

# Analysis of Everglades Round Robin Results

## Rounds 2-8

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### Procedure:

- 1 Compile data for Round Robins 2-8; Govt, Research, Contract Labs Used by SFWMD
- 2 Set observations  $\leq 4$  ppb to 4 ppb (~removes effects of differences in lab detection limits)
- 3 Take median of 3-4 replicates for each sample & lab
- 4 Compute reference value for each sample = median (DEP, FIU, Duke, SFWMD, USSC)
- 5 Compare lab result with reference value for each sample.
- 6 Summarize Accuracy (vs. Reference V) & Precision (Replicate Variance) for each lab (P1)
- 7 Plot lab results vs. reference values (P 2-4)
- 8 Plot Deviations from Reference vs. Sample for each lab (P 5-12)
- 9 Plot Correlations with Reference Value for each lab (P 13-20)

### Results:

- 1 Statistical Summary
- 2 Lab Results vs. Reference Values - Linear Scales
- 3 Lab Results vs. Reference Values - Linear Scales, 0-20 ppb
- 4 Lab Results vs. Reference Values - Log Scales
- 5 Deviations from Reference Value DEP
- 6 Deviations from Reference Value Duke
- 7 Deviations from Reference Value FIU
- 8 Deviations from Reference Value PBB
- 9 Deviations from Reference Value PBS&J
- 10 Deviations from Reference Value SFWMD
- 11 Deviations from Reference Value USGS
- 12 Deviations from Reference Value US Sugar Research
- 13 Correlations with Reference Value DEP
- 14 Correlations with Reference Value Duke
- 15 Correlations with Reference Value FIU
- 16 Correlations with Reference Value PBB
- 17 Correlations with Reference Value PBS&J
- 18 Correlations with Reference Value SFWMD
- 19 Correlations with Reference Value USGS
- 20 Correlations with Reference Value US Sugar Research

\* dashed lines in Pages 5-12 show  $\pm 2$  standard deviation control limits, with standard deviations computed from DEP results ( $\approx 7\%$  or 1.7 ppb).

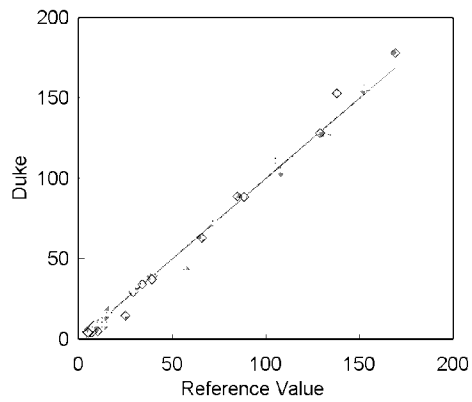
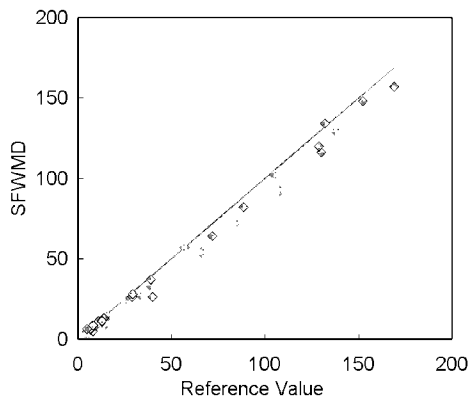
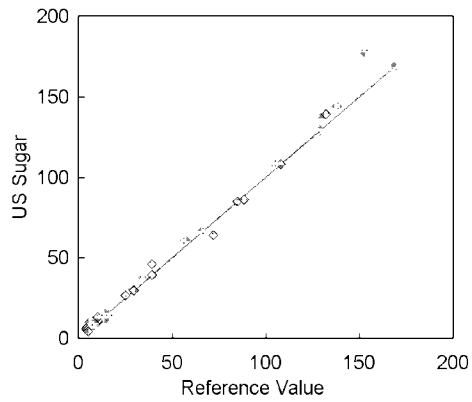
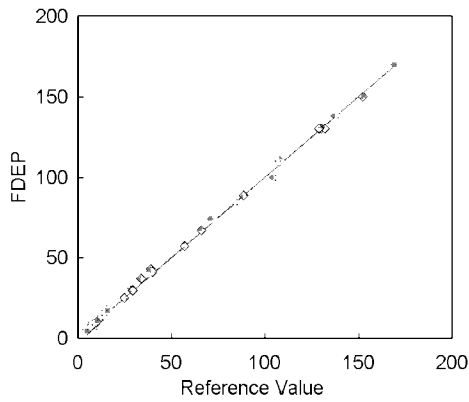
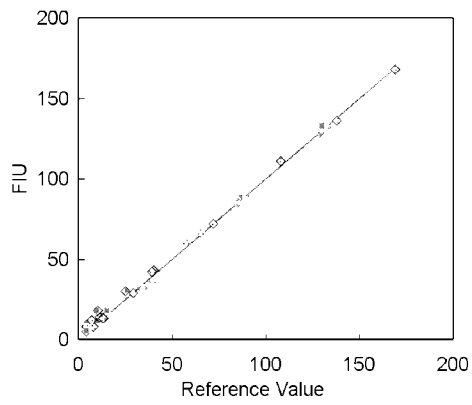
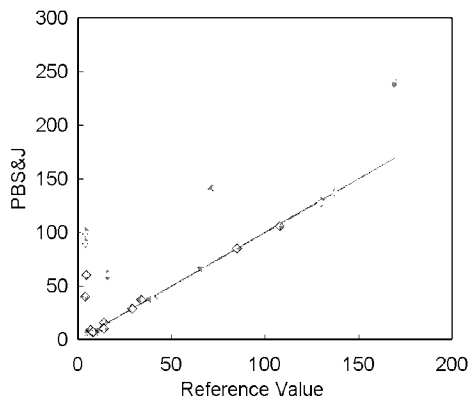
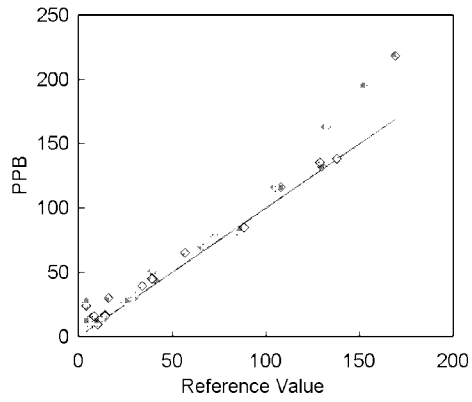
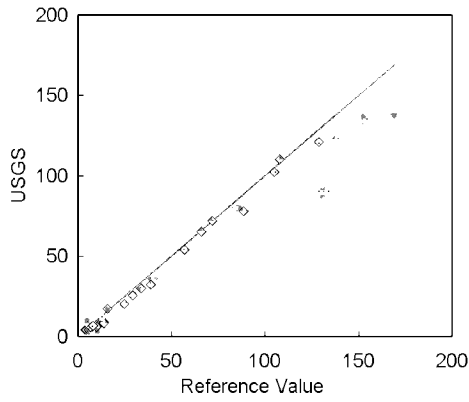
## Statistical Summary - Everglades Round Robins 2-8

Reference Values: Median (Duke WC, US Sugar Research, SFWMD, FIU, DEP)

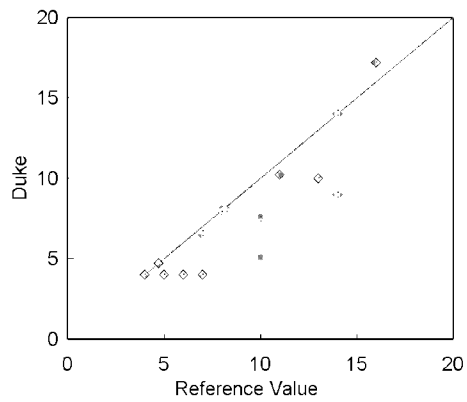
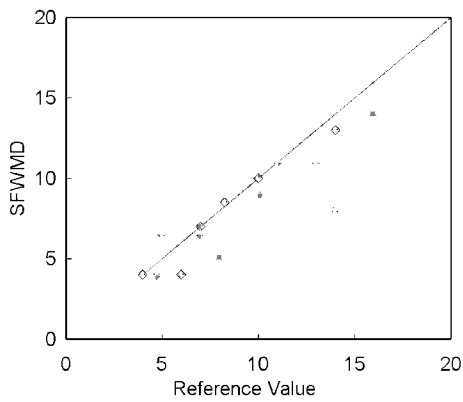
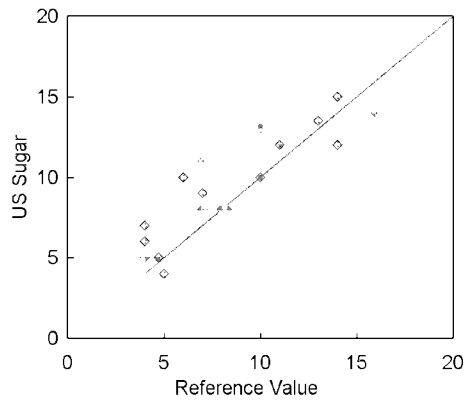
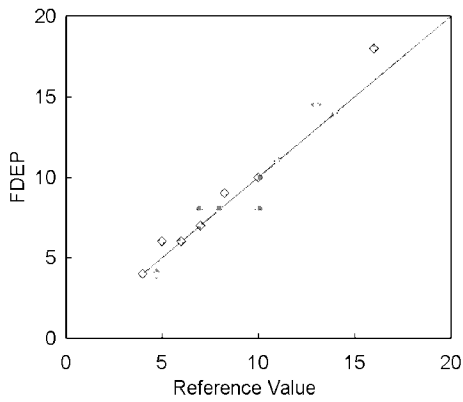
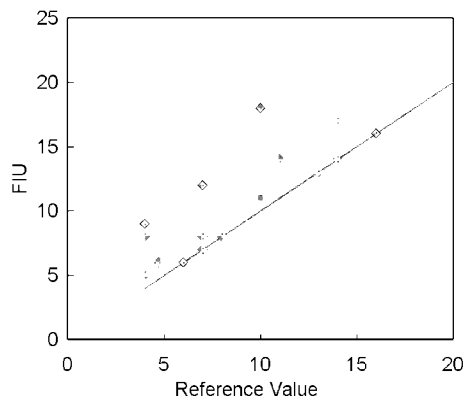
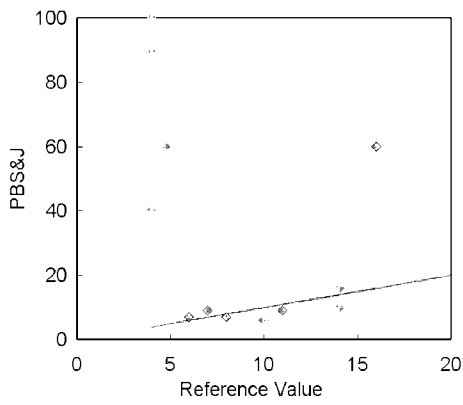
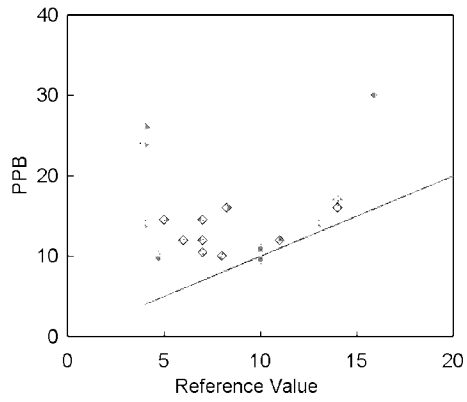
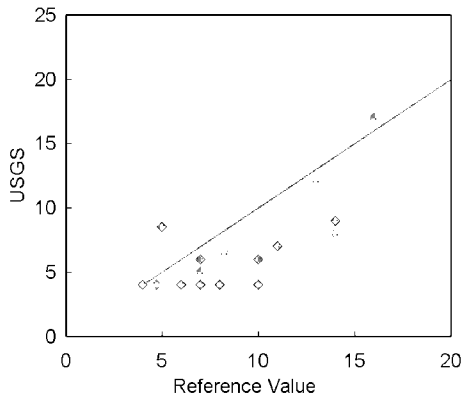
Lab	Duke WC	US Sugar	USGS	PBB	PBS&J	SFWMD	FIU	DEP
<b>All Samples</b>								
Samples	38	38	38	38	38	38	33	38
<b>Relative Accuracy: Lab Result - Reference Result, %</b>								
Median	-0%	4%	-13%	14%	10%	-7%	1%	0%
Mean	-9%	10%	-15%	63%	214%	-9%	16%	2%
Standard Deviation	16%	21%	21%	123%	553%	13%	32%	7%
t (Mean = 0)	-3.35	3.00	-4.42	3.17	2.39	-4.32	2.90	1.49
Signif	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.14
<b>Relative Accuracy: Lab Result - Reference Result, ppb</b>								
Median	-0.13	0.90	-4.00	5.15	2.00	-2.00	0.50	0.00
Mean	-0.77	1.92	-6.43	8.19	14.88	-4.08	1.32	0.31
Standard Deviation	4.62	4.87	10.29	11.18	26.92	4.97	2.44	1.56
t (Mean = 0)	-1.03	2.42	-3.85	4.52	3.41	-5.07	3.11	1.23
Signif.	0.31	0.02	0.00	0.00	0.00	0.00	0.00	0.23
<b>Relative Precision: Standard Deviations Among Replicates %</b>								
Median	14%	11%	13%	20%	25%	21%	19%	13%
Mean	20%	19%	23%	41%	39%	28%	33%	19%
<b>Low-Range Samples ( Reference Value &lt; 20 ppb )</b>								
Samples	18	18	18	18	18	18	16	18
<b>Relative Accuracy: Lab Result - Reference Result, %</b>								
Median	-7%	8%	-25%	79%	42%	-4%	18%	0%
Mean	-16%	18%	-20%	122%	436%	-8%	31%	2%
Standard Deviation	19%	28%	30%	161%	752%	17%	40%	10%
t (Mean = 0)	-3.59	2.70	-2.80	3.20	2.46	-2.06	3.12	0.81
Signif	0.00	0.02	0.01	0.01	0.02	0.06	0.01	0.43
<b>Relative Accuracy: Lab Result - Reference Result, ppb</b>								
Median	-0.65	1.00	-1.88	5.15	3.75	-0.25	1.00	0.00
Mean	-1.38	0.98	-2.00	6.67	20.95	-0.91	2.02	0.20
Standard Deviation	1.82	1.79	2.53	6.45	31.29	1.66	2.42	0.86
t (Mean = 0)	-3.22	2.31	-3.35	4.39	2.84	-2.33	3.34	0.97
Signif.	0.01	0.03	0.00	0.00	0.01	0.03	0.00	0.34
<b>Relative Precision: Standard Deviations Among Replicates %</b>								
Median	24%	24%	21%	41%	47%	34%	24%	26%
Mean	25%	26%	30%	55%	47%	36%	32%	25%

