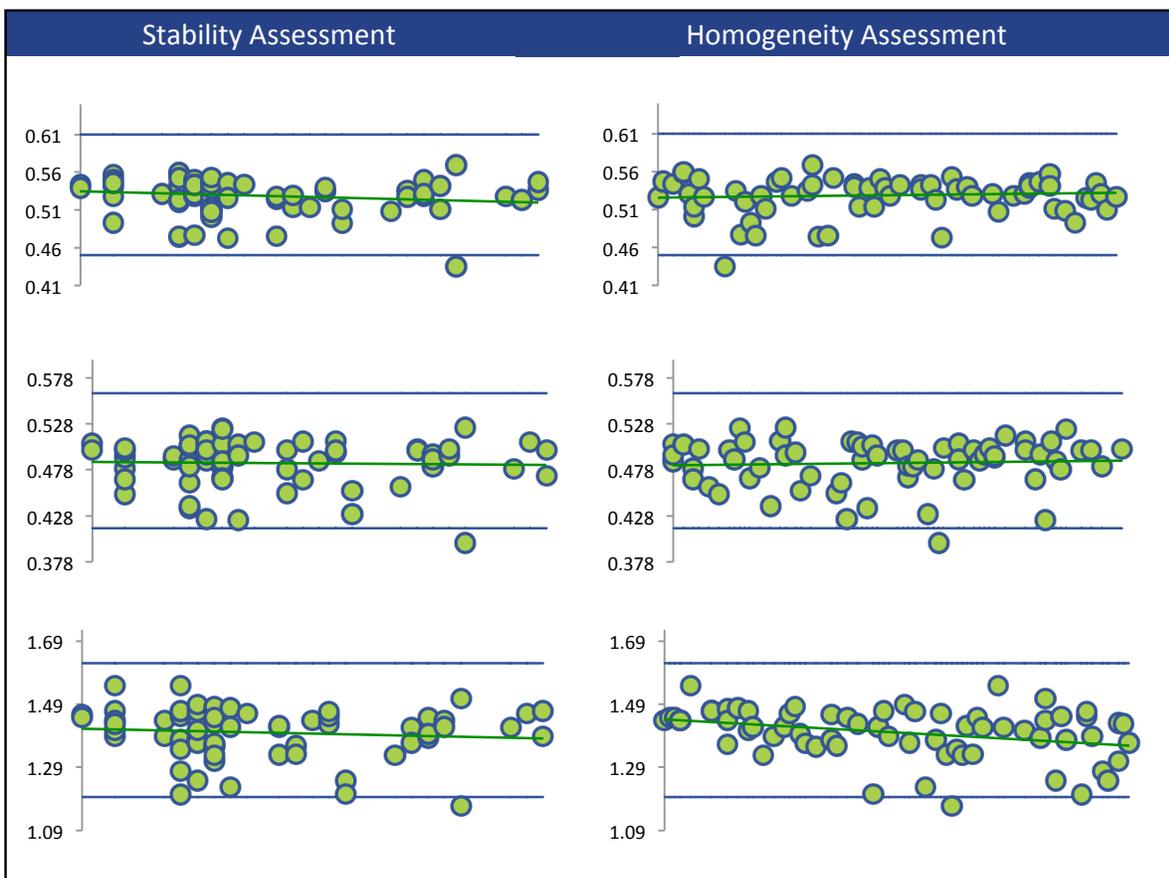
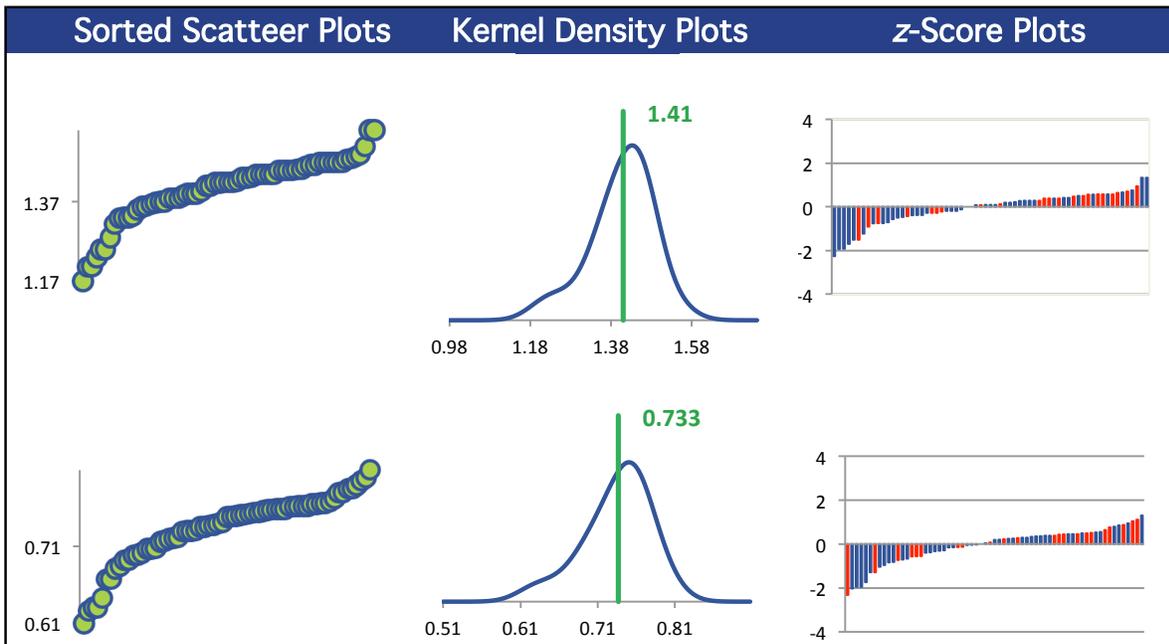
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	42	42	42	42
ICP/OES (Red)	23	23	23	23

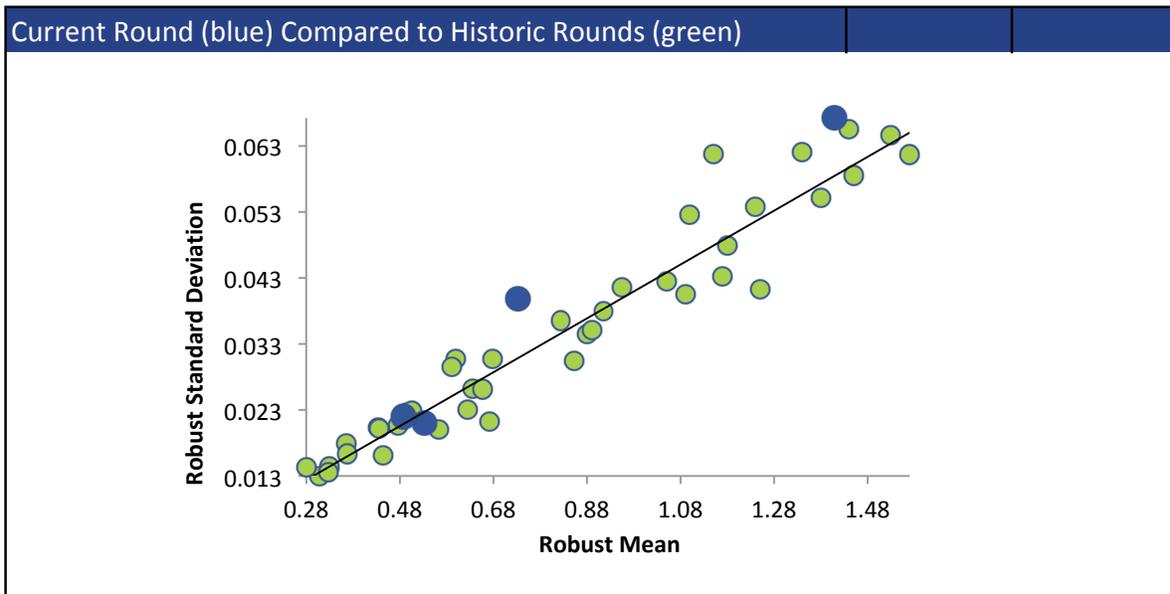
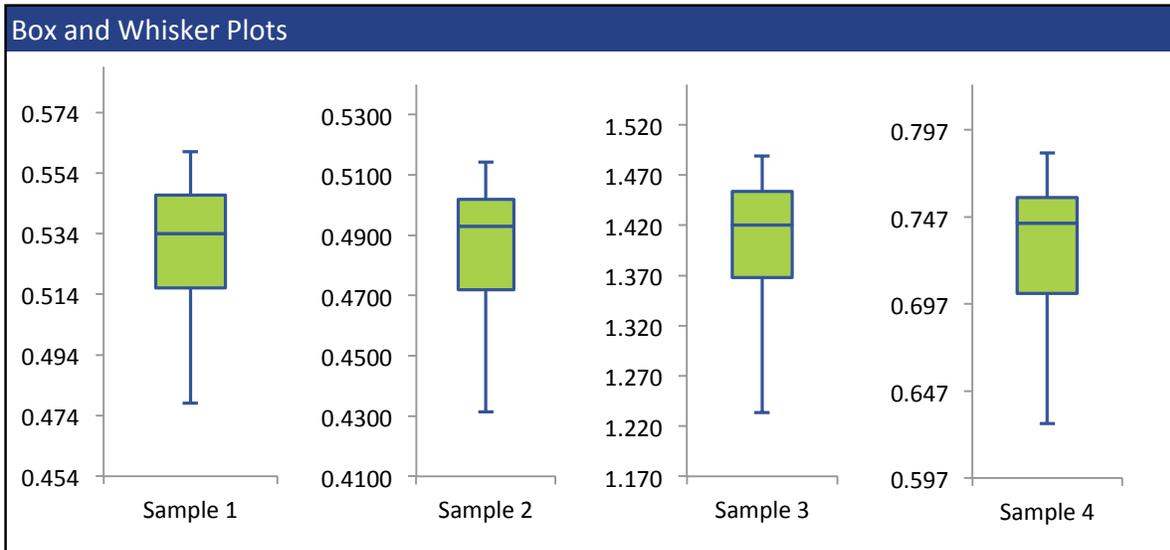
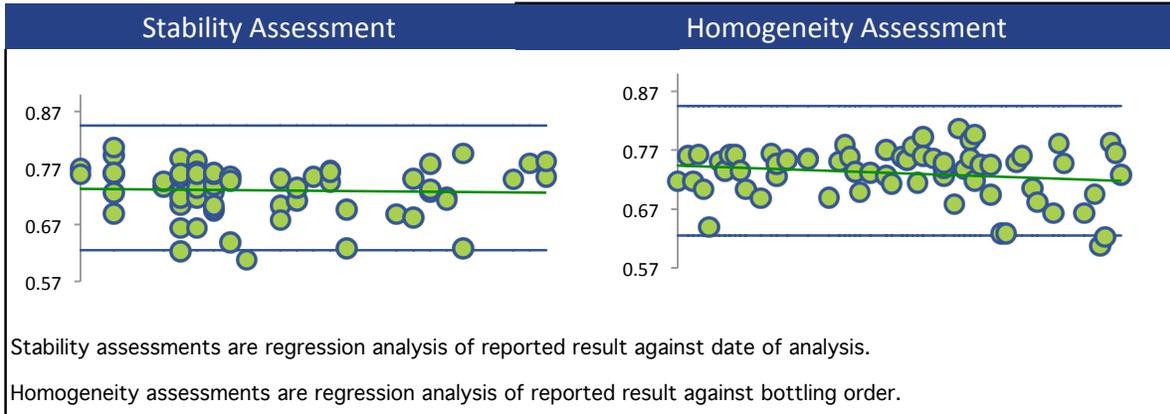
All summary stats and the plots below are based on the data excluding any flagged outliers



