NATTS Quality Assurance Update

National Air Monitoring Conference

November 8, 2006

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Outline

- The NATTS Program QA Indicators
  - Evolution of the NATTS Program and Compounds
  - Data Quality Objectives
  - Measurement Quality Objectives
- Assessments
  - Precision
  - Bias
  - Completeness
  - Detectability
- Technical System Audits (TSAs)
- Proficiency Testing (PT) Program Expansion
- Is the Program Cost Effective?
- Is the Program Working to meet DQOs?
- Is the NATTS QA Program Successful?
- Recommendations

Evolution of the NATTS Compound List

CAA 1990

188 HAPs

→

UATS

"Dirty Thirty"

acrylonitrile, benzene, 1,3-butadiene, carbon tetrachloride, chloroform, 1,2 dibromomethane, 1,3-dichloropropene, 1,2-dichloropropane, ethylene dichloride, ethylene oxide, dichloromethane, tetrachloroethane, tetrachloroethylene, trichloroethylene, vinyl chloride, arsenic, beryllium, cadmium, chromium, lead, mercury, manganese, nickel, acetaldehyde, formaldehyde acrolein, 2,2,7,8 tetrachlorobenzo-p-dioxin, coke oven emissions, hexachlorobenzene, hydrazine, polycyclic organic matter, polychloronated biphenyls, quinoline

→

Concept Paper

"Core 18"

benzene, 1,3-butadiene, carbon tetrachloride, chloroform, 1,2-dichloropropane, dichloromethane, tetrachloroethylene trichloroethylene, vinyl chloride, arsenic, beryllium, cadmium, chromium, lead, manganese, nickel, formaldehyde, acetaldehyde, acrolein

→

NATA

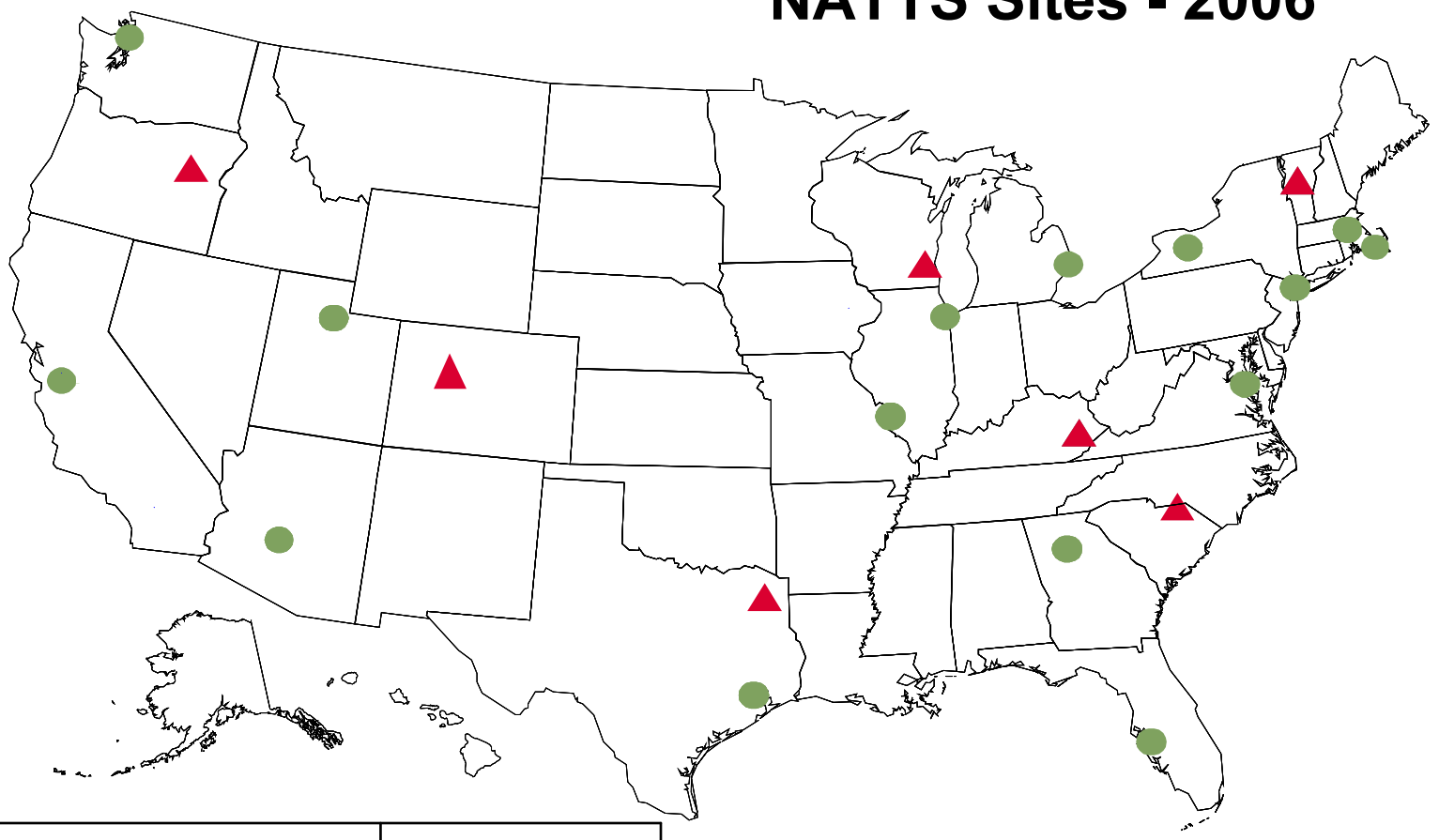
"6 NATTS"

benzene, acrolein, 1, 3 butadiene, arsenic, formaldehyde, hexavalent chromium

Blue – EPA method

Black – no EPA method

NATTS Sites - 2006



•Urban Sites		•Rural
•E. Providence, RI •Boston (Roxbury), MA •New York, NY •Rochester, NY •Washington, DC •Decatur, GA •Tampa, FL •Detroit, MI	•Chicago, IL •Houston (Deer Park), TX •St. Louis, MO •Bountiful, UT •San Jose. CA •Phoenix, AZ •Seattle WA	•Underhill, VT •Hazard, KY •Chesterfield, SC •Mayville, WI •Grand Junction, CO •La Grande, OR •Harrison County, TX

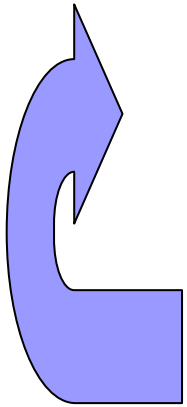
NATTS QA Objective

Data Quality Objectives (DQOs) are tied to the GPRA goal of reduction of Air Toxics by 75% (1993 levels) by 2010:

"To be able to detect a 15% difference (trend) between two successive 3-year annual mean concentrations within acceptable levels of decision error."

To meet these DQOs we need:

- **1-in-6 day sampling frequency with at least an 85% quarterly completeness;**
- **precision controlled to a Coefficient of Variance (CV) of no more than 15%;**
- **detectability based on 2001 Pilot Study Minimum Detection Limits (MDLs);**
- **bias for the data set is expected to be zero.**



These are our Measurement Quality Objectives (MQOs)!

DQOs and Parameters

- Initially, six compounds had DQOs calculated
- benzene, 1,3-butadiene –VOCs
- formaldehyde, acrolein – Aldehydes
- arsenic, chromium – Metals
  - chromium was replaced with hexavalent chromium;
  - acrolein – issues with method;
  - Bottom line: There are now 4 compounds with DQOs. chromium and acrolein DQOs are not valid!

NATTS QA Program

Measurement Quality Objectives (MQOs)

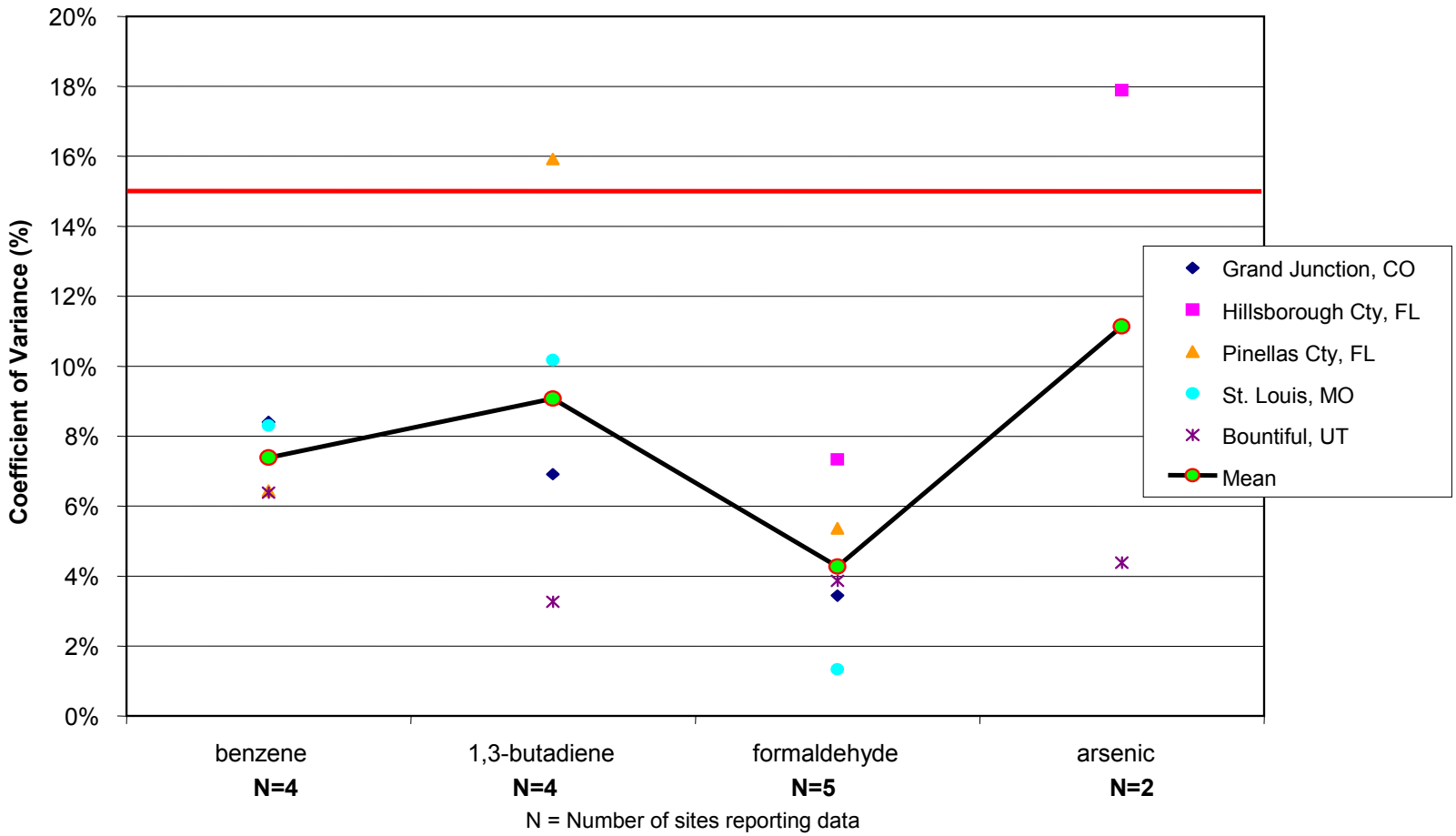
Compound	Precision (CV)	Bias (Lab)	Detectability (Pilot Study)	Completeness
Arsenic	< 15%	< 25%	0.046 ng/m3	> 85%
Benzene	< 15%	< 25%	0.044 ug/m3	> 85%
1,3-Butadiene	< 15%	< 25%	0.020 ug/m3	> 85%
Formaldehyde	< 15%	< 25%	0.014 ug/m3	> 85%

