# National Atmospheric Deposition Program

## Mercury Deposition Network

Mercury Analytical Laboratory
2004 Annual Quality Assurance Report

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*In 2005, scientists, students, educators, and others interested in the National Atmospheric Deposition Program (NADP) logged more than 310,000 sessions and viewed nearly 93,000 maps on the NADP Web site. Users downloaded 18,564 data files from this site, which now annually receives more than 1.2 million hits. These data are used to address important questions about the impact of the wet deposition of nutrients on eutrophication in coastal estuarine environments; the relationship between wet deposition, the health of unmanaged forests, and the depletion of base cations from forest soils; the impact of pollutant emissions changes on precipitation chemistry; and the rate at which precipitation delivers mercury to remote lakes and streams.*

The NADP was organized in 1977 under State Agricultural Experiment Station (SAES) leadership to address the problem of atmospheric deposition and its effects on agricultural crops, forests, rangelands, surface waters, and other natural and cultural resources. In 1978, sites in the NADP precipitation chemistry network first began collecting one-week, wet-only deposition samples analyzed by the Central Analytical Laboratory (CAL) at the Illinois State Water Survey. The network was established to provide data on amounts, temporal trends, and geographic distributions of the atmospheric deposition of acids, nutrients, and base cations by precipitation. The NADP initially was organized as SAES North Central Regional Project NC-141, which all four SAES regions endorsed as Interregional Project IR-7 in 1982. A decade later, IR-7 was reclassified as National Research Support Project NRSP-3, which it remains.

In October 1981, the federally supported National Acid Precipitation Assessment Program (NAPAP) was established to increase understanding of the causes and effects of acidic precipitation. This program sought to establish a long-term precipitation chemistry network of sampling sites distant from point source influences. Because of its experience in organizing and operating a national-scale network, the NADP agreed to coordinate operation of NAPAP's National Trends Network (NTN). To benefit from identical siting criteria and operating procedures and a shared analytical laboratory, NADP and NTN merged with the designation NADP/NTN. Many NADP/NTN sites were supported by the U.S. Geological Survey, NAPAP's lead federal agency for deposition monitoring. Under Title IX of the federal Clean Air Act Amendments of 1990, NAPAP continues. Today there are more than 250 sites in the network, and the network designation has been shortened to NTN.

In October 1992, the Atmospheric Integrated Research Monitoring Network (AIRMoN), currently with seven sites, joined the NADP. AIRMoN sites collect samples daily when precipitation occurs. Samples are refrigerated until analysis at the CAL for the same constituents measured in NTN samples. The AIRMoN seeks to investigate pollutant source/receptor relationships and the effect of emissions changes on precipitation chemistry, combining measurements with atmospheric models. The AIRMoN also evaluates sample collection and preservation methods.

In January 1996, the Mercury Deposition Network (MDN), currently with more than 90 sites, joined the NADP. MDN sites collect wet-only deposition samples that are sent to the MDN analytical laboratory at Frontier Geosciences, Inc. The MDN was formed to provide data on the wet deposition of mercury to surface waters, forested watersheds, and other receptors. Forty-five states and eight Canadian provinces have advisories against consuming fish from lakes with high mercury concentrations in fish tissues. MDN data enable researchers to investigate the link between mercury in precipitation and this problem.

The NADP receives support from the U.S. Geological Survey; Environmental Protection Agency; National Park Service; National Oceanic and Atmospheric Administration; U.S. Department of Agriculture - Forest Service; U.S. Fish & Wildlife Service; Tennessee Valley Authority; Bureau of Land Management; and U.S. Department of Agriculture - Cooperative State Research, Education, and Extension Service under agreement 2002-39138-11964. Additional support is provided by other federal, state, local, and tribal agencies, State Agricultural Experiment Stations, universities, and nongovernmental organizations. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of the U.S. Department of Agriculture or any other sponsor.

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The Illinois State Water Survey is an Affiliated Agency of the University of Illinois and a Division of the Illinois Department of Natural Resources

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## Definitions of Acronyms and Abbreviations

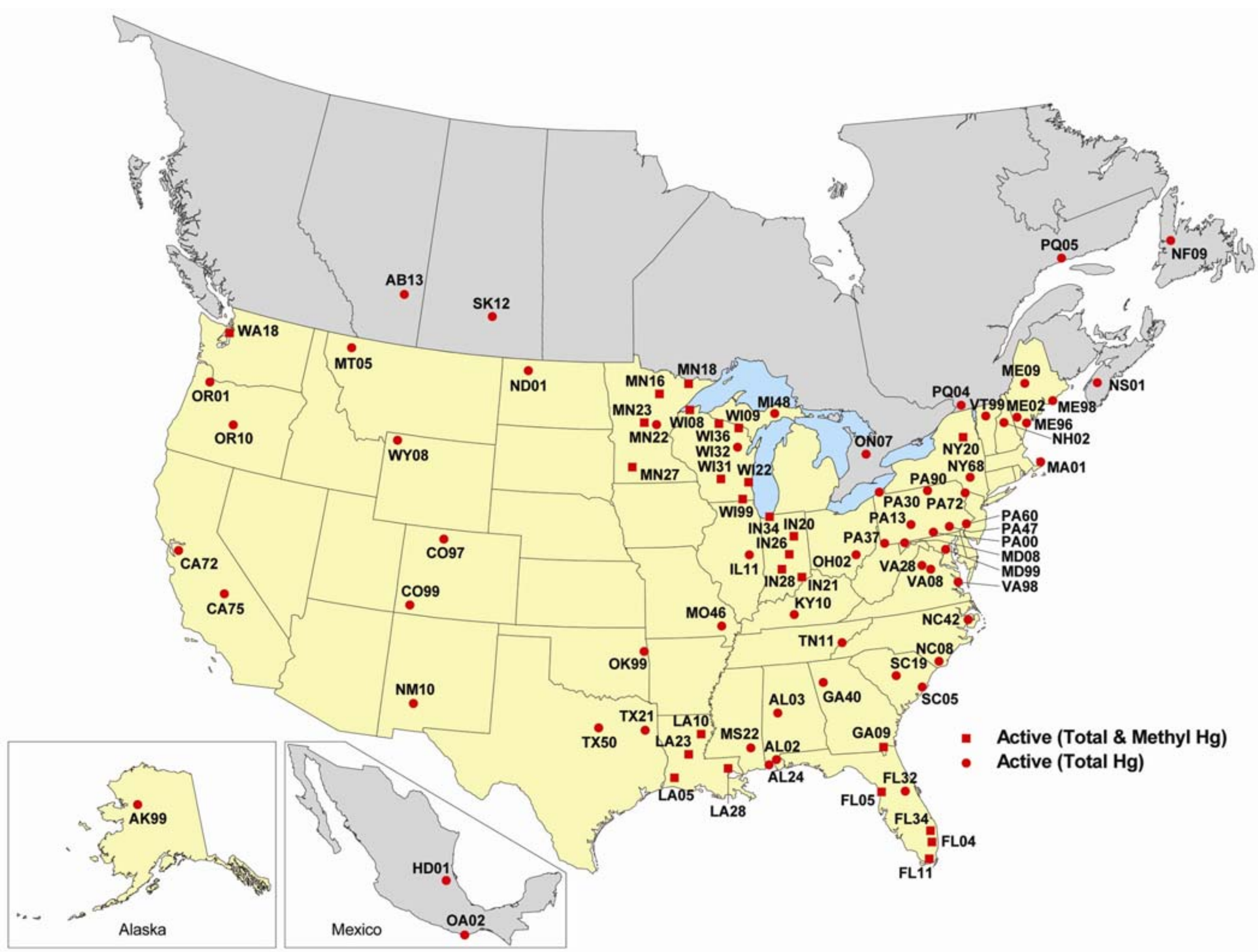
| | |
|---|---|
| **CAL** | Central Analytical Lab |
| **CCB** | Continued Calibration Blank |
| **CCV** | Continued Calibration Verification |
| **COC** | Chain of Custody |
| **CRM** | Certified Reference Material |
| **CVAFS** | Cold Vapor Atomic Fluorescence Spectrometry |
| **DQO** | Data Quality Objectives |
| **EMOF** | Electronic Mercury Observer Form |
| **HAL** | Mercury (Hg) Analytical Lab |
| **ICB** | Initial Calibration Blank |
| **ICV** | Initial Calibration Verification |
| **MD** | Matrix Duplicate |
| **MDL** | Method Detection Limit |
| **MDN** | Mercury Deposition Network |
| **MOF** | Mercury Observer Form |
| **MS** | Matrix Spike |
| **MSD** | Matrix Spike Duplicate |
| **NADP** | National Atmospheric Deposition Program |
| **NED** | Network Equipment Depot |
| **PB** | Preparation Blanks |
| **PE** | Performance Evaluation |
| **PT** | Proficiency Test |
| **QA/QC** | Quality Assurance/Quality Control |
| **QAP** | Quality Assurance Plan |
| **QR** | Quality Rating Code |
| **RL** | Reporting Limit |
| **RPD** | Relative Percent Difference |
| **SOP** | Standard Operating Procedure |
| **SRM** | Standard Reference Material |

# 1. Introduction

Since January 1996, Frontier GeoSciences Inc. (FGS) has served as the Mercury Analytical Laboratory (HAL) and Site Liaison Center for the Mercury Deposition Network (MDN). MDN, coordinated through the National Atmospheric Deposition Program (NADP), was designed with the primary objective of quantifying the wet deposition of mercury in North America to determine long-term geographic and temporal distributions. MDN has grown to incorporate over 87 sites in the United States, Canada, and Mexico. In 2005, MDN is expected to incorporate 10-15 additional new sites.

As HAL, FGS receives weekly precipitation samples to be analyzed for total mercury. HAL also analyzes samples for methylmercury from selected sites participating in the methylmercury program. The analytical technique — Modified EPA Method 1631 Revision B — was developed by Nicolas S Bloom, one of FGS' founders. FGS also served as the referee lab for the Method 1631 final validation study.

Robert Brunette, Principle Investigator and HAL Director, oversees FGS's involvement in MDN. He serves as the HAL contact for the multiple agencies currently sponsoring MDN. His multiple roles require him to provide guidance and direction to all HAL staff and to maintain his proficiency in all aspects of HAL activities, including MDN site selection and equipment installation, MDN equipment troubleshooting, field and laboratory training, analysis and report writing, as well as research on new MDN initiatives including Trace Metals (in addition to mercury) in Wet Deposition.



Mr. Brunette is assisted by Gerard Van der Jagt - the MDN Group Leader, and an analytical laboratory staff skilled in processing incoming samples, analyzing sample sets, cleaning glassware, shipping weekly field equipment, and entering data. Senior Research Scientist, Eric M. Prestbo, serves as a Science Advisor for HAL, and helps support MDN related research initiatives. The Project Investigator also works closely with FGS' Laboratory Manager, Eric Wyse and FGS' Quality Assurance Program Director, Carl Hensman Ph.D., to ensure that all Quality Control (QC) parameters are consistently maintained, and that FGS' standards of professional and scientific quality are met.

FGS continued to maintain and demonstrate acceptable quality control in 2004. Due to the addition of new MDN sites, the number of quality control points increased from 1,214 in 2003, to more than 1,500 quality control measurements in 2004. FGS demonstrated consistency and reproducibility in bottle blanks, preparation blanks, certified reference materials, matrix duplicates, and matrix spikes. All of these parameters are plotted control charts in this report.

**Outlook**

The MDN continues to gain attention as the largest and longest-running national mercury wet deposition network in North America. Feedback from sponsors and other interested organizations indicates that MDN will experience significant growth in 2005-2006. With this growth, HAL will continue to look for ways to improve the program to ensure the highest quality. The following are goals HAL has set to maintain and improve quality throughout 2005-2006:

- HAL will continue to improve our database in 2005.
- HAL and the NADP Program Office incorporated dual data entry verification to all database operations.
- HAL will continue trace metals in wet deposition research in 2005. There is a strong indication that there are many sponsors that will want to participate in a combined mercury and trace metals program. In 2004, five MDN sites were collecting samples for trace metals following HAL's retrofit and trace metal standard operating procedures.
- HAL research in dry deposition of mercury and trace metals in sites in the southern U.S. will continue, likely through 2005. HAL expects this research to lay the groundwork for a potential non-NADP product for interested MDN sponsors.

# 2. Quality Assurance

## 2.1. Philosophy and Objectives

Frontier GeoSciences Inc. (FGS) is committed to a rigorous quality assurance program and philosophy. Quality control begins at the bench level. Process improvements are solicited from laboratory technicians and analysts. Management implements the improvements. The Quality Assurance program is a system for ensuring that all information, data, and interpretation resulting from an analytical procedure are technically sound, statistically valid, and appropriately documented.

HAL data quality is assessed against FGS' Data Quality Objectives (DQO). Our DQOs consist of five components: precision, accuracy, representativeness, comparability, and completeness.

- *Precision* is a measure of data reproducibility. HAL assesses analytical precision using matrix duplicates. The acceptance criterion for matrix duplicates is ≤ 25 RPD.
- *Accuracy* is a measure of how close experimental data is to a "true" value. HAL assesses accuracy using certified reference materials and matrix spikes. The acceptance criterion for reference materials and matrix spikes is 75-125% recovery.
- *Representativeness* is a measure of how typical a sample is compared to the sample population. It is achieved by accurate, artifact-free sampling procedures and appropriate sample homogenization.
- *Comparability* is a measure of how variable one set of data is to another. Control charts enable HAL to assess comparability over the course of an ongoing monitoring project such as MDN.
- *Completeness* is measured by the number of usable data points compared to the number of possible data points. HAL DQO for MDN project is at least 95% completeness.

## 2.2. Method Detection Limits

Method detection limit (MDL) studies are maintained for most matrix/analyte combinations available at FGS. Studies are performed using the protocols in 40 CFR, Section 136, Appendix A. Specifically; seven or more low-level, matrix-specific spikes are processed according to preparation and analytical method protocols. MDL is determined as t*SD of the replicates (where t is the Student's T-value for the number of replicates and SD is the standard deviation). The HAL updates MDL studies periodically for the MDN project. See Appendix A for the latest MDL study results.

## 2.3. Accreditations

FGS currently holds certifications through departments in eight states: the California Department of Health, the Florida Department of Health, the Louisiana Department of Environmental Quality, the Minnesota Department of Health, the New Jersey Department of Environmental Protection, the New York Department of Health, the Washington Department of Ecology, and the Wisconsin Department of Natural Resources. The Florida Department of Health acts as FGS' primary accreditor under the National Environmental Laboratory Accreditation Program (NELAP).

# 3. Quality Control

Quality Control (QC) samples each have an expected target value that can be used to objectively assess preparation and analytical method performance. If performance on these known samples is acceptable, client sample results and other *unknowns* are assumed to be acceptable, as well. Conversely, unacceptable QC results require immediate troubleshooting and re-assessment of affected sample results. The HAL utilizes eight types of QC samples for the MDN project: laboratory bottle blanks, preparation blanks, ongoing calibration standards, ongoing calibration blanks, matrix duplicates, matrix spikes, certified reference materials, field blanks, and system blanks.

## 3.1. Laboratory Bottle Blanks

### 3.1.1. Description

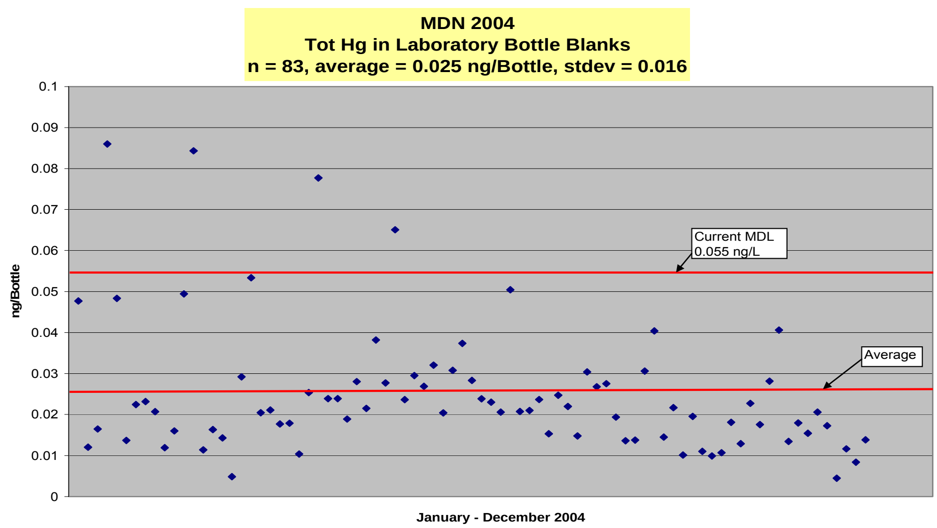
Following cleaning, HAL bottles are charged with 20mL of 1% hydrochloric acid. A random selection of these bottles is then analyzed for total mercury.

### 3.1.2. Purpose

Even in an ultra-clean laboratory, mercury exposure is inherent to the handling of MDN sample bottles. Because such contamination is inevitable, it must be analyzed and quantified so that it can be objectively subtracted from final sample results.

### 3.1.3. Discussion

In 2004, the mean of 83 laboratory bottle blanks was 0.025ng/bottle with a standard deviation of 0.016ng/bottle. In 2004, four laboratory bottle blanks were higher than MDL. Laboratory bottle blanks are expected to be at or near MDL. In cases where the blanks are significantly higher, the situation is investigated. Possible contamination sources are researched and identified. Once the contamination has been isolated and corrected, the run is continued.




## 3.2. Preparation Blanks

### 3.2.1. Description

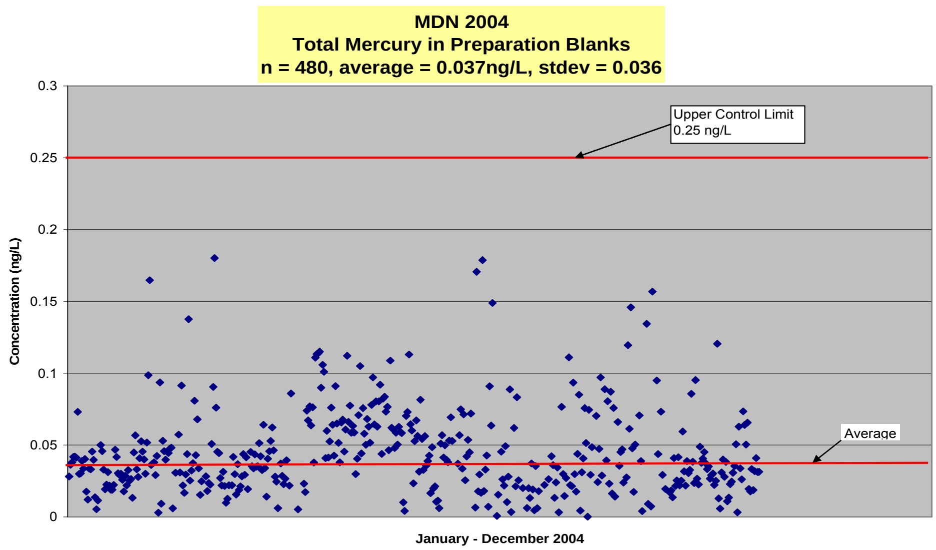
Preparation blanks for total mercury consist of 1% (v/v) 0.2N bromine monochloride, 0.2mL 20% hydroxylamine hydrochloride, and 0.3mL 20% stannous chloride in 100mL of reagent water. Preparation blanks for methylmercury consist of hydrochloric acid, APDC solution, ethylating agent, acetate buffer, and reagent water.

