Arkansas Water Quality Monitoring Program

Quality Assurance Project Plan

Clean Water Act Water Quality Grants

DATE: 1/27/2025

Period of Performance: Five years from the date of Approval

(QTRAK #25-133)

DIVISION OF ENVIRONMENTAL QUALITY
Office of Water Quality
5301 Northshore Drive
North Little Rock, Arkansas 72118

Arkansas Department of Energy and Environment (E&E)

The mission of the Arkansas Department of Energy and Environment is to provide effective and efficient energy and environmental solutions informed by science. The Department promotes responsible management of resources and protects the environment for the benefit of all Arkansans.

Division of Environmental Quality (DEQ)

The Division of Environmental Quality (DEQ) is the primary environmental regulatory agency for the State of Arkansas. The Division is responsible for implementing the state's environmental laws and rules established by the Arkansas Legislature and the Arkansas Pollution Control and Ecology Commission.

Office of Water Quality (OWQ)

The Office of Water Quality's mission is to protect and improve the quality of Arkansas's water resources. Administration of state and federal environmental laws is accomplished through permitting, inspections, sampling, analytical services and monitoring activities.

Element A2: Approval Page

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APPROVAL:

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State/Tribal Programs Section, Region 6

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Ms. Christy Warren

U.S. EPA Project Manager TEANDRA TAYLOR Digitally signed by TEANDRA TAYLOR Date: 2025.04.18 09:51:27 -05'00' Date _____
Ms. TeAndra Taylor

E&E Quality Assurance Manager Brie Lusk Date 2/6/25
Ms. Brie Lusk

DEQ Operations Manager Jim Wise Date 1/30/25
Mr. Jim Wise

Element A3: Table of Contents

List of Abbreviations and Acronyms

CAMC	Compliance and Ambient Monitoring Coordinator
COC	Chain of Custody
CSI	Compliance Sampling Inspections
CWA	Clean Water Act
DEQ	Division of Environmental Quality
E&E	Arkansas Department of Energy and Environment
EIO	Environmental Information Operation
EPA	Environmental Protection Agency. Sometimes preceded by U. S.
IT	DEQ Agency Information Technology
LIMS	Laboratory Information Management System
NPDES	National Pollution Discharge Elimination System
OWQ	Office of Water Quality
PM	Project Manager
QA	Quality Assurance
QAC	Quality Assurance Coordinator
QAP	Quality Assurance Plan
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QMP	Quality Management Plan
RPD	Relative Percent Difference
SOP	Standard Operating Procedures
SSPC	Special Study Projects Coordinator
WQX	Water Quality Exchange, the US EPA data storage system

Element A4: Purpose, Problem Definition, Background

Project Purpose

Since the 1960's the basic objective of the water quality management program has been to produce scientifically defensible data for use in implementing and adhering to Clean Water Act mandates and for use by other federal, state, local and private entities. The environmental information operations (EIO) needed to meet the objective is the collection of chemical, physical, and biological samples of the waters of the state. The collection of information needed to achieve the objective is accomplished through the implementation of routine and non-routine monitoring activities.

Quality Assurance (QA) Planning Documents

All monitoring programs are carried out following the Quality Assurance (QA) criteria outlined or referenced in this Quality Assurance Project Plan (QAPP). Additional documents with relevant QA guidelines include the Arkansas Department of Energy and Environment Quality Management

Plan (QMP) and the Office of Water Quality (OWQ) Standard Operating Procedure (SOP) Manuals discussed later in this QAPP. The SOPs are not stand-alone documents. They are designed to supplement and define in greater detail the QA procedures associated with this QAPP.

Background

Surface water quality monitoring in the State of Arkansas was first initiated in the early 1960s by the Arkansas Oil and Gas Commission. In the late 1960s, monitoring and management of the state's water resources became the responsibility of the Arkansas Department of Pollution Control and Ecology, now known as the Arkansas Department of Energy and Environment (E&E), Division of Environmental Quality (DEQ). With the creation of the Environmental Protection Agency (EPA) and the passage of the Clean Water Act (CWA) in 1972, new federal and state mandates were implemented. Significant expansion of monitoring activities occurred to address these new mandates and better characterize the state's water bodies. Examples of the mandates are the monitoring of all waters of the state, development of water quality criteria, and reporting on the condition of these waters. Quality assurance continues to be crucial to ensure scientific defensibility of the data collected and assembled under this QAPP.

