Implementing and Evaluating Laboratory Quality and Managements Systems Across Multiple Regulatory Programs and Analytical Procedures

National Environmental Monitoring and TNI Conferences

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DISCLAIMER

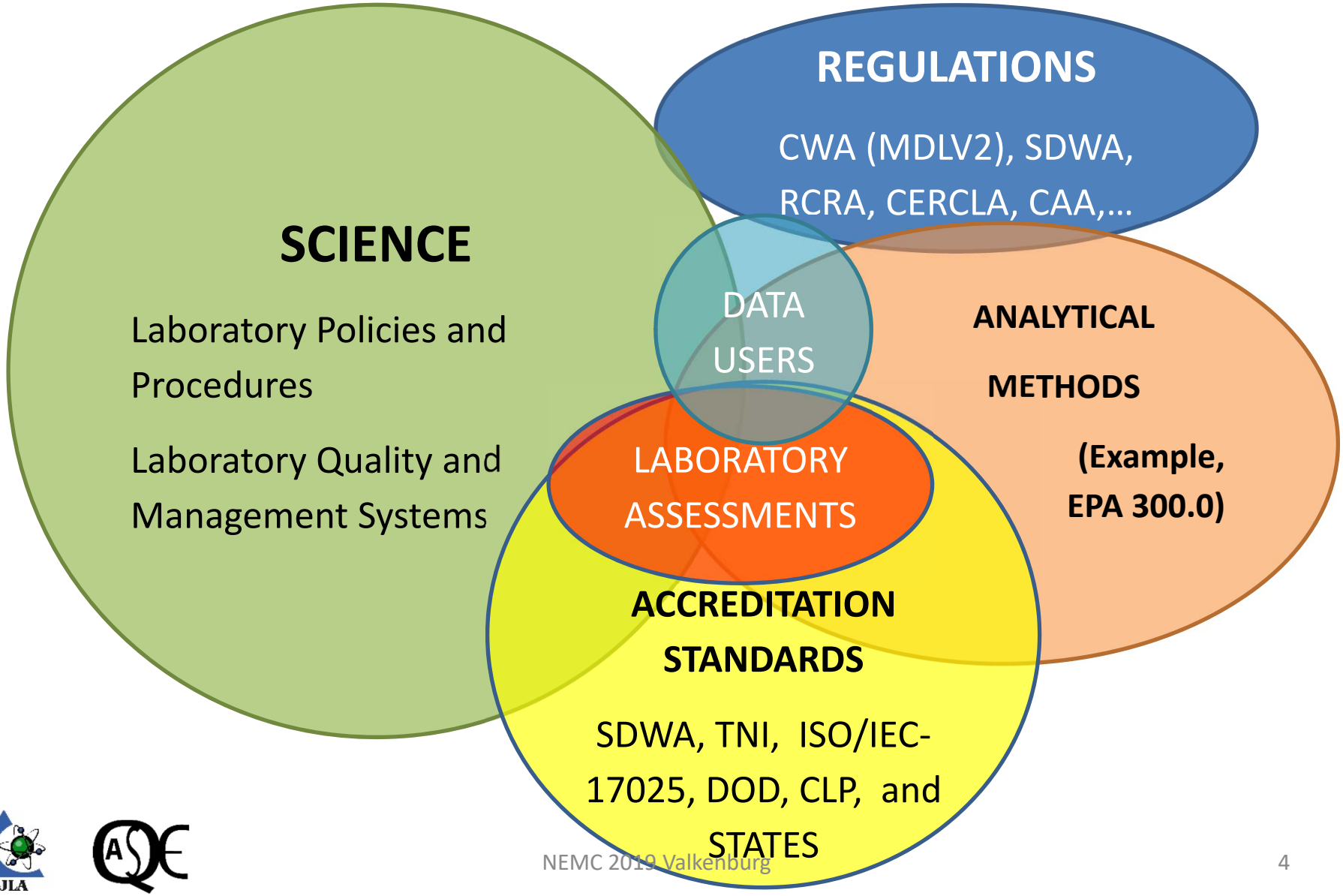
- The material given in this presentation is the professional opinion and interpretations of the presenter only.

QA/QC
Quality Assurance/Quality Control

Laboratory QA/QC

A total Quality System to generate data of acceptable quality to include both a QA component, which encompasses the management procedures and controls, as well as an operational day-to-day method QC component to ensure analytical results of known precision and accuracy.

DATA TREND VENN Diagram



Method Update Rule-2012
40 CFR Part 136 - CWA

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 136, 260, 423, 430, and 435

[EPA–HQ–OW–2010–0192; FRL–9664–6]

RIN 2040–AF09

Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Analysis and Sampling Procedures

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: This rule modifies the testing procedures approved for analysis and sampling under the Clean Water Act. EPA proposed these changes for public comment on September 23, 2010. The changes adopted in this final rule fall into the following categories: New and revised EPA methods and new and revised methods published by voluntary consensus standard bodies (VCSB), such as ASTM International and the Standard Methods Committee; updated versions of currently approved methods; methods reviewed under the alternate

by the Director of the Federal Register on June 18, 2012. For judicial review purposes, this final rule is promulgated as of 1:00 p.m. (Eastern time) on June 1, 2012 as provided at 40 CFR 23.2 and 23.7.

ADDRESSES: EPA has established a docket for this action under Docket ID No. EPA–HQ–OW–2010–0192. All documents in the docket are listed on the *http://www.regulations.gov* Web site. Although listed in the index, some information is not publically available, *e.g.,* CBI or other information whose disclosure is restricted by statute. Certain other materials, such as copyrighted material, are not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available either electronically through *http://www.regulations.gov* or in hard copy at the HQ Water Docket Center, EPA/DC, EPA West, Room 3334, 1301 Constitution Ave. NW., Washington, DC. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is 202–566–1744, and the telephone number is 202–566–

Pennsylvania Ave. NW., Washington, DC 20460, 202–566–1005 (email: *gomez-taylor.maria@epa.gov*). For information regarding the changes to microbiological and whole effluent toxicity methods, contact Robin Oshiro, Engineering and Analysis Division (4303T), USEPA Office of Science and Technology, 1200 Pennsylvania Ave. NW., Washington, DC 20460, 202–566–1075 (email: *oshiro.robin@epa.gov*).

SUPPLEMENTARY INFORMATION:

A. General Information

1. Does this action apply to me?

EPA Regions, as well as States, Territories and Tribes authorized to implement the National Pollutant Discharge Elimination System (NPDES) program, issue permits with conditions designed to ensure compliance with the technology-based and water quality-based requirements of the Clean Water Act (CWA). These permits may include restrictions on the quantity of pollutants that may be discharged as well as pollutant measurement and reporting requirements. If EPA has approved a test procedure for analysis of a specific pollutant, the NPDES permittee must

General Quality Assurance and Quality Control Language at 40 CFR 136.7

*I*EPA is specifying "essential" quality control elements at § 136.7 for use in conducting an analysis for CWA compliance monitoring. This new language is added because auditors, coregulators, laboratory personnel, and the regulated community have noted the variations in quality assurance (QA) and quality control (QC) procedures practiced by laboratories that use 40 CFR part 136 methods for compliance monitoring. Some of these methods are published by voluntary consensus standards bodies, such as the Standard Methods Committee, and ASTM International.

12 Essential QC Steps

For methods that lack QA/QC requirements (as specified in this new section at 40 CFR 136.7), whether developed by EPA, a vendor, or a consensus standard body, analysts can refer to and follow the QA/QC published in several public sources. Examples of these sources include the relevant QA/QC sections of an equivalent approved EPA method, or voluntary consensus standards published as Part 136 approved methods (e.g., Standard Methods, ASTM international, and AOAC).

12 Essential QC Steps

1) Demonstration of Capability (DOC) – (TNI 2003 Form)
2) Method Detection Limit (MDL) - (CWA MDLV2)
3) Laboratory Reagent Blank (LRB or Method Blank)
4) Laboratory Fortified Blank, Laboratory Control Sample, (LFB/LCS/QCS, or ICV for direct methods);
5) Matrix spike (MS) Matrix spike duplicate (MSD), (LF/LFMD)
6) Internal standards (for ICP/MS or GC/MS analyses), surrogate standards (for organic analysis), or tracers (for radiochemistry);

12 Essential QC Steps

7) Calibration (initial and continuing verifications (ICV,CCV),
8) Control charts (or other trend analyses of quality control results)
9) Corrective action (root cause analysis)
10) QC acceptance criteria;
11) Definitions of preparation and analytical batches that may drive QC frequencies; and
12) Minimum frequency for conducting all QC elements.

