

WHAT IS QUALITY ASSURANCE (QA)?

A SYSTEMATIC PROGRAM OF PROCEDURES DESIGNED TO ASSESS A MEASUREMENT AGAINST AN AGREED-UPON SET OF SPECIFICATIONS...

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WHAT IS QUALITY CONTROL (QC)?

THE GROUP OF INDIVIDUAL MECHANISMS USED TO ARRIVE AT QUANTITATIVE ESTIMATES OF ADHERENCE TO THE AGREED-UPON QUALITY ASSURANCE PROGRAM...




EXAMPLES OF QC ELEMENTS IN ENVIRONMENTAL ANALYSES

(WHAT DO WE WANT TO MEASURE?)

- PRECISION
 - ACCURACY
 - COMPARABILITY
 - COMPLETENESS
 - (● DETECTION LIMITS)
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EXAMPLES OF MECHANISMS TO QUANTITATE THESE QC ELEMENTS (QC CHECKS)

- **DUPLICATES (PRECISION ESTIMATE)**
 - **MATRIX SPIKES (ACCURACY ESTIMATE)**
 - **SPIKED BLANKS (DIGESTION/EXTRACTION)**
 - **BLIND PE SAMPLES (ACCURACY ESTIMATE)**
 - **THERE ARE MANY OTHERS...**
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QC CHECKS YOU (USUALLY) WON'T SEE IN A DATA REPORT

- **CALIBRATION STATISTICS (R-VALUE, RESPONSE FACTOR, ETC.)**
- **INITIAL & CONTINUING CAL STATISTICS**

**THESE GO ON “IN THE BACKGROUND,”
BUT ALL HAVE CONTROL LIMITS &
CORRECTIVE ACTIONS**



EXAMPLE OF PARAMETERS FOR A SINGLE CALIBRATION QC CHECK (TAKEN FROM AN SOP)

9.5.2 Initial Calibration Verification (ICV) Standard

Frequency: once, immediately after generating an acceptable calibration curve

QC statistic: percent recovery

Control limits: 95 – 105% (aqueous samples); 90 – 110% (soils, sludges)

Corrective actions: terminate run; recalibrate using same standards; if control limits not met the second time, review instrument operating parameters and then recalibrate using freshly prepared standards

QC CHECKS YOU SHOULD SEE IN A DATA REPORT

- **BLANKS (REAGENT, MATERIAL, TRAVEL, ETC.)**
- **DUPLICATE PRECISION (RPD)**
- **MATRIX SPIKES (% RECOVERY)**
- **LCS/SPIKED BLANK (% RECOVERY)**
- **SURROGATES (% RECOVERY, ORGANICS)**

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- **MDLs (NOT A QC CHECK, BUT A QA ELEMENT)**
 - **PQLs/LOQs/MRLs (DITTO)**

EXAMPLE OF PARAMETERS FOR THE DUPLICATE QC CHECK (TAKEN FROM AN SOP)

11.3.1 Matrix Duplicate

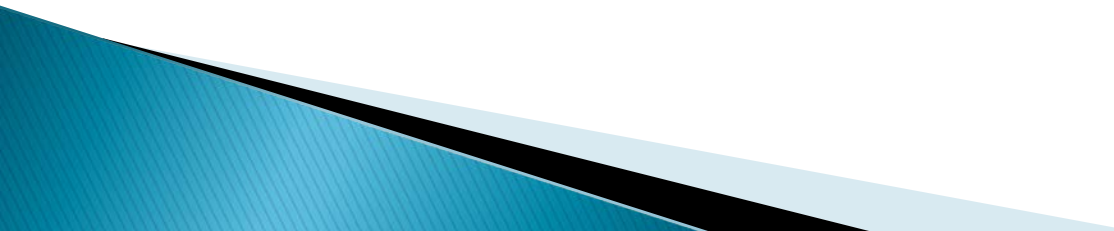
Frequency: one for each 10 samples or one per analytical run, whichever is more frequent. When a run includes several types of sample, run one set of duplicates for each matrix type.

QC statistic: relative percent difference (RPD) (Section 12.3)

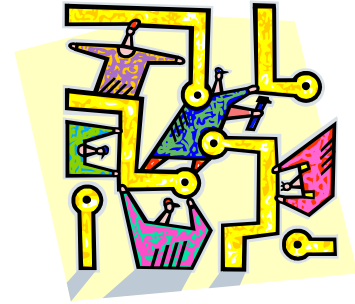
Control limits: < 20%

Corrective action: re-analyze sample, duplicate, and spike. If duplicate precision is still not acceptable, report result as an estimate. (Note: control limits do not apply if analyte concentrations are less than 5 times the method reporting limit. If needed, put a comment to this effect on the report.)

**HOW DO YOU USE THE RESULTS OF
ALL THESE QC STATISTICS TO ARRIVE
AT DEFENSIBLE CONCLUSIONS ABOUT
THE QUALITY OF THE DATA??**



Rule 1



If you don't ask for it, you may not get it.

Be sure the lab knows they need to:

- **follow appropriate protocols**
- **use the QLs you need**
- **report to their MDL**
- **include QC in their reports**
- **note any outliers in the report**

Rule 2

You are responsible for the data your laboratory generates.



It is up to you to work with your lab to ensure you get what you need.