Some of the products produced and answers derived using the data collected from this ongoing project include, but are not limited to, the:

- development of indices of biological integrity;
- refinement of ecoregion boundaries and characteristics;
- development of total maximum daily loads;
- development of the Water Quality Inventory Report (CWA § 305(b));
- water quality standards and criteria (CWA § 303(c) and 40 C.R.F § 131.20);
- National Pollutant Discharge Elimination System (NPDES); and
- for use by other Federal, State, Municipal, and Non-Governmental organizations to assist with the planning and implementation of their programs.

Element A5: Project Task Description

Description of Work to be Performed

Water samples are collected on a routine schedule from surface and ground water ambient water quality monitoring stations and delivered to an accredited laboratory for chemical analyses. Field measurements for routine in-situ parameters are taken at the time of sample collection. These activities are part of the water quality monitoring activities that began in the 1960s and continue today. There is not a final completion date as it is an ongoing project.

Special studies are implemented on an as needed basis. This monitoring is typically conducted over multiple years with samples collected for chemical, physical, or biological analysis or a combination thereof. The specifics for these studies are documented in individual Quality Assurance Plans (QAP) on a project-by-project basis.

Compliance Sampling Inspections (CSIs) are used to verify compliance with effluent limitations and to evaluate the permittee self-monitoring program. Water samples are collected and delivered to an accredited laboratory for analysis. Sample collection and analyses is dependent on the NPDES permit requirements for the facility being monitored.

The goal of these tasks is to provide scientifically defensible information to assist with the items listed in Element A4.

Products Produced

Deliverables from these activities include, but are not limited to:

- water samples;
- chemical analyses of the water samples;
- *in situ* data;
- biological data; and
- physical data.

Personnel

OWQ personnel perform most of all field duties. On occasion, personnel from other entities, mostly governmental, assist OWQ. These entities are identified in the QAP specific to the project.

Quality Assurance Assessment Procedure

E&E's Quality Assurance Manager (QAM), or designee, performs technical reviews and surveillance of field and laboratory activities to establish conformity to the DEQ QMP.

Quality Assurance Plans

The OWQ develops QAPs for special studies as addenda to the OWQ QAPP. The purpose of a QAP is to document project specific EIO procedures and protocols. No data collection will occur without a signed QAP in place. Approved QAPs will remain on file in the OWQ according to DEQs record retention protocol (ADEQ 2006). Routine monitoring activities are covered under this QAPP.

Records Required

Field notes for field parameters measured, field equipment calibration, and any laboratory Quality Assurance/Quality Control (QA/QC) issues will be kept at the OWQ for review by the QAM or designee until project completion.

Element A6: Data Quality Objectives and Performance/Acceptance Criteria

A high confidence level in the data must be attained and maintained to meet the objectives of the program. The data must be representative of the conditions being measured and be reported in units that allow for the comparison of the data to baseline information and criteria.

Representativeness

The measurements and samples must be representative of the waterbody. The data quality objective is to take samples and perform analyses that depict the existing environmental conditions as accurately as possible. The quantitative goal is to have 95% of field duplicate samples be within the acceptance criteria as outlined in Element B4.

Comparability

EPA approved analytical procedures listed in 40 C.F.R. Part 136 are used to assure data comparability.

Precision

The precision objectives are the control limits as determined by the procedures in Element B4. These control limits are based on the Relative Percent Difference (RPD) of the duplicate and/or spike analyses. The quantitative goals for precision of field sampling activities are depicted in Element B4.

Bias

Bias is the difference between the average of measurements of an analyte and its true value. A measurement is considered unbiased when the value reported does not differ from the true value. Field blanks evaluate potential bias from the process of sample handling, processing, and laboratory analysis.