These twelve quality control elements must be clearly documented in the written standard operating procedure for each analytical method

STANDARD METHODS Sections "#"020 ","2020") = METHOD TYPES - ACCURACY-PRECISION REQUIREMENTS

TABLE 2020:I. METHODS IN PART 2000 INDICATING OR AMENABLE TO INITIAL QUALITY CONTROL

	PARAMETER Section	BIAS Bias	PRECISION Precision	MDL MDL	Operational Range
2120B	Color	–	×	–	–
2120C		–	×	×	–
2120D		–	×	×	–
2120E		–	×	×	–
2120F		–	×	×	–
2130B	Turbidity	–	–	×	–
2170B	Flavor Profile Analysis	–	×	–	–
2310B	Acidity	–	×	–	–
2320B	Alkalinity	×	×	–	–
2340C	Hardness	×	×	–	–
2350B	Oxidant Demand/Requirement	–	–	×	–
2350C		–	–	×	–
2350D		–	–	×	–
2350E		–	–	×	–
2510B	Conductivity	–	×	–	–
2520B	Salinity	–	×	–	×

2320B ALKALINITY X X 0 0

STANDARD METHODS Sections "#"020 ","2020") = METHOD QC TYPE REQUIREMENTS

QUALITY ASSURANCE/QUALITY CONTROL (2020)/Quality Control Practices

TABLE 2020:II. SUMMARY OF ONGOING QUALITY CONTROL FOR METHODS IN PART 2000

		Calibrate or Standardize	QCS	MB	LFB	Duplicates	LFM
	Section						
2120B	Color	×	×	–	–	×	–
2120C		×	×	–	–	×	–
2120D		×	×	–	–	×	–
2120E		×	×	–	–	×	–
2120F		×	×	–	–	×	–
2130B	Turbidity	×	×	–	–	–	–
2150B	Odor	–	–	×	–	–	–
2150C		–	–	×	–	×	–
2160B	Taste	–	–	×	–	–	–
2170B	Flavor Profile Analysis	–	–	×	–	×	–
2310B	Acidity	×	×	×	×	×	–
2320B	Alkalinity	×	×	–	×	×	–
2340C	Hardness	×	×	×	×	×	–
2350B	Oxidant Demand/ Requirement	–	–	×	–	–	–
2350C		–	–	×	–	–	–
2350D		–	–	×	–	–	–
2350E		–	–	×	–	–	–
2510B	Conductivity	×	×	–	×	×	–
2520B	Salinity	×	×	–	×	×	–

PARAMETER CAL LCS MB LFB DUP LFM

2320B ALKALINITY X X 0 X X 0?

Hg by CVAA: E245.1, SM3112B, SW7470A

<u>All 3 Methods are Procedurally Equivalent:</u>

Sample is digested under diluted acid and potassium permanganate potassium persulfate oxidative conditions for two hours at 95°C0. Mercury is then reduced with stannous chloride to elemental mercury and measured by cold vapor atomic absorption at 253.7 nm.

Differences

- SW7470A specifies digestion of calibrations standards.
- QC Elements and their Criteria and Definitions of Terms are Different between Methods.

Hg CVAA: E245.1, SM3112B, and SW7470A

Method Approval and allowed Modifications are dependent on regulatory program requirements.

- SDWA – Potable Waters - EPA 245.1 and SM3112B are approved.
  - Chemical/Procedural modification is not permitted unless specified by EPA Federal Level Approval or Guidance
- CWA - EPA 245.1 and SM 3112B are approved. Modifications are allowed by Memo/Regulation (ATP)
  - Methods may not be sufficiently sensitive for regulation. Modification or alternate procedures may be needed. EPA Memo to Regions from James A Hanlon August 23, 2007…
- RCRA – SW846 - 7470A is approved.
  - "Method Innovation Rule and ATP Guidance
  - EPA Method 7470A specifies digestion of standards, but comparison of ICV (undigested) to the same standard digested (and used for the "LCS") verifies that omitting digestion for 7470A Method has no impact on data validity.

QC ELEMENT TABLE, Hg by CVAA

QA SAMPLE INDICATOR	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	COMMENTS
Sample Preparation	All samples digested	Meet method QC criteria for the matrix.	1) Re-analyze sample. 2) Re-prepare sample/batch.	
Instrument Calibration (IC)	Daily, after maintenance, or when needed. At least 5-point calibration including blank. Calibration Standards are not digested per 245.1 except at ultra-trace levels.	Correlation coefficient ≥0.995 also includes visual interpretation for quadratic or higher order calibration fit types. Evaluation of RE. 90-=110% Recovery	1) Perform instrument maintenance. 2) Re-calibrate. 3) Prepare new standard.	Establishes calibration curve over a range of analyte concentrations to quantify analytes of interest. Calibration validity Tested by ICV and ICB.
Initial Calibration Verification (ICV) =QCS per 245.1	Immediately follows calibration or when new standards are prepared. Analyzed each analytical sequence.	%R= 90-110	1) Recalibrate and reanalyze. 2) Prepare fresh standards and/or ICV. 3) Instrument maintenance.	Evaluates calibration accuracy and method performance. Must be prepared from Second source standard.
Method Blank (MBLK) =LRB per 245.1	Minimum 1/20 samples or for each batch-whichever is more frequent.	Must be less than the larger of: 1) ± 1*lowest reporting limit or 2) 2.2 X MDL. (245.1) < Reporting limit (7470A)	1) Re-analyze MBLK. 2) Re-digest samples from batch which fail acceptance criteria or flag and report data. 3) Test/re-prep all reagents for contamination.	Evaluates calibration accuracy, reagent/glassware contamination, and instrument carryover.