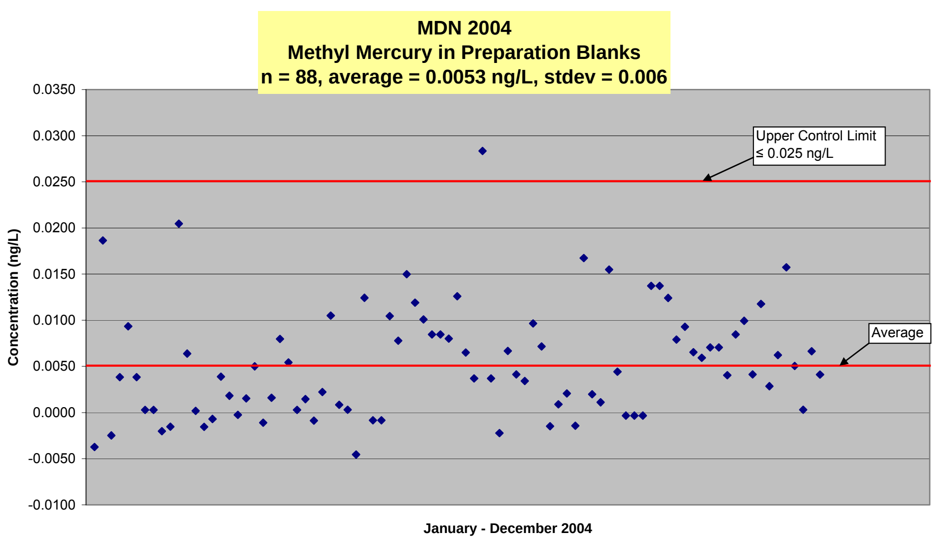
### 3.2.2. Purpose:

Mercury content is inherent even in FGS' preparatory and analytical reagents. Preparation blanks are a measure of how much of each sample result can be attributed to these necessary reagents. Preparation Blanks also help when investigating possible sources of contamination.

### 3.2.3. Discussion

In 2004, the mean for total mercury of 480 preparation blanks was 0.037ng/L with a standard deviation of 0.036ng/L. In 2004, no preparation blanks for total mercury were above the control limit of 0.25ng/L. In 2004, the mean for methylmercury of 87 preparation blanks was 0.0053ng/L with a standard deviation of 0.006ng/L. In 2004, one preparation blank for methylmercury was above the control limit of 0.025ng/L.




## 3.3. Ongoing Calibration Standards

### 3.3.1. Description

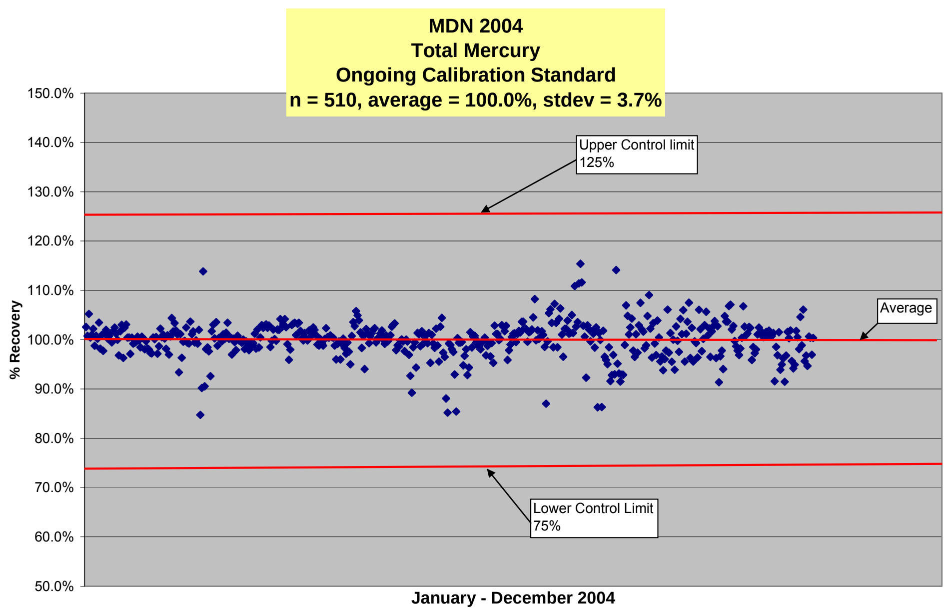
Ongoing calibration standards are continuously analyzed during the course of sample analysis, typically after a suite of ten samples and at the end of each analytical day. A 1.0ng standard for total mercury and a 0.1ng standard for methylmercury are typically analyzed as an ongoing calibration standard.

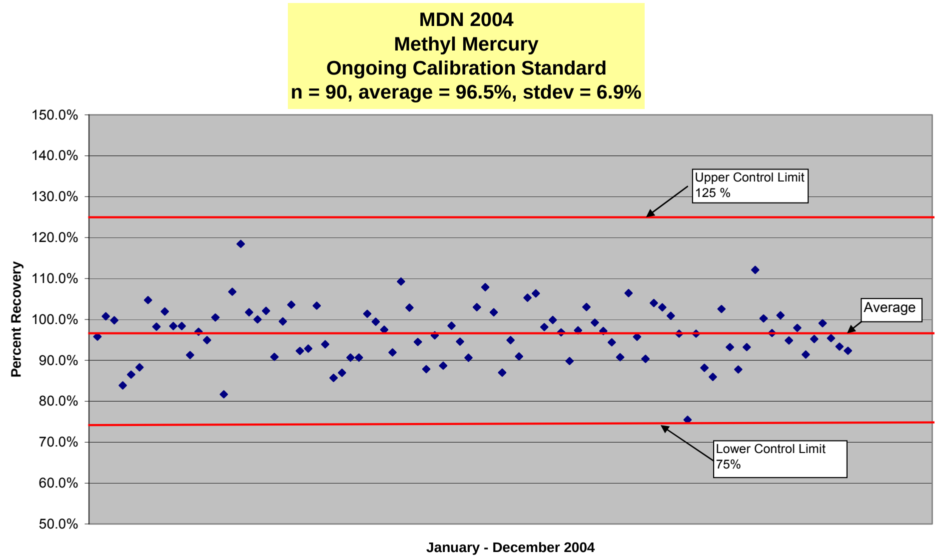
### 3.3.2. Purpose

Ongoing calibration standards verify that the analytical system is in control. All total mercury standard solutions are traceable to certified standards or manufacturer lot number. Currently there is no commercial available methylmercury standard. All raw data references a unique laboratory ID number for associated standards. This ID may then be traced through the standards logbooks to the original shipment, container, and certification.

### 3.3.3. Discussion

In 2004, the mean of 510 ongoing calibration standard recoveries for total mercury was 100.0% with a standard deviation of 3.7%. In 2004, no ongoing calibration standards were out statistical control. In 2004, the mean of 90 ongoing calibration standard recoveries for methylmercury was 96.5% with a standard deviation of 6.9 %. There were no ongoing calibration standard recoveries for the MDN project in 2004 that were out of statistical control.






## 3.4. Ongoing Calibration Blanks

### 3.4.1. Description

Ongoing calibration blanks are continuously analyzed during the course of sample analysis, typically after a suite of ten samples and at the end of each analytical day.

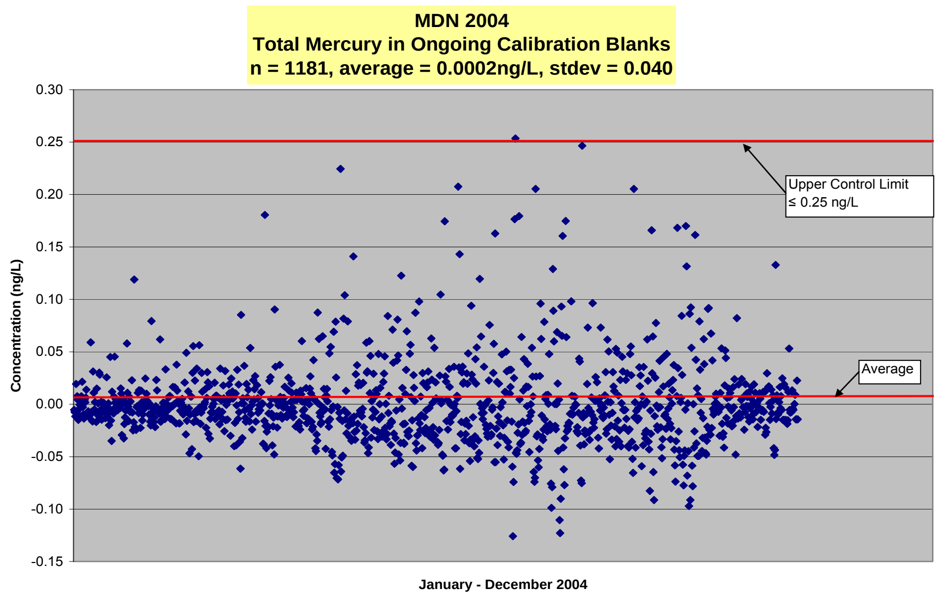
### 3.4.2. Purpose

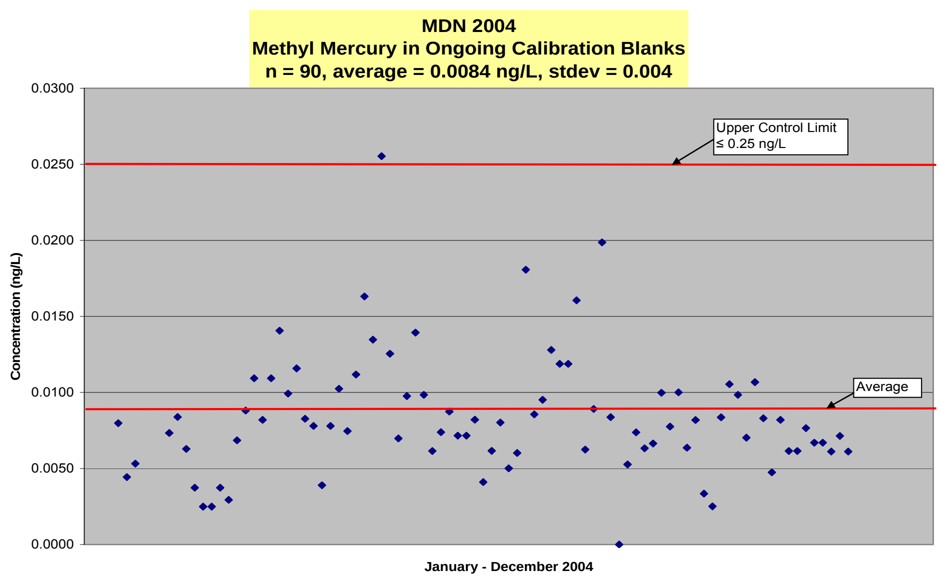
Instrument blanks are used to demonstrate freedom from system contamination, carryover, and to monitor baseline drift.

### 3.4.3. Discussion

In 2004, the mean concentration of 1181 ongoing calibration blanks for total mercury was 0.0002ng/L with a standard deviation of 0.040. There was one ongoing calibration blank for the MDN project in 2004 that was above the upper control limit (0.25ng/L). In 2004, the mean concentration of 90 ongoing calibration blanks for methylmercury was 0.0084ng/L with a standard deviation of 0.004. There was one ongoing calibration blank for methylmercury that was above the upper control limit (0.025ng/L).

Ongoing calibration blanks are expected to be at or near MDL. In cases where the blanks are significantly higher, the situation is investigated. Possible contamination sources are researched and identified. Once the contamination has been isolated and corrected, the run is continued.




## 3.5. Matrix Duplicates

### 3.5.1. Description

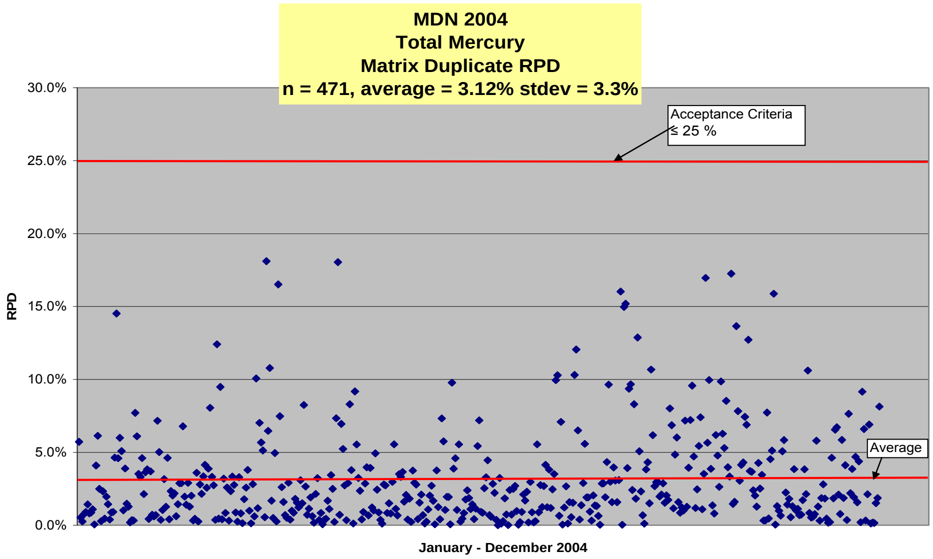
Matrix duplicates are created when an existing sample is split into two portions that can then be compared analytically.

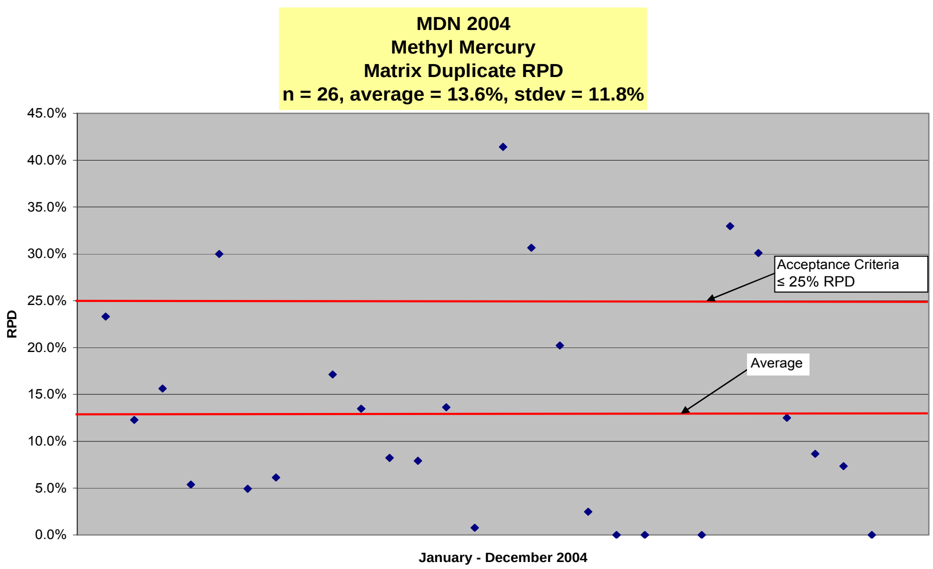
### 3.5.2. Purpose

As there is no theoretical difference between a pair of matrix duplicates, their relative percent difference (RPD) is expected to be less than 25%. Out of control results are indicative of a heterogeneous sample matrix and/or poor analytical precision.

### 3.5.3. Discussion

In 2004, the mean RPD of 471 matrix duplicate pairs for total mercury was 3.12% with a standard deviation of 3.3%. This low mean reflects the homogeneous nature of the MDN sample matrix, as well as the analytical precision of HAL. In 2004, the mean RPD of 26 matrix duplicate pairs for methylmercury was 13.6 % with a standard deviation of 11.8%. Several RPDs were above the 25% RPD acceptance level. However, all of these matrix duplicates concentrations were less than or equal to five times MDL. At such low concentrations, variability is expected to increase. Therefore, the larger RPD values at low concentrations are not of concern. No corrective action was taken.




## 3.6. Matrix Spikes

### 3.6.1. Description

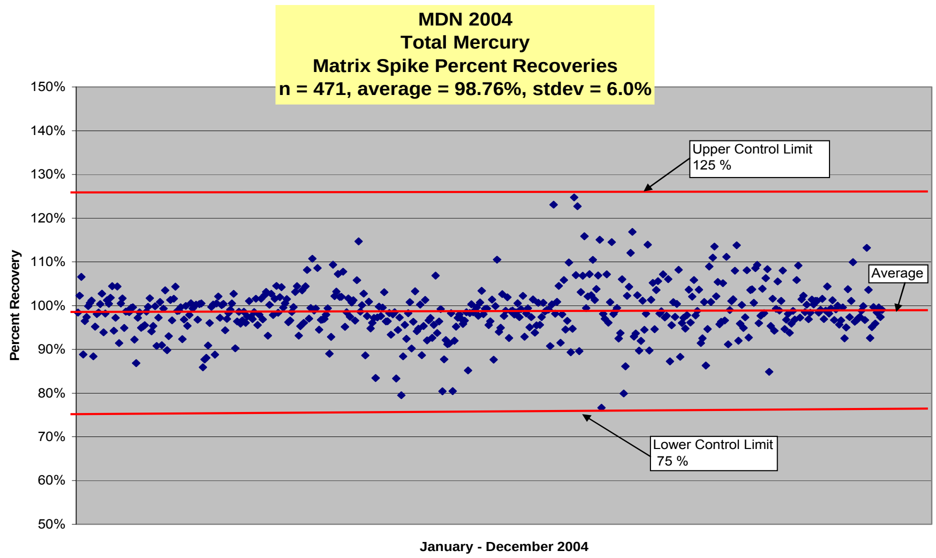
A matrix spike is created when an MDN sample with known mercury content is supplemented with an additional 1.00ng of mercury standard.

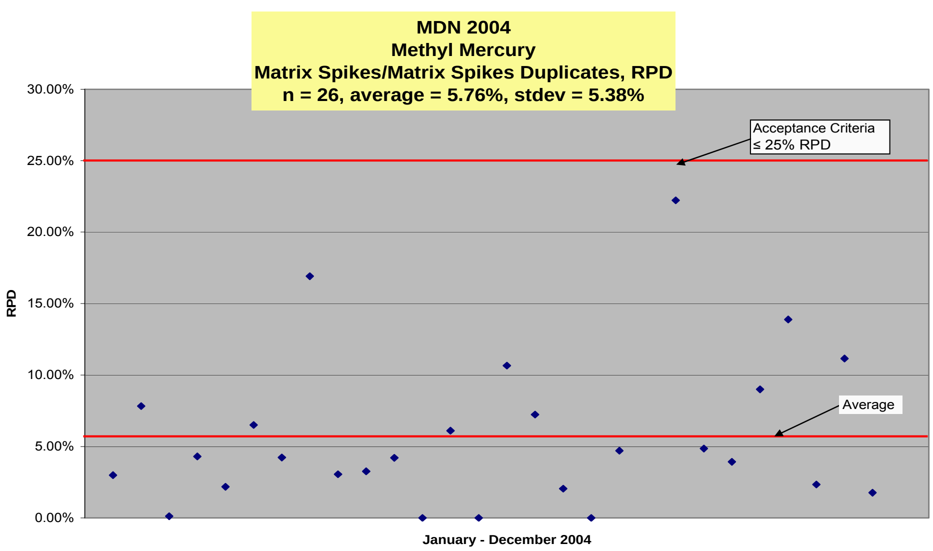
### 3.6.2. Purpose

As the combined mercury content of the matrix spike sample is known in theory, matrix spike recoveries are expected to be within 75% and 125% of this theoretical value. Matrix spike recoveries determine if, and how, the sample matrix interferes with target analyte recovery. They also ensure that HAL's preparation and analytical procedures do not result in significant analyte losses.