Accuracy

The accuracy objectives are the control limits as determined by the procedures in Element B4. These control limits are based upon the percent recovery of spiked samples. Acceptable accuracy is defined by the analytical method used as described in 40 C.F.R. Part 136.

Completeness

Data completeness, the amount of valid data obtained compared to the amount expected, is dependent upon both field and laboratory personnel. Improper sample collection, sample contamination, and out of control analytical procedures can cause data loss. The goal for completeness is to have 90% of data collected meet acceptance criteria.

Element A7: Distribution List

The following individuals (or successor) will receive a copy of, or have access to this QAPP:

U.S. Environmental Protection Agency (EPA)
Ms. TeAndra Taylor
Project Officer
State/Tribal Programs Section

Arkansas Department of Energy and Environment (E&E)
Mr. Alan York
E&E Director of Operations (Senior Manager)

Ms. Brie Lusk
Quality Assurance Manager

E&E Division of Environmental Quality (DEQ)
Office of Water Quality (OWQ)

Mr. Jim Wise
Operations Manager (OM)

Mr. Jason Bolenbaugh
Compliance and Ambient Monitoring Coordinator (CAMC)

Others as needed. To be identified in the project QAP.

Element A8: Project Organization

Personnel from the OWQ are responsible for collecting water and biological community samples. Personnel perform biological analysis and the associated QA, data processing, and records retention requirements. Outside entities are hired to perform related tasks as needed.

E&E Senior Manager

The responsibilities of the Senior Manager include the oversite of EIO related to the OWQ.

E&E Quality Assurance Manager (QAM)

The responsibilities of the QAM include management and implementation of the Quality Assurance Program. Specific duties for this project include:

- Annual review of the E&E Quality Management Program;
- Accreditation of laboratories;
- Annual review of this QAPP.

OWQ Operations Manager

The duties of the Operations Manager include:

- Overall project management;
- Annual review of the QAPP;
- Preparing and/or updating the QAPP as needed;
- Appointing Project Managers (PM), as needed, to perform the following tasks;
    - Ensuring all procedures and reports meet QA requirements;
    - Reporting any field quality control (QC) failures to the QAM; and
    - Establishing QA audits if necessary.

OWQ Compliance and Ambient Monitoring Coordinator (CAMC)

The CAMC implements the ambient water sampling and compliance sampling inspection programs. Responsibilities include:

- Ensuring that all field instruments meet performance and calibration criteria;
- Ensuring that proper labeling, handling, storage, and shipping requirements are met;
- Assigning and scheduling of personnel to the project;
- Selection and scheduling of all compliance sampling inspections;
- Approving all compliance sampling reports; and
- Ensuring all QA procedures are attained.

Special Study Projects Coordinator (SSPC)

The SSPC will be identified as needed. Responsibilities include:

- Ensuring field equipment and instruments meet performance and calibration criteria;
- Ensuring proper labeling, handling, storage, and shipping requirements are met;
- Assigning and scheduling personnel to the project;
- Ensuring QA procedures are attained.

Ground Water Sampling Coordinator (GWSC)

The GWSC implements the Ground Water Monitoring Program. Responsibilities include:

- Ensuring field equipment and instruments meet performance and calibration criteria;
- Ensuring proper labeling, handling, storage, and shipping requirements are met;
- Assigning and scheduling personnel to the project;
- Ensuring QA procedures are attained.

Element A9: Project QAM Independence

As discussed in the most current E&E QMP, the QAM is responsible for the oversite of the QA program and is independent of the environmental information operations associated with this QAPP.

Element A10: Project Organizational Chart and Communications

For CSI and ambient monitoring sampling, communication between the primary collector of environmental information and either the project specific management designee or the OM should occur frequently during sampling and as soon as possible after every QA issue arises. All issues should be reported to the OM as soon as possible.