SAMPLE PREPARATION* **QC = Passing**

CALIBRATION* **R2 and RE** **Direct=Not Digested**

CALIBRATION VERIFICATION (ICV)** **Direct**

METHOD BLANKS * **<2.2 x MDL or RL, <1/10** **Digested**

***= 245.1 Method, **=Second Source**

QC ELEMENT TABLE, Hg by CVAA

Laboratory Control Sample (LCS) = LFB per 245.1 = QCS per 245.1 **LABORATORY CONTROL SAMPLE** (QCS*/LCS/LFB**)**	Minimum 1/20 samples or for each batch- whichever is more frequent.	%R = 80-120 (7470A) %R = 85-115 (245.1)	1) Repeat analyses 2) Prepare new standards 3) Re-calibrate 4) Re-extract and re-analyze samples associated with failed LCS.	Evaluates method accuracy. Must be Second Source Standard per NELAC. Also used to evaluate spiking technique for MS/MSD analysis. **Digested**
Continuing Calibration Verification (CCV) = Instrument Performance Check (IPC) per 245.1 **CONTINUING CALIBRATION VERIFICATION (CCV/IPC*)**	Analyzed at beginning of run, every 10 samples and at end of run. Same source standard.	%R = 95-105 Immediately after IC (245.1 only) %R = 90-110 as continuing calibration check.	1) Recalibrate and reanalyze all samples since last valid CCV. 2) Check for sample matrix problem.	Evaluates Instrument calibration drift. **Direct**
Continuing Calibration Blank (CCB) **CONTINUING CAL BLANK (CCB*) <2.2 x MDL or RL or <1/10**	Analyzed after every CCV. Run every 10 samples and at end of run.	Must be less than the larger of: 1) ± 1*lowest reporting limit or 2) 2.2 X MDL.	1) Check for high concentration sample. 2) Re-analyze CCB. 3) Re-analyze all samples associated with failing CCB.	Evaluates baseline drift, contamination in the analytical system, and analyte carryover. **Direct**
Reporting Limit Check Solution (CCV2)= RLCS for SM3112 **Reporting Limit Check Solution (CCV2/IPC/LLRV)**	Immediately follows calibration or when new standards are prepared. Analyzed each analytical sequence.	%R= 50-150 (3112)	1) Recalibrate and reanalyze. 2) Prepare fresh standards and/or CCV2. 3) Instrument maintenance.	Evaluates calibration accuracy at reporting limit. Must be made identically to lowest level standard used in calibration. **Direct**

QC ELEMENT TABLES, Hg by CVAA

QA SAMPLE/ INDICATOR	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	COMMENTS
Matrix Spike Sample and Matrix Spike Duplicate (MS/MSD) = LFM per 245.1	Minimum 1 set/10 samples for 245.1 Minimum 1 set/20 samples for 7470A	%R = 70-130 for 245.1 %R = 75-125 for 7470A RPD < 30% for 245.1 RPD < 20% for 7470A	1) If matrix interference suspected report as found, or 2) Re-analyze and re-spike if no matrix interference suspected, or 3) Use "A" qualifier for sample amount > 4X spike level.	Evaluates effect of matrix on method performance. Results not evaluated when sample analyte concentration > 3X spike level. Spike with same source as LCS. Control limits valid for spike level 1/3 of sample amount or higher.
MATRIX SPIKE(MS), MS-DUPLICATE (MSD), (LFM*/LFMD), (SAMPLE/FIELD DUP*)				**Digested**
Dilution Sample (SD)	Minimum 1/20 samples for method 7470A	RPD 10%	1) Repeat dilution analysis. 2) Investigate cause. 3) Redigest batch or flag data results.	Measures method precision/sample homogeneity. D
DILUTION SAMPLE*		**< RPD**		**Direct**
MDL Studies	Annually, or whenever instrument changes might affect sensitivity.	< PQL, Spike level < 1X-10X MDL, consistent with prior studies.	1) Repeat if obvious problem occurs. 2) Adjust reporting limit to >MDL.	Evaluates overall method detection limits in clean sample matrix. Actual samples may have higher MDL.
MDLs/QUARTERLY LOQs		**!/3 RL/PQL**		**Digested**
LOD Verification Required for each analyte/method to verify calculated MDL	Annually or whenever a new MDL study is required	Positive Result above signal-to-noise	1) Examine method or preparatory steps, 2) Verify MDL study, 3) Repeat analysis. 4) Consult QA.	Spike at 2-3X calculated MDL for single analyte test .
LOD VERIFICATION/Spikes		**3-5X Signal to Noise**		**3-4X MDL**