Comparison of Sample Medians - Linear Scales

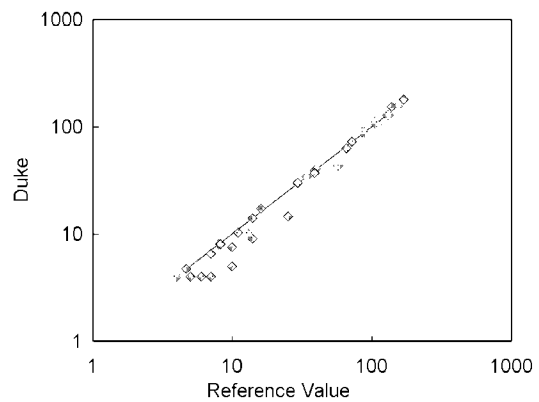
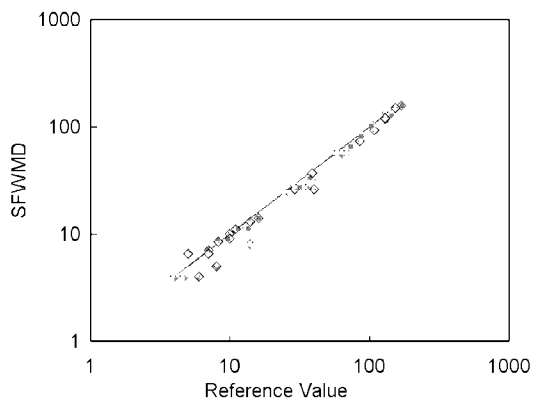
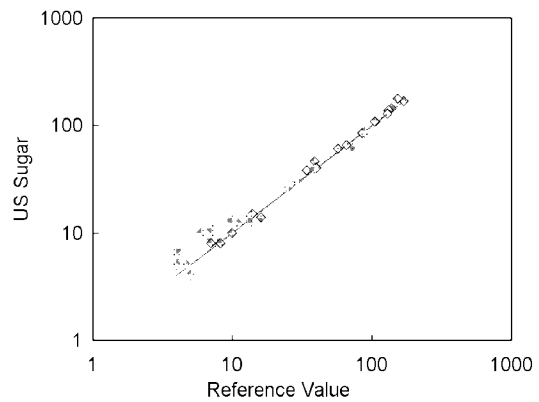
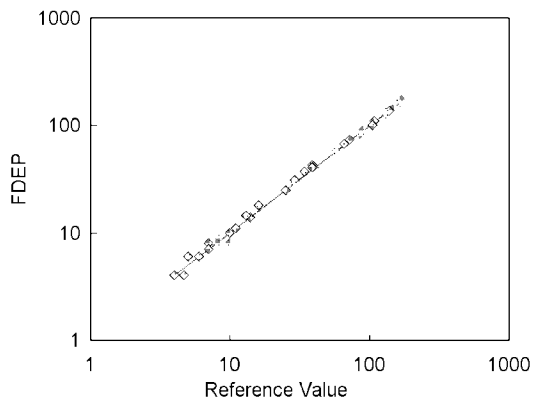
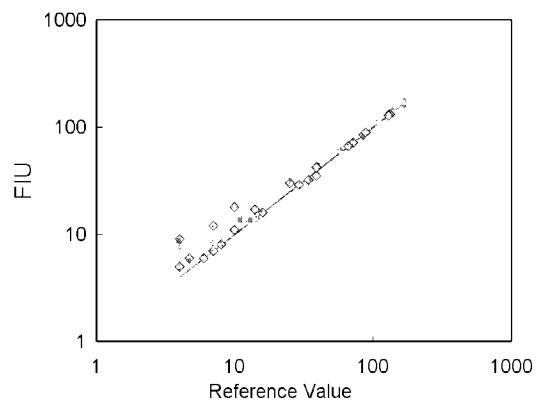
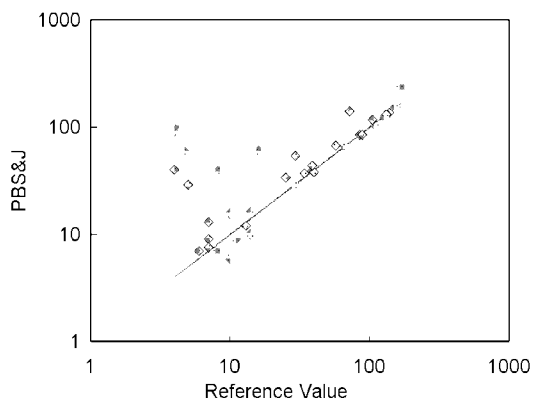
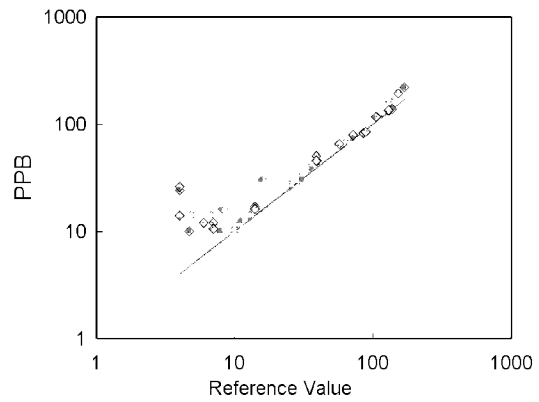
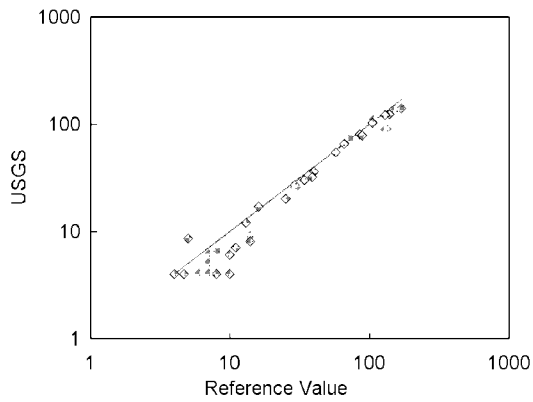
Reference Value = Median (Duke WC, US Sugar Research, SFWMD, FIU, DEP)



Comparison of Sample Medians - Linear Scales - 0-20 ppb  
 Reference Value = Median (Duke WC, US Sugar Research, SFWMD, FIU, DEP)

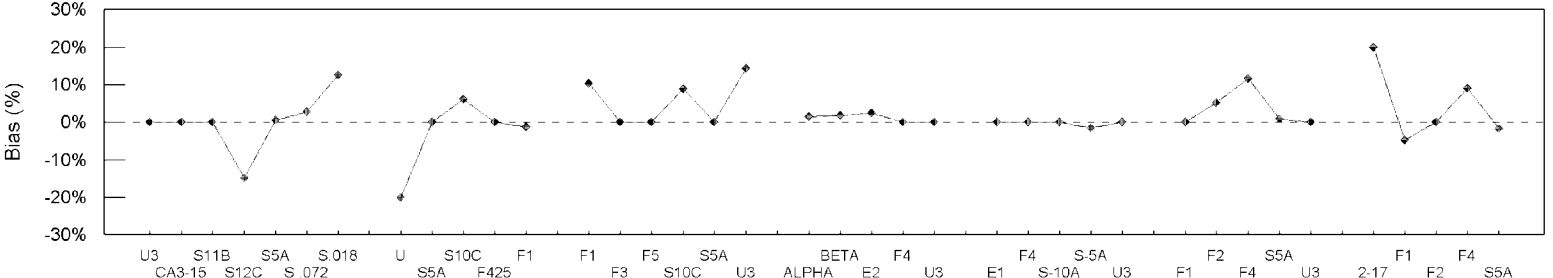
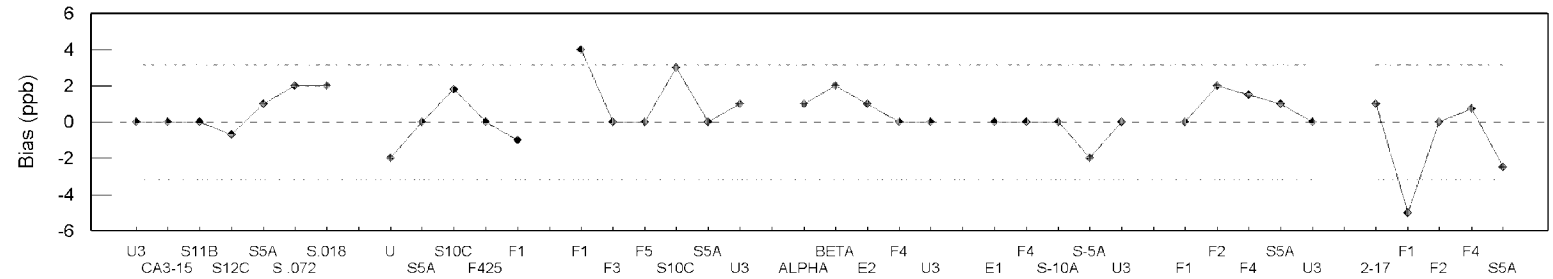


Comparison of Sample Medians -Logarithmic Scales  
Reference Value = Median (Duke WC, US Sugar Research, SFWMD, FIU, DEP)