Element A11: Personnel Training Requirements and Laboratory Accreditation

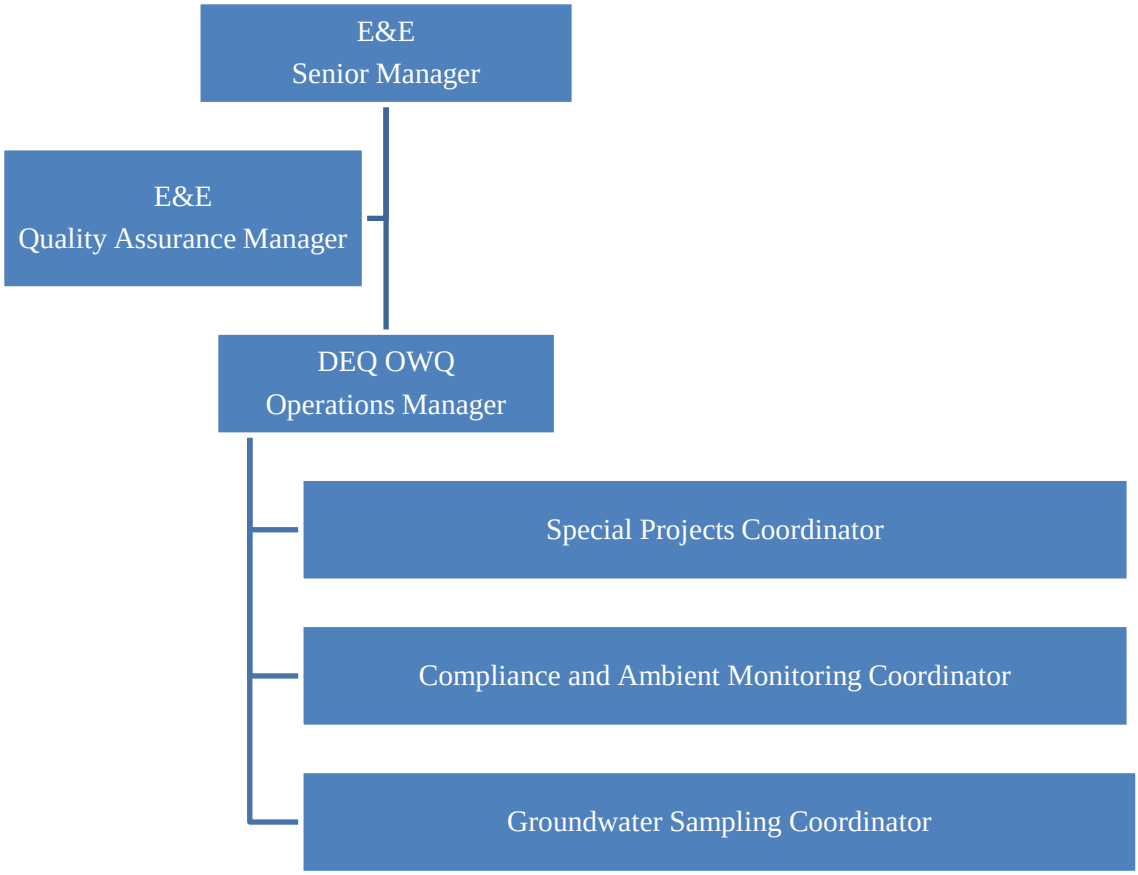
Laboratory accreditation under the State Environmental Laboratory Accreditation Program Act, Ark. Code Ann. § 8-2-201 *et seq*., is required for any laboratory providing analytical services to a person other than itself, of which the data generated will be submitted to DEQ for regulatory purposes. The requirements for the accreditation process can be found on the DEQ website.

OWQ Field Personnel

OWQ field personnel are trained on water sampling, handling and preservation techniques; equipment usage and maintenance; and other field and in-house procedures under the supervision of senior scientists or the project specific designee. This training includes, but is not limited to:

- On-line training modules for most all sampling activities included in the OWQ SOP;
- Annual training occurs as a refresher to those methods routinely used in sampling;
- Periodic training of field staff when new sampling techniques are established;
- Specialized field training as needed, or soon after a problem has been identified by field reports, senior staff members, or supervisors;
- Additional federal, state, or private sponsored training when available;
- The OM or designee performs QA/QC training of field personnel regarding the operation of field monitoring equipment and special monitoring assignments.

Figure 1: E&E Project Quality Assurance Organizational Chart



Element A12: Documentation and Records

Field Data Retention Procedures

Bench sheets, QC checks, calibration logs, instruments printouts, chain of custody forms, and field sheets are scanned and stored per DEQ Records Retention Policy. In addition, QA documents and project reports are retained in accordance with the DEQ Records Retention Policy.

Training Records

Training records are kept electronically and stored on DEQ servers.

Element B1: Environmental Information Operations

Environmental Information Operations is a collective term for work performed to collect, evaluate, or use environmental information and the design, construction, operation, or application of environmental technology.

Environment Measurement Methods

Environment Measurement Methods are documented in the most recent version of the DEQ SOP. Environmental information is collected such that data can be utilized for its intended uses as indicated in Element A4. Most importantly, the information must represent the characteristics of the main water mass. The precision of the measurements must be such that it allows for the comparison of the data between the actual measurement and the needed data quality objectives.

Element B2: Methods for Environmental Information Acquisition

Surface Waters (Chemical, Biological and Physical)

Collection and preservation methods are described in the most current DEQ SOP for sampling chemical, physical, and biological constituents. If deviations are necessary, the methods used, the reasons for deviation, and the identification of the decision maker are documented.

Groundwater Samples

Groundwater should be sampled as per the latest version of the DEQ "Standard Operating Procedure for Groundwater Sample Collection." Field measurements generally include temperature, specific conductance, and pH. Sample containers and the collection of field parameters should follow the procedures outlined in the current DEQ SOP.

Decontamination and Waste Disposal

Hazardous waste is not produced when performing activities associated with this QAPP.

Element B3: Integrity of Environmental Information

Field Activities

The measures and activities to assure the integrity of environmental information collected during field sampling is outlined in the most recent DEQ SOP. In-situ information collected during sampling activities is recorded on a field sheet. Prior to recording the data on the COC it is checked by the sampler for accuracy and completeness. The information on the COC is then validated by the sampler by comparing the information on the field sheet with the data on the COC.

Samples collected by DEQ personnel are transported and delivered to the accredited laboratory by the individual performing the sampling. If samples are passed off to another individual for delivery to the laboratory, both individuals must sign and date the COC to document the transaction.

Laboratory Activities

Any laboratory performing work on behalf of DEQ must be accredited as per the requirements set forth in Arkansas Code Annotated §§ 8-2-201 *et seq.*, State Environmental Laboratory Accreditation Program Act.

Element B4: Quality Control

Field Sampling

Duplicate samples and in-situ measurements are collected at a rate of 10% or a minimum of one per week, if less than ten samples are collected per week per field personnel. DEQ's SOP outlines the protocols for collecting field duplicate samples.

Procedures to Assess Data Precision and Accuracy

Assess precision and accuracy of all data immediately after analyses are performed. Data from all duplicate and spiked samples will be checked against the acceptance criteria and qualify violations.

Precision

- Determine data precision from field duplicate samples.
- Base field precision on the relative percent difference between the sample and its field duplicate. Calculate the RPD as follows:

  RPD = ({Duplicate – Original}/{(Duplicate + Original)/2})*100

Accuracy

Determining the accuracy of field readings of environmental information is not plausible. However, determining the accuracy of the field equipment used in collecting information is achievable for most water quality constituents.

- Temperature – The percent difference between the reading of the meter versus the reading of a certified thermometer.

- pH - The percent difference between the reading of the meter versus a standard.
- Conductivity - The percent difference between the reading of the meter versus a standard.
- Dissolved oxygen – The percent difference of the reading of the meter versus the reading of another, or several other meters.

Corrective Action

- The purpose of a corrective action is to document and promptly address major and/or minor problems, and to develop a plan that will eliminate the potential for repetition of the problem.
- Corrective actions are taken when:
  - Quality control checks reveal a problem.
  - The QC data are out of control.
  - Deficiencies are cited during an audit.
  - Samples are lost.

Representativeness

Determining whether the results from a sample represent the characteristics of the main water mass sampled is controlled by the sampling process. The PM, or designee, is responsible for site selection. The PM and CAMC, or designee, are responsible for field staff training and adherence to sampling procedures. The control limits set for each field duplicate parameter are meant to assure proper sampling technique.

Completeness

The work plan for monitoring lists the CSI sites to be evaluated during the federal fiscal year. A mid-year and an end-of-year progress report, incorporating the number of ambient samples and CSI samples collected is prepared by the PM, or designee.

Element B5: Instrument Calibration, Testing, Inspection, and Maintenance

Field Instruments

Instantaneous and in-situ field measurements are conducted using single or multiparameter instruments. The resolution, range, and accuracy of each instrument ensures that data quality objectives will be attained. The procedures and frequency for calibrating, testing, inspecting, and performing maintenance of all field instruments are contained in DEQ SOPs. Most repair and operating parts are maintained at DEQ for use as needed.

Inspections and Acceptance Testing of Instruments

All instruments should meet specific performance criteria before acceptance. Each instrument will be inspected during its scheduled cleaning as per manufacturers' recommendations or operating instructions.

Resolution of Deficiencies

If deficiencies are found during the testing procedure the vendor will be given every opportunity to correct the problem within the available time allowed by the project and funding mechanisms.

Preventive Maintenance

Manufactures' recommendations are followed for preventive maintenance. Calibration checks and probe and power source condition checks are examples of activities that could occur during preventive maintenance activities.

Element B6: Inspection/Acceptance Requirements for Supplies and Services

The PM, or designee, purchases supplies and consumables. The individual receiving the items inspects them and checks the items received against the packing slip.

All chemicals and reagents are inspected for proper expiration dates. Purchase chemical standards used for calibration from reputable vendors with Certificates of Analysis listing the certified chemical content.

Element B7: Environmental Information Management

Field Data

Upon receipt of the sample by an accredited lab, the date of sample receipt, time of sampling, and station number is entered into the Laboratory Information Management System (LIMS) and issued a laboratory log number. In addition, in-situ data (stream water temperature, dissolved oxygen, pH, and flow severity) is entered into LIMS after it has been checked for reasonable results by the data entry analyst. Verification of abnormally high or low temperatures, pH, or dissolved oxygen results occurs.

Control Mechanisms for Detection/Correcting Errors

Data must pass all precision and accuracy checks for both the field duplicates and the laboratory matrix spike replicates. The data must be within the allowed range, *i.e.* pH between 0 and 14 standard units. The data is manually checked for logical errors, *i.e.* dissolved fraction greater than the total concentration.

Data Handling Equipment and Procedures

Acquire computer hardware and software according to the DEQ Agency Information Technology (IT) Budget and Expenditure Plan. IT is responsible for the computer and network infrastructure as well as all DEQ software needs. The datacenter is equipped with a large Uninterruptible Power Supply and generator backup that support both IT and Laboratory Services infrastructure. An off-site disaster recovery site helps maintain a backup and image of data housed at the main campus.

Programs used to process, compile, and analyze the data include the EPA Water Quality Exchange storage system (WQX) and programs developed by DEQ personnel or purchased programs such as Microsoft Office.

Data Storage

Data are transferred to the DEQ server and backed up daily. Data from all water quality monitoring networks are regularly transferred to the WQX.

Data Use

Data generated are available to users from several sources. The DEQ computer system is available to staff directly and through the website. Data in the WQX system is available to all users.

Element C1: Assessment and Response Actions

Field Activities

Field duties are evaluated by OM or designee to assess sampling methodologies, data handling, field quality control procedures, and personnel activities. Annual refresher training courses should be made available to sample collectors on sampling methodologies and quality control procedures.

Element C2: Oversite and Reports to Management

An annual summary QA report may be prepared and submitted to either the OM or the QAM. The report should identify any quality assurance issue that resulted in a significant amount of data loss and the corrective measures that were immediately taken, if any, to address the issue. The report may also discuss recommendations to help prevent future QA failures and/or any actions that did occur that may help limit future QA issues. All quality assurance issues, either major (significant loss of data) or minor (meter failure) should be verbally reported to one of the above individuals as soon as possible. Minor QA issues may or may not be included in the annual report.

One additional report that may be prepared, if requested, is the results of a periodic evaluation of the data produced by the projects associated with this QAPP. The report may include information such as an assessment of the data quality in terms of precision, accuracy, and completeness of the project as described in Element D1, 2, and 3.

As a result of these reports, senior management may or may not instruct senior staff members to establish training or educational opportunities to enhance the quality assurance knowledge of field staff. These opportunities may include training on new sampling and preservation methods, documentation records, corrective action procedures, and other QA related activity.

Element D1: Environmental Information Review

Data integrity must be validated prior to entry into the database. The CAMC and SSPC are responsible for ensuring all field and biological data are properly reviewed and verified and are in the proper format for submittal to storage databases. All data produced must meet data quality objectives outlined in Element A6. Data that do not meet data quality objectives will not be input into data storage databases.

Element D2: Useability Determination

Data Verification

Verification refers to the process of confirming a process or procedure was followed. Data verification is performed using self-assessments and by a technical review by the PM or designee. Data to be verified are evaluated against project specifications and are checked for errors in transcriptions, calculations, and data input. Potential outliers are handled by the procedure listed below. Issues that can be resolved will be corrected and documented.

Data Validation

The CAMC and PM, or designee, are responsible for validating that the verified data are usable and reportable. They are also responsible for re-evaluating the data to determine whether any anomalies are present.

Data integrity will be verified at several points during the collection and reporting process. The two principal check points are laboratory quality control checks and data processing checks made during the data preparation for entry into WQX. These checks consist of use of field duplicates, laboratory duplicates, and spikes to monitor the levels of precision and accuracy of the collection and analytical processes.

The data processing checks are designed to assure the accurate transfer of the data to the computer system. Water constituent data are verified by a computer program that inspects the data for values out of the permissible or normal range.

Outliers

- Quality Control Data
  - Outliers from the quality control checks indicate sampling or analytical problems. Re-analyze all samples in these out-of-control situations. If re-analysis is impossible, examine data for obvious causes.
  - If reasons are found for the problem, e.g. dilution error or field duplicate samples are obviously different, the QC data will not be used in the database to calculate new control limits. If the analytical process is found to be on control, based on other control samples in the same analysis set, the data for the samples can be used.

  - If reasons for the problem are not found, test the QC data to see if it is an outlier. If the test results do not justify calling the suspect data point an outlier use the data in the QC database to calculate new control limits.
- Sample Data
  - When a value in a data set is suspiciously high or low, examine to see if it must be discarded to avoid biasing the data set. The first check should be to see if there is any physical reason, e.g. high flow, low flow, abnormal temperature, reporting error, transcription error, or any other explanation for the abnormal data.
  - If a reason for the suspicious value is not found it must be tested to see if it is statistically judged to be an outlier. The suspect data point and the eleven closest data points in the data set should be used in the test.

Results obtained from projects associated with this QAPP are evaluated periodically and at the end of the project to determine if data quality objectives are being, or have been, obtained. Project completeness will be reconciled with the expected outputs. Data precision and accuracy developed for the project will be reported to the decision makers to establish the limits that should be placed on the data.

Data generated by projects associated with this QAPP that meet the QA/QC requirements set forth by this QAPP may be used to establish trend analyses, background or baseline levels of water quality criteria, and indicate those areas of the state that may need more intensive monitoring. Data produced from this project may be used to determine attainment of water quality criteria.

References

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ADEE 2022. Wadeable Stream Sampling Protocols. Arkansas Department of Energy and Environment. Division of Environmental Quality.

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ADPC&E. 2011. #014.00-002. Rule No. 2. Regulation Establishing Water Quality Standards For Surface Water Of The State Of Arkansas.