QUALITY ASSURANCE OFFICER'S MANUAL

March, 1998

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1.0. INTRODUCTION

As a Certified Water Quality Monitor with Texas Watch, you are no doubt aware of the importance of collecting usable information about the environment in which you monitor. All certified monitors of the Texas Watch program are participating in a statewide project that is primarily funded through the U.S. EPA. The EPA requires that data collected under their grants be collected following very precise standards outlined in an approved quality assurance project plan (QAPP). For both these reasons, Texas Watch must be able to assure all users of volunteer data that the data meet acceptable standards of quality.

This Quality Assurance Officer's (QAO) Manual has been developed to help guide you through the two phases of training in becoming certified to lead quality control (QC) lab sessions. This is also a guide for Certified Texas Watch Trainers to use when conducting a field QC session. Both QA officers and trainers can lead field QC sessions, but only a certified QA officer can lead the lab QC sessions. Attendance at two QC sessions the first year of monitoring and once annually the following years is required for all Certified Water Quality Monitors in the Texas Watch Volunteer Environmental Monitoring Program of the Texas Natural Resource Conservation Commission (TNRCC).

Maintaining the QC status of the Certified Monitors is an extremely important part of the Texas Watch program. Volunteers who adhere to the QC procedures outlined in this and other Texas Watch documents can be confident that Texas Watch will promote the use of their data in enhancing professionally collected data. As a QA Officer for both lab sessions and field sessions, you will be responsible for providing Texas Watch with the appropriate documentation for verifying quality assured data.

WHAT IS QUALITY ASSURANCE/QUALITY CONTROL ?

It is very important for users of water quality data, whether it be a State agency or the citizens themselves, to have confidence in the data being furnished by either professional or volunteer monitors. Without some form of quality assurance there is no way to be certain that the data collected are valid.

Quality assurance (QA) is the overall process that we implement to assure that data collected by volunteers and professionals are useful and reliable. Quality assurance guides the entire program from training the monitor to analyzing the data.

Quality control (QC) is part of quality assurance. It is the activities that are performed during data collection which ensure the data collected are of the highest quality. Quality control is also the process by which we document the separate components of our quality assurance plan. For instance, the forms you fill out to document a volunteer's training or the monitoring forms a monitor fills in to record the field data are both examples of quality control.

PURPOSE OF QC SESSIONS

The purpose of holding QC sessions is to check the accuracy and precision of the equipment, reagents, and protocol of the monitors in their monitoring activities. These checks are performed at QC sessions twice per year.

Volunteer monitors are required to attend a minimum of two QC sessions in their first year of monitoring and one per year thereafter. Lab sessions are administered by a Texas Watch Certified Quality Assurance Officer (QAO) and field QC sessions are administered by either a QAO or a Certified trainer.

Results of the laboratory QC session provide a measure of how accurately and precisely the monitors measure the water quality variables. The field QC session ensures monitors can conduct the measurements of theses variables in the field and provides an indication of how comparable volunteer data are to a QAO or trainer. Both sessions provide an opportunity to replace chemical reagents that are near expiration (Figure 1 and Table 1) and check the equipment for any damage or problems.

A volunteer monitor may attend two lab QC sessions, two field QC sessions, or a combination of the two during the first year of monitoring. The advantage of a lab QC session is that a QAO could lead a number of monitors from multiple groups through the session thus keeping a large number of monitors QC'd. The field QC session is a site visit and is limited to the number of volunteers monitoring at a particular site. Field QC sessions could be conducted in cases where there are few sites being monitored in an area or when a small number of monitors were unable to attend the lab QC session.

WHO IS A QUALITY ASSURANCE OFFICER ?

In order to meet the data quality requirements in its QAPP, Texas Watch has established specific protocol for training, field monitoring, and a continuing quality assurance program for volunteer monitors. As a new QA Officer, it is important for you to become familiar with the Texas Watch QAPP, the monitoring kit and how it is used, and the training requirements all volunteer monitors must meet to be certified as water quality monitors. For this reason Texas Watch has made the following requirements for becoming a Certified Quality Assurance Officer:

- You must be a Certified Water Quality Monitor. You do not need to be a Certified Trainer, although it is desirable.

- You must complete two phases of QA Officer's training with a completed QA Officer's Training Record on file with Texas Watch to lead lab QC sessions.

- A certified trainer may lead a field QC session if they have led all three phases of training and have received approval from Texas Watch to lead a field QC.

In order to maintain certification as a Certified QA Officer:

For Lab QAO

You must hold a minimum of one lab QC session per year to maintain your status as a QAO. Please send Texas Watch the completed QC session packet after QC sessions.

If your certification expires, you must lead a lab QC session under the supervision of a Certified QAO.

For Field QAO

You must remain a Certified Trainer and lead at least one field QC session per year to maintain your status as a field QAO. Please send to Texas Watch the completed Field QC session forms. Include the monitors complete data form.

If a field QAO loses their trainer certification they must lead a training with the supervision of a certified trainer. If it has been more than a year since a certified trainer has led a field QC session, but has maintained trainer certification, all that is needed is approval from Texas Watch to conduct a field QC session again.

WHO IS A QA MENTOR ?

A QA Mentor is a Certified Water Quality Monitor who assists one or more Certified QA Officers during a QC session. This person may be in the first or second phase of training to

become a QA Officer. A QA Mentor may also be a Certified Monitor or Trainer who wishes to assist at a QC Session without pursuing certification as a QA Officer.

2.0 GUIDELINES FOR QC SESSIONS

1. Each Certified Monitor is required to attend two lab QC sessions, or two field QC sessions, or a combination of the two during the first year. After the first year a minimum of one QC session (lab or field) is required.

2. Texas Watch suggests that Partners hold enough QC sessions to ensure all monitors supported by them are QC'd every six months. Field QC sessions are useful for partners when QC'ing monitors that are unable to attend a lab session or in areas where there are a small number of monitors.

3. Texas Watch attempts to publicize all known, upcoming QC sessions and partners can always request QC guidance and assistance from Texas Watch. Texas Watch will assist partners in tracking monitors that need to be QC'd.

4. If one year passes and the monitor has not attended a QC session, the data, gathered in the time between the missed QC session and the next one attended, will be entered as uncertified data (level 2 data) in the Texas Watch database. Only after a monitor attends and successfully completes a QC session will subsequent data be entered as certified data (level 1 data) in the Texas Watch database.

5. It is important for monitoring groups and partners to take as much responsibility as possible for ensuring monitors attend QC sessions on a regular basis by informing monitors either in writing or by telephone of upcoming QC sessions.

3.0 LABORATORY QC SESSION

The laboratory session provides an opportunity for volunteer monitors to check the accuracy and precision of their equipment as well as their testing techniques. The monitor brings their monitoring kit to the session to be checked. The laboratory QC session takes 3-4 hours to conduct, depending on the number of volunteers attending. The time for an individual complete the session is approximately one hour. At least one QAO needs to be present and, if possible, one to three QAO mentors should be available to assist. To assure mentors receive adequate training, there is a limit of three mentors who can be working on QAO certification at any one lab session. Texas Watch suggests volunteers come to the session in staggered time intervals. A session runs most smoothly if a steady flow of monitors passes through the stations rather than having arriving at once and waiting. The stations for various checks are as follows:

Station 1: The monitor calibrates meter(s) and conducts the tests with the reagents the monitor has been using in their sampling.

The monitor first picks up a QC session data form and calibrate the conductivity and pH meter (if used). Conductivity standard solution and pH buffers are provided. A QAO is present at this station to ensure the temperature and calibration information is properly filled out on the QC session data form. The monitor then conducts all the tests using the reagents currently in their kit (the old reagents).

The volunteer values are checked for precision and accuracy against a precalibrated multiprobe or QAO kit. **The monitor performs duplicate tests on dissolved oxygen, temperature, conductivity or salinity, and pH using the old reagents.** These duplicate samples are the basis of determining precision.

All results are recorded by the monitor on the data form including the values from the multiprobe or QAO kit. The measured values between the monitor and QAO should be within the acceptable limits for accuracy as listed in Table 2. If the values are outside the acceptable limits for precision and accuracy, the QAO will take corrective action measures with the monitor for those variables in question. See corrective action below.

The QAO should have his/her own QA monitoring kit at this station. The QAO should run tests prior to monitors taking their samples and again after the last monitor has sampled. These pre-test and post-test values should be recorded on the front of the QC session packet. If a multiprobe is used be sure to include the pre and post calibration values with the QC session packet.

Figure 1.

How to Determine the Date of Reagents

4169-H

SODIUM THIOSULFATE
0.025N
FOR CHEMICAL
TESTS ONLY!

