

Bryan W. Shaw, Ph.D., *Chairman*  
Buddy Garcia, *Commissioner*  
Carlos Rubinstein, *Commissioner*  
Mark R. Vickery, P.G., *Executive Director*



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY  
*Protecting Texas by Reducing and Preventing Pollution*

August 19, 2013

Brian Sims  
ANRA Project Manager  
P.O. Box 387  
Lufkin, TX 75902

Re: ANRA FY 2014-2015 Clean Rivers Program QAPP

Dear Mr. Sims:

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Enclosed is an approved copy of the referenced document for your files and distribution.

Please ensure that copies of this document are distributed to each project participant as required by Section A3 of the QAPP. The documentation of QAPP distribution and subcontractor commitment to QAPP requirements must be available for review during monitoring system audits.

If you have any questions, please contact your TCEQ Clean Rivers Program project manager, or you may contact me at (512) 239-0011, or by email at [Daniel.burke@tceq.texas.gov](mailto:Daniel.burke@tceq.texas.gov).

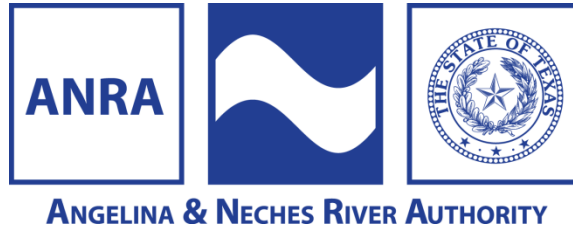
Sincerely,

A handwritten signature in cursive script that reads "Daniel R. Burke".

Daniel R. Burke  
Lead CRP Quality Assurance Specialist

enclosure

cc: Allison Fischer, TCEQ CRP Project Manager, MC 234



# Quality Assurance Project Plan Upper Neches River Basin

**Angelina & Neches River Authority  
PO Box 387  
Lufkin, Texas 75902**

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**Clean Rivers Program  
Water Quality Planning Division  
Texas Commission on Environmental Quality  
P.O. Box 13087, MC 234  
Austin, Texas 78711-3087**

**Effective Period: FY 2014 to FY 2015**

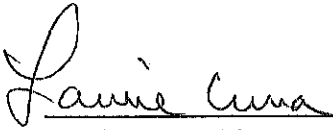
Questions concerning this QAPP should be directed to:


**Brian Sims  
Environmental Division Manager  
Angelina & Neches River Authority  
PO Box 387  
Lufkin, Texas 75902  
(936) 633-7527  
bsims@anra.org**

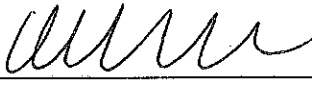
# A1 Approval Page


## Texas Commission on Environmental Quality


### Water Quality Planning Division

  
Laurie Curra, Manager  
Water Quality Monitoring & Assessment Section  
8-19-2013  
Date

  
Patricia Wise, Work Leader  
Clean Rivers Program  
19 Aug 2013  
Date

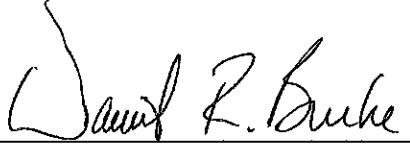
  
Allison Fischer  
Project Quality Assurance Specialist  
CRP  
8-19-2013  
Date

  
Allison Fischer  
Project Manager, CRP  
CRP  
8-19-2013  
Date


  
Nancy Ragland, Team Leader  
Data Management and Analysis  
8/19/13  
Date

### Monitoring Division

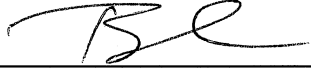
  
Sharon R. Coleman  
TCEQ Quality Assurance Manager (Acting)  
08/19/2013  
Date

  
Daniel R. Burke  
Lead CRP Quality Assurance Specialist  
Laboratory and Quality Assurance Section  
8/19/2013  
Date

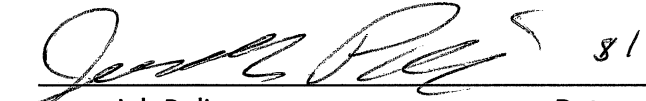
**Angelina & Neches River Authority (ANRA)**  
**Environmental Division – Clean Rivers Program**

  
\_\_\_\_\_  
Brian Sims  
ANRA CRP Project Manager

8/12/13  
\_\_\_\_\_  
Date

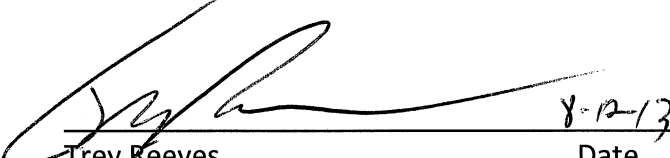
  
\_\_\_\_\_  
Brian Sims  
ANRA CRP Quality Assurance Officer

8/12/13  
\_\_\_\_\_  
Date

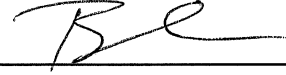
  
\_\_\_\_\_  
Jeremiah Poling  
ANRA CRP Data Manager

8/12/13  
\_\_\_\_\_  
Date

**Environmental Division - Environmental Laboratory**

  
\_\_\_\_\_  
Trey Reeves  
ANRA Laboratory Manager

8-12-13  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Brian Sims  
ANRA Laboratory Quality Assurance Officer

8/12/13  
\_\_\_\_\_  
Date

Sub-tier project participants (e.g., subcontractors, other units of government) will sign the QAPP, indicating the organization's awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or added appendices of this plan. Signatures in section A1 will eliminate the need to adherence letters to be maintained.

**Lower Colorado River Authority (LCRA)**

**Environmental Laboratory Services (ELS)**

 8/16/13

Alicia Gill  
LCRA ELS Manager

Date

 8/16/13

Roland Garcia  
LCRA ELS Quality Assurance Director

Date

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## List of Acronyms

ANRA	Angelina & Neches River Authority
AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
CAP	Corrective Action Plan
COC	Chain of Custody
CRP	Clean Rivers Program
DMRG	Surface Water Quality Monitoring Data Management Reference Guide, January 2012, or most recent version
DM&A	Data Management and Analysis
ELS	Environmental Laboratory Services
EPA	United States Environmental Protection Agency
FY	Fiscal Year
GIS	Geographical Information System
GPS	Global Positioning System
LCRA	Lower Colorado River Authority
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
NELAP	National Environmental Lab Accreditation Program
QA	Quality Assurance
QM	Quality Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QC	Quality Control
QEC	Quality Environmental Containers, Inc.
QMP	Quality Management Plan
SLOC	Station Location
SOP	Standard Operating Procedure
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TMDL	Total Maximum Daily Load
TCEQ	Texas Commission on Environmental Quality
TNI	The NELAC Institute
TSWQS	Texas Surface Water Quality Standards
VOA	Volatile Organic Analytes

## **A3 Distribution List**

### **Texas Commission on Environmental Quality**

**P.O. Box 13087**

**Austin, Texas 78711-3087**

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Clean Rivers Program

MC-234

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Lead CRP Quality Assurance Specialist

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Team Leader, Data Management and Analysis

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### **Angelina & Neches River Authority**

**PO Box 387**

**Lufkin, Texas 75902**

Brian Sims, CRP Project Manager/QAO

(936) 633-7527

Jeremiah Poling, CRP Data Manager

(936) 633-7551

Trey Reeves, Laboratory Manager

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### **Lower Colorado River Authority Environmental Laboratory Services**

**3505 Montopolis**

**Austin, Texas 78744**

Dale Jurecka, LCRA ELS Project Manager

(512) 730-6337

The Angelina & Neches River Authority will provide copies of this project plan and any amendments or appendices of this plan to each person on this list and to each sub-tier project participant, e.g., subcontractors, other units of government. The Angelina & Neches River Authority will document distribution of the plan and any amendments and appendices, maintain this documentation as part of the project's quality assurance records, and will ensure the documentation is available for review.



## **A4 PROJECT/TASK ORGANIZATION**

### ***Description of Responsibilities***

#### **TCEQ**

##### **Patricia Wise**

##### **CRP Work Leader**

Responsible for Texas Commission on Environmental Quality (TCEQ) activities supporting the development and implementation of the Texas Clean Rivers Program (CRP). Responsible for verifying that the TCEQ Quality Management Plan (QMP) is followed by CRP staff. Supervises TCEQ CRP staff. Reviews and responds to any deficiencies, corrective actions, or findings related to the area of responsibility. Oversees the development of Quality Assurance (QA) guidance for the CRP. Reviews and approves all QA audits, corrective actions, reviews, reports, work plans, contracts, QAPPs, and TCEQ Quality Management Plan. Enforces corrective action, as required, where QA protocols are not met. Ensures CRP personnel are fully trained.

##### **Daniel R. Burke**

##### **CRP Lead Quality Assurance Specialist**

Participates in the development, approval, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Assists program and project manager in developing and implementing quality system. Serves on planning team for CRP special projects. Coordinates the review and approval of CRP QAPPs. Prepares and distributes annual audit plans. Conducts monitoring systems audits of Planning Agencies. Concurrs with and monitors implementation of corrective actions. Conveys QA problems to appropriate management. Recommends that work be stopped in order to safeguard programmatic objectives, worker safety, public health, or environmental protection. Ensures maintenance of QAPPs and audit records for the CRP.

##### **Allison Fischer**

##### **CRP Project Manager**

Responsible for the development, implementation, and maintenance of CRP contracts. Tracks, reviews, and approves deliverables. Participates in the development, approval, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Assists CRP Lead QA Specialist in conducting Basin Planning Agency audits. Verifies QAPPs are being followed by contractors and that projects are producing data of known quality. Coordinates project planning with the Basin Planning Agency Project Manager. Reviews and approves data and reports produced by contractors. Notifies QA Specialists of circumstances which may adversely affect the quality of data derived from the collection and analysis of samples. Develops, enforces, and monitors corrective action measures to ensure contractors meet deadlines and scheduled commitments.

##### **Nancy Ragland**

##### **Team Leader, Data Management and Analysis (DM&A) Team**

Participates in the development, approval, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Ensures DM&A staff perform data management related tasks, including coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval; ensuring that data is reported following

instructions in the Surface Water Quality Monitoring Data Management Reference Guide, January 2012, or most current version (DMRG); running automated data validation checks in Surface Water Quality Monitoring Information System (SWQMIS) and coordinating data verification and error correction with CRP Project Managers; generating SWQMIS summary reports to assist CRP Project Managers' data review; identifying data anomalies and inconsistencies; providing training and guidance to CRP and Planning Agencies on technical data issues to ensure that data are submitted according to documented procedures; reviewing QAPPs for valid stream monitoring stations, validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s); developing and maintaining data management-related standard operating procedures (SOPs) for CRP data management; and coordinating and processing data correction requests.

**Peter Bohls**

**CRP Data Manager, DM&A Team**

Responsible for coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval. Ensures that data is reported following instructions in the DMRG. Runs automated data validation checks in SWQMIS and coordinates data verification and error correction with CRP Project Managers. Generates SWQMIS summary reports to assist CRP Project Managers' data review. Identifies data anomalies and inconsistencies. Provides training and guidance to CRP and Planning Agencies on technical data issues to ensure that data are submitted according to documented procedures. Reviews QAPPs for valid stream monitoring stations. Checks validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s). Develops and maintains data management-related SOPs for CRP data management. Coordinates and processes data correction requests. Participates in the development, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP).

**Allison Fischer**

**CRP Project Quality Assurance Specialist**

Serves as liaison between CRP management and TCEQ QA management. Participates in the development, approval, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Serves on planning team for CRP special projects and reviews QAPPs in coordination with other CRP staff. Coordinates documentation and implementation of corrective action for the CRP.

## **ANGELINA & NECHES RIVER AUTHORITY**

**Brian Sims**

**ANRA Environmental Division Manager / CRP Project Manager**

Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Ensures monitoring systems audits are conducted to ensure QAPPs are followed by basin planning agency participants and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures CRP project managers and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ.

**Brian Sims****ANRA CRP Quality Assurance Officer**

Responsible for coordinating the implementation of the QA program. Responsible for writing and maintaining the QAPP and monitoring its implementation. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Responsible for documenting particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective action. Coordinates and maintains records of data verification and validation. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Conducts monitoring systems audits on project participants to determine compliance with project and program specifications, issues written reports, and follows through on findings. Ensures that field staff is properly trained and that training records are maintained.

**Jeremiah Poling****ANRA Data Manager**

Responsible for ensuring that field data are properly reviewed and verified. Responsible for the transfer of basin quality-assured water quality data to the TCEQ in a format compatible with SWQMIS. Maintains quality-assured data on ANRA internet sites.

**Mike Parrish****ANRA Field Technician**

Coordinate and conduct field data collection activities in accordance with the basin coordinated monitoring schedule and the QAPP.

**Trey Reeves****ANRA Laboratory Manager**

Responsible for ensuring adequate training and supervision of all laboratory personnel involved in generating analytical data. Ensures all laboratory personnel have a thorough knowledge of the laboratory QM and all SOP's specific to the analyses or task performed. Ensures that analytical tests are performed in accordance with approved methods. Ensures that the laboratory maintains adequate Quality Assurance/Quality Control (QA/QC) procedures during the time samples are being analyzed and that all requirements are met and documentation related to the analyses is completely and accurately reported. Enforces corrective action as required.

**Brian Sims****ANRA Laboratory QAO**

Monitors the implementation of the QA Plan within the laboratory to ensure complete compliance with the QA objectives as defined by the contract and in the QAPP. Conducts in-house audits to identify potential problems and ensures compliance with written SOP's. Responsible for supervising all aspects of the QA/QC in the laboratory. Performs validation and verification of laboratory data.

## **LOWER COLORADO RIVER AUTHORITY**

### **Alicia Gill**

#### **LCRA ELS Laboratory Manager**

Responsible for overall performance, administration, and reporting of analyses performed by LCRA's Environmental Laboratory Services. Responsible for supervision of laboratory personnel involved in generating analytical data for the project. Ensures that laboratory personnel have adequate training and a thorough knowledge of the QAPP and related SOPs. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation is complete and adequately maintained, and results are reported accurately.

### **Roland Garcia**

#### **LCRA ELS Quality Assurance Director**

Maintains operating procedures that are in compliance with the QAPP, amendments and appendices. Responsible for the overall quality control and quality assurance of analyses performed by LCRA's Environmental Laboratory Services.

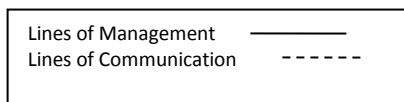
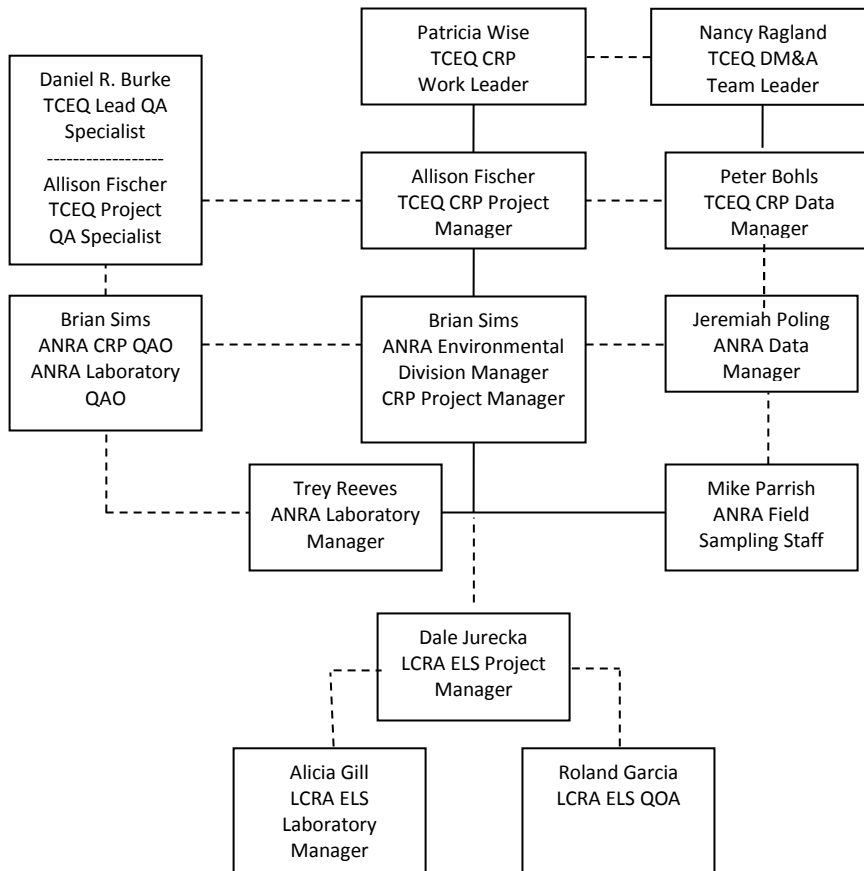
### **Dale Jurecka**

#### **LCRA ELS Project Manager**

Reviews and verifies all laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validated against the measurement performance specifications listed in Table A7.1 of the QAPP.

