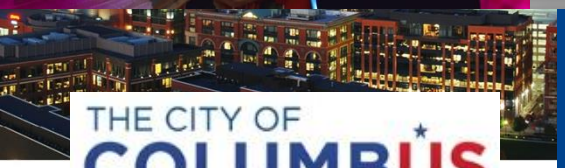
Quality Assurance/Quality Control

for

Industrial User Sampling Programs

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR



THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

Jeffrey L. Bertacchi ENE, MPA

City of Columbus

Pretreatment Program Manager

What is QA/QC?

- QA = Quality Assurance
- QC = Quality Control
- Both are Important to the Integrity of the Sample and Resultant Data
- Both Start Before the Sample is Taken

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

Why is QA/QC Important?

Without Adequate QA/QC Sample Data Could be Considered Invalid and/or May **NOT** be Defensible

THE CITY OF COLUMBUS
ANDREW J. GINTHER, MAYOR

Why is QA/QC Important?

Ohio EPA

State of Ohio Environmental Protection Agency

Manual of Ohio EPA
Surveillance Methods and Quality Assurance Practices
2009

Division of Surface Water
Division of Environmental Services

www.epa.state.oh.us/portals/35/documents/Field_Manual_1-9-09_revision.pdf

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

Field and Laboratory QA/QC

- ✓ Laboratory Quality Control Policy: Ten percent of the samples collected will be analyzed in duplicate to establish levels of precision.
  - ➢ Ten percent of the samples will be spiked and analyzed for recovery efficiency and accuracy.
- ✓ Field Quality Control Policy: Ten percent of the samples collected will be used for quality control purposes.
  - ➢ Duplicate samples will be used to determine representativeness of sampling.

QA/QC Sample Types

- ❑ Equipment Blanks
- ❑ Field Duplicates/Splits
- ❑ Trip Blanks
- ❑ Field Blanks
- ❑ Spiked Samples
- ❑ Reference Samples

QA/QC Sample Types

Equipment Blanks

Auto Sampling Equipment and Grab Sample Stainless Steel Buckets or Cups

Samples of Deionized Water used to rinse sampling equipment in the field AFTER collecting the sample and prior to starting a new sample sequence

Equipment Blanks are collected AFTER completion of the decontamination process prior to sampling

Equipment Blanks are used to document adequate decontamination of ALL sampling equipment

QA/QC Sample Types

Field Duplicates/Splits

Field Duplicates/Split samples are duplicate samples taken from the same container and analyzed independently

Field Duplicates/Split samples are used to obtain the magnitude of errors due to contamination, random and systematic errors, and any other variability

Care must be taken to ensure that the samples are split in a way to ensure consistency

QA/QC Sample Types

Trip Blanks

Trip Blanks are used to detect contamination resulting from the container and/or preservative during transport and storage

Trip Blanks are solely for VOC (volatile organic carbon)

The vials are filled by the analyzing laboratory with deionized water

Only 1 trip blank is sent with each crew going out sampling VOC's for the day

Trip blanks remain unopened, travelling with the sampling crew and brought back in the same manner as other samples collected

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

QA/QC Sample Types

Field Blanks

Field Blanks mimic sampling and preservation process

Field Blanks are exposed to the sampling environment at the sample site

Field Blanks provide information on contamination resulting from handling techniques and exposure to the atmosphere and are processed in the same manner as the associate samples

Field Blanks are prepared by pour deionized water into the pre-labeled bottles and preserving them, if necessary

QA/QC Sample Types

Spiked Samples

Spiked samples for each variable being tested are prepared by spiking a single water sample with known amounts of the pollutant of interest.

The information gained from spiked samples is used to reveal any systematic errors (or bias) in the analytical method.

The spike solution will be prepared by the laboratory prior to the sampling trip.

QA/QC Sample Types

Reference Samples

Reference samples are used to document the bias of the analytical (laboratory) process. There are two types of reference samples:

1) An independent laboratory will prepare a sample with the addition of a known quantity of the pollutant of interest.

2) A certified reference sample obtained from a recognized national scientific body such as the National Research Council. The sample itself is an aliquot of a very large stabilized (may be preserved) batch sample that was collected from one place at one time.

