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UaW41 Participating Laboratories

Lab Code	Lab Name	Matrix Code
ARGO01	Idaho National Laboratory	UaW
AY1201	Consolidated Nuclear Security, LLC, ACO Laboratory	UaW
ERCL01	Washington State Public Health Laboratories	UaW
LOCK03	Advanced Test Reactor (ATR) Complex Radioanalytical Laboratory	UaW
MART01	Fluor B&W Ports Analytical Laboratory	UaW
ORIS01	ORISE/IEAV	UaW
SOUT01	Southwest Research Institute	UaW
WSHL01	Wisconsin State Laboratory of Hygiene	UaW
YPGA01	US Army Yuma Proving Ground / Material Analysis Lab	UaW

Laboratories Not Reporting

Lab Code	Lab Name	Matrix Code
ARSA01	ARS Aleut Analytical, LLC (Luckey)	UaW
FSCL01	Forensic Science Center Lawrence Livermore Laboratory	UaW
SRPD01	Sandia National Laboratories, Radiation Protection Sample Diagnostics	UaW

MAPEP Mixed Analyte Performance Evaluation Program

Study Reference Values

MAPEP-19-UaW41

Radiological Reference Date: 08/01/2019

Analyte	Ref Value	Ref Unc
Mass	Units: (ng/g)	
Uranium-235	8.12	0.16
Uranium-238	264	5

Analyte	Ref Value	Ref Unc
Mass (%)	Units: (%)	
Wt% U-235	2.98	0.08

MAPEP Mixed Analyte Performance Evaluation Program

Sample Statistical Summary

MAPEP-19-UaW41

Radiological Reference Date: 08/01/2019

Analyte	T(1)	A(2)	Grand(3) Mean	Std Dev	Ref Value	Ref Unc	Acceptance Range
Mass							Units: (ng/g)
Uranium-235	9	9	8.12	0.66	8.12	0.16	5.68 - 10.56
Uranium-238	9	8	259	15	264	5	185 - 343

Analyte	T(1)	A(2)	Grand(3) Mean	Std Dev	Ref Value	Ref Unc	Acceptance Range
Mass (%)							Units: (%)
Wt% U-235	9	9	2.91	0.23	2.98	0.08	2.09 - 3.87

Note: (1) T = Total number of laboratories reporting analyte.
(2) A = Number of laboratories with 'Acceptable' performance.
(3) Mean excludes values outside of a bias range of +/- 30%.

Result Flags:

A = Result acceptable Bias <=20%

W = Result acceptable with warning 20% < Bias < 30%

N = Result not acceptable Bias > 30%

RW = Report Warning

NR = Not Reported

Mixed Analyte Performance Evaluation Program

Flag Summary Report

MAPEP-19-UaW41

Mass				
Analyte	**A**	**W**	**RW**	**N**
Uranium-235	9			
Uranium-238	8			1

Mass (%)				
Analyte	**A**	**W**	**RW**	**N**
Wt% U-235	8	1		

Mixed Analyte Performance Evaluation Program
Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-19-UaW41
(ARGO01) Idaho National Laboratory
INL, Materials and Fuels Complex
Idaho Falls, ID 83415

Mass								Units: (ng/g)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Uranium-235	8.09	8.12	A		-0.4	5.68 - 10.56	0.24	
Uranium-238	248	264	A		-6.1	185 - 343	7	

Mass (%)								Units: (%)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Wt% U-235	3.16	2.98	A		6.0	2.09 - 3.87	0.13	

Result Flags:

A = Result acceptable Bias <=20%

W = Result acceptable with warning 20% < Bias < 30%

N = Result not acceptable Bias > 30%

RW = Report Warning

NR = Not Reported

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-19-UaW41

(AY1201) Consolidated Nuclear Security, LLC, ACO Laboratory
Y12, NSC, Bldg. 9995, Rm 142
Oak Ridge, TN 37831-8189

Mass								Units: (ng/g)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Uranium-235	8.192	8.12	A		0.9	5.68 - 10.56	0.81	
Uranium-238	265.2	264	A		0.5	185 - 343	26.5	

Mass (%)								Units: (%)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Wt% U-235	3.00	2.98	A		0.6	2.09 - 3.87	0.41	

Result Flags:

A = Result acceptable Bias <=20%

W = Result acceptable with warning 20% < Bias < 30%

N = Result not acceptable Bias > 30%

RW = Report Warning

NR = Not Reported

Mixed Analyte Performance Evaluation Program
Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-19-UaW41

(ERCL01) Washington State Public Health Laboratories
1610 N.E. 150th Street
Shoreline, WA 98155-9701

Mass

Units: (ng/g)

Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Uranium-235	8.47	8.12	A		4.3	5.68 - 10.56	0.43	
Uranium-238	271	264	A		2.7	185 - 343	11	

Mass (%)

Units: (%)

Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Wt% U-235	3.03	2.98	A		1.7	2.09 - 3.87	0.19	

Result Flags:

A = Result acceptable Bias <=20%

W = Result acceptable with warning 20% < Bias < 30%

N = Result not acceptable Bias > 30%

RW = Report Warning

NR = Not Reported

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-19-UaW41
(LOCK03) Advanced Test Reactor (ATR) Complex Radioanalytical Laboratory
INL/Battelle Energy Alliance, LLC
Idaho Falls, ID 83415-7111

Mass								Units: (ng/g)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Uranium-235	8.035	8.12	A		-1.0	5.68 - 10.56	0.7	
Uranium-238	287.4	264	A		8.9	185 - 343	25	

Mass (%)								Units: (%)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Wt% U-235	2.72	2.98	A		-8.7	2.09 - 3.87	0.33	

Result Flags:

A = Result acceptable Bias <=20%

W = Result acceptable with warning 20% < Bias < 30%

N = Result not acceptable Bias > 30%

RW = Report Warning

NR = Not Reported

MAPEP Mixed Analyte Performance Evaluation Program

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-19-UaW41
(MART01) Fluor B&W Ports Analytical Laboratory
Lab COC, Bldg. X-710, Rm 222
Piketon, OH 45661-

Mass								Units: (ng/g)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Uranium-235	9.64	8.12	A		18.7	5.68 - 10.56	0.964	
Uranium-238	395	264	N		49.6	185 - 343	39.5	

Mass (%)								Units: (%)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Wt% U-235	2.38	2.98	W		-20.1	2.09 - 3.87	0.33	

Result Flags:

A = Result acceptable Bias <=20%

W = Result acceptable with warning 20% < Bias < 30%

N = Result not acceptable Bias > 30%

RW = Report Warning

NR = Not Reported

MAPEP Mixed Analyte Performance Evaluation Program

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-19-UaW41

(ORIS01) ORISE/IEAV
PO Box 117
Oak Ridge, TN 37831-0117

Mass								Units: (ng/g)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Uranium-235	7.36	8.12	A		-9.4	5.68 - 10.56	0.60	
Uranium-238	241	264	A		-8.7	185 - 343	16	

Mass (%)								Units: (%)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Wt% U-235	2.96	2.98	A		-0.6	2.09 - 3.87	0.31	

Result Flags:

A = Result acceptable Bias <=20%

W = Result acceptable with warning 20% < Bias < 30%

N = Result not acceptable Bias > 30%

RW = Report Warning

NR = Not Reported

MAPEP Mixed Analyte Performance Evaluation Program

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-19-UaW41

(SOUT01) Southwest Research Institute
6220 Culebra Rd.
San Antonio, TX 78228-0510

Mass								Units: (ng/g)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Uranium-235	7.65	8.12	A		-5.8	5.68 - 10.56	0.462	
Uranium-238	252	264	A		-4.5	185 - 343	15.1	

Mass (%)								Units: (%)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Wt% U-235	2.95	2.98	A		-1.1	2.09 - 3.87	0.25	

Result Flags:

A = Result acceptable Bias <=20%

W = Result acceptable with warning 20% < Bias < 30%

N = Result not acceptable Bias > 30%

RW = Report Warning

NR = Not Reported

Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-19-UaW41

(WSHL01) Wisconsin State Laboratory of Hygiene
2601 Agriculture Drive
Madison, WI 53718

Mass

Units: (ng/g)

Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Uranium-235	7.98	8.12	A		-1.7	5.68 - 10.56	0.02	
Uranium-238	255.1	264	A		-3.4	185 - 343	0.5	

Mass (%)

Units: (%)

Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Wt% U-235	3.03	2.98	A		1.8	2.09 - 3.87	0.01	

Result Flags:

A = Result acceptable Bias <=20%

W = Result acceptable with warning 20% < Bias < 30%

N = Result not acceptable Bias > 30%

RW = Report Warning

NR = Not Reported

Mixed Analyte Performance Evaluation Program
Department of Energy RESL - 1955 Fremont Ave, MS4149 - Idaho Falls, ID 83415

Laboratory Results For MAPEP-19-UaW41
(YPGA01) US Army Yuma Proving Ground / Material Analysis Lab
301 C. Street
Yuma, AZ 85365

Mass								Units: (ng/g)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Uranium-235	7.7	8.12	A		-5.2	5.68 - 10.56	0.4	
Uranium-238	251	264	A		-4.9	185 - 343	4	

Mass (%)								Units: (%)
Analyte	Result	Ref Value	Flag	Notes	Bias (%)	Acceptance Range	Unc Value	Unc Flag
Wt% U-235	2.98	2.98	A		-0.1	2.09 - 3.87	0.16	

Result Flags:

A = Result acceptable Bias <=20%

W = Result acceptable with warning 20% < Bias < 30%

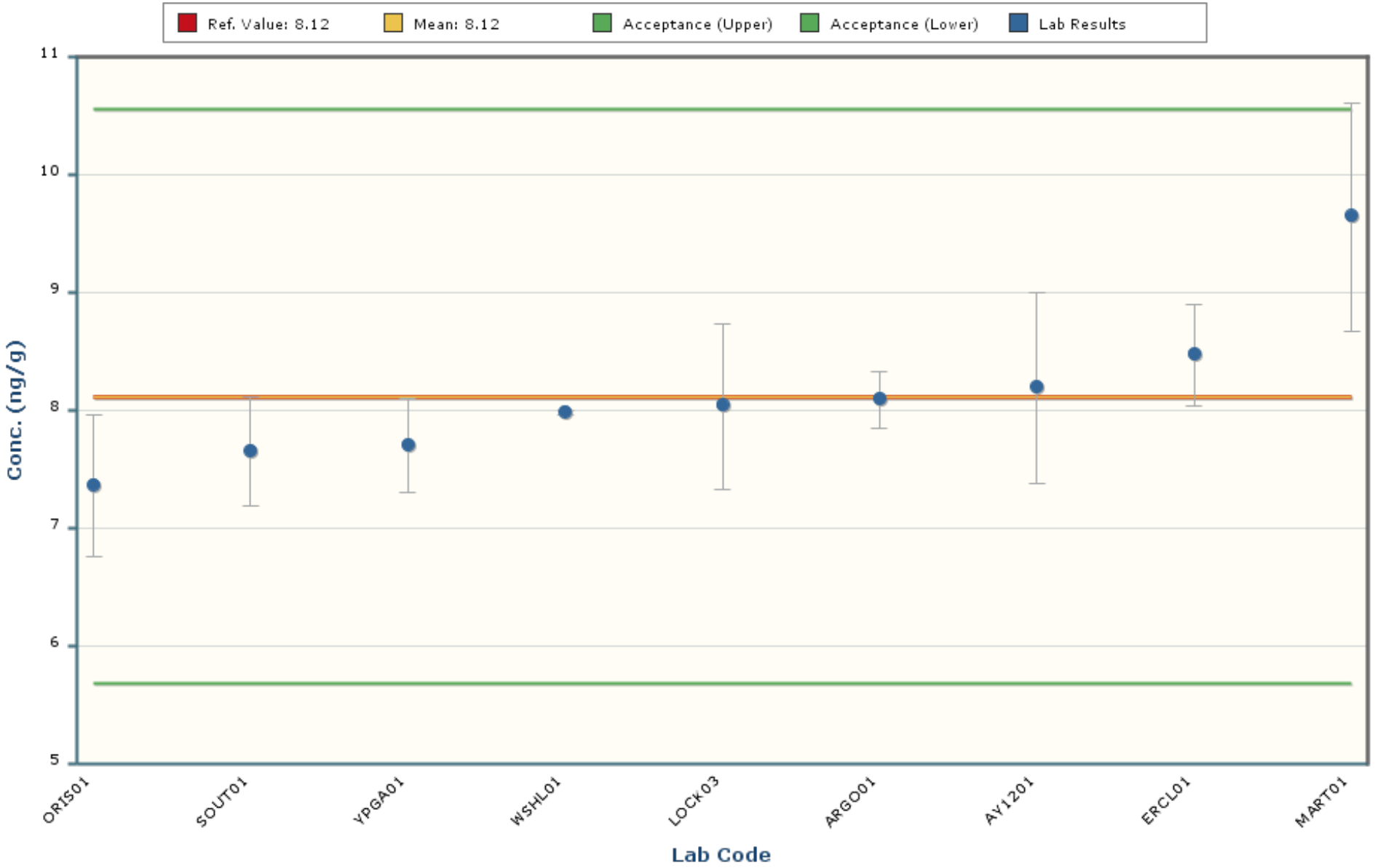
N = Result not acceptable Bias > 30%

RW = Report Warning

NR = Not Reported

Uranium-235

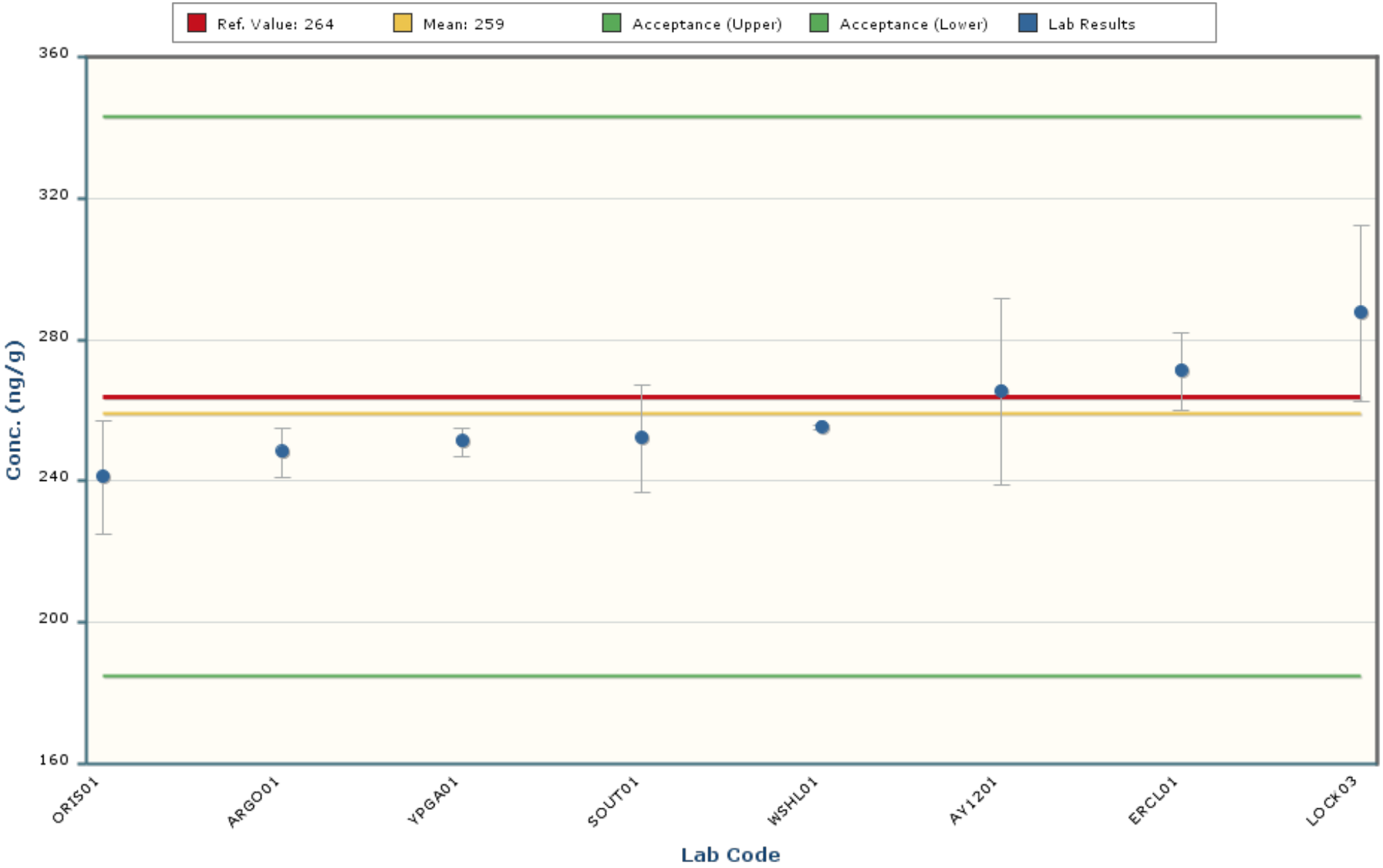
MAPEP-19-UaW41



Notes:
The chart mean excludes values outside of a bias range of ± 30%.
The chart shows only data points with values between 4.85 and 11.40 (± 5 Standard Deviations).
The error bars encompassing each result are plotted at ± one standard deviation.