NATTS MQOs

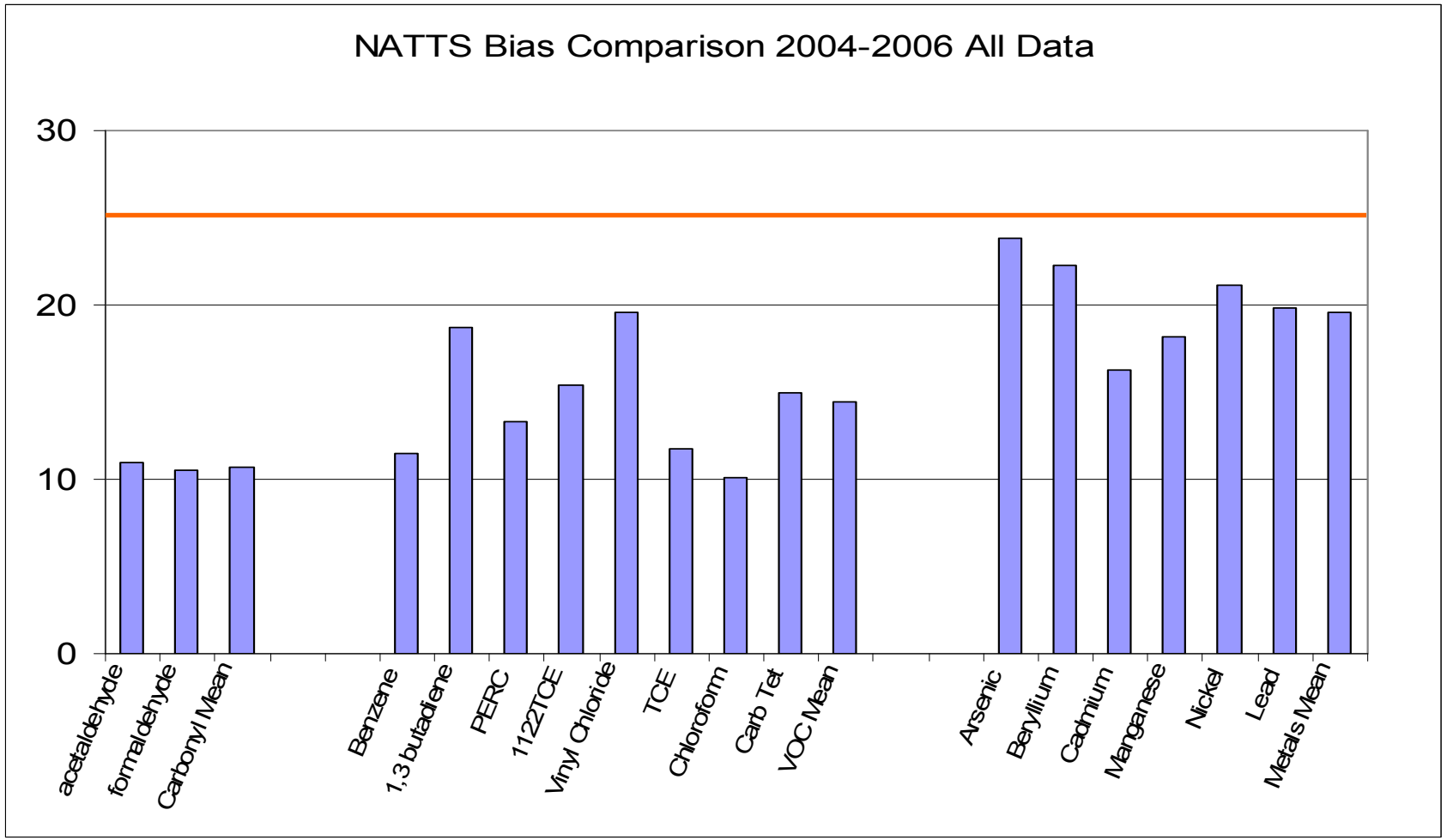
Sources of MQO data

MQO	Source of Data	Tolerance	Units
Precision – CV	Air Quality System (AQS)	< 15%	Percent Difference
Bias	Proficiency Testing and Field Sampler Audits	< 25% for Labs and < 15% for field	Percent Difference
Detectability	Laboratories	Variable	ug/m3 or ng/m3
Completeness	AQS	> 85%	Percent of possible samples

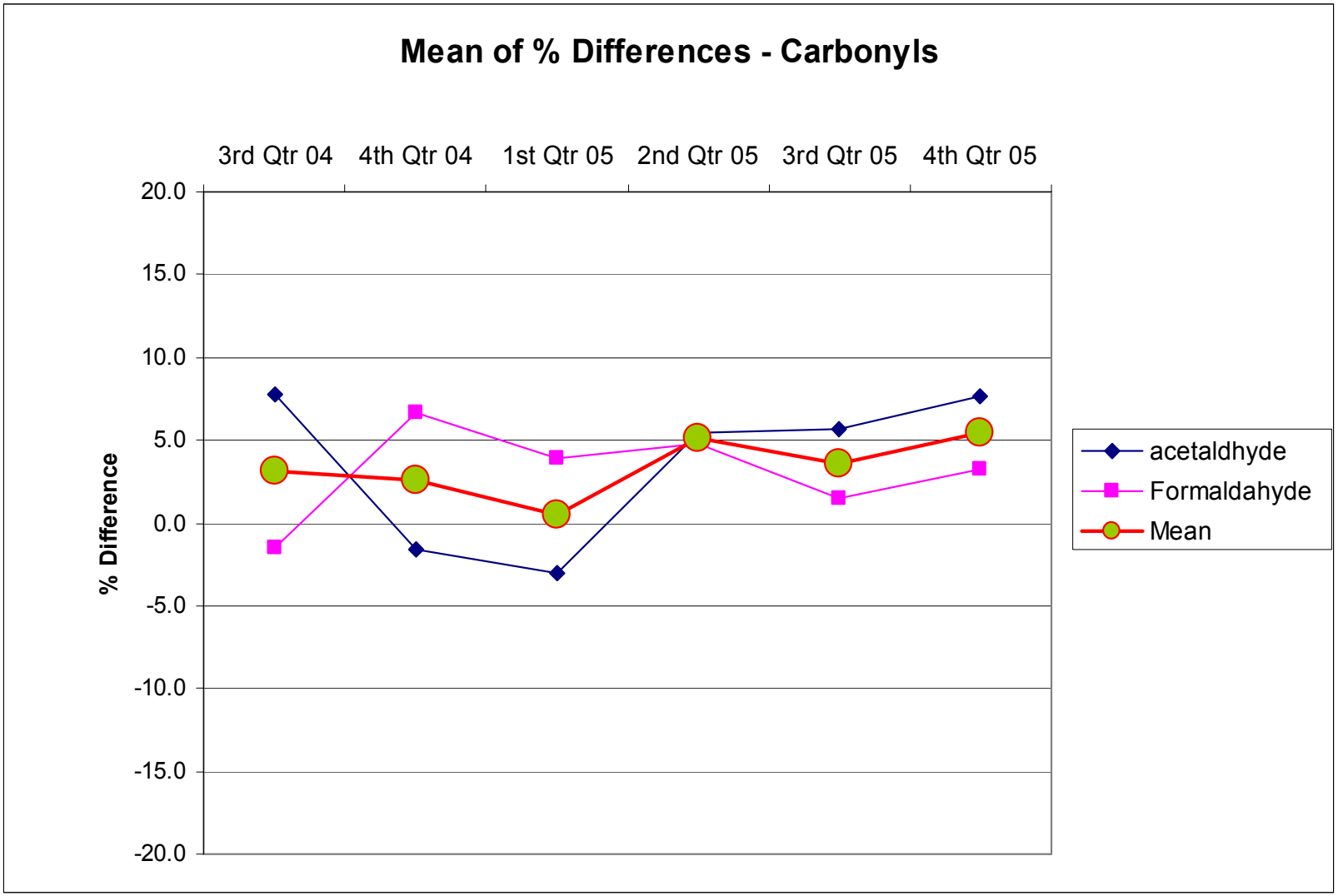
Precision Results: Collocated Sampling Data 2005



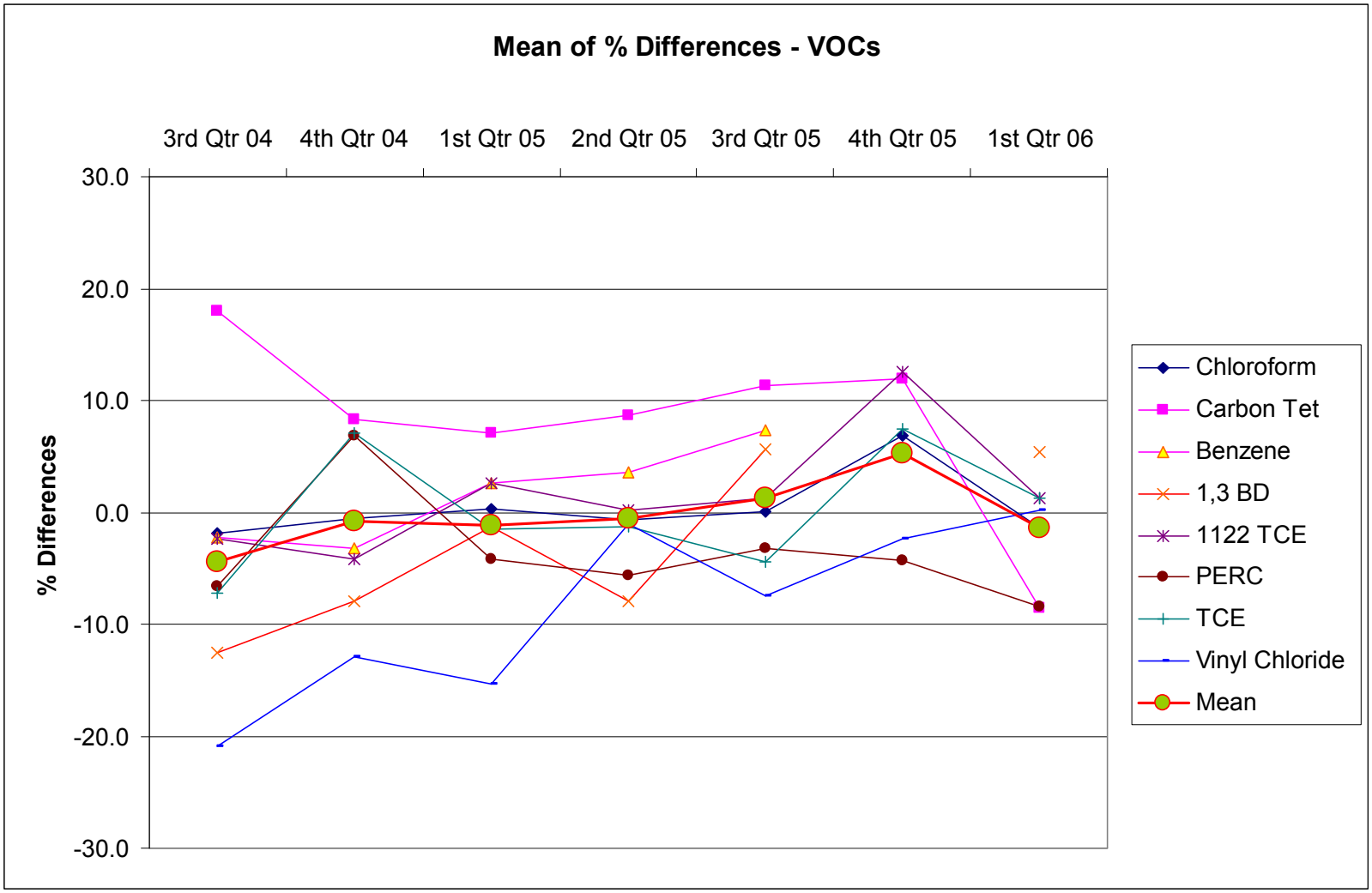
Bias: Proposed Bias Calculation All Qtrs