What to do if QC not met for Equipment Blanks

- ✓ Go back through the cleaning process of the equipment and make sure everything is being done properly
- ✓ Check the sampling methods, field logs, and equipment cleaning logs
- ✓ The reporting lab should check their data to make sure its not a precision problem on their end
- ✓ Make sure training is up to date

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

What to do if QC not met for Field Duplicates/Splits

- ✓ Check the sampling methods, field logs, and equipment cleaning logs
- ✓ Potentially going out in the field to observe how the splits are being done to see if it is a procedural issue
- ✓ Check with the reporting lab to make ensure precision and accuracy
- ✓ Make sure training is up to date

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

What to do if QC not met for Trip Blanks

- ✓ First have the entire batch of samples reanalyzed
- ✓ Depending on the impact to the data the samples might need to be rejected or qualified
- ✓ The reporting lab should check their QA/QC to make sure its not on their end
- ✓ The sampling methods and sampling logs need to be reviewed along with potential training
- ✓ If it persists over multiple sampling events a intensive investigation needs to take place with remedial measures taken

What to do if QC not met for Field Blanks

- ✓ Find the source of the contamination (bottles, preservatives, DI water)
- ✓ Collect and analyze more laboratory blanks, equipment blanks, etc. to try to isolate the contamination
- ✓ The Reporting lab should check its internal QA/QC
- ✓ All field sampling methods, logs and training need to be reviewed to find the source of the contamination

What to do if QC not met for Spiked Samples

- ✓ Find the source of the contamination (bottles, preservatives, DI water)
- ✓ The Reporting lab should check its internal QA/QC
- ✓ All field sampling methods, logs and training need to be reviewed to find the source of the contamination

What to do if QC not met for Reference Samples

- ✓ This is a Lab Issue, not sampling issue
- ✓ The Reporting lab should check its internal QA/QC
- ✓ All field sampling methods, logs and training need to be reviewed to find the source of the contamination

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

Frequency

How often should QA/QC be done?

- It depends on the situation and requirements
- City of Columbus has 2 crews that collect samples 4 days a week
- The city gets a QA/QC set from each sampling crew once a week
- The goal is to capture the entire sampling sequence and test per week and per crew

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

Ensuring Proper QA/QC

There are a number of things that go into QA/QC that are not just about the actual sample.

- Chain of Custody
- Proper Sample Labels
- Proper Preservation on samples
- Sample Receipt and Sample check in

Chain of Custody

A legally defensible document and the most important document that goes with the samples

- The chain of custody needs to be filled out completely and accurately

Most chain of custodies have the same items on them:

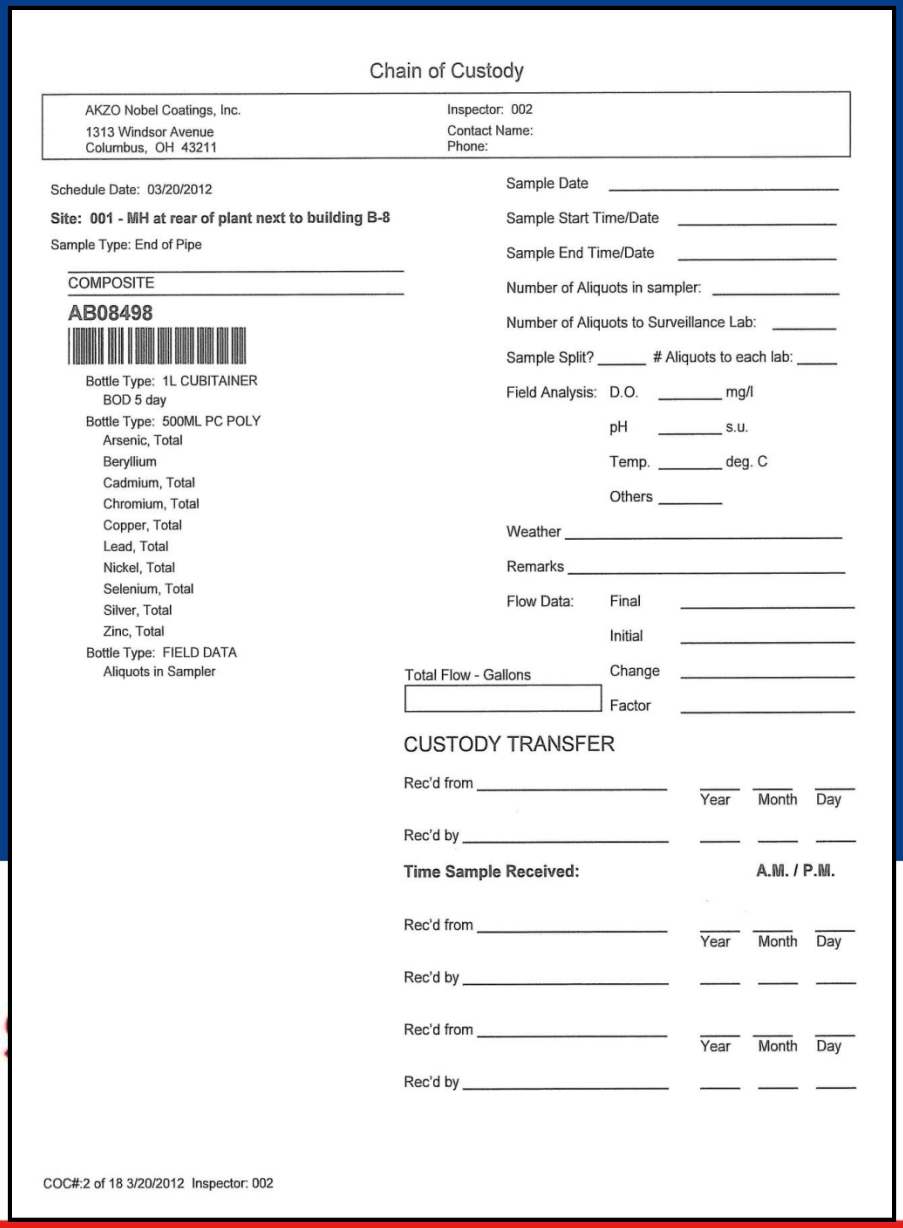
- Date and time of collection, location names or codes, the tests that need run, preservation, how many bottles per sample, contact information, sample matrix (e.g., water, wastewater), what reporting requirements
- Signatures of collectors and people receiving the samples with dates and times

Field Data

Included on the Chain of Custody

- FIELD DATA
  - pH, Sample Temperature, Flow Conditions, Color of Sample, Heavy Solids, etc.
- Field Data helps determine the validity of the sample
- Field Data helps determine if proper procedures were used at collection time
- Other Field Data may include conductivity, chlorine, ammonia, etc.
- This information stays with the sample collector;
  - Some Labs may request this data for their own use

Sample Chain of Custody



Chain of Custody

AKZO Nobel Coatings, Inc.
1313 Windsor Avenue
Columbus, OH 43211

Inspector: 002
Contact Name:
Phone:

Schedule Date: 03/20/2012

Site: 001 - MH at rear of plant next to building B-8

Sample Type: End of Pipe

COMPOSITE

AB08498

Bottle Type: 1L CUBITAINER
BOD 5 day
Bottle Type: 500ML PC POLY
Arsenic, Total
Beryllium
Cadmium, Total
Chromium, Total
Copper, Total
Lead, Total
Nickel, Total
Selenium, Total
Silver, Total
Zinc, Total
Bottle Type: FIELD DATA
Aliquots in Sampler

Sample Date _____
Sample Start Time/Date _____
Sample End Time/Date _____
Number of Aliquots in sampler: _____
Number of Aliquots to Surveillance Lab: _____
Sample Split? _____ # Aliquots to each lab: _____
Field Analysis: D.O. _____ mg/l
pH _____ s.u.
Temp. _____ deg. C
Others _____
Weather _____
Remarks _____
Flow Data: Final _____
Initial _____
Change _____
Factor _____

Total Flow - Gallons

CUSTODY TRANSFER

Rec'd from _____ ____ ____ ____ Year Month Day
Rec'd by _____ ____ ____ ____
Time Sample Received: **A.M. / P.M.**
Rec'd from _____ ____ ____ ____ Year Month Day
Rec'd by _____ ____ ____ ____
Rec'd from _____ ____ ____ ____ Year Month Day
Rec'd by _____ ____ ____ ____