KEEP CONTAINER TIGHTLY
CAPPED. STORE IN A
COOL PLACE AWAY FROM
DIRECT SUNLIGHT

LaMotte

257717

The bolded underlined numbers (not bolded or underlined on the actual bottle) on the bottom left hand side of the of the reagent label indicates the 25th week of 1997. This bottle will expire in the middle of July, 1998. It should be replaced before this time.

Table 1.

Shelf Life of Texas Watch Reagents
Whether Opened or Not

Manganese Sulfate..... 3years
Alkaline Potassium Iodide Azide.....3 years
Sulfuric Acid.....3 years
Sodium Thiosulfate.....1 year
Starch Indicator.....1.5 years
pH Wide Range Indicator.....2 years

Station 2: The monitor's kit will be checked for completeness.

The monitor then has the kit checked for completeness of all components. This includes a check to make sure all kit components are present and in good condition; and a check of reagent supply, condition, and dates. Reagents are replaced if they are within 6 months of expiration (see Figure 1 and Table 1). The expiration date should be written on the new reagent bottles. Batteries of the meters are replaced on an annual basis. When station 2 is complete and the kit has been checked, a sticker with the date of the QC session is placed on the underside of the kits' lid.

If the monitor successfully meets the precision and accuracy requirements at station 1(refer to Table 2.), received new reagents at station two, and completed the QC data sheet; they

have successful completed the QC session.

Corrective Action Station:

The QAO will then discuss with each monitor individually any corrective actions that are recommended as a result of the QC session. If a monitor does not achieve the precision or accuracy requirements for one of the variables, the test for that variable will be repeated with the **NEW** reagents. If the monitor does not meet the precision requirements, the monitor will run duplicate tests for that variable. If the monitor does not meet the accuracy requirements, the monitor will conduct the test at the same time as the QAO. Again, the monitor is using the new reagents at the Corrective Action Station.

Records of these corrective actions should be filled in on the monitors QC form under the Corrective Action column and also written on the QC packet. Then the packet is sent to Texas Watch.

4.0 LIST OF NEEDED EQUIPMENT FOR QC SESSIONS

Station 1

1. QC data forms and QC session packet
2. KCl standard solution for calibrating conductivity meter
3. Either 7 or 10 (or 4 for East Texas) pH buffer solution to calibrate pH meter if needed.
4. Battery voltage meter to check meters' batteries (optional)
5. Extra batteries for replacing dead ones.
6. Waste container
7. Deionized water in a squirt bottle
8. Kit component checklists
9. Replacement reagents and parts for kits

Station 2

1. Precalibrated (within 24 hours) Multiprobe or QAO kit for providing “known" values
2. Waste container
3. Deionized water in a squirt bottle
4. Large, clean tub, ice chest or other container which can hold a Multiprobe for water sample

GENERAL EQUIPMENT NEEDS

1. Station signs and instructions
2. Permanent markers
3. Masking tape
4. Stickers for marking kits
5. Goggles and gloves
6. Pens and pencils
7. Paper towels

5.0 FIELD QC SESSIONS

The field QC session is a site visit by a field QAO which provides an opportunity for monitors to check their testing procedures, protocol and safety practices. These sessions are conducted at the monitoring site of the volunteer and is very similar to the phase III portion of the training. It is encouraged to have at least one other QAO or trainer learn how to run the field QC session.

Each volunteer monitor should calibrate any pH or conductivity meter within 24 hours of the field QC check. The monitor(s) should have recorded the calibration information on a monitoring form and bring the form to the site visit. The field QAO reports to the site with a precalibrated (within 24 hours) Multiprobe or the field QAO's test kit complete with up to date chemicals. Each monitor is provided with a Field QC data form and records the calibration information on the form.

The volunteer values are checked for precision and accuracy against a precalibrated multiprobe or QAO kit. **The monitor performs duplicate tests on dissolved oxygen, temperature, conductivity or salinity, and pH using the old reagents.** These duplicate samples are the basis of determining precision.

All results are recorded by the monitor on the data form including the values from the multiprobe or QAO kit. The measured values between the monitor and QAO should be within the acceptable limits for accuracy as listed in Table 2. If the values are outside the acceptable limits for precision and accuracy, the QAO takes corrective action measures with the monitor for those variables in question. See corrective action below.

FIELD QC CHECKLIST

Before you go out on the Field QC

Equipment
- -Conductivity and pH replacement standards
- -batteries
- -gloves and goggles
- -Test Kit for comparison (or multiprobe- include pre and post calibration)

Paper work
- -New data sheets
- -Field QC notebook
  - Field QC data sheet
  - The Texas Watch QAO manual

Review
- -Review the site data for reoccurring problems. Have the station and group ID blocks been filled out? Has the calibration block been filled out correctly? Field QAOs should contact Texas Watch to determine if there are problems that could be addressed during the field QC session.
- -Review monitoring plan for completeness. Are there maps of the site? Do they have a station location form and a group number that matches their data sheets?

Other
- Waste container
- Permanent marker to write expiration dates on reagent bottles
- Map of site area

While on the Field QC

Ask monitor to complete any paper work that is lacking
Collect completed data sheets and supply new ones
Restock supplies, check for expired reagents (include how to read date on this form)
Record the ID number of the kit, if no ID record the partner that supplied the kit
Ask monitor(s) to conduct water tests, observe and critique on field QC checklist
Conduct tests or use a multiprobe to get comparison results ("known values")
Ask monitor to share general concerns, observations, needs and record on Field QC Log
Mark site on map if needed and write a short site description (see, "How to Make a Site Description)

When you return from the field QC

Clean your kit
Send data sheets to Texas Watch Data manager
See section 4.0 for a list of necessary equipment.

6.0 DATA QUALITY OBJECTIVES

Texas Watch has established Data Quality Objectives which ensure environmental data meet standards of quality required for their intended use. The three phases of training, the two QC sessions, and all the other QC details are part of the plan to meet the quality objectives set by Texas Watch and the Surface Water Quality Monitoring Program of TNRCC.

By becoming a volunteer monitor and agreeing to collect the highest quality data, you agree to attend two QC sessions the first year and one annually thereafter to determine the reliability of your data collected. Values produced by volunteers during the quality control session are compared to values produced by a Certified QAO or Trainer. Evaluation of individual data sets results in a score based on where these data sets fall in the data quality ranges. Values which fall within the acceptable ranges indicated in Table 3 are categorized as Level 1 data.

Duplicate precision refers to the difference the monitor may be off if they performed the test twice. For example, if a monitor performed the dissolved oxygen test two times, the results would need to be +/- 0.5 mg/l. The QC Officer accuracy refers to the difference the monitor's result may vary from the results of a QC officer. For dissolved oxygen the monitor may be +/- 1.0 mg/l.

When monitors do not meet the above ranges during a QC session, the data collected for that variable during the previous six months are considered Level 2 data. If a Level 2 score is due to monitor error, the monitor is retrained on that variable and tested again. If it is due to equipment error, calibration and maintenance techniques are assessed and any equipment is replaced if necessary.

The following paragraphs discuss the rational for the ranges of each variable.

Dissolved Oxygen- An accuracy of 0.5 mg/l of dissolved oxygen (DO) is required for water quality modeling of waste water discharges. State standards are based on historical data collected with instruments having an accuracy of 0.5 mg/l. Therefore, the range for the duplicate precision is 0.5 mg/l. Because both the monitor and the QC Officer are accurate within 0.5 mg/l as established by the method, the acceptable range that the monitor is allowed to deviate from the QC Officer is 1.0 mg/l.

Temperature- Due to the relationship between temperature and dissolved oxygen, the data quality ranges of the two are related. As previously explained, the accuracy of the DO test is +/- 0.5 mg/l DO. A change in 1.0 C changes the solubility of oxygen in water by 0.2 mg/l DO which is within the +/- 0.5 mg/l accuracy for DO. Temperature is readily measured to a duplicate precision of +/- 0.5 C. Therefore the temperature data quality range is 1 C.

pH- The pH of surface waters is specified for protection of fish life and to control undesirable chemical reactions, such as the dissolution of metal ions in acidic waters and the increased toxicity of ammonium ions in alkaline waters. These reactions are minimized at pH values close to neutral. Changes of about 1.0 su begin to cause these undesirable effects. An accuracy of one

half this amount is necessary to indicate pending threats. Monitors are allowed to differ from QC officers by +/- 0.5 pH units and the duplicate precision required of the monitors is +/- 0.25 su.

Conductivity- Conductivity data is useful for determining threats from industrial, municipal, and nonpoint pollution sources. The accuracy must be able to measure +/- 25% of the annual range to discern trends. Because conductivity varies greatly geographically and annually, the data quality ranges are based on annual means of low (<500 umho/cm), medium (<2,000 umho/cm), and high (<10,000 umho/cm). These annual means have approximate related annual ranges of 100 umho/cm, 500 umho/cm, and 2,000 umho/cm respectively. The duplicate precision is +/- 10 umho/cm for low to medium conductive waters and 100 umho/cm for high. The range monitors may differ from QC officers is 25 umho/cm for low conductivity waters, 125 umho/cm for medium conductive waters, and 500 umho/cm for high conductive waters. These ranges may be changed if enough historical data are available from a reference area to support a broader range than indicated in this QAPP.