QC ELEMENT TABLES, Hg by CVAA

QA SAMPLE/ INDICATOR	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	COMMENTS
Linear Dynamic Range (LDR)	Annually, or whenever method changes might affect sensitivity.	Calculated standard values within 10% of expected.	1) Repeat. 2) Correct problem. 3) Adjust upper calibration limit.	Used to determine upper linear range for instrument.
External PE Samples	Semi-annually, WS (245.1) and WP 7470A) study samples.	PT sample defined acceptance limits (Must pass 2 out of last 3 PT studies).	1) Complete corrective action report. 2) Repeat with another make- up study (for failure of 2 out of 3).	External review of analytical method accuracy.
Control Charting	Annual statistical review of method performance.	Data statistically within control limits.	1) Trend Analysis/Method Review. 2) Correct method/instrument problem. 3) Replace Analyst.	For statistical process control.
Batch Definition	Each batch of 20 samples	Must pass all method QC criteria as specified above	Re-analyze batch or qualify results.	A group of samples and associated QC.

Linear Dynamic Range*

Direct

External PE Samples

Z Scores

Corrective Actions

Control Charting

Data Trend Analysis

Corrective Actions

Batch Definition

20+ = 2Many

More QC

CVAA Preparation/Digestion for Total Hg & Calibration Standards EPA Method 245.1 **Rev.** 3.0 for SDWA

- 100 ml aliquot Standard or Sample + 5 ml conc. H2S04 + 2.5 ml conc. HN03
- Add 8 ml KMnO4 solution.-- Mix thoroughly/Cap or cover/Heat for 2 hours in 95•c water bath/Cool to room temp.
  - Section 10.3 states that the recommended calibration routine is in Section 11 .2, (without heating); original publication in J. Am. Water Works **Assoc.** Includes heating the standards. Either way okay. (SDWA 2019 Assessor Training)
- Add 6 ml Sodium chloride-hydroxylammonium chloride (or sulfate) solution.
- Reduces excess potassium permanganate.
  - NOTE: Reduced volume or semiautomated versions of this method that use the same reagents and molar ratios are acceptable provided they meet the quality control and performance requirements stated in the method,

EPA PROGRAMS-PART 1

- *SDWA* - The Safe Drinking Water Act, enacted 1974, amended in 1986, 1996, 2018
  - First to implement National Laboratory Certification Program
    - Ongoing SDWA Certification Officer Training
    - New Methods by ATP and Expedited Approval CFR Part 141 Part C Appendix A

- *CERCLA* - Comprehensive Environmental Response, Compensation, and Liability Act, enacted December 11, 1980 (Love Canal concerns 1978) Updated as SARA - Superfund Amendments and Reauthorization Act, enacted October 17, 1986
  - Developed Contract Laboratory Program and CLP Analytical Methods
    - Functional Guidelines for the Validation of Inorganic Data
    - Functional Guidelines for the Validation of Organic Data

EPA PROGRAMS - PART2

RCRA – Resource Conservation and Recovery Act – enacted 1976. Based on Solid Waste and Disposal Act of 1965.

– Waste, Hazardous Waste, Underground Storage Tanks

Developed SW-846 Analytical Methods and numerous QA Guidance Topics. Chain-of-Custody, QAPP, Sampling Plans, etc.

-Methods 6020B, 8270D QC Elements - See DOD QSM 5.2)

-SW-846 8000D (Calibration Guidance)

CWA – Clean Water Act enacted 1977 from amendments of the Federal Water Pollution Control Act of 1972.

– NPDES National Pollutant Discharge Elimination System

600 Series Methods

1600 Series Methods

Method Update Rules – 2012, 2017

Useful for ATP Process and Method Validation/Modification Guidance

- Do not modify "Method Defined Parameter Procedures"