# Project Organization Chart

Figure A4.1. Organization Chart - Lines of Communication



## A5 Problem Definition/Background

In 1991, the Texas Legislature passed the Texas Clean River Act (Senate Bill 818) in response to growing concerns that water resource issues were not being pursued in an integrated, systematic manner. The act requires that ongoing water quality assessments be conducted for each river basin in Texas, an approach that integrates water quality issues within the watershed. The CRP legislation mandates that each river authority (or local governing entity) shall submit quality-assured data collected in the river basin to the commission. Quality-assured data in the context of the legislation means data that comply with TCEQ rules for surface water quality monitoring (SWQM) programs, including rules governing the methods under which water samples are collected and analyzed and data from those samples are assessed and maintained. This QAPP addresses the program developed between the ANRA and the TCEQ to carry out the activities mandated by the legislation. The QAPP was developed and will be implemented in accordance with provisions of the TCEQ Quality Management Plan, January 2013 or most recent version (QMP).

The purpose of this QAPP is to clearly delineate ANRA QA policy, management structure, and procedures which will be used to implement the QA requirements necessary to verify and validate the surface water quality data collected. The QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are scientifically valid and legally defensible. This process will ensure that data collected under this QAPP and submitted to SWQMIS have been collected and managed in a way that guarantees its reliability and therefore can be used in water quality assessments, total maximum daily load (TMDL) development, establishing water quality standards, making permit decisions and used by other programs deemed appropriate by the TCEQ. Project results will be used to support the achievement of CRP objectives, as contained in the *Clean Rivers Program Guidance and Reference Guide FY 2014 -2015*.

The ANRA monitoring program was developed to implement a basin-wide water quality monitoring to help meet the goals of the Texas Clean Rivers Program, as well as the River Authority's statutory responsibilities. ANRA's monitoring strategy is primarily based upon impairments and/or concerns identified in the TCEQ's *Texas Integrated Report of Surface Water Quality*. Other monitoring stations have been selected based upon local concern and stakeholder input. Beginning in FY 2014, ANRA's surface water quality monitoring program is expanding to include water bodies that have not previously been monitored in an effort to gain a more thorough and complete knowledge of the water quality issues in the basin.

ANRA's monitoring program is reviewed annually and includes the following activities:

- Analyzing available water quality data and basin assessment reports to insure proper data collection.
- Coordinating with other monitoring programs in the basin to minimize and duplication of efforts.
- Developing a basin-wide coordinated monitoring schedule with maps to review at annual stakeholder meetings and coordinated monitoring meetings.

## **A6 Project/Task Description**

During the FY 2014-2015 biennium, ANRA's monitoring program will include routine (RT) monitoring in all areas of the basin. The routine monitoring includes the following field parameters: pH, water temperature, dissolved oxygen, specific conductance, secchi depth (transparency), total water depth (reservoir sites), instantaneous stream flow (stream sites), flow severity, flow measurement method, days since last significant rainfall, present weather, and stream flow estimate (when instream flow is not available). The routine monitoring also includes the following conventional parameters analyzed in the laboratory: *E. coli*, Ammonia-N, Nitrate-N+Nitrite-N, Total Phosphorus, Sulfate, Chloride, Total Dissolved Solids, Total Suspended Solids, Chlorophyll-a, and Pheophytin. The ANRA and/or the LCRA laboratories perform the sample analyses for conventional parameters. All chlorophyll-a and pheophytin samples are analyzed by the LCRA laboratory.

See Appendix B for the project-related work plan tasks and schedule of deliverables for a description of work defined in this QAPP. Attach work plan tasks pertaining to this QAPP.

See Appendix B for sampling design and monitoring pertaining to this QAPP.

### ***Amendments to the QAPP***

Revisions to the QAPP may be necessary to address incorrectly documented information or to reflect changes in project organization, tasks, schedules, objectives, and methods. Requests for amendments will be directed from the ANRA Project Manager to the CRP Project Manager electronically. The Basin Planning Agency will submit a completed QAPP Amendment document, including a justification of the amendment, a table of changes, and all pages, sections or attachments affected by the amendment. Amendments are effective immediately upon approval by the ANRA Project Manager, the ANRA QAO, the CRP Project Manager, the CRP Lead QA Specialist, the CRP Project QA Specialist, and additional parties affected by the amendment. Amendments are not retroactive. No work shall be implemented without an approved QAPP or amendment prior to the start of work. Any activities under this contract that commence prior to the approval of the governing QA document constitute a deficiency and are subject to corrective action as described in section C1 of this QAPP. Any deviation or deficiency from this QAPP which has occurs after the execution of this QAPP should be addressed through a Corrective Action Plan (CAP). An Amendment may be a component of a CAP to prevent future recurrence of a deviation. Amendments will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by the ANRA Project Manager.

### ***Special Project Appendices***

Projects requiring QAPP appendices will be planned in consultation with the ANRA and the TCEQ Project Manager and TCEQ technical staff. Appendices will be written in an abbreviated format and will reference the Basin QAPP where appropriate. Appendices will be approved by ANRA Project Manager, the ANRA QAO, the Laboratory (as applicable), and the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist and other TCEQ personnel, as appropriate. Copies of approved QAPPs appendices will be distributed by the ANRA to project participants before data collection activities commence..

## A7 Quality Objectives and Criteria

The purpose of routine water quality monitoring is to collect surface water quality data that can be used to characterize water quality conditions, identify significant long-term water quality trends, support water quality standards development, support the permitting process, and conduct water quality assessments in accordance with TCEQ's *2012 Guidance for Assessing and Reporting Surface Water Quality in Texas*, or the most recent version, which is located at [http://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/12twqi/2012\\_guidance.pdf](http://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/12twqi/2012_guidance.pdf). These water quality data, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

Systematic watershed monitoring is defined by sampling that is planned for a short duration (1 to 2 years) and is designed to: screen waters that would not normally be included in the routine monitoring program, monitor at sites to check the water quality situation, and investigate areas of potential concern. Due to the limitations regarding these data (e.g., not temporally representative, limited number of samples, biological sampling does not meet the specimen vouchering requirements), the data will be used to determine whether any locations have values exceeding the TCEQ's water quality criteria and/or screening levels (or in some cases values elevated above normal). The ANRA will use this information to determine future monitoring priorities. These water quality data and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

The measurement performance specifications to support the project purpose for a minimum data set are specified in Appendix A: Table A7.1 and in the text following.

### **Ambient Water Reporting Limits (AWRLs)**

The AWRL establishes the reporting specification at or below which data for a parameter must be reported to be compared with freshwater screening criteria. The AWRLs specified in Appendix A Table A7.1 are the program-defined reporting specifications for each analyte and yield data acceptable for the TCEQ's water quality assessment. A full listing of AWRLs can be found at <http://www.tceq.state.tx.us/compliance/monitoring/crp/qa/index.html>. The limit of quantitation (LOQ) is the minimum level, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The following requirements must be met in order to report results to the CRP:

- The laboratory's LOQ for each analyte must be at or below the AWRL as a matter of routine practice
- The laboratory must demonstrate its ability to quantitate at its LOQ for each analyte by running an LOQ check sample for each analytical batch of CRP samples analyzed.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria are provided in Section B5

### **Precision**

Precision is the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. It is a measure of agreement among



replicate measurements of the same property, under prescribed similar conditions, and is an indication of random error.

Field splits are used to assess the variability of sample handling, preservation, and storage, as well as the analytical process, and are prepared by splitting samples in the field. Control limits for field splits are defined in Section B5.

Laboratory precision is assessed by comparing replicate analyses of laboratory control samples (LCS) in the sample matrix (e.g. deionized water, sand, commercially available tissue) or sample/duplicate pairs in the case of bacterial analysis. Precision results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for precision are defined in Appendix A.

### **Bias**

Bias is a statistical measurement of correctness and includes multiple components of systematic error. A measurement is considered unbiased when the value reported does not differ from the true value. Bias is determined through the analysis of LCS and LOQ Check Samples prepared with verified and known amounts of all target analytes in the sample matrix (e.g. deionized water, sand, commercially available tissue) and by calculating percent recovery. Results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for bias are specified in Appendix A.

### **Representativeness**

Site selection, the appropriate sampling regime, the sampling of all pertinent media according to TCEQ SOPs, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Routine data collected under CRP for water quality assessment are considered to be spatially and temporally representative of routine water quality conditions. Water Quality data are collected on a routine frequency and are separated by approximately even time intervals. At a minimum, samples are collected over at least two seasons (to include inter-seasonal variation) and over two years (to include inter-year variation) and include some data collected during an index period (March 15- October 15). Although data may be collected during varying regimes of weather and flow, the data sets will not be biased toward unusual conditions of flow, runoff, or season. The goal for meeting total representation of the water body will be tempered by the potential funding for complete representativeness.

### **Comparability**

Confidence in the comparability of routine data sets for this project and for water quality assessments is based on the commitment of project staff to use only approved sampling and analysis methods and QA/QC protocols in accordance with quality system requirements and as described in this QAPP and in TCEQ SOPs. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format as specified in the Data Management Plan Section B10.

### **Completeness**

The completeness of the data is basically a relationship of how much of the data is available for use

compared to the total potential data. Ideally, 100% of the data should be available. However, the possibility of unavailable data due to accidents, insufficient sample volume, broken or lost samples, etc. is to be expected. Therefore, it will be a general goal of the project(s) that 90% data completion is achieved.

## **A8 Special Training/Certification**

New field personnel receive training in proper sampling and field analysis by the QA Officer (or designee) and/or existing field personnel. Before actual sampling or field analysis occurs, new personnel will demonstrate his or her ability to properly calibrate field equipment, and perform field sampling analysis procedures to the QA Officer (or designee). Field personnel training is documented and retained in the personnel file, and will be available during a monitoring systems audit.

The requirements for Global Positioning System (GPS) certification are located in Section B10, Data Management.

Contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in section The NELAC Institute (TNI) Volume 1 Module 2, Section 4.5.5 (Subcontracting of Environmental Tests).

## **A9 Documents and Records**

The documents and records that describe, specify, report, or certify activities are listed. The list below is limited to documents and records that may be requested for review during a monitoring systems audit. Add other types of project documents and records as appropriate.

**Table A9.1 Project Documents and Records**

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	ANRA	5	Paper, Electronic
Field SOPs	ANRA	5	Paper, Electronic
Laboratory Quality Manuals	ANRA LCRA	5	Paper, Electronic
Laboratory SOPs	ANRA/LCRA	5	Paper, Electronic
QAPP distribution documentation	ANRA	5	Paper, Electronic
Field staff training records	ANRA	5	Paper, Electronic
Field equipment calibration/maintenance logs	ANRA	5	Paper
Field instrument printouts	n/a	n/a	n/a
Field notebooks or data sheets	ANRA	5	Paper
Chain of custody records	ANRA/LCRA	5	Paper, Electronic
Laboratory calibration records	ANRA/LCRA	5	Paper, Electronic
Laboratory instrument printouts	ANRA/LCRA	5	Paper
Laboratory data reports/results	ANRA/LCRA	5	Paper, Electronic
Laboratory equipment maintenance logs	ANRA/LCRA	5	Paper, Electronic
Corrective Action Documentation	ANRA/LCRA	5	Paper, Electronic

**Laboratory Test Reports**

Test/data reports from the laboratory must document the test results clearly and accurately. Routine data reports should be consistent with the TNI Volume 1, Module 2, Section 5.10 and include the information necessary for the interpretation and validation of data. The requirements for reporting data and the procedures are provided.

Reports of results of analytical tests performed by the laboratory contain the following elements:

- Title of report
- Name and address of the laboratory
- Name and address of the client
- A clear identification of the sample(s) analyzed (unique identifiers)
- Identification of method used
- Identification of samples that did not meet QA requirements (by use of data qualifiers)
- Sample results
- Units of measurement
- Sample matrix
- Dry weight or wet weight (as applicable)
- Station information
- Date and time of collection
- Sample depth

- Holding time for E. coli
- LOQ and limit of detection (LOD) (formerly referred to as the reporting limit and the method detection limit, respectively), and qualification of results outside the working range (if applicable)
- Certification of NELAP compliance
- Clearly identified subcontract laboratory results (as applicable)
- A name and title of the person accepting responsibility for the report
- Project-specific QC results

Upon completion of all analyses, the ANRA Environmental Laboratory generates a Report Cover Page, a Laboratory Analysis Report, and a Quality Control Data Report. The chain of custody documentation, field data sheets, and subcontract laboratory reports (if applicable) are attached to form the final report. The ANRA Laboratory Manager reviews the report and submits it to the ANRA CRP QAO for additional review. Upon final review by the ANRA CRP QAO, the report is submitted to the ANRA Data Manager for electronic submittal.

### **Electronic Data**

Subcontract laboratory reports from LCRA are received electronically via email.

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the most current version of the DMRG, which can be found at [http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wdma/dmrg\\_index.html](http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wdma/dmrg_index.html). A completed Data Review Checklist and Data Summary (see Appendix F) will be submitted with each data submittal.

## B1 Sampling Process Design

See Appendix B for sampling process design information and monitoring tables associated with data collected under this QAPP.

## B2 Sampling Methods

### Field Sampling Procedures

Field sampling will be conducted in accordance with the latest versions of the *TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring, 2012 (RG-415)* and *Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416)*, collectively referred to as "SWQM Procedures". Updates to SWQM Procedures are posted to the Surface Water Quality Monitoring Procedures website ([http://www.tceq.texas.gov/waterquality/monitoring/swqm\\_procedures.html](http://www.tceq.texas.gov/waterquality/monitoring/swqm_procedures.html)), and shall be incorporated into the ANRA's procedures, QAPP, SOPs, etc., within 60 days of any final published update. Additional aspects outlined in Section B below reflect specific requirements for sampling under CRP and/or provide additional clarification.

**Table B2.1 Sample Storage, Preservation and Handling Requirements**

Parameter	Matrix	Container**	Preservation	Sample Volume	Holding Time
TSS	Water	Plastic	< 6 °C	1000 ml	7 days
TDS	Water	Plastic	< 6 °C	500 ml	7 days
Ammonia-N	Water	Plastic	Acidify with H <sub>2</sub> SO <sub>4</sub> to pH<2, < 6 °C	500 ml (minimum) 1000 ml (requested)	28 days
Nitrate+Nitrite-N	Water	Plastic	Acidify with H <sub>2</sub> SO <sub>4</sub> to pH<2, < 6 °C	500 ml	28 days
Phosphorus, Total	Water	Plastic	Acidify with H <sub>2</sub> SO <sub>4</sub> to pH<2, < 6 °C	500 ml	28 days
Chlorophyll- <i>a</i> / Pheophytin	Water	Plastic, Amber	< 6 °C*, keep in dark; filter within 48 hours	200 ml (minimum)	Filter within 48 hours; frozen filters can be held 3 ½ weeks
<i>E. coli</i> *	Water	SPS	< 6 °C (not frozen); sodium thiosulfate	100 ml (minimum) 250 ml (for duplicates)	8 hours
Chloride	Water	Plastic	< 6 °C	500 ml	28 days
Sulfate	Water	Plastic	< 6 °C	500 ml	28 days

\**E. coli* samples should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 48 hours.