Bias: PT study by Quarter



Bias: PT study by Quarter



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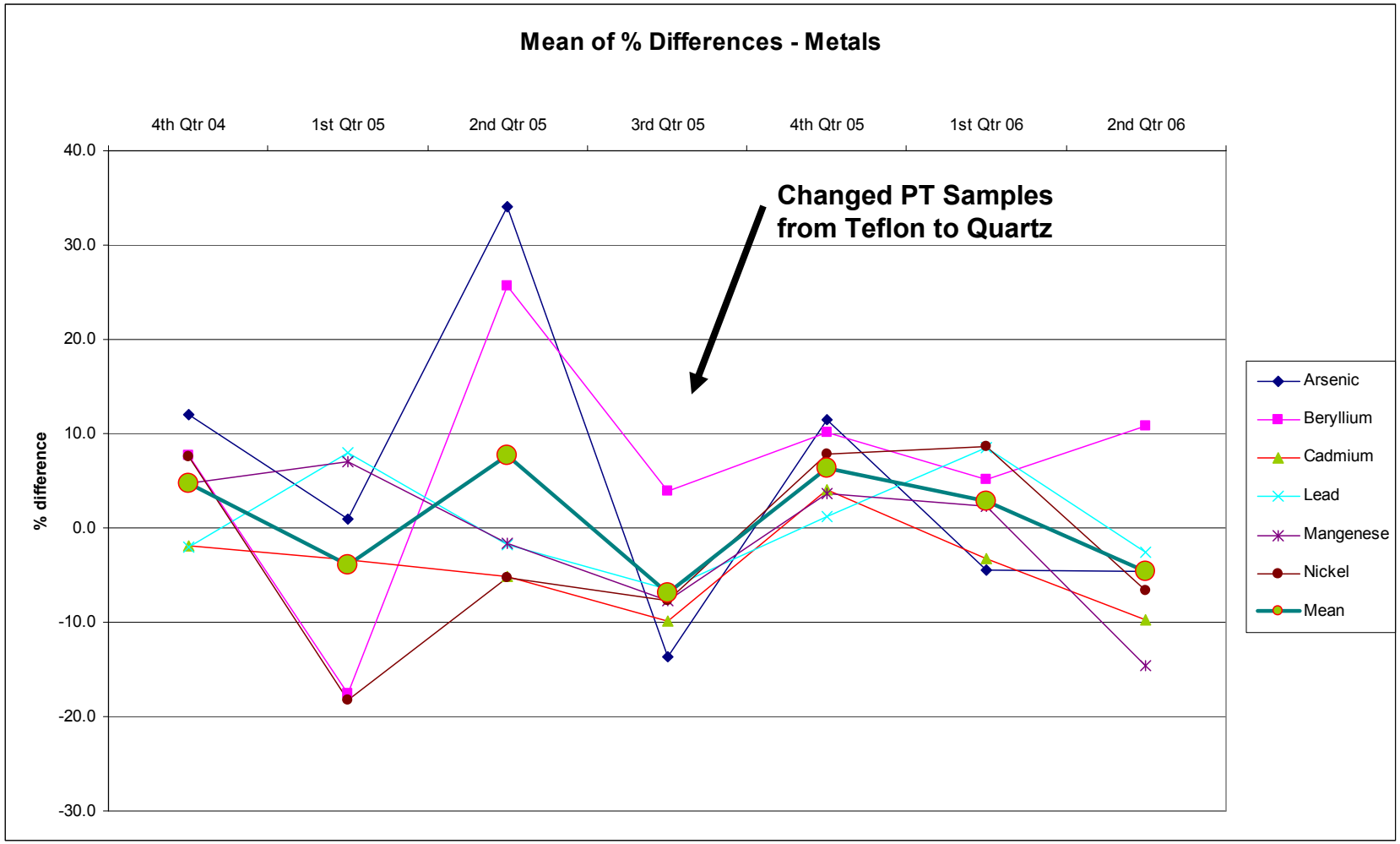
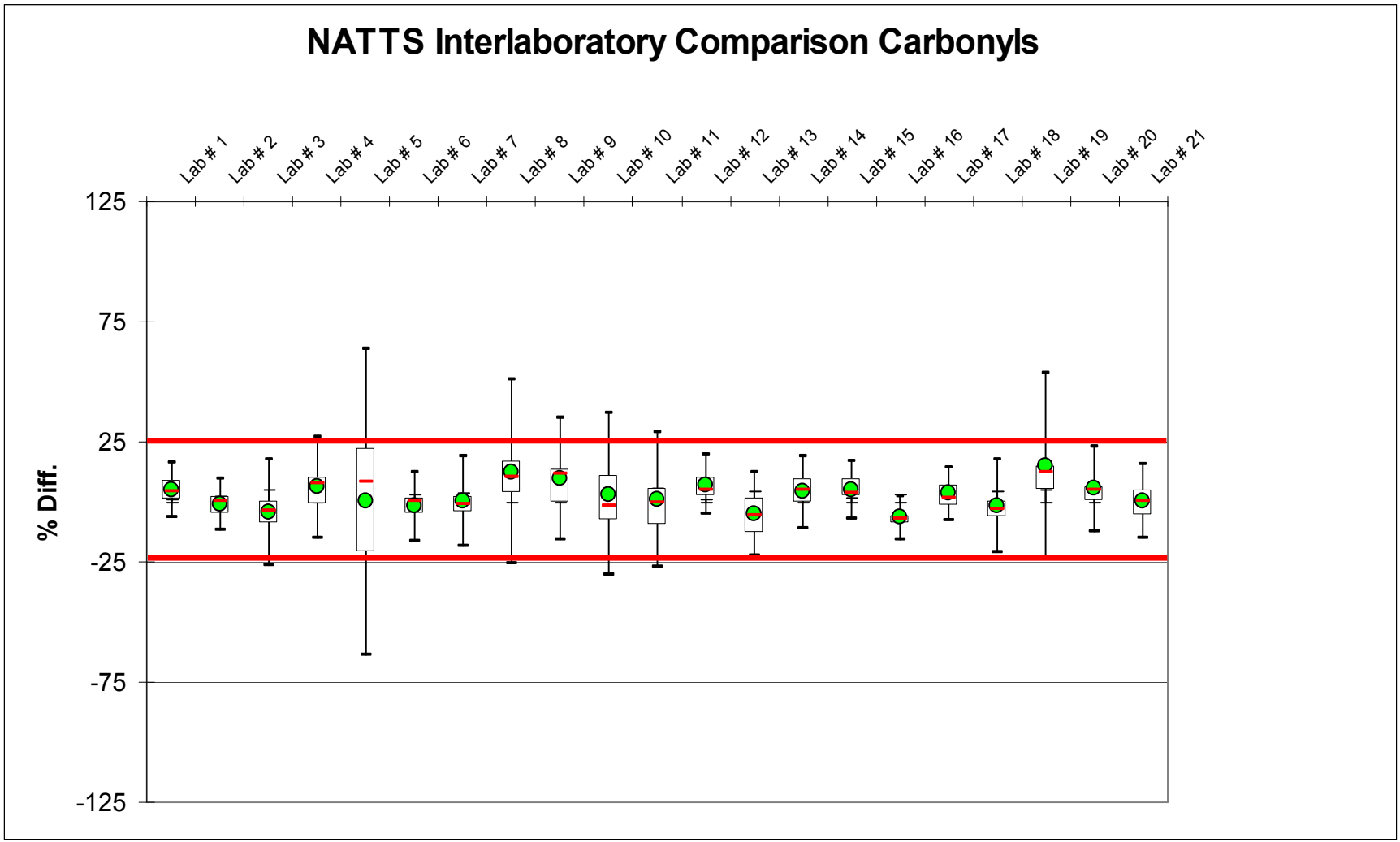
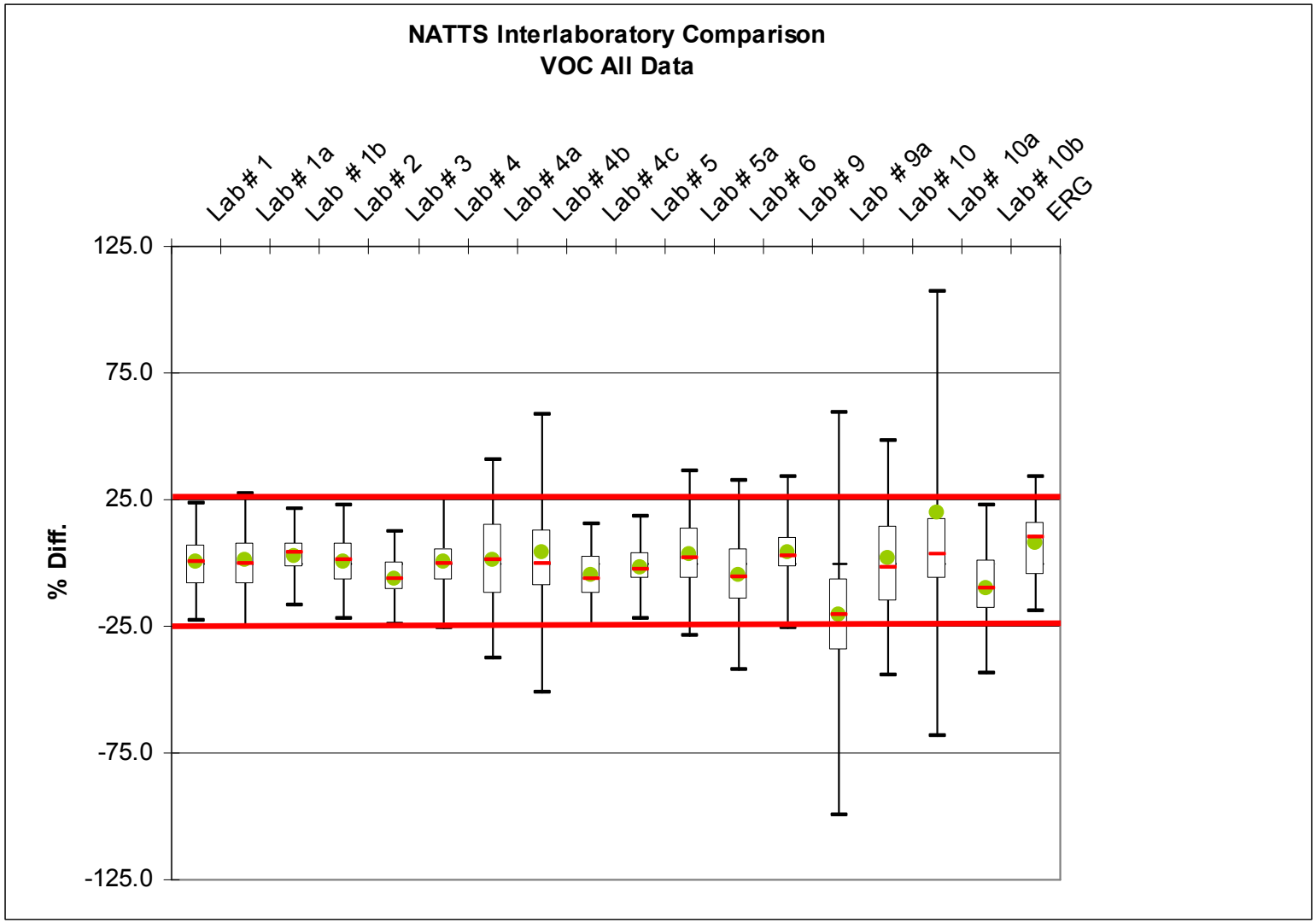