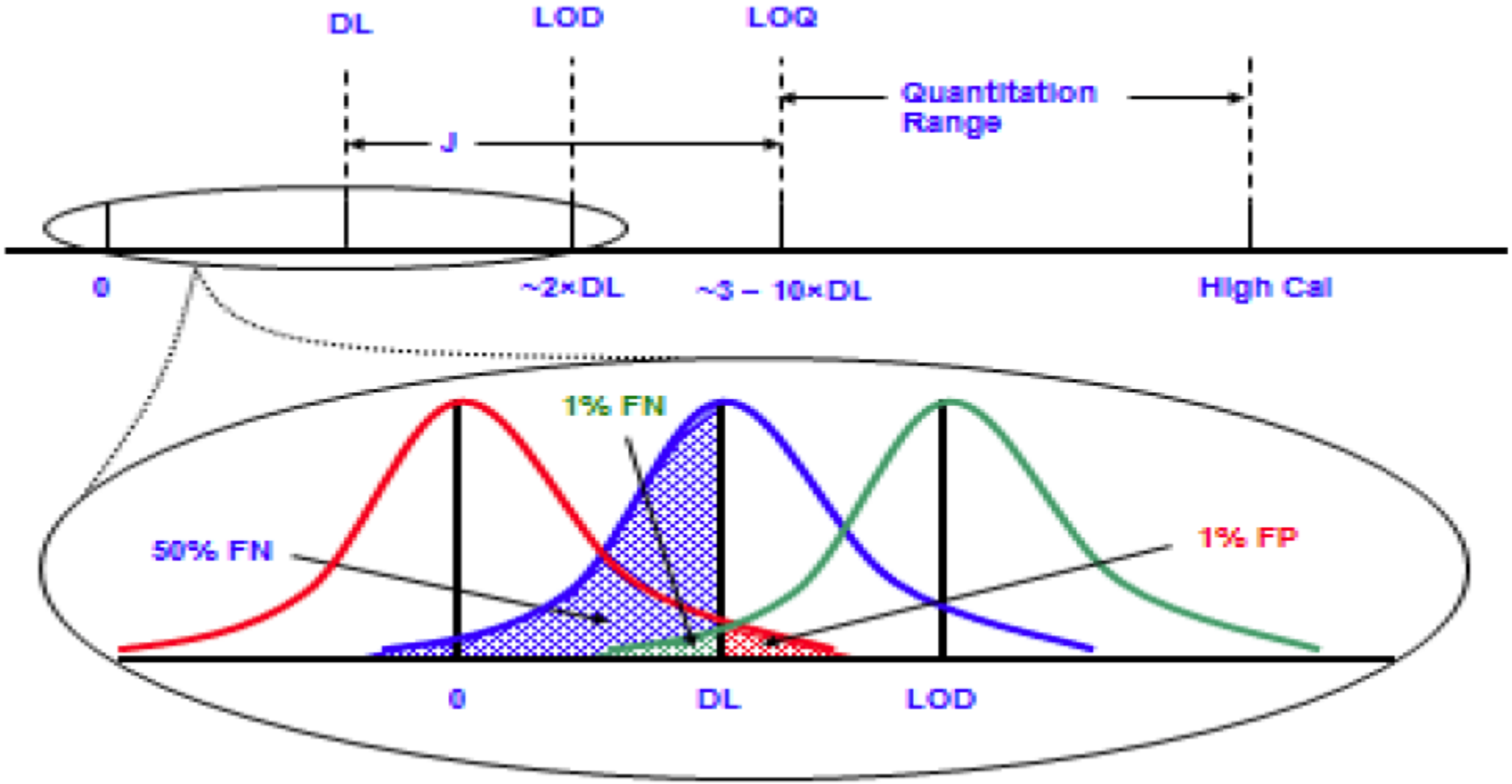
EPA PROGRAMS PART 3…

CAA – Clean Air Act – Amended 1990
Market based approach

FIFRA - Federal Insecticide Fungicide and Rodenticide Act
FDA – Food and Drug Administration

- **GLP = Good Laboratory Practice (1978)**
- **GALP = Good Automated Lab Practice**

DL(MDL Version 2), LOD, LOQ – DOD Guidance



- *"Detection and Quantitation – What Project Managers and Data Users Need to Know",* DOD Environmental Data Quality Workgroup, October 2017.
- DOD QSM 5.1.1

CWA METHOD UPDATE RULE 2017 MDL Version 2

SDWA - Requires CFR Part 136 Procedure for VOCs, or, if MDL procedure is not given in method. Allowed for all procedures

RCRA – Not specified for in procedures. May be Required/Expected by State or Clients

- Initial MDL Determination
  - MDL- 7 Spikes done over 3 days/3 batches
  - MDL- 7 Blanks done over 3 days/3 batches
  - Schedule Quarterly MDL spike analysis
- Ongoing MDL Determinations (Due 2019)
  - Calculate Quarterly MDL-Spike Results
  - Evaluate Method Blank Data for MDL-Blank Value
  - Implement suitable corrective action processes