### 3.6.3. Discussion

In 2004, the mean of 471 matrix spike recoveries for total mercury was 98.76% with a standard deviation of 6.0%. There were no unacceptable matrix spike recoveries for the MDN project in 2004. This is indicative of a chemically passive sample matrix, as well as good analytical accuracy. Had any Matrix Spikes fallen outside the 75%-125% control limits, involved samples would have been rerun to investigate possible matrix interference. In 2004, the mean RPD of 26 matrix spike/matrix spike duplicates for methyl mercury was 5.76% with a standard deviation of 5.38%. No matrix spike/matrix spike duplicate RPD was above the acceptance criteria.




## 3.7. Certified Reference Materials

### 3.7.1. Description

Certified reference materials are commercially available samples containing known quantities of analyte in a specific matrix. Currently, there is no available Reference Material matching the MDN rainwater matrix. Instead, HAL uses National Institute of Standards and Technology

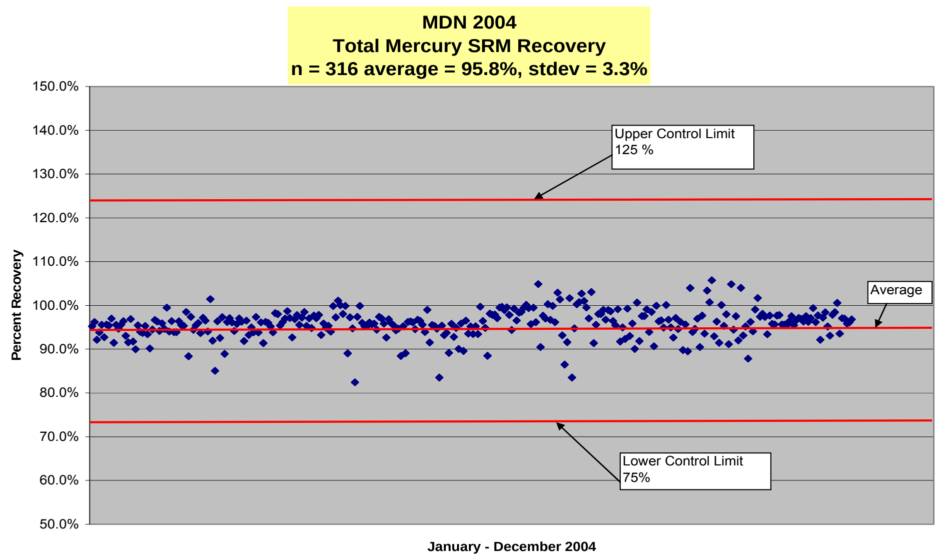
Reference Material 1641d – Total Mercury in Water. For methylmercury, HAL uses National Research Council Canada Reference Material DORM-2.

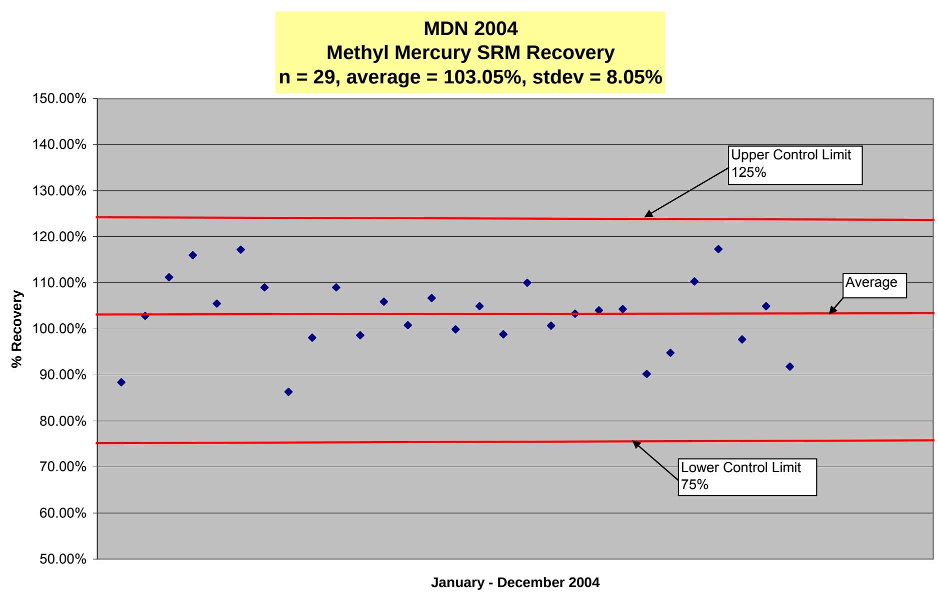
### 3.7.2. Purpose

Certified reference materials are used to demonstrate HAL's ability to recover a target analyte from a specific matrix. They are also a secondary source for verifying the validity of the analytical curve.

### 3.7.3. Discussion

In 2004, the mean of 316 certified reference material recoveries for total mercury was 95.8% with a standard deviation of 3.5%. For methylmercury, the mean of 29 certified reference material recoveries was 103.05% with a standard deviation of 8.05%. In 2004, there were no recoveries outside the control limits for total and methylmercury. Failing recoveries are immediately rerun to ensure that the analytical failure is isolated rather than systemic.



# 4. Calculations

Calculations have been color-coded in instances where results become variables in subsequent calculations.

## 4.1. Calculation: Gross MDN Sample Concentration

{(Sample PA - Ave BB) / Slope} - {(Aliquot * BrCl RB) / 100} = ng Hg/aliquot (mL)

Sample PA = sample peak area (PA units)
Ave BB = average bubbler blank (PA units)
Slope = slope (PA units/ng)
Aliquot = volume of sample analyzed (mL)
BrCl RB = BrCl reagent blank value (ng/mL of preservative)
1/100 = correction for 1% preservation concentration

## 4.2. Calculation: Net MDN Sample Concentration

ng Hg/aliquot (mL) * mL / Sample Bottle = ng Hg/Sample Bottle

ng Hg/Sample Bottle – ng Hg/Quarterly Bottle Blank = net ng Hg/Sample Bottle

net ng Hg/Sample Bottle * (Sample Bottle / mL) * 1000 = net ng Hg/L

## 4.3. Calculation: MDN Deposition

(net ng Hg/L) * (precip vol (mL) / 120.0cm$^2$) * (1/1000mL) * (10000cm$^2$/m$^2$) = (ng/m$^2$)

*Alternatively, because there are 10000 cm$^2$ in 1m$^2$:*

(net ng Hg/L) * (precip vol (mL) / 120.0cm$^2$)*10 = (ng/m$^2$)

120.0cm$^2$ = Area of MDN Funnel
Precip volume (mL) = Precipitation Volume — see below

*The standard rain gauge (Belfort) is used for the precipitation volume when the rain gauge data has passed Quality Assurance.*

Precip volume (Rain Gauge (mL)) = Inches of Rain (rain gauge) * (825mL / Inch Belfort)

*When the standard rain gauge (Belfort) has not passed Quality Assurance, we use the Bottle Catch to calculate deposition (as long as the Event Recorder shows that the collector worked properly).*

Precip volume (Bottle Catch (mL)) = Total mL of sample captured in MDN Sample Bottle minus 20mL preservative

## 5. Analytical Run Sequence

HAL routinely includes the aforementioned QC samples in all of its analyses for the MDN project. The following bench sheet shows how these samples are arranged within a typical analysis day. For every set of ten samples analyzed, the sample set is preceded and superceded with a matrix duplicate, a matrix spike, ongoing calibration standard, and an ongoing calibration blank. In addition, after the twentieth sample an additional reference material sample is analyzed.

**MDN Precipitation Sample Analysis Lab Sheet**

FGS DATA SET ID:
MDN LAB DATA SET CODE:

Analysis Date:
Analyzer:
Analyst:

REVIEWER: DATE:

**Analytical Run** Trap Set:
D=Duplicate Analysis S=Sample Spike @ 1.00ng

| Run | Tp | Bub | HAL Code | Sample ID | PA | % BrCl | Aliquot Volume | THg per Aliquot | THg Conc (Net) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | | 4.00 ng | | | | | | |
| 2 | 2 | 2 | | 2.00 ng | | | | | | |
| 3 | 3 | 3 | | 1.00 ng | | | | | | |
| 4 | 4 | 4 | | 0.50 ng | | | | | | |
| 5 | 5 | 1 | | 0.05 ng | | | | | | |
| 6 | 6 | 2 | | BB-1 | | | | | | |
| 7 | 7 | 3 | | BB-2 | | | | | | |
| 8 | 8 | 4 | | BB-3 | | | | | | |
| 9 | 9 | 1 | | NIST1641d | | 2 | | | | |
| 10 | 10 | 2 | | BrCl-1 | | | | | | |
| 11 | 1 | 3 | | BrCl-2 | | | | | | |
| 12 | 2 | 4 | | BrCl-3 | | | | | | |
| 13 | 3 | 1 | | BB-4 | | | | | | |
| 14 | 4 | 2 | | Sample #1 | | | | | | |
| 15 | 5 | 3 | | Sample #1 D | | | | | | |
| 16 | 6 | 4 | | Sample #1 S | | | | | | |
| 17 | 7 | 1 | | Sample #2 | | | | | | |
| 18 | 8 | 2 | | Sample #3 | | | | | | |
| 19 | 9 | 3 | | Sample #4 | | | | | | |
| 20 | 10 | 4 | | Sample #5 | | | | | | |
| 21 | 1 | 1 | | Sample #6 | | | | | | |
| 22 | 2 | 2 | | Sample #7 | | | | | | |
| 23 | 3 | 3 | | Sample #8 | | | | | | |
| 24 | 4 | 4 | | Sample #9 | | | | | | |
| 25 | 5 | 1 | | Sample #10 | | | | | | |
| 26 | 6 | 2 | | 1.00 | | | | | | |
| 27 | 7 | 3 | | BB-5 | | | | | | |
| 28 | 8 | 4 | | Sample #11 | | | | | | |
| 29 | 9 | 3 | | Sample #12 | | | | | | |
| 30 | 10 | 4 | | Sample #13 | | | | | | |
| 31 | 1 | 1 | | Sample #14 | | | | | | |
| 32 | 2 | 2 | | Sample #15 | | | | | | |
| 33 | 3 | 3 | | Sample #16 | | | | | | |
| 34 | 4 | 4 | | Sample #17 | | | | | | |
| 35 | 5 | 1 | | Sample #18 | | | | | | |
| 36 | 6 | 2 | | Sample #19 | | | | | | |
| 37 | 7 | 3 | | Sample #20 | | | | | | |
| 38 | 8 | 4 | | Sample #11 D | | | | | | |
| 39 | 9 | 3 | | Sample #11 S | | | | | | |
| 40 | 10 | 4 | | 1.00 | | | | | | |
| 41 | 1 | 1 | | BB-6 | | | | | | |
| 42 | 2 | 2 | | NIST1641d | | | | | | |
| 43 | 3 | 3 | | Sample #21 | | | | | | |
| 44 | 4 | 4 | | Sample #22 | | | | | | |
| 45 | 5 | 1 | | Sample #23 | | | | | | |
| 46 | 6 | 2 | | etc... | | | | | | |
| 47 | 7 | 3 | | | | | | | | |
| 48 | 8 | 4 | | | | | | | | |
| 49 | 9 | 1 | | | | | | | | |
| 50 | 10 | 2 | | | | | | | | |
| 51 | 1 | 3 | | | | | | | | |
| 52 | 2 | 4 | | | | | | | | |
| 53 | 3 | 1 | | Sample #21 D | | | | | | |
| 54 | 4 | 2 | | Sample #21 S | | | | | | |
| 55 | 5 | 3 | | 1.00 | | | | | | |
| 56 | 6 | 4 | | BB-7 | | | | | | |

| Key |
|---|
| Reference materials |
| Preparation blanks |
| Matrix duplicates |
| Matrix spikes |
| Ongoing calibration |
| Ongoing calibration |

# 6. Proficiency Tests and Laboratory Intercomparisons

Proficiency tests (PT) and laboratory intercomparisons are an important part of the Quality Assurance Program. Each year, FGS completes at least four PTs representing a suite of trace metals in wastewater and solid waste matrices. While these studies are a requirement of accreditation, they are also a valuable tool for internal quality control.

## 6.1. Proficiency Tests

The following proficiency tests were completed by HAL during 2004. Results for these tests are available upon request.

Table 1

| | | |
|---|---|---|
| Non-Potable Water / Solid and Hazardous Waste Proficiency Study | New York Department of Health | 01/2004 |
| Water Pollution January 2004 | Analytical Products Group | 01/2004 |
| Water Pollution June 2004 | Analytical Products Group | 06/2004 |
| Water Pollution August 2004/DMR-QA 24 | Analytical Products Group | 08/2004 |
| Non-Potable Water / Solid and Hazardous Waste Proficiency Study | New York Department of Health | 07/2004 |

## 6.2. Laboratory Intercomparisons

HAL participates in a U.S. Geological Survey PE sample laboratory intercomparison program. This program is coordinated by the USGS.

FGS is also an invited participant in several domestic and international laboratory intercomparisons each year. Many intercomparison participants are fellow world leaders in mercury and trace metals analysis. While functionally similar to PTs, these studies often involve more complex matrices or additional analytes and while project-specific intercomparison studies are helpful for assessing interlaboratory comparability, they do not necessarily address individual laboratory accuracy, and are not designed to function as third party validation. For these reasons although FGS does provide proficiency test study results, clients are not provided with intercomparison study results.

The following laboratory intercomparison studies were completed by HAL during 2004.

Table 2

| | | |
|---|---|---|
| Trace Elements in Surface Waters and Total Mercury Study 83 Winter 2003 | National Water Research Institute | 01/2004 |
| 17th Intercomparison for Metals in Marine Sediments & Biological Tissues | National Research Council — Canada | 06/2004 |
| Standard Reference Sample Spring 2004 | United States Geological Survey | 02/2004 |
| Trace Elements in Surface Waters: Study FP84 | National Water Research Institute — Canada | 06/2004 |
| Mercury Round Robin HgRR5 | Florida Department of Environmental Protection | 08/2004 |
| Standard Reference Sample Fall 2004 | United States Geological Survey | 10/2004 |
| Trace Elements in Surface Waters and Total Mercury Study 85 Winter 2004 | National Water Research Institute | 12/2004 |

# 7. Field Quality Control

## 7.1. Field Bottle Blanks

### 7.1.1. Description

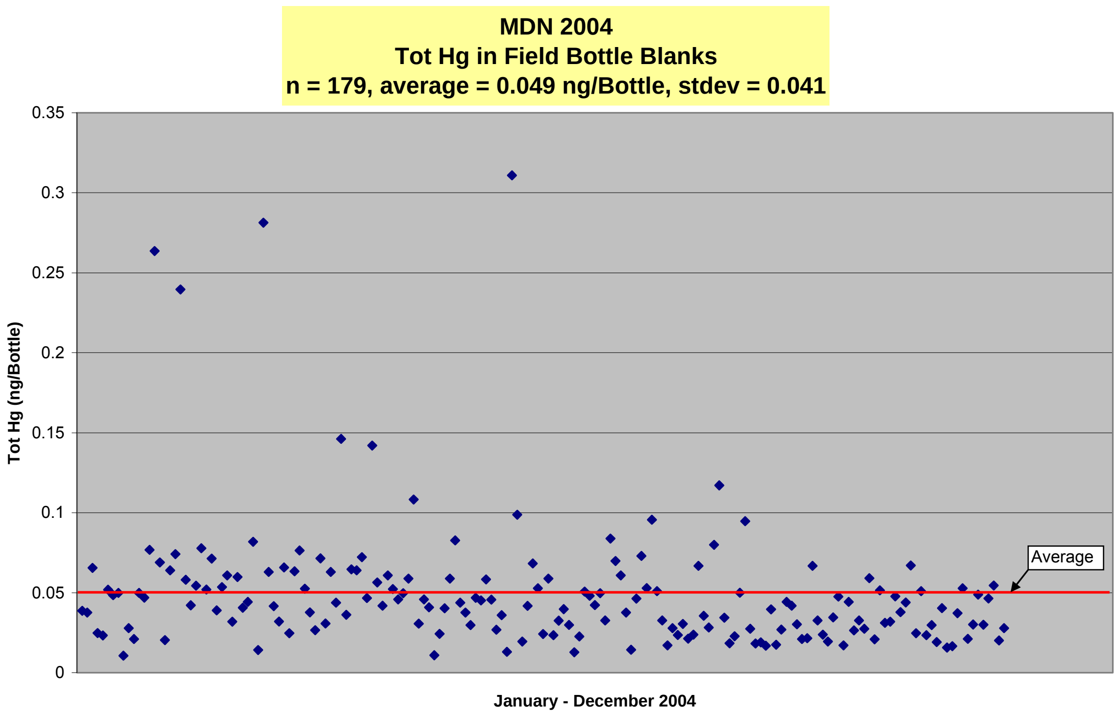
A field bottle blank has the same contents as a laboratory bottle blank. However, this blank is left exposed at the sampling site for the entire collection period without any collector openings. All field bottle blanks that maintain at least 15mL of the initial 20mL1% hydrochloric acid charge are then analyzed for total mercury.

### 7.1.2. Purpose

Outside of the controlled laboratory environment, ambient mercury levels increase and additional sample handling occurs. Because such contamination sources are inevitable, their contributions must be quantified so that they can be objectively subtracted from final sample results.

### 7.1.3. Discussion

In 2004, the mean of 179 Field Bottle Blanks was 0.049ng/bottle with a standard deviation of 0.041ng/bottle. This suggests that the MDN aerochem collector protects the sample train and bottle well and the field exposure is minimal.




## 7.2. Field System Blanks

### 7.2.1. Description

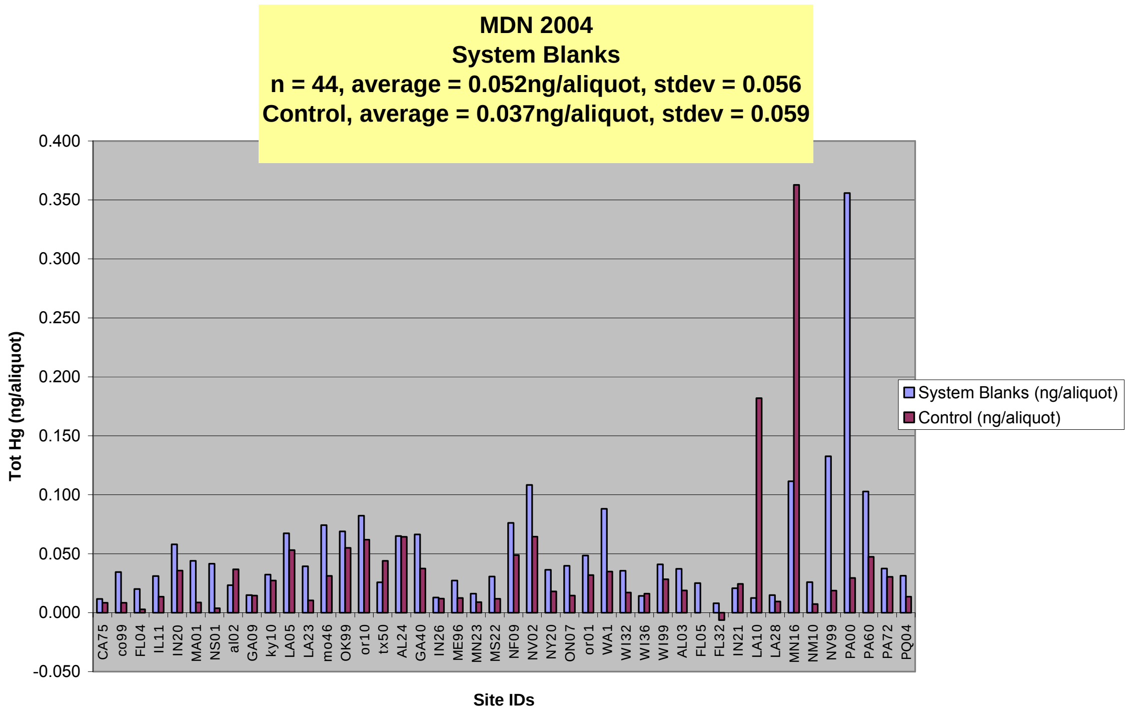
A field system blank is essentially a field bottle blank in which a solution is poured through the wet side collection sample train that was installed in the field for an entire week with no precipitation.

### 7.2.2. Purpose

This quality assurance program, conducted jointly by the U.S. Geological Survey and FGS, is intended to measure the effects of field exposure, handling, and processing on the chemistry of MDN precipitation samples.

### 7.2.3. Discussion

In 2004, the mean of 44 system blanks was 0.052ng/aliquot with a standard deviation of 0.056ng/aliquot. This again suggests that the MDN sample train is well protected.



## 8. Quality Rating Codes

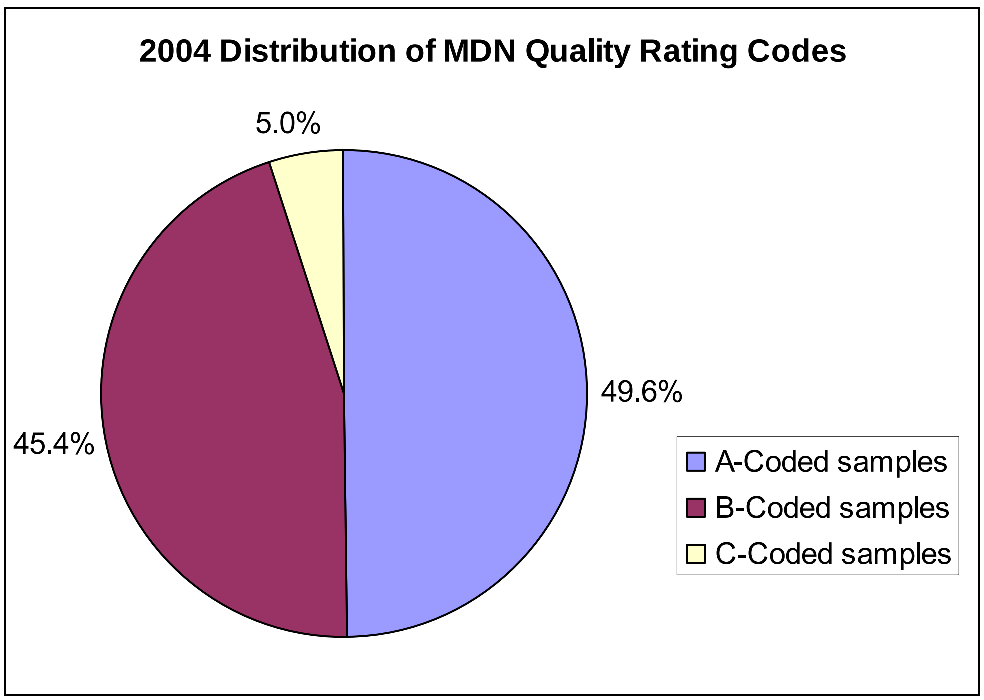
The quality rating code (QR) is designed as a user-friendly method to indicate the overall quality of each individual MDN data value. The MDN QR is modeled directly from the NADP AirMon QR. The QR code is what the general user of the final database will use in the evaluation of MDN data. This QR code is assigned by the computer program based on the results of the notes codes given to each MDN sample. A general description of each code follows.

A. Valid samples with no problems; contained only water; all sampling and laboratory protocols were followed; all required equipment was installed and operating properly.

B. Valid samples with minor problems; may have contaminants such as insects or other debris; there may be an exception to approved sampling or laboratory methods; required equipment may be lacking or not operating properly. The laboratory does not consider these problems sufficient to invalidate the data, but there is more uncertainty than for A data. These data are used along with A data to calculate average concentrations and deposition.

C. Invalid samples; major problems occurred; the laboratory does not have confidence in the data.

The HAL processed 4628 samples in 2004. 2297 samples received a QR code of A, 2100 received a B QR code, and 231 received a C QR code. FGS continued to maintain and demonstrate acceptable quality control in 2004.



# Appendix A

## Matrix Specific MDL Studies

# Matrix Specific MDL Study 1

**Objective** Determine the method detection limit (MDL) for total mercury in water using preservation method FGS 012 and analysis method FGS 069, and following the protocols outlined in 40 CFR 136. As detailed below, the MDL for total mercury in water was determined to be 0.096ng/L.

**Analytical Method** A calibration was performed according to FGS 069. Briefly, this method incorporates oxidation with the addition of BrCl, reduction of mercury in the sample aliquot with $SnCl_2$, analysis by purge and trap and dual amalgamation CVAFS. The MDL study consisted of the analysis of nine replicates of a waters sample spiked with 0.5ng/L mercury oxidized with 1% BrCl. The results of these measurements are found in the table below, as well in the raw data sheets (ID # THg9-050331-1). All results are reported uncorrected for the method blanks.

**MDL Calculation** Using 40 CFR 136, the MDL was calculated using the standard deviation of the spiked samples, with n=10 replicates (9 degrees of freedom). In this case, the t value of 2.821 was used in the following equation, where s is the standard deviation of the results obtained on samples spiked at a level near the MDL.

$$MDL = t*s$$

The MDL calculated from these data is (2.821)*(0.034), or 0.096ng/L.

## Total Mercury in Water (THg) MDL Study (CVAFS #9)
## March 31, 2005

| Sample | | THg (ng/L) | %Rec |
|---|---|---|---|
| method blank #1 | | 0.039 | - |
| method blank #2 | | 0.018 | - |
| method blank #3 | | 0.030 | - |
| | **Mean** | 0.029 | - |
| | **SD** | 0.011 | - |
| IPR-1(5.0 ng/L) | | 5.044 | 100.9 |
| IPR-2(5.0 ng/L) | | 4.995 | 99.9 |
| IPR-3(5.0 ng/L) | | 5.173 | 103.5 |
| IPR-4(5.0 ng/L) | | 5.144 | 102.9 |
| | **Mean** | 5.089 | 101.8 |
| | **SD** | 0.084 | 1.7 |
| MDL-1 (0.5 ng/L) | | 0.510 | 102.0 |
| MDL-2 (0.5 ng/L) | | 0.601 | 120.2 |
| MDL-3 (0.5 ng/L) | | 0.480 | 96.0 |
| MDL-4 (0.5 ng/L) | | 0.511 | 102.2 |
| MDL-5 (0.5 ng/L) | | 0.521 | 104.2 |
| MDL-6 (0.5 ng/L) | | 0.524 | 104.8 |
| MDL-7 (0.5 ng/L) | | 0.492 | 98.4 |
| MDL-8 (0.5 ng/L) | | 0.479 | 95.8 |
| MDL-9 (0.5 ng/L) | | 0.478 | 95.6 |
| MDL-10 (0.5 ng/L) | | 0.511 | 102.2 |
| | **Mean** | **0.511** | **102.1** |
| | **SD** | **0.034** | **6.9** |
| **NIST 1641d** | | **16.167** | **101.0** |
| certified value NIST 1641 d | | 16.010 | - |

## Matrix Specific MDL Study 2

**Objective** Determine the method detection limit (MDL) for total mercury in water using preservation method FGS 012 and analysis method FGS 069, and following the protocols outlined in 40 CFR 136. As detailed below, the MDL for total mercury in water was determined to be 0.055ng/L.

**Analytical Method** A calibration was performed according to FGS 069. Briefly, this method incorporates oxidation with the addition of BrCl, reduction of mercury in the sample aliquot with $SnCl_2$, analysis by purge and trap and dual amalgamation CVAFS. The MDL study consisted of the analysis of nine replicates of a waters sample spiked with 0.5ng/L mercury oxidized with 1% BrCl. The results of these measurements are found in the table below, as well in the raw data sheets (ID # THg9-050331-1). All results are reported uncorrected for the method blanks.

**MDL Calculation** Using 40 CFR 136, the MDL was calculated using the standard deviation of the spiked samples, with n=10 replicates (9 degrees of freedom). In this case, the t value of 2.896 was used in the following equation, where s is the standard deviation of the results obtained on samples spiked at a level near the MDL.

$$MDL = t*s$$

The MDL calculated from these data is (2.896)*(0.019), or 0.055ng/L.

### Total Mercury in Water (THg) MDL Study (CVAFS #10)
### March 31, 2005

| **Sample** | | **THg ( ng/L)** | **%Rec** |
|---|---|---|---|
| method blank #1 | | 0.040 | - |
| method blank #2 | | 0.062 | - |
| method blank #3 | | 0.035 | - |
| | **Mean** | 0.046 | - |
| | **SD** | 0.014 | - |
| IPR-1(5.0 ng/L) | | 5.020 | 100.4 |
| IPR-2(5.0 ng/L) | | 5.186 | 103.7 |
| IPR-3(5.0 ng/L) | | 5.129 | 102.6 |
| IPR-4(5.0 ng/L) | | 5.122 | 102.4 |
| | **Mean** | 5.114 | 102.3 |
| | **SD** | 0.069 | 1.4 |
| MDL-1 (0.5 ng/L) | | 0.542 | 108.4 |
| MDL-2 (0.5 ng/L) | | 0.480 | 96.0 |
| MDL-3 (0.5 ng/L) | | 0.533 | 106.6 |
| MDL-4 (0.5 ng/L) | | 0.510 | 102.0 |
| MDL-5 (0.5 ng/L) | | 0.517 | 103.4 |
| MDL-6 (0.5 ng/L) | | 0.514 | 102.8 |
| MDL-7 (0.5 ng/L) | | 0.547 | 109.4 |
| MDL-8 (0.5 ng/L) | | 0.524 | 104.8 |
| MDL-9 (0.5 ng/L) | | 0.515 | 103.0 |
| | **Mean** | 0.520 | 104.0 |
| | **SD** | 0.019 | 3.8 |
| **NIST 1641d** | | 15.853 | 99.0 |
| **certified value NIST 1641 d** | | 16.010 | - |

## Matrix Specific MDL Study 3

**Objective** Determine the method detection limit (MDL) for methyl mercury in water, using distillation method FGS 013, and following the protocols outlined in 40 CFR 136. As detailed below, the MDL for methylmercury in water was determined to be 0.015ng/L.

**Analytical Method** A calibration was performed according to FGS 070. Briefly, this method incorporates distillation followed by analysis utilizing aqueous phase ethylation, CV purge and trap, thermal desorption, GC separation, pyrolytic decomposition, and detection using CVAFS. The MDL study consisted of the distillation and analysis of nine waters spiked with 0.111ng/L of MHg. The results of these measurements are found in the table below, as well in the raw data sheets (ID # MHg1-050616-1). All results are reported uncorrected for the method blanks.

**MDL Calculation** Using 40 CFR 136, the MDL was calculated using the standard deviation of the spiked samples, with n=9 replicates (8 degrees of freedom). In this case, the t value of 2.896 was used in the following equation, where s is the standard deviation of the results obtained on samples spiked at a level near the MDL.

$$MDL = t*s$$

The MDL calculated from these data is (2.896)*(0.005), or 0.015ng/L.

### Methyl Mercury in Water (MHg) MDL Study (CV-GC-AFS #1)
### June 16, 2005

| **Sample** | | **MeHg (ng/L)** | **%Rec** |
|---|---|---|---|
| method blank #1 | | 0.019 | - |
| method blank #2 | | 0.017 | - |
| method blank #3 | | 0.014 | - |
| | **Mean** | 0.017 | - |
| | **SD** | 0.003 | - |
| MDL #1+ 0.111 ng/L | | 0.116 | 104.6 |
| MDL #2+ 0.111 ng/L | | 0.110 | 99.3 |
| MDL #3+ 0.111 ng/L | | 0.113 | 102.0 |
| MDL #4+ 0.111 ng/L | | 0.119 | 107.3 |
| MDL #5+ 0.111 ng/L | | 0.100 | 90.4 |
| MDL #6+ 0.111 ng/L | | 0.114 | 102.8 |
| MDL #7+ 0.111 ng/L | | 0.110 | 99.3 |
| MDL #8+ 0.111 ng/L | | 0.111 | 100.2 |
| MDL #9+ 0.111 ng/L | | 0.110 | 99.3 |
| | **Mean** | 0.112 | 100.6 |
| | **SD** | 0.005 | 0.0 |
| **DORM-2 (4470ug/L)** | | 4415 | 98.8 |

# Appendix B

## QC Summary Tables

**MDN Quarterly Analysis QC Summary, Quarter 1 of 2004**

| Analysis | Calibration | | BrCl Blk | SRM (Nist 1641-d) | | Duplicates | | Spikes | | Bottle Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | Conc | TV=8.005 ng/mL | %Rec | Bottle ID | RPD | Bottle ID | Rec. | Bottle ID | Conc |
| | CVAFS-10 | | | | | | | | | | |
| 2004-001 | 1/20/2004 | 0.99988 | 0.034 ng/L | 7.62 ng/mL | 95.2% | MDN2113 | 5.7% | MDN2113 | 102.3% | MDN0135 | 0.014 ng/Bottle |
| | CVAFS-9 | | | 7.70 ng/mL | 96.2% | MDN2203 | 0.5% | MDN2203 | 98.4% | | |
| | | | | | | MDN2439 | 0.3% | MDN2439 | 106.6% | | |
| 2004-002 | 1/20/2004 | 0.99989 | 0.042 ng/L | 7.38 ng/mL | 92.1% | MDN0774 | 0.8% | MDN0774 | 96.4% | MDN2498 | 0.020 ng/Bottle |
| | CVAFS-10 | | | 7.51 ng/mL | 93.8% | MDN0952 | 0.9% | MDN0952 | 97.4% | MDN2115 | 0.100 ng/Bottle |
| | | | | | | MDN2418 | 1.4% | MDN2418 | 88.9% | | |
| 2004-003 | 1/22/2004 | 0.99987 | 0.044 ng/L | 7.65 ng/mL | 95.6% | MDN0183 | 0.8% | MDN0183 | 101.1% | | |
| | CVAFS-9 | | | 7.42 ng/mL | 92.7% | MDN2321 | 0.9% | MDN2321 | 99.9% | | |
| | | | | | | MDN2443 | 1.1% | MDN2443 | 100.6% | | |
| 2004-004 | 1/22/2004 | 0.99996 | 0.038 ng/L | 7.65 ng/mL | 95.6% | MDN2014 | 0.1% | MDN2014 | 95.2% | | |
| | CVAFS-10 | | | 7.64 ng/mL | 95.4% | MDN2069 | 4.1% | MDN2069 | 98.1% | | |
| | | | | | | MDN2145 | 6.1% | MDN2145 | 88.4% | | |
| 2004-005 | 1/26/2004 | 0.99996 | 0.021 ng/L | 7.76 ng/mL | 97.0% | MDN0597 | 65.1% | MDN0597 | 258.7% | MDN2001 | 0.016 ng/Bottle |
| | CVAFS-9 | | | 7.32 ng/mL | 91.4% | MDN0819 | 2.5% | MDN0819 | 102.7% | MDN0283 | 0.059 ng/Bottle |
| | | | | | | MDN2048 | 0.3% | MDN2048 | 98.4% | | |
| | | | | | | MDN2275 | 2.3% | MDN2275 | 100.3% | | |
| 2004-006 | 1/26/2004 | 0.99999 | 0.039 ng/L | 7.65 ng/mL | 95.6% | MDN0680 | 0.5% | MDN0680 | 98.2% | MDN0943 | 0.027 ng/Bottle |
| | CVAFS-10 | | | 7.58 ng/mL | 94.7% | MDN2316 | 2.0% | MDN2316 | 93.9% | | |
| | | | | | | MDN2497 | 1.4% | MDN2497 | 101.2% | | |
| 2004-007 | 2/3/2004 | 0.99985 | 0.010 ng/L | 7.65 ng/mL | 95.6% | MDN0145 | 0.4% | MDN0145 | 101.8% | | |
| | CVAFS-9 | | | 7.72 ng/mL | 96.4% | MDN2127 | 0.9% | MDN2127 | 104.4% | | |
| | | | | | | MDN2402 | 0.9% | MDN2402 | 100.4% | | |
| 2004-008 | 2/2/2004 | 0.99998 | 0.026 ng/L | 7.45 ng/mL | 93.0% | MDN0156 | 4.6% | MDN0156 | 94.3% | MDN1943 | 0.027 ng/Bottle |
| | CVAFS-10 | | | 7.33 ng/mL | 91.6% | MDN2361 | 14.5% | MDN2361 | 97.2% | MDN0187 | 0.023 ng/Bottle |
| | | | | | | MDN2375 | 4.6% | MDN2375 | 104.4% | | |
| 2004-009 | 2/3/2004 | 0.99950 | 0.025 ng/L | 7.75 ng/mL | 96.9% | MDN1739 | 6.0% | MDN1739 | 100.5% | | |
| | CVAFS-10 | | | 7.34 ng/mL | 91.7% | MDN2383 | 5.1% | MDN2383 | 101.7% | | |
| | | | | | | MDN2401 | 1.0% | MDN2401 | 91.4% | | |
| 2004-010 | 2/4/2004 | 0.99898 | 0.024 ng/L | 7.20 ng/mL | 90.0% | MDN2122 | 3.9% | MDN2122 | 98.6% | | |
| | CVAFS-9 | | | 7.64 ng/mL | 95.4% | MDN2352 | 1.5% | MDN2352 | 98.7% | | |
| | | | | | | MDN3009 | 1.3% | MDN3009 | 94.9% | | |
| 2004-011 | 2/10/2004 | 0.99999 | 0.029 ng/L | 7.52 ng/mL | 93.9% | MDN1969 | 0.2% | MDN1969 | 99.6% | MDN0141 | 0.014 ng/Bottle |
| | CVAFS-9 | | | 7.50 ng/mL | 93.7% | MDN2028 | 0.3% | MDN2028 | 98.5% | MDN2115 | 0.021 ng/Bottle |
| | | | | | | MDN2534 | 0.3% | MDN2534 | 99.5% | | |
| 2004-012 | 2/10/2004 | 0.99998 | 0.034 ng/L | 7.63 ng/mL | 95.3% | MDN0163 | 7.7% | MDN0163 | 92.2% | | |
| | CVAFS-10 | | | | | | | | | | |
| 2004-013 | 2/16/2004 | 0.99968 | 0.025 ng/L | 7.48 ng/mL | 93.4% | MDN0915 | 6.1% | MDN0915 | 97.2% | | |
| | CVAFS-10 | | | 7.22 ng/mL | 90.2% | MDN2049 | 3.5% | MDN2049 | 86.9% | | |
| | | | | | | MDN2523 | 3.3% | MDN2523 | 98.4% | | |
| 2004-014 | 2/18/2004 | 0.99997 | 0.028 ng/L | 7.56 ng/mL | 94.5% | MDN2246 | 4.6% | MDN2246 | 95.5% | MDN2395 | 0.020 ng/Bottle |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CVAFS-9 | | | 7.74 ng/mL | 96.6% | MDN2313 | 2.1% | MDN2313 | 95.2% | | |
| | | | | | | MDN2397 | 3.6% | MDN2397 | 95.0% | | |
| 2004-015 | 2/18/2004 | 0.99997 | 0.022 ng/L | 7.71 ng/mL | 96.3% | MDN0910 | 3.8% | MDN0910 | 99.8% | | |
| | CVAFS-10 | | | 7.54 ng/mL | 94.2% | MDN2358 | 0.4% | MDN2358 | 98.6% | | |
| | | | | | | MDN2430 | 3.7% | MDN2430 | 101.7% | | |
| 2004-016 | 2/20/2004 | 0.99999 | 0.045 ng/L | 7.68 ng/mL | 95.9% | MDN0177 | 0.7% | MDN0177 | 94.1% | MDN2391 | 0.057 ng/Bottle |
| | CVAFS-9 | | | 7.58 ng/mL | 94.7% | MDN1913 | 0.6% | MDN1913 | 95.3% | MDN0425 | 0.095 ng/Bottle |
| | | | | | | MDN1996 | 0.7% | MDN1996 | 99.9% | | |
| 2004-017 | 2/20/2004 | 0.99989 | 0.040 ng/L | 7.96 ng/mL | 99.5% | MDN0683 | 7.2% | MDN0683 | 97.2% | MDN2028 | 0.013 ng/Bottle |
| | CVAFS-10 | | | 7.53 ng/mL | 94.0% | MDN2085 | 5.0% | MDN2085 | 100.8% | | |
| | | | | | | MDN2370 | 0.4% | MDN2370 | 90.8% | | |
| 2004-018 | 2/25/2004 | 0.99998 | 0.038 ng/L | 7.72 ng/mL | 96.4% | MDN0487 | 1.0% | MDN0487 | 99.3% | | |
| | CVAFS-9 | | | 7.52 ng/mL | 93.9% | MDN0976 | 3.2% | MDN0976 | 103.5% | | |
| | | | | | | MDN2107 | 1.3% | MDN2107 | 91.0% | | |
| | | | | | | MDN2470 | 4.6% | | | | |
| 2004-019 | 2/27/2004 | 0.99912 | 0.105 ng/L | 7.51 ng/mL | 93.9% | MDN2105 | 0.4% | MDN2105 | 89.8% | | |
| | CVAFS-9 | | | 7.72 ng/mL | 96.4% | MDN2324 | 2.3% | MDN2324 | 93.0% | | |
| | | | | | | MDN2421 | 2.0% | MDN2421 | 101.3% | | |
| 2004-020 | 2/27/2004 | 0.99958 | 0.037 ng/L | 7.64 ng/mL | 95.5% | MDN2158 | 2.2% | MDN2158 | 96.6% | MDN0735 | 0.020 ng/Bottle |
| | CVAFS-10 | | | 7.63 ng/mL | 95.3% | MDN2263 | 0.6% | MDN2263 | 104.3% | | |
| | | | | | | MDN2400 | 1.4% | MDN2400 | 101.6% | | |
| 2004-021 | 3/2/2004 | 0.99972 | 0.025 ng/L | 7.88 ng/mL | 98.5% | MDN0266 | 2.9% | MDN0266 | 99.6% | | |
| | CVAFS-9 | | | 7.07 ng/mL | 88.4% | MDN2195 | 2.9% | MDN2195 | 98.8% | | |
| | | | | | | MDN2514 | 6.8% | MDN2514 | 98.8% | | |
| 2004-022 | 3/2/2004 | 0.99982 | 0.052 ng/L | 7.80 ng/mL | 97.4% | MDN2153 | 2.0% | MDN2153 | 96.8% | MDN1910 | 0.016 ng/Bottle |
| | CVAFS-10 | | | 7.56 ng/mL | 94.4% | MDN2457 | 1.4% | MDN2457 | 92.4% | | |
| | | | | | | MDN3003 | 2.9% | MDN3003 | 99.9% | | |
| 2004-023 | 3/10/2004 | 0.99899 | 0.021 ng/L | 7.64 ng/mL | 95.4% | MDN0832 | 1.3% | MDN0832 | 100.5% | | |
| | CVAFS-10 | | | 7.68 ng/mL | 96.0% | MDN0909 | 2.0% | MDN0909 | 97.9% | | |
| | | | | | | MDN2438 | 0.3% | MDN2438 | 95.4% | | |
| 2004-024 | 3/16/2004 | 0.99911 | 0.047 ng/L | 7.50 ng/mL | 93.7% | MDN2142 | 0.4% | MDN2142 | 99.3% | | |
| | CVAFS-9 | | | 7.78 ng/mL | 97.2% | MDN2321 | 3.6% | MDN2321 | 99.9% | | |
| | | | | | | MDN2399 | 0.3% | MDN2399 | 100.2% | | |
| 2004-025 | 3/18/2004 | 0.99949 | 0.012 ng/L | 7.72 ng/mL | 96.5% | MDN2192 | 2.8% | MDN2192 | 100.5% | MDN0925 | 0.035 ng/Bottle |
| | CVAFS-10 | | | 7.53 ng/mL | 94.0% | MDN2277 | 2.2% | MDN2277 | 100.4% | MDN2292 | 0.006 ng/Bottle |
| | | | | | | MDN2295 | 3.3% | MDN2295 | 96.8% | | |
| 2004-026 | 3/17/2004 | 0.99956 | 0.029 ng/L | 8.12 ng/mL | 101.4% | MDN2280 | 4.1% | MDN2280 | 85.9% | | |
| | CVAFS-10 | | | | | | | | | | |
| 2004-027 | 3/21/2004 | 0.99940 | 0.043 ng/L | 7.36 ng/mL | 91.9% | MDN0437 | 2.6% | MDN0437 | 90.9% | | |
| | CVAFS-9 | | | 6.81 ng/mL | 85.1% | MDN2331 | 3.9% | MDN2331 | 87.7% | | |
| | | | | | | MDN2553 | 8.1% | MDN2553 | 88.1% | | |
| 2004-028 | 3/21/2004 | 0.99937 | 0.070 ng/L | 7.71 ng/mL | 96.4% | MDN2110 | 3.3% | MDN2110 | 96.0% | MDN2520 | 0.064 ng/Bottle |
| | CVAFS-10 | | | 7.41 ng/mL | 92.5% | MDN2353 | 2.7% | MDN2353 | 100.3% | | |
| | | | | | | MDN2451 | 0.4% | MDN2451 | 99.7% | | |
| 2004-029 | 3/29/2004 | 0.99990 | 0.032 ng/L | 7.79 ng/mL | 97.3% | MDN0739 | 12.4% | MDN0739 | 100.5% | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | CVAFS-9 | | | 7.12 ng/mL | 88.9% | MDN2275 | 0.5% | MDN2275 | 88.8% | | |
| | | | | | | MDN2522 | 9.5% | MDN2522 | 102.1% | | |
| 2004-030 | 3/29/2004 | 0.99916 | 0.064 ng/L | 7.70 ng/mL | 96.2% | MDN0862 | 0.4% | MDN0862 | 97.2% | MDN0146 | 0.025 ng/Bottle |
| | CVAFS-10 | | | 7.77 ng/mL | 97.1% | MDN2086 | 3.2% | MDN2086 | 100.1% | | |
| | | | | | | MDN2201 | 0.8% | MDN2201 | 100.4% | | |
| 2004-031 | 3/31/2004 | 0.99985 | 0.025 ng/L | 7.69 ng/mL | 96.1% | MDN1756 | 2.6% | MDN1756 | 97.0% | | |
| | CVAFS-10 | | | 7.54 ng/mL | 94.1% | MDN2409 | 0.3% | MDN2409 | 98.3% | | |
| | | | | | | MDN2439 | 2.3% | MDN2439 | 94.4% | | |
| 2004-032 | 3/30/2004 | 0.99967 | -0.050 ng/L | 7.66 ng/mL | 95.7% | MDN0783 | 3.3% | MDN0783 | 100.5% | | |
| | CVAFS-10 | | | 7.77 ng/mL | 97.0% | MDN2261 | 2.8% | MDN2261 | 99.1% | | |
| | | | | | | MDN2308 | 0.9% | MDN2308 | 102.7% | | |
| 2004-033 | 3/31/2004 | 0.99998 | 0.021 ng/L | 7.71 ng/mL | 96.3% | MDN0405 | 0.3% | MDN0405 | 96.4% | | |
| | CVAFS-9 | | | 7.35 ng/mL | 91.9% | MDN1987 | 3.3% | MDN1987 | 90.3% | | |
| | | | | | | MDN2103 | 0.8% | MDN2103 | 98.6% | | |
| 2004-158 | 1/3/2004 | 0.99998 | 0.034 ng/L | 7.77 ng/mL | 97.1% | MDN0677 | 2.1% | MDN0677 | 92.6% | MDN2697 | 0.010 ng/Bottle |
| | CVAFS-9 | | | 7.76 ng/mL | 97.0% | MDN2103 | 6.9% | MDN2103 | 95.1% | | |
| | | | | | | MDN2170 | 0.1% | MDN2170 | 99.7% | | |
| 3004-012 | 2/16/2004 | 0.99998 | 0.028 ng/L | 7.67 ng/mL | 95.8% | MDN0132 | 0.2% | MDN0132 | 98.4% | | |
| | CVAFS-9 | | | 7.69 ng/mL | 96.1% | MDN2437 | 0.2% | MDN2437 | 95.9% | | |
| | | | | | | MDN2545 | 1.5% | MDN2545 | 99.6% | | |
| 3004-026 | 3/19/2004 | 0.99990 | 0.034 ng/L | 7.75 ng/mL | 96.8% | MDN0419 | 1.9% | MDN0419 | 99.0% | | |
| | CVAFS-10 | | | | | MDN0731 | 8.1% | MDN0731 | 97.4% | | |
| | Quarterly Mean: | 0.99974 | 0.032 ng/L | | 95.0% | | 3.4% | | 99.5% | | 0.036 ng/Bottle |
| | Std Dev: | ±0.00029 | ±0.021 | | ±2.6% | | ±6.2% | | ±14.9% | | ±0.031 |

**MDN Quarterly Analysis QC Summary, Quarter 2 of 2004**

| Analysis | | Calibration R | BrCl Blk Conc | SRM (Nist 1641-d) TV=8.005 ng/mL | %Rec | Duplicates Bottle ID | RPD | Spikes Bottle ID | Rec. | Bottle Blanks Bottle ID | Conc |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004-034 | 4/4/2004 | 0.99984 | 0.107 ng/L | 7.73 ng/mL | 96.5% | MDN0716 | 0.1% | MDN0716 | 98.6% | | |
| | CVAFS-9 | | | 7.46 ng/mL | 93.2% | MDN0750 | 1.8% | MDN0750 | 96.6% | | |
| | | | | | | MDN2099 | 2.6% | MDN2099 | 95.9% | | |
| 2004-035 | 4/4/2004 | 0.99952 | 0.055 ng/L | 7.60 ng/mL | 95.0% | MDN0683 | 3.8% | MDN0683 | 96.1% | MDN2284 | 0.024 ng/Bottle |
| | CVAFS-10 | | | 7.51 ng/mL | 93.9% | MDN1928 | 1.0% | MDN1928 | 97.5% | MDN0953 | 0.021 ng/Bottle |
| | | | | | | MDN2269 | 0.1% | MDN2269 | 101.0% | | |
| | | | | | | | | MDN2319 | 194.8% | | |
| 2004-036 | 4/8/2004 | 0.99995 | 0.027 ng/L | 7.79 ng/mL | 97.3% | MDN0847 | 2.8% | MDN0847 | 101.6% | MDN0427 | 0.021 ng/Bottle |
| | CVAFS-9 | | | 7.51 ng/mL | 93.8% | MDN1981 | 0.6% | MDN1981 | 98.5% | | |
| | | | | | | MDN2317 | 10.1% | MDN2317 | 96.9% | | |
| 2004-037 | 4/8/2004 | 0.99975 | 0.015 ng/L | 7.69 ng/mL | 96.1% | MDN2344 | 1.2% | MDN2344 | 101.6% | MDN2206 | 0.012 ng/Bottle |
| | CVAFS-10 | | | 7.31 ng/mL | 91.4% | MDN2358 | 7.0% | MDN2358 | 98.0% | | |
| | | | | | | MDN2481 | 5.7% | MDN2481 | 95.6% | | |
| 2004-038 | 4/20/2004 | 0.99997 | 0.011 ng/L | 7.70 ng/mL | 96.2% | MDN0896 | 5.1% | MDN0896 | 103.1% | | |
| | CVAFS-9 | | | 7.69 ng/mL | 96.0% | MDN1759 | 0.5% | MDN1759 | 96.8% | | |
| | | | | | | MDN2129 | 18.1% | MDN2129 | 102.4% | | |
| 2004-039 | 4/19/2004 | 0.99976 | 0.029 ng/L | 7.62 ng/mL | 95.2% | MDN0795 | 6.5% | MDN0795 | 93.1% | MDN0898 | 0.032 ng/Bottle |
| | CVAFS-10 | | | 7.51 ng/mL | 93.8% | MDN0899 | 10.8% | MDN0899 | 102.7% | | |
| | | | | | | MDN2181 | 1.7% | MDN2181 | 100.2% | | |
| 2004-040 | 4/20/2004 | 0.99939 | 0.025 ng/L | 7.86 ng/mL | 98.2% | MDN0267 | 0.5% | MDN0267 | 104.5% | | |
| | CVAFS-10 | | | 7.84 ng/mL | 98.0% | MDN2051 | 4.9% | MDN2051 | 101.6% | | |
| | | | | | | MDN2131 | 0.3% | MDN2131 | 97.9% | | |
| 2004-041 | 4/22/2004 | 0.99987 | 0.034 ng/L | 7.64 ng/mL | 95.4% | MDN1929 | 16.5% | MDN1929 | 104.2% | MDN1742 | 0.093 ng/Bottle |
| | CVAFS-9 | | | 7.70 ng/mL | 96.1% | MDN2463 | 7.5% | MDN2463 | 102.0% | | |
| | | | | | | MDN2555 | 2.6% | MDN2555 | 98.4% | | |
| 2004-042 | 4/22/2004 | 0.99969 | 0.012 ng/L | 7.76 ng/mL | 97.0% | MDN0640 | 1.6% | MDN0640 | 99.6% | | |
| | CVAFS-10 | | | 7.90 ng/mL | 98.7% | MDN0844 | 0.7% | MDN0844 | 100.6% | | |
| | | | | | | MDN2524 | 0.5% | MDN2524 | 101.5% | | |
| 2004-043 | 4/29/2004 | 0.99993 | 0.036 ng/L | 7.77 ng/mL | 97.1% | MDN1953 | 2.9% | MDN1953 | 96.6% | | |
| | CVAFS-9 | | | 7.42 ng/mL | 92.7% | MDN2379 | 0.4% | MDN2379 | 98.5% | | |
| | | | | | | MDN2443 | 1.0% | MDN2443 | 96.2% | | |
| 2004-044 | 4/23/2004 | 0.99993 | 0.038 ng/L | 7.75 ng/mL | 96.8% | MDN0492 | 0.9% | MDN0492 | 104.4% | MDN2143 | 0.028 ng/Bottle |
| | CVAFS-9 | | | 7.83 ng/mL | 97.8% | MDN0802 | 1.8% | MDN0802 | 99.7% | | |
| | | | | | | MDN1921 | 1.5% | MDN1921 | 103.2% | | |
| 2004-045 | 4/23/2004 | 0.99998 | 0.042 ng/L | 7.65 ng/mL | 95.5% | MDN0225 | 1.2% | MDN0225 | 95.3% | | |
| | CVAFS-10 | | | 7.79 ng/mL | 97.3% | MDN2043 | 3.1% | MDN2043 | 93.1% | | |
| | | | | | | MDN2490 | 1.5% | MDN2490 | 103.5% | | |
| 2004-046 | 4/29/2004 | 0.99955 | 0.037 ng/L | 7.88 ng/mL | 98.5% | MDN0255 | 8.2% | MDN0255 | 104.4% | | |
| | CVAFS-10 | | | 7.63 ng/mL | 95.3% | MDN2445 | 2.7% | MDN2445 | 108.2% | | |
| | | | | | | MDN2509 | 0.7% | MDN2509 | 96.1% | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004-047 | 5/3/2004 | 0.99999 | 0.046 ng/L | 7.77 ng/mL | 97.0% | MDN0656 | 1.1% | MDN0656 | 99.5% | MDN1974 | 0.028 ng/Bottle |
| | CVAFS-9 | | | 7.59 ng/mL | 94.8% | MDN0740 | 1.9% | MDN0740 | 97.0% | | |
| | | | | | | MDN2049 | 0.6% | MDN2049 | 110.7% | | |
| 2004-048 | 5/3/2004 | 0.99960 | 0.046 ng/L | 7.82 ng/mL | 97.7% | MDN0633 | 0.2% | MDN0633 | 99.4% | MDN2263 | 0.022 ng/Bottle |
| | CVAFS-10 | | | 7.77 ng/mL | 97.1% | MDN2310 | 2.1% | MDN2310 | 108.6% | | |
| | | | | | | MDN3007 | 3.2% | MDN3007 | 98.9% | | |
| 2004-049 | 5/6/2004 | 0.99998 | 0.010 ng/L | 7.83 ng/mL | 97.8% | MDN0120 | 0.4% | MDN0120 | 94.5% | | |
| | CVAFS-9 | | | 7.46 ng/mL | 93.2% | MDN2295 | 0.8% | MDN2295 | 96.7% | | |
| | | | | | | MDN2529 | 0.1% | MDN2529 | 96.8% | | |
| 2004-050 | 5/13/2004 | 0.99996 | 0.030 ng/L | 7.67 ng/mL | 95.9% | MDN0085 | 0.4% | MDN0085 | 97.0% | | |
| | CVAFS-9 | | | 7.60 ng/mL | 94.9% | MDN2127 | 0.4% | MDN2127 | 99.4% | | |
| | | | | | | MDN2195 | 1.7% | MDN2195 | 97.9% | | |
| 2004-051 | 5/13/2004 | 0.99998 | 0.015 ng/L | 7.63 ng/mL | 95.3% | MDN0448 | 1.1% | MDN0448 | 109.4% | MDN2234 | 0.034 ng/Bottle |
| | CVAFS-10 | | | 7.52 ng/mL | 94.0% | MDN2275 | 3.4% | MDN2275 | 92.9% | | |
| | | | | | | MDN2527 | 2.5% | MDN2527 | 89.0% | | |
| 2004-052 | 5/20/2004 | 0.99992 | 0.035 ng/L | 7.99 ng/mL | 99.8% | MDN1931 | 0.2% | MDN1931 | 102.2% | | |
| | CVAFS-9 | | | 7.79 ng/mL | 97.3% | MDN2137 | 7.3% | MDN2137 | 103.2% | | |
| | | | | | | MDN2334 | 18.0% | MDN2334 | 107.2% | | |
| 2004-053 | 5/20/2004 | 0.99958 | -0.009 ng/L | 8.09 ng/mL | 101.1% | MDN1996 | 0.7% | MDN1996 | 102.0% | | |
| | CVAFS-10 | | | 8.01 ng/mL | 100.1% | MDN2121 | 7.0% | MDN2121 | 102.0% | | |
| | | | | | | MDN2302 | 5.2% | MDN2302 | 107.8% | | |
| 2004-054 | 5/21/2004 | 0.99989 | -0.008 ng/L | 7.85 ng/mL | 98.0% | MDN0735 | 2.7% | MDN0735 | 98.5% | | |
| | CVAFS-9 | | | 8.00 ng/mL | 99.9% | MDN0847 | 0.3% | MDN0847 | 101.6% | | |
| | | | | | | MDN2454 | 2.9% | MDN2454 | 95.1% | | |
| 2004-055 | 5/21/2004 | 0.99974 | 0.011 ng/L | 7.13 ng/mL | 89.0% | MDN0256 | 8.3% | MDN0256 | 100.7% | MDN2473 | 0.027 ng/Bottle |
| | CVAFS-10 | | | 7.79 ng/mL | 97.3% | MDN2202 | 3.8% | MDN2202 | 97.5% | | |
| | | | | | | MDN2227 | 0.1% | MDN2227 | 101.2% | | |
| 2004-056 | 5/25/2004 | 0.99980 | 0.073 ng/L | 7.58 ng/mL | 94.7% | MDN2031 | 9.2% | MDN2031 | 105.8% | | |
| | CVAFS-9 | | | 6.60 ng/mL | 82.4% | MDN2319 | 5.5% | MDN2319 | 114.7% | | |
| | | | | 7.79 ng/mL | 97.4% | MDN2358 | 3.2% | MDN2358 | 96.6% | | |
| 2004-057 | 5/25/2004 | 0.99995 | 0.059 ng/L | 7.99 ng/mL | 99.9% | MDN0020 | 2.4% | MDN0020 | 102.7% | MDN2441 | 0.077 ng/Bottle |
| | CVAFS-10 | | | 7.68 ng/mL | 96.0% | MDN0493 | 0.4% | MDN0493 | 100.1% | | |
| | | | | | | MDN2364 | 0.9% | MDN2364 | 98.6% | | |
| 2004-058 | 5/27/2004 | 0.99998 | 0.113 ng/L | 7.62 ng/mL | 95.2% | MDN2129 | 2.9% | MDN2129 | 88.6% | MDN1972 | 0.045 ng/Bottle |
| | CVAFS-10 | | | 7.63 ng/mL | 95.3% | MDN2342 | 4.0% | MDN2342 | 97.6% | MDN2277 | 0.033 ng/Bottle |
| | | | | | | MDN2482 | 0.7% | MDN2482 | 100.9% | MDN0448 | 0.027 ng/Bottle |
| 2004-059 | 6/2/2004 | 0.99991 | 0.104 ng/L | 7.69 ng/mL | 96.1% | MDN0289 | 3.9% | MDN0289 | 97.2% | | |
| | CVAFS-9 | | | 7.66 ng/mL | 95.7% | MDN0421 | 1.2% | MDN0421 | 94.8% | | |
| | | | | | | MDN1989 | 1.0% | MDN1989 | 96.1% | | |
| 2004-060 | 6/2/2004 | 0.99997 | 0.067 ng/L | 7.67 ng/mL | 95.8% | MDN2160 | 4.9% | MDN2160 | 83.5% | | |
| | CVAFS-10 | | | 7.56 ng/mL | 94.5% | MDN2530 | 2.4% | MDN2530 | 99.8% | | |
| | | | | | | MDN2546 | 0.9% | MDN2546 | 97.3% | | |
| 2004-061 | 6/3/2004 | 0.99986 | 0.057 ng/L | 7.79 ng/mL | 97.4% | MDN0716 | 0.4% | MDN0716 | 97.6% | | |
| | CVAFS-9 | | | 7.77 ng/mL | 97.0% | MDN2184 | 0.1% | MDN2184 | 103.1% | | |
| | | | | | | MDN2523 | 2.8% | MDN2523 | 99.6% | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004-062 | 6/8/2004 | 0.99994 | 0.066 ng/L | 7.67 ng/mL | 95.8% | MDN0861 | 2.7% | MDN0861 | 98.3% | | |
| | CVAFS-9 | | | 7.42 ng/mL | 92.7% | MDN0954 | 0.8% | MDN0954 | 96.4% | | |
| | | | | | | MDN2539 | 1.5% | MDN2539 | 96.4% | | |
| 2004-063 | 6/8/2004 | 0.99994 | 0.051 ng/L | 7.75 ng/mL | 96.8% | MDN0494 | 0.8% | MDN0494 | 93.3% | | |
| | CVAFS-10 | | | 7.68 ng/mL | 95.9% | MDN0689 | 3.0% | MDN0689 | 98.0% | | |
| | | | | | | MDN0822 | 5.5% | MDN0822 | 98.5% | | |
| 2004-064 | 6/14/2004 | 0.99996 | 0.060 ng/L | 7.64 ng/mL | 95.4% | MDN0187 | 1.1% | MDN0187 | 97.3% | MDN2254 | 0.036 ng/Bottle |
| | CVAFS-10 | | | 7.55 ng/mL | 94.3% | MDN0292 | 0.7% | MDN0292 | 94.4% | MDN2048 | 0.035 ng/Bottle |
| | | | | | | MDN1927 | 3.5% | MDN1927 | 83.3% | | |
| 2004-065 | 6/15/2004 | 0.99981 | 0.080 ng/L | 7.58 ng/mL | 94.7% | MDN0945 | 3.3% | MDN0945 | 79.5% | MDN2246 | 0.024 ng/Bottle |
| | CVAFS-9 | | | 7.08 ng/mL | 88.4% | MDN2157 | 3.7% | MDN2157 | 95.6% | MDN1964 | 0.037 ng/Bottle |
| | | | | | | MDN2158 | 1.6% | MDN2158 | 88.4% | | |
| 2004-066 | 6/15/2004 | 0.99998 | 0.066 ng/L | 7.62 ng/mL | 95.2% | MDN0661 | 2.1% | MDN0661 | 100.8% | MDN2640 | 0.050 ng/Bottle |
| | CVAFS-10 | | | 7.13 ng/mL | 89.1% | MDN1760 | 0.4% | MDN1760 | 98.3% | | |
| | | | | | | MDN2163 | 1.8% | MDN2163 | 92.4% | | |
| 2004-067 | 6/16/2004 | 0.99997 | 0.043 ng/L | 7.70 ng/mL | 96.2% | MDN0816 | 0.2% | MDN0816 | 96.3% | | |
| | CVAFS-10 | | | 7.71 ng/mL | 96.3% | MDN1913 | 3.7% | MDN1913 | 103.3% | | |
| | | | | | | MDN2408 | 2.9% | MDN2408 | 90.2% | | |
| 2004-068 | 6/18/2004 | 0.99996 | 0.073 ng/L | 7.69 ng/mL | 96.1% | MDN0199 | 2.8% | MDN0199 | 94.1% | | |
| | CVAFS-10 | | | 7.57 ng/mL | 94.6% | MDN0288 | 0.4% | MDN0288 | 94.7% | | |
| | | | | | | MDN2490 | 1.6% | MDN2490 | 100.2% | | |
| 2004-069 | 6/22/2004 | 0.99996 | 0.061 ng/L | 7.74 ng/mL | 96.7% | MDN0663 | 2.1% | MDN0663 | 101.3% | MDN1989 | 0.036 ng/Bottle |
| | CVAFS-10 | | | 7.72 ng/mL | 96.5% | MDN0741 | 0.7% | MDN0741 | 88.6% | | |
| | | | | | | MDN0774 | 0.1% | MDN0774 | 95.3% | | |
| 2004-070 | 6/23/2004 | 0.99995 | 0.061 ng/L | 7.65 ng/mL | 95.6% | MDN0676 | 0.2% | MDN0676 | 96.6% | MDN2382 | 0.046 ng/Bottle |
| | CVAFS-10 | | | 7.52 ng/mL | 93.9% | MDN2301 | 1.1% | MDN2301 | 97.2% | | |
| | | | | | | MDN2422 | 2.0% | MDN2422 | 92.1% | | |
| Quarterly Mean: | | 0.99986 | 0.045 ng/L | | 95.7% | | 2.8% | | 99.3% | | 0.036 ng/Bottle |
| Std Dev: | | ±0.00015 | ±0.029 | | ±2.8% | | ±3.4% | | ±10.5% | | ±0.018 |