Salinity- The data quality range for salinity is established based on the tolerance of fishes and in order to reflect a stable water column in estuarine environments. Estuarine environments range from 1 to 35 ppt. The salt content of the water affects the distribution of animal and plant species according to the amount of salinity they can tolerate. A change of 6000 umho/cm, equivalent to 4 ppt salinity, is used to determine the location of the mixed layer in a stable water column. An accuracy of one half this amount allows the data to be used for this purpose. The duplicate precision for salinity is 1.0 ppt. Monitors are required to be within 2.0 ppt salinity of the QC officer. 2 ppt salinity corresponds to 2400 umho/l at 15 C which is not a significant variance for the purposes of determining the stability of an estuarine environment.

Table 2. Texas Watch Data Quality Objectives

VARIABLE	METHOD/ RANGE	UNITS	DUPLICATE PRECISION	ACCURACY (ALLOWABLE RANGE COMPARING MONITOR VALUE TO QAO VALUE)	METHOD SENSITIVITY	COMPLETENESS
Temperature	Thermometer -5.0 to 45.0	Degrees Celsius (EC)	+/- 0.5EC	+/- 1.0EC	0.5 EC	83%
pH	Meter	Standard pH units (su)	+/- 0.1su	+/- 0.2 su	0.1 su	83%
	Color Comparator 3.0 - 7.0, 7.0 - 10.5	Standard pH units (su)	+/- 0.25 su	+/- 0.5 su	0.1 su	83%
Specific conductance	Meter 0 - 1990	:mho/cm (:S)	+/- 10 :S	*** Low +/- 25 Medium +/- 125	10 :S	83%
	0 - 19.90	mmho/cm (mS)	+/- 100 mS	High +/- 500	100 mS	83%
Salinity	Hydrometer 0.0 to 42.8	Parts per thousand (ppt)	+/- 1.0 ppt	+/- 2.0 ppt	0.1 ppt	83%
Dissolved Oxygen	Winkler Titration	Milligrams per liter (mg/l)	+/- 0.5 mg/l	+/- 1.0 mg/l	0.1 mg/l	83%
Clarity	Secchi Disk	Meters (m)	+/- 0.1 m	+/- 0.2 m	0.01 m	83%

* It is expected that volunteers committed to quality assured monthly sampling will submit data which meets all quality assurance objectives for ten months of each calendar year.

** It is not possible to determine accuracy for Secchi disk clarity because of the environmental variability associated with a visual test.

*** Low specific conductance waters are <500 :S with an annual range of approximately 100.
Medium specific conductance waters are <2000:S with an annual range of approximately 500.
High specific conductance waters are <20,000:S with an annual range of approximately 2000.

7.0 HOW TO MAKE A SITE DESCRIPTION

In order for Texas Watch to enter the quality assured data, there must be a completed Station Location (SLOC) form filled out for that site. When a group submits a monitoring plan there must be a map with the site clearly marked and if possible the longitude and latitude. Part of the SLOC form requires a short description and long description of the site. When Field QAOs are on the site visit it may be helpful if they record the short and long description for the site. Texas Watch or the area partner should be contacted to see if this information would be useful.

SHORT DESCRIPTION

The Short Descriptions is a brief description first stating the water body being tested and secondly, a major intersection, for example:

East Bouldin Creek at Mary Street
Town Lake at the confluence with Barton Creek
Blunn Creek below Stacey Pool
Lake Arboles in the Westwood Arm
Colorado River at FM 1890

LONG DESCRIPTION

The Long Description is a more detailed description which includes information from the Short Description, for example:

East Bouldin Creek at the northeastern intersection with Mary Street in Austin
Town Lake immediately after the confluence with Barton Creek in Austin
Blunn Creek 500 meters below Stacey Pool in Big Stacey Park in Austin
Lake Arboles in the Westwood Arm approximately 1000 meters below the confluence with Red Bud Creek in Lago Vista
Colorado River at 2nd low water crossing 100 feet downstream from FM 1890 30 miles southeast of Bastrop

8.0 QC AND DATA

QC SESSION DATA - WHAT DO WE DO WITH IT ?