\*\*Container Types: Plastic = High Density Polyethylene (HDPE) or Low Density Polyethylene (LDPE)  
SPS = Sterile Polyethylene

### Sample Containers

Certificates from sample container manufacturers are maintained in a notebook by the ANRA

Environmental Laboratory. The sample container types used for sampling are as follows:

- The preferred bacteriological sample containers are the 120 and 290 mL bottles from QEC or IDEXX (or equivalent). The bottles contain sufficient sodium thiosulfate to remove 10 mg/L or 15 mg/L total chlorine, respectively.
- Brown polyethylene bottles are recommended for chlorophyll-a sampling. Bottles are provided by the LCRA ELS laboratory, or if necessary, purchased from QEC.
- Sample containers used for conventional parameters are purchased pre-cleaned and are disposable. Sample containers are either HDPE or LDPE.

### ***Processes to Prevent Contamination***

Procedures outlined in SWQM Procedures outline the necessary steps to prevent contamination of samples. These include: direct collection into sample containers, when possible; use of certified containers for organics; and clean sampling techniques for metals. Field QC samples (identified in Section B5) are collected to verify that contamination has not occurred.

### ***Documentation of Field Sampling Activities***

Field sampling activities are documented on field data sheets as presented in Appendix D. Flow worksheets, aquatic life use monitoring checklists, habitat assessment forms, field biological assessment forms, and records of bacteriological analyses (if applicable) are part of the field data record. Parameters which are preferred by the SWQM and Water Quality Standards Programs are highlighted in the shell A7 document. The following will be recorded for all visits:

Station ID  
Sampling Date  
Location  
Sampling Depth  
Sampling Time  
Sample Collector's name and signature  
Values for all field parameters

Notes containing detailed observational data not captured by field parameters, including;  
Water appearance  
Weather  
Biological activity  
Recreational activity  
Unusual odors  
Pertinent observations related to water quality or stream uses  
Watershed or instream activities  
Specific sample information  
Missing parameters

### **Recording Data**

For the purposes of this section and subsequent sections, all field and laboratory personnel follow the

basic rules for recording information as documented below:

- Write legibly, in indelible ink
- Changes are made by crossing out original entries with a single line strike-out, entering the changes, and initialing and dating the corrections.
- Close-out incomplete pages with an initialed and dated diagonal line.

### ***Sampling Method Requirements or Sampling Process Design Deficiencies, and Corrective Action***

Examples of sampling method requirements or sample design deficiencies include but are not limited to such things as inadequate sample volume due to spillage or container leaks, failure to preserve samples appropriately, contamination of a sample bottle during collection, storage temperature and holding time exceedance, sampling at the wrong site, etc. Any deviations from the QAPP, SWQM Procedures, or appropriate sampling procedures may invalidate data, and require documented corrective action. Corrective action may include for samples to be discarded and re-collected. It is the responsibility of the ANRA Project Manager, in consultation with the ANRA QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the CRP Project Manager both verbally and in writing in the project progress reports and by completion of a CAP.

The definition of and process for handling deficiencies and corrective action are defined in Section C1.

## **B3 Sample Handling and Custody**

### ***Sample Tracking***

Proper sample handling and custody procedures ensure the custody and integrity of samples beginning at the time of sampling and continuing through transport, sample receipt, preparation, and analysis.

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The Chain of Custody (COC) form is a record that documents the possession of the samples from the time of collection to receipt in the laboratory. The following information concerning the sample is recorded on the COC form (See Appendix E). The following list of items matches the COC form in Appendix E. All COC forms to be used in the project should be included in Appendix E for the TCEQ's review.

Date and time of collection

Site identification

Sample matrix

Number of containers

Preservative used

Was the sample filtered

Analyses required

Name of collector  
Custody transfer signatures and dates and time of transfer  
Bill of lading, if applicable

### ***Sample Labeling***

Samples from the field are labeled on the container, or on a label; with an indelible marker. Label information includes:

Site identification  
Date and time of collection  
Preservative added, if applicable  
Indication of field-filtration for metals, as applicable  
Sample type (i.e., analyses) to be performed

### ***Sample Handling***

ANRA field data sheets (Appendix D) are supplied to all field personnel prior to initiation of collection procedures. The field data sheets have spaces dedicated to recording of all pertinent field observations and water quality parameters. The field staff has the prime responsibility to insure that all pertinent information is recorded correctly and in the proper units.

All samples brought to the ANRA Environmental Laboratory are examined for proper documentation, holding times, sample temperature, and preservation by the ANRA Sample Custodian. The Sample Custodian accepts delivery by signing the final portion of the official COC submitted with the samples. The accepted samples are immediately logged into the laboratory LIMS and assigned a unique laboratory sample identification (ID) number. It is the responsibility of the sample custodian to log-in collected water samples in the proper format, and to record the unique laboratory sample ID number on the sample container. The sample container is placed in the proper laboratory refrigerator by the sample custodian.

Samples to be sent to a contract laboratory (LCRA) are relinquished by the sample custodian when they are deemed acceptable after a thorough inspection of the sample documentation, preservation, hold times, and containers. The samples are then packed on ice in a cooler to maintain a <6°C temperature. The sealed cooler, containing sample containers and COC forms, is then received by the sample transporter and transported to the contract laboratory, where it is relinquished by the sample transporter. The contract laboratory inspects the custody seal and sample containers to be sure that the samples have not been tampered with. After this examination, the samples are received by the contract laboratory.

Proper sample custody is a joint effort of the field sampling staff, the sample transporter, and the laboratory staff. The main documentation of proper sample custody for all events up to the arrival of the sample at the laboratory is the chain-of-custody (COC) form which is provided in Appendix E. If any of the information blanks or signature locations on the COC form are not completely filled out, there is a gap in the documentation of sample custody. In such an event, the laboratory sample custodian will question whether the sample should be accepted. All data acceptance questions are referred to the Laboratory Manager and ANRA Project Manager.



The following procedures outline sample handling from collection to receipt of analytical results:

1. After a sample is transferred into the proper sample container, the container is tightly capped as quickly as possible to prevent the loss of volatile components and to exclude possible oxidation. Where appropriate, samples are preserved and/or split in the field. All samples are placed on ice immediately following field measurements and transported to the laboratory as soon as possible.
2. The container is labeled with the proper laboratory sample identification number (a unique designation) on a label securely affixed to the container. A marker with waterproof ink is used when labeling the sample container and filling out the appropriate COC form.
3. The COC form is filled out completely and accurately.
4. Samples requiring subcontractor lab analysis are delivered to the subcontract laboratory for analysis as soon as possible via ground shipment. These samples are accompanied by the contract laboratory's COC form. The COC is relinquished by the ANRA Laboratory and is delivered to the sub-contract laboratory personnel authorized to receive samples. The date and time the sample was shipped and received by the ANRA Laboratory must be filled out, along with the ANRA Laboratory custodian relinquishment signature before the subcontract lab accepts the sample(s). Copies of complete COC forms are returned along with subcontract laboratory analysis information.
5. A copy of the COC form is retained for ANRA records. Copies of COC forms are kept along with the laboratory analysis reports and associated field sheet(s).

### ***Sample Tracking Procedure Deficiencies and Corrective Action***

All deficiencies associated with COC procedures, as described in this QAPP, are immediately reported to the Lead Organization Project Manager. These include such items as delays in transfer resulting in holding time violations; violations of sample preservation requirements; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc. The ANRA Project Manager in consultation with the ANRA QAO will determine if the procedural violation may have compromised the validity of the resulting data. Any failures that have reasonable potential to compromise data validity will invalidate data and the sampling event should be repeated. The resolution of the situation will be reported to the TCEQ CRP Project Manager in the project progress report. CAPs will be prepared by the Lead Organization QAO and submitted to TCEQ CRP Project Manager along with project progress report.

The definition of and process for handling deficiencies and corrective action are defined in Section C1.

## **B4 Analytical Methods**

The analytical methods, associated matrices, and performing laboratories are listed in Appendix A.

The authority for analysis methodologies under CRP is derived from the 30 Tex. Admin. Code ch. 307, in that data generally are generated for comparison to those standards and/or criteria. The Standards state "Procedures for laboratory analysis must be in accordance with the most recently published edition of the book entitled Standard Methods for the Examination of Water and Wastewater, the TCEQ Surface Water Quality Monitoring Procedures as amended, 40 CFR 136, or other reliable procedures acceptable to the TCEQ, and in accordance with chapter 25 of this title."

Laboratories that produce analytical data under this QAPP must be NELAP accredited. Copies of laboratory QMs and SOPs are available for review by the TCEQ.

### ***Standards Traceability***

All standards used in the field and laboratory are traceable to certified reference materials. Standards preparation is fully documented and maintained in a standards log book. Each documentation includes information concerning the standard identification, starting materials, including concentration, amount used and lot number; date prepared, expiration date and preparer's initials/signature. The reagent bottle is labeled in a way that will trace the reagent back to preparation.

### ***Analytical Method Deficiencies and Corrective Actions***

Deficiencies in field and laboratory measurement systems involve, but are not limited to such things as instrument malfunctions, failures in calibration, blank contamination, quality control samples outside QAPP defined limits, etc. In many cases, the field technician or lab analyst will be able to correct the problem. If the problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, then it is conveyed to the ANRA Laboratory Supervisor, who will make the determination and notify the ANRA QAO. If the analytical system failure may compromise the sample results, the resulting data will not be reported to the TCEQ. The nature and disposition of the problem is reported on the data report which is sent to the ANRA Manager. The Lead Organization Project Manager will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ CRP Project Manager.

The definition of and process for handling deficiencies and corrective action are defined in Section C1.

The TCEQ has determined that analyses associated with the qualifier codes (e.g., "holding time exceedance", "sample received unpreserved", "estimated value") may have unacceptable measurement uncertainty associated with them. This will immediately disqualify analyses from submittal to SWQMIS. Therefore, data with these types of problems should not be reported to the TCEQ. Additionally, any data collected or analyzed by means other than those stated in the QAPP, or data suspect for any reason should not be submitted for loading and storage in SWQMIS.

## **B5 Quality Control**

### ***Sampling Quality Control Requirements and Acceptability Criteria***

The minimum field QC requirements, and program-specific laboratory QC requirements, are outlined

in SWQM Procedures. Specific requirements are outlined below. Field QC sample results are submitted with the laboratory data report (see Section A9.).

### **Field Split**

A field split is a single sample subdivided by field staff immediately following collection, and submitted to the laboratory as two separately identified samples, according to procedures specified in the SWQM Procedures. Split samples are preserved, handled, shipped, and analyzed identically, and are used to assess variability in all of these processes. Field splits apply to conventional samples only. To the extent possible, field splits prepared and analyzed over the course of the project should be performed on samples from different sites. The frequency requirement for field splits is specified in the SWQM Procedures. Field splits are collected on a 10% basis. If less than ten samples are collected in a month, one set of field splits will be collected per month. Field splits are not collected for bacteriological samples.

The precision of field split results is calculated by relative percent difference (RPD) using the following equation:

$$RPD = \frac{|X_1 - X_2|}{\left(\frac{X_1 + X_2}{2}\right)} \times 100$$

A 30% RPD criteria will be used to screen field split results as a possible indicator of excessive variability in the sample handling and analytical system. If it is determined that elevated quantities of analyte (i.e., > 5 times the LOQ) were measured and analytical variability can be eliminated as a factor, than variability in field split results will primarily be used as a trigger for discussion with field staff to ensure samples are being handled in the field correctly. Some individual sample results may be invalidated based on the examination of all extenuating information. The information derived from field splits is generally considered to be event specific and would not normally be used to determine the validity of an entire batch; however, some batches of samples may be invalidated depending on the situation. Professional judgment during data validation will be relied upon to interpret the results and take appropriate action. The qualification, or invalidation, of data will be documented on the Data Summary. Deficiencies will be addressed as specified in this section under Quality Control or Acceptability Requirements Deficiencies and Corrective Actions.

In the event of a field split QC failure the single sample associated with the split may need to be qualified as not meeting project QC requirements, and these qualified data will not be reported to the TCEQ.

## ***Laboratory Measurement Quality Control Requirements and Acceptability Criteria***

### **Batch**

A batch is defined as environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same NELAP-defined matrix, meeting the above mentioned

criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 25 hours. An analytical batch is composed of prepared environmental samples (extract, digestates, or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

### **Method Specific QC requirements**

QC samples, other than those specified later this section, are run (e.g., sample duplicates, surrogates, internal standards, continuing calibration samples, interference check samples, positive control, negative control, and media blank) as specified in the methods and in SWQM Procedures. The requirements for these samples, their acceptance criteria or instructions for establishing criteria, and corrective actions are method-specific.

Detailed laboratory QC requirements and corrective action procedures are contained within the individual laboratory quality manuals (QMs). The minimum requirements that all participants abide by are stated below.

### **Comparison Counting**

For routine bacteriological samples, repeat counts on one or more positive samples are required, at least monthly. If possible, compare counts with an analyst who also performs the analysis. Replicate counts by the same analyst should agree within 5 percent, and those between analysts should agree within 10 percent. Record the results.

### **Limit of Quantitation (LOQ)**

The laboratory will analyze a calibration standard (if applicable) at the LOQ published in Appendix A, Table A7, on each day calibrations are performed. In addition, an LOQ check sample will be analyzed with each analytical batch. Calibrations including the standard at the LOQ listed in Appendix A 7.1 will meet the calibration requirements of the analytical method or corrective action will be implemented.

### **LOQ Check Sample**

An LOQ check sample consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The LOQ check sample is spiked into the sample matrix at a level less than or near the LOQ published in Appendix A, Table A7, for each analyte for each analytical batch of CRP samples run. If it is determined that samples have exceeded the high range of the calibration curve, samples should be diluted or run on another curve. For samples run on batches with calibration curves that do not include the LOQ published in Appendix A, Table A7, a check sample will be run at the low end of the calibration curve.

The LOQ check sample is carried through the complete preparation and analytical process. LOQ Check Samples are run at a rate of one per analytical batch.

The percent recovery of the LOQ check sample is calculated using the following equation in which %R is percent recovery,  $S_R$  is the sample result, and  $S_A$  is the reference concentration for the check

sample:

$$\%R = S_R/S_A \times 100$$

Measurement performance specifications are used to determine the acceptability of LOQ Check Sample analyses as specified in Appendix A Table A7.1.

### **Laboratory Control Sample (LCS)**

An LCS consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system. The LCS is spiked into the sample matrix at a level less than or near the midpoint of the calibration for each analyte. In cases of test methods with very long lists of analytes, LCSs are prepared with all the target analytes and not just a representative number, except in cases of organic analytes with multipeak responses.

The LCS is carried through the complete preparation and analytical process. LCSs are run at a rate of one per preparation batch.

Results of LCSs are calculated by percent recovery (%R), which is defined as 100 times the measured concentration, divided by the true concentration of the spiked sample.

The following formula is used to calculate percent recovery, where %R is percent recovery;  $S_R$  is the measured result; and  $S_A$  is the true result:

$$\%R = S_R/S_A \times 100$$

Measurement performance specifications are used to determine the acceptability of LCS analyses as specified in Appendix A Table A7.1.

### **Laboratory Duplicates**

A laboratory duplicate is an aliquot taken from the same container as an original sample under laboratory conditions and processed and analyzed independently. A laboratory duplicate is prepared in the laboratory by splitting aliquots of an LCS. Both samples are carried through the entire preparation and analytical process. Laboratory duplicates are used to assess precision and are performed at a rate of one per preparation batch.

For most parameters except bacteria, precision is evaluated using the relative percent difference (RPD) between duplicate LCS results as defined by 100 times the difference (range) of each duplicate set, divided by the average value (mean) of the set. For duplicate results,  $X_1$  and  $X_2$ , the RPD is calculated from the following equation:

$$RPD = \frac{|X_1 - X_2|}{\left(\frac{X_1 + X_2}{2}\right)} \times 100$$

For bacteriological parameters, precision is evaluated using the results from laboratory duplicates. Bacteriological duplicates are collected on a 10% frequency (or once per sampling run, whichever is more frequent). These duplicates will be collected in sufficient volume (200 mL or more) for analysis of the sample and its laboratory duplicate from the same container.