Uranium-238

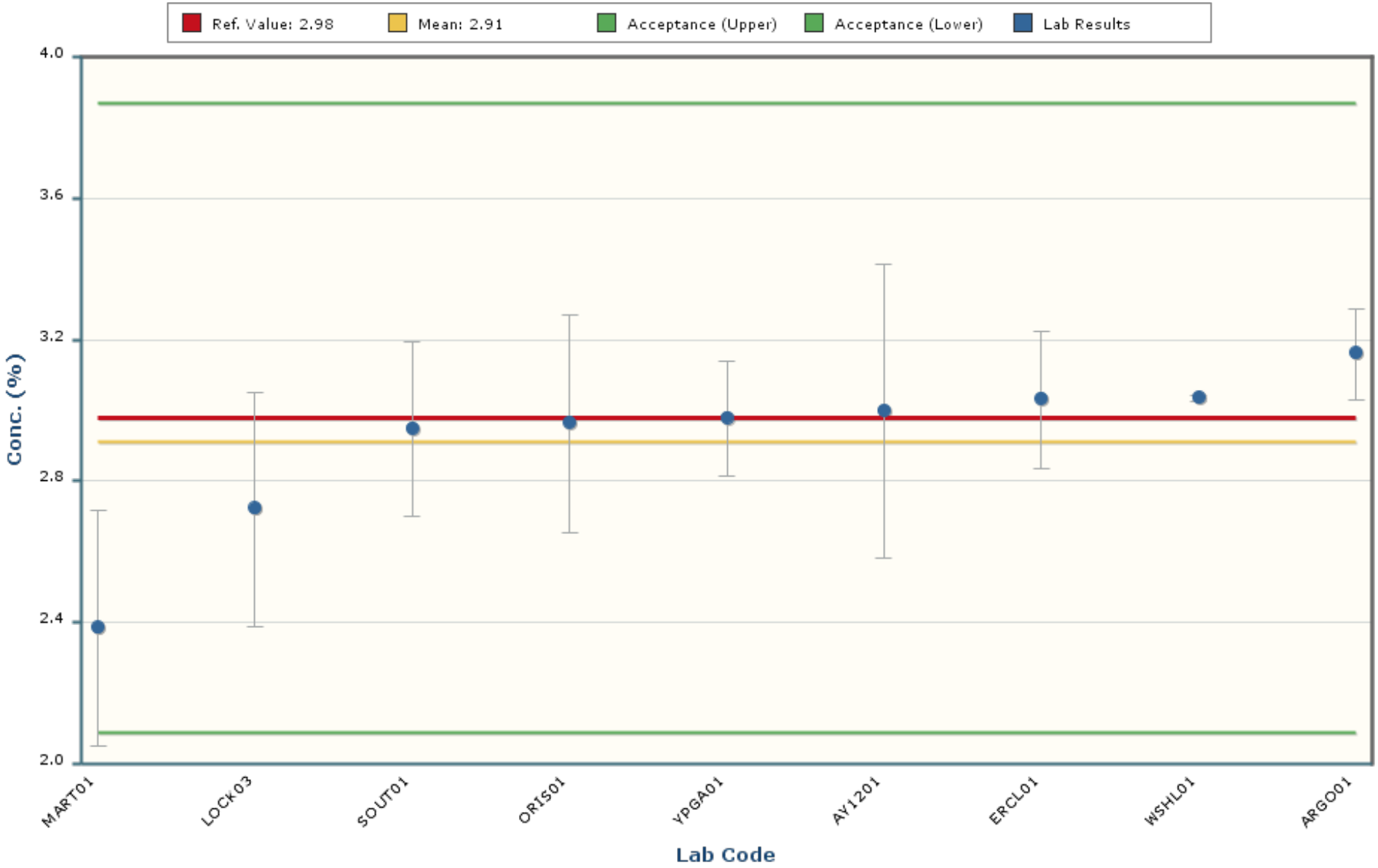
MAPEP-19-UaW41



Notes:
The chart mean excludes values outside of a bias range of ± 30%.
The chart shows only data points with values between 184 and 334 (± 5 Standard Deviations).
The error bars encompassing each result are plotted at ± one standard deviation.

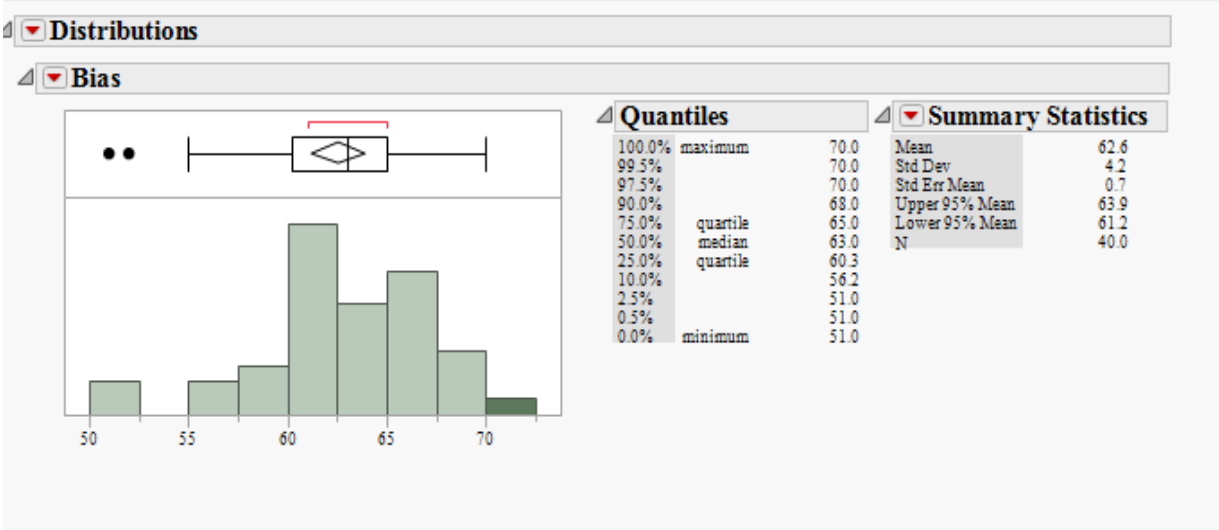
Wt% U-235

MAPEP-19-UaW41



Notes:
The chart mean excludes values outside of a bias range of ± 30%.
The chart shows only data points with values between 1.76 and 4.06 (± 5 Standard Deviations).
The error bars encompassing each result are plotted at ± one standard deviation.

The intent of the distribution graphs contained within this report is to graphically demonstrate to users how % Bias data within the current MAPEP Series appears when examined by matrix, by analyte, by method of sample preparation or by method of detection. Biases greater than +/- 100% have been screened from the data. The box plot of the bias data points and the mean visually illustrate the breadth of the distribution and where potential outliers in the distribution might lie. The statistics for the distribution plot are provided adjacent to the Bias plot. In some cases, N becomes very small and thus developed statistics may not accurately reflect estimates of the population if N were a significantly larger value.