QA SYSTEMS FAVORITE SOURCES

- TNI - Provides Overall Prescriptive QA Systems Requirements/Guidance
  - Quality Manual and SOPs Format Examples; DO Forms (2003 TNI Standard)
  - Courses and Workshops (Examples: Internal Auditing and Corrective Actions)
  - Quality Systems Checklist
  - Method Validation Categories (TNI-2016)
  - Method and Analyte Codes
  - Proficiency Testing (PT) Minimum Report Level a Acceptance Criteria (FOPT Tables)
    - Watch for TNI 2009/2016 differences

QA SYSTEMS FAVORITE SOURCES

- DOD QSM = TNI 2009+ with ISO 17025-2017;
  - Defines additional prescriptive criteria for selected TNI topics (Added Text and ISO Grey Boxes)
  - LOD/LOQ/DL (MDL)
  - Method QC Element Details (SW-846)
  - Additional Ethics Topics
  - ISO/IEC 17025-2017 Updated Topics
    - Management Review Areas
    - Complaints
    - Purchasing/Inventory
    - Subsampling
    - Risk Analysis/Impartiality

QA SYSTEMS FAVORITE SOURCES

- Accrediting Bodies - States, and 3rd Party
  - Application Forms
    - Review Lists: Instruments, Employee Summary, QA Manual Checklist, DOC/PTs, Controlled Documents, MDLs, LOQs, PQL/RL,
    - Matrix/Method (Version)/Analyte lists
      - Use TNI Method and Analyte Codes
      - See PJLA Guidance if no PTs available.
  - QA Systems Training Material and Courses
    - PJLA, ANAB, A2LA, and TNI - Web Based are readily available

QA SYSTEMS FAVORITE SOURCES

- Accrediting Bodies - States, and 3rd Party
  - State Monitoring Requirements
    - State Regulations for (Analytes, Methods, Detection Limits)
    - Example State sources:
      - Florida DOH - Method Checklists
      - Oregon (ORELAP) – Ethics Training Material
      - Virginia – Technical Assistance Documents (Traceability Manual manual Integration, audit checklists, etc.)
      - Texas – TCEQ "Laboratory Review Checklist"
        - » TCEQ publication RG-366/TRRP-13, QA Manual Checklist

QA SYSTEMS FAVORITE SOURCES

- EPA and SDWA, CWA, RCRA Websites
  - https://www.epa.gov/laws-regulations/policy-guidance
  - https://www.epa.gov/quality/epa-quality-management-tools-organizations-and-programs
- Standard Methods
  - QC Sections: 1020, 2020, 3020, etc.
- ASTM Procedures
  - Petroleum methods, metal alloys, leaching, etc.
  - Subsampling, Quality Systems, Statistics
- Recent EPA Approved Method Revisions

SUMMARY

- TNI/NELAP Program 2009 and 2016 Versions
  - DOD – TNI 2009 and ISO 17025-2017
    - MDL/LOD/LOQ Guidance
    - TNI Interpretations/Additions
- CWA MURs
  - 12 Essential Quality Control Steps
  - MUR MDL V2 – 3-Day/3Batches, Implementation of Blank data review in establishing method MDLs
- Environmental Regulations – Utilize Approved Methods per Federal Register Regulations
- Prepare in Advance for Expected Accreditation Regulation Changes
  - –RISK Analysis

REFERENCES

TNI (The NELAC Institute)

https://nelac-institute.org/content/CSDP/standards.php (Guidance Documents)
https://nelac-institute.org/content/NEPTP/fopt.php (Fields of Proficiency Testing)
https://lams.nelac-institute.org/ (TNI/NELAP - Method and Analyte Codes)

Perry Johnson Laboratory Accreditation Inc. (PJLA)

http://www.pjlabs.com/resources/pjla-documents (Certification Guidance/Requirements Documents/Traceability)
http://www.pjlabs.com/training/pjla-webinars/past-webinars (No Charge, ISO 17025-2017 Training Material)

National Environmental Monitoring Conference (NEMC) - Past Presentations

http://www.nemc.us/proceedings.php

Safe Drinking Water Act Drinking Water (SDWA) for Drinking and Source Groundwater

https://www.epa.gov/ground-water-and-drinking-water (Approved methods and Manual for Certification of Laboratories Analyzing Drinking Water)

Clean Water Act (CWA) for (NPDES Permits, Wastewater, Stormwater run-off, etc.)

https://www.epa.gov/cwa-methods (Method Update Rules for Approved Methods)
https://www.epa.gov/cwa-methods/other-support-documents-cwa-methods (Pumpkin Book for Data Validation)
https://www.epa.gov/cwa-methods/alternate-test-procedures (ATP Process and allowed method modifications)

Resource Conservation and Recovery Act (RCRA) (Hazardous Waste and Site Monitoring)

https://www.epa.gov/hw-sw846 (Approved validated method versions versus promulgated, meet State requirements)
https://www.epa.gov/hw-sw846/final-rule-methods-innovation-rule-mir (Method Defined Parameters and allowed modifications)