See Rule 1

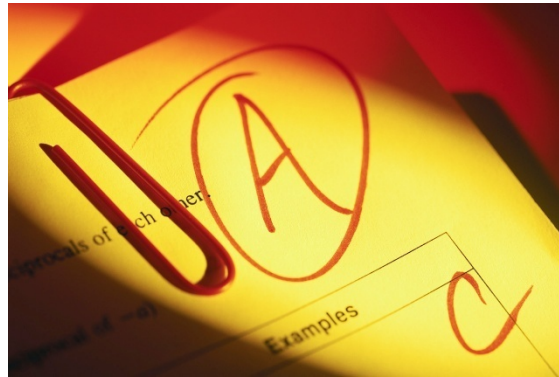
Rule 3

All laboratory data is not perfect.



Rule 4

Just because a QC is out, it doesn't mean the data is unusable.

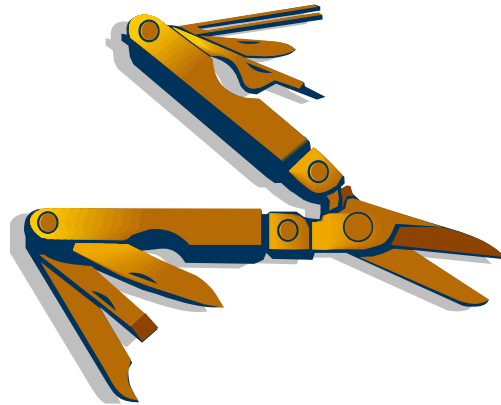


More on Rule 4 in a minute

Rule 5

To figure out rule 4,

You must understand what the purpose
is of each QC sample



QC Failures should be identified in the lab report either with Data Qualifiers or in a case narrative



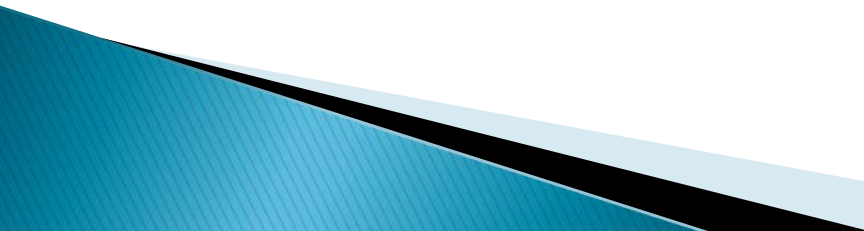
Rule 4 – Blanks



Blanks are used to indicate if potential contamination is present

- 1. Are your samples still below the action level (or still ND)?**
- 2. Are your samples way above the action level (does the blank have any real impact)?**

Rule 4 – Blanks (Continued)

- 3. Does your laboratory verify their MDLs to make sure they are reasonable?**
 - 4. Is the blank and equipment, field, calibration, or analytical method blank.**
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Rule 4 – Blanks (Continued)

5. Are you collecting and running field QC?

- Trip Blanks – VOCs**
- Equipment Rinse Blanks**
- Transfer Blanks**

Rule 4 – Blanks (Continued)

6. Common Lab contaminants

- **Methylene Chloride**
- **Hexane**
- **Acetone**
- **Phthalates**
- **Zinc**

Rule 4 – Calibrations/Verifications

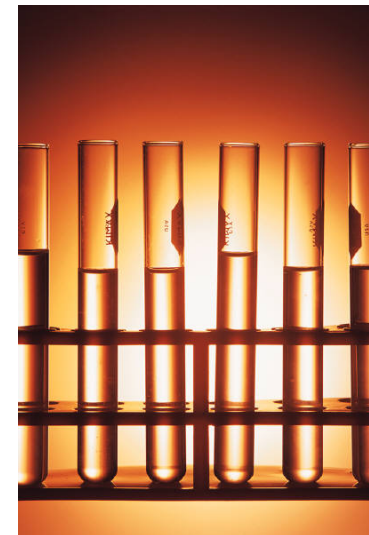
Calibrations and Verifications demonstrate to the potential accuracy of a result.

If a calibration is out you still have the analyte present. The question is how much.



Rule 4 – Laboratory Control Samples (LCS)

The LCS demonstrates to the potential accuracy of a result as well as the effectiveness of the preparation.



Rule 4 – Laboratory Control Samples

If a LCS is out you still have the analyte present. The question is how much.

- Are your samples above or below the action levels?
(impact is dependent on the bias of the calibration.)**

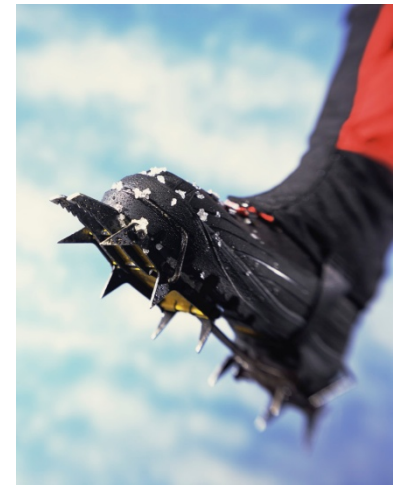
Rule 4 – Matrix Spikes



Similar in function to LCS but it is a spike into actual sample matrices to test performance of the method.

- **Are your samples above or below the action levels? (impact is dependent on the bias of the calibration.)**

Rule 4 – Surrogates Spikes



- **Similar in nature to LCS but:**
 - **is sample specific**
 - **Uses non-Target analytes**

Rule 4 – Internal standards

Adjusts individual sample results based on instrument performance and sample matrix.



- **Sample specific**
- **Uses non-Target analytes and associates target analytes based on chemistry**

Look at your data as a whole rather than isolated incidents.



1 QC failure upon further review may be acceptable. (e.g LCS failure, matrix spike good, surrogates OK).

**Notify permit writer if you find that
there are documented problems
with the data.**