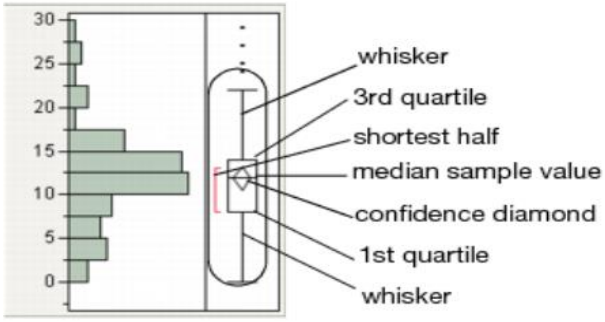


Outlier Box Plot

The BLACK small vertical line inside the small rectangle at the top of the data distribution graph is the median of the population of the bias shown for that analyte in the matrix. The confidence diamond contains the mean and the upper and lower 95% of the mean. If you drew a line through the middle of the diamond, you would have the mean. The top and bottom points of the diamond represent the upper and lower 95% of the mean. The ends of the box represent the 25th and 75th quantiles, also expressed as 1st and 3rd quartile. The difference between the 1st and 3rd quartiles is called the interquartile range. Each box has lines that extend from each end, sometimes called whiskers. The whiskers extend from the ends of the box to the outermost data point that falls within the distances computed as follows:

3rd quartile + 1.5*(interquartile range)

1st quartile - 1.5*(interquartile range)



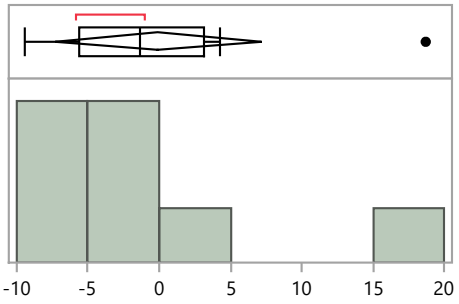
If the data points do not reach the computed ranges, then the whiskers are determined by the upper and lower data point values (not including outliers). The bracket outside of the box identifies the *shortest half*, which is the most dense 50% of the observations (Rousseuw and Leroy 1987).

Ref. "SAS Institute Inc. 2016. JMP® 13 Basic Analysis. Cary, NC: SAS Institute Inc."

UaW Distribution by Detection Method

Distributions Analyte_Detection=Uranium-235 Inductively Coupled Plasma Mass Spectrometry

Bias

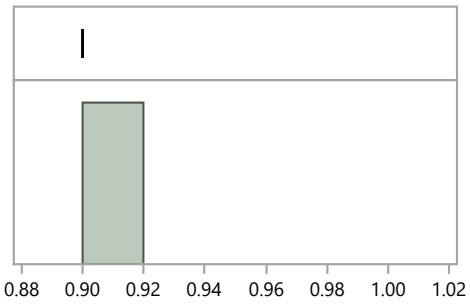


Quantiles		
100.0%	maximum	18.7
99.5%		18.7
97.5%		18.7
90.0%		18.7
75.0%	quartile	3.1
50.0%	median	-1.4
25.0%	quartile	-5.7
10.0%		-9.4
2.5%		-9.4
0.5%		-9.4
0.0%	minimum	-9.4

Summary Statistics	
Mean	-0.1
Std Dev	8.6
Std Err Mean	3.1
Upper 95% Mean	7.2
Lower 95% Mean	-7.3
N	8.0

Distributions Analyte_Detection=Uranium-235 Thermal Ionization Mass Spectrometry

Bias

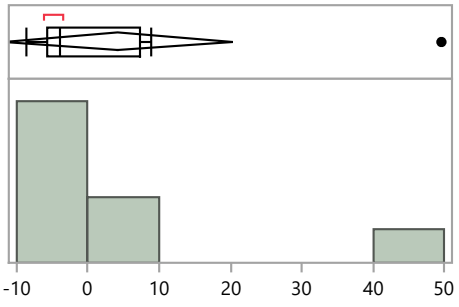


Quantiles		
100.0%	maximum	0.9
99.5%		0.9
97.5%		0.9
90.0%		0.9
75.0%	quartile	0.9
50.0%	median	0.9
25.0%	quartile	0.9
10.0%		0.9
2.5%		0.9
0.5%		0.9
0.0%	minimum	0.9

Summary Statistics	
Mean	0.9
Std Dev	.
Std Err Mean	.
Upper 95% Mean	.
Lower 95% Mean	.
N	1.0

Distributions Analyte_Detection=Uranium-238 Inductively Coupled Plasma Mass Spectrometry

Bias



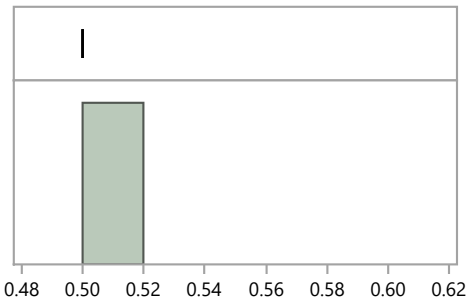
Quantiles		
100.0%	maximum	49.6
99.5%		49.6
97.5%		49.6
90.0%		49.6
75.0%	quartile	7.4
50.0%	median	-4.0
25.0%	quartile	-5.8
10.0%		-8.7
2.5%		-8.7
0.5%		-8.7
0.0%	minimum	-8.7