**MDN Quarterly Analysis QC Summary, Quarter 3 of 2004**

| Analysis | | Calibration R | BrCl Blk Conc | SRM (Nist 1641-d) TV=8.005 ng/mL | %Rec | Duplicates Bottle ID | RPD | Spikes Bottle ID | Rec. | Bottle Blanks Bottle ID | Conc |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **2004-071** | 7/1/2004 | 0.99948 | 0.080 ng/L | 7.92 ng/mL | 99.0% | MDN0638 | 2.7% | MDN0638 | 92.6% | | |
| | CVAFS-9 | | | 7.33 ng/mL | 91.5% | MDN0640 | 1.7% | MDN0640 | 95.6% | | |
| | | | | | | MDN0655 | 0.1% | MDN0655 | 106.9% | | |
| **2004-072** | 7/1/2004 | 0.99992 | 0.075 ng/L | 7.64 ng/mL | 95.5% | MDN1950 | 3.8% | MDN1950 | 99.2% | | |
| | CVAFS-10 | | | 7.63 ng/mL | 95.3% | MDN2329 | 1.2% | MDN2329 | 96.4% | | |
| | | | | | | MDN2379 | 0.4% | MDN2379 | 93.7% | | |
| **2004-073** | 7/2/2004 | 0.99997 | 0.073 ng/L | 7.58 ng/mL | 94.7% | MDN1924 | 7.3% | MDN1924 | 87.7% | MDN2523 | 0.033 ng/Bottle |
| | CVAFS-9 | | | 6.68 ng/mL | 83.5% | MDN2055 | 5.8% | MDN2055 | 92.1% | | |
| | | | | | | MDN2148 | 1.0% | MDN2148 | 80.4% | | |
| **2004-074** | 7/2/2004 | 0.99993 | 0.078 ng/L | 7.63 ng/mL | 95.3% | MDN0122 | 1.9% | MDN0122 | 91.3% | MDN2069 | 0.037 ng/Bottle |
| | CVAFS-10 | | | 7.46 ng/mL | 93.2% | MDN1962 | 1.9% | MDN1962 | 91.2% | | |
| | | | | | | MDN2117 | 0.1% | MDN2117 | 98.3% | | |
| **2004-075** | 7/8/2004 | 0.99994 | 0.072 ng/L | 7.50 ng/mL | 93.7% | MDN2001 | 9.8% | MDN2001 | 80.5% | MDN3011 | 0.029 ng/Bottle |
| | CVAFS-9 | | | 7.14 ng/mL | 89.1% | MDN2388 | 3.9% | MDN2388 | 95.2% | | |
| | | | | | | MDN2549 | 4.6% | MDN2549 | 92.0% | | |
| **2004-076** | 7/7/2004 | 0.99995 | 0.056 ng/L | 7.67 ng/mL | 95.8% | MDN0085 | 1.0% | MDN0085 | 97.2% | MDN0698 | 0.022 ng/Bottle |
| | CVAFS-10 | | | 7.43 ng/mL | 92.8% | MDN2584 | 5.5% | MDN2584 | 195.4% | MDN2540 | 0.027 ng/Bottle |
| | | | | | | MDN2643 | 0.3% | MDN2643 | 98.0% | | |
| **2004-077** | 7/8/2004 | 0.99999 | 0.057 ng/L | 7.59 ng/mL | 94.9% | MDN0983 | 0.5% | MDN0983 | 96.6% | | |
| | CVAFS-10 | | | 7.21 ng/mL | 90.0% | MDN1976 | 0.8% | MDN1976 | 98.5% | | |
| | | | | | | MDN2438 | 1.8% | MDN2438 | 95.8% | | |
| **2004-078** | 7/19/2004 | 0.99989 | 0.024 ng/L | 7.67 ng/mL | 95.9% | MDN0445 | 2.4% | MDN0445 | 98.3% | MDN0956 | 0.060 ng/Bottle |
| | CVAFS-9 | | | 7.17 ng/mL | 89.6% | MDN1916 | 1.9% | MDN1916 | 85.2% | | |
| | | | | | | MDN2429 | 1.1% | MDN2429 | 100.3% | | |
| **2004-079** | 7/13/2004 | 0.99999 | 0.085 ng/L | 7.73 ng/mL | 96.5% | MDN0405 | 1.4% | MDN0405 | 98.9% | | |
| | CVAFS-10 | | | 7.49 ng/mL | 93.6% | MDN0735 | 0.4% | MDN0735 | 99.6% | | |
| | | | | | | MDN2616 | 1.1% | MDN2616 | 98.5% | | |
| **2004-080** | 7/19/2004 | 1.00000 | 0.049 ng/L | 7.62 ng/mL | 95.2% | MDN0421 | 5.4% | MDN0421 | 100.7% | | |
| | CVAFS-10 | | | 7.48 ng/mL | 93.5% | MDN2507 | 7.2% | MDN2507 | 103.4% | | |
| | | | | | | MDN2602 | 0.9% | MDN2602 | 97.7% | | |
| **2004-081** | 7/20/2004 | 0.99998 | 0.059 ng/L | 7.62 ng/mL | 95.2% | MDN0646 | 0.9% | MDN0646 | 98.1% | BB20 | 0.025 ng/Bottle |
| | CVAFS-10 | | | 7.48 ng/mL | 93.4% | MDN2395 | 2.5% | MDN2395 | 99.3% | | |
| | | | | | | MDN2621 | 3.3% | MDN2621 | 99.3% | | |
| **2004-082** | 7/24/2004 | 0.99977 | 0.056 ng/L | 7.98 ng/mL | 99.7% | MDN0952 | 4.5% | MDN0952 | 101.4% | MDN2103 | 0.026 ng/Bottle |
| | CVAFS-10 | | | 7.72 ng/mL | 96.4% | MDN1921 | 0.7% | MDN1921 | 95.5% | | |
| | | | | | | MDN2478 | 0.6% | MDN2478 | 96.4% | | |
| **2004-083** | 7/20/2004 | 0.99989 | 0.041 ng/L | 7.59 ng/mL | 94.9% | MDN0276 | 2.8% | MDN0276 | 110.5% | | |
| | CVAFS-9 | | | 7.08 ng/mL | 88.5% | MDN2628 | 2.2% | MDN2628 | 99.9% | | |
| | | | | | | MDN2639 | 0.4% | MDN2639 | 87.7% | | |
| **2004-084** | 7/28/2004 | 0.99988 | 0.033 ng/L | 7.85 ng/mL | 98.1% | MDN0666 | | MDN0666 | 94.9% | | |
| | CVAFS-10 | | | 7.83 ng/mL | 97.8% | MDN0833 | 3.2% | MDN0833 | 94.0% | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MDN2592 | 0.1% | MDN2592 | 102.6% | | |
| **2004-085** | 7/30/2004 | 0.99986 | 0.030 ng/L | 7.84 ng/mL | 97.9% | MDN0827 | 0.3% | MDN0827 | 97.6% | | |
| | CVAFS-9 | | | 7.77 ng/mL | 97.1% | MDN2170 | 1.8% | MDN2170 | 98.8% | | |
| | | | | | | MDN2470 | 0.7% | MDN2470 | 101.9% | | |
| **2004-086** | 7/30/2004 | 0.99988 | 0.009 ng/L | 7.97 ng/mL | 99.5% | MDN2113 | | MDN2113 | 92.6% | MDN1984 | 0.028 ng/Bottle |
| | CVAFS-10 | | | 7.98 ng/mL | 99.7% | MDN2342 | 2.4% | MDN2342 | 98.9% | MDN0116 | 0.019 ng/Bottle |
| | | | | | | MDN2573 | 0.7% | MDN2573 | 98.7% | | |
| **2004-087** | 7/31/2004 | 0.99995 | 0.050 ng/L | 7.92 ng/mL | 98.9% | MDN0836 | 2.5% | MDN0836 | 98.5% | MDN1991 | 0.032 ng/Bottle |
| | CVAFS-10 | | | 7.97 ng/mL | 99.5% | MDN2197 | 2.7% | MDN2197 | 100.5% | | |
| | | | | | | MDN2260 | 1.0% | MDN2260 | 98.0% | | |
| **2004-088** | 8/3/2004 | 0.99966 | 0.043 ng/L | 7.83 ng/mL | 97.8% | MDN2310 | | MDN2310 | 97.3% | | |
| | CVAFS-9 | | | 7.56 ng/mL | 94.4% | MDN2541 | 0.2% | MDN2541 | 102.2% | | |
| | | | | | | MDN2647 | 0.9% | MDN2647 | 99.2% | | |
| **2004-089** | 8/3/2004 | 0.99998 | 0.058 ng/L | 7.95 ng/mL | 99.3% | MDN1732 | 2.1% | MDN1732 | 92.9% | MDN2619 | 0.026 ng/Bottle |
| | CVAFS-10 | | | 7.73 ng/mL | 96.5% | MDN2087 | 1.7% | MDN2087 | 99.4% | | |
| | | | | | | MDN3016 | 2.3% | MDN3016 | 98.2% | | |
| **2004-090** | 8/4/2004 | 0.99997 | -0.002 ng/L | 7.87 ng/mL | 98.3% | MDN0126 | 0.2% | MDN0126 | 97.4% | MDN2233 | 0.017 ng/Bottle |
| | CVAFS-10 | | | 7.88 ng/mL | 98.5% | MDN2289 | 3.0% | MDN2289 | 101.4% | | |
| | | | | | | MDN2435 | 0.9% | MDN2435 | 95.1% | | |
| **2004-091** | 8/13/2004 | 0.99981 | 0.056 ng/L | 7.96 ng/mL | 99.4% | MDN0678 | 0.2% | MDN0678 | 95.5% | | |
| | CVAFS-10 | | | 8.01 ng/mL | 100.1% | MDN2349 | 0.3% | MDN2349 | 93.8% | | |
| | | | | | | MDN2509 | 5.6% | MDN2509 | 100.6% | | |
| **2004-092** | 8/17/2004 | 0.99994 | 0.043 ng/L | 7.95 ng/mL | 99.4% | MDN0114 | 0.9% | MDN0114 | 97.4% | | |
| | CVAFS-10 | | | 7.66 ng/mL | 95.7% | MDN2498 | 2.8% | MDN2498 | 100.6% | | |
| | | | | | | MDN2645 | 1.2% | MDN2645 | 95.6% | | |
| **2004-093** | 8/16/2004 | 0.99992 | 0.047 ng/L | 7.96 ng/mL | 99.5% | MDN0075 | 2.7% | MDN0075 | 98.7% | MDN2635 | 0.032 ng/Bottle |
| | CVAFS-10 | | | 7.70 ng/mL | 96.2% | MDN0492 | 4.1% | MDN0492 | 99.1% | MDN2234 | 0.036 ng/Bottle |
| | | | | | | MDN2436 | 1.2% | MDN2436 | 99.0% | | |
| **2004-094** | 8/17/2004 | 0.99989 | -0.048 ng/L | 8.39 ng/mL | 104.9% | MDN0831 | 3.8% | MDN0831 | 100.3% | | |
| | CVAFS-9 | | | 7.24 ng/mL | 90.5% | MDN2134 | 1.2% | MDN2134 | 123.1% | | |
| | | | | | | MDN3009 | 2.5% | MDN3009 | 90.8% | | |
| **2004-095** | 8/18/2004 | 0.99992 | 0.065 ng/L | 7.82 ng/mL | 97.6% | MDN0297 | 3.5% | MDN0297 | 98.2% | | |
| | CVAFS-10 | | | 7.76 ng/mL | 97.0% | MDN2026 | 9.9% | MDN2026 | 104.5% | | |
| | | | | | | MDN2615 | 10.3% | MDN2615 | 100.9% | | |
| **2004-096** | 8/25/2004 | 0.99986 | 0.075 ng/L | 8.03 ng/mL | 100.3% | MDN0871 | 0.6% | MDN0871 | 98.0% | | |
| | CVAFS-10 | | | 7.74 ng/mL | 96.7% | MDN1741 | 7.1% | MDN1741 | 105.9% | | |
| | | | | | | MDN2092 | | MDN2092 | 91.5% | | |
| **2004-097** | 8/26/2004 | 0.99975 | 0.031 ng/L | 8.00 ng/mL | 99.9% | MDN2097 | 1.2% | MDN2097 | 96.5% | MDN0836 | 0.023 ng/Bottle |
| | CVAFS-10 | | | 7.70 ng/mL | 96.1% | MDN2213 | 2.7% | MDN2213 | 109.9% | MDN2342 | 0.033 ng/Bottle |
| | | | | | | MDN2263 | 0.1% | MDN2263 | 94.6% | | |
| **2004-098** | 8/30/2004 | 0.99961 | 0.054 ng/L | 8.24 ng/mL | 102.9% | MDN2069 | 1.6% | MDN2069 | 89.3% | MDN0102 | 0.024 ng/Bottle |
| | CVAFS-10 | | | 8.11 ng/mL | 101.4% | MDN2077 | 0.6% | MDN2077 | 124.7% | | |
| | | | | | | MDN2451 | 1.5% | MDN2451 | 94.7% | | |
| **2004-099** | 8/30/2004 | 0.99768 | 0.039 ng/L | 7.46 ng/mL | 93.1% | MDN1924 | 10.3% | MDN1924 | 89.6% | MDN2330 | 0.017 ng/Bottle |
| | CVAFS-9 | | | 6.92 ng/mL | 86.5% | MDN2501 | 12.1% | MDN2501 | 107.0% | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MDN2503 | 6.5% | MDN2503 | 118.7% | | |
| **2004-100** | 8/31/2004 | 0.99989 | 0.001 ng/L | 7.33 ng/mL | 91.6% | MDN0183 | 0.4% | MDN0183 | 103.1% | | |
| | CVAFS-10 | | | 8.14 ng/mL | 101.6% | MDN0439 | 1.4% | MDN0439 | 106.8% | | |
| | | | | | | MDN0934 | 2.9% | MDN0934 | 115.9% | | |
| **2004-101** | 9/3/2004 | 0.99989 | 0.031 ng/L | 6.69 ng/mL | 83.5% | MDN0144 | 5.6% | MDN0144 | 102.1% | | |
| | CVAFS-10 | | | 7.58 ng/mL | 94.7% | MDN1958 | 1.9% | MDN1958 | 107.2% | | |
| | | | | | | MDN2372 | 1.9% | MDN2372 | 99.4% | | |
| **2004-102** | 9/7/2004 | 0.99990 | 0.029 ng/L | 8.03 ng/mL | 100.3% | MDN0481 | 0.9% | MDN0481 | 110.5% | | |
| | CVAFS-10 | | | 8.06 ng/mL | 100.7% | MDN0925 | 0.3% | MDN0925 | 102.4% | | |
| | | | | | | MDN2206 | 2.0% | MDN2206 | 101.3% | | |
| **2004-103** | 9/9/2004 | 0.99795 | 0.015 ng/L | 8.22 ng/mL | 102.7% | MDN2059 | 1.4% | MDN2059 | 115.1% | MDN0896 | 0.037 ng/Bottle |
| | CVAFS-9 | | | 8.09 ng/mL | 101.0% | MDN2317 | 1.3% | MDN2317 | 103.8% | MDN2310 | 0.017 ng/Bottle |
| | | | | | | MDN2397 | 0.6% | MDN2397 | 106.9% | | |
| **2004-104** | 9/13/2004 | 0.99961 | 0.056 ng/L | 7.97 ng/mL | 99.5% | MDN0751 | | MDN0751 | 76.7% | MDN0155 | 0.049 ng/Bottle |
| | CVAFS-10 | | | 7.77 ng/mL | 97.0% | MDN0845 | 2.9% | MDN0845 | 98.1% | | |
| | | | | | | MDN2561 | 2.9% | MDN2561 | 192.3% | | |
| **2004-105** | 9/13/2004 | 0.99642 | -0.024 ng/L | 8.25 ng/mL | 103.1% | MDN0843 | 1.9% | MDN0843 | 107.1% | | |
| | CVAFS-9 | | | | | | | | | | |
| **2004-106** | 9/17/2004 | 0.99885 | -0.014 ng/L | 7.32 ng/mL | 91.4% | MDN1927 | 4.3% | MDN1927 | 100.8% | | |
| | CVAFS-9 | | | 7.65 ng/mL | 95.6% | MDN2131 | 9.6% | MDN2131 | 114.5% | | |
| | | | | | | MDN2324 | 3.0% | MDN2324 | 96.1% | | |
| **2004-107** | 9/17/2004 | 0.99993 | 0.013 ng/L | 7.85 ng/mL | 98.0% | MDN0398 | 1.6% | MDN0398 | 99.4% | | |
| | CVAFS-10 | | | 7.85 ng/mL | 98.0% | MDN2358 | 4.0% | MDN2358 | 98.1% | | |
| | | | | | | MDN3000 | 3.1% | MDN3000 | 98.7% | | |
| **2004-108** | 9/22/2004 | 0.99997 | 0.020 ng/L | 7.92 ng/mL | 99.0% | MDN0225 | 1.6% | MDN0225 | 93.7% | MDN2328 | 0.027 ng/Bottle |
| | CVAFS-10 | | | 7.74 ng/mL | 96.7% | MDN0405 | 3.1% | MDN0405 | 92.5% | MDN2168 | 0.018 ng/Bottle |
| | | | | | | MDN2338 | 16.0% | MDN2338 | 106.0% | | |
| **2004-109** | 9/21/2004 | 0.99871 | 0.020 ng/L | 7.92 ng/mL | 98.9% | MDN1736 | | MDN1736 | 79.9% | | |
| | CVAFS-9 | | | 7.90 ng/mL | 98.6% | MDN2578 | 15.0% | MDN2578 | 102.2% | | |
| | | | | | | MDN2646 | 15.2% | MDN2646 | 86.1% | | |
| **2004-110** | 9/22/2004 | 0.99979 | -0.039 ng/L | 7.72 ng/mL | 96.4% | MDN1972 | 3.9% | MDN1972 | 104.3% | MDN3008 | 0.012 ng/Bottle |
| | CVAFS-9 | | | 7.64 ng/mL | 95.4% | MDN2080 | 9.4% | MDN2080 | 116.9% | | |
| | | | | | | MDN2535 | 9.7% | MDN2535 | 112.1% | | |
| **2004-111** | 9/23/2004 | 0.99999 | 0.005 ng/L | 7.94 ng/mL | 99.1% | MDN0483 | 2.4% | MDN0483 | 92.9% | | |
| | CVAFS-9 | | | 7.34 ng/mL | 91.7% | MDN1935 | 8.3% | MDN1935 | 102.4% | | |
| | | | | | | MDN2406 | 1.8% | MDN2406 | 93.6% | | |
| **2004-112** | 9/24/2004 | 0.99963 | 0.022 ng/L | 7.60 ng/mL | 95.0% | MDN0197 | 12.9% | MDN0197 | 101.1% | | |
| | CVAFS-9 | | | 7.39 ng/mL | 92.3% | MDN2223 | 5.1% | MDN2223 | 92.0% | | |
| | | | | | | MDN2608 | 2.3% | MDN2608 | 89.7% | | |
| **2004-113** | 9/24/2004 | 0.99959 | 0.024 ng/L | 7.95 ng/mL | 99.3% | MDN0487 | 0.7% | MDN0487 | 113.9% | | |
| | CVAFS-10 | | | 7.45 ng/mL | 93.0% | MDN2160 | 0.1% | MDN2160 | 94.5% | | |
| | | | | | | MDN2468 | 3.8% | MDN2468 | 98.2% | | |
| **2004-115** | 9/28/2004 | 0.99994 | 0.040 ng/L | 8.06 ng/mL | 100.6% | MDN0799 | 6.2% | MDN0799 | 103.6% | | |
| | CVAFS-9 | | | 7.35 ng/mL | 91.9% | MDN0816 | 2.7% | MDN0816 | 105.6% | | |