The base-10 logarithms of the result from the original sample and the result from its duplicate will be calculated. The absolute value of the difference between the two logarithms will be calculated, and that difference will be compared to the precision criterion in Appendix A, Table A7.1.

If the difference in logarithms is greater than the precision criterion, the data are not acceptable for use under this project and will not be reported to TCEQ. Results from all samples associated with that failed duplicate (usually a maximum of 10 samples) will be considered to have excessive analytical variability and will be qualified as not meeting project QC requirements.

The precision criterion in Appendix A Table A7.1 for bacteriological duplicates applies only to samples with concentrations > 10 MPN/100mL. Field splits will not be collected for bacteriological analyses.

**Matrix spike (MS)** – Matrix spikes are prepared by adding a known quantity of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

Matrix spikes indicate the effect of the sample on the precision and accuracy of the results generated using the selected method. The frequency of matrix spikes is specified by the analytical method, or a minimum of one per preparation batch, whichever is greater. To the extent possible, matrix spikes prepared and analyzed over the course of the project should be performed on samples from different sites.

The components to be spiked shall be as specified by the mandated analytical method. The results from matrix spikes are primarily designed to assess the validity of analytical results in a given matrix, and are expressed as percent recovery (%R).

The percent recovery of the matrix spike is calculated using the following equation, where %R is percent recovery,  $S_{SR}$  is the concentration measured in the matrix spike,  $S_R$  is the concentration in the parent sample, and  $S_A$  is the concentration of analyte that was added:

$$\%R = \frac{S_{SR} - S_R}{S_A} \times 100$$

Matrix spike recoveries are compared to the acceptance criteria published in the mandated test method. If the matrix spike results are outside established criteria, the data for the analyte that failed in the parent sample is not acceptable for use under this project and will not be reported to TCEQ.

The result from the parent sample associated with that failed matrix spike will be considered to have excessive analytical variability and will be qualified by the laboratory as not meeting project QC requirements. Depending on the similarities in composition of the samples in the batch, the Basin Planning Agency may consider excluding all of the results in the batch related to the analyte that failed recovery.

### **Method blank**

A method blank is a sample of matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as the samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. The method blanks are performed at a rate of once per preparation batch. The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values less than the LOQ. For very high-level analyses, the blank value should be less than 5% of the lowest value of the batch, or corrective action will be implemented. Samples associated with a contaminated blank shall be evaluated as to the best corrective action for the samples (e.g. reprocessing, data qualifying codes). In all cases the corrective action must be documented.

The method blank shall be analyzed at a minimum of one per preparation batch. In those instances for which no separate preparation method is used (e.g., VOA) the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

### ***Quality Control or Acceptability Requirements Deficiencies and Corrective Actions***

Sampling QC excursions are evaluated by the ANRA Project Manager, in consultation with the ANRA QAO. In that differences in sample results are used to assess the entire sampling process, including environmental variability, the arbitrary rejection of results based on pre-determined limits is not practical. Therefore, the professional judgment of the ANRA Project Manager and QAO will be relied upon in evaluating results. Rejecting sample results based on wide variability is a possibility. Field blanks for trace elements and trace organics are scrutinized very closely. Field blank values exceeding the acceptability criteria may automatically invalidate the sample, especially in cases where high blank values may be indicative of contamination which may be causal in putting a value above the standard. Notations of field split excursions and blank contamination are noted in the quarterly report and the final QC Report. Equipment blanks for metals analysis are also scrutinized very closely.

Laboratory measurement quality control failures are evaluated by the laboratory staff. The disposition of such failures and the nature and disposition of the problem is reported to the ANRA Laboratory QAO. The Laboratory QAO will discuss with the ANRA Project Manager. If applicable, the ANRA Project Manager will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ CRP Project Manager.

The definition of and process for handling deficiencies and corrective action are defined in Section C1.

## **B6 Instrument/Equipment Testing, Inspection, and Maintenance**

All sampling equipment testing and maintenance requirements are detailed in the SWQM Procedures. Sampling equipment is inspected and tested upon receipt and is assured appropriate for use. Equipment records are kept on all field equipment and a supply of critical spare parts is maintained.

All laboratory tools, gauges, instrument, and equipment testing and maintenance requirements are contained within laboratory QM(s).

## **B7 Instrument Calibration and Frequency**

Field equipment calibration requirements are contained in the SWQM Procedures. Post-calibration error limits and the disposition resulting from error are adhered to. Data collected from field instruments that do not meet the post-calibration error limits specified in the SWQM Procedures will not be submitted for inclusion into SWQMIS.

Detailed laboratory calibrations are contained within the QM(s).

## **B8 Inspection/Acceptance of Supplies and Consumables**

No special requirements for acceptance are specified for field sampling supplies and consumables. Reference to the laboratory QM may be appropriate for laboratory-related supplies and consumables.

## **B9 Acquired Data**

Non-directly measured data, secondary data, or acquired data involves the use of data collected under another project, and collected with a different intended use than this project. The acquired data still meets the quality requirements of this project, and is defined below. The following data source(s) will be used for this project:

USGS gage station data will be used throughout this project to aid in determining gage height and flow. Rigorous QA checks are completed on gage data by the USGS and the data is approved by the USGS and permanently stored at the USGS. This data will be submitted to the TCEQ under parameter code 00061 Flow, Instantaneous or parameter code 74069 Flow Estimate depending on the proximity of the monitoring station to the USGS gage station.

Reservoir stage data are collected every day from the United States Geological Survey (USGS), International Boundary and Water Commission (IBWC), and the United States Army Corps of Engineers (USACE) websites. These data are preliminary and subject to revision. The Texas Water Development Board (TWDB) derives reservoir storage (in acre-feet) from these stage data (elevation in feet above mean sea level), by using the latest rating curve datasets available. These data are published at the TWDB website at <http://waterdatafortexas.org/reservoirs/statewide>. The web



application uses real time gaged observations 7 AM reading each day (or closest reading available) from 119 major reservoirs to approximate daily storage for each reservoir, as well as daily total storage for water planning regions, river basins and the state of Texas. These instantaneous data are updated to mean daily data for all previous days. These data will be submitted to the TCEQ under parameter code 00052 Reservoir Stage and parameter code 00053 Reservoir Percent Full. Insert additional sources of non-direct measurements as needed.

## **B10 Data Management**

### ***Data Management Process***

It is imperative that Clean Rivers Program data and associated applications be maintained and managed in a manner consistent with the development and use of the data. For scientifically valid results, the data, program applications, and reports must be handled in an orderly and consistent manner. Documented quality assurance and quality control checks/procedures are applied to all received data sets, individual data points and data manipulation programs.

Data to be incorporated into the ANRA database is subject to varying levels of review. The QA/QC checks evaluate each data set as a whole, and the validity of individual data points. An initial review is performed by the ANRA Laboratory Manager, who is responsible for entering all laboratory data into the lab's LIMS. The ANRA Laboratory Manager also reviews laboratory analysis reports before they are submitted to the ANRA CRP Project Manager/Quality Assurance Officer.

Each data set to be processed into the database is evaluated by the ANRA Lab/CRP QAO for any problems that might impose a limitation on the use of the data. This check is performed prior to processing/importing to the database. The following information is considered:

- a. Credibility of data source
- b. Acceptable QA/QC procedures
- c. Intended use of the data
- d. Frequency of data collection/impact of missed sampling events
- e. Sample size
- f. Sample collection and preservation methods
- g. Field and laboratory test procedures
- h. General documentation

Upon passing the evaluation of a data set's limitations, the data is incorporated into the ANRA CRP Database by the ANRA Data Manager. Initially the data is entered, either manually or via automatic query of the LIMS, into a data entry form in the ANRA CRP Database file. Any deviation found in the data set will be conveyed to the TCEQ CRP Project Manager by ANRA. Disqualified data will be removed from the dataset and will not be submitted to the TCEQ for inclusion in SWQMIS. The reason for the data removal will be listed on the data summary.

Electronic data input procedures vary according to the source and format of the data. Manual data input will be made to appropriately structured MS Access tables. Standardized procedures are

followed to ensure proper data entry. Laboratory data will be queried directly from the Laboratory's LIMS and imported into the ANRA CRP Database.

The data dictionary has been adopted and maintained to provide information on each data field of each database. The TCEQ data dictionary has been adopted and will be updated as necessary.

After the data/data sets have been input/converted into an appropriate working directory database, the individual data points will be evaluated by the ANRA Data Manager and the ANRA CRP QAO to determine their reasonableness. Data values that are considered outliers will be discarded or coded prior to entry into the records directory. The criteria for determination of outliers will be based on individual data sets being processed for entry into the TCEQ's SWQMIS database. Once the data set is complete, any individual points falling outside the most recent Max/Min range as defined by the TCEQ SWQM Parameters Table will be considered outliers. If an outlier does occur, then it will be noted in the remark section of the database and verified against the original data report, and if necessary, verified by the laboratory. After verification, outliers will either be assigned the appropriate remark code by the ANRA Data Manager or documented as verified with a 1 in the verify\_flg section of the results table.

After the final QA checks are performed by the ANRA CRP QAO, data are submitted by the ANRA Data Manager to the TCEQ CRP Project Manager. Data are then transferred from the TCEQ CRP Project Manager to the TCEQ CRP Data Manager, who then loads the data into SWQMIS.

Only data entered since the last data transfer, previous data sets not included in a data transfer, and/or revised data sets are transferred. The tag series transferred is documented on the Data Summary (QAPP Appendix F) that is submitted to the TCEQ upon the completion of the data transfer. All QA data sets associated with the data transfer will be submitted in the form of a QA Table. The files are transferred as pipe delimited text files formats as described in the Surface Water Quality Monitoring Data Management Reference Guide, 2012 (or most recent version) to the TCEQ Project Manager.

After the Data has been transferred, reviewed, and loaded into the TCEQ Database, the same Data will either be uploaded to the on-line database at [www.anra.org](http://www.anra.org), or a link provided to the TCEQ's Surface Water Quality Web Reporting Tool at <http://www80.tceq.texas.gov/SwqmWeb/public/index.faces> for public access. Also, electronic and/or hard copies of the data will be available upon request from ANRA.

### Data Dictionary

Terminology and field descriptions are included in the January 2012 DMRG, or most recent version. A table outlining the entities that will be used when submitting data under this QAPP is included below for the purpose of verifying which entity codes are included in this QAPP.

Name of Entity	Tag Prefix	Submitting Entity	Collecting Entity
Angelina & Neches River Authority (ANRA)	K	AN	AN

## ***Data Errors and Loss***

To prevent loss of data and minimize errors, all data generated under this QAPP are verified against the appropriate quality assurance checks as defined in the QAPP, including but not limited to chain of custody procedures, field sampling documentation, laboratory analysis results, and quality control data.

Automated and manual Data Reviews are performed prior to data transmittal to TCEQ. Examples of checks that are used to review for data errors and data loss include:

- Parameter codes are contained in the QAPP
- Sites are in the QAPP Coordinated Monitoring Schedule
- Transcription or input errors
- Relationships among analytes (ex:  $TDS \geq SO_4 + Cl$ )
- Count of reported analytes (ex: # pH = # DO = # Temperature)
- Significant figures
- Values are at or above the LOQs
- Values are below the highest standard of the calibration curve, and appropriate dilutions (if necessary) have been used
- Check for outliers
- Verified outliers are flagged
- Use of correct reporting units
- Flows should have a flow method associated with the data
- If flow severity = 1, then flow = 0
- If flow severity = 6, then no value is reported for flow
- Depth of surface sample is reported
- Field Splits RPD <30%, inclusion of data is based on best professional judgment

Results and Events files are automatically generated from the ANRA CRP Database. These files contain the correct number of fields.

Data exceeding holding times, improperly preserved samples, and estimated concentrations have unacceptable measurement uncertainty associated with them. This uncertainty will immediately disqualify analyses for submittal to SWQMIS. Therefore, data with these types of issues are not reported to the TCEQ and will be noted in the Data Summary Report.

All data is uploaded to the SWQMIS User Acceptance Test environment, and a validator report is generated. The validator report is reviewed and any issues are corrected prior to the data being transmitted to the TCEQ CRP Project Manager.

## ***Record Keeping and Data Storage***

A three ring binder will be used as a data set log to track all hard copy data sets associated with the ANRA CRP Database.

Complete original electronic data sets are backed up on a daily basis Monday through Friday of each

work week, with data stored at an off-site location to prevent loss due to a disaster such as fire or flood. The original hard copies of field data sheets and laboratory reports are stored in binders at the ANRA offices for a minimum period of five years.

### ***Data Handling, Hardware, and Software Requirements***

Hardware – The ANRA water quality database is stored on a Windows-based PC. The ANRA Laboratory’s LIMS (LabLite) is run from a Windows Server-based system. The server provides security by limiting access to restricted users. The ANRA LIMS is also protected by user-level login and user-specific menus which can be used to restrict access to certain functions in the system. For staff, several Windows-based PCs are utilized.

Software – Laboratory data is stored in Lablite LIMS, a SQL-based database program. This program has user-level access control. From the LIMS, analytical results are exported to ANRA’s Water Quality Database, which is a MS Access-based database. Several data checks have been implemented into the ANRA Water Quality Database to identify values which do not meet criteria for inclusion into SWQMIS. The ANRA Water Quality Database sequentially assigns Tag IDs to samples entered into the system. The database is capable of automatically generating Results and Events files which are compliant with the specifications listed in the DMRG.

Staff uses MS Office software (Word, Excel, Access, PowerPoint, and Outlook). For GIS, ANRA uses ESRI ArcView.

### ***Information Resource Management Requirements***

Data will be managed in accordance with the DMRG, and applicable ANRA information resource management policies.

ANRA has the responsibility for assimilating and compiling the data for the Upper and Middle Neches River Basins collected under the Clean Rivers Program project. Data analyzed by the ANRA Laboratory is stored in Lablite LIMS, a commercially available SQL-based relational database. The ANRA CRP Database, created in-house and based on MS Access, has been modified to import data directly from Lablite LIMS, automating the process and eliminating the manual reentry of the data, reducing the chance of transcription errors. Additional validity checks have also been included in the ANRA Water Quality Database. Imported data is linked to parameter code tables in the ANRA CRP Database, ensuring that results are reported under the correct parameter code. Additional functions, such as a graphing module, have been added to the database for data review purposes. Results and Events files are automatically generated by the database in the proper format for submittal to SWQMIS.

Data in both Lablite and the ANRA CRP Database are stored on a password-protected server, and access is granted only to authorized individuals. Data backups are performed nightly, with copies of backups stored off-site.

Monitoring data is made available to the public by way of a link to TCEQ's public interface for the Surface Water Quality Web Reporting Tool. In instances where ANRA is asked to provide data, only quality-assured data exported directly from SWQMIS is provided to the requestor in either pipe-delimited text, Excel, or Access format.

GPS equipment may be used as a component of the information required by the Station Location (SLOC) request process for creating the certified positional data that will ultimately be entered into SWQMIS database. Positional data obtained by CRP grantees using a GPS will follow the TCEQ's OPP 8.11 and 8.12 policy regarding the collection and management of positional data. All positional data entered into SWQMIS will be collected by a GPS certified individual with an agency approved GPS device to ensure that the agency receives reliable and accurate positional data. Certification can be obtained in any of three ways: completing a TCEQ training class, completing a suitable training class offered by an outside vendor, or by providing documentation of sufficient GPS expertise and experience. Contractors must agree to adhere to relevant TCEQ policies when entering GPS-collected data.

In lieu of entering certified GPS coordinates, positional data may be acquired with a GPS and verified with photo interpolation using a certified source, such as Google Earth or Google Maps. The verified coordinates and map interface can then be used to develop a new SLOC.

## C1 Assessments and Response Actions

The following table presents the types of assessments and response actions for data collection activities applicable to the QAPP.

**Table C1.1 Assessments and Response Requirements**

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	ANRA	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report
Monitoring Systems Audit of Basin Planning Agency	Dates to be determined by TCEQ CRP	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the TCEQ to address corrective actions
Laboratory Inspection	Dates to be determined by TCEQ	TCEQ Laboratory Inspector	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the TCEQ to address corrective actions
Laboratory Proficiency Testing	Twice Annually	ANRA Environmental Laboratory	Laboratory analysis of unknown performance evaluation samples, as required for maintaining NELAP certification	Report to TCEQ Laboratory Certification program

### ***Corrective Action Process for Deficiencies***

Deficiencies are any deviation from the QAPP, *SWQM Procedures*, SOPs, or the DMRG. Deficiencies may invalidate resulting data and require corrective action. Repeated deficiencies should initiate a CAP. Corrective action for deficiencies may include for samples to be discarded and re-collected. Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff, are communicated to the ANRA Project Manager (or other appropriate staff), and should be subject to periodic review so their responses can be uniform, and their frequency tracked. It is the responsibility of the ANRA Project Manager, in consultation with the ANRA QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the CRP Project Manager both verbally and in writing in the project progress reports and by completion of a CAP.

## ***Corrective Action***

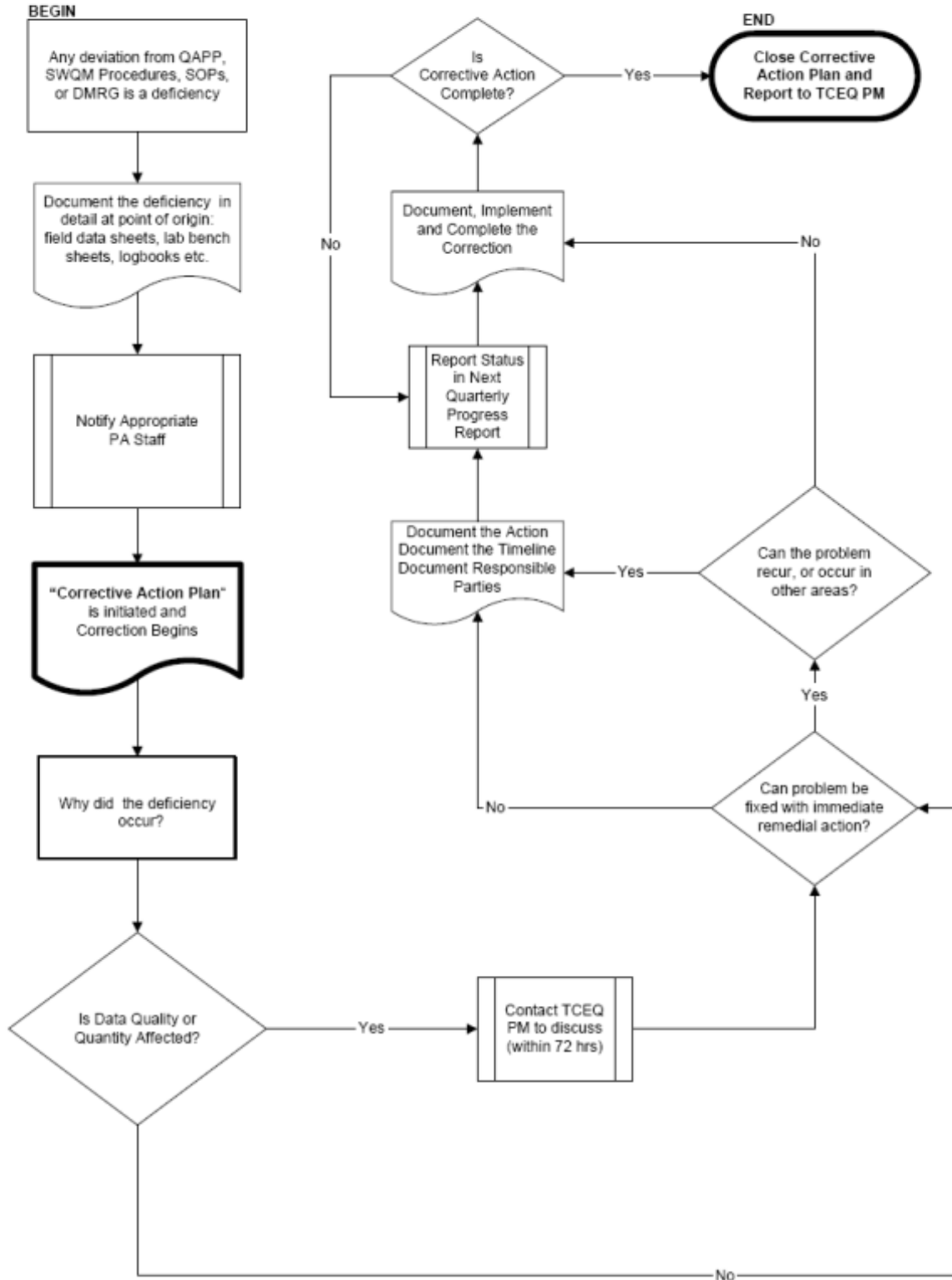
CAPs should:

- Identify the problem, nonconformity, or undesirable situation
- Identify immediate remedial actions if possible
- Identify the underlying cause(s) of the problem
- Identify whether the problem is likely to recur, or occur in other areas
- Evaluate the need for corrective action
- Use problem-solving techniques to verify causes, determine solution, and develop an action plan
- Identify personnel responsible for action
- Establish timelines and provide a schedule
- Document the corrective action

To facilitate the process a flow chart has been developed (see figure C1.1: Corrective Action Process for Deficiencies).

Figure C1.1 Corrective Action Process for Deficiencies

### Corrective Action Process for Deficiencies





Status of CAPs will be included with quarterly progress reports. In addition, significant conditions which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data will be reported to the TCEQ immediately.

The ANRA Project Manager is responsible for implementing and tracking deficiencies and corrective actions in a pre-CAP log. Records of audit findings and corrective actions are maintained by the ANRA Project Manager. Audit reports and corrective action documentation will be submitted to the TCEQ with the Progress Report.

If audit findings and corrective actions cannot be resolved, then the authority and responsibility for terminating work are specified in the TCEQ QMP and in agreements in contracts between participating organizations.

## C2 Reports to Management

**Table C2.1 QA Management Reports**

Type of Report	Frequency (daily, weekly, monthly, quarterly, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipients
Lab Analysis, Lab QA/QC Reports	Monthly	Monthly	Laboratory Manager	ANRA Project Manager, ANRA Data Manager
Corrective Action Reports	As needed	With Progress Reports	ANRA Quality Assurance Officer	ANRA Project Manager, TCEQ Project Manager
Progress Reports	Quarterly	12/15/13, 3/15/14, 6/15/14, 9/15/14, 12/15/14, 3/15/15, 6/15/15, 8/31/15	ANRA Project Manager	TCEQ Project Manager
Monitoring Systems Audit Report and Response	Once per contract period	With Progress Report	ANRA Project Manager and ANRA Quality Assurance Officer	TCEQ Project Manager
Data Review Checklist and Summary	Quarterly	With Progress Report	ANRA Data Manager/ Project Manager	TCEQ Project Manager
Contractor Evaluation	Once per contract period	8/31/15	TCEQ Project Manager	ANRA Project Manager

## ***Reports to ANRA Project Management***

The ANRA Project Manager is charged with the responsibility to report the status of implementation and application of the quality assurance procedures described in this QAPP and thereby the status of data quality. It is imperative that the Project Manager is properly informed of any quality assurance problems encountered and assists in the development and implementation of corrective actions. This information will be provided to the Project Manager by the ANRA QAO, Data Manager, Field Personnel and/or any performance auditor through the completion of reports. These reports may include but are not limited to the following: analytical and QC summary reports from the laboratory, field QC results and calibration records, and a data summary and data review checklist. These reports will be provided to the Project Manager as requested. The data summary and data review checklist are submitted to the Project Manager before each database transfer to the TCEQ. Other reports may include any corrective action forms, correspondence, etc. describing corrective actions or implementation of new processes to ensure that quality assured data are produced.

## ***Reports to TCEQ Project Management***

All reports detailed in this section are contract deliverables and are transferred to the TCEQ in accordance with contract requirements.

### **Progress Report**

Summarizes the ANRA's activities for each task; reports monitoring status, problems, delays, deficiencies, status of open CAPs, and documentation for completed CAPs; and outlines the status of each task's deliverables.

### **Monitoring Systems Audit Report and Response**

Following any audit performed by the ANRA, a report of findings, recommendations and response is sent to the TCEQ in the quarterly progress report.

### **Data Summary**

Contains basic identifying information about the data set and comments regarding inconsistencies and errors identified during data verification and validation steps or problems with data collection efforts (e.g. Deficiencies).

## ***Reports by TCEQ Project Management***

### **Contractor Evaluation**

The ANRA participates in a Contractor Evaluation by the TCEQ annually for compliance with administrative and programmatic standards. Results of the evaluation are submitted to the TCEQ Financial Administration Division, Procurement and Contracts Section.

## **D1 Data Review, Verification, and Validation**

All field and laboratory data will be reviewed and verified for integrity and continuity, reasonableness, and conformance to project requirements, and then validated against the project objectives and measurement performance specifications which are listed in Section A7. Only those data which are supported by appropriate quality control data and meet the measurement performance specifications defined for this project will be considered acceptable, and will be reported to the TCEQ for entry into SWQMIS.

## **D2 Verification and Validation Methods**

All field and laboratory data will be reviewed, verified and validated to ensure they conform to project specifications and meet the conditions of end use as described in Section A7 of this document.

Data review, verification, and validation will be performed using self-assessments and peer and management review as appropriate to the project task. The data review tasks to be performed by field and laboratory staff is listed in the first two columns of Table D2.1, respectively. Potential errors are identified by examination of documentation and by manual, examination of corollary or unreasonable data, or computer-assisted. If a question arises or an error is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues which can be corrected are corrected and documented. If an issue cannot be corrected, the task manager consults with the higher level project management to establish the appropriate course of action, or the data associated with the issue are rejected and not reported to the TCEQ for storage in SWQMIS. Field and laboratory reviews, verifications, and validations are documented.

Data reduction, validation, and reporting of laboratory data is conducted by the ANRA Environmental Laboratory as specified in *SOP ANRA-610 Data Reduction, Validation, and Reporting*.

After the field and laboratory data are reviewed, another level of review is performed once the data are combined into a data set. This review step as specified in Table D2.1 is performed by the ANRA Data Manager and QAO. Data review, verification, and validation tasks to be performed on the data set include, but are not limited to, the confirmation of laboratory and field data review, evaluation of field QC results, additional evaluation of anomalies and outliers, analysis of sampling and analytical gaps, and confirmation that all parameters and sampling sites are included in the QAPP.

The Data Review Checklist (See Appendix F) covers three main types of review: data format and structure, data quality review, and documentation review. The Data Review Checklist is transferred with the water quality data submitted to the TCEQ to ensure that the review process is being performed.

Another element of the data validation process is consideration of any findings identified during the monitoring systems audit conducted by the TCEQ CRP Lead Quality Assurance Specialist. Any issues

requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. After the data are reviewed and documented, the ANRA Project Manager validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

If any requirements or specifications of the CRP are not met, based on any part of the data review, the responsible party should document the nonconforming activities and submit the information to the ANRA Data Manager with the data in the Data Summary (See Appendix F). All failed QC checks, missing samples, missing analytes, missing parameters, and suspect results should be discussed in the Data Summary.

**Table D2.1: Data Review Tasks**

<b>Data to be Verified</b>	<b>Field Task</b>	<b>Laboratory Task</b>	<b>Data Manager Task</b>
Sample documentation complete; samples labeled, sites identified	ANRA Project Manager	ANRA/LCRA Laboratory Manager	
Field QC samples collected for all analytes as prescribed in the TCEQ SWQM Procedures Manual	ANRA Project Manager		
Standards and reagents traceable	ANRA Project Manager	ANRA/LCRA Laboratory Manager	
Chain of custody complete/acceptable	ANRA Project Manager	ANRA/LCRA Laboratory Manager	
NELAP Accreditation is current		ANRA/LCRA Laboratory Manager	
Sample preservation and handling acceptable	ANRA Project Manager	ANRA/LCRA Laboratory Manager	
Holding times not exceeded	ANRA Project Manager	ANRA/LCRA Laboratory Manager	
Collection, preparation, and analysis consistent with SOPs and QAPP	ANRA Project Manager	ANRA/LCRA Laboratory Manager	
Field documentation (e.g., biological, stream habitat) complete	ANRA Project Manager		ANRA Data Manager
Instrument calibration data complete	ANRA Project Manager	ANRA/LCRA Laboratory Manager	ANRA Data Manager
QC samples analyzed at required frequency	ANRA Project Manager	ANRA/LCRA Laboratory Manager	ANRA Data Manager
QC results meet performance and program specifications	ANRA Project Manager	ANRA/LCRA Laboratory Manager	ANRA Data Manager
Analytical sensitivity (LOQ/AWRL) consistent with QAPP		ANRA/LCRA Laboratory Manager	ANRA Data Manager
Results, calculations, transcriptions checked	ANRA Project Manager	ANRA/LCRA Laboratory Manager	ANRA Data Manager
Laboratory bench-level review performed		ANRA/LCRA Laboratory Manager	
All laboratory samples analyzed for all scheduled parameters		ANRA/LCRA Laboratory Manager	

Corollary data agree	ANRA Project Manager	ANRA/LCRA Laboratory Manager	ANRA Data Manager
Nonconforming activities documented	ANRA Project Manager	ANRA/LCRA Laboratory Manager	ANRA Data Manager
Outliers confirmed and documented; reasonableness check performed	ANRA Project Manager	ANRA/LCRA Laboratory Manager	ANRA Data Manager
Dates formatted correctly	ANRA Project Manager	ANRA/LCRA Laboratory Manager	ANRA Data Manager
Depth reported correctly and in correct units	ANRA Project Manager	ANRA/LCRA Laboratory Manager	ANRA Data Manager
TAG IDs correct			ANRA Data Manager
TCEQ Station ID number assigned			ANRA Data Manager
Valid parameter codes			ANRA Data Manager
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			ANRA Data Manager
Time based on 24-hour clock			ANRA Data Manager
Check for transcription errors	ANRA Project Manager	ANRA/LCRA Laboratory Manager	ANRA Data Manager
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)			ANRA Data Manager
Field instrument pre- and post-calibration results within limits	ANRA Project Manager		ANRA Data Manager
10% of data manually reviewed	ANRA Project Manager	ANRA/LCRA Laboratory Manager	ANRA Data Manager

### D3 Reconciliation with User Requirements

Data produced in this project, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be analyzed and reconciled with project data quality requirements. Data meeting project requirements will be used by the TCEQ for the Texas Water Quality Integrated Report in accordance with TCEQ's *2012 Guidance for Assessing and Reporting Surface Water Quality in Texas* (or the most recent version), and for TMDL development, water quality standards development, and permit decisions, as appropriate. Data which do not meet requirements will not be submitted to SWQMIS nor will be considered appropriate for any of the uses noted above.

## Appendix A: Measurement Performance Specifications (Table A7.1)

Measurement performance specifications define the data quality needed to satisfy project objectives. To this end, measurement performance specifications are qualitative and quantitative statements that:

- clarify the intended use of the data
- define the type of data needed to support the end use
- identify the conditions under which the data should be collected

Appendix A of the QAPP addresses measurement performance specifications, including:

- analytical methodologies
- AWRLs
- limits of quantitation
- bias limits for LCSs
- precision limits for LCSDs
- completeness goals
- qualitative statements regarding representativeness and comparability

The items identified above need to be considered for each type of monitoring activity. The CRP emphasizes that data should be collected to address multiple objectives, if possible, thereby maximizing the expenditure of resources. Caution should be applied when attempting to collect data for multiple purposes because measurement performance specifications may vary according to the purpose. For example, limits of quantitation may differ for data used to assess standards attainment and for trend analysis. When planning projects, first priority should be given to the main use of the project data and the data quality needed to support that use, then secondary goals should be considered.

Table A7.1 should be modified to reflect actual parameters, methods, etc. employed by the Basin Planning Agency and its participants. Alternative methods than those listed in the following table may be used. Procedures for laboratory analysis must be in accordance with the most recently published edition of Standard Methods for the Examination of Water and Wastewater, 40 CFR 136, or otherwise approved independently. Only data collected that have a valid TCEQ parameter code assigned in Table A7.1 are stored in SWQMIS. Any parameters listed in Table A7.1 that do not have a valid TCEQ parameter code assigned will not be stored in SWQMIS.



**TABLE A7.1 Measurement Performance Specifications for Angelina & Neches River Authority**

Conventional Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	2.5	NA	NA	NA	ANRA
	mg/L	water	SM 2540D	00530	5	1	NA	NA	NA	LCRA ELS
<b>NITROGEN, AMMONIA, TOTAL (MG/L AS N)</b>	mg/L	water	SM 4500-NH <sub>3</sub> -D (20th)	00610	0.1	0.1	70-130	20	80-120	ANRA
	mg/L	water	EPA 350.1 Rev. 2.0 (1993)	00610	0.1	0.02	70-130	20	80-120	LCRA ELS
NITRITE PLUS NITRATE, TOTAL ONE LAB DETERMINED VALUE (MG/L AS N)	mg/L	water	EPA 353.2 Rev. 2.0 (1993)	00630	0.05	0.04	70-130	20	80-120	ANRA
	mg/L	water	SM 4500-NO <sub>3</sub> E	00630	0.05	0.04	70-130	20	80-120	ANRA
	mg/L	water	SM 4500 - NO <sub>3</sub> H	00630	0.05	0.02	70-130	20	80-120	LCRA ELS
<b>PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)</b>	mg/L	water	EPA 365.1	00665	0.06	0.02	70-130	20	80-120	ANRA
	mg/L	water	SM 4500-P E	00665	0.06	0.06	70-130	20	80-120	ANRA
	mg/L	water	EPA 365.4 Rev. 2.0 (2993)	00665	0.06	0.02	70-130	20	80-120	LCRA ELS
<b>CHLORIDE (MG/L AS CL)</b>	mg/L	water	SM 4500Cl-B	00940	5	5	70-130	20	80-120	ANRA
	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	5	70-130	20	80-120	LCRA ELS
<b>SULFATE (MG/L AS SO4)</b>	mg/L	water	SM 426C 15th Ed	00945	5	5	70-130	20	80-120	ANRA
	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	5	70-130	20	80-120	LCRA ELS
RESIDUE, TOTAL FILTRABLE (DRIED AT 180C) (MG/L)	mg/L	water	SM 2540C	70300	10	10	NA	20	80-120	ANRA
	mg/L	water	SM 2540C	70300	10	10	NA	20	80-120	LCRA ELS
CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH	ug/L	water	EPA 446.0	32211	3	2	NA	20	80-120	LCRA ELS
PHEOPHYTIN-A UG/L FLUOROMETRIC METHOD	µg/L	Water	EPA 445	32213	3	2	NA	NA	NA	LCRA ELS
PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	µg/L	water	EPA 446	32218	3	2	NA	NA	NA	LCRA ELS
<b>CHLOROPHYLL-A, FLUOROMETRIC METHOD, UG/L</b>	µg/L	water	EPA 445.0	70953	3	2	NA	20	80-120	LCRA ELS

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020  
 American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)  
 TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).  
 TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2007 (RG-416)

**TABLE A7.1 Measurement Performance Specifications for Angelina & Neches River Authority**

Bacteriological Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
<b>E. COLI, COLILERT, IDEXX METHOD, MPN/100ML</b>	MPN/100 mL	water	IDEXX (SM 9223-B)**	31699	1	1	NA	0.50*	NA	ANRA
<b>E.COLI, COLILERT, IDEXX, HOLDING TIME</b>	hours	water	NA	31704	NA	NA	NA	NA	NA	ANRA

\* This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.

\*\* E.coli samples analyzed by SM 9223-B should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 48 hours.

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020  
 American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)  
 TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).  
 TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2007 (RG-416)

**TABLE A7.1 Measurement Performance Specifications for Angelina & Neches River Authority**

Flow Parameters										
Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
<b>FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)</b>	cfs	water	TCEQ SOP V1	00061	NA*	NA	NA	NA	NA	Field
<b>FLOW SEVERITY: 1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry</b>	NU	water	TCEQ SOP V1	01351	NA*	NA	NA	NA	NA	Field
STREAM FLOW ESTIMATE (CFS)	cfs	Water	TCEQ SOP V1	74069	NA*	NA	NA	NA	NA	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	NA*	NA	NA	NA	NA	Field

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020  
 American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)  
 TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).  
 TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2007 (RG-416)

**TABLE A7.1 Measurement Performance Specifications for Angelina & Neches River Authority**

**Field Parameters**

Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %ave. of LCS	Lab
<b>TEMPERATURE, WATER (DEGREES CENTIGRADE)</b>	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	NA*	NA	NA	NA	NA	Field
<b>TRANSPARENCY, SECCHI DISC (METERS)</b>	meters	water	TCEQ SOP V1	00078	NA*	NA	NA	NA	NA	Field
<b>SPECIFIC CONDUCTANCE, FIELD (US/CM @ 25C)</b>	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	NA*	NA	NA	NA	NA	Field
<b>OXYGEN, DISSOLVED (MG/L)</b>	mg/L	water	SM 4500- O G and TCEQ SOP V1	00300	NA*	NA	NA	NA	NA	Field
<b>PH (STANDARD UNITS)</b>	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	NA*	NA	NA	NA	NA	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	NA*	NA	NA	NA	NA	Field
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE	meters	water	TCEQ SOP V2	82903	NA*	NA	NA	NA	NA	Field
RESERVOIR STAGE (FEET ABOVE MEAN SEA LEVEL)†	FT ABOVE MSL	water	TWDB	00052	NA*	NA	NA	NA	NA	Field
RESERVOIR PERCENT FULL†	% RESERVOIR CAPACITY	water	TWDB	00053	NA*	NA	NA	NA	NA	Field
RESERVOIR ACCESS NOT POSSIBLE LEVEL TOO LOW ENTER 1 IF REPORTING	NS	other	TCEQ Drought Guidance	00051	NA*	NA	NA	NA	NA	Field
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)***	meters	other	TCEQ SOP V2	89864	NA*	NA	NA	NA	NA	Field
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)***	meters	other	TCEQ SOP V2	89865	NA*	NA	NA	NA	NA	Field
POOL LENGTH, METERS***	meters	other	TCEQ SOP V2	89869	NA*	NA	NA	NA	NA	Field
% POOL COVERAGE IN 500 METER REACH***	%	other	TCEQ SOP V2	89870	NA*	NA	NA	NA	NA	Field
WIND INTENSITY (1=CALM,2=SLIGHT,3=MOD.,4=STRONG)	NU	other	NA	89965	NA	NA	NA	NA	NA	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	NA	NA	NA	NA	NA	Field
WATER SURFACE(1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)	NU	water	NA	89968	NA	NA	NA	NA	NA	Field
<b>PRIMARY CONTACT, OBSERVED ACTIVITY (# OF PEOPLE OBSERVED)</b>	# of people observed	other	NA	89978	NA	NA	NA	NA	NA	Field

**EVIDENCE OF PRIMARY CONTACT RECREATION (1 = OBSERVED, 0 = NOT OBSERVED)**

NU	other	NA	89979	NA	NA	NA	NA	NA	NA	Field
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\* Reporting to be consistent with SWQM guidance and based on measurement capability.

\*\* Chlorine residual to be collected downstream of chlorinated outfalls.

\*\*\* To be routinely reported when collecting data from perennial pools.

† As published by the Texas Water Development Board on their website <http://wiid.twdb.state.tx.us/ims/resinfo/BushButton/lakestatus.asp?selcat=3&slbasin=2>

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2007 (RG-416)

## **Appendix B: Task 3 Work Plan & Sampling Process Design and Monitoring Schedule (Plan)**

# FY14 – 15 CLEAN RIVERS PROGRAM WORKPLAN FOR THE UPPER NECHES BASIN

## TASK 3: WATER QUALITY MONITORING

**Objectives:** Water quality monitoring will focus on collecting information to characterize water quality in a variety of locations and conditions. These efforts will include a combination of:

- planning and coordinating basin-wide monitoring,
- routine, regularly-scheduled monitoring to collect long-term information and support statewide assessment of water quality,
- systematic, regularly-scheduled short-term monitoring to screen water bodies for issues,
- permit support monitoring to provide information for setting permit effluent limits, and
- special study, intensive monitoring targeted to:
  - identify sources and causes of pollution,
  - assess priority water quality issues,
  - obtain background water quality information,
  - provide information for setting site-specific permit effluent limits, and
  - evaluate statewide, regional, and site-specific water quality standards.

### Task Description:

**Monitoring Description** - In FY 2014, ANRA will monitor a minimum of 25 sites quarterly (4 times per year) for conventional, bacteria (*E. coli*), flow (stream sites only), and field parameters. Total Dissolved Solids (TDS) will be removed from the list of conventional parameters. An additional site will be monitored bimonthly (6 times per year) for bacteria.

In FY 2015, ANRA will monitor a minimum of 23 sites quarterly. The final number of sites, location, frequency, and parameters collected for FY 2015 will be based on priorities identified at the basin Steering Committee and Coordinated Monitoring meetings and included in the amended Appendix B schedule of the QAPP. An additional site will be monitored bimonthly (6 times per year) for bacteria.

Additional details concerning the monitoring activities conducted by ANRA are outlined in the Angelina & Neches River Authority QAPP.

All monitoring procedures and methods will follow the guidelines prescribed in the ANRA QAPP, the TCEQ *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods (RG-415)* and the TCEQ *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416)*.

**Coordinated Monitoring Meeting** - ANRA will hold an annual coordinated monitoring meeting. Qualified monitoring organizations will be invited to attend the working meeting in which monitoring needs and purposes will be discussed segment by segment and station by station. Information from participants and stakeholders will be used to select stations and parameters that will enhance overall water quality monitoring coverage, eliminate duplication of effort, and address basin priorities. A summary of the changes will be provided to the participants within two weeks of the meeting. The changes to the monitoring schedule will be entered into the statewide database on the Internet (<http://cms.lcra.org>) and communicated to meeting attendees. Changes to monitoring that occur during the course of the year will be entered into the statewide database on the Internet and communicated to meeting attendees.

**Progress Report** - Each Progress Report will indicate the number of sampling events and the types of monitoring conducted in the quarter, to include all types of monitoring.

**Deliverables & Dues Dates:**

**September 1, 2013 through August 31, 2014**

- A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - December 15, 2013; March 15 and June 15, 2014
- B. Coordinated Monitoring Meeting - between March 15 and April 30, 2014
- C. Coordinated Monitoring Meeting Summary of Changes - May 15, 2014
- D. Email notification that Coordinated Monitoring Schedule updates are complete - May 31, 2014

**September 1, 2014 through August 31, 2015**

- A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - September 15 and December 15, 2014; March 15 and June 15 and August 31, 2015
- B. Coordinated Monitoring Meeting - between March 15 and April 30, 2015
- C. Coordinated Monitoring Meeting Summary of Changes – May 15, 2015
- D. Email notification that Coordinated Monitoring Schedule updates are complete - May 31, 2015



## ***Appendix B Sampling Process Design and Monitoring Schedule (plan)***

### **Sample Design Rationale FY 2014**

The sample design is based on the legislative intent of CRP. Under the legislation, the Basin Planning Agencies have been tasked with providing data to characterize water quality conditions in support of the Texas Water Quality Integrated Report, and to identify significant long-term water quality trends. Based on Steering Committee input, achievable water quality objectives and priorities and the identification of water quality issues are used to develop work plans which are in accord with available resources. As part of the Steering Committee process, the ANRA coordinates closely with the TCEQ and other participants to ensure a comprehensive water monitoring strategy within the watershed.

The following changes or additions have been made to the monitoring schedule. These changes have come about because of concerns or requests of steering committee members or monitoring entities.

- ANRA will begin monitoring at Lake Striker (monitoring formerly conducted by TCEQ-Region 5 Tyler).
- Monitoring stations will be added on Bowles Creek and Johnson Creek, which are tributaries that drain into Lake Striker. Neither water body has been historically monitored, but both have a history of low pH values which may be contributing factors in fish kills on Lake Striker.
- ANRA will add an additional monitoring station on Ayish Bayou.
- ANRA will add 2 additional monitoring stations on Cedar Creek and 2 additional monitoring stations on Hurricane Creek. All four additional stations will be located within the city limits of the City of Lufkin. Site selection was coordinated with City of Lufkin personnel to address issues affecting the City.
- ANRA will conduct monitoring on Bayou Carrizo, which drains to Sam Rayburn Reservoir. This site has not been historically monitored.
- ANRA will establish a monitoring location on Lake Naconiche, which has not been previously monitored.
- ANRA will add additional monitoring in the Attoyac Bayou watershed, to address not only bacterial impairments, but also as a way to monitor effectiveness of any BMPs implemented as part of the Attoyac Bayou Watershed Protection Plan.

## Site Selection Criteria

This data collection effort involves monitoring routine water quality, using procedures that are consistent with the TCEQ SWQM program, for the purpose of data entry into the SWQMIS database maintained by the TCEQ. To this end, some general guidelines are followed when selecting sampling sites, as basically outlined below, and discussed thoroughly in SWQM Procedures. Overall consideration is given to accessibility and safety. All monitoring activities have been developed in coordination with the CRP Steering Committee and with the TCEQ. The site selection criteria set forth here may not apply to all programs. The site selection criteria specified are those the TCEQ would like considered in order to produce data which is complementary to that collected by the state and which can be used in assessments, etc. Other criteria may be considered and should be described.

1. Locate stream sites so that samples can be safely collected from the centroid of flow. Centroid is defined as the midpoint of that portion of stream width which contains 50 percent of the total flow. If few sites are available for a stream segment, choose one that would best represent the water body, and not an unusual condition or contaminant source. Avoid backwater areas or eddies when selecting a stream site.
2. At a minimum for reservoirs, locate sites near the dam (reservoirs) and in the major arms. Larger reservoirs might also include stations in the middle and upper (riverine) areas. Select sites that best represent the water body by avoiding coves and back water areas. A single monitoring site is considered representative of 25 percent of the total reservoir acres, but not more than 5,120 acres.
3. Routine monitoring sites are selected to maximize stream coverage or basin coverage. Very long segments may require more stations. As a rule of thumb, stream segments between 25 and 50 miles long require two stations, and longer than 50 miles require three or more depending on the existence of areas with significantly different sources of contamination or potential water quality concerns. Major hydrological features, such as the confluence of a major tributary or an instream dam, may also limit the spatial extent of an assessment based on one station.
4. Because historical water quality data can be very useful in assessing use attainment or impairment, it may be best to use sites that are on current or past monitoring schedules.
5. All classified segments (including reservoirs) should have at least one routine monitoring site that adequately characterizes the water body, and should be coordinated with the TCEQ or other qualified monitoring entities reporting routine data to TCEQ.
6. Routine monitoring sites may be selected to bracket sources of pollution, influence of tributaries, changes in land uses, and hydrological modifications.
7. Sites should be accessible. When possible, stream sites should have a USGS or IBWC stream flow gauge. If not, it should be possible to conduct flow measurement during routine visits.