COC#:2 of 18 3/20/2012 Inspector: 002

THE CITY OF COLUMBUS
ANDREW J. GINTHER, MAYOR

Sample Labels

Sample labels need to be complete and accurate

Two types of labels can be used:

1. Labels that have Sample ID, Preservation, Type of Tests, Date/Ttime of Collection and Samplers Initials

2. City of Columbus: The LIMS/PIMS tracks all samples received by the use of a bar code label. This unique identifier must be affixed to all samples for delivery to the surveillance laboratory and be printed on all chain-of-custody forms for proper tracking.

Receipt and Logging of Samples

When you deliver the sample(s) to the lab the receiving Analyst will do a sample check

- The check includes Temperature, Proper Preservation, Hold Times, Labels and Chain of Custody
- After verification, the sample is relinquished to the Lab by signing the Chain of Custody… the lab analyst will also sign the Chain of Custody
- You need to keep a copy of the Chain of Custody with the signatures
- The lab will keep the sample check list they used to ensure the sample(s) suitable to be analyzed

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

Shipping Samples

When shipping samples, extra care needs to be taken:

Keeping Samples Cold is Priority #1

- Ice Packs work best; no leaking water or possibility of contamination
- Ice cubes pose risks: **IF WATER LEAKS THE SHIPPING COMPANY WILL MOST LIKELY NOT SHIP THE SAMPLES!**

Ensure sample bottles are packed in an upright position and supported

Glass sample bottles should be wrapped in bubble wrap

Complete the documentation the receiving lab provided to ensure proper analysis

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

Shipping Samples

Shipping Labels:

Make sure all addresses are correct

Make sure you have a contact name on the shipping label

Make sure you have marked the proper type of shipping;

- ✓ overnight express is recommended to ensure the samples are still cold and all hold times are met

Shipping Sample

Chain of Custody:

This is more important than ever

You will not physically be handing over the samples

- care needs to be taken to ensure the chain of custody is filled out completely and accurately

Sign the Chain of Custody relinquishing it to the receiving lab;

The receiving lab will sign the Chain of Custody and send you a copy with the final report

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

Shipping Samples

Field Data or other information

Field Data is Crucial

- This ensures the lab knows exactly what is going on with the samples
- The receiving lab needs accurate data and does not have the luxury of talking to the sample collectors

Put all documentation in a zip lock bag and tape it to a safe, dry place in or on the shipping container

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

Equipment Calibration

Depending on what type of equipment you use the list could be different

- pH/Temperature Meters
- Automatic Samplers
- Flow Meters
- ORP Meters
- ???

Calibration needs to be performed regularly to ensure proper quality control

Calibration check sheets need to be used every time the equipment is checked

Summary

QA/QC STARTS BEFORE YOU LEAVE THE FACILITY TO SAMPLE

A. There are 4 types of QA/QC- Field Blanks, Trip Blanks, Duplicates/Splits and Equipment Blanks

B. There are specific QA/QC criteria that need to be met for the samples to be considered valid

C. Steps need to be taken when QA/QC criteria are not met to determine WHY

Summary

- ✓ Frequency is dependent on your specific operation BUT at least 1 in 10 samples (10%) should be QA/QC
- ✓ Many items factor into good quality samples (chain of custody, labels, proper preservation, and sample receipt)
- ✓ Documents need to be accurate and complete
- ✓ Calibration is very important.
- ✓ Cleaning of equipment and supplies is very important.

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

Final Thought

QA/QC STARTS BEFORE YOU LEAVE THE FACILITY TO SAMPLE

- ✓ If the lab is given a bad sample that wasn't handled right the data is going to be bad
- ✓ The lab can't make magic happen

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

FIELD SAMPLING
QUALITY ASSURANCE AND QUALITY CONTROL PLAN
FOR THE CITY OF COLUMBUS
DIVISION OF SEWERAGE AND DRAINAGE
INDUSTRIAL WASTEWATER PRETREATMENT PROGRAM

Implementation Date
April 25, 2012

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

Questions?

Jeffrey L. Bertacchi

jlb@columbus.gov

614-645-5912 Office
614-645-0227 Fax

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR