Disclaimer

The Model Quality Assurance Plan (QAP) has been compiled and reviewed by the Illinois Water Environment Association Laboratory Committee. This document is intended as guidance only and not a detailed explanation of the accreditation rules. Review does not indicate the contents of the Model QAP reflect the official positions, policies or practices of the Illinois Water Environment Association or the Illinois Environmental Protection Agency. This manual has not been officially reviewed or approved by the Illinois EPA. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the Illinois Water Environment Association.

Section 1
Quality Policy Statement

1.1 Quality Policy Statement

This Quality Assurance Plan (QAP) provides a written plan of operation for the laboratory that insures the accuracy, precision, and reliability of laboratory analyses and that data produced in the laboratory meets or exceeds user requirements. Good Laboratory Practices are employed to maximize data reliability.

1.2 Specific Objectives

1.2.1 The laboratory will employ methods capable of meeting user's needs for accuracy, precision, sensitivity, and specificity. Whenever possible, analytical methods used will be those approved by regulatory or accrediting authorities.

1.2.2 Laboratory management will ensure all staff members receive training in basic quality technology in sufficient depth to perform their assigned duties.

1.2.3 The laboratory will establish a level of quality for routine performance to use as a baseline from which to measure quality improvement efforts.

1.2.4 Laboratory staff will monitor routine operational performance through analysis of appropriate quality control solutions and through participation in inter-laboratory testing programs. The laboratory will provide for corrective actions as necessary.

1.2.5 The laboratory will operate in conformance with requirements established by the Illinois Environmental Protection Agency (IEPA) and/or the National Environmental Laboratory Accreditation Conference (NELAC).

1.3 QAP Availability

Copies of the laboratory's QAP are available from (*insert appropriate name or title here*).

Section 2
Laboratory Organization and Staff Responsibilities

2.1 Laboratory Organization

The Laboratory operates as a department of (*insert department name here*). The laboratory performs analyses on (*insert sample types here*).

2.2 Staff Responsibilities

Appendix 1 contains job descriptions and responsibilities for all laboratory positions.

2.3 Current Personnel

Appendix 2 lists the laboratory's positions, IEPA environmental laboratory accreditation titles, and names of personnel currently holding each position.

Section 3
Organizational Charts

3.1 Laboratory's Place in Company

(*insert diagram of company organization here*)

3.2 Laboratory Organization

(*insert diagram of laboratory organization here*)

Section 4
Documentation Control and Maintenance Procedures

4.1 Scope

The laboratory maintains document control procedures for its QAP and all standard operation procedures (SOPs) including analytical procedures and sample preparation procedures.

4.2 QAP Documentation Control Procedures

4.2.1 Each page of the QAP includes the title, revision number, effective date, and page number.

4.2.2 Copies of previous versions of the QAP are archived and kept by laboratory management and are subject to Record Keeping requirements in Section 14.

4.2.3 When minor revisions are made to a section of the QAP, the updated section is added to the QAP and the previous version is removed and archived for a minimum of five years.

4.2.4 With each revision, laboratory management writes a brief summary explaining the reason for the revision and what changes were made. This summary is stored with the archive copies of the QAP.

4.2.5 Archived information shall be available to regulatory agencies.

4.3 SOP Documentation Control Procedures

4.3.1 All SOPs are assigned a unique name or code.

4.3.2 Each SOP document contains a revision number.

4.3.3 Each page of a SOP includes its unique name or code, revision number, effective date, and current page number of total pages in section.

4.3.4 Copies of previous versions of SOPs are archived and kept by laboratory management for a minimum of five years. These are subject to Record Keeping requirements of Section 14.

4.3.5 SOPs are available to laboratory personnel as part of a comprehensive lab manual. New SOPs are added to the lab manual as they are issued. When SOPs are revised, the revision is added to the lab manual and the previous version is removed and archived. Likewise, any procedure no longer in effect is removed from the lab manual and archived for a minimum of five years.

4.3.6 With each SOP revision, laboratory management writes a brief summary explaining the reason for the revision and what changes were made. This summary is stored with the archive copies of the SOP.

4.4 Forms/Data Sheets Documentation Control Procedures

All forms and data sheets prepared by the laboratory display a title, version number, and effective date.

Section 5
Laboratory's Approved Signatories

5.1 Approved Signatories

The laboratory's approved signatures with job titles and accreditation position are shown in Appendix III. Also, the QAP title page has signed concurrence with appropriate titles of all responsible parties, including the quality assurance officer and laboratory director.

____
Laboratory Director

____
Laboratory Supervisor

____
Quality Assurance Officer

Section 6
General Quality Control Procedures and Practices

6.1 Documentation of Test Methods and Laboratory Practices

6.1.1 All test methods have written standard operating procedures (SOPs). The written methods describe each procedure and the equipment needed. Each SOP follows a standard format, which includes additional information on quality control measures and acceptance criteria for data.

6.1.2 All laboratory practices pertaining to QA/QC as well as laboratory operation practices other than analytical methods have written standard operating procedures.

6.2 General Quality Control Guidelines

6.2.1 For each test method, the quality control measures described in this QAP are followed wherever applicable. However, the test method quality control measures are used whenever they are more stringent than those in this QAP.

6.2.2 All quality control protocol and test procedures are assessed and evaluated on an on-going basis.

6.2.3 Quality control procedures follow the direction provided in the test method SOP for evaluation of results; and accept, reject, or qualify sample data based upon the acceptance criteria specified in the test method. The laboratory establishes the evaluation procedure and acceptance criteria for a quality control procedure when not specified by the test method. Whether specified in the test procedure or established by the laboratory, the evaluation procedures and the acceptance criteria are documented either in this QAP or in the test method SOP.

6.2.4 If a quality control procedure results in the laboratory rejecting or qualifying sample data, the problem is investigated, appropriate corrective action implemented, and the incident documented.

6.3 Method Blanks

6.3.1 Method blanks are prepared and analyzed with each batch of environmental samples and are carried through the entire analytical process.

6.3.2 The method blank is acceptable if it does not contain an analyte of interest at a concentration greater than the highest of the following:

- The MDL
- of the regulatory limit for that analyte, or
- of the measured concentration for that analyte in any environmental sample in the batch.

6.3.3 When method blank acceptance criteria are not met, any non-detect results in the associated batch of environmental samples are reported with qualification.

6.3.4 Section 15, Corrective Action Policies and Procedures, references procedures for taking corrective actions when blanks do not meet acceptance criteria.

6.4 Matrix Spikes

6.4.1 For all test methods performed by the laboratory in which materials suitable for matrix spiking are available, matrix spikes are performed at a rate of one per sample set of similar matrix type, per sample extraction or preparation procedure.

6.4.2 The laboratory utilizes the spiking analytes specified in the test method. When the test method indicates that all method analytes are to be matrix spiked, then the laboratory spikes all analytes of interest.

6.4.3 Samples are selected on a rotating basis for matrix spike analysis from among various waste streams, monitoring locations and other applicable locations.

6.4.4 Procedures used to select samples and analytes for spiking are documented.

6.4.5 Each analytical SOP references quality control criteria to use in determining discrepancies and accepting data when matrix spikes do not meet acceptance criteria.

6.4.6 Section 15, Corrective Action Policies and Procedures, references procedures for taking corrective actions when matrix spikes do not meet acceptance criteria.

6.4.7 Section 15, Corrective Action Policies and Procedures, and Section 16, Procedures for Permitting Departures from Documented Policies and Procedures, reference procedures for qualifying data when matrix spikes do not meet acceptance criteria.

6.5 Laboratory Control Samples

6.5.1 For each test method performed by the laboratory, laboratory control samples (LCS) are analyzed at a minimum of one per batch.

6.5.2 The results of the LCS analyses are used to determine batch acceptance.

6.5.3 Standards for preparing LCS samples are obtained from a second source.

6.5.4 The matrix spike sample may be used as an LCS when the matrix spike acceptance criteria are as stringent as the LCS acceptance criteria and a LCS has not been prepared and analyzed for the sample batch.

6.5.5 Each analytical SOP references quality control criteria to use in determining discrepancies and accepting data when laboratory control samples do not meet acceptance criteria.

6.5.6 Section 15, Corrective Action Policies and Procedures, references procedures for taking corrective actions when laboratory control samples do not meet acceptance criteria.

6.5.7 Section 15, Corrective Action Policies and Procedures, and Section 16, Procedures for Permitting Departures from Documented Policies and Procedures, reference procedures for qualifying data when laboratory control samples do not meet acceptance criteria.

6.6 Matrix Spike Duplicates and Sample Duplicates

6.6.1 Matrix spike duplicates or sample duplicates are performed at a rate of one per 20 or fewer environmental samples per matrix type, per sample extraction, or preparation procedure.

6.6.2 The sample used for the matrix spike duplicate is the same as used for the matrix spike.

6.6.3 When sample duplicate analyses are performed, samples are selected on a rotating basis from among various waste streams, monitoring locations and other applicable locations.

6.6.4 All procedures used to select samples for matrix spike duplicate or sample duplicate analyses are documented.

6.6.5 Each analytical SOP references quality control criteria to use in determining discrepancies and accepting data when duplicate samples do not meet acceptance criteria.

6.6.6 Section 15, Corrective Action Policies and Procedures, references procedures for taking corrective actions when duplicate samples do not meet acceptance criteria.

6.6.7 Section 15, Corrective Action Policies and Procedures, and Section 16, Procedures for Permitting Departures from Documented Policies and Procedures, reference procedures for qualifying data when duplicate samples do not meet acceptance criteria.

6.7 Quality Control Charts and Tabulations

6.7.1 The laboratory maintains tabulations, quality control charts or a combination of tabulations and quality control charts of the results from all quality control procedures. All calculations for the tabulations and/or control charts are performed according to *Standard Methods, 20th Edition,* Part 1020B.

6.7.2 Separate tabulations and/or control charts are maintained for each test method, for each matrix, and for each analytical range.

6.7.3 Each tabulation and/or control chart includes the following information:

- Title
- Identification of standard operating procedure
- Name of quality control procedure being tabulated
- Analytical Method
- Analyte
- Analyte units of measure
- Matrix
- Fortification concentration
- Mean
- Standard Deviation
- Upper Control Limit (UCL)
- Lower Control Limit (LCL)
- Upper Warning Limit (UWL)
- Lower Warning Limit (LWL)
- Date of Analysis
- Analyst Identification

6.8 <u>Initial Demonstration of Method Performance Studies (IDMP)</u>

6.8.1 Each analyst performs an IDMP study prior to initiation of sample analyses, unless the IDMP is not applicable to the approved test method, such as: BOD, CBOD, total suspended solids; total dissolved solids; total volatile solids; total solids; pH; temperature; dissolved oxygen; or turbidity. The IDMP study is repeated whenever there is a change in analyst, instrument type, or approved test method. The following steps are performed for an IDMP study:

6.8.2 A quality control (QC) check sample is obtained from an outside source. If not available, the QC check sample may be prepared by the laboratory using standards that are prepared separately from the calibration standards by someone not running the test.

6.8.3 The laboratory prepares four aliquots of the QC check samples at the required method volume to a concentration approximately 10 times the method-stated or laboratory-calculated MDL.

6.8.4 The four aliquots are prepared and analyzed according to the approved test method.

6.8.5 Using the four results, the average recovery and standard deviation are calculated in the appropriate units for each analyte.

6.8.6 For each analyte, the standard deviation and average recovery are compared to the corresponding acceptance criteria for precision and accuracy in the approved test method (if applicable) or laboratory-generated acceptance criteria (if a non-standard method). If standard deviation and average recovery for all analytes meet the acceptance criteria, the analysis of actual samples may begin. If any one of the analytes exceeds the acceptance range, the performance is considered unacceptable for that analyte.

6.8.7 The laboratory maintains a tabulation to track all current IDMP studies.

6.9 Method Detection Limits (MDL)

6.9.1 MDLs for each analyte of interest are determined by the test method procedure specified in 40 CFR, Part 136, Appendix B, unless the test method specifies another procedure for MDL determination, or the determination of an MDL is not applicable to the test method.

6.9.2 The laboratory analyzes a minimum of seven replicates to determine the MDL

- If seven replicates are analyzed, the laboratory uses all analytical results when calculating the MDL.
- If the laboratory analyzes more than seven replicates, the laboratory only excludes analytical results which the laboratory determines are outliers by utilizing a statistical outlier test.

6.9.3 The laboratory determines MDLs for each approved test method annually; and when there is a change in instrument type.

6.9.4 The laboratory may, in lieu of the annual determination of the MDL, annually verify the MDL by the preparation and analysis of a minimum of one matrix spike sample, spiked at the current MDL.

- An MDL is considered verified and acceptable for continued use if the results of the analysis of the matrix spike sample is within the 95% confidence interval as set forth in 40 CFR, Part 136, Appendix B.
- If an MDL cannot be verified, a new MDL is determined.

6.9.5 MDL replicate percent a recovery acceptance criterion is defined by the range of the percent mean recovery ±2 times the percent relative standard deviation (%RSD) found for the seven replicates. If any of the seven replicates fails this acceptance criterion, then the analyst discards all results and performs another set of seven replicates.

6.9.6 The spiking concentrations used to determine an MDL are between 1 and 10 times the calculated MDL.

6.10 Internal Audits

6.10.1 The laboratory conducts annual internal audits of its operations, QA/QC practices, and record keeping.

6.10.2 The internal audit is performed by the designated quality assurance officer.

6.10.3 The results of the internal audit should specify procedures or practices that are not in compliance with the QAP, and corrective action shall be taken and documented.

6.10.4 Where the results of an internal audit indicate that the laboratory’s test results are invalid, the laboratory takes immediate corrective action and immediately notifies, in writing, the parties that receive the data.

6.11 Analytical Quality Control Standards

All analytical quality control standards that are used are traceable to a national standard.

6.12 Reagents

Reagents are prepared using reagent grade chemicals or better. Each reagent container received by the laboratory is documented by marking the container with an adhesive label and indelible ink. Each marking label indicates the date received, date opened, and any applicable expiration date.

6.13 Glassware

Glassware used for purposes that may subject it to damage from heat or chemicals is made of borosilicate glass. Glassware used for volumetric measurement purposes is Class A rated.

6.14 Laboratory Pure Water

The Laboratory uses laboratory pure water. The resistivity of the laboratory pure water is checked each day of use with a calibrated conductivity meter. Resistivity values of the laboratory pure water are at least 0.5 megohm/cm at 25°C.

Section 7
Verification Practices

7.1 Performance Evaluation (PE) Testing

7.1.1 Samples are analyzed for this laboratory facility as appropriate for the mandatory USEPA DMR-QA Laboratory Performance Evaluation Study.

7.1.2 PE samples are analyzed twice per year, where appropriate samples are available, for each test method, each matrix and each analyte included in its scope of accreditation as required by the provisions of Part 186 Rules for the Accreditation of Laboratories for Drinking Water, Wastewater and Hazardous Waste Analyses.

7.1.3 PE samples are processed without any extraordinary care as the results obtained will be considered typical of the laboratory’s performance. All directions are followed without change for sample preparation, dilution or analysis.

7.1.4 The laboratory’s personnel do not engage in inter-laboratory communications regarding PE sample results, or attempt to obtain the true values of the PE samples prior to reporting at the designated deadline for the PE Study.

7.1.5 All unacceptable results for PE samples are investigated by a standardized procedure. Appropriate corrective actions are implemented where assignable error was found. When assignable error is not found corrective actions are focused on review of the procedure and improvement of test method execution. The test procedure is re-validated by successful analysis of a second source standard or reference material.

7.2 Inter-laboratory Comparisons

7.2.1 The laboratory participates in inter-laboratory comparison studies (round robins).

7.2.2 Round robin samples analyzed by this laboratory are from environmental sources and analyzed for a variety of parameters.

7.2.3 Laboratory management and staff review round robin analysis results.

7.3 Standard Reference Materials

The laboratory uses standards traceable to Standard Reference Materials (SRMs), where available.

7.4 Internal Quality Control Programs

7.4.1 Statistical Process Control is generally used to establish batch acceptance criteria for analytical test results. The test results for the laboratory control standard are evaluated annually to set limits for control charts. Warning limits are set at $\pm 2\sigma$ from the mean recovery, and control limits are set at $\pm 3\sigma$.

7.4.2 When a control limit is exceeded the analyst is required to respond in a manner that assumes something is wrong with the measurement system. Whenever possible, a response to an exceeded control limit includes the following:

- Inform the immediate supervisor of the control limit exceedance.
- Stop the analysis of samples, if possible.
- Conduct a systematic investigation as soon as possible to locate the source of the problem.
- Take appropriate corrective action when a problem is located.
- Rerun samples to the last good laboratory control standard whenever possible.
- Document the control limit event, including the details of the occurrence, whether a problem was detected, and any corrective actions taken.
- Maintain a state of increased vigilance.

7.4.3 Warning limit trend exceedance occurs when two or more consecutive results for the laboratory control standard exceed the warning limit. A general response to a trend exceedance includes the following.

- Inform the immediate supervisor of the warning limit trend exceedence.
- Conduct a systematic investigation as soon as possible to locate the source of the problem.
- Take appropriate corrective action when a problem is located.
- Document warning limit exceedance, including the details of the occurrence, whether a problem was detected, and any corrective actions taken.

7.4.4 The laboratory has a written response plan for the analyst to follow in the event of a failure of a laboratory control standard or other criteria. This plan is found in Appendix 4.

7.4.5 SOPs for test methods and lab procedures are reviewed on a regular basis. The designated Quality Assurance Officer or Laboratory Supervisor performs reviews.

Section 8
Equipment Procedures for Calibration, Verifications, and Maintenance

8.1 Equipment Calibration

8.1.1 An initial calibration is performed on all instrumentation and equipment as specified in the test method. Calibration standards are traceable to a national standard, where available.

8.1.2 The procedures for calibration verification and maintenance are found in the analytical method SOPs or the sample preparation SOPs. Manufacturers operation manuals may be referenced in the method SOPs where when they are the source for calibration or maintenance procedures.

8.1.3 Documentation is maintained for all maintenance, calibration and instrument operation activities. All defective equipment is removed from service and is not placed back in operation until repaired and shown by calibration, certification or test to perform satisfactorily.

8.1.4 An adequate number of standards are used to define the calibration curve. The test method SOP states if the calibration curve is linear or non-linear.

8.1.5 If the test method does not state the number of calibration standards to use, the laboratory will determine the number of standards using the procedure set forth in IEPA Part 186 Accreditation of Laboratories, Section 186.155b.

8.1.6 Unless specified by the test method, the lowest calibration standard is set at one to 15 times the MDL whenever the sample results will be used in a decision related to the determination of a non-occurrence of an analyte or a non-detect the MDL of an analyte.

8.1.7 All sample results for test methods utilizing a calibration curve are reported within the highest calibration standard, or within the linear dynamic range where the test method requires determination of the linear dynamic range.

8.1.8 For further guidance regarding calibration refer to Section 186.155 of Illinois regulations Title 35: Environmental Protection, Subtitle A: General Provisions, Chapter II: Environmental Protection Agency, Part 186: Accreditation of Laboratories for Drinking Water, Wastewater, and Hazardous Waste Analysis, Section 186.155 Calibration. Copies of this document may be obtained from the laboratory director or the quality assurance officer.

8.2 Balances

The laboratory has *(insert #)* analytical balances with a sensitivity of 0.1 mg. All analytical balances are placed on a stable base. Each balance is checked at least *(insert frequency)* with two or more ASTM type 1 or 2 weights covering the effective range of the balance’s use. A service contract is maintained which requires that analytical balances be serviced and calibrated at least annually by a qualified service representative. The service representative issues the laboratory a certificate of calibration with weights traceable to national standards.

8.3 pH Meters

All pH meters have an accuracy of at least plus or minus 0.1 pH unit and provide for temperature correction of pH measurements. Calibrations are performed with a minimum of two standardization buffers in the appropriate pH range.

8.4 Conductivity Meters

A conductivity meter is maintained with an error not exceeding 1% of one micromhos/cm whichever is greater. The conductivity meter is calibrated before each use with a standard that reflects the sample conductivity.

8.5 Thermometers

8.5.1 The laboratory has one certified thermometer traceable to national standards, with 1 centigrade degree or finer subdivisions and a range which spans the various requirements of the analytical methods, equipment temperature monitoring, and checking for thermal preservation. This thermometer, traceable to national standards is recalibrated a minimum of every five years. Certificates of calibration are maintained which identify traceability of the calibration to national standards.

8.5.2 All thermometers are calibrated against thermometers traceable to national standards. Liquid-in-glass and digital thermometers are calibrated annually. Metal and continuously monitoring thermometers are calibrated at least quarterly. Calibration factors are employed based upon the most recent calibration.

8.6 Refrigerators

8.6.1 Each refrigerator is uniquely identified. Each refrigerator is provided with a uniquely identified thermometer graduated in increments no larger than 1 degree centigrade. Thermometer readings are monitored and recorded each day the laboratory is in operation. The monitoring logs include refrigerator identification, thermometer identification, date, temperature, initials of the responsible person, and the acceptable temperature range.

8.6.2 Samples which require thermal preservation are stored under refrigeration which is +/-2 degrees centigrade of the specified preservation temperature unless method specific criteria exist. For samples with a specified storage temperature of 4 degrees centigrade, storage at a temperature of 0.1 degrees to 6 degrees centigrade is acceptable.

8.7 Incubators

Each incubator is uniquely identified. Each incubator is provided with a uniquely identified thermometer graduated in increments no larger than 1 degree centigrade. Thermometer readings are monitored and recorded each day the laboratory is in operation. The monitoring logs include incubator identification, thermometer identification, date, temperature, initials of the responsible person, and the acceptable temperature range.

8.8 Ovens

8.8.1 Each oven is uniquely identified. Each oven is provided with a uniquely identified thermometer graduated in increments no larger than 10 degrees centigrade for muffle furnaces and 1 degree centigrade increments for oven and warm air incubators.

8.8.2 Temperatures are recorded daily. The monitoring logs include; oven identification, thermometer identification, date, temperature, initials of the responsible person and the acceptable temperature range.

8.9 Microwave Digestion Units

Microwave digestion units are calibrated by the procedure in EPA No. 600/8-91/213 or the manufacturer's manual of operation before being placed in service. The maximum wattage of microwave digestion units is checked at least annually and after repairs.

8.10 Other Laboratory Equipment

8.10.1 The laboratory monitors and controls method specific temperature requirements for heating blocks and water baths, etc. The laboratory also maintains documentation of the results.

8.10.2 Autopipetors and dilutors of sufficient accuracy are used for some applications. The delivery volumes are checked gravimetrically on an annual basis.

Section 9
Test Methods and SOPs

9.1 Scope

Appendix 5 lists all SOPs currently in use by the laboratory. Included in this Appendix are each method's SOP number, document name, source, and whether it is listed in 40 CFR Part 136 as an approved method.

9.2 SOPs

The SOPs are incorporated in this Quality Assurance Plan by reference to Appendix 5 and may be obtained from the laboratory management. In addition, each laboratory staff member is issued a manual containing all current SOPs.

Section 10
The Laboratory's Physical Facilities Including Services and Resources

10.1 Building

The *(Name)* laboratory is located *(Site)*, *(Address)*. The laboratory and offices occupy approximately ________ square feet of floor space in the ___________ building. The _______________ laboratory performs the routine monitoring for the _________________ treatment plant operated by the ______________________________. The laboratory building was constructed in *(Date)*. *(Include any renovations and remodeling dates).* A schematic layout of the laboratory showing current space utilization is shown in Appendix 6.

10.2 Access and Security Measures

10.2.1 Entrance(s) to the *(Name)* treatment plant is/are located at *(Location)*. (*Insert a narrative concerning times the entrance is open and what type of security available at the entrance to the site.)*

(Narrative concerning your policy about visitors at the site and the lab.)

10.2.2 *(Narrative concerning the time the laboratory is open.)*

10.3 Building Services

10.3.1 Air Temperature and Quality - The laboratory's heating and air-conditioning are generally to control laboratory temperatures between 68 and 75 degrees and temperature fluctuations rarely exceed more than 4 degrees per hour. *(Insert narrative concerning any humidity control in the lab.)*

10.3.2 Electricity - 110 and 220 volt electrical service is provided throughout the laboratory. *(Insert a narrative concerning any electrical protection devices i.e. (UPS) uninterrupted power supplies, surge protectors and any battery powered emergency lighting system maintained in the lab.)*

10.3.3 Illumination - Lighting in most areas and all work areas is provided by *(Type of lighting).*

10.4 Safety

10.4.1 Fire Safety – *(Insert a narrative on the fire alarm, fire extinguishers, fire blankets and any other fire, safety equipment located in the lab.)*

10.4.2 Other Safety Equipment – The following safety equipment and related supplies are available. *(Insert a list and narrative of the location of the equipment. Some of the common items are: first aid supplies, eye washes, safety shower, ventilation hoods, neutralization and spill kits, acid and flammable storage cabinets, MSDS sheets.)*

10.4.3 Access to Emergency Medical Aid

(Insert Narrative)

10.5 Computer Resources Including Equipment and Software

(Insert a narrative concerning the computer capability and equipment, software and how it is implemented in the laboratory.)

10.6 Equipment Inventory List

Appendix 7 is a list of all equipment and instrumentation with serial number, purchase date and room location for each item as appropriate.

10.7 Laboratory Work Areas

(*Name the various work areas/sections in the laboratory, designate the location of the sections, the approximate size, the number of employees who routinely uses the area and a description of the analyses/work performed in this area.)*

Section 11
Procedures for Reviewing New Work

11.1 Scope

Laboratory management reviews all new work to ensure the laboratory is able to perform the additional task(s) in a timely and accurate manner. Laboratory management consults, if necessary, with sampling personnel and end data users to ensure sample integrity and data quality.

11.2 Contract Analyses

The laboratory does not perform contract analyses.

(If the laboratory does perform contract analyses, delete the above sentence and insert the procedures for reviewing new work here.)

Section 12
Sample Acceptance and Receipt Policy

12.1 Scope

Sampling is critical to producing data that is representative of the conditions that occur at the sampling location. This section of the QAP constitutes the laboratory's written sample acceptance policy. It details the conditions under which the laboratory will accept samples. It is readily available to all laboratory staff and sample collectors.

12.2 Sample Acceptance Requirements

The (*insert position*) initiates the appropriate sampling plan to ensure that sampling techniques are consistent with the intended use of the data. Sampling equipment is selected and pre-cleaned to preserve sample integrity and eliminate contamination.

12.2.1 Accepted samples are logged upon arrival and checked for sampling preservation and holding times.

12.2.2 Indelible ink is used for all written documentation associated with samples. Corrections to sampling documents are made by a single line strikeout. The corrected entry is written above the strikeout and initialed by the person making the correction.

12.2.3 Samples must be received with complete documentation including sample identification, location, date and time of collection, collector’s name, sample type, person receiving sample, and any special remarks.

12.2.4 Samples must be received in the sample container required by the test method and properly labeled.

12.2.5 Each sample container must have a unique identification.

12.2.6 Sample preservation must comply with the requirements of the approved test method.

12.2.7 Sample volume must be sufficient to perform the necessary analyses.

12.2.8 Samples must be received within the time specified by the test method. Upon receiving a sample, the laboratory will determine if the analysis can be performed within the allotted holding time.

12.2.9 All samples will be brought to (*insert location*) within the operating hours of the laboratory.

12.3 Verification of Preservation

12.3.1 Samples are examined for method preservation and proper documentation.

12.3.2 Samples are examined upon receipt for thermal preservation (if possible). Thermal preservation will be acceptable if:

- arrival temperature is either within ±2°C or the method specified range. For samples with a specified temperature range of 4°C., a temperature of 0.1 to 6°C. is acceptable.
- samples have been hand delivered to the laboratory within six hours after collection and there is evidence, such as arrival on ice, that the chilling process has begun.

12.3.3 Samples are examined for chemical preservation upon receipt, or prior to additional sample preparation or analysis.

12.4 Actions for Deviations from the Laboratory's Sample Acceptance Requirements

12.4.1 Deviations from the sample acceptance policy is brought to the attention of (*insert position*) and documented at the time of sample log-in.

12.4.2 Whenever possible, the laboratory proceeds to correct errors in sample documentation. The person responsible for the error is contacted so that a deviation from the sample acceptance policy can be avoided.

12.4.3 If a sample does not meet all of the sample acceptance criteria:

- retain correspondence and records of information concerning the final disposition of rejected samples.
- retain correspondence and records of information concerning the final disposition of rejected samples.
- contact client from which the laboratory received samples

12.5 Laboratory Log of Received Samples

Each sample received is logged with the following information:

- date and time of laboratory receipt of sample
- sample collection date
- whether sample is composite or grab
- unique laboratory identification code
- sample collection point
- requested analyses
- signature or initials of data logger
- comments resulting from inspection for acceptance or rejection
- sample collector
- person receiving sample

Section 13
Sample Tracking and Storage Procedures

13.1 Scope

A clear sample tracking record allows any questions concerning sample integrity to be answered at any step of the process. Samples are stored in areas that isolate samples sufficiently to prevent cross-contamination with other samples, reagents or standards. Procedures for sample handling and tracking may vary, depending upon sample origin. Sample integrity and reliable test data are ensured when valid laboratory procedures are established and strictly followed.

13.2 Sample Tracking Record

13.2.1 Sample logs, bench sheets, and preparatory records are clearly marked to identify all personnel associated with each sample.

13.2.2 Chain of custody forms or bench sheets must be completed to include use of preservation and sample containers required by approved test method.

13.2.3 No samples are accepted without proper documentation. Samples are checked to insure that the container is compatible with the intended analysis.

13.3 Proper Storage and Avoidance of Cross-contamination of Samples

13.3.1 Storage facilities are provided for samples that prevent cross-contamination and are consistent with sample preservation requirements of the method.

13.3.2 Laboratory blanks are stored with samples to verify that cross-contamination has not occurred.

13.3.3 Samples are stored away from all standards, reagents, food and other potentially contaminating sources.

13.3.4 Sample fractions, extracts, leachates and other sample preparation products are stored according to this section or according to specifications in the method.

13.4 Security of Samples

The laboratory stores all samples within the confines of the laboratory and limits access to authorized laboratory personnel only.

13.5 Sample Disposal

If possible, samples and aliquots are kept to the end of the maximum permitted holding time so that re-analysis of the sample may be performed when necessary. Proper temperature and holding times must be observed for re-analysis.

Section 14
Record Keeping, Data Review and Reporting Procedures

14.1 Scope

The record keeping system allows historical reconstruction of all laboratory activities that produce the resultant sample analytical data. The laboratory maintains a complete sample tracking record. Documentation of laboratory activities includes inter-laboratory transfers of samples and sample extracts. The laboratory issues sample data or sample result reports accurately and in a manner that is understandable to the recipient.

14.2 Records Maintained by the Laboratory

14.2.1 The laboratory retains records related to all procedures and activities to which a sample is subjected. These records include:

- identity of personnel involved in sampling, preparation and testing
- sample preservation, including sample container and compliance with holding times
- sample identification code, receipt, log-in, acceptance or rejection
- sample storage and tracking, including shipping receipts, transmittal forms, and internal routing and assignment records
- sample preparation including: cleanup and separation procedures, extract or digestate identification codes, volumes, weights, instrument printouts, meter readings, calculations, reagents
- sample analysis
- equipment receipt, use, specification, operating conditions and preventative maintenance
- calculations and statistical formula used by the laboratory including written procedures for calculations, raw data and supporting information used for each calculation, correct use of significant figures, and identification of the least precise step in accord with limitations of the measurement system
- procedure to verify that the reported data is free from transcription and calculation errors

- data handling including: reduction, review confirmation, interpretation, assessment or validation and reporting
- QC measurements, including procedure to select samples on which to perform QC measurements, and assessment of method performance

14.2.2 Other records retained by the laboratory include:

- all original raw data, whether hard copy of electronic, for calibrations, analyst's worksheets, and data output from instruments or equipment
- copies of final reports
- archived SOPs
- correspondence with sample submitters
- corrective action reports, audits and audit responses
- PE sample results and raw data

14.3 <u>Records of Standards and Analytical Reagents</u>

14.3.1 Traceability of standards - The laboratory verifies that standards are traceable to national standards. If traceability is not possible, the laboratory demonstrates, by appropriate means (for example analyses of PE samples) that the instrumentation and equipment is properly calibrated.

14.3.2 Receipt and use of reagents and standards - The laboratory retains records of the origin, purity and traceability of all reagents and standards. These records also include the date of receipt, storage conditions, the date of opening and an expiration date.

14.3.3 Traceability of working and intermediate standards - The laboratory maintains records of traceability from working and intermediate standards to purchased stock standards or neat compounds which include the date or preparation and preparer's initials.

14.3.4 Identification of prepared reagents and standards - All prepared reagents and standards are labeled with the identity the reagent or standard, concentration, preparation date, and preparer's initials.

14.4. Records of Instrument or Equipment Calibrations

14.4.1 The laboratory documents and maintains calibration procedures that establish calibration frequency and calibration acceptance criteria.

14.4.2 All graphs of calibration curves have descriptive titles, labeled axes, date of calibration, test method, analyte, standard concentrations, instrument response and the calibration curve.

14.4.3 All calibrations record the equation of the calibration curve and the correlation coefficient.

14.5 Computerized Data Storage

14.5.1 The laboratory maintains a listing of computer software used for the capture, processing, manipulating, recording, reporting, storage or retrieval of test data with a description of the software's intended use in the laboratory.

14.5.2 The laboratory establishes and implements procedures for protecting the integrity of the data, including data protection procedures during data entry and capture, data storage, data transmission and data processing. (*You may want to reference an appendix detailing your data protection procedures.*)

14.5.3 The laboratory provides procedures for the maintenance of the security of the data, including the prevention of unauthorized access to data, and the unauthorized change of computer records.

14.5.4 The laboratory maintains hard copy or write protected backup copies of computer generated records.

14.6 Administrative Records

14.6.1 Personnel qualifications - The laboratory maintains records of personnel qualifications, education, experience and training.

14.6.2 IDMP studies - The laboratory maintains records of IDMP studies and any required repetitions of the IDMP for each analyst.

14.6.3 Initials and signatures - The laboratory maintains a log of names, initials and signatures for all individuals who are responsible for signing or initialing any laboratory record.

14.7 Laboratory Record Entries and Change of Entries

14.7.1 Laboratory personnel sign or initial all record entries. The reason for the signature or initials is clearly indicated in the records, including, but not limited to: sampled by, prepared by, reviewed by.

14.7.2 Permanent ink is used for manually recorded data.

14.7.3 Corrections of manually recorded data are made by one line through the error. The correction is initialed and dated. Corrections are not made by erasure or White Out™.

14.7.4 Electronically maintained records are kept in such a fashion as to indicate any change in the record.

14.7.5 After the laboratory delivers its sample data and results to client, the laboratory will only correct, add or delete information from the report when it supports those actions by supplementary documentation. Any supplemental report clearly identifies there purpose and contains all reporting requirements.

14.7.6 Facilities with in-house laboratories which provide data to regulatory agencies must include all items in sections 14.10 with their reports if so required by the regulatory agency.

14.8.1 Record Retention

14.8.1 All records are retained for a minimum of five years. They include information pertaining to environmental analyses, performance testing, obsolete or replaced procedures, supplies for tests, support services, and laboratory accreditation.

14.8.2 Access to archived records is documented with an access log. All records are protected against loss of deterioration including fire, theft, and electromagnetic deterioration in the case of electronic records.

14.9 Raw Data Associated with Sample Analysis

All raw data associated with sample analyses (for example: calibration curves, strip charts, tabular printouts, computer data files, analytical notebooks, and run logs) include the follow:

- the laboratory sample identification code;
- the date of analysis;
- analysis type;
- the instrument identification;
- instrument operating conditions (or reference to such information);
- all calculations automated or manual to which the sample data is subjected; and
- the analyst's and technician's initials or signature.

14.10 Test Data Reports

Laboratory sample data or sample result reports include the following:

- report title such as "laboratory results"
- a unique identification of the report such as serial number
- description and identification of samples
- date of sample receipt, sample collection and sample analysis (time of sample preparation and analysis if the required holding time for either activity is less than or equal to 48 hours)
- characterization and condition of sample, where appropriate
- reference to sampling procedure, where applicable
- test method utilized
- sample results with any failures or deviations from approved test methods or QC criteria identified, such as data qualifiers
- description of the calculations or operations performed on the data, a summary and analysis of the data
- identification of the reporting units, such as ug/L or mg/kg

- identification of any results not generated by the laboratory preparing the data report and identification of the laboratory from which such results were obtained
- a statement that the report shall not be reproduced , except in full, without the written approval of the laboratory
- a statement that samples results relate only to the analytes of interest tested or to the sample as received by the laboratory
- additional information may be required for sample data reports submitted to a regulatory authority

The laboratory certifies that the sample results meet all the requirements of any environmental laboratory program for which it maintains accreditation.

14.11 Electronic Data Transfer

Documented procedures are established for the transmission of test results by telephone, fax or other electronic or electromagnetic means.

14.12 Sample Disposal Records

Ordinarily, the laboratory need not maintain records for disposal of samples. For a record of possible litigation samples and other samples that the laboratory director wishes to retain, such records will be catalogued by date of disposal and person responsible. Common ways samples may be disposed of include sample depletion, sample returned to submitter, sample washed down sink, and sample manifested to a hazardous waste facility. Any correspondence concerning sample disposal must be retained.

14.13 Waste Disposal

Waste collection, storage, recycling, and disposal procedures and policies are part of method SOPs. Where disposal procedures and policies are included as part of a test method, the test method disposal practices are strictly followed.

Section 15
Corrective Action Policies and Procedures

15.1 Scope

The following policies and procedures are used when any analysis or reporting discrepancies are detected, or when any deviation from the policies and procedures in this manual occur.

15.2 Identification of Discrepancies

15.2.1 Discrepancies or deviations shall be defined as, but not limited to, any of the following:

- quality control sample results outside control limits;
- reporting sample results in wrong units;
- using un-approved analytical procedures;
- data which appears to be erroneous to current trends;

15.2.2 Each analytical procedure SOP references quality control criteria to use in determining discrepancies and accepting data.

15.3 Staff Responsible for Investigation and Corrective Action

15.3.1 Any of the Laboratory staff may detect discrepancies. Once a discrepancy is detected, it is reported to laboratory management. Laboratory management or staff may investigate any discrepancies. Data that has discrepancies should not be recorded and should be reviewed.

15.3.2 Once a discrepancy is established, staff should proceed with one or more of the following:

- re-run samples, if available and holding time permits;
- document results as invalid and note on any reports;
- investigate discrepancy; document cause and corrective action taken and include with data.

15.3.3 Staff responsible for investigating the discrepancy shall review sample and quality control results, integrity of quality control samples, and technique. If a quality control result does not meet method or laboratory criteria, it shall be documented on the analysis bench sheet and quality control chart. Staff should also review sampling procedures and preservation, washing of glassware and any sources of contamination to samples or quality control standards.

15.3.4 The Laboratory staff performs corrective actions to eliminate any of the fore mentioned possible causes for data discrepancies. Examples of corrective actions are: review of proper procedures, quality control standard preparation, changes to procedures or sampling protocol, and improving analyst technique. If the investigation cannot determine a known cause for invalid results, retraining and procedure review are the appropriate corrective actions.

15.3.5 For each data discrepancy event, the investigation and corrective action shall be documented.

15.4 Documentation and Review of Corrective Action

Laboratory management reviews raw data, reports, quality control data, discrepancies, and corrective actions on a regular basis. This review establishes any recurring problems that require further investigation and action.

Section 16
Procedures for Permitting Departures from Documented Policies and Procedures

16.1 Scope

Departures from documented policies and procedures may include, but are not limited to:

- use of analytical methodology which is not USEPA or IEPA approved;
- use of samples which are not properly sampled or preserved for intended purpose;
- analysis of samples outside the required holding times;
- deviations from analytical or other laboratory SOPs;
- deviations from standard QC practices;
- use of alternative calibration practices,
- reporting data which is not compliant with USEPA or IEPA analytical or QC requirements.

16.2 Requests for and Approval of Departures

Requests for allowing departure from documented policies and procedures are directed to the Laboratory Director. The Laboratory Director shall evaluate the reasons for such departures. The quality assurance office is consulted for all matters that may affect the quality of analytical data. Written approval by the Laboratory Director is required before such departures are made. The Laboratory Director documents all departures and their duration. Permanent departures are documented by changes in the established policies and procedures.

16.3 Use of Analytical Methods Which Are Not Approved by USEPA or IEPA

When analytical methods are used which are not approved by USEPA or IEPA, SOPs are used to document the actual procedures performed as well as the source of the method. The methods used to determine the criteria for IDMP are established and documented prior to use of the method. Quality assurance and control procedures are typically included in the method; however, SOPs may not include all the requirements for SOPs required by 35 Ill. Adm. Code 186.165(g).

16.4 Reporting of Non-compliant Data

Data which is produced from samples that do not meet the regulatory sampling, holding, or preservation requirements, or which is produced using methods that deviate from EPA-required analytical or QC requirements, is reported only when accompanied by a statement that the data may not be used for regulatory compliance purposes.

Section 17
Procedures for Dealing with Complaints

17.1 Scope

The Laboratory has specific procedures for dealing with complaints from clients or other parties.

17.2 Complaint Receipt Procedures

17.2.1 Document the initial complaint with the following information.

- Name of person with complaint
- Company name
- Phone number
- Sample Identification
- Nature of complaint

17.2.2 Inform person with complaint that it will be investigated promptly. Also inform him of the estimated time or date for a response to the complaint.

17.3 Complaint Investigation Procedures

17.3.1 Review the following items regarding the sample or analysis in question with laboratory staff.

- Receipt of sample
- Internal Chain of Custody
- Analyses performed
- Analysis methods
- Analytical results
- Calibration check
- Quality control results
- Calculations
- Unit conversions

17.3.2 Document whether any discrepancies were revealed during the review, especially discrepancies which address specific complaint.

17.4 Complaint Response Procedures

17.4.1 Laboratory management will contact the person with complaint and reveal findings of investigation. If necessary, a corrected report will be issued.

17.4.2 File the documented complaint investigation for use during the annual review of the Quality Assurance Plan. If any corrective actions are required, reference Section 15 of this QAP manual, “Corrective Action Policies and Procedures.”

Section 18
Procedures for Protecting Confidentiality and Proprietary Rights

18.1 Procedure for Protecting Confidentiality

The laboratory must protect confidentiality and proprietary rights. Laboratory employees are instructed not to divulge any information that may involve issues of confidentiality or proprietary without the approval of the (*insert title*).

18.2 Examples of Confidential Data

Some examples of confidential data include:

- Analytical results for samples obtained from industrial dischargers.
- Sample results that may be integral to on-going or possible litigation.

Section 19
Procedures for Internal Audits

19.1 Annual Internal Audit

The Quality Assurance Officer or his designee conducts an annual internal audit of the laboratory.

- This auditor conducts a systematic audit of technical activities from previously prepared checklists. (*You may wish to reference an appendix with a sample audit check list.*)
- The auditor determines whether the quality assurance practices and other laboratory procedures described or referenced in the QAP have been implemented.
- The auditor then prepares a written report which includes copies of the check-lists and a list of all noted deficiencies.

19.2 Corrective Actions Regarding the Annual Internal Audit

Laboratory management takes appropriate corrective actions in response to the internal audit. He also prepares a written response plan which includes:

- Completed corrective actions
- Planned corrective actions
- Implementation schedule for planned corrective actions.

19.3 Notification of Invalid Data

Where results of the internal audit indicate the laboratory’s test results are invalid, immediate corrective action is taken. All persons are notified who received the invalid data.

Section 20
Annual Review of the Quality Assurance Plan (QAP)

20.1 Scope

The QAP is reviewed annually. The laboratory supervisor conducts an internal review with the laboratory's quality assurance officer. The laboratory, in its review, determines whether requirements of the Illinois EPA Laboratory Accreditation Program have been adequately addressed, the results of the annual review must be documented.

20.2 Correcting Deficiencies in the QAP

If the laboratory supervisor and quality assurance officer find deficiencies, the QAP is changed as necessary. The revised QAP is then issued with the appropriate version number and is implemented at the agreed upon effective date. All copies of the preceding version are replaced with the new version.

Section 21
Training and Personnel Requirements

21.1 Scope and Training Objectives

All personnel involved in laboratory analysis or quality assurance/quality control shall have sufficient training to contribute to the analysis and reporting of complete, high quality data in compliance with the procedures of this Comprehensive Quality Assurance Plan. Laboratory Management is responsible for ensuring the required training is made available.

21.2 Training Required for Laboratory Director

21.2.1 The Laboratory Director shall hold a bachelor's degree in natural or physical sciences or have completed enough course work in chemistry to equal a minor in chemistry.

21.2.2 The Laboratory Director shall have a minimum of two year's experience in managing a laboratory

21.3. Training Required for Laboratory Supervisor

21.3.1 The Laboratory Supervisor shall hold a bachelor's degree in natural or physical sciences or have completed enough course work in chemistry to equal a major in chemistry.

21.3.2 The Laboratory Supervisor shall have a minimum of one year's experience in analyses pertaining to the applicable fields of testing.

21.4 Training Required for Quality Assurance Officer

21.4.1 The QA Officer shall hold a bachelor's degree in natural or physical sciences or have completed enough course work in chemistry to equal a major in chemistry

21.4.2 The QA Officer shall have a minimum of one year's experience as an analyst in a laboratory.

21.4.3 The QA Officer shall have documented training in quality assurance and quality control.

21.5. Training Required for Analysts

21.5.1 Analysts shall hold a bachelor's degree in natural or physical sciences or have completed enough course work to equal a major in chemistry

21.5.2 Analysts shall have a minimum of one year's experience in the analyses pertaining to the applicable fields of testing for which the laboratory is seeking accreditation.

21.5.3 Analysts shall meet the instrument training requirements specified in Section 21.8 of this QAP.

21.5.4 After completing training, analysts shall perform an Initial Demonstration of Method Performance (IDMP) study for each analysis as specified in section 6.8 of this QAP.

21.5.5 The laboratory shall have on file documentation indicating the analyst's acceptable performance on a blind sample at least once per year and a certification that the analyst has read, understood and agreed to perform the most recent version of the standard operating procedure.

21.6 Training Required for Technicians

21.6.1 Technicians shall hold a high school diploma or its equivalent.

21.6.2 Technicians shall meet the instrument training requirements specified in Section 21.8 of this QAP

21.6.3 After completing training, technicians shall perform an Initial Demonstration of Method Performance (IDMP) study for each analysis as specified in section 6.8 of this QAP.

21.6.4 The laboratory shall have on file documentation indicating the technician's acceptable performance on a blind sample at least once per year and a certification that the analyst has read, understood and agreed to perform the most recent version of the standard operating procedure.

21.7 Substituting Experience or Education to Meet Training Requirements

21.7.1 A person may serve as Laboratory Director, Laboratory Supervisor, Quality Assurance Officer, Analyst, or Technician when that person does not meet the training, educational or experience requirements for the position. In such cases the laboratory shall submit written justification to the IEPA explaining why a person should serve in a particular position. This written justification shall take into account the following factors:

- Experience as an offset for education requirements
- Education as an offset for experience requirements

21.7.2 Other justifications for a person serving in a position for which he does not meet the training, educational of experience requirements are discussed in Section 186.140 of the IEPA Laboratory Accreditation Regulations.

21.8 Instrument Training Requirements

Analysts and technicians must meet either of the following requirements for analyses performed utilizing Atomic Absorption. (*You should also list other instruments requiring special training here, for example, GCMS, ICP, etc.*)

- The analyst or technician shall have satisfactorily completed a minimum of four hours training that is offered by the equipment manufacturer, a professional organization, a university, or qualified training facility.
- The analyst or technician shall have served a two week period of apprenticeship under an experienced analyst or technician.

21.9 Training Records

Laboratory management maintains employee training records. The records are updated periodically for each employee receiving training.

Section 22
Definition of Terms

Acceptance limits - the data quality limits specified for analytical method performance.

Accreditation - the issuance by an accrediting authority of certificates of competency to laboratories meeting the minimum standards established by the accreditation program. Accreditation is not a guarantee of the validity of the data generated by the accredited laboratory.

Accuracy - a measure of the degree of agreement between an observed value generated by a specific procedure and a true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator.

ASTM - the American Society for Testing and Materials, Philadelphia, PA, a not-for-profit, voluntary standards development system.

Analyte - a chemical element, chemical compound, or physical property capable of detection, quantification or measurement.

Analyte of interest - the chemical element, chemical compound, or physical property for which the laboratory is performing an analysis.

Analyzed reagents - chemicals analyzed for impurities where the level of impurities is reported in accordance with specifications of the Committee on Analytical Reagents of the American Chemical Society.

Analytical standard - a pure compound of a mix of pure compounds used to calibrate an instrument or a single piece of equipment. An analytical standard may be traceable to a national standard or reference material.

Audit - a thorough, systematic, qualitative examination of a laboratory and activities within the laboratory, for compliance with the laboratory's QAP and the requirements of any accreditation program it may be a participant of.

Batch - one to 20 environmental samples of the same matrix that are prepared together with the same process and personnel, using the same lot of reagents with a maximum time between the start of processing of the first sample and the start of processing of the last sample is 24 hours.

Bias - the systematic of persistent distortion of a measurement system which causes errors in one direction resulting in measured values that are consistently less than or greater than the true value.

Blind sample - a sample submitted for analysis whose composition is known to the submitter, but unknown to the analyst. A blind sample is one way to test proficiency of a measurement system.

Calibration - the comparison of a measurement standard or instrument with another standard or instrument to report or eliminate by adjustment any variation (deviation) in the accuracy of the item being compared.

Chain-of Custody - an unbroken trail of accountability that ensures the physical security of samples, data, and records.

Corrective action - an action taken by the laboratory to eliminate or correct the causes of an existing nonconformance in order to prevent the reoccurrence of the nonconformance.

Document - any written or pictorial information describing, defining, specifying, reporting, or certifying any activities, requirements, procedures, or results.

Environmental samples - samples, excluding and laboratory generated quality control samples such as matrix spikes, duplicates, and laboratory control samples, for which the laboratory analytical results will be reported.

Field sample duplicate - a second sample obtained from the same sampling point as the first sample and at approximately the same time, in a manner that would yield two representative samples of identical or nearly identical composition.

Inorganic - all parameters not included in organic parameters.

Laboratory - a facility that is equipped and used for the testing of samples.

Laboratory control sample - an uncontaminated sample matrix with known quantities of analytes. The analytes shall be obtained from a second source. The laboratory control sample is analyzed exactly like a sample to determine whether the measurement system is performing as expected using, depending on the test method, either acceptance criteria contained in the method or laboratory generated.

Least precise step - the part of the analytical procedure that results in the greatest error in measurement.

Linear dynamic range - the range of concentrations over which the analytical system exhibits a linear relationship between the amount of material introduced into the instrument and the instrument’s response.

Linear calibration range - the range of standards used for calibration between which a linear relationship exists between the amount of material introduced into the instrument and the instrument’s response.

Litigation sample - a sample that a laboratory knowingly analyzes for possible legal action.

Matrix - the predominant material of which the sample to be analyzed is composed. Sample matrices include aqueous, drinking water, saline or estuarine waters, non-aqueous liquid, solids, and chemical waste.

Matrix spike - an aliquot of matrix, fortified (spiked with known quantities of specific analytes and subject to the entire analytical procedure in order to determine the effect of the matrix on the recovery of a test method).

Matrix spike duplicate - a replicate matrix spike that is prepared and analyzed in order to determine the precision of the text method.

Measurement system - means any instruments, gauges, tools, devices, equipment, procedures, method, or aggregates thereof, used to acquire or control sample data generated.

Method - a procedure or technique for performing an activity (for example sample preparation and sample analysis).

Method blank - a sample which does not contain an analyte of interest above an acceptable level and which is processed simultaneously with, and under the same conditions as samples being analyzed or analytes of interest.

Method detection limit - the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte.

NPDES - National Pollutant Discharge Elimination System, a USEPA program designed to control discharges of wastewater and wastewater effluents into surface and ground wastes.

Organic all analytes analyzed by all forms of gas chromatography, and high pressure liquid chromatography (excluding ion chromatography).

Out-of-Control - out of statistical control and is a single measurement, quality control data point, series of measurements or series of quality control data points which fall outside expected limits as determined by the statistical analysis or historical data or in compliance with test method specified limits.

Parameter - analyte.

Performance evaluation program - the aggregate of providing rigorously controlled and standardized sample to a laboratory for analysis, reporting of results, statistical evaluation of the results in comparison to peer laboratories and the collective demographics and results summary of all participating laboratories.

Performance evaluation sample - a sample provided by a performance evaluation study to test whether the laboratory can produce analytical results within specified performance limits.

Performance evaluation study - a single testing cycle within a performance evaluation program.

Precision - the measure of mutual agreement among individual measurements of a sample, usually under prescribed similar conditions, usually expressed as the standard deviation, variance, or range, in either absolute or relative terms.

Quality assurance - an integrated system of activities involving planning, quality control, quality assessment, reporting, and quality improvement to ensure that a product or service meets or exceeds the requirements of the user of the product or service.

Quality assurance plan (QAP) - the laboratory’s written plan of operation that will ensure that the accuracy and precision as well as the overall reliability of laboratory results, meets or exceeds the needs and expectations of those for which laboratory data is produced. Management, administrative, statistical, investigative, preventative, and corrective techniques will be employed to maximize reliability of data.

Quality control - the overall system of technical activities whose purpose is to measure and control the quality of laboratory data so that it meets the needs of users.

Quality control acceptance limits - the statistically determined or test method specified limits within which a single measurement, quality control data point, series of measurements or series of quality control data points will fall when the analytical process is producing data of satisfactory quality.

Quality control chart - a graphical plot of data points used to demonstrate statistical control and monitor a measurement process. The charts have a vertical scale plotted in units of the analytical results, a horizontal scale, in units of time, or sequence of results, and lines within which or around which the data points are expected to lie.

Quality control check sample - an aliquot of the method blank fortified with a solution of the analytes of interest of know concentration prepared from a standard obtained from an outside source. The quality control check sample is used to check either laboratory or instrument performance.

Replicate sample - two or more equal aliquots taken from the same sample container and analyzed independently for the same analytes.

Sample any solution or media introduced into an analytical instrument on which an analysis is performed excluding calibration standards, initial calibration verification check standards, calibration blanks, and continuing calibration verification check standards.

Sample duplicate - a second sample aliquot taken in the laboratory from the same sample container and carried through all steps of the analytical procedures in an independent and identical manner. Sample duplicates are used to assess variance of the total method including sampling and analysis.

Sample tracking - an unbroken trail of accountability that ensures the physical security of samples, data, and records.

Second source - obtained from different vendor or manufacturer, or different lots from the same vendor or manufacturer.

Spike concentration - a specified amount of an analyte of interest in a matrix spike, laboratory control sample, or quality control check sample.

Standard Operating Procedure (SOP) - a written laboratory specific document which details the method of an operation, analysis of action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks.

Standard Methods - Standard Methods for the Examination of Water and Wastewater.

Surrogate - an organic compound which is similar to the analytes of interest in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples.

Test - a technical operation that consists of the determination of one or more characteristics or performances of a given product material, equipment, organism, physical phenomenon, process or service according to a specified procedure.

Traceability - an unbroken chain of comparisons of a laboratory standard to a national standard that will substantiate the accuracy of the laboratory standard.

True Value - the accepted or actual value of the quantity being measured.

USEPA - the United States Environmental Protection Agency.

Section 23
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