Summary Statistics	
Mean	4.2
Std Dev	19.2
Std Err Mean	6.8
Upper 95% Mean	20.2
Lower 95% Mean	-11.8
N	8.0

UaW Distribution by Detection Method

Distributions Analyte_Detection=Uranium-238 Thermal Ionization Mass Spectrometry

Bias

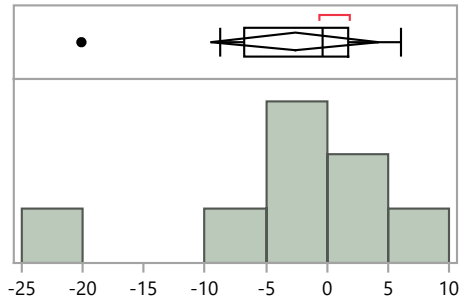


Quantiles		
100.0%	maximum	0.5
99.5%		0.5
97.5%		0.5
90.0%		0.5
75.0%	quartile	0.5
50.0%	median	0.5
25.0%	quartile	0.5
10.0%		0.5
2.5%		0.5
0.5%		0.5
0.0%	minimum	0.5

Summary Statistics	
Mean	0.5
Std Dev	.
Std Err Mean	.
Upper 95% Mean	.
Lower 95% Mean	.
N	1.0

Distributions Analyte_Detection=Wt% U-235 Inductively Coupled Plasma Mass Spectrometry

Bias

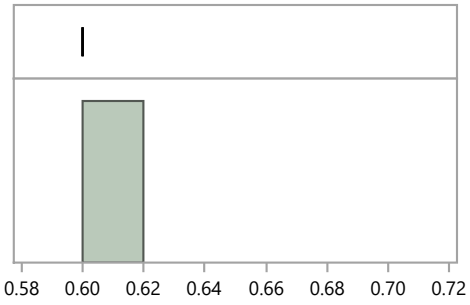


Quantiles		
100.0%	maximum	6.0
99.5%		6.0
97.5%		6.0
90.0%		6.0
75.0%	quartile	1.8
50.0%	median	-0.4
25.0%	quartile	-6.8
10.0%		-20.1
2.5%		-20.1
0.5%		-20.1
0.0%	minimum	-20.1

Summary Statistics	
Mean	-2.6
Std Dev	8.2
Std Err Mean	2.9
Upper 95% Mean	4.2
Lower 95% Mean	-9.5
N	8.0

Distributions Analyte_Detection=Wt% U-235 Thermal Ionization Mass Spectrometry

Bias



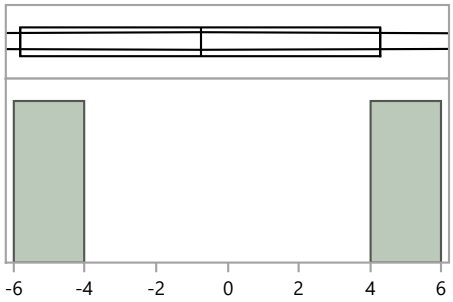
Quantiles		
100.0%	maximum	0.6
99.5%		0.6
97.5%		0.6
90.0%		0.6
75.0%	quartile	0.6
50.0%	median	0.6
25.0%	quartile	0.6
10.0%		0.6
2.5%		0.6
0.5%		0.6
0.0%	minimum	0.6

Summary Statistics	
Mean	0.6
Std Dev	.
Std Err Mean	.
Upper 95% Mean	.
Lower 95% Mean	.
N	1.0

UaW Distribution by Prep Method

Distributions Analyte_Method=Uranium-235 EPA Method 200.8 Trace Metals in Waters & Wastes

Bias

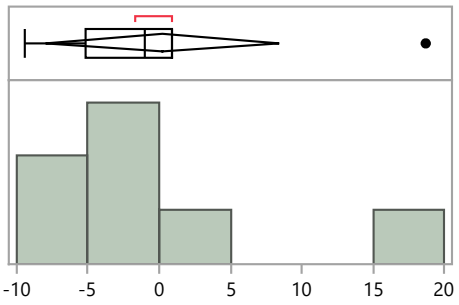


Quantiles		
100.0%	maximum	4.3
99.5%		4.3
97.5%		4.3
90.0%		4.3
75.0%	quartile	4.3
50.0%	median	-0.8
25.0%	quartile	-5.8
10.0%		-5.8
2.5%		-5.8
0.5%		-5.8
0.0%	minimum	-5.8

Summary Statistics	
Mean	-0.8
Std Dev	7.1
Std Err Mean	5.1
Upper 95% Mean	63.4
Lower 95% Mean	-64.9
N	2.0