# TITANIUM



# TITANIUM



## URANIUM

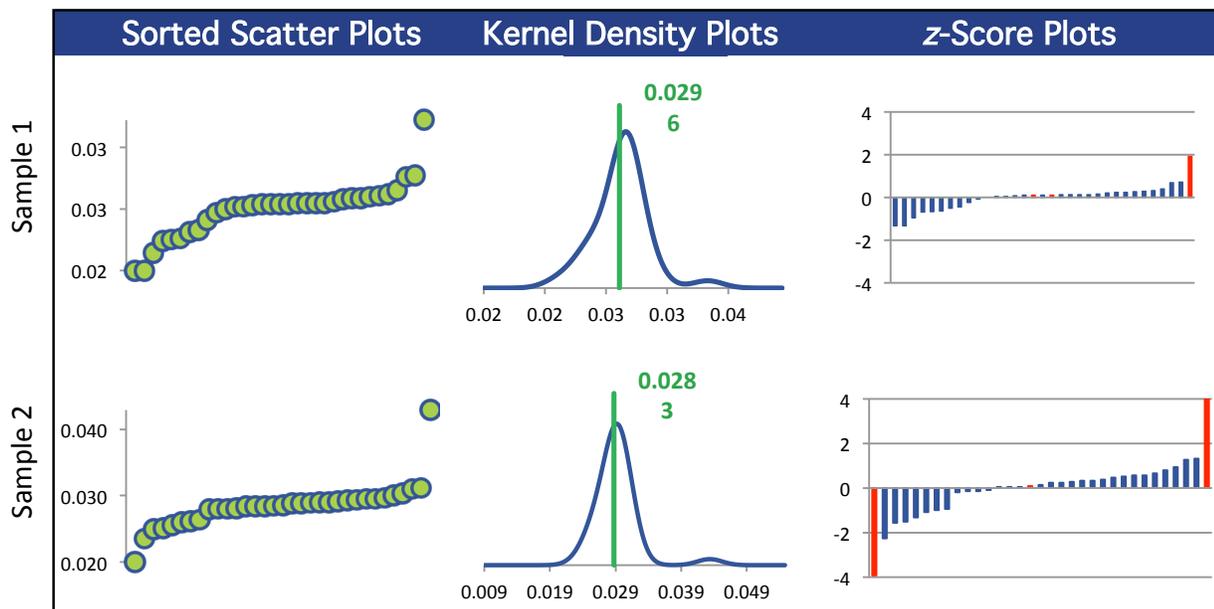
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	33	33	34	34
Median mg/L	0.0300	0.0286	0.0807	0.0797
Robust Mean mg/L	0.0296	0.0283	0.0800	0.0795
U mg/L	0.000387	0.000431	0.000821	0.000800
Robust Standard Deviation mg/L	0.00178	0.00198	0.00383	0.00373
Regression Standard Deviation mg/L	0.00222	0.00212	0.00600	0.00596
Stability Flag	<b>Stability</b>			
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.00375	0.00212	0.00600	0.00596
Outliers	1	1	1	1
z >3.0	0	2	0	0
2< z <3	0	1	2	1

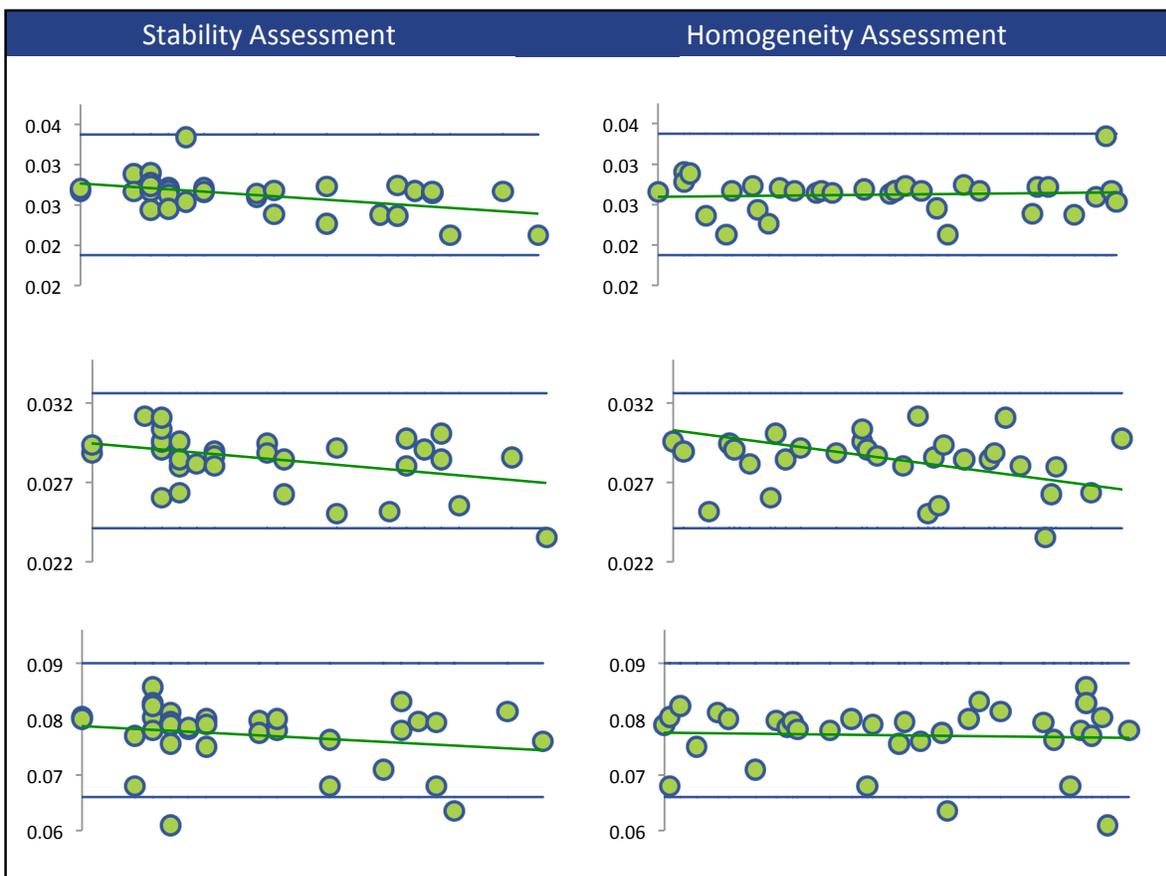
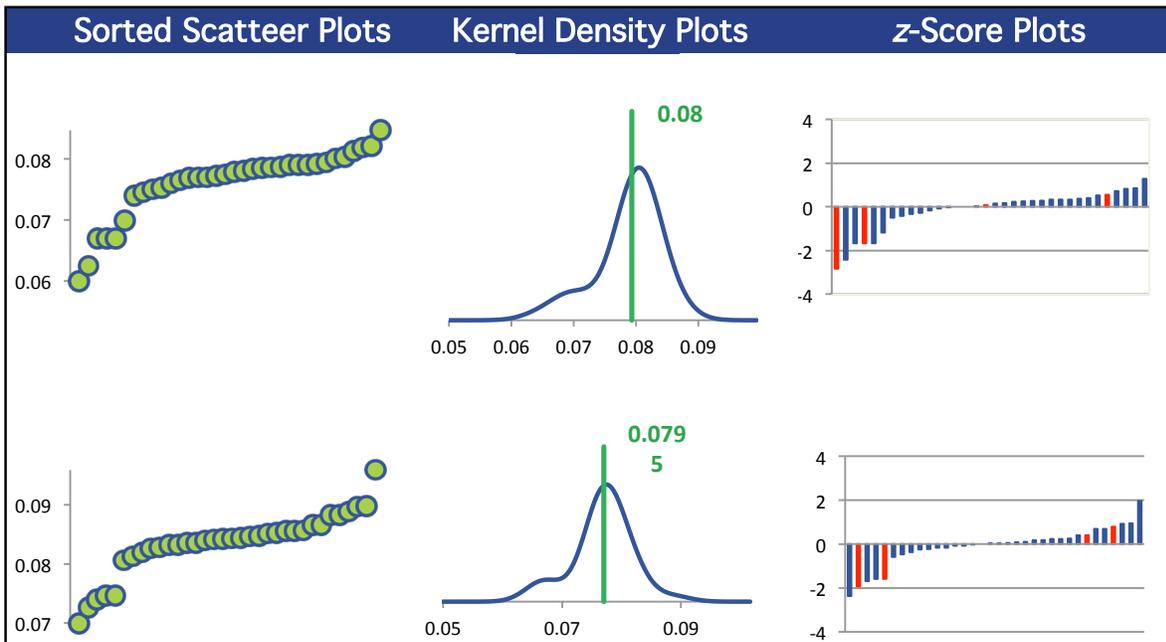
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	30	30	30	30
ICP/OES (Red)	3	3	4	4