Data collected at the QC sessions are used to assess and update the accuracy and precision of the data collected by volunteer monitors in the Texas Watch Program. QA/QC results are used by Texas Watch to document that QAPP requirements for precision and accuracy are being met.

Special QC data forms have been developed to record the results from QC sessions. These data forms are different from those used by the volunteers in their monthly monitoring. A QC data form is completed by each monitor at a QC session. It is the responsibility of each QAO to collect a copy of these forms in a QC session packet and forward it to the Texas Watch office in Austin. Results and analysis from the QC sessions are retained by Texas Watch. Each QAO is encouraged to keep a copy of all QC records for his/her own files.

HOW QC AFFECTS VOLUNTEER MONITORING DATA

Texas Watch data are distinguished by levels in the database based on the successful completion of all required QC sessions by the volunteer monitors. Level 1 data are defined as data collected under the approved Texas Watch QAPP on file with the US EPA. These data are collected by monitors who meet all training and QC requirements within the prescribed time constraints of the program and the data collected meet all the data requirements. Level 2 data are defined as data collected by certified monitors who have not attended QC sessions in the prescribed time frame or data collected with expired chemical reagents or faulty equipment.

If during a QC session, a problem with the monitoring kit such as expired chemicals or broken equipment is found; the data from the questionable variable is classified as level 2 data back to the last successful QC check for that variable. If six months pass and the monitor has not attended a QC session, the data gathered in the time between the missed QC session and the next one attended is classified as level 2 data. Only after a monitor attends and successfully completes a QC session will subsequent data be admitted into the Texas Watch database as level 1 data.

9.0 HELPFUL REMINDERS FOR QA OFFICERS

* Reagent dates written on bottles are to be the date the bottle expires (see Figure 1 and Table 1).

* There is a minimum of one QAO for both the laboratory session and field session. There should be at least one QC mentor at each to help the QAO.

* For monitors who share a kit, **each** monitor must do all the tests at both the laboratory and field sessions.

* Extra kits should be brought to sessions by the session coordinator, in addition to kit components, in case a monitor forgets to bring his/her kit.

* QAOs should send Texas Watch a regular update on where and when QC sessions will be held in their area. This information is very important and is sent out to all QAO's through the newsletter or in the form of a QA/QC Bulletin listing all upcoming sessions in the Regions.

10.0 GLOSSARY OF QA/QC TERMS

QUALITY ASSURANCE (QA) - Is a broad plan for maintaining quality in all aspects of a program. The quality assurance plan guides:

a) the selection of parameters and procedures;
b) data management and analysis; and
c) the steps taken to determine the validity of specific sampling or analysis procedures. These steps are divided into two categories: quality control and quality assessment.

QUALITY CONTROL (QC) - Refers to those activities performed during environmental data collection to produce data of a desired quality. It includes activities designed to ensure that no systematic bias develops in the analysis system (beyond what is normally present) that would exceed the accepted accuracy and precision limits of the analysis. In other words, QC procedures let you know right away if you have a problem with your data, so you can take immediate action to correct the problem.

QUALITY ASSESSMENT - Is your "after the fact" assessment of the overall precision and accuracy of your data. It is a continuing evaluation of the performance of the people collecting and analyzing the data.

PRECISION - The reproducibility of your method (how close the results are to each other). This refers to the person using the equipment. Are you following the correct sampling and testing procedures?

ACCURACY - How close your results are to the true value, a measure of bias in a system. This refers to the equipment or procedures. Is your equipment measuring correctly?

REPRESENTATIVENESS - Degree to which data accurately and precisely represent an environmental condition. For example, a sample collected from the bank of a stream or in a riffle may or may not be representative of the stream environment as a whole.

COMPARABILITY - A measure of confidence with which one data set can be compared to another.

COMPLETENESS - A measure of the amount of valid data obtained compared to the amount expected to be obtained. For example, one may expect to find 12 months worth of data in a complete annual data set. If, however, the monitor missed a few months of monitoring, the completeness of the data set would be decreased from 100%.

** Definitions are taken from:

Ellett, Kathleen and Alice Mayio. Volunteer Water Monitoring: A Guide For State Managers: US EPA, Office of Water. Publication EPA 440/4-90-010. 1990. p. 23-24.

Mattson, Mark. The Basics of Quality Control. Volunteer Monitor: V.4, No.2. 1992. p. 6-8.

11.0 APPENDIX

A. Lab Quality Control Session Data Form/Kit Component Checklist

B. Field Quality Control Session Data Form

C. Quality Control Session Packet

D. Quality Assurance Officer Training Record