Distributions Analyte_Method=Uranium-235 No preparation - analyzed as received

Bias

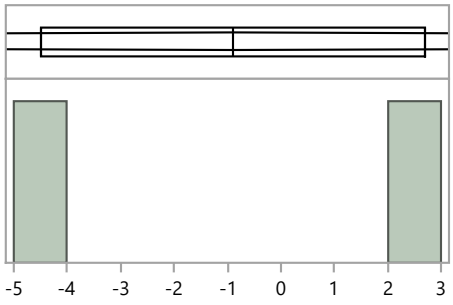


Quantiles		
100.0%	maximum	18.7
99.5%		18.7
97.5%		18.7
90.0%		18.7
75.0%	quartile	0.9
50.0%	median	-1.0
25.0%	quartile	-5.2
10.0%		-9.4
2.5%		-9.4
0.5%		-9.4
0.0%	minimum	-9.4

Summary Statistics	
Mean	0.3
Std Dev	8.8
Std Err Mean	3.3
Upper 95% Mean	8.5
Lower 95% Mean	-7.9
N	7.0

Distributions Analyte_Method=Uranium-238 EPA Method 200.8 Trace Metals in Waters & Wastes

Bias



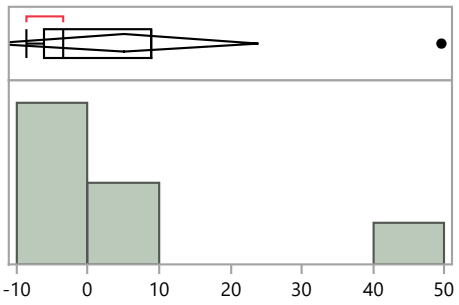
Quantiles		
100.0%	maximum	2.7
99.5%		2.7
97.5%		2.7
90.0%		2.7
75.0%	quartile	2.7
50.0%	median	-0.9
25.0%	quartile	-4.5
10.0%		-4.5
2.5%		-4.5
0.5%		-4.5
0.0%	minimum	-4.5

Summary Statistics	
Mean	-0.9
Std Dev	5.1
Std Err Mean	3.6
Upper 95% Mean	44.8
Lower 95% Mean	-46.6
N	2.0

UaW Distribution by Prep Method

Distributions Analyte_Method=Uranium-238 No preparation - analyzed as received

Bias

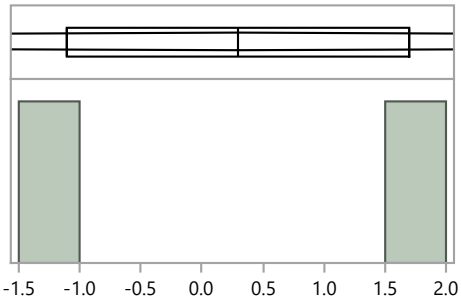


Quantiles		
100.0%	maximum	49.6
99.5%		49.6
97.5%		49.6
90.0%		49.6
75.0%	quartile	8.9
50.0%	median	-3.4
25.0%	quartile	-6.1
10.0%		-8.7
2.5%		-8.7
0.5%		-8.7
0.0%	minimum	-8.7

Summary Statistics	
Mean	5.1
Std Dev	20.4
Std Err Mean	7.7
Upper 95% Mean	24.0
Lower 95% Mean	-13.8
N	7.0

Distributions Analyte_Method=Wt% U-235 EPA Method 200.8 Trace Metals in Waters & Wastes

Bias

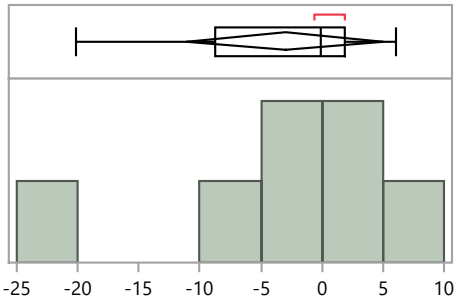


Quantiles		
100.0%	maximum	1.7
99.5%		1.7
97.5%		1.7
90.0%		1.7
75.0%	quartile	1.7
50.0%	median	0.3
25.0%	quartile	-1.1
10.0%		-1.1
2.5%		-1.1
0.5%		-1.1
0.0%	minimum	-1.1

Summary Statistics	
Mean	0.3
Std Dev	2.0
Std Err Mean	1.4
Upper 95% Mean	18.1
Lower 95% Mean	-17.5
N	2.0

Distributions Analyte_Method=Wt% U-235 No preparation - analyzed as received

Bias



Quantiles		
100.0%	maximum	6.0
99.5%		6.0
97.5%		6.0
90.0%		6.0
75.0%	quartile	1.8
50.0%	median	-0.1
25.0%	quartile	-8.7
10.0%		-20.1
2.5%		-20.1
0.5%		-20.1
0.0%	minimum	-20.1

Summary Statistics	
Mean	-3.0
Std Dev	8.7
Std Err Mean	3.3
Upper 95% Mean	5.0
Lower 95% Mean	-11.1
N	7.0