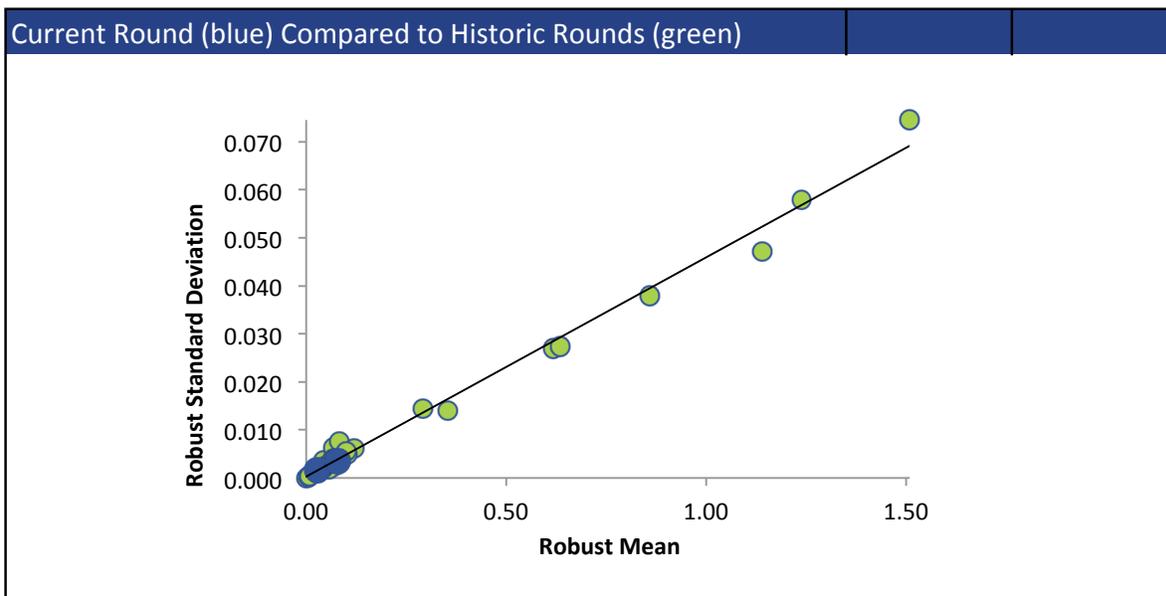
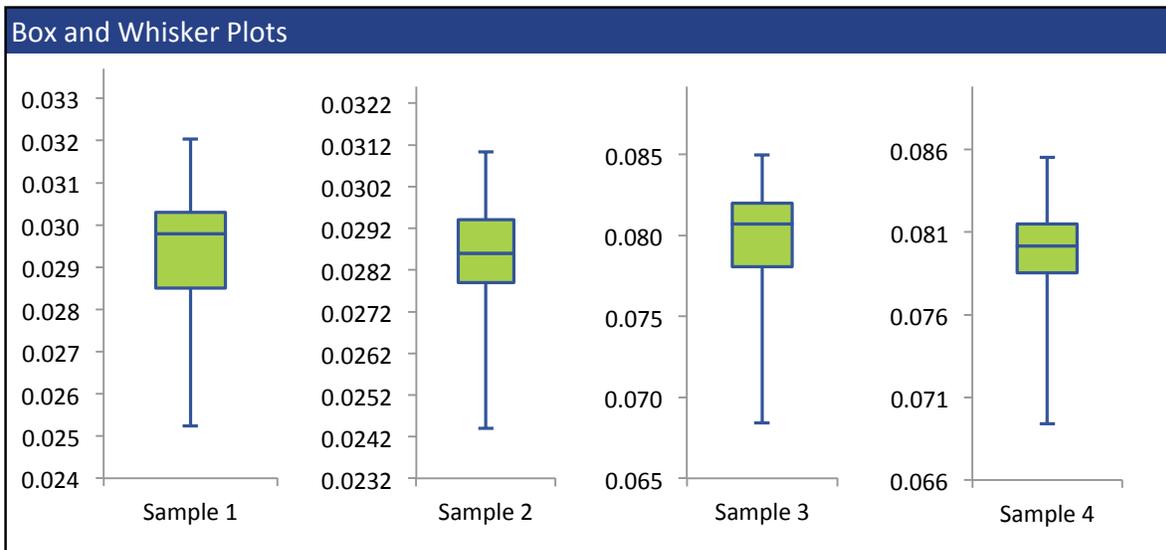
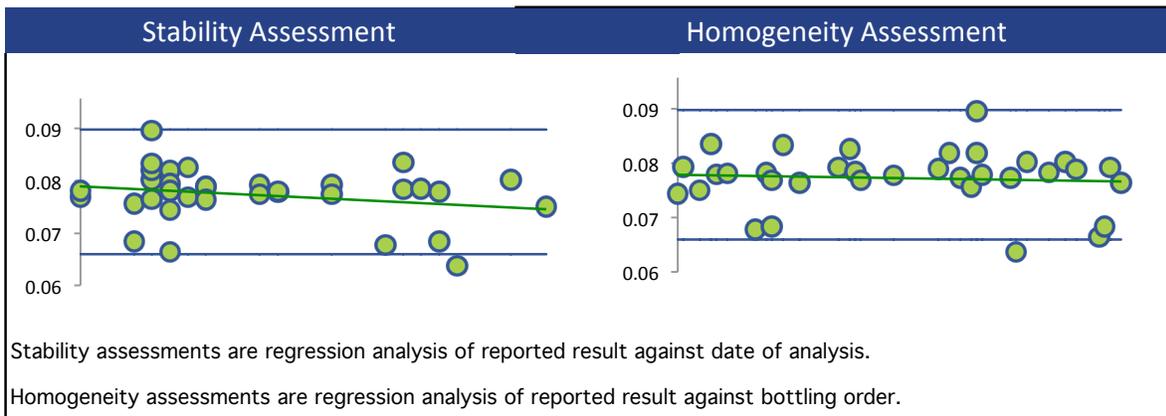
All summary stats and the plots below are based on the data excluding any flagged outliers