# Monitoring Sites for FY 2014

Table B1.1 Sample Design and Schedule, FY 2014

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Metal Water	Organic Water	Metal Sed	Organic Sed	Fish Tissue	Amb Tox Water	Amb Tox Sed	Comments
NECHES RIVER AT US 69 1.01 KM NORTH OF FM 1014/US 69 INTERSECTION 1.8 KM NORTHWEST OF ROCKLAND IN TYLER COUNTY	10585	0604	6	10	AN	AN	RT	4	4	4	4												
CEDAR CREEK AT ELLIS AVE IN LUFKIN	21434	0604A	6	10	AN	AN	RT	4	4	4	4												
CEDAR CREEK AT FM 1336 1.29 KM WEST-SOUTHWEST OF FM 324/FM 1336 INTERSECTION IN SOUTHWEST LUFKIN	13528	0604A	6	10	AN	AN	RT	4	4	4	4												
CEDAR CREEK AT FM 2497 5.55 KM NORTHWEST OF FM 2497/US 59 INTERSECTION 7.45 KM NORTH NORTHWEST OF CITY OF DIBOLL	10478	0604A	6	10	AN	AN	RT	4	4	4	4												
CEDAR CREEK AT ST LOOP 287 IN LUFKIN	10479	0604A	6	10	AN	AN	RT	4	4	4	4												
HURRICANE CREEK 38 METERS DOWNSTREAM OF KIWANIS PARK DRIVE AND DIRECTLY DOWNSTREAM OF CONFLUENCE WITH UNNAMED TRIBUTARY IN LUFKIN	21433	0604B	6	10	AN	AN	RT	4	4	4	4												
HURRICANE CREEK AT FM 324 6.74 KM SOUTH SOUTHWEST OF LUFKIN	13529	0604B	6	10	AN	AN	RT	4	4	4	4												
HURRICANE CREEK AT ST LOOP 287 IN SOUTH LUFKIN	10487	0604B	6	10	AN	AN	RT	4	4	4	4												

<i>Site Description</i>	<i>Station ID</i>	<i>Waterbody ID</i>	<i>Basin</i>	<i>Region</i>	<i>SE</i>	<i>CE</i>	<i>MT</i>	<i>Field</i>	<i>Conv</i>	<i>Bacteria</i>	<i>Flow</i>	<i>24 hr DO</i>	<i>AqHab</i>	<i>Benthics</i>	<i>Nekton</i>	<i>Metal Water</i>	<i>Organic Water</i>	<i>Metal Sed</i>	<i>Organic Sed</i>	<i>Fish Tissue</i>	<i>Amb Tox Water</i>	<i>Amb Tox Sed</i>	<i>Comments</i>
JACK CREEK AT FM 2497 5 KM SOUTHEAST OF SH 94/FM 2497 INTERSECTION 13.3 KM SOUTHWEST OF LUFKIN	10492	0604C	6	10	AN	AN	RT	4	4	4	4												
JACK CREEK AT FM 3150 7 KM WEST OF LUFKIN	10494	0604C	6	10	AN	AN	RT	4	4	4	4												
JACK CREEK AT SH 94 WEST OF LUFKIN 550 M EAST OF FM 706/ SH 94 INTERSECTION	10493	0604C	6	10	AN	AN	RT	4	4	4	4												
PINEY CREEK AT FM 358 2.4 KM EAST OF FM 3154/FM 358 INTERSECTION 10 KM EAST OF CITY OF PENNINGTON	16096	0604D	6	10	AN	AN	RT	4	4	4	4												
BILOXI CREEK AT ANGELINA CR216 8 KM SOUTHEAST OF LUFKIN 2.4 KM DOWNSTREAM OF US69	10499	0604M	6	10	AN	AN	RT			6	6												
BILOXI CREEK AT FM 1818 2.5 KM EAST OF FM 1818/ FM 58 INTERSECTION 13.8 KM EAST OF DIBOLL	16097	0604M	6	10	AN	AN	RT	4	4	4	4												
BUCK CREEK AT FM 1818 4.72 KM WEST OF FM 844/ FM 1818 17.94 KM EAST OF DIBOLL	16098	0604N	6	10	AN	AN	RT	4	4	4	4												
LAKE RATCLIFF WHERE NORTHWEST ARM OF LAKE JOINS MAIN BODY 350 M NORTHWEST OF THE SOUTHWEST CORNER OF DAM1.48 KM WEST OF RATCLIFF	17339	0604T	6	10	AN	AN	RT	4	4	4													
BAYOU CARRIZO AT SH 21 NEAR NACOGDOCHES	21432	0610	6	10	AN	AN	RT	4	4	4	4												

<i>Site Description</i>	<i>Station ID</i>	<i>Waterbody ID</i>	<i>Basin</i>	<i>Region</i>	<i>SE</i>	<i>CE</i>	<i>MT</i>	<i>Field</i>	<i>Conv</i>	<i>Bacteria</i>	<i>Flow</i>	<i>24 hr DO</i>	<i>AqHab</i>	<i>Benthics</i>	<i>Nekton</i>	<i>Metal Water</i>	<i>Organic Water</i>	<i>Metal Sed</i>	<i>Organic Sed</i>	<i>Fish Tissue</i>	<i>Amb Tox Water</i>	<i>Amb Tox Sed</i>	<i>Comments</i>
SAM RAYBURN RESERVOIR NEAR SHIRLEY CREEK IN THE ANGELINA RIVER CHANNEL 5.13 KM NE OF FM 2109/ FM 2801 INTERSECTION	15524	0610	6	10	AN	AN	RT	4	4	4													
SAM RAYBURN RESERVOIR ADJACENT TO ALLIGATOR COVE IN THE ATTOYAC RIVER CHANNEL 3.94 KM NORTHWEST OF FM 3185/ SH 147 INTERSECTION	15523	0610	6	10	AN	AN	RT	4	4	4													
SAM RAYBURN RESERVOIR ON ANGELINA RIVER CHANNEL 0.75 KM DOWNSTREAM OF MARIONS FERRY BOAT RAMP 4.2 KM NORTH AND 2.2 KM EAST OF FM 1669/ SH 103 INTERSECTION NEAR LUFKIN	21100	0610	6	10	AN	AN	RT	4	4	4													
AYISH BAYOU AT SH 103 0.8 KM EAST OF FM 705	15361	0610A	6	10	AN	AN	RT	4	4	4	4												
AYISH BAYOU AT WEST COLUMBIA STREET IN CITY OF SAN AUGUSTINE	21431	0610A	6	10	AN	AN	RT	4	4	4	4												
ANGELINA RIVER 340 METERS UPSTREAM OF SH 204 9.93 KM WEST OF CUSHING	10633	0611	6	5	AN	AN	RT	4	4	4	4												
ANGELINA RIVER AT SH 21 11.17 KM EAST NORTHEAST OF ALTO	10630	0611	6	10	AN	AN	RT	4	4	4	4												
ANGELINA RIVER UPSTREAM SAM RAYBURN RESERVOIR AT FM 1798 5.5 KM WEST OF LANEVILLE	10635	0611	6	5	AN	AN	RT	4	4	4	4												

<i>Site Description</i>	<i>Station ID</i>	<i>Waterbody ID</i>	<i>Basin</i>	<i>Region</i>	<i>SE</i>	<i>CE</i>	<i>MT</i>	<i>Field</i>	<i>Conv</i>	<i>Bacteria</i>	<i>Flow</i>	<i>24 hr DO</i>	<i>AqHab</i>	<i>Benthics</i>	<i>Nekton</i>	<i>Metal Water</i>	<i>Organic Water</i>	<i>Metal Sed</i>	<i>Organic Sed</i>	<i>Fish Tissue</i>	<i>Amb Tox Water</i>	<i>Amb Tox Sed</i>	<i>Comments</i>
LA NANA BAYOU AT LOOP 224 NORTH IN THE CITY OF NACOGDOCHES 1.2 KM EAST OF THE INTERSECTION OF US BUS 59F/ST LOOP 224 NORTH	16301	0611B	6	10	AN	AN	RT	4	4	4	4												
LA NANA BAYOU AT NACOGDOCHES CR 526 6.9 MI SOUTH OF NACOGDOCHES BETWEEN FM 2863 AND FM 3228	10474	0611B	6	10	AN	AN	RT	4	4	4	4												
LA NANA BAYOU IMMEDIATELY UPSTREAM OF EAST MAIN STREET/STATE HIGHWAY 7/ STATE HIGHWAY 21 IN NACOGDOCHES	20792	0611B	6	10	AN	AN	RT	4	4	4	4												
MUD CREEK AT US 79 9.8 KM EAST OF JACKSONVILLE AND 5.9 KM WEST OF NEW SUMMERFIELD	14477	0611C	6	5	AN	AN	RT	4	4	4	4												
MUD CREEK AT US 84 0.87 KM SOUTHWEST OF REKLAW	10532	0611C	6	5	AN	AN	RT	4	4	4	4												
LAKE NACOGDOCHES IN MAIN POOL NEAR DAM 375 M EAST OF WESTERN EDGE OF DAM 126 M NORTH OF DAM 10 MI WEST OF NACOGDOCHES	15801	0611Q	6	10	AN	AN	RT	4	4	4													
LAKE NACOGDOCHES NEAR ISLAND IN UPPER LAKE EQUIDISTANT BETWEEN ISLAND AND BOAT RAMP AT THE END OF HARBOR DRIVE AND 3.37 KM SOUTH OF SH 21	21021	0611Q	6	10	AN	AN	RT	4	4	4													
BOWLES CREEK AT CHEROKEE CR 4608/RUSK CR 4194 SOUTHWEST OF HENDERSON	21429	0611R	6	5	AN	AN	RT	4	4	4	4												

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Metal Water	Organic Water	Metal Sed	Organic Sed	Fish Tissue	Amb Tox Water	Amb Tox Sed	Comments
JOHNSON CREEK AT RUSK CR 476 SOUTHWEST OF HENDERSON	21430	0611R	6	5	AN	AN	RT	4	4	4	4												
LAKE STRIKER NEAR DAM APPROX 0.8 MILES SOUTHEAST OF POWERPLANT 138 M NORTHWEST OF SPILLWAY AND 7.5 MILES SOUTHEAST OF NEW SUMMERFIELD	17824	0611R	6	5	AN	AN	RT	4	4	4													
LAKE STRIKER UPPER LAKE EQUIDISTANT BETWEEN SHORELINES 2.28KM SOUTHEAST OF INTERSECTION OF FM2274/FM32889.4 KM E. OF NEW SUMMERFIELD	17822	0611R	6	5	AN	AN	RT	4	4	4													
ATTOYAC BAYOU AT SH 21 0.71 KM WEST OF INTERSECTION OF SH 21/ FM 1196 4.77 KM EAST OF CHIRENO	10636	0612	6	10	AN	AN	RT	4	4	4	4												
ATTOYAC BAYOU AT SH 7 1.75 KM NORTHEAST OF MARTINSVILLE	15253	0612	6	10	AN	AN	RT	4	4	4	4												
ATTOYAC BAYOU AT US 59 4.12 KM NORTHEAST OF GARRISON	16076	0612	6	10	AN	AN	RT	4	4	4	4												
NACONICHE LAKE NEAR THE DAM 226 METERS NORTH AND 715 METERS WEST OF INTERSECTION OF FM 2435 AND US 59 NORTHEAST OF CITY OF NACOGDOCHES	21435	0612	6	10	AN	AN	RT	4	4	4													
WEST CREEK AT FM 2913 2.57 KM N OF INTERSECTION WITH SH 7	20845	0612	6	10	AN	AN	RT	4	4	4	4												

Field - Dissolved oxygen, pH, conductivity, water temperature  
Conventional - Sulfate, Chloride, TSS, TDS, Total Phosphorus, Nitrate+Nitrite-N, Ammonia-N, Chlorophyll-a, Pheophytin

Bacteria - *E. coli*  
Flow - In-stream Flow or Flow Estimate

## **Critical vs. non-critical measurements**

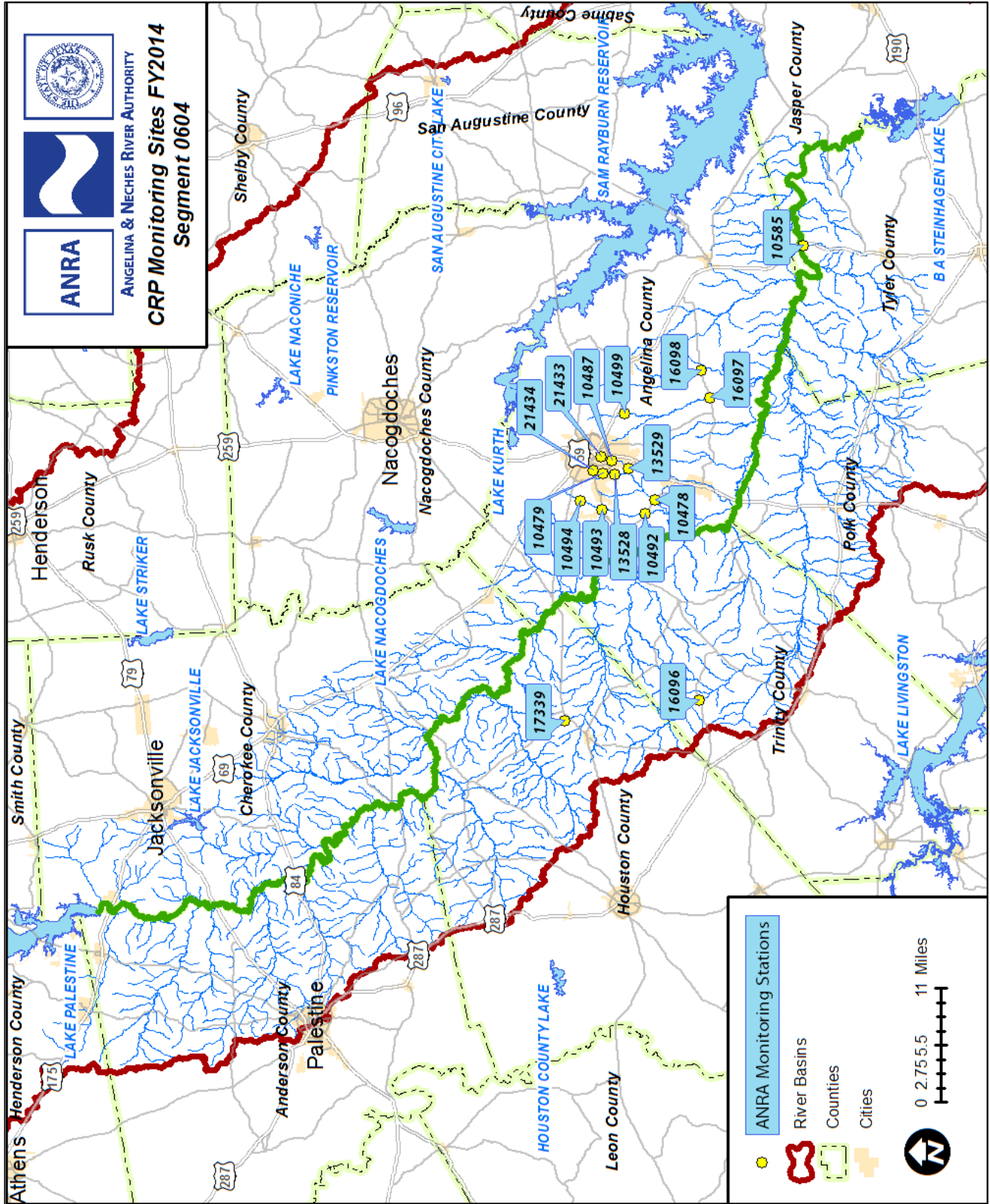
All data taken for CRP and entered into SWQMIS are considered critical.