Bias: Inter-laboratory Comparison – All Qtrs



Bias: Inter-laboratory Comparison-All Qtrs



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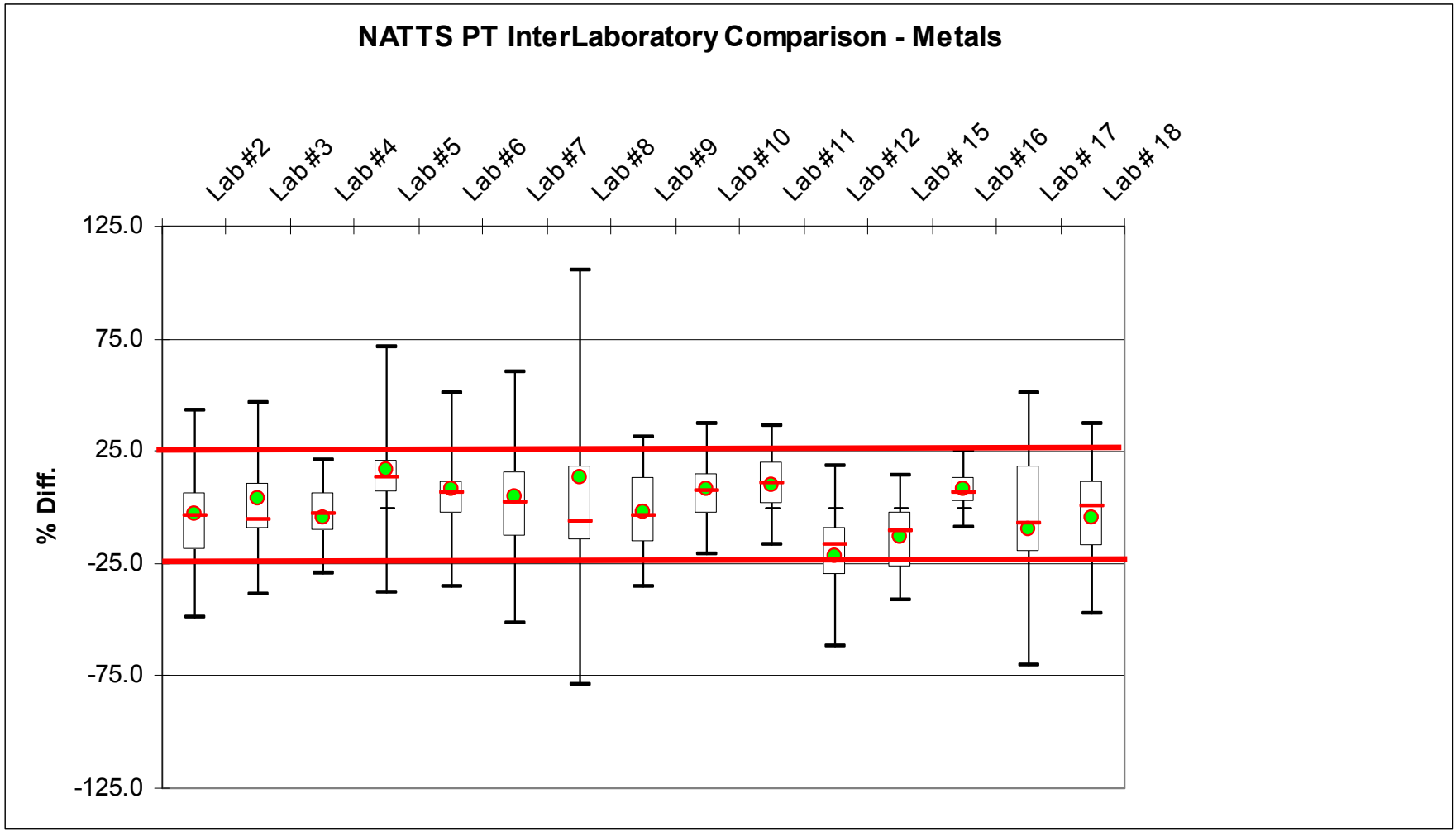
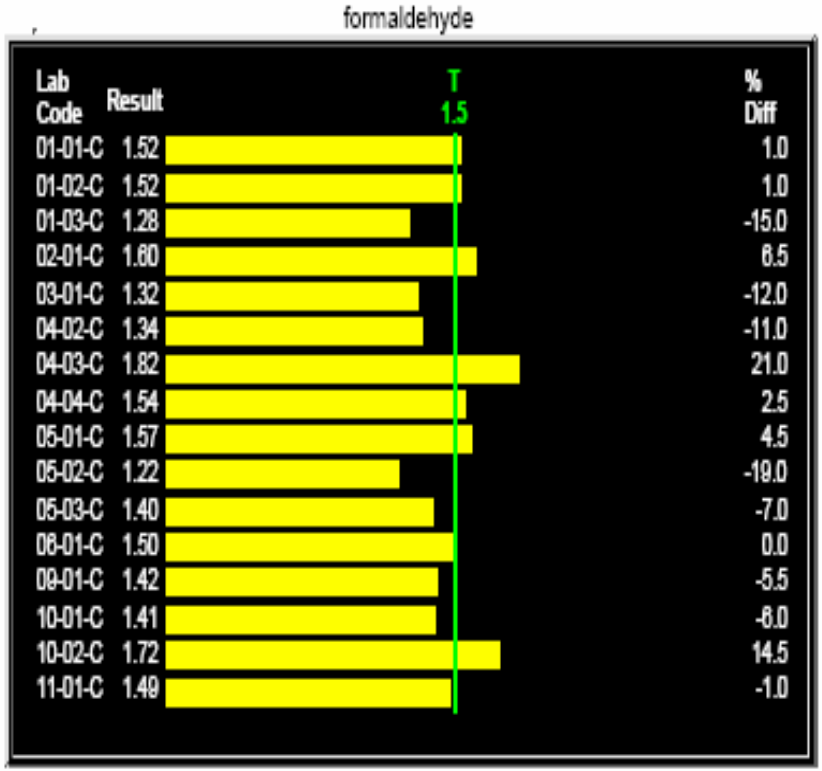
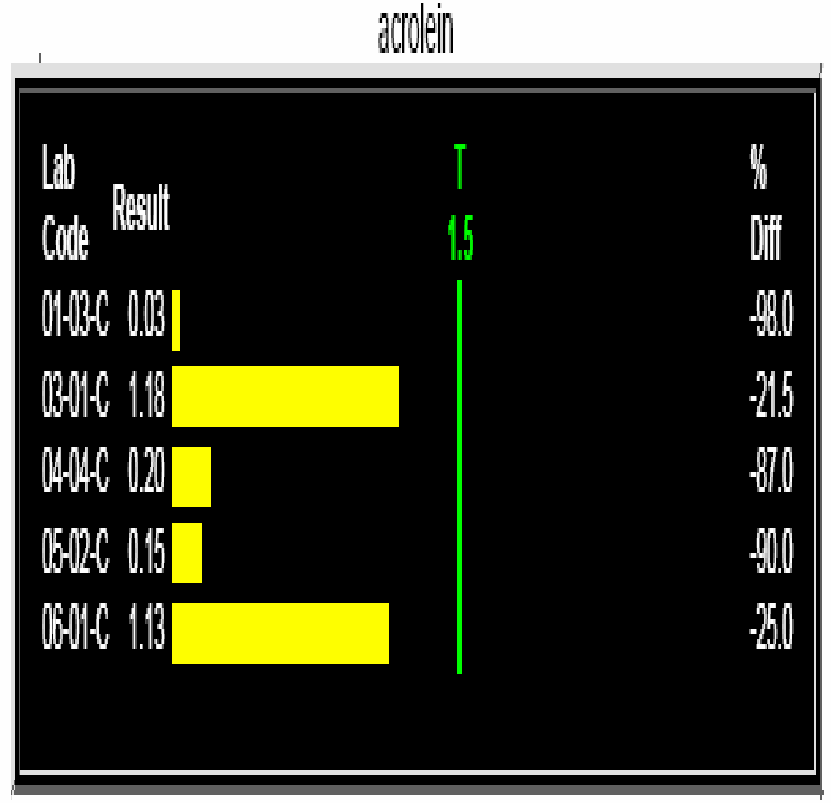


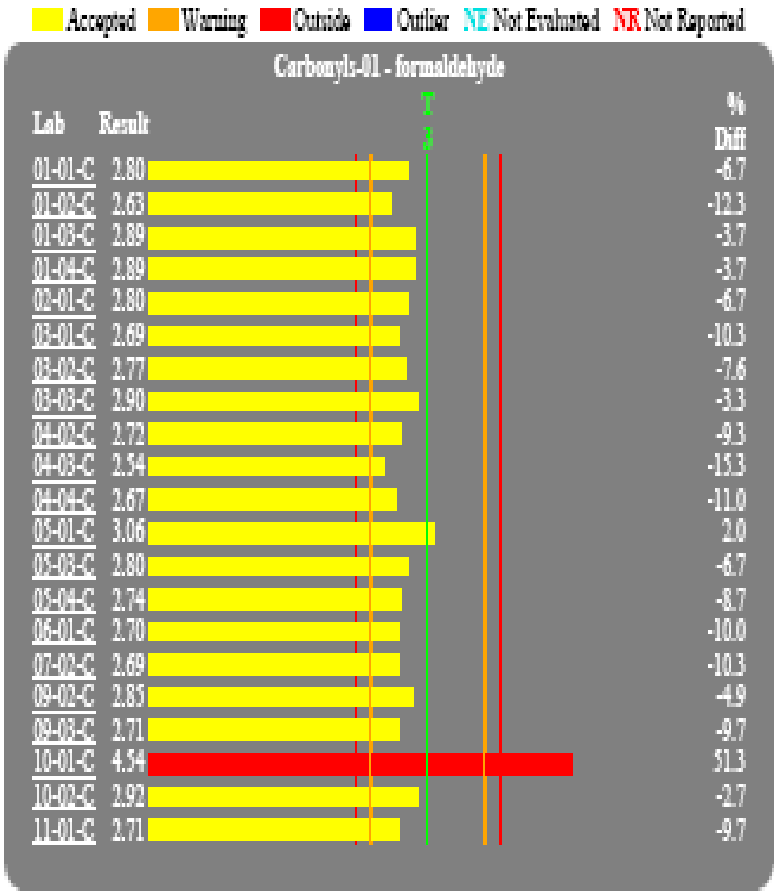
Bias: Early Acrolein Results: 3rd Qtr '04