# URANIUM



# URANIUM



## VANADIUM

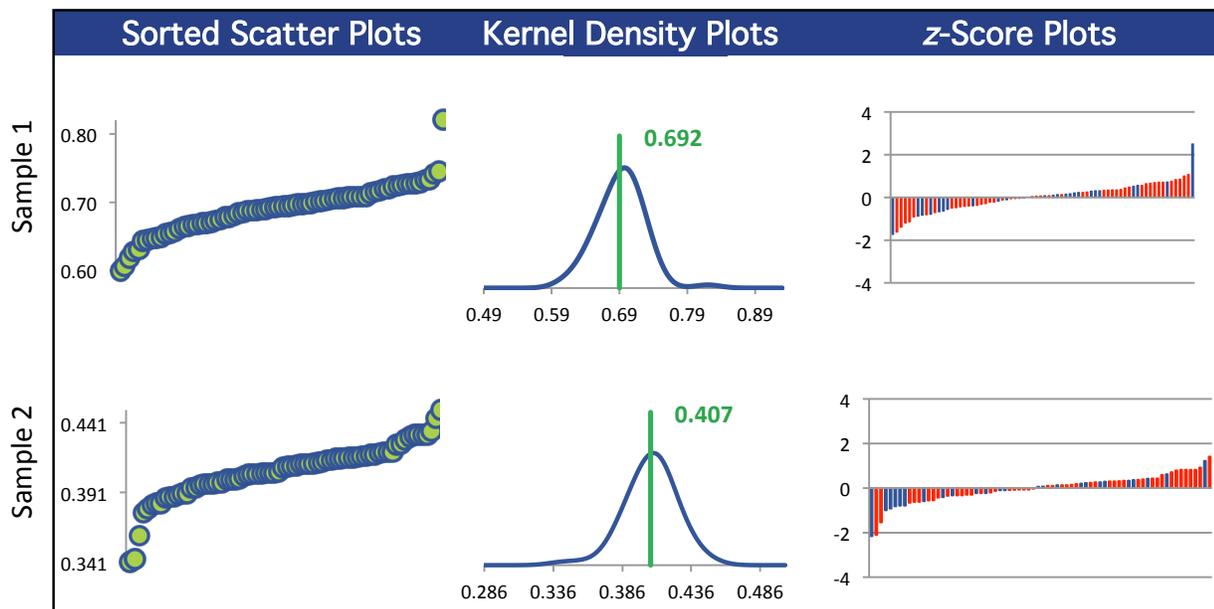
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	72	72	72	72
Median mg/L	0.696	0.409	1.16	1.25
Robust Mean mg/L	0.692	0.407	1.15	1.25
U mg/L	0.00473	0.00253	0.00846	0.00900
Robust Standard Deviation mg/L	0.0321	0.0172	0.0574	0.0611
Regression Standard Deviation mg/L	0.0519	0.0305	0.0865	0.0936
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0519	0.0305	0.0865	0.0936
Outliers	1	1	1	1
z >3.0	0	0	0	0
2< z <3	1	2	2	3

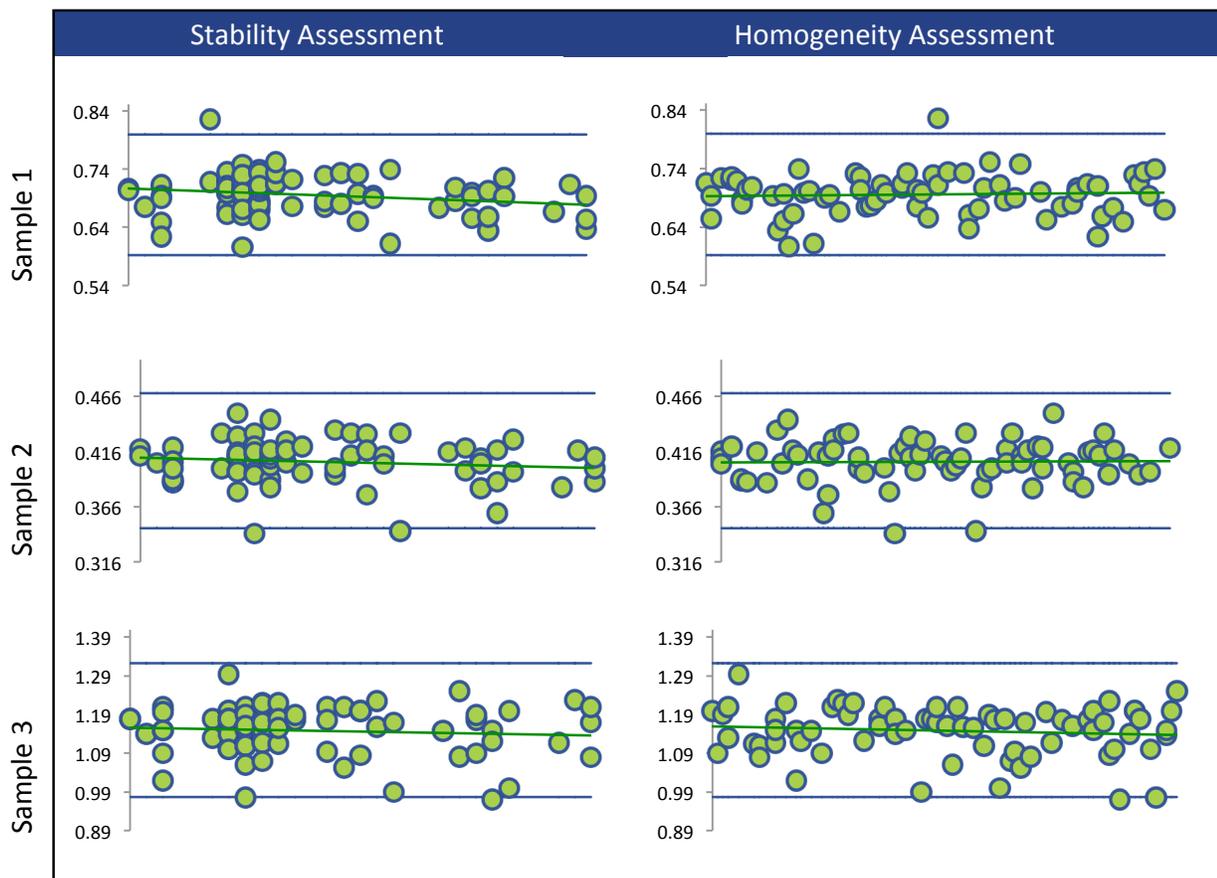
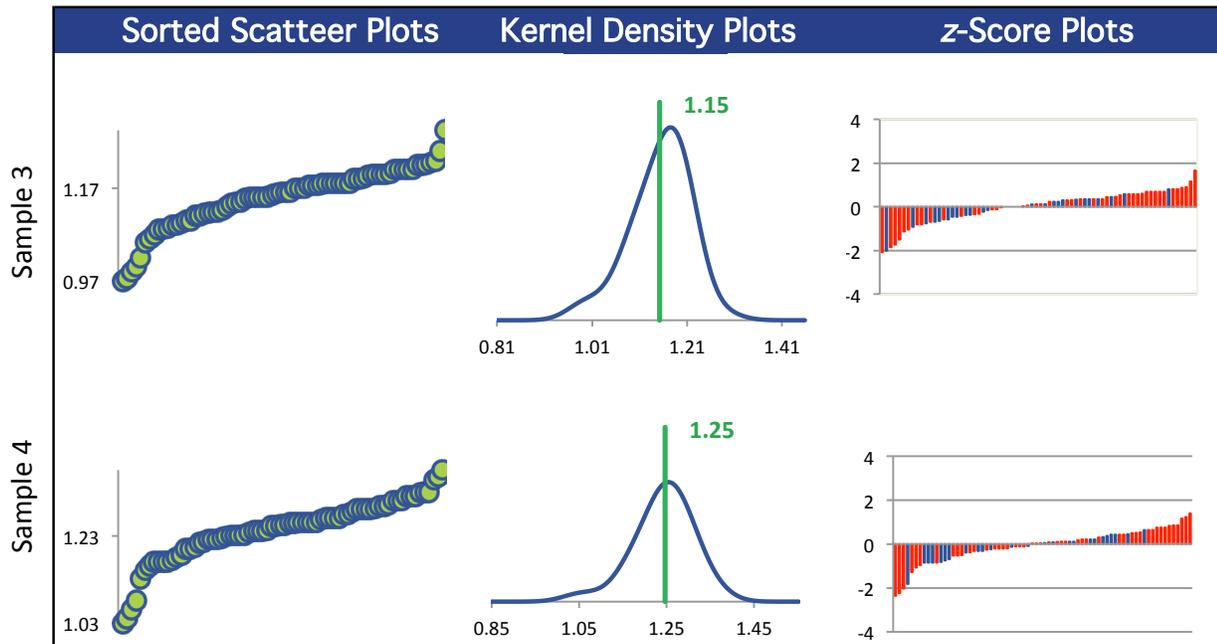
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/OES (Blue)	25	25	25	25
ICP/MS (Red)	47	47	47	47

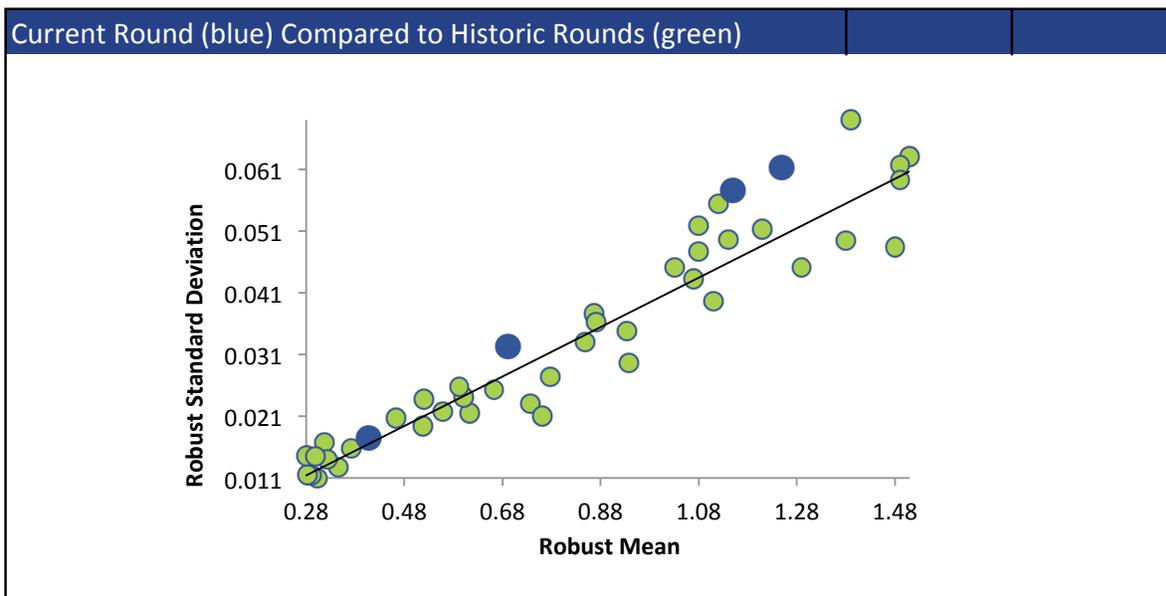
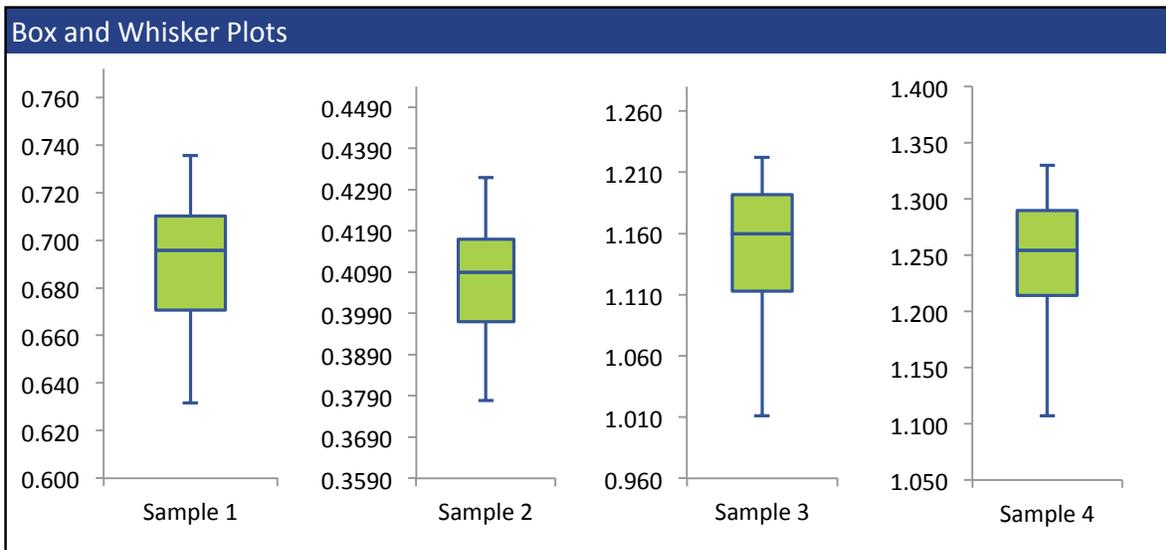
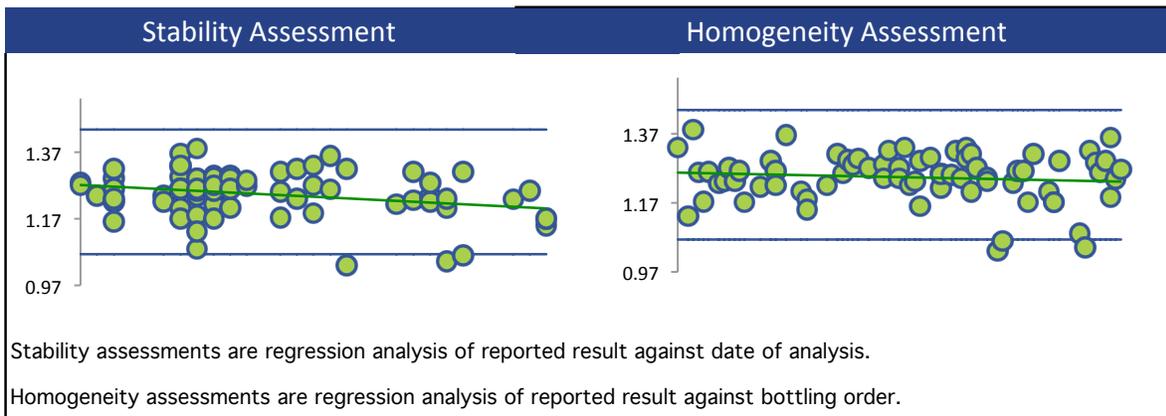
All summary stats and the plots below are based on the data excluding any flagged outliers



# VANADIUM



# VANADIUM



## ZINC

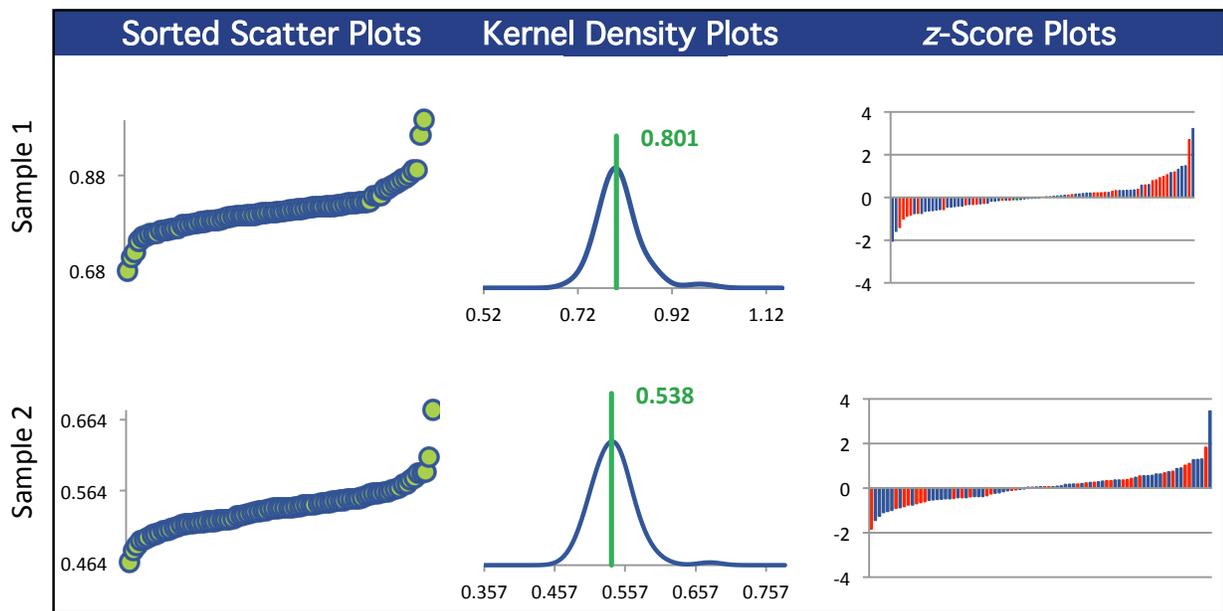
### Summary Statistics

Statistic	C02C-1	C02C-2	C02C-3	C02C-4
N	83	83	83	83
Median mg/L	0.801	0.540	1.33	1.14
Robust Mean mg/L	0.801	0.538	1.34	1.14
U mg/L	0.00477	0.00357	0.00930	0.00752
Robust Standard Deviation mg/L	0.0348	0.0260	0.0678	0.0548
Regression Standard Deviation mg/L	0.0601	0.0404	0.100	0.0852
Stability Flag				
Homogeneity Flag				
Standard Deviation Used (SDPA) mg/L	0.0601	0.0404	0.100	0.0852
Outliers	1	1	1	1
z >3.0	1	1	0	0
2< z <3	2	0	1	1