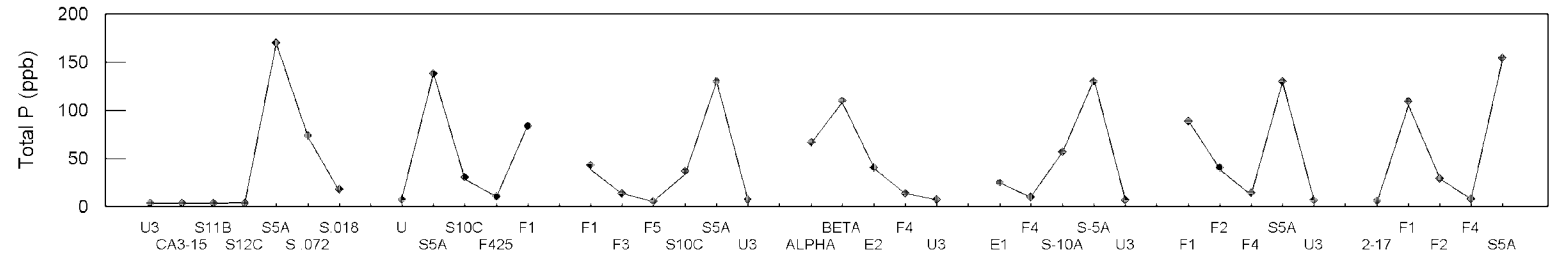
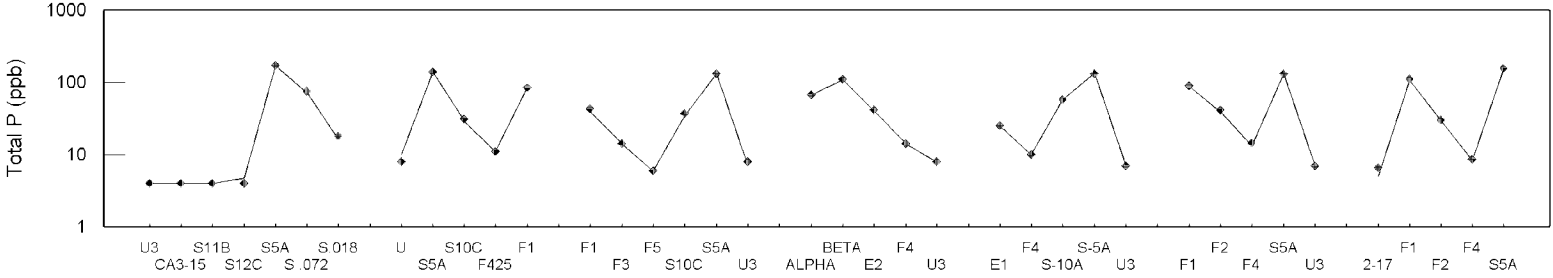


Lab: DEP

Bias = Lab Result - Median (Duke, FDEP, FIU, USSC, SFWMD)



----- +/- 2 Std Deviations (DEP)



◆ DEP      — Median (Duke, FDEP, FIU, USSC, SFWMD)

RR-2

RR-3

RR-4

RR-5

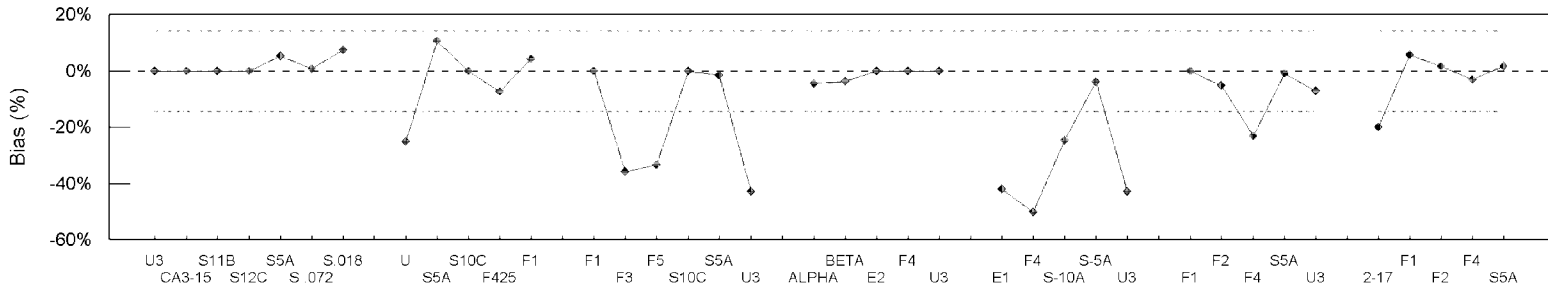
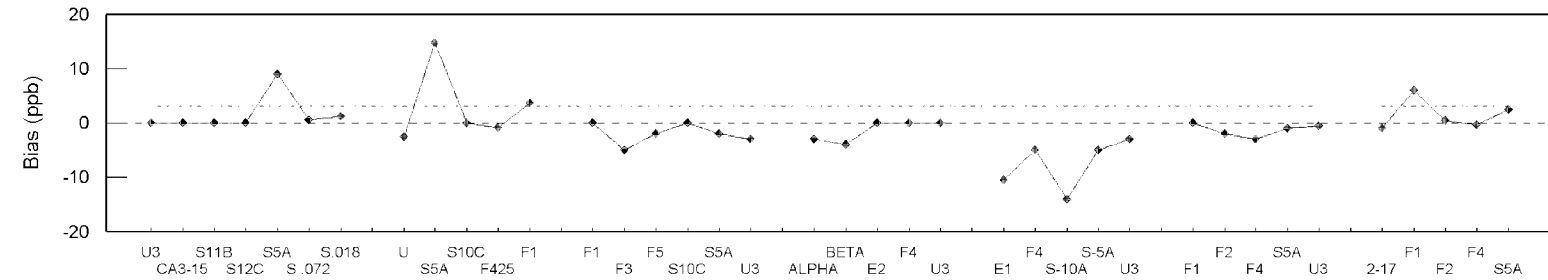
RR-6

RR-7

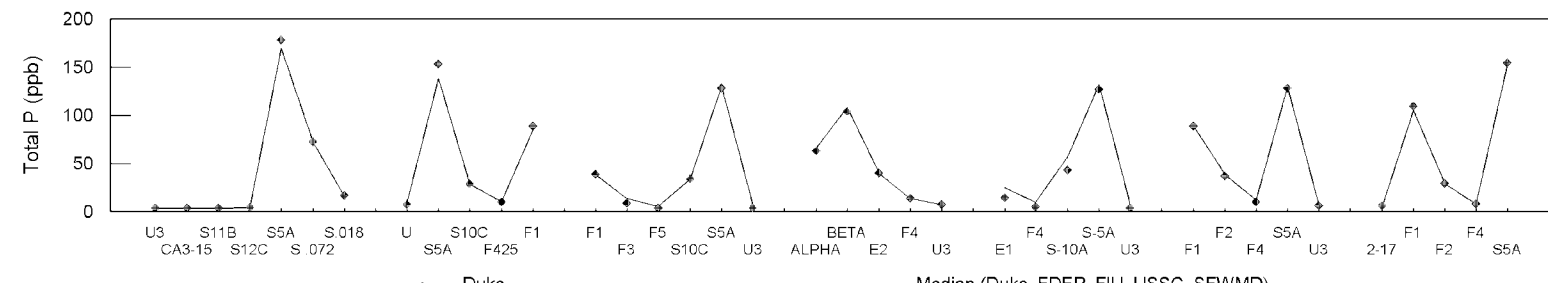
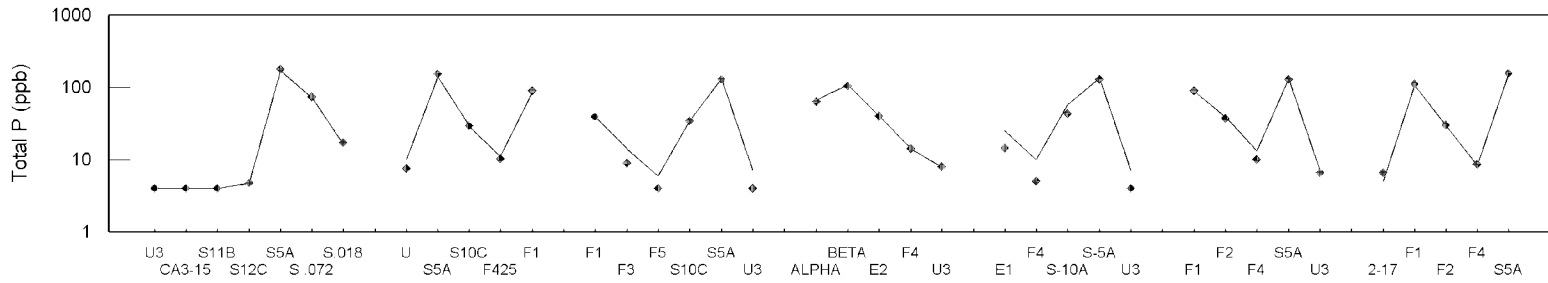
RR-8

Lab: Duke

Bias = Lab Result - Median (Duke, FDEP, FIU, USSC, SFWMD)



--- +/- 2 Std Deviations (DEP)



◆ Duke      — Median (Duke, FDEP, FIU, USSC, SFWMD)

RR-2

RR-3

RR-4

RR-5

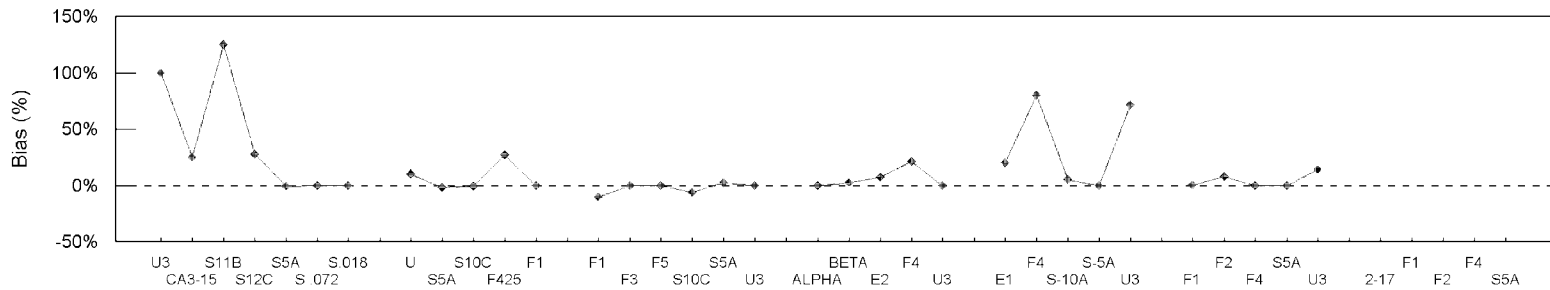
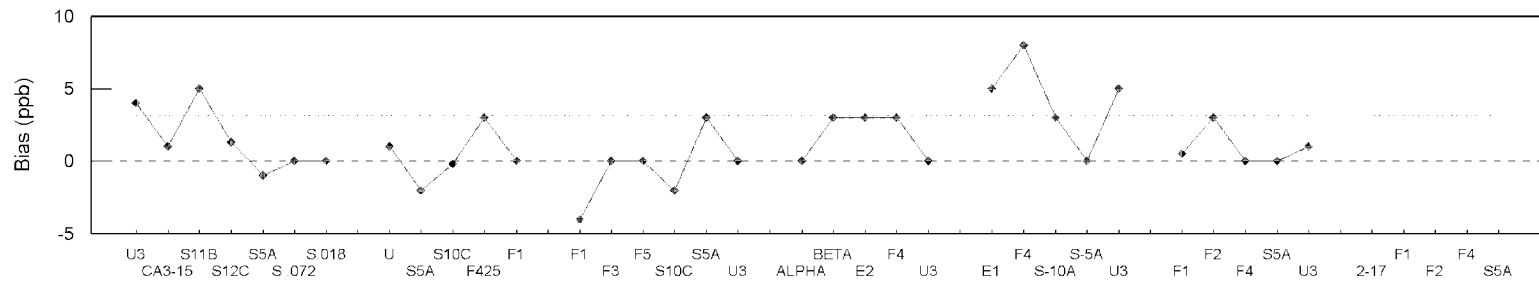
RR-6

RR-7

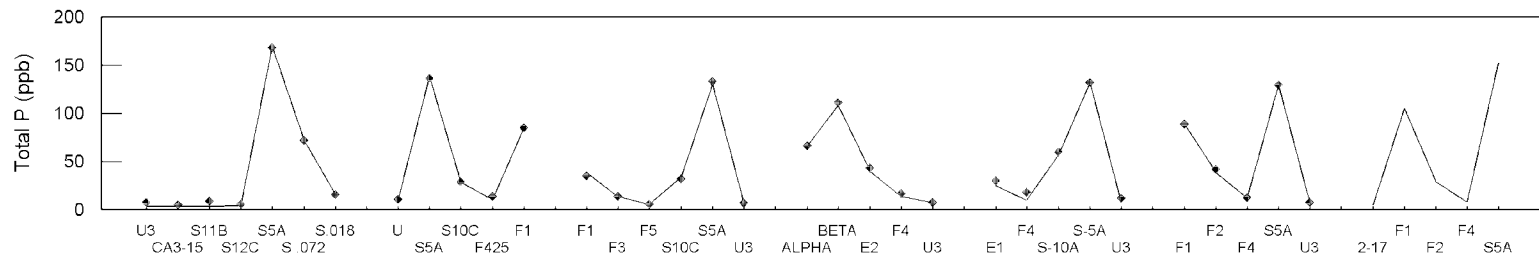
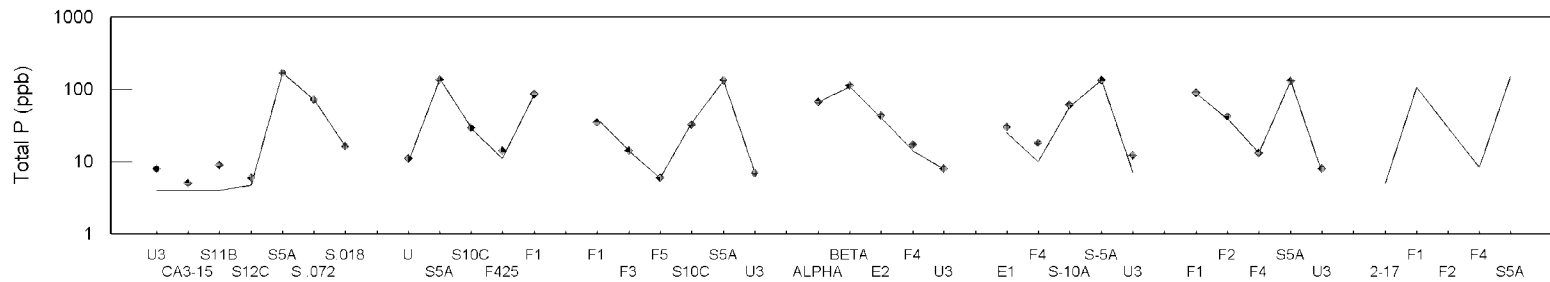
RR-8