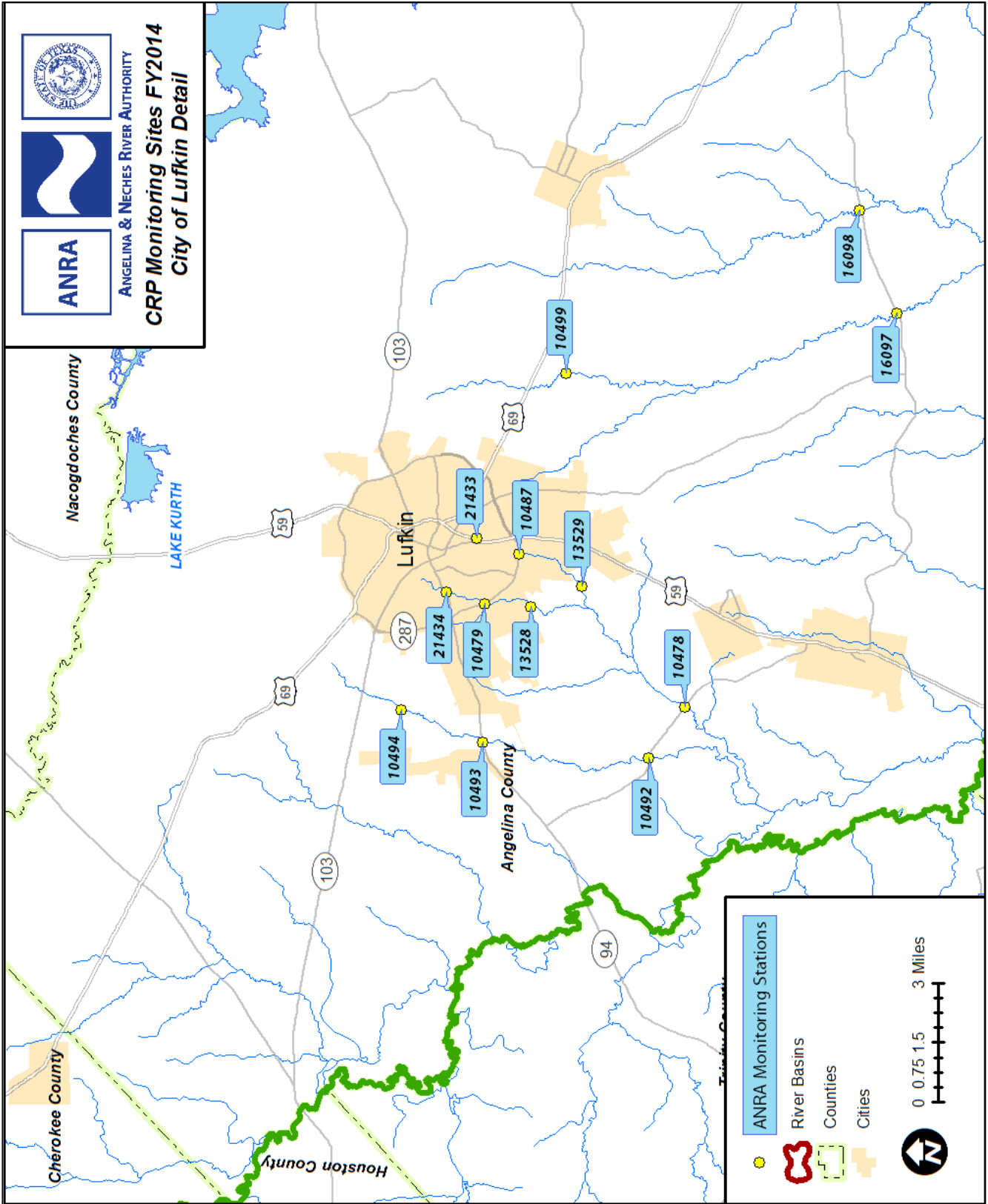


## Appendix C: Station Location Maps

## Station Location Maps

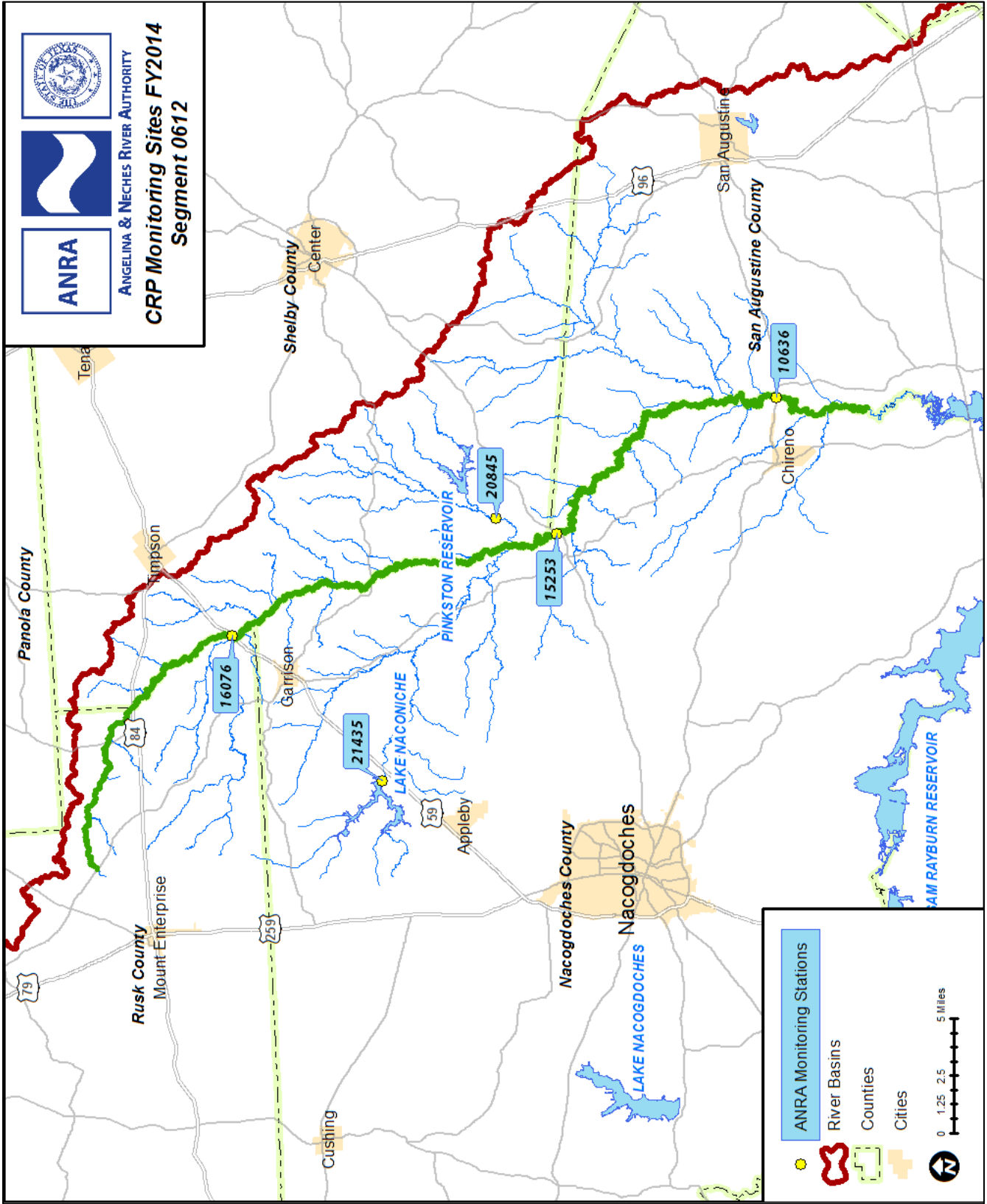
Maps of stations monitored by the ANRA are provided below. The maps were generated by the ANRA Information Technology department. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact Jeremiah Polling, ANRA Information Systems Coordinator, at 936-633-7551, or via email at [jpolling@anra.org](mailto:jpolling@anra.org).











## Appendix D: Field Data Sheets



# Example Field Data Sheet

## SURFACE WATER QUALITY MONITORING PROGRAM FIELD DATA SHEET

ANGELINA & NECHES RIVER AUTHORITY • P.O. BOX 387 / 210 LUFKIN AVE. • LUFKIN, TEXAS 75902-0387 • (936) 632-7795

Station ID: 00000 Station Description: Site Name

Collector(s) Name/Signature: \_\_\_\_\_

Date Collected: \_\_\_\_\_ Time Collected: \_\_\_\_\_ Sample Depth (meters): \_\_\_\_\_

Field Tests and Measurements:		Sample Identification:			
Air Temperature °C	00020	TAG ID		Sample ID	
Water Temperature °C	00010	<b>Parameters Collected:</b>			
Specific Conductance (µS/cm)	00094	X	E. Coli	X	Chlorophyll-a
pH (standard units)	00400	X	TSS	X	Pheophytin-a
Dissolved Oxygen (mg/L)	00300	X	TDS	X	Chloride
Secchi Depth (meters)	00078	X	Ammonia-N	X	Sulfate
Total Water Depth (meters)	82903	X	T. NO <sub>3</sub> +NO <sub>2</sub>		Other:
Instantaneous Stream Flow (cfs)	00061	X	T. Phosphorus		Field Split

Field Observations:	
	01351 - Flow Severity (1-no flow, 2- low, 3-normal, 4-flood, 5-high, 6-dry)
	89835 - Flow measurement method (1-gage, 2-electric, 3-mechanical, 4-weir/flume, 5-doppler)
	72053 - Days since last significant rainfall
	89966 - Present Weather (1-clear, 2-partly cloudy, 3-cloudy, 4-rain, 5-other)
	89979 - Evidence of Primary Contact Recreation (1 = Observed, 0 = Not Observed)
	89978 - Primary Contact, Observed Activity (Number of people observed. Reported as 0-10 or >10)
	If sampling from a Reservoir
	00052 - Reservoir Stage (Feet Above Mean Sea Level) (collected from TWDB website)
	00053 - Reservoir Percent Full (collected from TWDB website)
	00051 - Reservoir Access Not Possible, Level Too Low (Enter "1" if true)
	If sampling from an perennial pool (isolated pool)
	89864 - Maximum pool width in meters
	89865 - Maximum pool depth in meters
	89869 - Pool length in meters
	89870 - Percentage the pool covers within a 500 meter reach
	74069 - Stream Flow Estimate (cfs) (All fields below are required to calculate a flow estimate)
	Stream Width (feet)
	Average Depth of Stream (feet)
	Distance Object Travels (feet)
	Time for Object to Travel Distance (seconds)
	Comments/Observations:

USGS Gage: 00000000 – USGS Gage Description

FORM: CRP Field Data Sheet Rev 1 7/31/12 JBS

## Appendix E: Chain of Custody Forms

# Example Chain of Custody (COC) Form

## CHAIN OF CUSTODY RECORD



Certificate # 1104704292

210 Lufkin Ave  
Lufkin, TX 75901  
Phone: 936-633-7550  
Fax: 936-632-7799  
Web: www.anra.org



PAGE 1 of 1

SECTION A - CLIENT INFORMATION (required)		SECTION B - PROJECT INFORMATION		SECTION C - REPORTING REQUIREMENTS		SECTION D - SAMPLER INFORMATION	
Company:	TCEQ - Clean Rivers Program	PO #:		Report To:	Brian Sims	Sampler Name (Printed):	Mike Parrish / Jeremiah Poling
Address:	210 E Lufkin Ave	Manifest #:		Copy To:			Sampler Signature
City, State, ZIP:	Lufkin, TX 75901			Format:	Hardcopy (mailed)		
Phone:	936-633-6435			<i>(Select all that apply)</i>			
Fax:	936-632-2564				Hardcopy (Pick-Up)		
Email:	bsims@anra.org				Electronic (PDF)		
					FAX		

SECTION E - SAMPLE CONTAINERS AND PRESERVATION		SECTION F - COMMENTS	
Matrix Codes	Container Type Codes	Preservative Codes	
DW = Drinking Water WW = Wastewater S = Soil SL = Sludge	P = Plastic G = Glass A = Amber V = Vial	0 = None 1 = HNO <sub>3</sub> 2 = H <sub>2</sub> SO <sub>4</sub> 3 = Ice 4 = NaOH 5 = HCl 6 = Na Thio. 7 = Other	
Matrix	Container Type	Preservative	
	S	P	A
	3,6	3	2,3

SECTION G - ANALYSIS REQUESTED		SECTION H - FIELD ANALYSIS		SECTION I - SAMPLE ID	
Matrix	Grab	Flow (MGD)	pH (SU)	Temp (°C)	Total Cl <sub>2</sub> (mg/L)
Composite	E.coli	○ Total ○ Instantaneous			# Cont.
	TSS				
	Chloride				
	Chlorophyll				
	Ammonia-N				
	T. Phosphorus				
	Sulfate				

SECTION J - COMPOSITE SAMPLE DATA (if applicable)		SECTION K - TRANSFER OF SAMPLE CUSTODY	
DATE	TIME	RELINQUISHED BY	RECEIVED BY
	TOTALIZER	DATE	DATE
		TIME	TIME
START			
END			
TOTAL FLOW (MGD)			

SECTION L - LAB USE ONLY	
DATE	ON ICE?
	Y N
	Y N
	Y N
	Y N
	Y N

Form ID: COC-ANRA  
Rev #: 1  
Effective: 9/6/12  
Approval: IBS

RS:\CRP Forms\COCs\Group A - COC-ANRA\_Chain\_of\_Custody\_Rev01\_2012-09-06.docx



## Appendix F: Data Review Checklist and Summary Shells

## Data Review Checklist

This checklist is to be used by the Planning Agency and other entities handling the monitoring data in order to review data before submitting to the TCEQ. This table may not contain all of the data review tasks being conducted.

<b>Data Format and Structure</b>	✓, X, or N/A
Are there any duplicate Tag Id numbers in the Events file?	
Do the Tag prefixes correctly represent the entity providing the data?	
Have any Tag Id numbers been used in previous data submissions?	
Are TCEQ SLOC numbers assigned?	
Are sampling Dates in the correct format, MM/DD/YYYY with leading zeros?	
Are sampling Times based on the 24 hr clock (e.g. 09:04) with leading zeros?	
Is the Comments field filled in where appropriate (e.g. unusual occurrence, sampling problems, unrepresentative of ambient water quality)?	
Are submitting Entity, Collecting Entity, and Monitoring Type codes used correctly?	
Do sampling dates in the Results file match those in the Events file for each Tag Id?	
Are values represented by a valid parameter code with the correct units?	
Are there any duplicate parameter codes for the same Tag Id?	
Are there any invalid symbols in the Greater Than/Less Than (GT/LT) field?	
Are there any Tag Ids in the Results file that are not in the Events file or vice versa?	
<b>Data Quality Review</b>	✓, X, or N/A
Are "less-than" values reported at the LOQ? If no, explain in Data Summary.	
Have the outliers been verified and a "1" placed in the Verify_flg field?	
Have checks on correctness of analysis or data reasonableness been performed? e.g., Is the sum of the chloride and sulfate less than (or equal to) the TDS? Is the minimum 24 hour DO less than the maximum 24 hour DO? Do the values appear to be consistent with what is expected for site?	
Have at least 10% of the data in the data set been reviewed against the field and laboratory data sheets?	
Are all parameter codes in the data set listed in the QAPP?	
Are all stations in the data set listed in the QAPP?	
<b>Documentation Review</b>	✓, X, or N/A
Are blank results acceptable as specified in the QAPP?	
Were control charts used to determine the acceptability of lab duplicates?	
Was documentation of any unusual occurrences that may affect water quality included in the Event file's Comments field?	
Were there any failures in sampling methods and/or deviations from sample design requirements that resulted in unreportable data? If yes, explain in Data Summary.	
Were there any failures in field and/or laboratory measurement systems that were not resolvable and resulted in unreportable data? If yes, explain in Data Summary.	
Was the laboratory's NELAP Accreditation current for analysis conducted?	

# Data Summary

## Data Set Information

Data Source: \_\_\_\_\_

Date Submitted: \_\_\_\_\_

Tag\_id Range: \_\_\_\_\_

Date Range: \_\_\_\_\_

- I certify that all data in this data set meets the requirements specified in Texas Water Code Chapter 5, Subchapter R (TWC §5.801 et seq) and Title 30 Texas Administrative Code Chapter 25, Subchapters A & B.
- This data set has been reviewed using the criteria in the Data Review Checklist.

Planning Agency Data Manager: \_\_\_\_\_ Date: \_\_\_\_\_

Please explain in the table below any data discrepancies discovered during data review including:

- o Inconsistencies with LOQs
- o Failures in sampling methods and/or laboratory procedures that resulted in data that could not be reported to the TCEQ (indicate items for which the Corrective Action Process has been initiated and send *Corrective Action Status Report* with the applicable Progress Report).

Dataset \_\_\_ contains data from FY\_\_ QAPP Submitting Entity code \_\_\_ and collecting entity \_\_\_. This is field and lab data that was collected by the (collecting entity). Analyses were performed by the (lab name). The following tables explain discrepancies or missing data as well as calculated data loss.

### Discrepancies or missing data for the listed tag ID:

Tag ID	Station ID	Date	Parameters	Type of Problem	Comment/PreCAPs/CAPs

### Data Loss

Parameter	Missing Data points out of Total	Percent Data Loss for this Dataset	Parameter	Missing Data points out of Total	Percent Data Loss for this Dataset