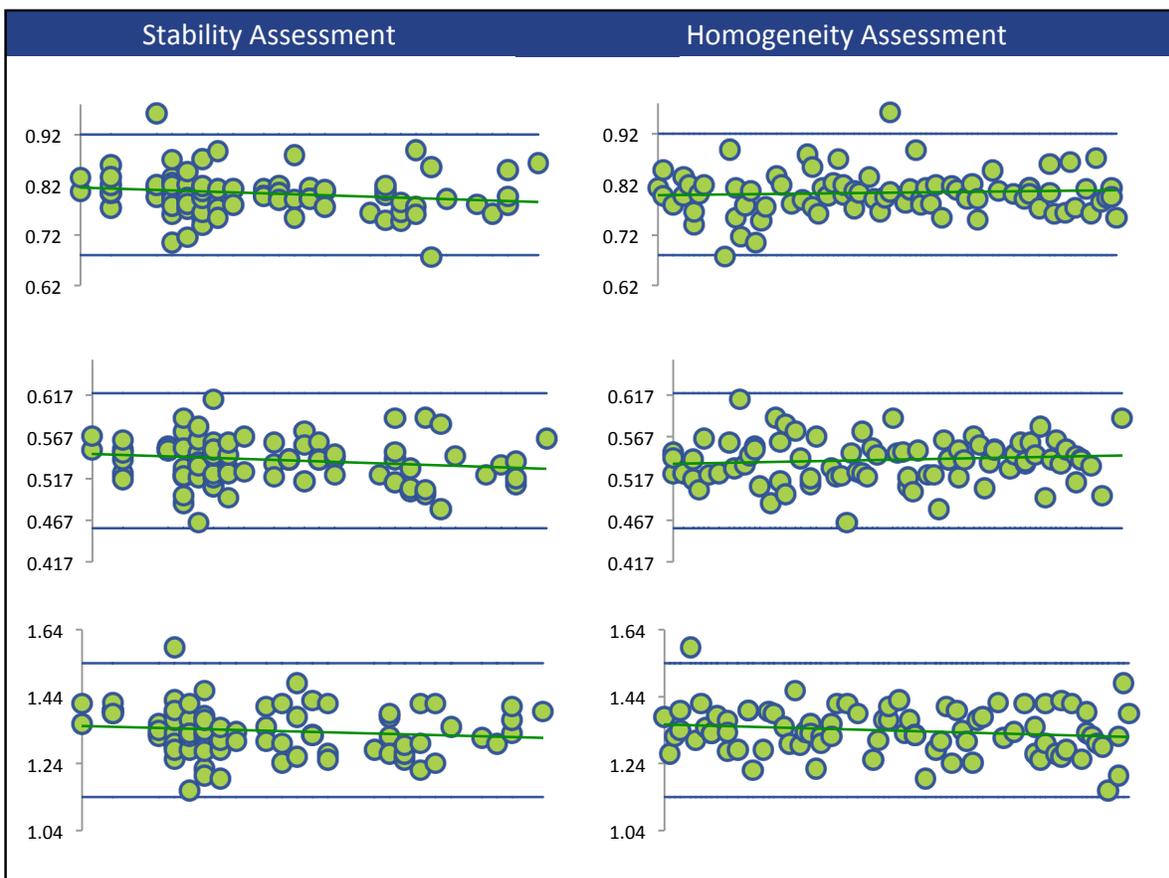
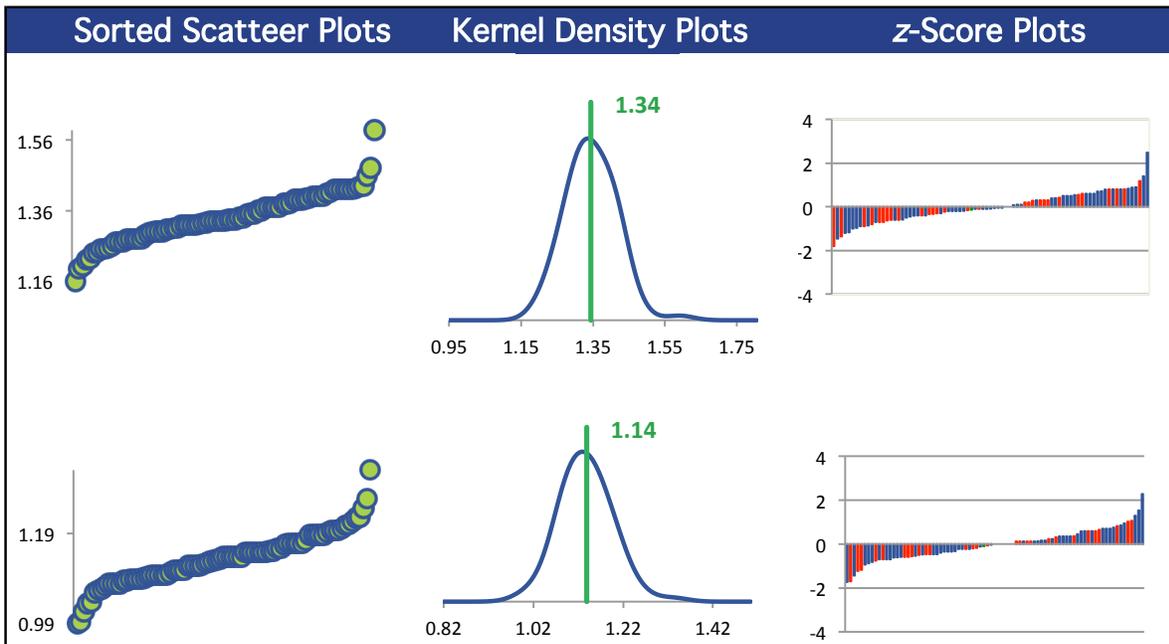
### Methods Used

Method	C02C-1	C02C-2	C02C-3	C02C-4
ICP/MS (Blue)	51	51	51	51
ICP/OES (Red)	31	31	31	31
AA (Green)	1	1	1	1

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



# ZINC



# ZINC