Lab: FIU

Bias = Lab Result - Median (Duke, FDEP, FIU, USSC, SFWMD)



..... +/- 2 Std Deviations (DEP)



◆ FIU      — Median (Duke, FDEP, FIU, USSC, SFWMD)

RR-2

RR-3

RR-4

RR-5

RR-6

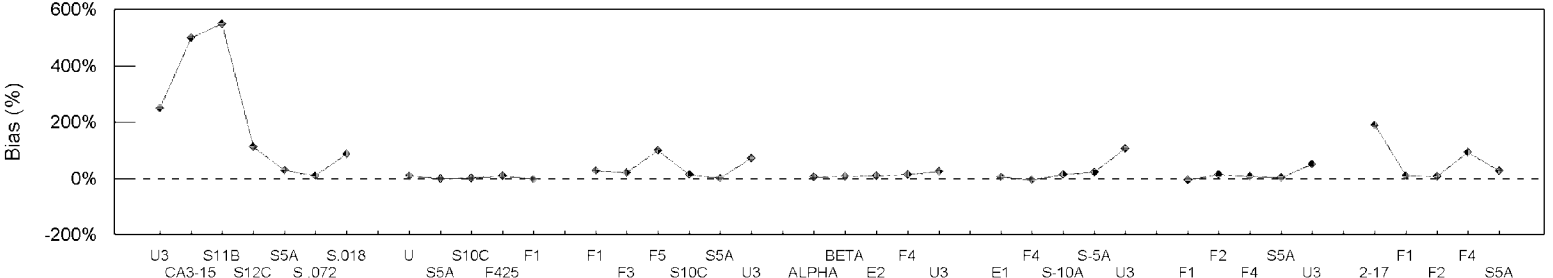
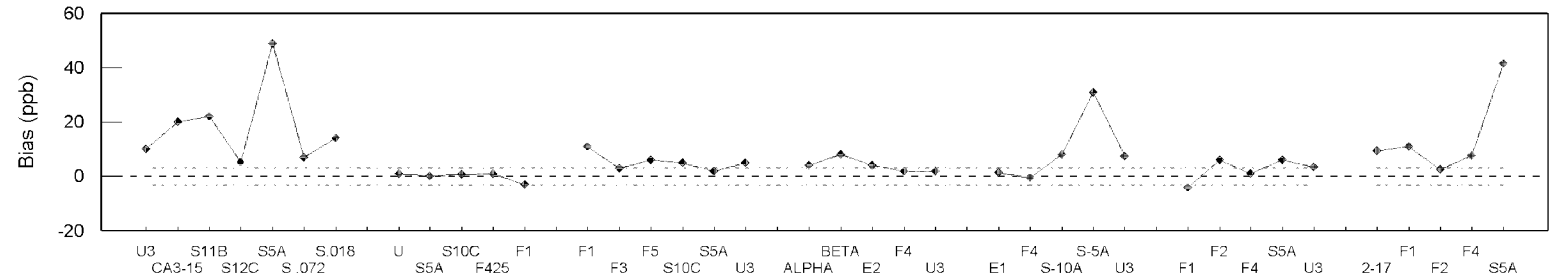
RR-7

RR-8

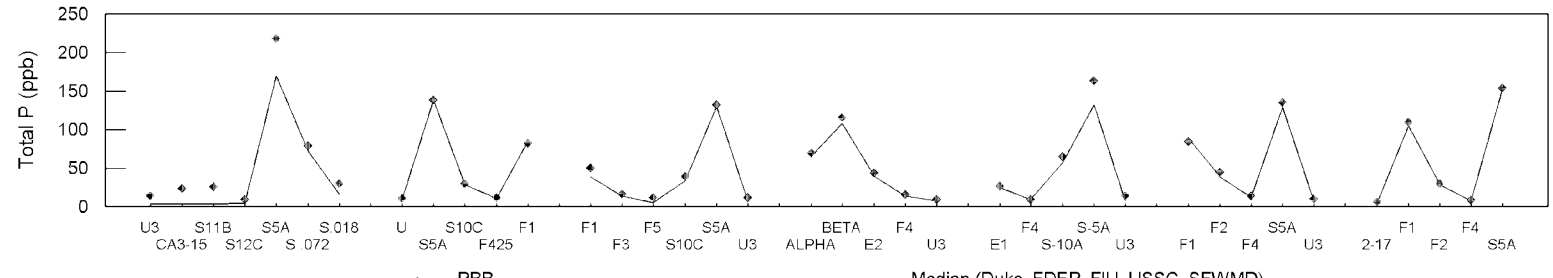
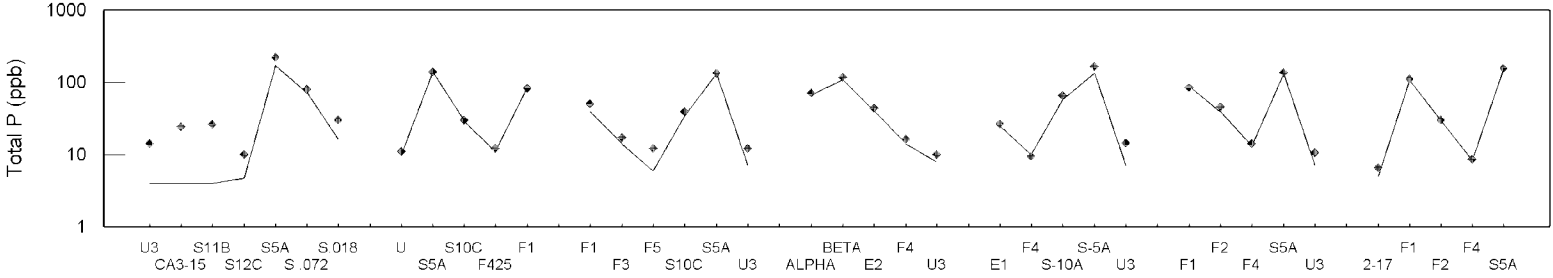


Lab: **PBB**

Bias = Lab Result - Median (Duke, FDEP, FIU, USSC, SFWMD)



--- +/- 2 Std Deviations (DEP)



◆ PBB      — Median (Duke, FDEP, FIU, USSC, SFWMD)

RR-2

RR-3

RR-4

RR-5

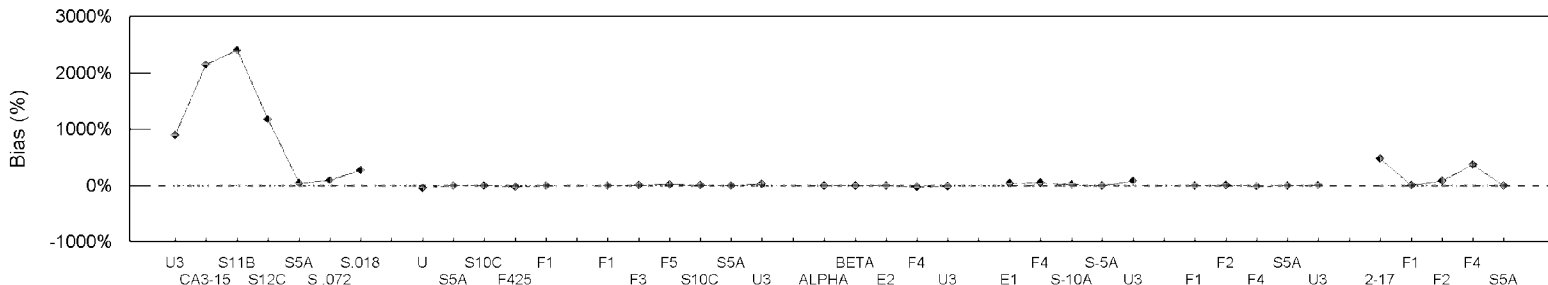
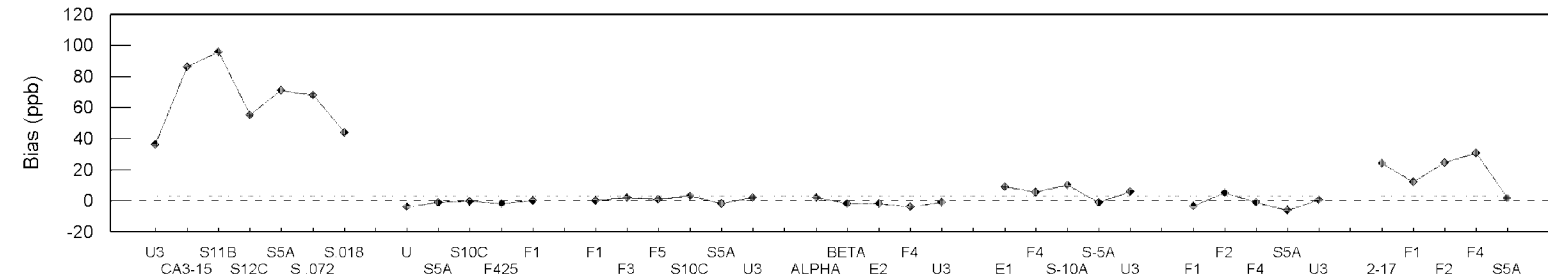
RR-6

RR-7

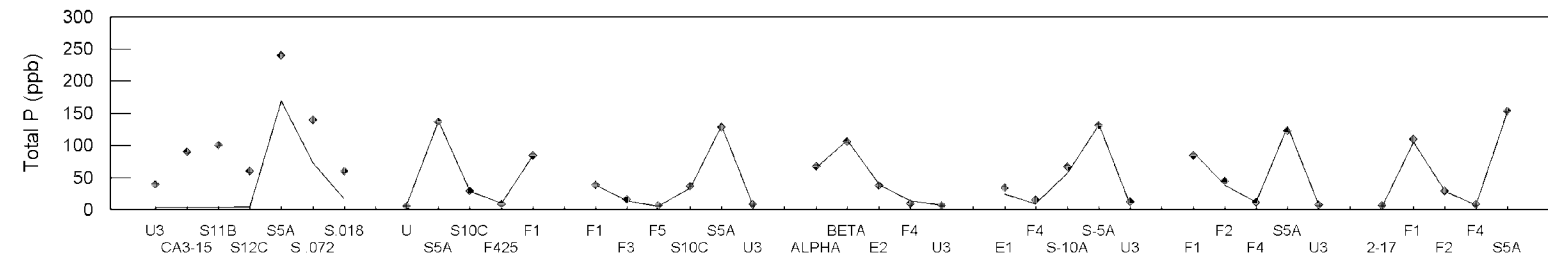
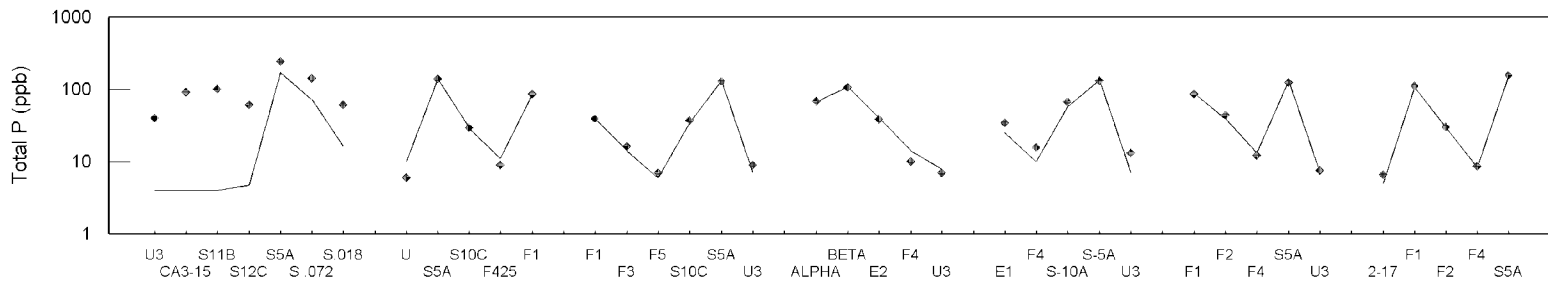
RR-8

Lab: **PBS&J**

Bias = Lab Result - Median (Duke, FDEP, FIU, USSC, SFWMD)



--- +/- 2 Std Deviations (DEP)



◆ PBS&J      — Median (Duke, FDEP, FIU, USSC, SFWMD)

RR-2

RR-3

RR-4

RR-5

RR-6

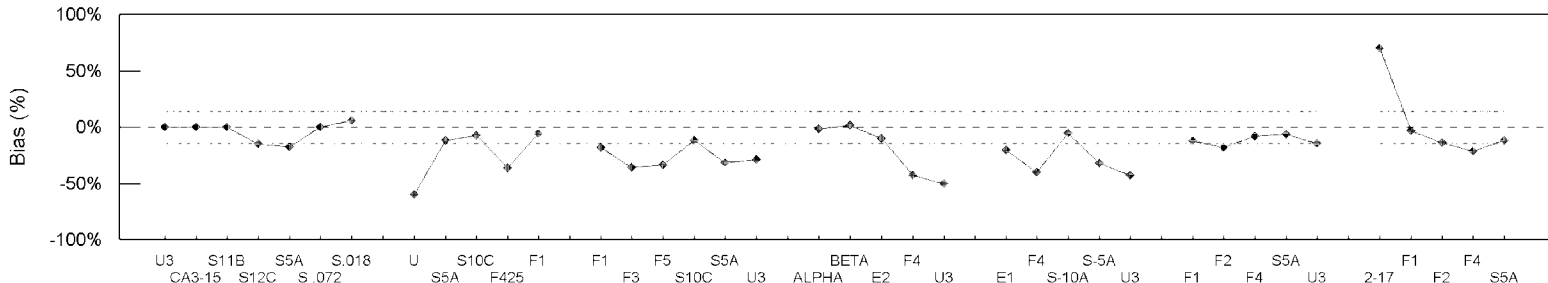
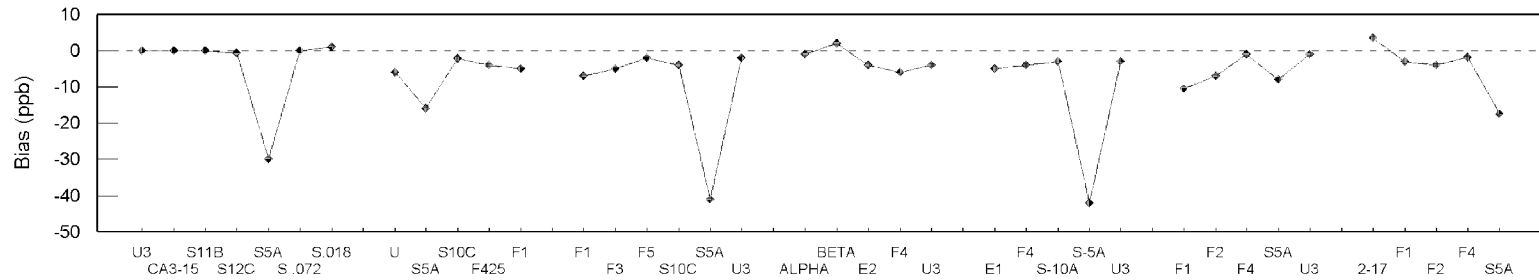
RR-7

RR-8

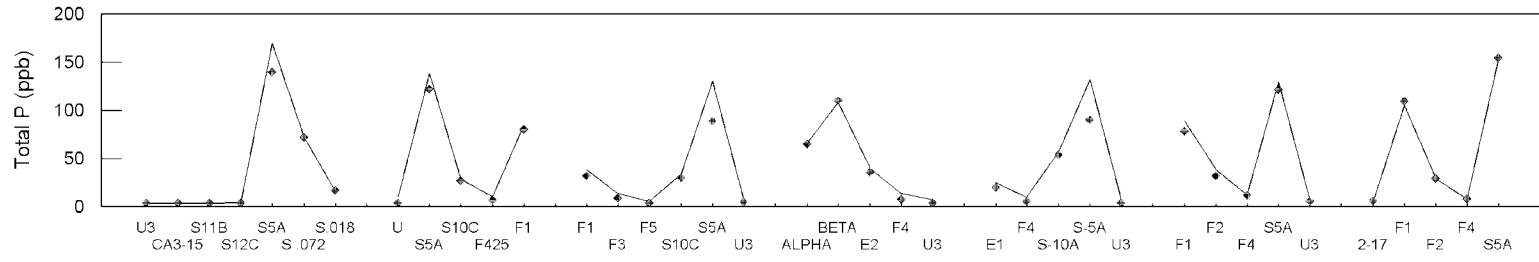
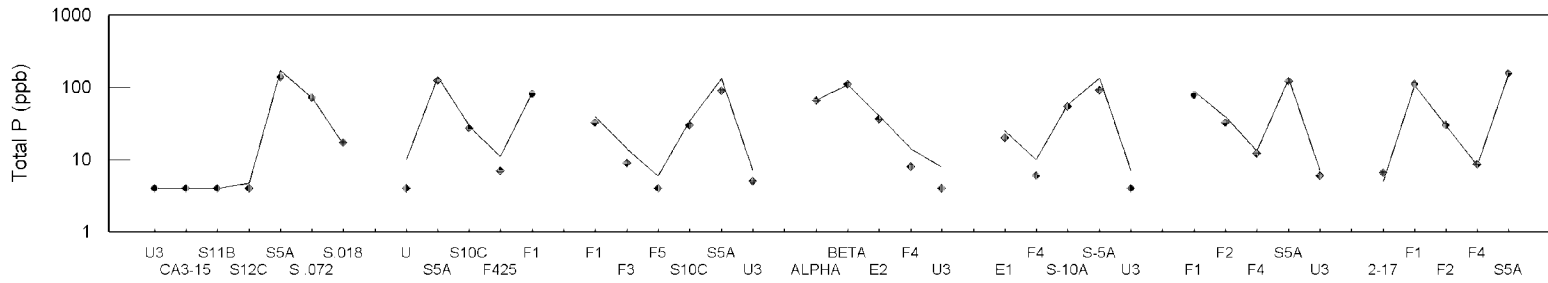


Lab: USGS

Bias = Lab Result - Median (Duke, FDEP, FIU, USSC, SFWMD)



--- +/- 2 Std Deviations (DEP)

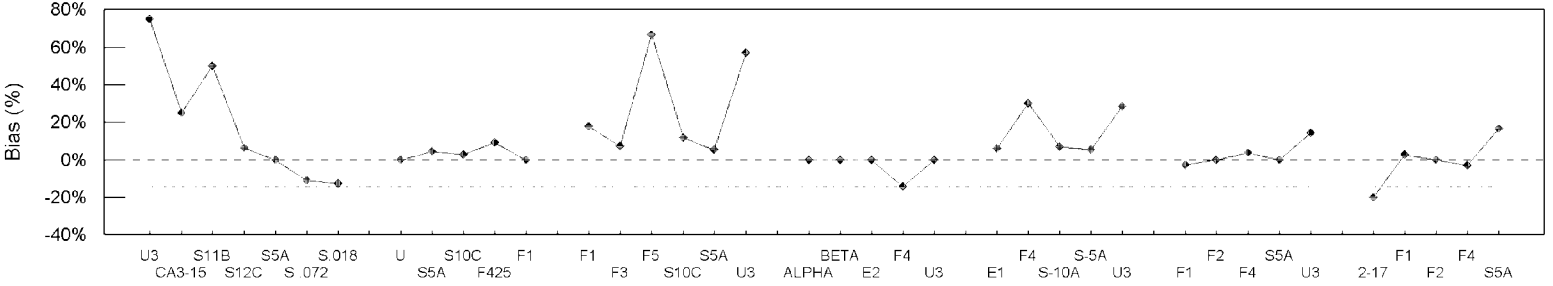
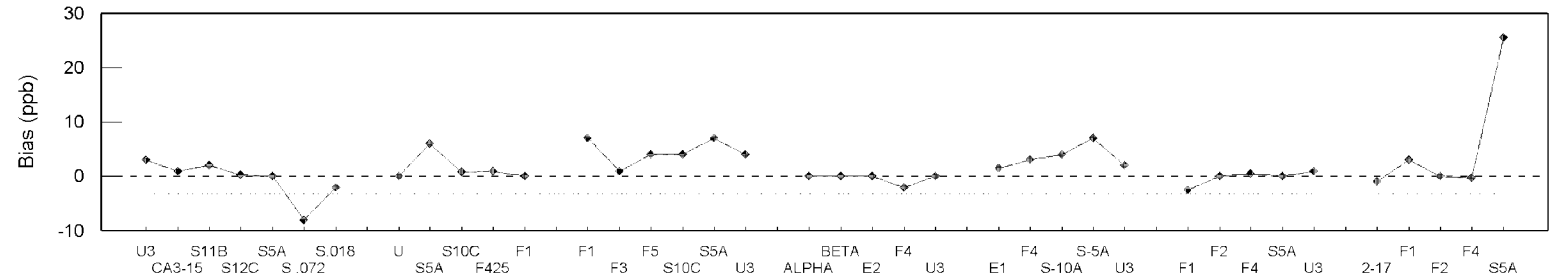


◆ USGS      — Median (Duke, FDEP, FIU, USSC, SFWMD)

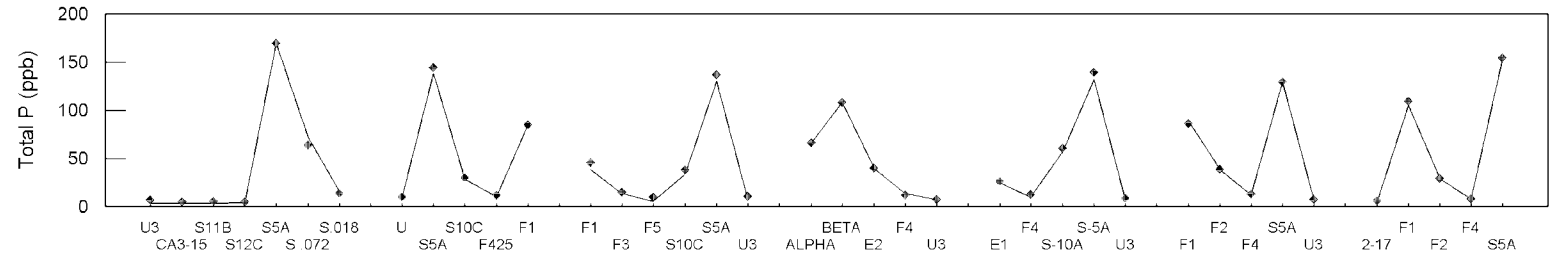
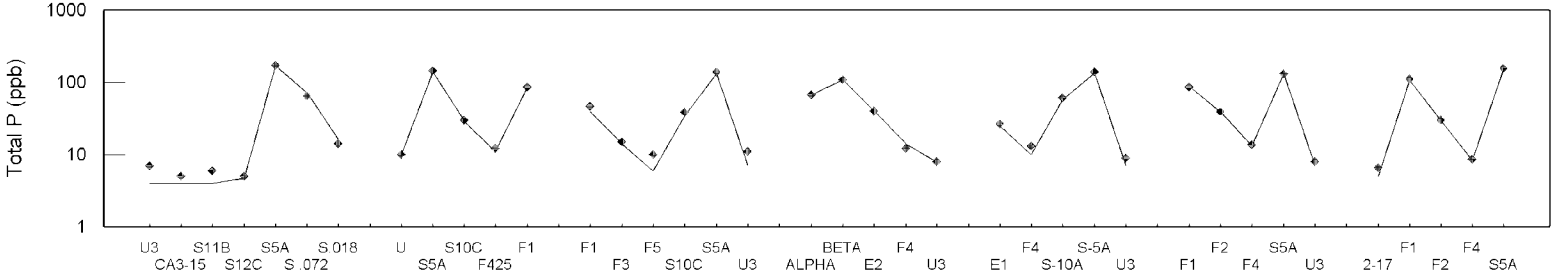
RR-2                      RR-3                      RR-4                      RR-5                      RR-6                      RR-7                      RR-8

Lab: US Sugar Research

Bias = Lab Result - Median (Duke, FDEP, FIU, USSC, SFWMD)



..... +/- 2 Std Deviations (DEP)



◆ US Sugar Research      — Median (Duke, FDEP, FIU, USSC, SFWMD)

RR-2

RR-3

RR-4

RR-5

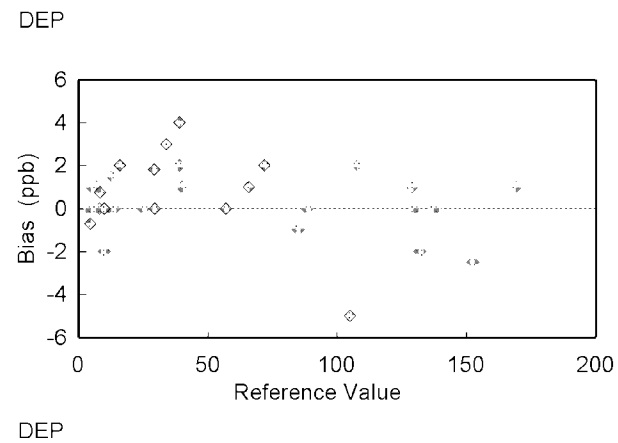
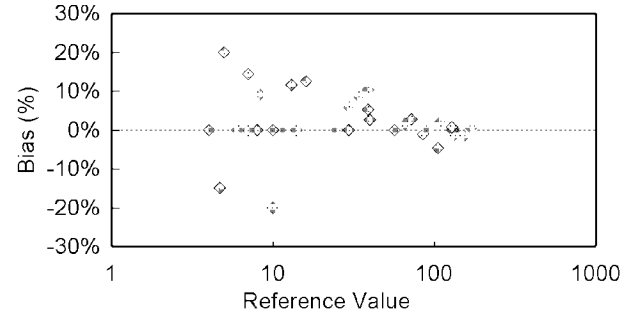
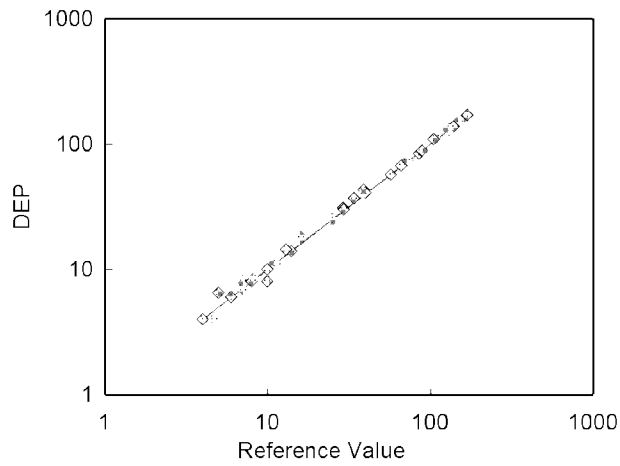
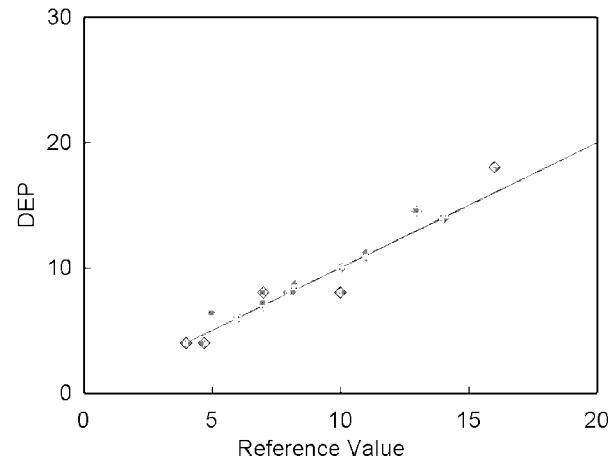
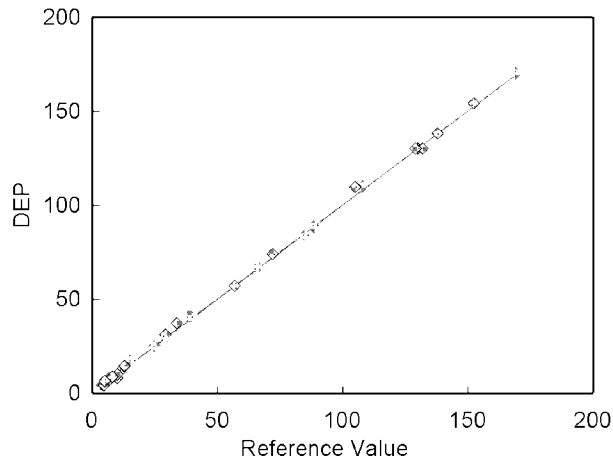
RR-6

RR-7

RR-8

Lab: DEP

Comparisons with Reference Value



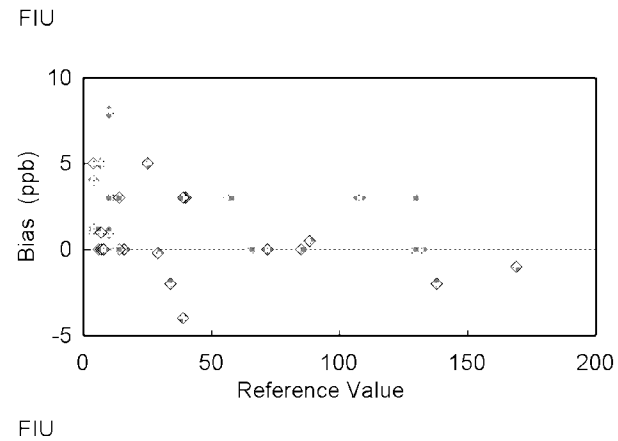
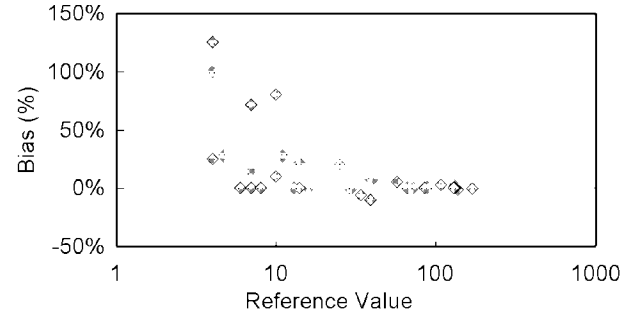
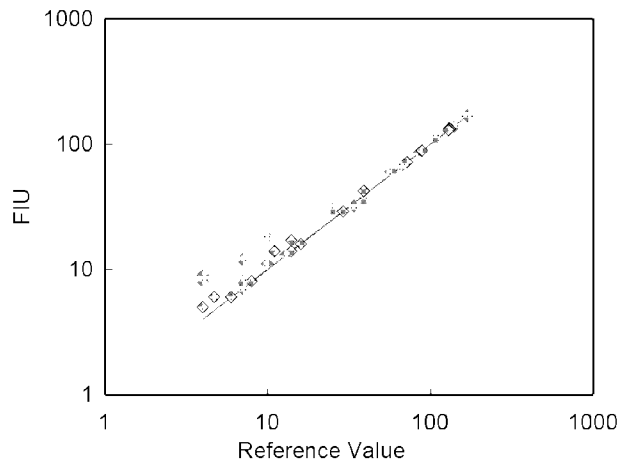
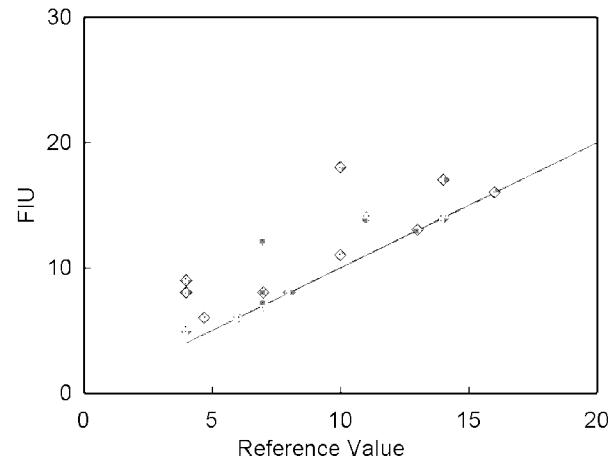
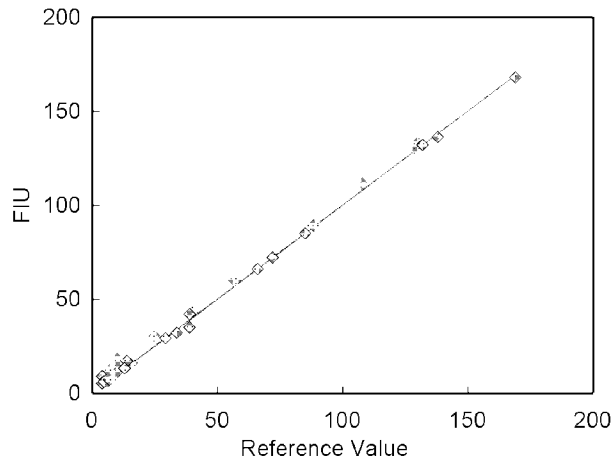
Bias = Lab Result - Reference Value

Bias	Median	Mean	Std Dev	Signif
<u>All Samples</u>				
Percent	0.0%	1.7%	7.0%	0.145
ppb	0.00	0.31	1.56	0.226
<u>Low-Range Samples (&lt; 20 pbb)</u>				
Percent	0.0%	1.8%	9.5%	0.432
ppb	0.00	0.20	0.86	0.345

DEP

Lab: FIU

Comparisons with Reference Value



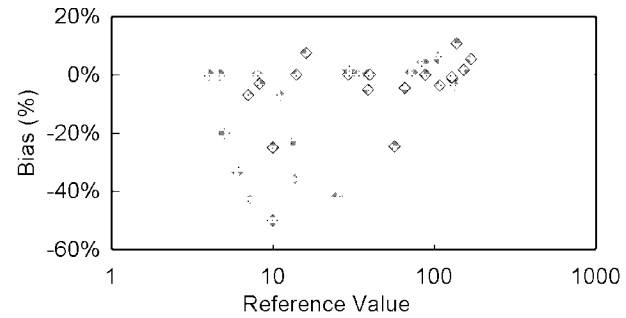
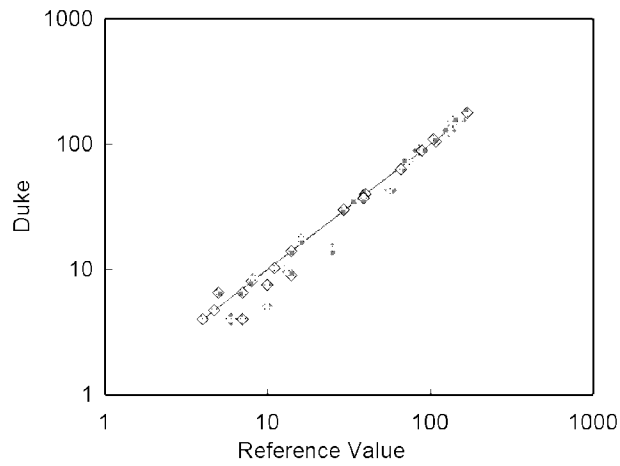
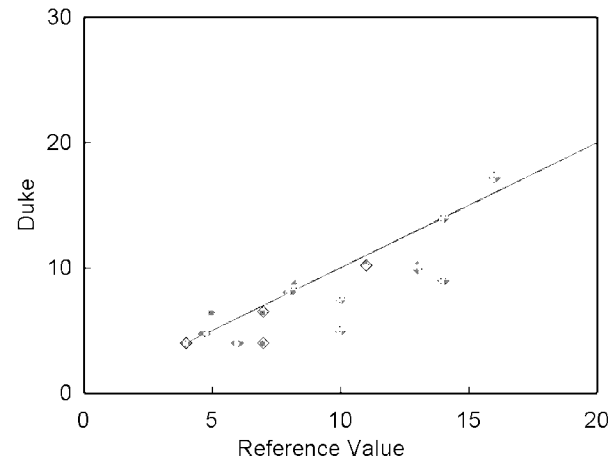
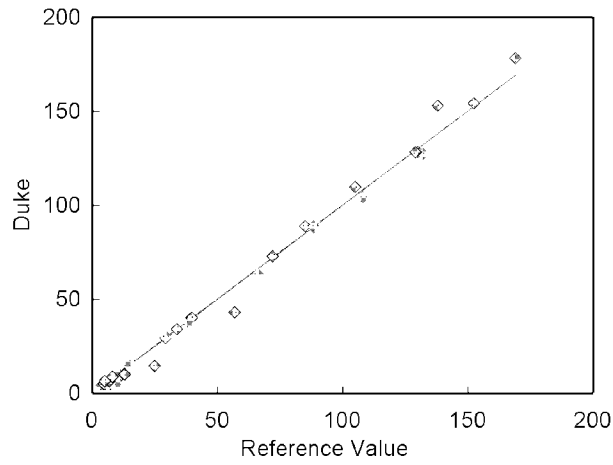
Bias = Lab Result - Reference Value