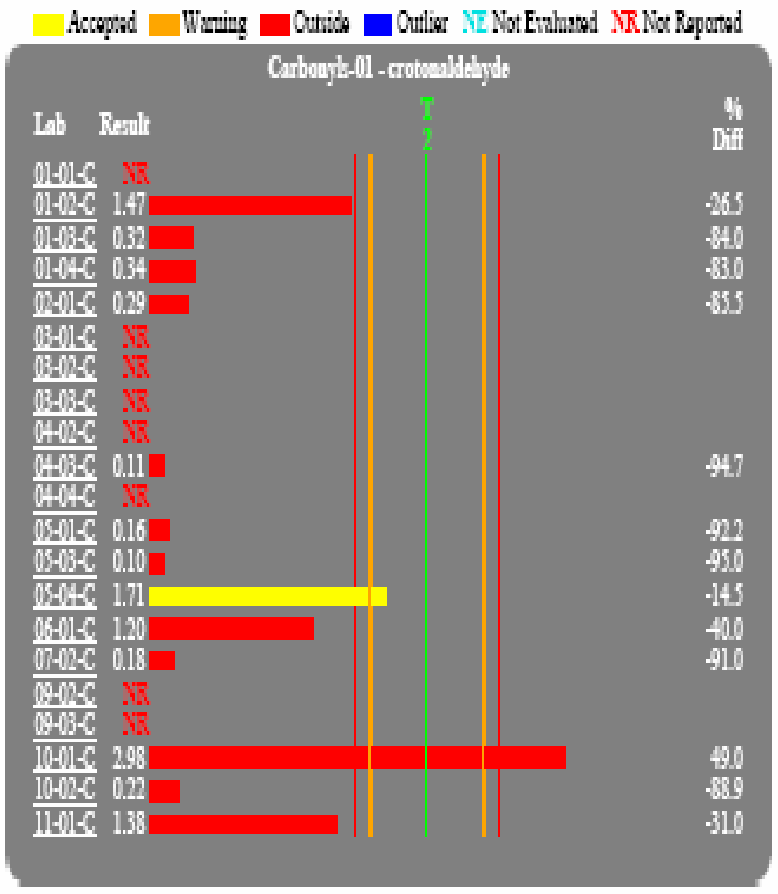


Bias: Crotonaldehyde Analysis

Study Number: 200601-C



Study Number: 200601-C

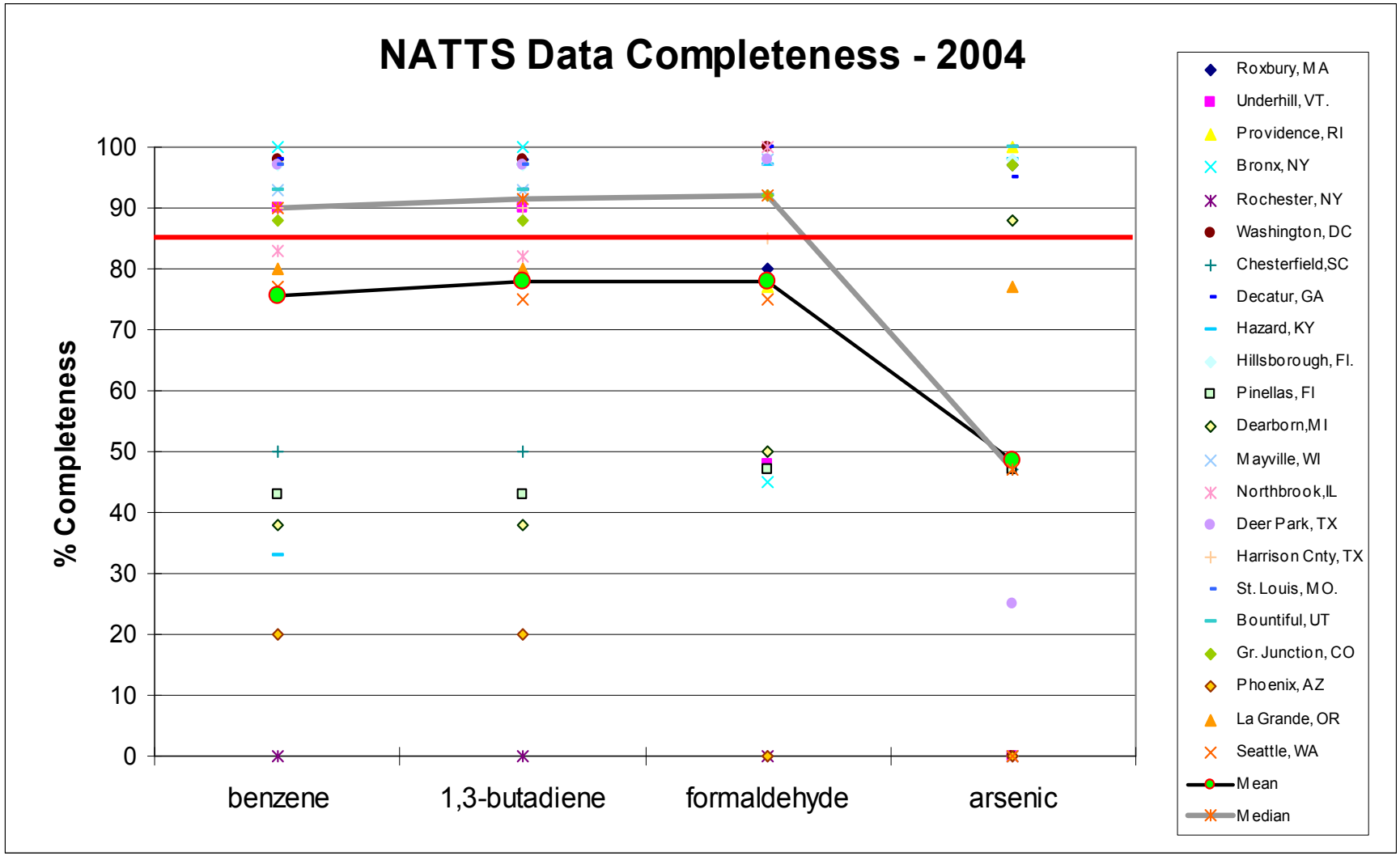


Data Completeness: Comparison 2004 – 2005

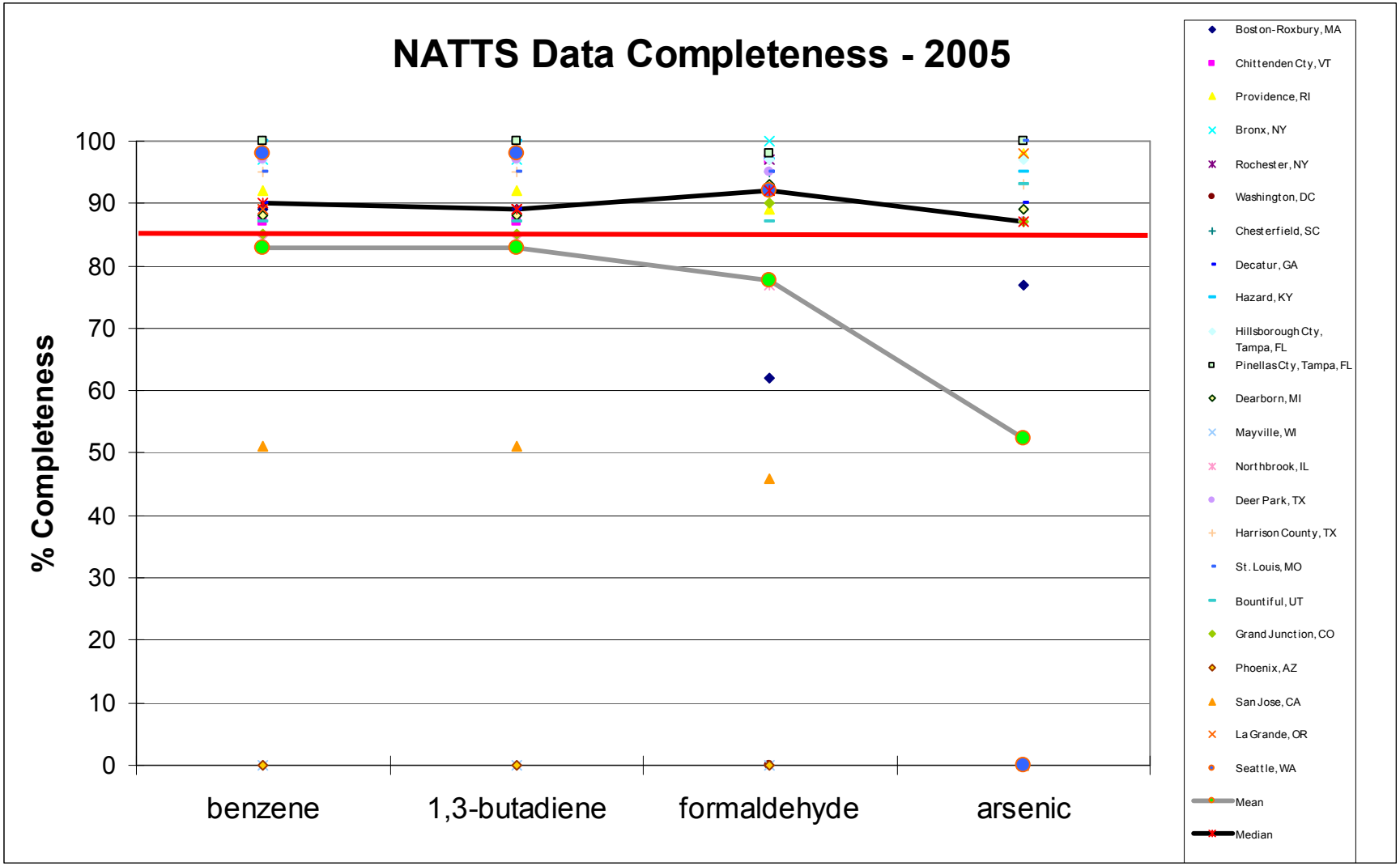
Target: 85%

Compound	Benzene	1,3 Butadiene	Formaldehyde	Arsenic
Mean 2004	75.5	78.0	78.0	48.6
Mean 2005	83.0	82.9	77.7	52.3
Median 2004	90.0	91.5	92.0	47.0
Median 2005	90.0	89.0	92.0	87.0

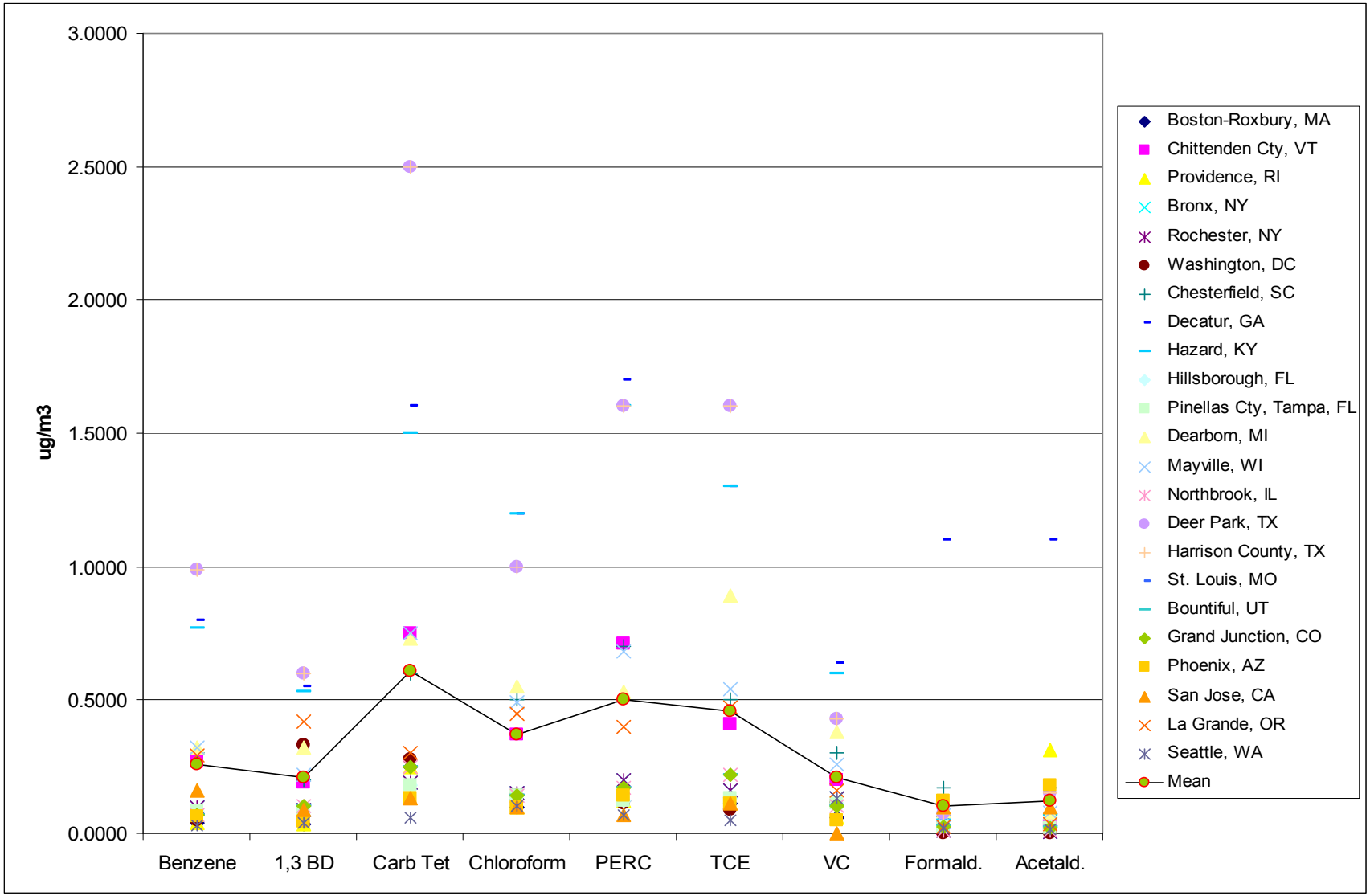
Completeness: Calendar Year 2004



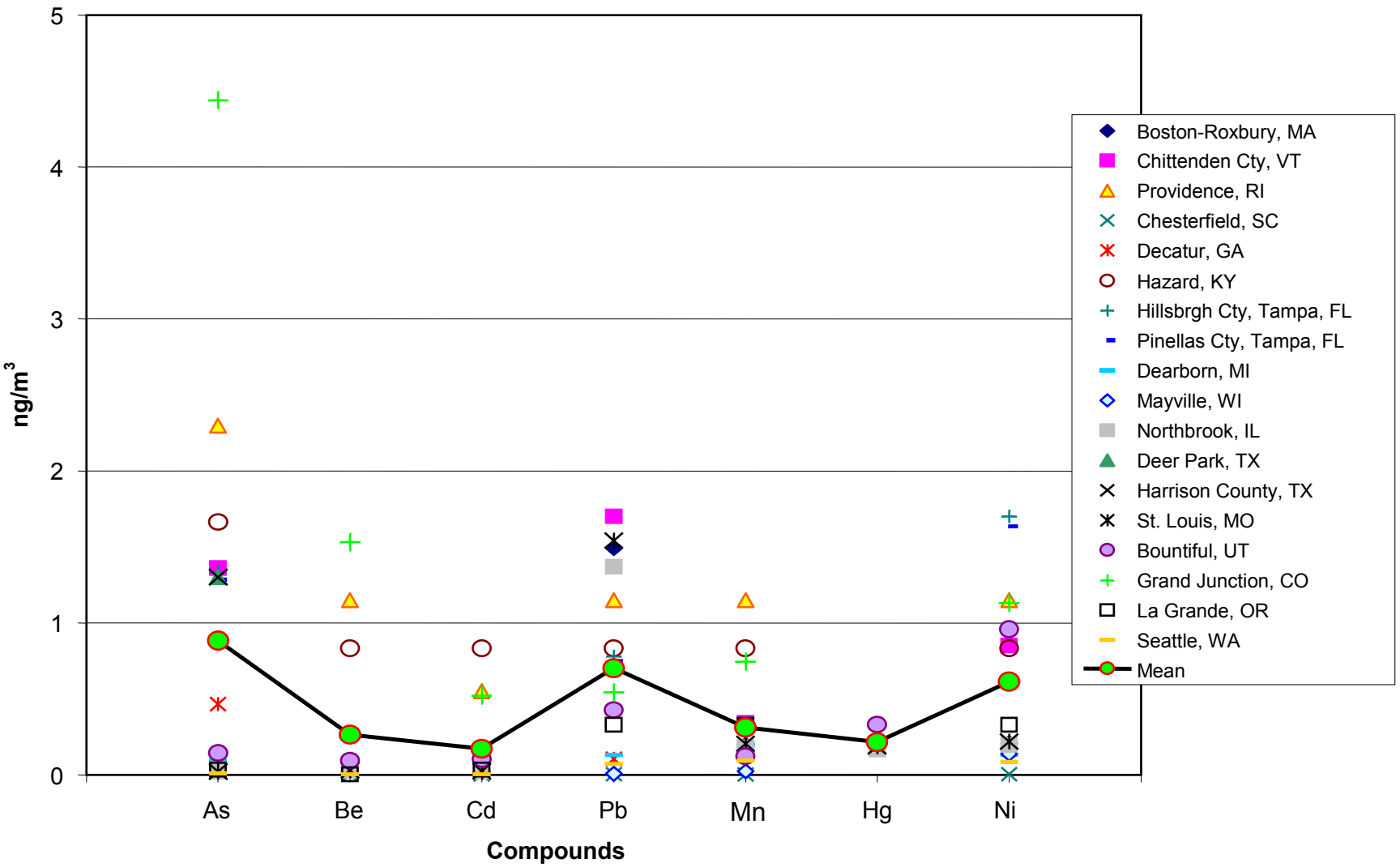
Completeness: Calendar Year 2005



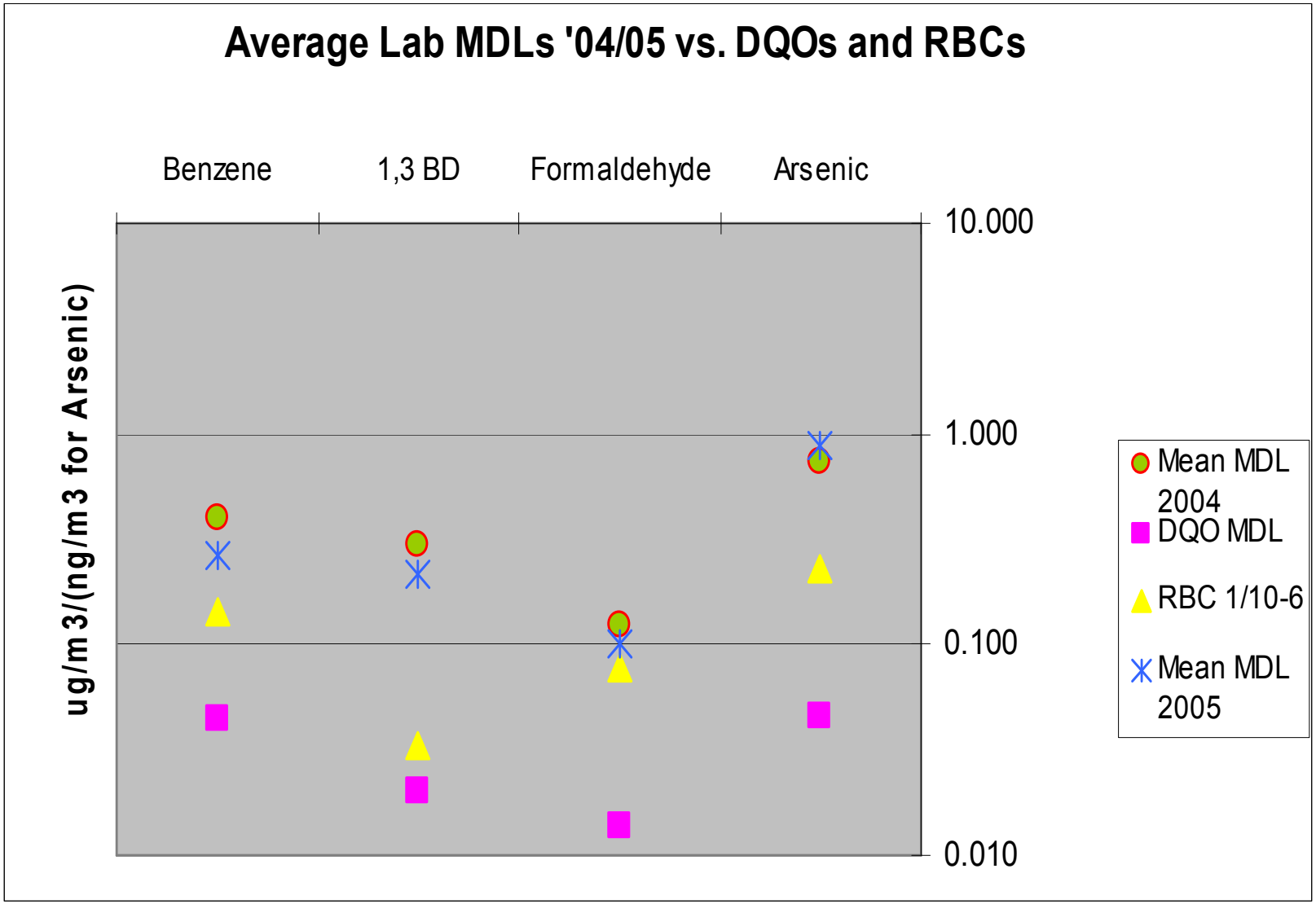
Detectability: MDLs Reported 2005 VOCs/Carbonyls



Detectability: MDLs Reported 2005 Metals



Detectability: Mean MDLs Reported 2004/2005



Technical System Audits: Lessons Learned

- All stations and most labs audited (DRI, Reno Nevada still to be audited)
- Two years to complete
- Most common problems found:
  - QAPPs and SOPs needing to be updated;
  - No system in place for QAPP/SOP review and updating;
  - Field Blanks were not collected at a number of sites.
- Overall, Battelle found most labs doing an excellent job!

PT Program Expansion

- Shortly after PT program started, we began to get requests from Non-NATTS labs for PT samples;
- In 2006, we expanded the program to include Non-NATTS lab;
- The EPA Regional Labs (6) requested inclusion;
- The PT program is flexible, i.e., a non-NATTS lab can buy-in for any number of samples.

PT Program Expansion: Number of Lab Participating

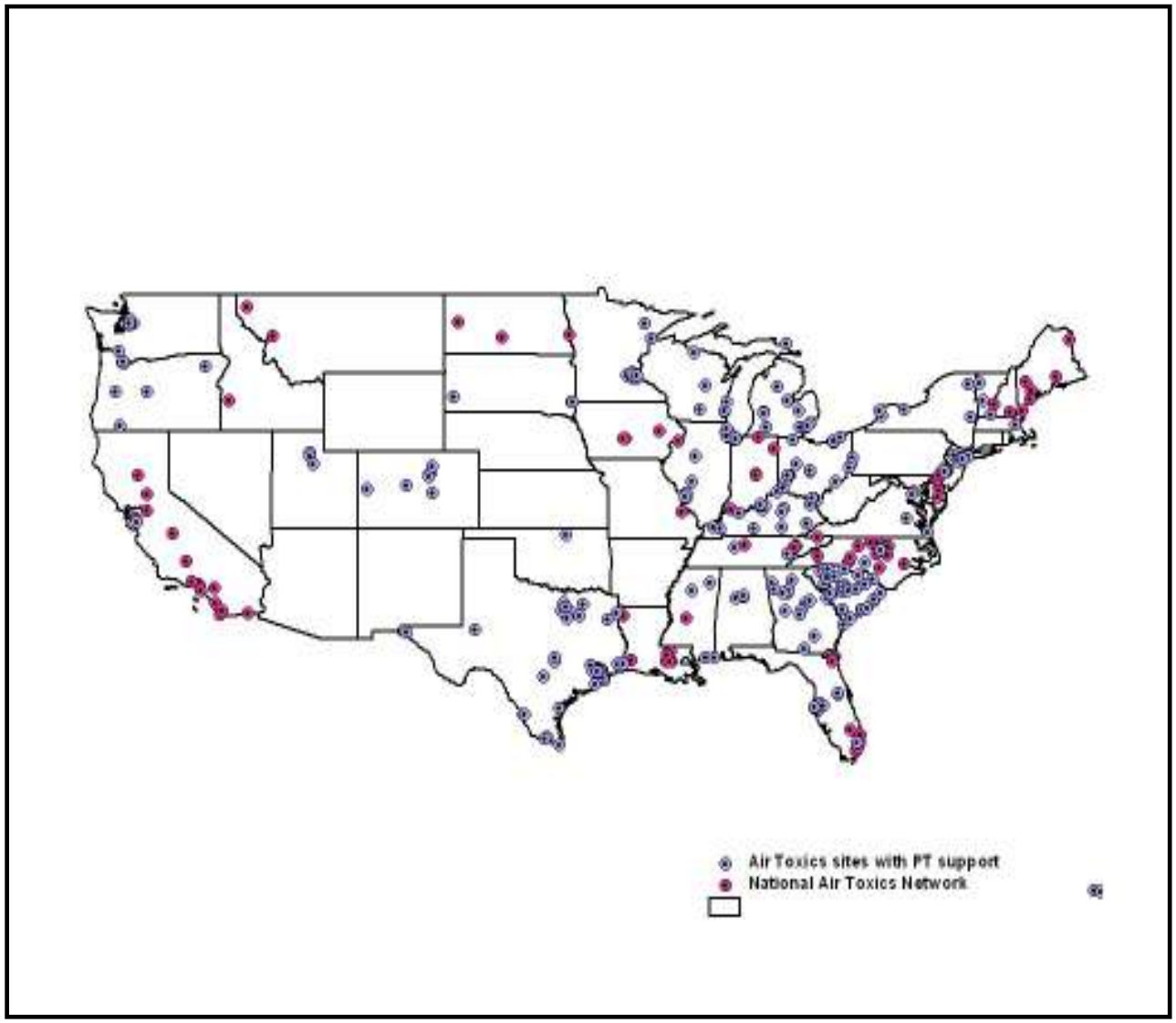
	Startup (2004)	Currently
Carbonyls	17	24
Metals	15	19
VOC	15	29*
Total	47	72*

This is a 53% increase

All Voluntary!!

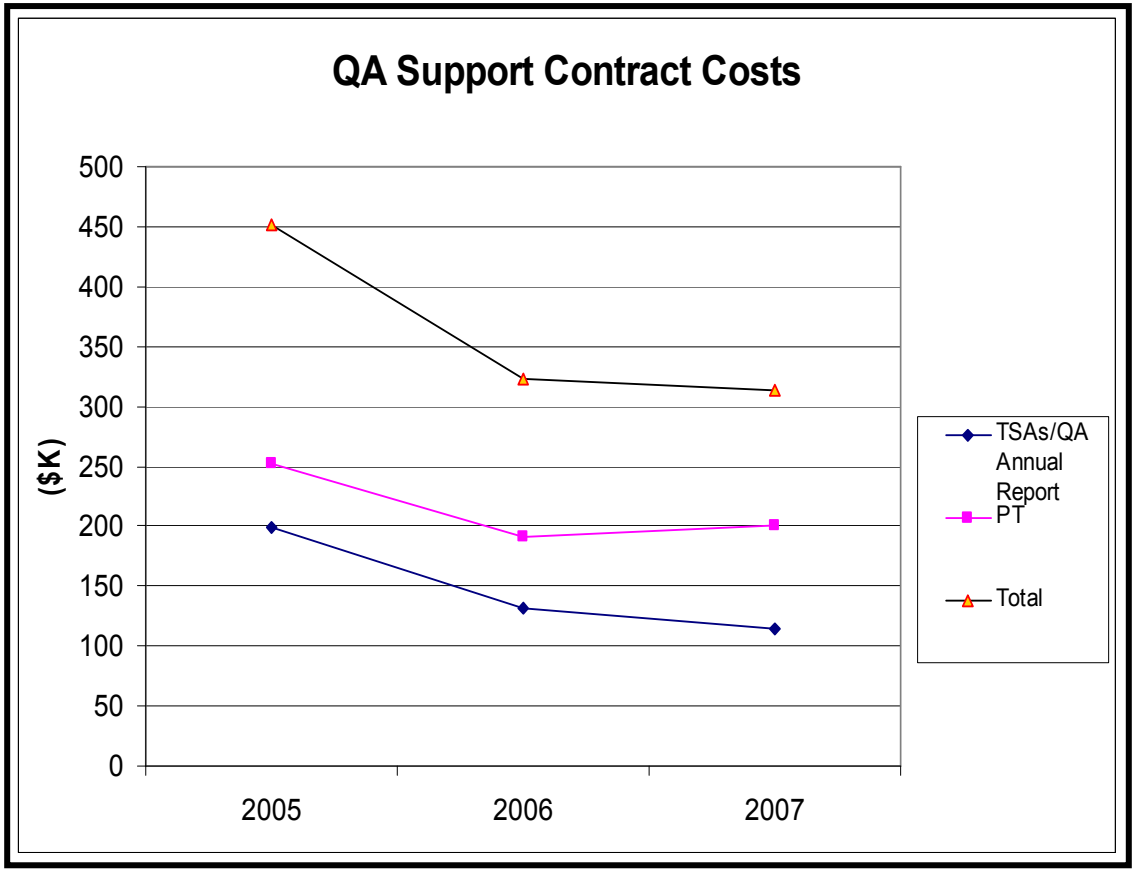
* Six of these labs are EPA Regional labs (Regions 1,3,4,5,6 and 9)

PT Program Expansion



- **Currently, there are 417 Air Toxics Stations in US**
- **For 75% (314) of these sites, the supporting labs are analyzing PT Samples**
- **<u>Our goal, 100% of all Air Toxics labs analyzing PT samples.</u>**

Is the QA Program Cost Effective?



Year	2005	2006	2007
% of NATTS Funds	14%	10%	9%

Is the Program Able to Meet the DQOs?

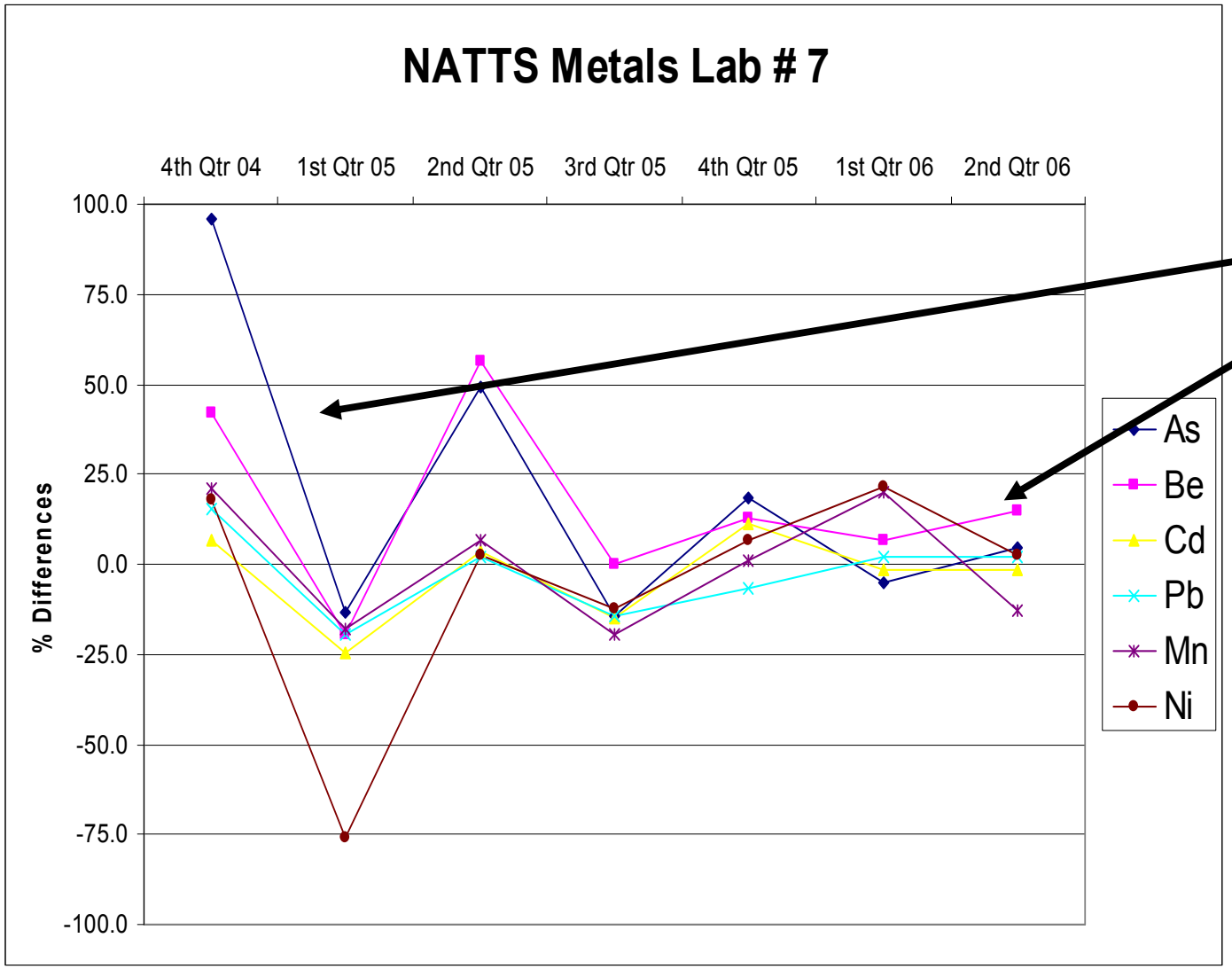
- **Short Answer: No, we are not meeting the DQOs for the second year in a row.**
  - The mean data completeness is below the required 85% for the 2nd year in a row. Improvement has been seen in this area;
  - The detectability for the 4 DQO compounds does not meet the MDLs stated in the DQOs, although there are improvement;
  - The CV data from the collocated/duplicate data illustrates that we are meeting a coefficient of variance of less than 15%;
  - Although not strictly a DQO, the laboratories are meeting the 25% Bias requirement.