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|---|---|---|---|---|---|---|
| | | | | MDN0848 3.0% | MDN0848 94.6% | |
| **Quarterly Mean:** | **0.99964** | **0.036 ng/L** | **96.3%** | **3.0%** | **102.9%** | **0.028 ng/Bottle** |
| **Std Dev:** | **±0.00070** | **±0.031** | **±4.1%** | **±3.4%** | **±21.9%** | **±0.011** |

**MDN Quarterly Analysis QC Summary, Quarter 4 of 2004**

| Analysis | | Calibration | BrCl Blk | SRM (Nist 1641-d) | | Duplicates | | Spikes | | Bottle Blanks | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R | Conc | TV=8.005 ng/mL | %Rec | Bottle ID | RPD | Bottle ID | Rec. | Bottle ID | Conc |
| 2004-114 | 10/5/2004 | 0.99909 | 0.010 ng/L | 7.67 ng/mL | 95.9% | MDN0699 | 4.3% | MDN0699 | 105.2% | | |
| | CVAFS-9 | | | 7.21 ng/mL | 90.1% | MDN1913 | 1.5% | MDN1913 | 89.7% | | |
| | | | | | | MDN2143 | 10.7% | MDN2143 | 101.3% | | |
| 2004-116 | 10/5/2004 | 0.99993 | 0.044 ng/L | 7.81 ng/mL | 97.5% | MDN2336 | 3.0% | MDN2336 | 98.7% | | |
| | CVAFS-10 | | | 7.81 ng/mL | 97.6% | MDN2385 | 2.0% | MDN2385 | 98.2% | | |
| | | | | | | MDN2445 | 2.1% | MDN2445 | 107.1% | | |
| 2004-117 | 10/14/2004 | 0.99995 | 0.046 ng/L | 7.93 ng/mL | 99.1% | MDN0954 | 2.9% | MDN0954 | 106.1% | | |
| | CVAFS-10 | | | 7.52 ng/mL | 93.9% | MDN1755 | 1.5% | MDN1755 | 97.3% | | |
| | | | | | | MDN2071 | 2.0% | MDN2071 | 97.7% | | |
| 2004-118 | 10/14/2004 | 0.99936 | 0.030 ng/L | 7.89 ng/mL | 98.5% | MDN0640 | 1.7% | MDN0640 | 100.8% | | |
| | CVAFS-9 | | | 7.26 ng/mL | 90.7% | MDN2027 | 8.0% | MDN2027 | 87.3% | | |
| | | | | | | MDN2129 | 6.9% | MDN2129 | 95.5% | | |
| 2004-119 | 10/15/2004 | 0.99968 | 0.040 ng/L | 8.00 ng/mL | 99.9% | MDN0492 | 1.2% | MDN0492 | 108.2% | | |
| | CVAFS-9 | | | 7.71 ng/mL | 96.4% | MDN2058 | 4.8% | MDN2058 | 100.4% | | |
| | | | | | | MDN2505 | 6.0% | MDN2505 | 97.4% | | |
| 2004-120 | 10/18/2004 | 0.99995 | 0.056 ng/L | 7.73 ng/mL | 96.6% | MDN0734 | 1.6% | MDN0734 | 96.0% | MDN0283 | 0.024 ng/Bottle |
| | CVAFS-10 | | | 6.00 ng/mL | 74.9% | MDN2272 | 0.9% | MDN2272 | 97.2% | | |
| | | | | 7.60 ng/mL | 94.9% | MDN2449 | 1.2% | MDN2449 | 88.3% | | |
| 2004-121 | 10/21/2004 | 0.99984 | 0.035 ng/L | 8.01 ng/mL | 100.1% | MDN2175 | 1.0% | MDN2175 | 103.7% | | |
| | CVAFS-10 | | | 7.74 ng/mL | 96.7% | MDN2367 | 7.2% | MDN2367 | 94.8% | | |
| | | | | | | MDN2542 | 1.3% | MDN2542 | 97.8% | | |
| 2004-122 | 10/18/2004 | 0.99987 | 0.002 ng/L | 7.60 ng/mL | 95.0% | MDN2064 | 3.9% | MDN2064 | 105.9% | MDN2470 | 0.014 ng/Bottle |
| | CVAFS-9 | | | 7.42 ng/mL | 92.6% | MDN2117 | 7.2% | MDN2117 | 102.1% | | |
| | | | | | | MDN2548 | 9.6% | MDN2548 | 96.1% | | |
| 2004-123 | 10/28/2004 | 0.99984 | 0.047 ng/L | 7.77 ng/mL | 97.1% | MDN0796 | 4.7% | MDN0796 | 98.8% | | |
| | CVAFS-9 | | | 7.57 ng/mL | 94.6% | MDN2049 | 1.2% | MDN2049 | 97.8% | | |
| | | | | | | MDN2331 | 2.5% | MDN2331 | 103.6% | | |
| 2004-124 | 10/27/2004 | 0.99985 | 0.033 ng/L | 7.70 ng/mL | 96.2% | MDN0142 | 5.4% | MDN0142 | 91.5% | | |
| | CVAFS-9 | | | 7.19 ng/mL | 89.8% | MDN0155 | 7.4% | MDN0155 | 92.5% | | |
| | | | | | | MDN3000 | 1.1% | MDN3000 | 100.8% | | |
| 2004-125 | 11/4/2004 | 0.99989 | 0.070 ng/L | 7.66 ng/mL | 95.6% | MDN0419 | 3.5% | MDN0419 | 94.6% | MDN2690 | 0.013 ng/Bottle |
| | CVAFS-9 | | | 7.16 ng/mL | 89.5% | MDN2190 | 17.0% | MDN2190 | 86.3% | MDN0739 | 0.012 ng/Bottle |
| | | | | | | MDN2539 | 5.7% | MDN2539 | 109.0% | | |
| 2004-126 | 11/4/2004 | 0.99985 | 0.042 ng/L | 8.32 ng/mL | 104.0% | MDN0123 | 10.0% | MDN0123 | 100.8% | | |
| | CVAFS-10 | | | 7.52 ng/mL | 93.9% | MDN1740 | 3.9% | MDN1740 | 113.5% | | |
| | | | | | | MDN2453 | 1.4% | MDN2453 | 111.0% | | |
| 2004-127 | 10/21/2004 | 0.99946 | 0.006 ng/L | 7.57 ng/mL | 94.6% | MDN2174 | 0.8% | MDN2174 | 105.4% | | |
| | CVAFS-10 | | | | | MDN2235 | 6.2% | MDN2235 | 102.1% | | |
| 2004-128 | 11/8/2004 | 0.99992 | 0.049 ng/L | 7.76 ng/mL | 97.0% | MDN0397 | 4.8% | MDN0397 | 105.1% | MDN2152 | 0.022 ng/Bottle |
| | CVAFS-9 | | | 7.24 ng/mL | 90.5% | MDN2413 | 2.6% | MDN2413 | 95.7% | MDN0199 | 0.016 ng/Bottle |

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|---|---|---|---|---|---|---|---|---|
| | | | | | | MDN2474 9.9% | MDN2474 96.3% | |
| 2004-129 | 11/9/2004 | 0.99990 | 0.021 ng/L | 7.82 ng/mL | 97.7% | MDN0494 6.3% | MDN0494 111.2% | |
| | CVAFS-9 | | | 7.49 ng/mL | 93.6% | MDN2378 5.3% | MDN2393 96.6% | |
| | | | | | | MDN2393 8.5% | | |
| 2004-130 | 11/9/2004 | 0.99991 | 0.069 ng/L | 8.28 ng/mL | 103.4% | MDN0811 4.0% | MDN0811 99.0% | |
| | CVAFS-10 | | | 8.06 ng/mL | 100.7% | MDN1975 3.3% | MDN1975 91.1% | |
| | | | | | | MDN2577 17.2% | MDN2577 101.0% | |
| 2004-131 | 11/16/2004 | 0.99984 | 0.070 ng/L | 8.46 ng/mL | 105.7% | MDN0141 1.5% | MDN0141 113.8% | |
| | CVAFS-10 | | | 7.44 ng/mL | 92.9% | MDN2276 1.6% | MDN2276 101.5% | |
| | | | | | | MDN2553 13.7% | MDN2553 108.0% | |
| 2004-132 | 11/10/2004 | 0.99993 | 0.006 ng/L | 7.71 ng/mL | 96.3% | MDN2358 7.8% | MDN2358 95.9% | MDN2523 0.028 ng/Bottle |
| | CVAFS-9 | | | 7.32 ng/mL | 91.5% | MDN2658 3.1% | MDN2658 100.2% | |
| | | | | | | MDN2660 4.1% | MDN2660 92.0% | |
| 2004-133 | 11/16/2004 | 0.99991 | 0.038 ng/L | 8.01 ng/mL | 100.1% | MDN2110 4.3% | MDN2110 94.9% | MDN0953 0.022 ng/Bottle |
| | CVAFS-9 | | | 7.63 ng/mL | 95.3% | MDN2659 7.4% | MDN2659 97.3% | |
| | | | | | | MDN2720 6.9% | MDN2720 108.1% | |
| 2004-134 | 11/11/2004 | 0.99993 | 0.032 ng/L | 7.84 ng/mL | 97.9% | MDN0111 12.7% | MDN0111 103.6% | |
| | CVAFS-9 | | | 7.30 ng/mL | 91.1% | MDN0666 3.7% | MDN0666 92.7% | |
| | | | | | | MDN1761 3.7% | MDN1761 103.7% | |
| 2004-135 | 11/11/2004 | 0.99989 | 0.093 ng/L | 8.39 ng/mL | 104.8% | MDN2391 2.4% | MDN2391 109.3% | |
| | CVAFS-10 | | | 7.56 ng/mL | 94.4% | MDN2439 2.0% | MDN2439 100.7% | |
| | | | | | | MDN2666 1.3% | MDN2666 108.6% | |
| 2004-136 | 11/12/2004 | 0.99925 | 0.029 ng/L | 7.81 ng/mL | 97.5% | MDN0633 4.3% | MDN0633 103.9% | |
| | CVAFS-9 | | | 7.36 ng/mL | 92.0% | MDN0668 2.5% | MDN0668 96.0% | |
| | | | | | | MDN0853 3.5% | MDN0853 97.7% | |
| 2004-137 | 11/10/2004 | 0.99983 | 0.039 ng/L | 8.32 ng/mL | 104.0% | MDN0146 0.3% | MDN0146 98.3% | MDN2641 0.035 ng/Bottle |
| | CVAFS-10 | | | 7.46 ng/mL | 93.1% | MDN0823 0.3% | MDN0823 106.3% | |
| | | | | | | | MDN1954 108.3% | |
| 2004-138 | 11/18/2004 | 0.99988 | 0.032 ng/L | 7.62 ng/mL | 95.2% | MDN1928 7.7% | MDN1928 95.3% | |
| | CVAFS-9 | | | 7.03 ng/mL | 87.8% | MDN2477 0.5% | MDN2477 101.6% | |
| | | | | | | MDN2694 4.5% | MDN2694 84.9% | |
| 2004-139 | 11/22/2004 | 0.99990 | 0.002 ng/L | 7.70 ng/mL | 96.2% | MDN0799 5.1% | MDN0799 99.3% | |
| | CVAFS-9 | | | 7.53 ng/mL | 94.0% | MDN2635 15.9% | MDN2635 105.5% | |
| | | | | | | MDN2676 | MDN2676 94.3% | |
| 2004-140 | 12/8/2004 | 0.99870 | 0.016 ng/L | 7.93 ng/mL | 99.0% | MDN0678 1.3% | MDN0678 108.0% | MDN1914 0.047 ng/Bottle |
| | CVAFS-10 | | | 8.14 ng/mL | 101.7% | MDN2395 1.0% | MDN2395 98.9% | |
| | | | | | | MDN2582 0.7% | MDN2582 101.1% | |
| 2004-141 | 12/7/2004 | 0.99990 | 0.029 ng/L | 7.80 ng/mL | 97.4% | MDN0949 5.1% | MDN0949 96.8% | |
| | CVAFS-10 | | | 7.85 ng/mL | 98.1% | MDN2583 5.8% | MDN2583 94.6% | |
| | | | | | | MDN2606 2.2% | MDN2606 98.1% | |
| 2004-142 | 12/2/2004 | 0.99977 | 0.030 ng/L | 7.80 ng/mL | 97.4% | MDN2600 1.4% | MDN2600 95.9% | MDN1761 0.014 ng/Bottle |
| | CVAFS-9 | | | 7.48 ng/mL | 93.4% | MDN2685 1.8% | MDN2685 93.8% | MDN1970 0.016 ng/Bottle |
| | | | | | | MDN2701 0.5% | MDN2701 98.8% | |
| 2004-143 | 12/2/2004 | 0.99979 | 0.038 ng/L | 7.82 ng/mL | 97.7% | MDN0757 1.3% | MDN0757 109.2% | |
| | CVAFS-10 | | | 7.67 ng/mL | 95.8% | MDN0772 3.9% | MDN0772 96.8% | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MDN2308 | 1.0% | MDN2308 | 105.9% | | |
| 2004-144 | 12/13/2004 | 0.99995 | 0.034 ng/L | 7.66 ng/mL | 95.6% | MDN2054 | 1.1% | MDN2054 | 101.5% | MDN0483 | 0.022 ng/Bottle |
| | CVAFS-10 | | | 7.82 ng/mL | 97.7% | MDN2569 | 0.7% | MDN2569 | 102.3% | MDN2080 | 0.013 ng/Bottle |
| | | | | | | MDN2587 | 0.7% | MDN2587 | 97.2% | MDN2059 | 0.012 ng/Bottle |
| 2004-145 | 12/15/2004 | 0.99983 | 0.049 ng/L | 7.83 ng/mL | 97.8% | MDN2213 | 1.7% | MDN2213 | 100.2% | | |
| | CVAFS-9 | | | 7.66 ng/mL | 95.6% | MDN2217 | 3.8% | MDN2217 | 98.5% | | |
| 2004-146 | 12/14/2004 | 0.99999 | 0.048 ng/L | 7.65 ng/mL | 95.6% | MDN0761 | 2.1% | MDN0761 | 96.9% | | |
| | CVAFS-9 | | | 7.64 ng/mL | 95.4% | MDN2487 | 10.6% | MDN2487 | 101.4% | | |
| | | | | | | MDN2608 | 0.8% | MDN2608 | 98.4% | | |
| 2004-147 | 12/14/2004 | 0.99985 | 0.042 ng/L | 7.71 ng/mL | 96.3% | MDN0183 | 0.5% | MDN0183 | 101.1% | MDN0969 | 0.019 ng/Bottle |
| | CVAFS-10 | | | 7.81 ng/mL | 97.5% | MDN0425 | 0.6% | MDN0425 | 101.1% | | |
| | | | | | | MDN2382 | 0.8% | MDN2382 | 100.3% | | |
| 2004-148 | 12/15/2004 | 0.99981 | 0.038 ng/L | 7.64 ng/mL | 95.5% | MDN0113 | 5.8% | MDN0113 | 101.5% | | |
| | CVAFS-10 | | | 7.73 ng/mL | 96.6% | MDN0392 | 1.3% | MDN0392 | 98.4% | | |
| | | | | | | MDN2053 | 0.3% | MDN2053 | 99.1% | | |
| 2004-149 | 12/21/2004 | 0.99981 | 0.030 ng/L | 7.78 ng/mL | 97.1% | MDN0123 | 1.9% | MDN0123 | 96.9% | MDN2093 | 0.025 ng/Bottle |
| | CVAFS-10 | | | 7.76 ng/mL | 96.9% | MDN0923 | 2.8% | MDN0923 | 98.9% | | |
| | | | | | | MDN2130 | 1.8% | MDN2130 | 104.4% | | |
| 2004-150 | 12/22/2004 | 0.99987 | 0.026 ng/L | 7.71 ng/mL | 96.3% | MDN2148 | 0.5% | MDN2148 | 98.2% | | |
| | CVAFS-10 | | | 7.81 ng/mL | 97.5% | MDN2498 | 0.2% | MDN2498 | 99.3% | | |
| | | | | | | MDN2524 | 0.2% | MDN2524 | 101.2% | | |
| 2004-151 | 12/30/2004 | 0.99996 | 0.046 ng/L | 7.70 ng/mL | 96.2% | MDN0489 | 4.6% | MDN0489 | 100.0% | MDN2365 | 0.022 ng/Bottle |
| | CVAFS-9 | | | 7.77 ng/mL | 97.1% | MDN0758 | 1.8% | MDN0758 | 96.7% | | |
| | | | | | | MDN2189 | 6.6% | MDN2189 | 99.1% | | |
| 2004-152 | 12/27/2004 | 0.99970 | 0.033 ng/L | 7.96 ng/mL | 99.4% | MDN0283 | 6.7% | MDN0283 | 99.6% | | |
| | CVAFS-9 | | | 7.70 ng/mL | 96.1% | MDN2262 | 2.1% | MDN2262 | 96.6% | | |
| | | | | | | MDN3011 | 0.8% | MDN3011 | 95.7% | | |
| 2004-153 | 12/28/2004 | 0.99992 | 0.021 ng/L | 7.82 ng/mL | 97.7% | MDN0125 | 5.9% | MDN0125 | 95.0% | | |
| | CVAFS-9 | | | 7.38 ng/mL | 92.1% | MDN1933 | 1.9% | MDN1933 | 92.5% | | |
| | | | | | | MDN2725 | 4.1% | MDN2725 | 103.8% | | |
| 2004-154 | 12/28/2004 | 0.99993 | 0.026 ng/L | 7.78 ng/mL | 97.2% | MDN2030 | 0.4% | MDN2030 | 101.1% | | |
| | CVAFS-10 | | | 7.88 ng/mL | 98.4% | MDN2516 | 7.6% | MDN2516 | 109.9% | | |
| | | | | | | MDN2566 | 2.2% | MDN2566 | 97.4% | | |
| 2004-155 | 12/29/2004 | 0.99964 | 0.030 ng/L | 7.62 ng/mL | 95.2% | MDN1927 | 3.9% | MDN1927 | 96.3% | MDN1931 | 0.006 ng/Bottle |
| | CVAFS-9 | | | 7.45 ng/mL | 93.1% | MDN1959 | 1.9% | MDN1959 | 97.1% | MDN0938 | 0.005 ng/Bottle |
| | | | | | | MDN2555 | 4.7% | MDN2555 | 96.6% | | |
| 2004-156 | 12/27/2004 | 0.99991 | 0.041 ng/L | 7.83 ng/mL | 97.8% | MDN1759 | 1.6% | MDN1759 | 98.8% | | |
| | CVAFS-10 | | | 7.88 ng/mL | 98.4% | MDN2451 | 4.4% | MDN2451 | 97.4% | | |
| | | | | | | MDN2491 | 0.2% | MDN2491 | 99.9% | | |
| 2004-157 | 12/29/2004 | 0.99949 | 0.063 ng/L | 8.05 ng/mL | 100.6% | MDN1973 | 9.2% | MDN1973 | 108.7% | MDN2413 | 0.014 ng/Bottle |
| | CVAFS-10 | | | 7.49 ng/mL | 93.6% | MDN2011 | 6.6% | MDN2011 | 94.9% | | |
| | | | | | | MDN2657 | 0.3% | MDN2657 | 103.6% | | |
| | Quarterly Mean: | 0.99978 | 0.037 ng/L | | 96.1% | | 3.9% | | 103.0% | | 0.019 ng/Bottle |
| | Std Dev: | ±0.00024 | ±0.019 | | ±4.1% | | ±3.5% | | ±18.6% | | ±0.009 |

## Methylmercury Quarterly Analysis QC Summary, Quarter 1 of 2004

| DataSetID | | Calibration R | Prep Blk Conc. (ng/L) | Dorm - 2 TV=4470 ng/L | %Rec | Duplicates Comp ID | RPD | Spikes Comp ID | %Rec | RPD |
|---|---|---|---|---|---|---|---|---|---|---|
| **MHG7-040106-1** | 1/6/2004 | 0.99848 | 0.050 | 3856.686 | 86.3 | WA1820031209 | 23.3 | NS0120031202 MS | 78.21 | 3.0 |
| CVAFS-7 | Batch#100 | | | | | | | NS0120031202 MSD | 80.77 | |
| **MHG1-040108-1** | 1/8/2004 | 0.99937 | 0.040 | 3951.369 | 88.4 | OR10 COMP 013 | 12.3 | OR10 COMP 013 MS | 84.29 | 7.8 |
| CVAFS-1 | Batch#101 | | | | | | | OR10 COMP 013 MSD | 92.99 | |
| **MHG7-040129-1** | 1/29/2004 | 0.99993 | 0.000 | 4385.717 | 98.1 | OR10 COMP 014 | 15.6 | OR10 COMP 014 MS | 92.08 | 0.1 |
| CVAFS-7 | Batch#103 | | | | | | | OR10 COMP 014 MSD | 91.95 | |
| **MHG7-040212-1** | 2/12/2004 | 0.99999 | 0.050 | 4871.615 | 109.0 | LA2320040203 | 5.4 | LA2320040127 MS | 103.19 | 4.3 |
| CVAFS-7 | Batch#104 | | | | | | | LA2320040127 MSD | 107.82 | |
| **MHG1-040302-1** | 3/2/2004 | 0.99985 | 0.060 | 4595.395 | 102.8 | LA0520040217 | 30.0 | LA1020040217 MS | 94.26 | 2.2 |
| CVAFS-1 | Batch#105 | | | | | | | LA1020040217 MSD | 92.06 | |
| **MHG7-040309-1** | 3/9/2004 | 0.99943 | 0.030 | 4407.775 | 98.6 | IN2120040203 | 4.9 | OR10 COMP 015 MS | 99.04 | 6.5 |
| CVAFS-7 | Batch#106 | | | | | | | OR10 COMP 015 MSD | 91.76 | |
| **MHG7-040316-1** | 3/16/2004 | 0.99989 | 0.030 | 4734.368 | 105.9 | LA2320040302 | 6.1 | LA2820040225 MS | 105.23 | 4.2 |
| CVAFS-7 | Batch#107 | | | | | | | LA2820040225 MSD | 100.71 | |
| **MHG7-040324-1** | 3/24/2004 | 0.99893 | 0.120 | 4506.614 | 100.8 | FL04 COMP 034 | 300.0 | OR10 COMP 016 MS | 102.33 | 16.9 |
| CVAFS-7 | Batch#108 | | | | | | | OR10 COMP 016 MSD | 83.85 | |
| **MHG7-040331-1** | 3/31/2004 | 0.99997 | 0.090 | 4770.290 | 106.7 | LA1020040309 | 17.1 | LA0520040316 MS | 101.97 | 3.1 |
| CVAFS-7 | Batch#109 | | | | | | | LA0520040316 MSD | 98.74 | |

## Methylmercury Quarterly Analysis QC Summary, Quarter 2 of 2004

| DataSetID | | Calibration R | Prep Blk Conc (ng/L) | Dorm - 2 TV=4470 ng/L | %Rec | Duplicates Comp ID | RPD | Spikes Comp ID | %Rec | RPD |
|---|---|---|---|---|---|---|---|---|---|---|
| **MHG7-040409-1** | 4/9/2004 | 0.99954 | 0.090 | 4464.019 | 99.9 | IN3420040330 | 13.5 | WA1820040330 MS | 94.39 | 3.3 |
| CVAFS-7 | Batch#110 | | | | | | | WA1820040330 MSD | 90.57 | |
| **MHG1-040414-1** | 4/14/2004 | 0.99981 | 0.000 | 4971.940 | 111.2 | IN3920040406 | 8.2 | NS0120040406 MS | 97.70 | 4.2 |
| CVAFS-1 | Batch#111 | | | | | | | NS0120040406 MSD | 93.08 | |
| **MHG7-040423-1** | 4/23/2004 | 0.99997 | 0.120 | 4687.644 | 104.9 | | | LA0520040413 MSD | 83.85 | 0.0 |
| CVAFS-7 | Batch#112 | | | | | | | LA0520040413 MS | 83.85 | |
| **MHG7-040519-1** | 5/19/2004 | 0.99995 | 0.030 | 4417.574 | 98.8 | NS0120040420 | 7.9 | FL04 COMP 037 MS | 95.77 | 6.1 |
| CVAFS-7 | Batch#113 | | | | | | | FL04 COMP 037 MSD | 102.01 | |
| **MHG7-040521-1** | 5/21/2004 | 0.99999 | 0.070 | 4916.858 | 110.0 | LA1020040505 | 13.6 | LA2820040504 MS | 101.29 | 0.0 |
| CVAFS-7 | Batch#114 | | | | | | | LA2820040504 MSD | 101.29 | |
| **MHG1-040609-1** | 6/9/2004 | 0.99995 | 0.080 | 5183.158 | 116.0 | WI22 COMP 016 | 0.8 | WI22 COMP 016 MS | 93.13 | 10.7 |
| CVAFS-1 | Batch#115 | | | | | | | WI22 COMP 016 MSD | 82.56 | |
| **MHG1-040617-1** | 6/17/2004 | 0.99514 | -0.010 | 4716.470 | 105.5 | WI31 COMP 029 | 41.4 | WI99 COMP 097 MS | 80.86 | 7.2 |
| CVAFS-1 | Batch#116 | | | | | | | WI99 COMP 097 MSD | 87.78 | |

## Methylmercury Quarterly Analysis QC Summary, Quarter 3 of 2004

| DataSetID | | Calibration | Prep Blk | Dorm - 2 | | Duplicates | | Spikes | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | R | Conc (ng/L) | TV=4470 ng/L | %Rec | Comp ID | RPD | Comp ID | %Rec | RPD |
| **MHG7-040709-1** | 7/9/2004 | 0.99969 | 0.000 | 4501.024 | 100.7 | LA0520040622 | 30.7 | NS0120040629 MS 101 | 0.60 | 2.0 |
| CVAFS-7 | Batch#117 | | | | | | | NS0120040629 MSD | 103.96 | |
| **MHG7-040722-1** | 7/22/2004 | 0.99976 | 0.060 | 4617.126 | 103.3 | FL32 COMP 010 | 20.2 | GA09 COMP 022 MS | 98.68 | 0.0 |
| CVAFS-7 | Batch#118 | | | | | | | GA09 COMP 022 MSD | 98.68 | |
| **MHG7-040805-1** | 8/5/2004 | 0.99840 | 0.070 | 4649.854 | 104.0 | LA2820040706 | 2.5 | LA2320040706 MS | 88.90 | 4.7 |
| CVAFS-7 | Batch#119 | | | | | | | LA2320040706 MSD | 84.70 | |
| **MHG7-040820-1** | 8/20/2004 | 0.99986 | 0.000 | 4662.252 | 104.3 | MD98 COMP 002 | 0.0 | GA09 COMP 023 MS | 95.40 | 143.4 |
| CVAFS-7 | Batch#120 | | | | | | | GA09 COMP 023 MSD | 9.86 | |
| **MHG7-040909-1** | 9/9/2004 | 0.99993 | 0.130 | 4029.792 | 90.2 | FL3220040814 | 0.0 | | | |
| CVAFS-7 | Batch#121 | | | | | | | | | |
| **MHG7-040916-1** | 9/16/2004 | 0.99982 | 0.080 | 4235.328 | 94.8 | GA0920040813 | 100.0 | SC0520040817 MS | 107.40 | 22.2 |
| CVAFS-7 | Batch#122 | | | | | | | SC0520040817 MSD | 85.12 | |
| **MHG7-040930-1** | 9/30/2004 | 0.99989 | 0.070 | 4930.021 | 110.3 | FL04 COMP 041 | 0.0 | FL11 COMP 041 MS | 94.40 | 4.9 |
| CVAFS-7 | Batch#123 | | | | | | | FL11 COMP 041 MSD | | |

## Methylmercury Quarterly Analysis QC Summary, Quarter 4 of 2004

| DataSetID | | Calibration | Prep Blk | Dorm - 2 | | Duplicates | | Spikes | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | R | Conc (ng/L) | TV=4470 ng/L | %Rec | Comp ID | RPD | Comp ID | %Rec | RPD |
| **MHG7-041007-1** | 10/7/2004 | 0.99837 | 0.030 | 5242.942 | 117.3 | NS0120040921 | 33.0 | FL05 COMP 025 MS | 114.24 | 3.9 |
| CVAFS-7 | Batch#124 | | | | | | | FL05 COMP 025 MSD | 109.82 | |
| **MHG7-041021-1** | 10/21/2004 | 0.99953 | 0.060 | 4368.177 | 97.7 | MN23 COMP 104 | 30.1 | FL32 COMP 013 MS | 97.87 | 9.0 |
| CVAFS-7 | Batch#125 | | | | | | | FL32 COMP 013 MSD | 89.35 | |
| **MHG1-041104-1** | 11/4/2004 | 0.99990 | 0.020 | 5240.390 | 117.2 | NS0120041005 | 12.5 | MN16 COMP 104 MS | 119.89 | 13.9 |
| CVAFS-1 | Batch#126 | | | | | | | MN16 COMP 104 MSD | 103.28 | |
| **MHG7-041111-1** | 11/11/2004 | 0.99974 | 0.090 | 4688.745 | 104.9 | LA2820040831 | 8.7 | | | |
| CVAFS-7 | Batch#127 | | | | | | | | | |
| **MHG7-041202-1** | 12/2/2004 | 0.99577 | 0.040 | 4101.590 | 91.8 | WA1820040914 | 7.3 | NS0120041109 MS | 95.10 | 11.2 |
| CVAFS-7 | Batch#128 | | | | | | | NS0120041109 MSD | 84.60 | |
| **MHG1-041218-1** | 12/18/2004 | 0.99928 | 0.020 | 4870.871 | 109.0 | FL04 COMP 044 | 0.0 | LA232009411003 MS | 97.42 | 1.8 |
| CVAFS-1 | Batch#129 | | | | | | | LA232009411003 MSD | 99.16 | |