Bias	Median	Mean	Std Dev	Signif
<u>All Samples</u>				
Percent	0.6%	16.0%	31.7%	0.007
ppb	0.50	1.32	2.44	0.004
<u>Low-Range Samples (&lt; 20 pbb)</u>				
Percent	17.9%	31.4%	40.2%	0.007
ppb	1.00	2.02	2.42	0.004

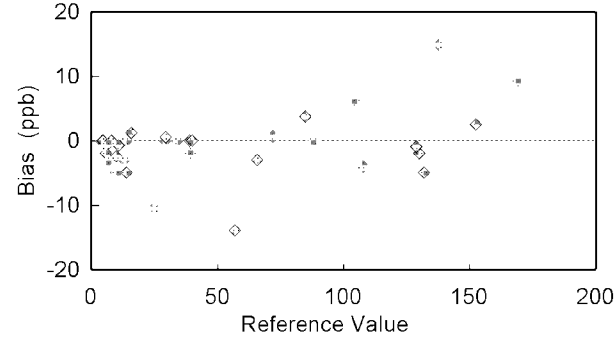
FIU

Lab: Duke

Comparisons with Reference Value



Duke



Duke

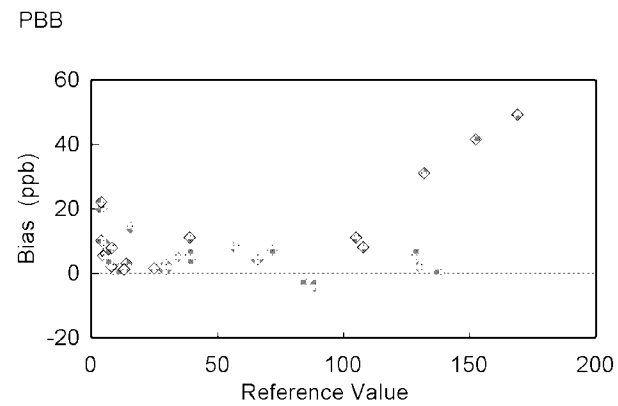
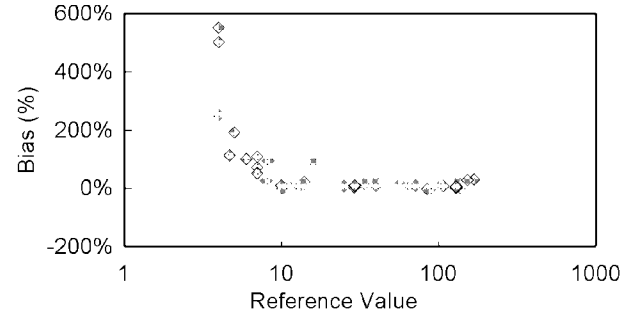
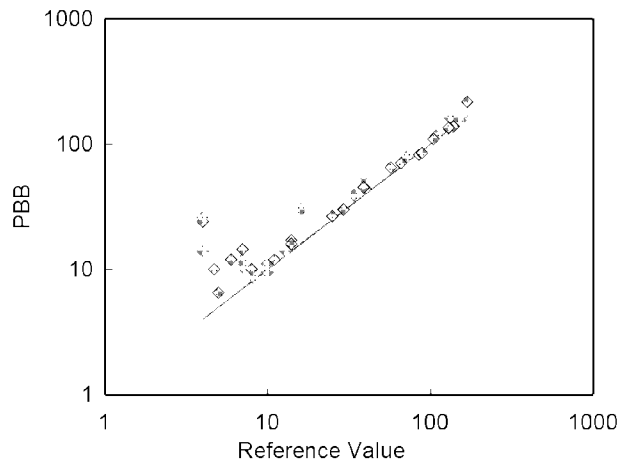
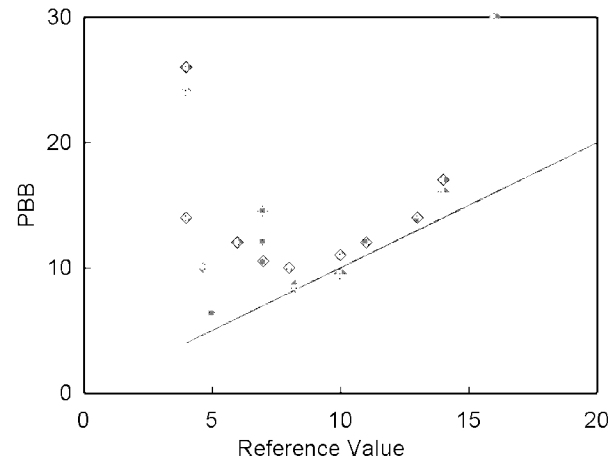
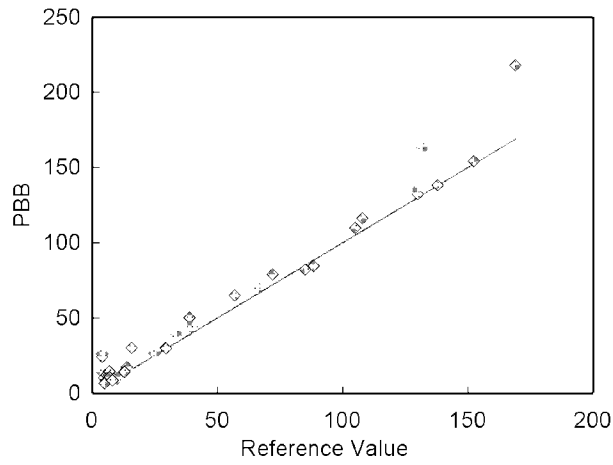
Bias = Lab Result - Reference Value

Bias	Median	Mean	Std Dev	Signif
<u>All Samples</u>				
Percent	-0.4%	-8.9%	16.4%	0.002
ppb	-0.13	-0.77	4.62	0.311
<u>Low-Range Samples (&lt; 20 pbb)</u>				
Percent	-7.2%	-15.7%	18.5%	0.002
ppb	-0.65	-1.38	1.82	0.005



Lab: PBB

Comparisons with Reference Value



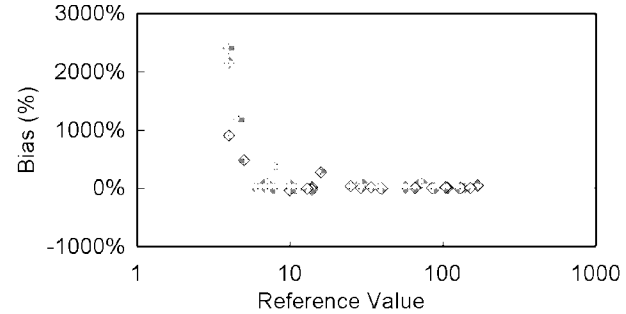
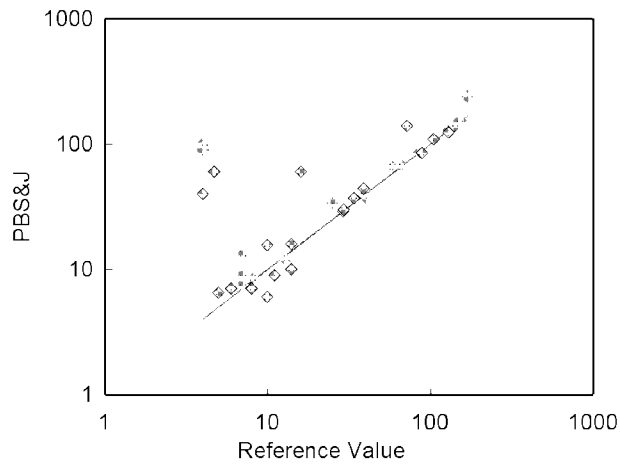
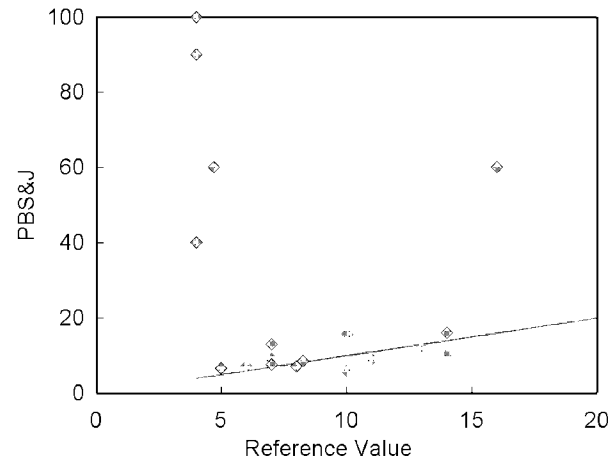
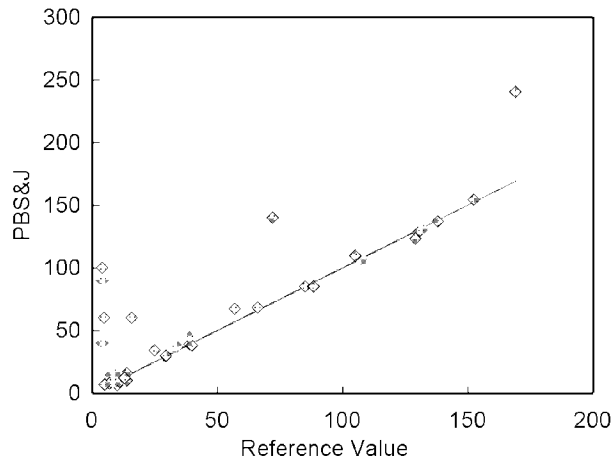
Bias = Lab Result - Reference Value

Bias	Median	Mean	Std Dev	Signif
<u>All Samples</u>				
Percent	14.5%	63.3%	123.3%	0.003
ppb	-3.50	8.19	11.18	0.000
<u>Low-Range Samples (&lt; 20 pbb)</u>				
Percent	79.5%	122.0%	161.5%	0.005
ppb	5.15	6.67	6.45	0.000

PBB

Lab: **PBS&J**

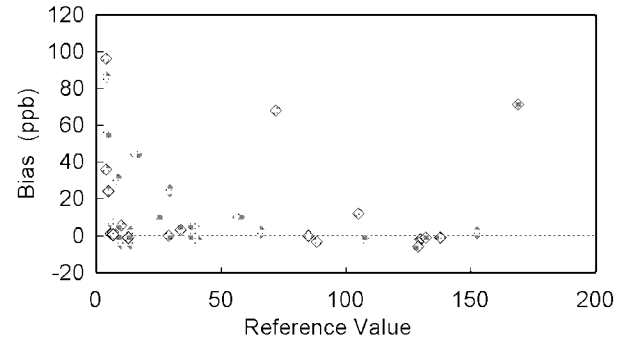
**Comparisons with Reference Value**



Bias = Lab Result - Reference Value

Bias	Median	Mean	Std Dev	Signif
<u>All Samples</u>				
Percent	10.1%	214.4%	552.9%	0.022
ppb	5.00	14.88	26.92	0.002
<u>Low-Range Samples (&lt; 20 pbb)</u>				
Percent	41.8%	436.4%	751.8%	0.025
ppb	3.75	20.95	31.29	0.011

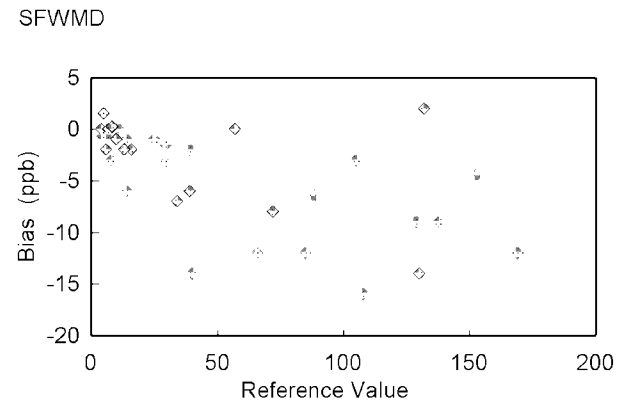
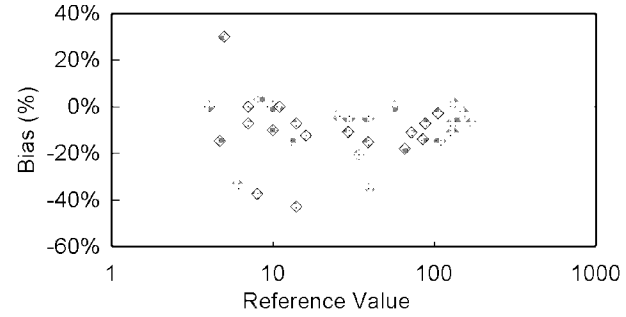
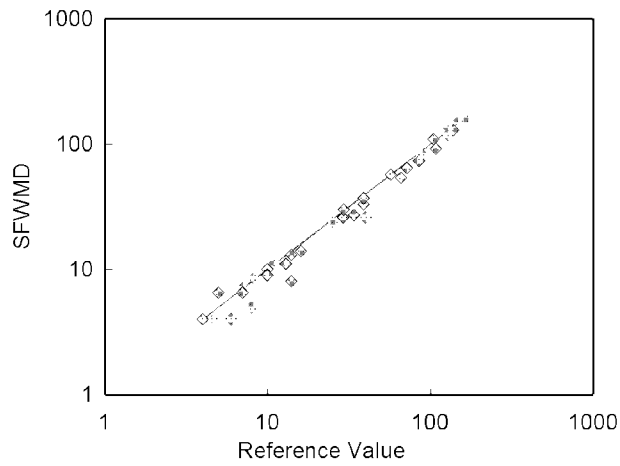
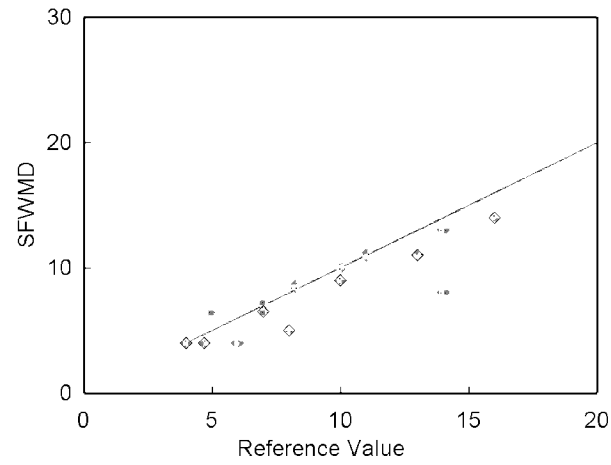
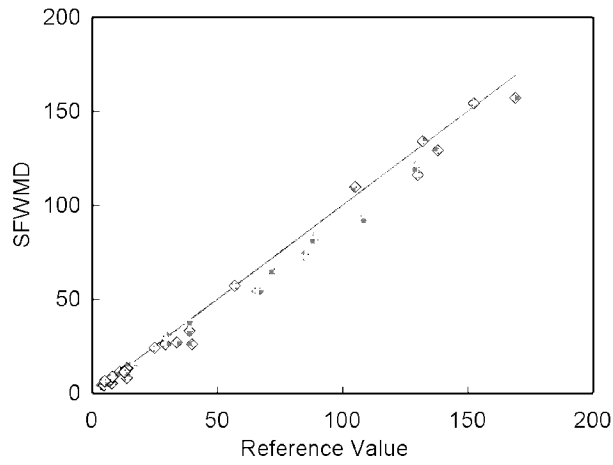
PBS&J



PBS&J

Lab: SFWMD

Comparisons with Reference Value



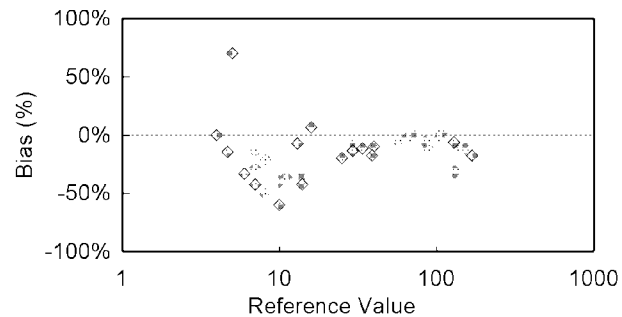
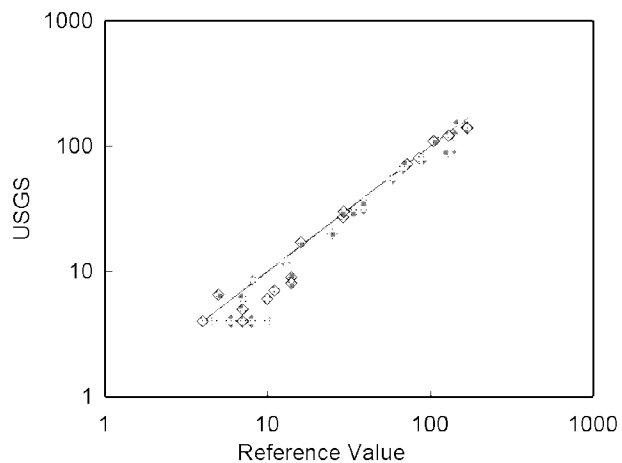
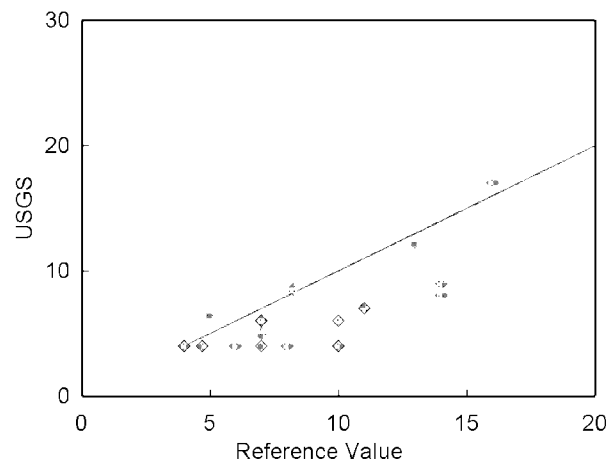
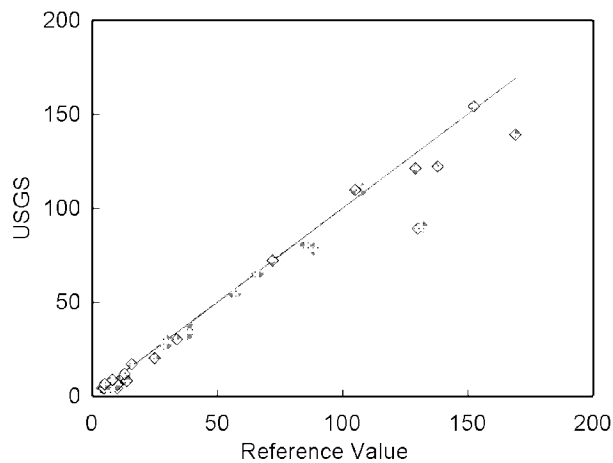
Bias = Lab Result - Reference Value

Bias	Median	Mean	Std Dev	Signif
<u>All Samples</u>				
Percent	-7.1%	-9.1%	13.0%	0.000
ppb	2.00	-4.08	4.97	0.000
<u>Low-Range Samples (&lt; 20 pbb)</u>				
Percent	-3.6%	-8.2%	16.9%	0.055
ppb	-0.25	-0.91	1.66	0.032

SFWMD

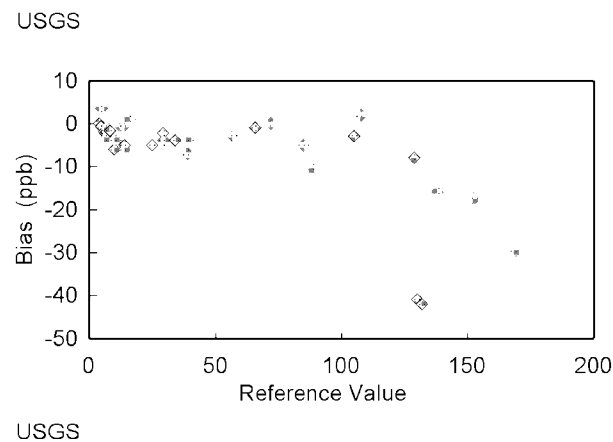
Lab: USGS

Comparisons with Reference Value



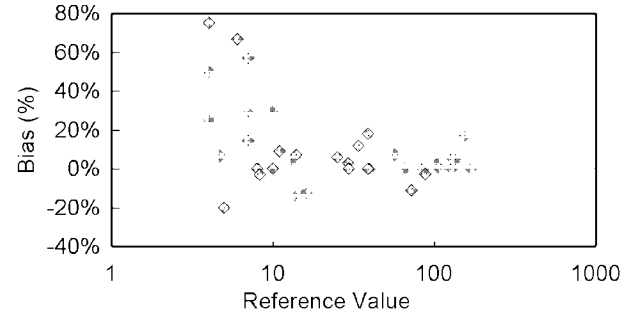
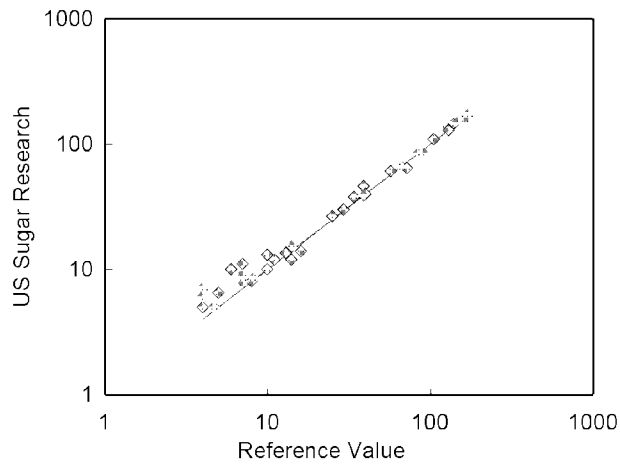
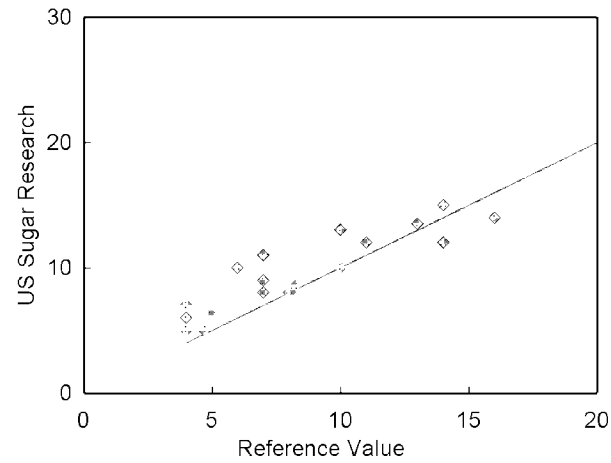
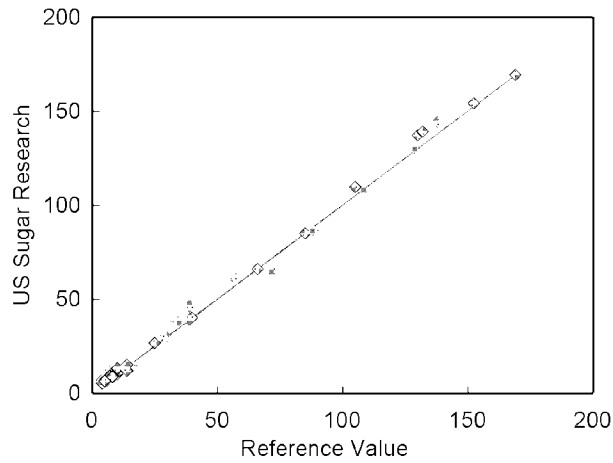
Bias = Lab Result - Reference Value

Bias	Median	Mean	Std Dev	Signif
<u>All Samples</u>				
Percent	-12.7%	-15.4%	21.5%	0.000
ppb	0.65	-6.43	10.29	0.000
<u>Low-Range Samples (&lt; 20 ppb)</u>				
Percent	-24.9%	-19.5%	29.6%	0.012
ppb	-1.88	-2.00	2.53	0.004

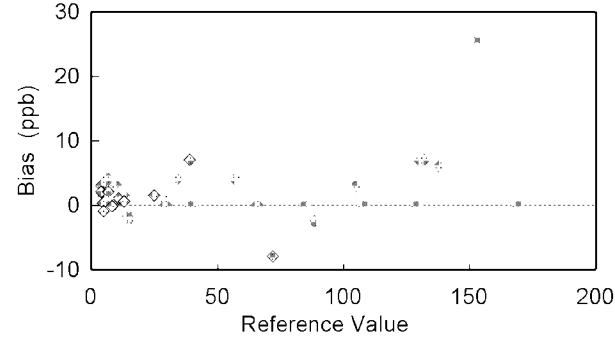


Lab: US Sugar Research

Comparisons with Reference Value



US Sugar Research



US Sugar Research

Bias = Lab Result - Reference Value

Bias	Median	Mean	Std Dev	Signif
<u>All Samples</u>				
Percent	4.1%	10.2%	21.1%	0.005
ppb	-0.13	1.92	4.87	0.020
<u>Low-Range Samples (&lt; 20 pbb)</u>				
Percent	8.1%	18.0%	28.2%	0.015
ppb	1.00	0.98	1.79	0.033