Superfund Amendment and Reauthorization Act (SARA)

https://www.epa.gov/clp/superfund-clp-national-functional-guidelines-data-review (Data Validation)
https://www.epa.gov/clp/superfund-clp-analytical-statements-work-sows (Level IV Data Package Requirements)

Department of Defense Environmental Data Quality Workgroup (DENIX)

https://denix.osd.mil/edqw/home/ DOD Quality System Manual (QSM), Data Package and Validation Guidance, PFOS Analysis

Analytical Methods

https://www.nemi.gov/home/

THANK YOU for YOUR TIME

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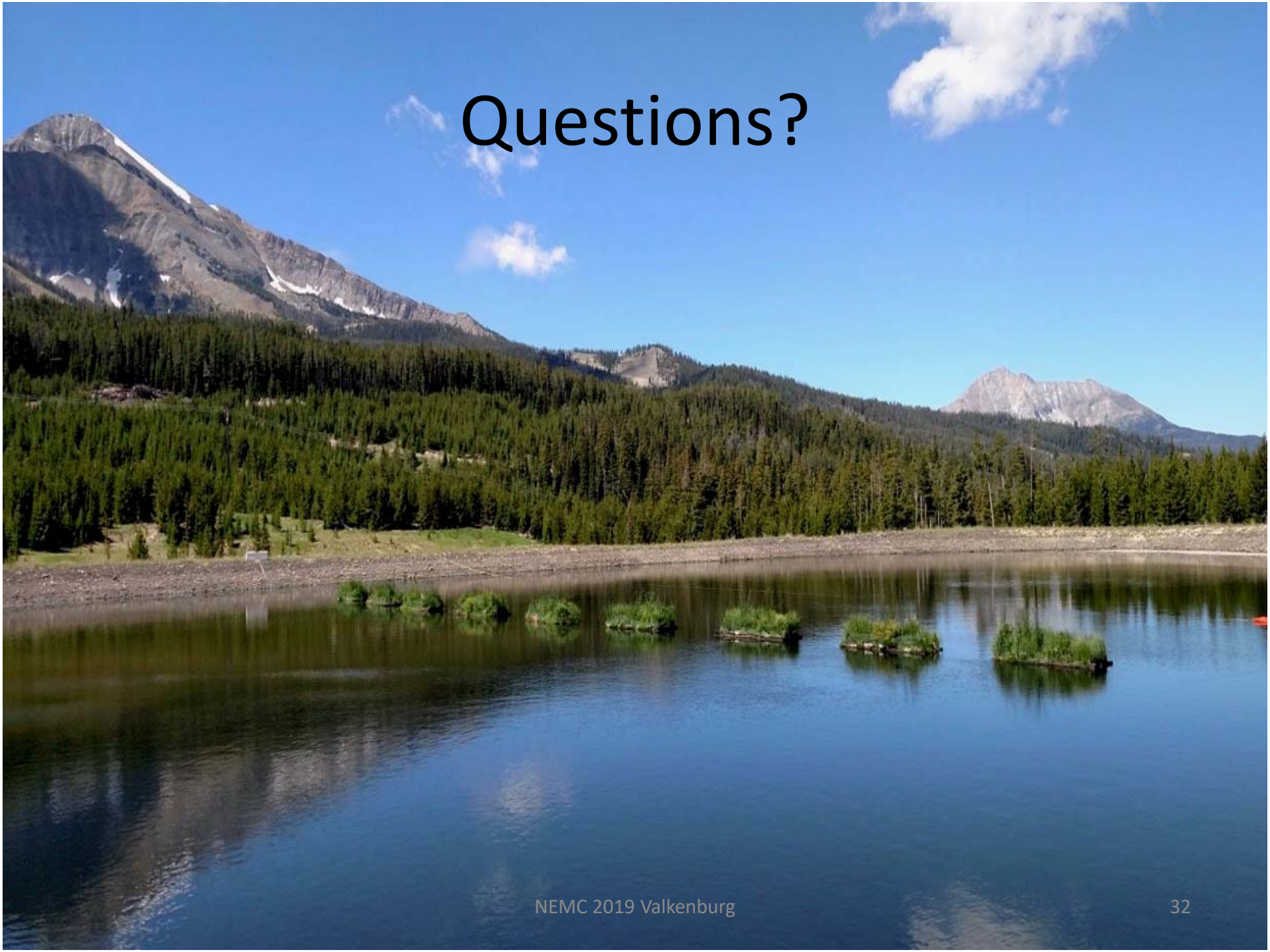
Appreciation for Support Goes To:


Questions?