Is the NATTS QA Program Successful?

- **Yes, the NATTS QA program is very successful:**

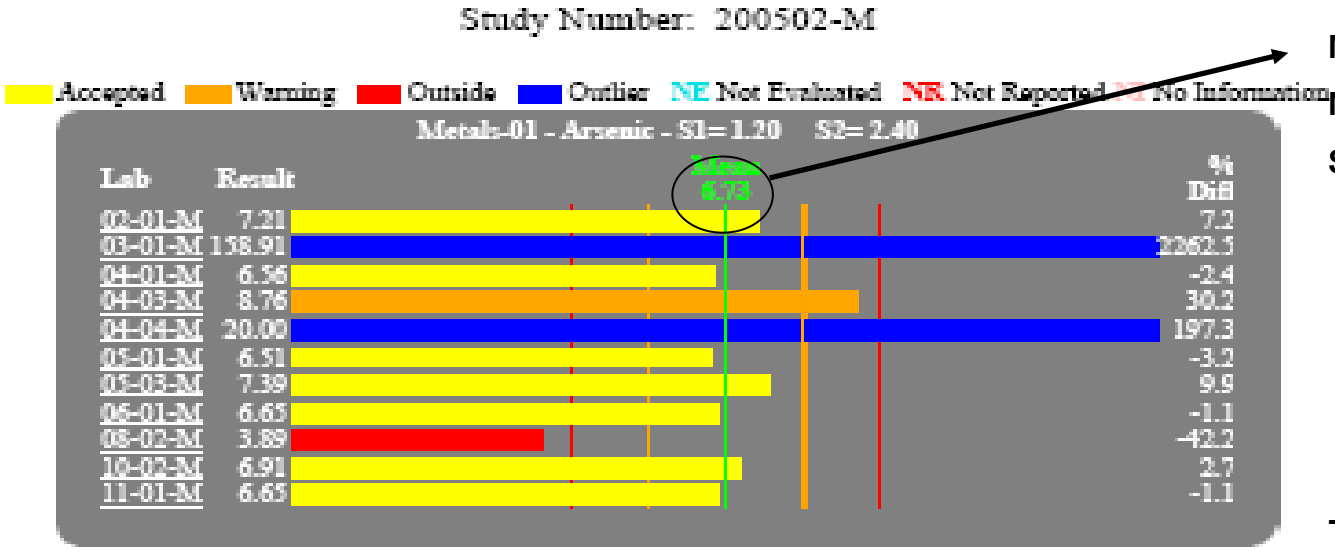
  - ✓ **The PT program illustrated the problem with quantifying double bond aldehydes and ketones;**
  - ✓ **The program allows all stakeholders to understand the precision, detectability, and bias;**
  - ✓ **The PT program illustrates there is method based bias;**
  - ✓ **NATTS labs can now see how they compare nationally;**
  - ✓ **Inter-laboratory variability exists;**
  - ✓ **PT program allows low-cost independent verification and helps labs meet NELAC requirements;**
  - ✓ **We understand the realistic quality of HAPS data;**
  - ✓ **It helped the labs decrease their variability, thus increasing confidence in the data.**

Is the QA Program Successful?



Example of the NATTS QA Program helping Improve Quality

Is the QA Program Successful?

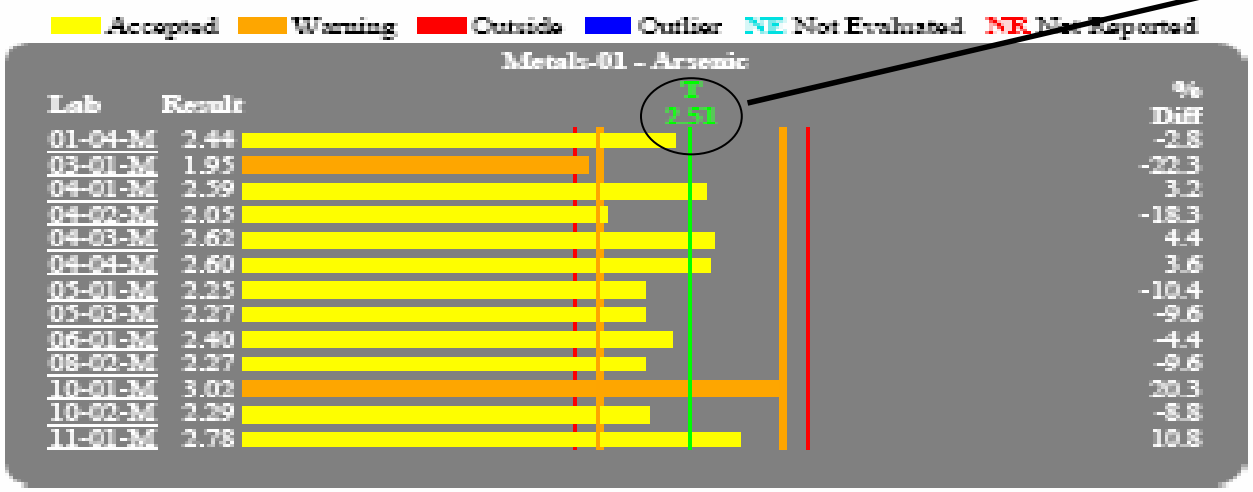


Target Value = 6.73 ng/filter

Mean = 15.1 ug/filter (223.6 %)

Median 6.9 ug/filter (2.7 %)

STD = 45.7 ug/filter (679.0 %)



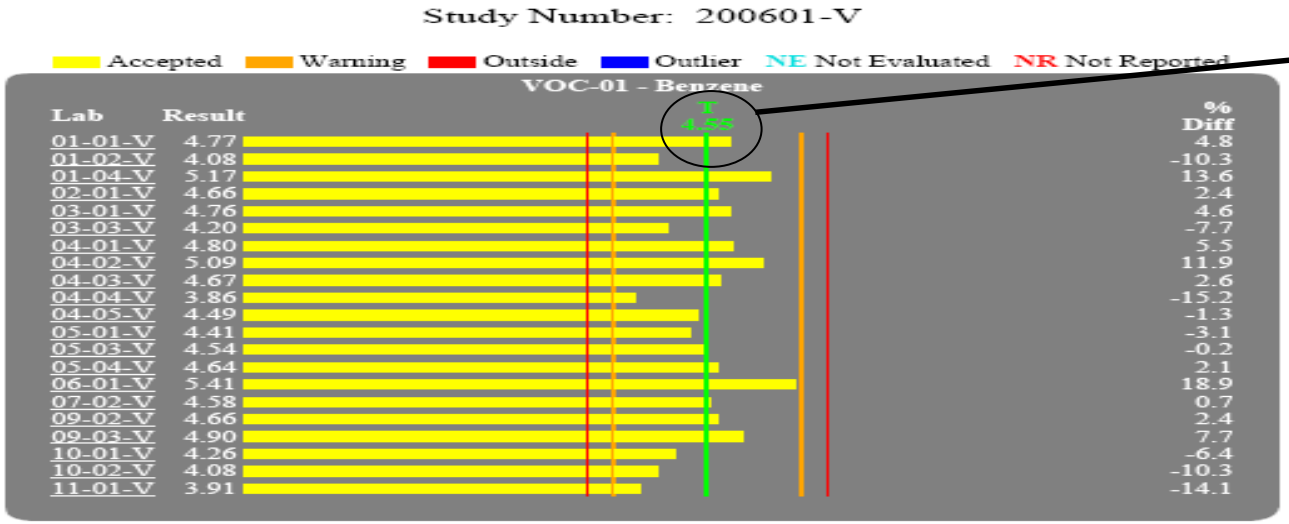
Target Value = 2.51 ng/filter

Mean = 2.42 ug/filter (-3.6 %)

Median 2.40 ug/filter (-4.4 %)

STD = 0.31 ug/filter (12.1 %)

Is the QA Program Successful?

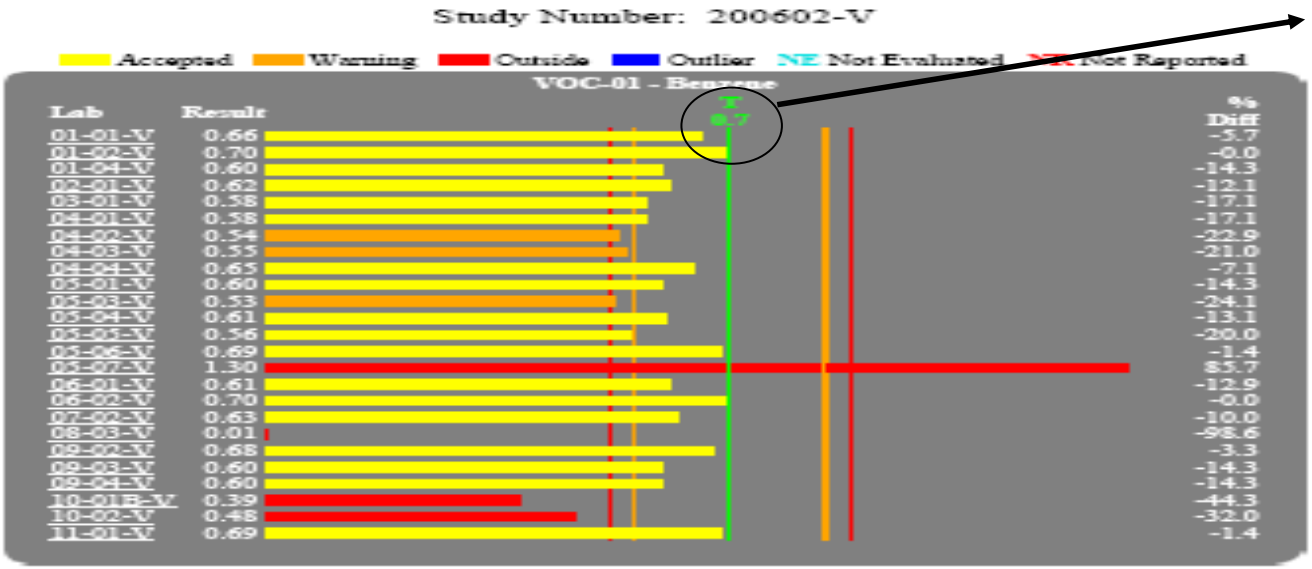


Target Value = 4.55 ppbv

Mean = 4.57 ppbv (0.5 %)

Median 4.65 ppbv (2.2 %)

STD = 0.405 ppbv (8.9 %)



Target Value = 0.7 ppbv

Mean = 0.62 ppbv (-12.1 %)

Median 0.60 ppbv (-13.7 %)

STD = 0.20 ppbv (28.4 %)

Recommendations

- Recommend working with STAPPA/ALAPCO and NATTS agencies to increase data completeness;
- Recommend that we work together to get all Air Toxics labs analyzing PT samples at least once per year;
- Recommend we continues our task force to see how to lower MDLs.