TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 28, 2015

Allen M. Pappas
Red River Authority of Texas
P.O. Box 240
Wichita Falls, TX 76307-0240

Re: RRA 2015-2016 CRP Quality Assurance Project Plan

Dear Mr. Pappas:

Enclosed is a set of final TCEQ signatures for the referenced QA document for your files, and distribution.

Please ensure that copies of the QAPP are distributed to each project participant as required by Section A3. 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.

Sincerely,

Daniel R. Burke
Lead CRP Quality Assurance Specialist

enclosure

cc: Russell Bond, TCEQ CRP Project Manager, MC 234

Clean Rivers Program
Quality Assurance Project Plan
for the

Red and Canadian River Basins

Red River Authority of Texas
P.O. Box 240
Wichita Falls, Texas 76307-0240

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 2016 to FY 2017

Questions concerning this QAPP should be directed to:

RED RIVER AUTHORITY OF TEXAS
ALLEN M. PAPPAS
CLEAN RIVERS PROGRAM PROJECT MANAGER
3000 HAMMON ROAD
P.O. BOX 240
WICHITA FALLS, TEXAS 76307-0240
(940) 723-8697
allen.pappas@rra.texas.gov

A1 APPROVAL PAGE

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Water Quality Planning Division

Patricia Wise 8/28/2015
Patricia Wise, Manager Date
Water Quality Monitoring & Assessment Section
patricia.wise@TCEQ.texas.gov

8/26/15
Sarah Eagle, Work Leader Date
Clean Rivers Program
sarah.eagle@TCEQ.texas.gov

8-26-2015
Allison Fischer Date
Project QA Specialist
Clean Rivers Program
allison.fischer@TCEQ.texas.gov

8/27/15
Russell Bond Date
Project Manager
Clean Rivers Program
russell.bond@TCEQ.texas.gov

8/26/2015
Cathy Anderson, Team Leader Date
Data Management and Analysis
cathy.anderson@TCEQ.texas.gov

Monitoring Division

08/28/2015
Sharon R. Coleman Date
TCEQ Quality Assurance Manager
sharon.coleman@TCEQ.texas.gov

8/28/2015
Daniel R. Burke Date
Lead CRP Quality Assurance Specialist
Laboratory and Quality Assurance Section
daniel.burke@TCEQ.texas.gov

RED RIVER AUTHORITY OF TEXAS

08-14-2015
Allen M. Pappas Date
Red River Authority CRP Project Manager
allen.pappas@rra.texas.gov

8-14-15
Jose Martinez Date
Red River Authority CRP QA Officer
jose.martinez@rra.texas.gov

RED RIVER AUTHORITY OF TEXAS ENVIRONMENTAL SERVICES LABORATORY

8/14/2015
Jill Simpson Date
Red River Authority Laboratory Supervisor
jill.simpson@rra.texas.gov

08-14-2015
Allen Pappas Date
Red River Authority Laboratory QA Officer
allen.pappas@rra.texas.gov

LOWER COLORADO RIVER AUTHORITY, ELS

8/21/15
Alicia Gill Date
LCRA ELS Laboratory Manager
alicia.gill@LCRA.org

08.21.2015
Jennifer Blossom Date
LCRA ELS Quality Assurance Coordinator
jennifer.blossom@LCRA.org

CITY OF SHERMAN

8-14-15
Nathan Whiddon Date
City of Sherman CRP Project Manager
nathanw@ci.sherman.tx.us

August 14, 2015
David Schwartz Date
City of Sherman CRP QA Officer
davids@ci.sherman.tx.us

CITY OF SHERMAN LABORATORY

8.14.15
Nicole Moseley Date
City of Sherman Laboratory Supervisor
nicolem@ci.sherman.tx.us

8.14.15
Nicole Moseley Date
City of Sherman Laboratory QA Officer
nicolem@ci.sherman.tx.us

NORTH TEXAS MUNICIPAL WATER DISTRICT

08/18/2015
Brooke Noack Date
NTMWD CRP Project Manager
bnoack@NTMWD.com

8/18/2015
Wayne Gilliland Date
NTMWD CRP QA Officer
wgilliland@NTMWD.com

NORTH TEXAS MUNICIPAL WATER DISTRICT LABORATORY

8/18/15		8/18/15	
Ray Cotton	Date	Russell Moody	Date
Laboratory Manager		NTMWD Laboratory QA Officer	
rcotton@NTMWD.com		rmoody@NTMWD.com	

Sub-tier participants (e.g., subcontractors, sub-participants, or 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 for adherence letters to be maintained.

A2 TABLE OF CONTENTS

Charts:

Tables:

A2 TABLE OF CONTENTS, Continued

Tables Continued:

Figures:

Appendices:

LIST OF ACRONYMS

AWRL	Ambient Water Reporting Limit
BAC	Basin Advisory Committee
BMP	Best Management Practices
CAP	Corrective Action Plan
CAR	Corrective Action Report
COC	Chain of Custody
COD	Chemical Oxygen Demand
CRP	Clean Rivers Program
CS	City of Sherman
DBMS	Database Management System
DM&A	Data Management and Analysis
DMP	Data Management Plan
DMRG[1]	Data Management Reference Guide
DO	Dissolved Oxygen
DOC	Demonstration of Capability
DQO	Data Quality Objective
EDP	Electronic Data Processing
EPA	United States Environmental Protection Agency
ESD	RRA Environmental Services Division
FOA	Field of Accreditation
FY	Fiscal Year
GIS	Geographic Information System
GPS	Global Positioning System
HUA	Hydrologic Unit Area
LAN	Local Area Network
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
mg	Milligrams
mL	Milliliter
NELAP	National Environmental Laboratory Accreditation Program
NTMWD	North Texas Municipal Water District
NTU	Nephalometric Turbidity Units
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QC	Quality Control
QM	Quality Manual
QMP	Quality Management Plan
RBP	Rapid Bioassessment Protocol
RL	Reporting Limit
RPD	Relative Percent Difference
RRA	Red River Authority of Texas
RWA	Receiving Water Assessment
SLOC	Station Location
SOP	Standard Operating Procedure
SQL	Structured Query Language
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TNI	The NELAC Institute
TOC	Total Organic Carbon
TSS	Total Suspended Solids
TSWQS	Texas Surface Water Quality Standards
TWQI	Texas Water Quality Inventory
µg	Micrograms
USGS	United States Geological Survey
VOA	Volatile Organic Analytes
VSS	Volatile Suspended Solids

[1] Refers to the *2014 SWQM Data Management Reference Guide, November 2013* or most recent version

A3 DISTRIBUTION LIST

Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Russell Bond, Project Manager
Clean Rivers Program
MC-234
(512) 239-2574

Daniel R. Burke
Lead CRP QA Specialist
MC-165
(512) 239-0011

Cathy Anderson
Team Leader, Data Management and Analysis
MC-234
(512) 239-1805

Red River Authority of Texas
P.O. Box 240
Wichita Falls, Texas 76307-0240

Allen M. Pappas
Red River Authority CRP Project Manager
(940) 723-1717

Allen M. Pappas
Red River Authority CRP QA Officer
(940) 723-1717

Red River Authority of Texas Environmental Laboratory
P.O. Box 240
Wichita Falls, Texas 76307-0240

Jill Simpson
Red River Authority Laboratory Supervisor
(940) 723-1717

Allen M. Pappas
Red River Authority Laboratory QA Officer
(940) 723-1717

Lower Colorado River Authority Environmental Services Laboratory
3505 Montopolis Drive
P.O. Box 220
Austin, Texas 78767-0220

Dale Jurescka
LCRA CRP Project Manager
(512) 356-6023

Alicia Gill
LCRA ELS Laboratory Manager
(512) 356-6023

City of Sherman Water Utilities Laboratory
288 Post Oak Road
Sherman, Texas 75090

Nathan Whiddon
City of Sherman CRP Project Manager
(903) 892-7287

David Schwartz
City of Sherman CRP QA Officer
(903) 892-7287

North Texas Municipal Water District
201 East Brown Street
P.O. Box 2408
Wylie, Texas 75098

Brooke Noack
NTMWD CRP Project Manager
(972) 442-5405

Wayne Gilliland
NTMWD CRP QA Officer
(972) 442-5405

The Red River Authority of Texas 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 Red River Authority of Texas 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

Texas Commission on Environmental Quality

Sarah Eagle
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. Concurs 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.

Russell Bond
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.

Cathy Anderson
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, November 2013, 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.

Red River Authority of Texas

Allen M. Pappas
CRP Project Manager
Responsible for implementing and monitoring CRP requirements in contracts, QAPP(s), 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.

Jose Martinez
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 quality assurance records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Coordinates and monitors deficiencies and corrective action. 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.

Glen K. Hite
CRP 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 the Authority's website.

Jill Simpson
Laboratory Supervisor
Responsible for ensuring that all samples received in the Environmental Services Division Laboratory are within the allotted holding time, and that the chain-of-custody has been properly completed. Ensures that the samples are analyzed in accordance with standard accepted methods as described in the SOP manual. Ensures all analyses results are correctly performed and properly recorded on the laboratory data sheets and in the appropriate analytical log books prior to transmittal to the CRP Quality Assurance Officer.

Allen M. Pappas
CRP Field Supervisor
Responsible for overseeing the field personnel that conduct sampling events. Ensures that all field personnel are properly trained and that training records are maintained. Ensure that all field staff are equipped to conduct the necessary monitoring. Ensures that personnel and equipment are available at appropriate times. The Field Supervisor also ensures that all field data are collected as outlined by the QAPP and the *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, August 2012 (RG-415)* or most current version. Serves as CRP Sample Custodian. Coordinates and maintains records of data verification and validation. Assists with monitoring systems audits on project participants to determine compliance with project and program specifications.

Allen M. Pappas / Jose Martinez
SWQM Data Entry Technician
Responsible for entering quality assured SWQM data into the Authority's water quality database. Assists during data collection events and serves as alternate CRP Sample Custodian.

Other Entities:

City of Sherman, Texas

Collects and analyzes specific water quality samples required for their specific operations. Data which are submitted to the Authority, as identified in **Appendix A**, **Table A7.1** for use in the CRP, will be collected and analyzed under the guidelines set forth by the QAPP.

Nathan Whiddon
CRP Project Manager
Responsible for implementing and monitoring CRP requirements of the QAPP(s), QAPP amendments and appendices. Coordinates planning activities and ensures internal monitoring systems audits are conducted to ensure that staff adheres to the QAPP and that the City of Sherman Utilities Laboratory participants are producing data of known quality. Ensures that subordinates are qualified to perform contracted work. Ensures that Authority CRP Project Managers and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved.

David Schwartz
CRP Quality Assurance Officer
Responsible for coordinating the implementation of the QA program. Notifies RRA Project Manager of 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 internal monitoring systems audits to determine compliance with project and program specifications. Ensures that field staff are properly trained and that training records are maintained.

Nicole Moseley
CRP Laboratory Supervisor
Responsible for ensuring that all samples received in the laboratory are within the allotted time, and that proper chain-of-custody procedures have been observed. Ensures samples are analyzed in accordance with standard accepted methods as described in the SOP manual. The Laboratory Supervisor further ensures that all analysis results are correctly performed and properly recorded on the laboratory data sheets and in the appropriate analytical log books prior to transmittal to the Quality Assurance Officer.

David Schwartz
CRP Field Supervisor
Responsible for overseeing the field personnel that conduct sampling events. Ensures that all field personnel are properly trained and equipped to conduct the necessary monitoring. Ensures that personnel and equipment are available at appropriate times. The Field Supervisor ensures that all field data are collected as outlined by the QAPP and the *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, August 2012 (RG-415)* or most current version.

North Texas Municipal Water District

Collects and analyzes specific water quality samples required for their specific operations. Data which are submitted to the Authority, as identified in **Appendix A**, **Table A7.1** for use in the CRP, will be collected and analyzed under the guidelines set forth by this QAPP.

Brooke Noack
NTMWD CRP Project Manager and CRP Field Supervisor
Responsible for overall project direction. As CRP Project Manager, is responsible for all CRP related activities conducted by NTMWD. The Project Manager will also oversee submittal of water quality samples to the contract laboratory, as appropriate, and will be responsible for confirming that requested analyses are carried out. Ensures that field staff is properly trained and that training records are

maintained.

Wayne Gilliland
NTMWD CRP Quality Assurance Officer
Responsible for coordinating the implementation of the CRP QA program. Responsible for maintaining the CRP 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 quality assurance records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the CRP Project Manager of particular circumstances which may adversely affect the quality of data. Coordinates with the CRP Project Manager to monitor 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.

Katie Goodwin
NTMWD CRP Field Supervisor
As CRP Field Supervisor, is responsible for ensuring that field samples and measurements are collected and recorded according to methodologies detailed in the QAPP and the *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, August 2012 (RG-415)* or most current version. The Field Supervisor role will have primary responsibility for initiating corrective actions in the field in support of data completeness goals of 90%. The Field Supervisor will ensure proper use of CRP Field Data Sheets, field notebooks, proper calibration of equipment and that chain-of-custody forms are correctly completed and received by the laboratory.

Ray Cotton
NTMWD Laboratory Manager
Serves as primary laboratory contact. Responsible for ensuring that all samples received in the NTMWD Environmental Laboratory are within the allotted time, and that the chain-of-custody has been observed. Ensures that the samples are analyzed in accordance with standard accepted methods as described in the SOP manual. Ensures all analysis results are correctly performed and properly recorded on the laboratory data sheets and in the appropriate analytical log books. Responsible for the implementation of the QA program for the NTMWD Environmental Laboratory. Ensures laboratory staff is properly trained. Responsible for distribution of hardcopy and electronic reports to customers.

Kelly Harden
NTMWD CRP Laboratory Operations Manager
Responsible for ensuring that all samples received in the NTMWD Environmental Laboratory are within the allotted time, and that the chain-of-custody has been observed. Ensures that the samples are analyzed in accordance with standard accepted methods as described in the SOP manual. Ensures all analysis results are correctly performed and properly recorded on the laboratory data sheets and in the appropriate analytical log books. Responsible for the implementation of the QA program for the NTMWD Environmental Laboratory. Ensures laboratory staff is properly trained. Generates laboratory reports.

Russell Moody
NTMWD CRP Laboratory Quality Assurance / Quality Control Officer

Responsible for coordinating the implementation of the Laboratory QA program. Notifies NTMWD Laboratory Manager of 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 internal monitoring systems audits to determine compliance with project and program specifications related to laboratory analysis. Responsible for identifying, and maintaining Laboratory quality assurance records. Maintains laboratory training records.

Contract Laboratories

Lower Colorado River Authority Laboratory (LCRA)

The Lower Colorado River Authority Laboratory (LCRA) is a river authority laboratory that is able to perform sophisticated chemical tests as required by the CRP and has contracted with the Authority to perform specific specialized analyses. The Authority will utilize LCRA in emergency situations where analysis(es) is/are unable to performed due to equipment failure or in the instance a requested analysis is not currently listed on the Authority's NELAP FOA.

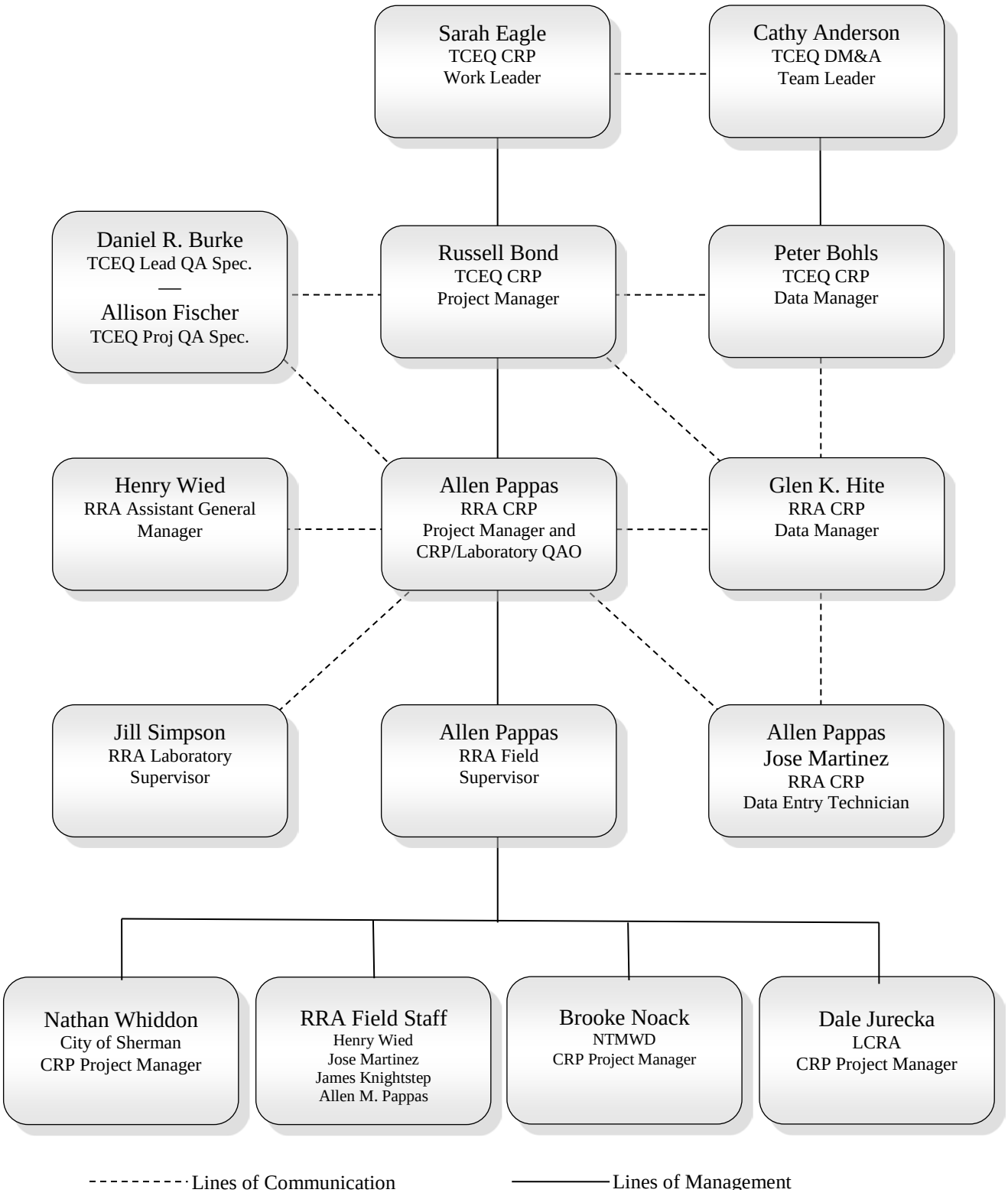
Dale Jurecka
LCRA CRP Project Manager
Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Ensures internal monitoring systems audits are conducted to ensure that LCRA Environmental Laboratory is producing data of known quality. Ensures 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 customer or to the TCEQ.

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 Clean Rivers Program. Ensures that laboratory personnel have adequate training and 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.

Jennifer Blossom
LCRA ELS Quality Assurance Coordinator
Responsible for the overall quality control and quality assurance of analyses performed by LCRA's Environmental Laboratory Services. Monitors the implementation of the QAM/QAPP within the laboratory to ensure complete compliance with QA data quality objectives, as defined by the contract and in the QAPP. Conducts in-house audits to ensure compliance with written SOPs and to identify potential problems. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory.

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 Red River Authority 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 the Authority's 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 2016 -2017*. The FY 2016 monitoring schedule and QAPP are based on:

- ✓ results from previous Water Quality Assessment Reports,
- ✓ constituents listed on the *2012 Texas Integrated Report (IR),*
- ✓ constituents listed on the *Draft 2014 Texas Integrated Report (IR),*
- ✓ requests received from the Basins Steering Committees, and
- ✓ requirements, as requested from TCEQ.

Primary concerns in both the Canadian and Red River Basins are depressed dissolved oxygen levels, and elevated chloride, nutrient, bacteria and chlorophyll-*a* levels. Therefore, the monitoring plan developed by the Authority is designed to accomplish the following:

- ✓ to provide adequate baseline water quality data throughout each basin,
- ✓ to collect data necessary to prove or dispute the *2012 Texas Water Quality IR,*
- ✓ to collect data necessary to prove or dispute the *Draft 2014 Texas Integrated Report (IR),*
- ✓ to consider Basin Steering Committees and stakeholder requests, and
- ✓ to collect data needed to meet the needs of TCEQ.

Figure 1 on page 18 illustrates the vicinity of the Canadian and Red River Basins. **Figures 1-1 through 2-5** located in **Appendix C** identify the Authority's FY 2016 Monitoring Sites. Under the guidance of this QAPP, the City of Sherman, and the North Texas Municipal Water Authority will collect and analyze specific water quality samples from sites in Reach I of the Red River Basin. The data collected is quality assured and submitted to the Authority on a quarterly or more frequent basis prior to the Authority's periodic data submittal to the TCEQ.

Red and Canadian River Basins
Vicinity Map

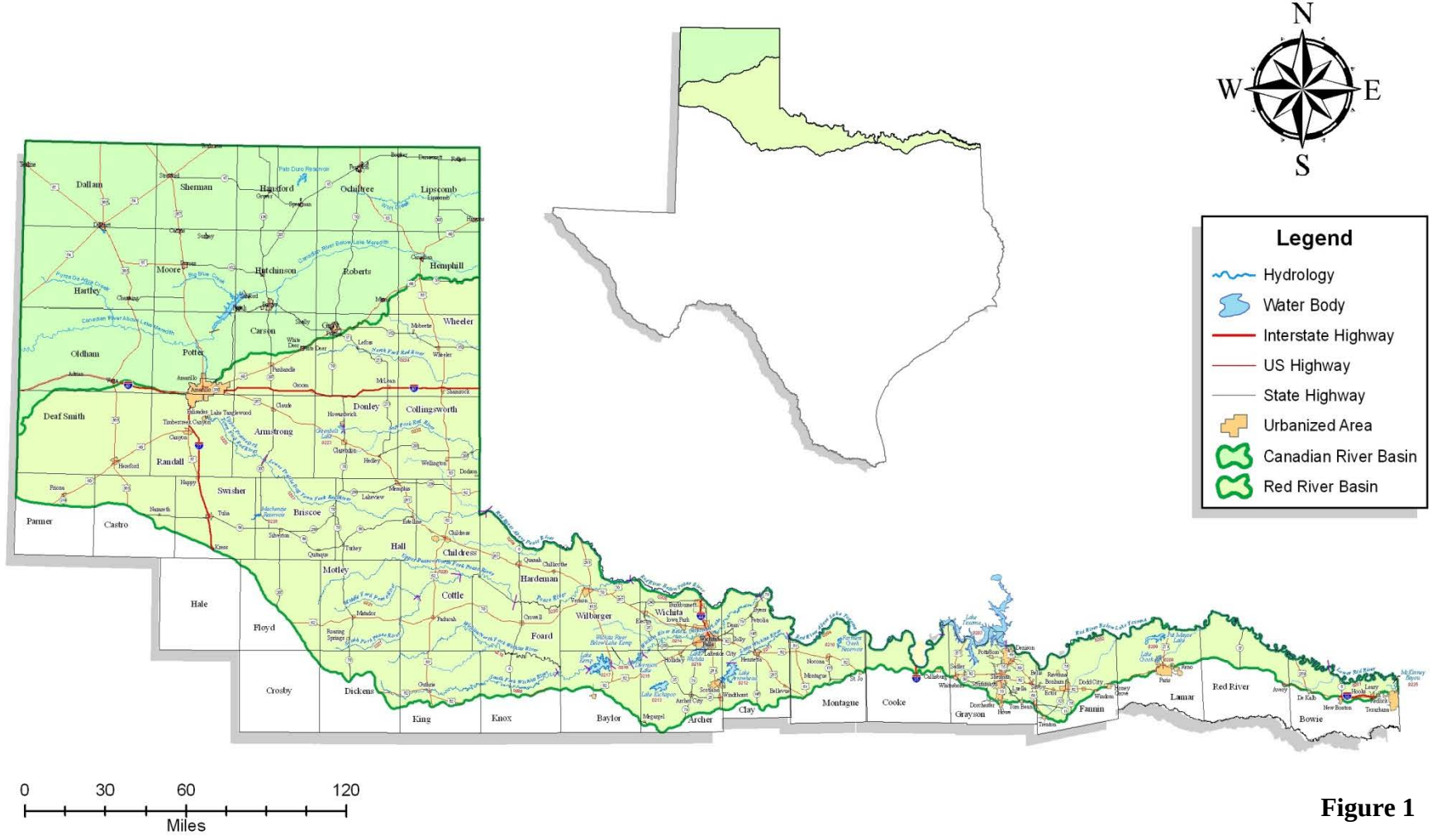


Figure 1

A6 PROJECT/TASK DESCRIPTION

The Authority's staff will be responsible for coordinating and conducting the collection of water samples and performing field measurements. The water samples will be relinquished to the Authority's Environmental Laboratory or LCRA for analysis. The City of Sherman and the North Texas Municipal Water District will collect and analyze water samples in their respective laboratory and/or the Authority's Environmental Laboratory. Laboratory and field data collected by the City of Sherman or the North Texas Municipal Water District will be submitted to the Authority on a quarterly or more frequent basis under this QAPP. The parameters to be analyzed by each laboratory are shown in **Appendix A**, **Table A7.1**. Annual monitoring will include, at a minimum, quarterly:

- ✓ field measurements,
- ✓ flow measurements as applicable,
- ✓ indicator bacteria analysis, and
- ✓ conventional parameter analyses.

Diurnal (24-hour) monitoring will be conducted by the Authority at specific locations to address dissolved oxygen (DO) impairments and/or concerns identified by the TCEQ. Additional monitoring may be performed depending on the type of contaminant or the primary use of the water body.

In order to provide adequate watershed coverage, it was necessary for the Authority to divide both the Red and Canadian River Basins into five reaches or sub-watersheds identified as Red or Canadian Reach I, II, III, IV or V (please refer to basin reach maps located in **Appendix C** of this QAPP). The Reaches were created using natural hydrology composed of classified and unclassified water bodies as described in the *Texas Surface Water Quality Standards (TSWQS).* This monitoring plan places an emphasis on a different reach each year in both basins so, that by the end of the fifth year, enough data will be collected for the next water quality assessment. The Authority's water quality monitoring plan will:

- ✓ include information from the *2012 Texas IR*,
- ✓ include input from monitoring partners, stakeholders and other interested parties,
- ✓ attempt to locate and identify sources of the elevated nutrient and bacteria concerns, and
- ✓ continue collecting surface water data necessary for present and future water quality assessments using a rotational monitoring approach.

Fiscal Year 2016 the Authority's Reaches of Focus will be;

- **Canadian ~ Reach II**
- **Red ~ Reach I**

Fiscal Year 2017 the Authority's Reaches of Focus will be;

- **Canadian ~ Reach III**
- **Red ~ Reach II**

<u>Canadian River Basin</u>

The Canadian River Basin, with the headwaters beginning in northeastern New Mexico, has a total drainage area of approximately 22,870 square miles. The Canadian River is a tributary of the Arkansas

River, which eventually flows into the Mississippi River. There are 13 Hydrologic Unit Areas (HUAs) in the five reaches of the Canadian River Basin along with five classified stream segments, which have been identified by the TCEQ.

The main water quality concerns within the Canadian River Basin are segments with elevated total dissolved solids (TDS) [chloride and sulfate], followed by those with elevated nutrient, chlorophyll *a* and bacteria issues. The elevated TDS levels within the basin originate primarily from a shallow, semi permeable brine aquifer under artesian pressure in the western part of the basin. The elevated nutrient and bacterial concerns generally have origins in both point and nonpoint sources, where the nonpoint sources may be attributed to runoff from areas where wildlife and livestock have been known to congregate.

Red River Basin

The Red River Basin covers a total drainage area of approximately 94,450 square miles of which roughly 24,460 square miles are within Texas. Reach I contains four HUAs with the remaining reaches each containing five HUAs. In addition, there are thirty classified stream segments in the basin, which have been identified by the TCEQ.

One of the main water quality concerns within the Red River Basin is elevated total dissolved solids (TDS) [chloride and sulfate]. One source of the elevated TDS levels are the naturally occurring salt springs found in the western half of the basin. Additionally, oilfield brine from abandoned or improperly plugged wells where the oilfield brines have corroded through old well casings have contaminated both surface and ground water sources.

Other water quality issues in the Red River Basin include segments with elevated nutrient, chlorophyll *a* and bacteria levels. The elevated nutrient and bacterial concerns generally have origins in both point and nonpoint sources, where the nonpoint sources may be attributed to runoff from areas where wildlife and livestock have been known to congregate.

See **Appendix B** for the project-related work plan tasks and **Table B1.1** for the 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 Authority's CRP Project Manager to the TCEQ's CRP Project Manager electronically. The Authority 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 Authority's CRP Project Manager, CRP QAO, Laboratory, as applicable, and the TCEQ's CRP Project Manager, CRP TCEQ Quality Assurance Manager (or designee), 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 Authority's CRP Project Manager.

Special Project Appendices

Projects requiring QAPP appendices will be planned in consultation with the Authority, 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 the Authority's CRP Project Manager, CRP QAO, Laboratory, as applicable, and the TCEQ's CRP Project Manager, CRP Project QA Specialist, CRP Lead QA Specialist and other TCEQ personnel, as appropriate. Copies of approved QAPPs appendices will be distributed by the Authority 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 the *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. These water quality data, and data collected by other organizations (e.g., City of Sherman, North Texas Municipal Water District, 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 Authority will use this information to determine future monitoring priorities. These water quality data and data collected by other organizations (e.g., City of Sherman, North Texas Municipal Water District, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

The City of Sherman and the North Texas Municipal Water District are cooperating partners with the Authority. They will collect and analyze specific water quality samples under the guidance of the Authority's QAPP. The data collected will then be submitted to the Authority, quality assured, then submitted with the Authority's data submittal.

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/assets/public/waterquality/crp/QA/awrlmaster.pdf.

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. Analytical results shall be reported down to the laboratory's LOQ (i.e., the laboratory's LOQ for a given parameter is its reporting limit).

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 quantify at its LOQ for each analyte by running an LOQ check sample for each analytical batch of CRP samples analyzed.
- ✓ The LOQ for chloride, sulfate and total dissolved solids is higher than the established AWRL since concentrations for these parameters are extremely high in both the Canadian and Red River Basins and values are typically not observed at or below the defined AWRL.

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.

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. Before actual sampling or field analysis occurs, they will demonstrate to the Authority's CRP QA Officer (or designee appointed by the Authority's CRP Project Manager) their ability to properly calibrate field equipment and perform field sampling and analysis procedures. 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 *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.

Table A9.1 Project Documents and Records

Document / Record	Location	Retention (Years)	Format
QAPPs, Amendments and Appendices	RRA	Seven	Paper, Digital
Field SOPs	RRA, SH, NM	Seven	Paper, Digital
Laboratory QA Manuals	RRA, LCRA[1], SH, NM	Seven	Paper, Digital
Laboratory SOPs	RRA, LCRA[1], SH, NM	Seven	Paper, Digital
QAPP Distribution Documentation	RRA, LCRA[1], SH, NM	Seven	Paper
Field Staff Training Records	RRA, SH, NM	Seven	Paper
Field Equip. Calibration/Maintenance Logs	RRA, SH, NM	Seven	Paper, Digital
Field Instrument Printouts	RRA, SH, NM	Seven	Paper, Digital
Field Notebooks or Data Sheets	RRA, SH, NM	Seven	Paper
Chain of Custody Records	RRA, LCRA[1], SH, NM	Seven	Paper
Laboratory Calibration Records	RRA, LCRA[1], SH, NM	Seven	Paper, Digital
Laboratory Instrument Printouts	RRA, LCRA[1], SH, NM	Seven	Paper, Digital
Laboratory Data Reports/Results	RRA, LCRA[1], SH, NM	Seven	Paper, Digital
Laboratory Equip. Maintenance Logs	RRA, LCRA[1], SH, NM	Seven	Paper, Digital
Corrective Action Documentation	RRA, LCRA[1], SH, NM	Seven	Paper, Digital

[1] *LCRA document retention is five years.*

1. Red River Authority of Texas (RRA)
   Environmental Laboratory
   P. O. Box 240
   Wichita Falls, Texas 76307-0240
   (3000 Hammon Road, 76310-7500)
2. LCRA Environmental Laboratory Services
   P. O. Box 200
   Austin, Texas 78767
   (3505 Montopolis, 78744-1417)
3. City of Sherman (SH)
   288 Post Oak Road
   Sherman, TX 75090
4. North Texas Municipal Water District (NM)
   P.O. Box 2408
   Wylie, Texas, 75098
   (505 East Brown Street)

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.

- ✓ Title of report and unique identifiers on each page
- ✓ Name and address of the laboratory
- ✓ Name and address of the client
- ✓ A clear identification of the sample(s) analyzed
- ✓ Date and time of sample receipt
- ✓ Identification of method used
- ✓ Identification of samples that did not meet QA requirements and why (e.g., holding times exceeded)
- ✓ 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 SM9223 B
- ✓ Clearly identified subcontract laboratory results (as applicable)
- ✓ A name and title of person accepting responsibility for the report
- ✓ Narrative information on QC failures or deviations from requirements that may affect the quality of results or is necessary for verification and validation of data
- ✓ LOQ and 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

Electronic Data

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the most current version of the TCEQ's *Surface Water Quality Monitoring DMRG, November 2013* or most recent version, which can be found at http://www.tceq.texas.gov/waterquality/data-management/dmrg_index.html. A Data Summary (see **Appendix F**) will be submitted with each data submittal.

The City of Sherman will submit both field data sheets and laboratory reports for parameters outlined in **Table A7.1** from surface water quality monitoring events on a quarterly or more frequent basis to the Authority in either digital or paper format. Data packets submitted to the Authority will be reviewed for completeness and then entered by the Authority's CRP Data Entry Technician into the Authority's SWQM Database for submission to TCEQ.

The North Texas Municipal Water District will submit both field data sheets and laboratory reports for parameters outlined in **Table A7.1** from surface water quality monitoring events on a quarterly or more frequent basis to the Authority in either digital or paper format. Data packets submitted to the Authority will be reviewed for completeness and then entered by the Authority's CRP Data Entry Technician into the Authority's SWQM Database for submission to TCEQ.

The LCRA Environmental Laboratory is utilized as a contract lab. Results from samples submitted to the LCRA Laboratory are electronically submitted to the Authority for review and submission in each data submittal to the TCEQ.

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 most recent versions of the TCEQ *Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water 2012 (RG-415), Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2014 (RG-416)* and *The Interim Guidance for Routine Surface Water Quality Monitoring During Extended Drought*, collectively referred to as the "*SWQM Procedures Manual*". Updates to the *SWQM Procedures Manual* are posted to the SWQM Procedures website located at http://www.tceq.texas.gov/waterquality/monitoring/swqm_guides.html and shall be incorporated into the Authority's procedures, QAPP, SOPs, etc., within 60 days of any final published update. Additional aspects outlined in **Table B2.1** below reflect specific requirements for sampling under CRP and/or provide additional clarification.

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Container[1]	Preservation[2]	Sample Volume[3]	Holding Time[4]
Bacteriological (Water)				
Enterococcus	I	Sodium Thiosulfate, Cool < 6°C	120mL/290 mL	8 Hours
Escherichia coli[8]	I	Sodium Thiosulfate, Cool < 6°C	120mL/290 mL	8 Hours
Conventionals and Minerals (Water)				
Alkalinity, Total	P	Cool < 6°C	1.0 L	14 Days
Chloride	P	Cool < 6°C	125 mL	28 Days
Solids (TSS and VSS)	P	Cool < 6°C	1.0 L	7 Days
Solids, Dissolved (TDS)	P	Cool < 6°C	250 mL	7 Days
Sulfate	P	Cool < 6°C	125 mL	28 Days
Turbidity	P	Cool < 6°C	250 mL	48 Hours
Nutrients (Water)				
Ammonia	P	Cool < 6°C,H2SO4 to pH<2	500 mL	28 Days
Chlorophyll *a* and Pheophytin	P Amber[6]	Unfiltered, Dark, Cool < 6°C	500 mL	48 Hours
		Filtered, Dark, Frozen - EPA		24 Days[7]
		Filtered, Dark, Frozen - SM		28 Days[7]
Chemical Oxygen Demand	P	Cool < 6°C, H2SO4 to pH<2	500 mL	28 Days
Nitrate +Nitrite	P	Cool < 6°C, H2SO4 to pH<2	500 mL	28 Days
Nitrate	P	Cool < 6°C	125 mL	48 Hours
Nitrite	P	Cool < 6°C	125 mL	48 Hours
Orthophosphate	P	Field Filtered[5], Cool < 6°C	125 mL	48 Hours
Total Organic Carbon[10]	P	Cool < 6°C, H2SO4 to pH<2	500 mL	28 Days
Total Kjeldahl Nitrogen	P	Cool < 6°C, H2SO4 to pH<2	500 mL	28 Days
Total Phosphorus	P	Cool < 6°C, H2SO4 to pH<2	500 mL	28 Days
Metals (Water)				
Hardness, Total	P	Cool < 6°C, HNO3 to pH<2	250 mL	6 Months
Iron, Total	P	Cool < 6°C, HNO3 to pH<2	500 mL	6 Months
Manganese, Total	P	Cool < 6°C, HNO3 to pH<2	500 mL	6 Months
Metals, Dissolved[9]	P	Cool < 6°C, HNO3 to pH<2	500 mL	6 Months

1. IDEXX (I) or Polyethylene (P).
2. Sample preservation is performed immediately upon sample collection.
3. Samples volumes are combined by preservative to minimize volumes and reduce container size and space.
4. Samples are analyzed as soon as possible after collection. The times listed are the maximum times that samples are held before sample preparation or analysis and still be considered valid.
5. Orthophosphate samples are field filtered within 15 minutes of sample collection. Individual filters are rinsed with collected sample prior to actual filling of the designated container.

6. Chlorophyll *a* and Pheophytin will be collected in amber containers.
7. Holding time for Chlorophyll-*a* was determined to be 24 days. EPA method 445, Section 8.3 states that samples can be analyzed up to 24 days after filtering, as long as they remain frozen. The 48 hours allotted for the samples to be filtered is not part of the 24 day holding time following filtration. NTMWD utilizes SM 10200 H for Chlorophyll-*a* and Pheophytin which has a different holding time compared to EPA method 445/446.
8. E.coli samples analyzed by SM 9223 B should always be processed as soon as possible and within 8 hours of sample collection. When transport conditions necessitate delays in delivery longer than 8 hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.
9. Metals, Dissolved includes aluminum, arsenic, copper, nickel and zinc.
10. NTMWD uses HCl for TOC preservation.

Sample Containers

The Authority utilizes commercially purchased plastic leak proof sample containers for all conventional, nutrient, and metal parameters. The sample containers are selected based on requirements from *40 CFR 136* and are both chemically and thermally preserved. Commercially purchased pre-sterilized plastic containers in 120 and/or 290 mL with sodium thiosulfate are used for collecting bacteriological samples. Certificates are maintained in a notebook by the Authority or by the laboratory manager. The Authority will provide the City of Sherman with the appropriate sample collection bottles.

NTMWD utilizes commercially purchased disposable plastic leak proof sample containers for the following conventional parameters: Total Organic Carbon, Chemical Oxygen Demand and metals (iron and manganese). For all other conventional parameters, NTMWD utilizes reusable plastic leak proof sample containers that have been cleaned in accordance with NTMWD's Labware Cleaning Procedures (36-084). All sample containers are selected based on requirements from *40 CFR 136* and are both chemically and thermally preserved. Commercially purchased pre-sterilized plastic containers in 120 and/or 290 mL with sodium thiosulfate are used by NTMWD for collecting bacteriological samples. Certificates of Analysis for both commercially purchased disposable plastic leak proof sample containers and pre-sterilized plastic containers in 120 and/or 290 mL with sodium thiosulfate are permanently maintained by NTMWD.

Processes to Prevent Contamination

Procedures in the TCEQ's *SWQM Procedures Manual* 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 C**. Flow and field worksheets comprise the field data record. 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
- ✓ Detailed observational data, including:
  - water appearance

- weather
- biological activity
- recreational activity
- unusual odors
- pertinent observations related to water quality or stream uses (e.g., exceptionally poor water quality conditions/standards not met; stream uses such as swimming, boating, fishing, irrigation pumps, etc.)
- watershed or in-stream activities (events impacting water quality, e.g., bridge construction, livestock watering upstream, etc.)
- specific sample information (number of sediments grabs, type/number of fish in a tissue sample, etc.)
- missing parameters (i.e., when a scheduled parameter or group of parameters is not collected)

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:

1. Write legibly in indelible ink.
2. Changes should be made by crossing out original entries with a single line, entering the changes, and initialing and dating the corrections.
3. 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 and appropriate sampling procedures may invalidate resulting data and may require corrective action. Corrective action may include for samples to be discarded and re-collected. It is the responsibility of the Authority's Project Manager, in consultation with the Authority's 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 TCEQ CRP Project Manager both verbally and in writing in the project progress reports and by completion of a corrective action plan (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.

- ✓ 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 collected in containers with prefixed printed labels that include much of the site information that does not change such as the Station ID, the Station Description, the parameter collected, designation and preservation if applicable. Sample collection date, time and samplers initials are marked in the field on the labels with an indelible marker. All 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., analysis(es)) to be performed

Sample Handling

Written SOPs have been developed for sample handling, sample receiving, and sample shipping. They are included in the QA Manual. The SOPs utilized for all Clean Rivers Program sampling include the following procedures:

During preparations for a sampling event, preliminary sample and event information is recorded on a COC form, leaving only the date, time and sample information to be recorded when the sample is collected.

1. Prior to the scheduled monitoring event(s), sample kits are prepared. The kits include sample containers with or without preservatives as required by the analysis method.
2. Samples are collected under protocols documented in the TCEQ's *SWQM Procedures Manual*. Samples are packed in loose ice in accordance with the preservation (or preserved according to) criteria listed in **Table B2.1** of this QAPP.
3. The date, time, collector and specific conductance (E. coli and, TDS/TSS, and anion sample containers only) information is completed on the sample container labels and the COC.
4. The ice chests containing the samples are secured until delivered to the laboratory. If the samples are left overnight in a vehicle, the vehicle will be locked and monitored periodically.
5. The samples are received in the laboratory in a designated area where the Sample Collector relinquishes the samples to the sample custodian who in turn inspects the containers and signs

the COC on the receiving line.

6. Each sample is logged into the Laboratory Information Management System (LIMS) and assigned a unique Sample ID Number. Information documented in the LIMS includes:

- ✓ Date Received
- ✓ Client
- ✓ Sample ID Number
- ✓ Sample Location
- ✓ Sample Source
- ✓ Collected by
- ✓ Collection Date
- ✓ Collection Time
- ✓ Analyses
- ✓ Time Sample Received
- ✓ Preservative
- ✓ Chain of Custody Number

7. The LIMS generates a label with the Sample ID Number, Analysis, Sample Location and Bottle ID Number which is placed on the sample container by the sample custodian.
8. Samples are then transferred to the laboratory storage facility by the sample custodian. Access to the storage facility is limited to authorized personnel only.
9. In the event that the Authority ships samples to LCRA for analyses, the samples to be shipped are recorded on a separate COC form with the original COC number written in the comment section. The samples along with the COC are then packed in an insulated shipping container with ice depending on the preservation requirements. The shipping container is then sealed, and labeled with LCRA's name and address. The sealed sample containers are then shipped via overnight delivery. LCRA is contacted by phone and/or e-mail informing them of the shipped sample(s) and when they should expect delivery.

Sample Tracking Procedure Deficiencies and Corrective Action

All deficiencies associated with COC procedures, as described in this QAPP, are immediately reported to the TCEQ CRP 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 Authority's CRP Project Manager in consultation with the Authority's CRP 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 Quarterly Progress Report. Corrective Action Plans will be prepared by the Authority's CRP QAO and submitted to TCEQ CRP Project Manager, along with the Quarterly 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 Texas Administrative*

Code, Chapter 307, in that data are generally 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. Additionally, analytical data which is intended for entry into the TCEQ's SWQMIS Database must be analyzed via a method listed on the laboratory's current NELAP FOA and in **Table A7.1** of this document. For those analytes which are not available for accreditation, such as chlorophyll-*a* and pheophytin, analysis method(s), reporting limit (LOQ), AWRL and quality data (including but not limited to LCS/LOQ % recovery, precision and bias when specified in **Table A7.1**) must be approved by a TCEQ CRP Project Manager prior to their submittal and consequent entry into the TCEQ's SWMQIS Database. 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 Authority's Laboratory Supervisor, who will make the determination and notify the Authority's CRP 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 Authority's CRP Project Manager. The Authority's CRP 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. However, when data is lost, its absence will be described in the data summary report submitted with the corresponding data set, and a corrective action plan (as described in section C1) may be necessary.

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

Field Blank – Field blanks are required for total metals-in-water samples when collected without sample equipment (i.e., as grab samples). For other types of samples, they are optional. A field blank is prepared in the field by filling a clean container with pure deionized water and appropriate preservative, if any, for the specific sampling activity being undertaken. Field blanks are used to assess contamination from field sources, such as airborne materials, containers, or preservatives. The frequency requirement for field blanks for total metals-in-water samples is specified in the *SWQM Procedures Manual*. Field blanks will be collected at a frequency of once per trip when metals-in-water samples are collected.

The analysis of field blanks should yield values lower than the LOQ. When target analyte concentrations are high, blank values should be lower than 5% of the lowest value of the batch.

Field blanks are associated with batches of field samples. In the event of a field blank failure for one or more target analytes, all applicable data associated with the field batch may need to be qualified as not meeting project QC requirements, and these qualified data will not be reported to the TCEQ. These data include all samples collected on that day during that sample run and should not be confused with the laboratory analytical batch.

Field Equipment Blank – Field equipment blanks are required for metals-in-water samples when collected using sampling equipment. Field equipment blank is a sample of analyte-free media which has been used to rinse common sampling equipment to check the effectiveness of decontamination procedures. It is collected in the same type of container as the environmental sample, preserved in the same manner and analyzed for the same parameter.

The analysis of field equipment blanks should yield values lower than the LOQ, or, when target analyte concentrations are very high, blank values must be less than 5% of the lowest value of the batch, or corrective action will be implemented.

Field equipment blanks are associated with batches of field samples. In the event of a field equipment blank failure for one or more target analytes, all applicable data associated with the field batch may need to be qualified as not meeting project QC requirements, and these qualified data will not be reported to the TCEQ. These data include all samples collected on that day during that sample run and should not be confused with the laboratory analytical batch.

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 Manual*. 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 A7.1**, 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, Table A7.1** 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 A7.1** 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 A7.1**, 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:

$$\%\boldsymbol{R} = {}^{\boldsymbol{S_R}}\!/_{\boldsymbol{S_A}} \times \mathbf{100}$$

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 multi-peak 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:

$$\%\boldsymbol{R} = {}^{\boldsymbol{S_R}}\!/_{\boldsymbol{S_A}} \times \mathbf{100}$$

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: (If other formulas apply, adjust appropriately.)

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

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.

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:

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

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 Authority 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 Authority's CRP Project Manager, in consultation with the Authority's CRP 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 Authority's CRP 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. Notations of 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 Authority's Laboratory QAO, who will discuss the problem with the Authority's CRP Project Manager. If applicable, the Authority's CRP Project Manager will include this information in the CAP and submit with the Quarterly Progress Report, which is submitted to the TCEQ CRP Project Manager.

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

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

All sampling equipment testing and maintenance requirements are detailed in the TCEQ's *SWQM Procedures Manual*. 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 TCEQ's *SWQM Procedures Manual*. 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

The Authority, LCRA, the City of Sherman, and the North Texas Municipal Water District purchase supplies, as needed for their laboratories. All participants will follow the guidelines below.

A vendor of testing or analytical supplies and materials is regarded as a resource to and as an extension of the laboratory. The standards of quality imposed on vendors are the same as those imposed on the laboratory.

The vendor is responsible for marking packing slips and containers of reagents, chemicals, and testing supplies with the name of the material, vendor's name and address, vendor's item number, quantity, material specification number, and date. This assures that the material is properly identified. Receiving documents and accompanying certifications are used as part of the receiving control procedures and show information necessary to identify the material being received. Incoming supplies are unpacked by laboratory personnel and checked against the packing slip and the purchase order. If any items are missing or damaged, the vendor is contacted immediately.

Standards, reagents, and chemicals are marked with the date received, the expiration date, if applicable, and placed in storage. All standards, chemicals, and reagents are logged into the Chemical Log with the lot number, date received, and technician's initials. Supplies are ordered on an "as needed" basis to avoid excessive inventories of reagents and chemicals and are used on a "first in, first out" basis.

Packing slips, certifications, and other receiving documents are maintained in a file as a reference of procurement. Chemical Logs are maintained as a trace reference for chemicals, standards, and reagents.

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 Unites States Geological Survey (USGS), International Boundary and Water Commission (IBWC), and the Unites 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 gauged observations 7 A.M. 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. Data obtained from the TWDB website will be submitted to the TCEQ under parameter codes 00052 – Reservoir Stage, 00053 – Reservoir Percent Full and 00054 – Reservoir Storage.

B10 DATA MANAGEMENT

Data Management Process

Water quality data that are generated by the Authority's SWQM staff are manually recorded onto Field Data Sheets (See **Appendix D**) and entered into the Authority's SWQM Database. Water quality data received in electronic format from the City of Sherman and the North Texas Municipal Water District are also manually entered into the Authority's SWQM Database.

Prior to data entry, the Authority's CRP QAO performs a manual/visual quality check of all SWQM data received from the Authority's SWQM staff and other entities monitoring under this QAPP. Following the visual quality check of the SWQM data, the Authority's CRP Data Entry Technician enters the data to the Authority's SWQM Database. The data is formatted, as specified in the most recent version of the TCEQ's *DMRG and SWQM Procedures Manual*. The Authority's CRP Data Manager then performs automated quality control checks to ensure that the SWQM data meets requirements, as specified on the SWQM Data Checklist (See **Appendix F**). Once these checks have been completed and any outliers have been identified, the Authority's CRP QAO researches and verifies those outliers. At a minimum, 10% of all SWQM data to be submitted is checked against the original Field Data Sheets and laboratory bench sheets by the Authority's CRP QAO. The Authority's CRP Data Manager then corrects any errors discovered during the Authority's CRP QAO's 10% check prior to the data submittal to TCEQ. The Authority's CRP Data Manager performs quality checks on the data utilizing the TCEQ's SWQMIS validation tool. The Authority's CRP Data Manager then electronically submits the datasets, data summaries and the SWQMIS Data Loading Validator Reports to the TCEQ CRP Project Manager. Once the TCEQ CRP Project Manager reviews the data for completeness and approval, he/she notifies the TCEQ CRP Data Manager, who uploads the data to the TCEQ's SWQMIS Database.

Data Dictionary

Terminology and field descriptions are included in the *DMRG*. For the purpose of verifying which source codes are included in this QAPP, a table outlining the codes to be used when submitting data under this QAPP is included below. **Submitting Entity** is the entity responsible for submitting data to the TCEQ. **Collecting Entity** is the entity responsible for actual sampling.

Name of Entity	Tag Prefix	Submitting Entity	Collecting Entity
Red River Authority of Texas	RR	RR	RR
City of Sherman	RR	RR	SH
North Texas Municipal Water District	RR	RR	NM

Data Errors and Loss

Prior to submittal of SWQM data to the TCEQ, automated and manual reviews of the data are performed. Reportable data meeting quality assurance requirements, as specified in the QAPP, but requiring further explanation are described in the Data Summary Report, which is submitted with each SWQM data submittal.

Record Keeping and Data Storage

1. Archives/Data File Backups

Backup of data is performed daily. Backup sets are maintained onsite for rapid recovery and replicated offsite as an additional safeguard against hazards which may affect the Authority's Main Office.

2. Disaster Recovery

Restoration of individual data files and source programs may be obtained from existing backups. A control duplicate of the CRP data volume contained on the Local Area Network (LAN) file server may be restored to any workstation or server upon recovery of the system.

3. Archives/Data Retention

Complete original data sets are archived on permanent media and retained indefinitely by the Authority. The Authority applies the rules of Generally Accepted Accounting Principles for internal controls and custody of funds in maintaining its data security and storage. That is, all software applications, source programs and archived data are retained in original form with a backup copy stored off-site. All data files are retained in their original media and format without modification.

Data Handling, Hardware, and Software Requirements

Hardware Considerations

Data management occurs within the framework of a LAN utilizing a Windows 2012R2 Server configured as follows: Dual Intel Xeon E5-2620 Processors 2.00 GHz, 15M Cache, 7.2GT/s QPI, Turbo, 6C 95W, 32GB RDIMM, 1600MT/s, Low Volt, Dual Rank, x4 Data Width, two 500GB 7.2K RPM SATA 3Gbps 3.5in Hot-plug Hard Drives connected via Hardware Raid 1. Workstation minimum configurations are as follows: Pentium IV class processors running at 2.8 GHz or higher, 80 GB Hard Drive, 500 Mb Ram, Windows XP SP2 OS. The LAN, Server and workstations are maintained by the Authority's IT Administrator under the direction of the General Manager.

Software Considerations

The Authority employs a complement of proprietary software applications and support utilities in the accomplishment of data management objectives. Software acquisitions and upgrades follow a defined procedure in that all critical software meets the data management objectives for the intended use, is compatible with other statistical and geographic software applications.

The Authority utilizes Microsoft Access 2007 as its primary database management software application to screen and manage all data entering the data management system. Paradox 7.0 is utilized as an alternate database management system to maintain compatibility with other entities.

Other applications considered essential to the data management system are Corel WordPerfect, Microsoft Office Suite 2007 for general word processing, presentations, graphics and subsidiary data management and analysis. AutoCAD 2012 and ArcGIS 10.1 are used for high end graphics and the Geographical Information System (GIS). StatSoft Statistica 12.0 for Windows is the primary statistical analysis software applied to processed data. Microsoft Excel 2007 is utilized as subsidiary analysis software and to maintain compatibility with other entities.

Information Resource Management Requirements

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

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	RRA	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Progress Report
Monitoring Systems Audit of RRA	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
Monitoring Systems Audit of Program Sub participants	Dates to be determined by the Authority (At least once per contract period)	RRA	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the RRA. RRA will report problems to TCEQ in Quarterly Progress Report.
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
Proficiency Testing	Biannually	RRA	Required to pass two out of three PT's annually to maintain certifications	Proficiency Providers Report results to TCEQ

Corrective Action Process for Deficiencies

Deficiencies are any deviation from this QAPP, *SWQM Procedures Manual*, 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 Authority's CRP 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 Authority's CRP Project Manager, in consultation with the Authority's CRP 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 TCEQ's CRP Project Manager both verbally and in writing in the project progress reports and by completion of a CAP.

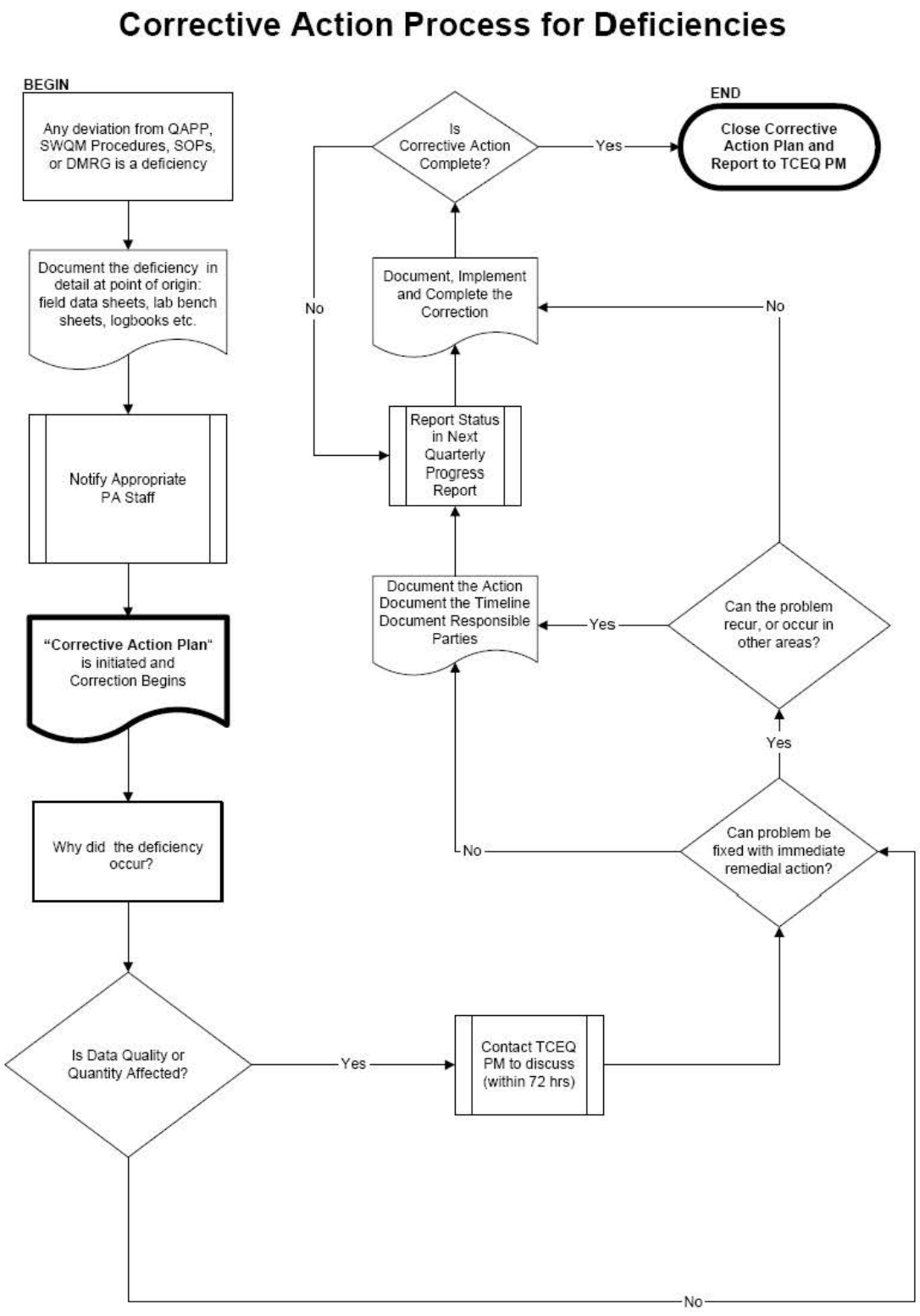
Corrective Action

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**).

Chart 2: 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 Authority's 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 Authority's CRP 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

Reports to the Red River Authority Project Management

The Authority's CRP Project Manager will be kept apprised of all project status, results of assessments and any significant QA issues as they occur. Additionally, written reports and daily time sheets will contain information regarding daily activities.

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 Authority'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 Authority, 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).

Contractor Evaluation – The Authority 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 QAPP.

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.

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 Authority's 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
- ✓ 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 Authority's CRP 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 Authority's CRP Data Manager with the data in the Data Summary (See **Appendix E**). 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

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	1,2,5		
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*	1		
Standards and reagents traceable		2,3,5	
Chain of custody complete/acceptable	1	2,3,5	
NELAP Accreditation is current		2,3,5	
Sample preservation and handling acceptable	1	2,3,5	
Holding times not exceeded	1	2,3,5	
Collection, preparation, and analysis consistent with SOPs and QAPP	1	2,3,5	
Field documentation (e.g., biological, stream habitat) complete	1		
Instrument calibration data complete	1	3	
Bacteriological records complete	1	3	
QC samples analyzed at required frequency		2,3,5	
QC results meet performance and program specifications		2,3,5	
Analytical sensitivity (LOQs / AWRLs) consistent with QAPP		2,3,5	
Results, calculations, transcriptions checked	1	2,3,5	2,4,5
Laboratory bench-level review performed		3	
All laboratory samples analyzed for all scheduled parameters		2,3,5	
Corollary data agree		2,3,5	4
Nonconforming activities documented	1,5	2,3,5	2,4,5
Outliers confirmed and documented; reasonableness check performed			2,4
Dates formatted correctly	1	2,3,5	2,4
Depth reported correctly and in correct units	1		2,4
TAG IDs correct			2,4
TCEQ Station ID number assigned	1		2,4
Valid parameter codes			2,4
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			2,4
Time based on 24-hour clock	1	2,3,5	2,4
Absence of transcription error confirmed	1	2,3,5	2,4
Absence of electronic errors confirmed			2,4
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)	1		2,4
Field instrument pre and post calibration results within limits			2,4,5
10% of data manually reviewed			2,4

1. Field Staff
2. RRA QAO
3. Laboratory Staff
4. RRA CRP Staff
5. Sub-tier Participant QAO

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 *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.

Red River Authority of Texas
Clean Rivers Program

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
- ✓ Ambient Water Reporting Limits (AWRL)
- ✓ limits of quantitation
- ✓ bias limits for Laboratory Control Samples (LCS)
- ✓ precision limits for Laboratory Control Sample Duplicates (LCSD)
- ✓ 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 Authority 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-A Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
FIELD PARAMETERS										
Days Since Precipitation Event (days)	Days	Other	TCEQ SOP V1	72053	NA[3]	NA	NA	NA	NA	Field
Depth of Bottom of Water Body at Sample Site	Meters	Water	TCEQ SOP V2	82903	NA[3]	NA	NA	NA	NA	Field
Oxygen, Dissolved (mg/L)	mg/L	Water	SM 4500-O G, TCEQ SOP V1	00300	NA[3]	NA	NA	NA	NA	Field
Evidence of Primary Contact Recreation (1 = Observed, 0 = Not Observed)	NU	Other	NA	89979	NA[3]	NA	NA	NA	NA	Field
Flow Mth 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	Water	TCEQ SOP V1	89835	NA[3]	NA	NA	NA	NA	Field
Flow Severity:1=No Flow, 2=Low, 3=Normal, 4=Flood, 5=High, 6=Dry	NU	Water	TCEQ SOP V1	01351	NA[3]	NA	NA	NA	NA	Field
Maximum Pool Width at Time of Study (Meters)	Meters	Other	TCEQ SOP V2	89864	NA[3]	NA	NA	NA	NA	Field
Maximum Pool Depth at Time of Study (Meters)	Meters	Other	TCEQ SOP V2	89865	NA[3]	NA	NA	NA	NA	Field
pH (Standard Units)	Standard Units	Water	TCEQ SOP V1, EPA 150.1	00400	NA[3]	NA	NA	NA	NA	Field
% Pool Coverage in 500 Meter Reach[1]	%	Other	TCEQ SOP V2	89870	NA[3]	NA	NA	NA	NA	Field
Pool Length, Meters[1]	Meters	Other	TCEQ SOP V2	89869	NA[3]	NA	NA	NA	NA	Field
Present Weather (1=CLEAR,2=PTC LDY,3=CLDY,4=R AIN,5=OTHER)	NU	Other	NA	89966	NA[3]	NA	NA	NA	NA	Field
Primary Contact, Observed Activity(# of People observed)	# of people observed	Other	NA	89978	NA[3]	NA	NA	NA	NA	Field
Reservoir Access Not Possible Level Too Low Enter 1 if Reporting	NS	Other	TCEQ Drought Guidance	00051	NA[3]	NA	NA	NA	NA	Field
Reservoir Percent Full[2]	% Reservoir Capacity	Water	TWDB	00053	NA[3]	NA	NA	NA	NA	Field
Reservoir Stage (Feet Above Mean Sea Level)[2]	FT Above MSL	Water	TWDB	00052	NA[3]	NA	NA	NA	NA	Field
Reservoir Storage (Acre-Feet)	Acre-Feet	Water	TWDB	00054	NA[3]	NA	NA	NA	NA	Field
Transparency, Secchi Disc (Meters)	meters	Water	TCEQ SOP V1	00078	NA[3]	NA	NA	NA	NA	Field

Table A7.1-A Continued Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
FIELD PARAMETERS										
Specific Conductance, Field (µS /cm @ 25°C)	µS /cm	Water	TCEQ SOP V1, SM 2510 B, EPA 120.1	00094	NA[3]	NA	NA	NA	NA	Field
Stream Flow Estimate (CFS)	cfs	Water	TCEQ SOP V1	74069	NA[3]	NA	NA	NA	NA	Field
Stream Flow, Instantaneous (CFS)	cfs	Water	TCEQ SOP V1	00061	NA[3]	NA	NA	NA	NA	Field
Temperature, Water (Degrees Celsius)	°C	Water	TCEQ SOP V1 SM 2550 B	00010	NA[3]	NA	NA	NA	NA	Field
Water Clarity, 1=Excellent 2=Good 3=Fair 4=Poor	NU	Water	NA	20424	NA[3]	NA	NA	NA	NA	Field
Water Color 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OT	NS	Water	NA	89969	NA[3]	NA	NA	NA	NA	Field
Water Odor (1=Sewage, 2=Oily/Chemical, 3=Rotten Eggs, 4=Musky, 5=Fishy, 6=None, 7=Other (Write in Comments))	NU	Water	NA	89971	NA[3]	NA	NA	NA	NA	Field
Water Surface (1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)	NU	Water	NA	89968	NA[3]	NA	NA	NA	NA	Field
WIND INTENSITY (1=Calm,2=Slight,3=Mod.,4=Strong)|	NS	Other	NA	89965	NA[3]	NA	NA	NA	NA	Field

[1] To be routinely reported when collecting data from perennial pools.
[2] As published by the Texas Water Development Board on their website http://waterdatafortexas.org/reservoirs/statewide.
[3] Reporting to be consistent with SWQM guidance and based on measurement capability.

References:

1. TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012, (RG-415)
2. TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

Table A7.1-B Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
24 HOUR FIELD PARAMETERS										
Dissolved Oxygen, # of Measurements in 24-Hours	#	Water	TCEQ SOP V1	89858	NA[1]	NA	NA	NA	NA	Field
Dissolved Oxygen, 24-Hour Average (mg/L) Minimum 4 Measurements	mg/L	Water	TCEQ SOP V1	89857	NA[1]	NA	NA	NA	NA	Field
Dissolved Oxygen, 24-Hour Maximum (mg/L) Minimum 4 Measurements	mg/L	Water	TCEQ SOP V1	89856	NA[1]	NA	NA	NA	NA	Field
Dissolved Oxygen 24-Hour Minimum (mg/L) Minimum 4 Measurements	mg/L	Water	TCEQ SOP V1	89855	NA[1]	NA	NA	NA	NA	Field
pH, # of Measurements in 24-Hours	#	Water	TCEQ SOP V1,	00223	NA[1]	NA	NA	NA	NA	Field
pH, S.U., 24-Hour Maximum Value	Standard Units	Water	TCEQ SOP V1,	00215	NA[1]	NA	NA	NA	NA	Field
pH, S.U., 24-Hour Minimum Value	Standard Units	Water	TCEQ SOP V1,	00216	NA[1]	NA	NA	NA	NA	Field
Specific Conductance, # of Measurements in 24-Hours	#	Water	TCEQ SOP V1	00222	NA[1]	NA	NA	NA	NA	Field
Specific Conductance, US/CM, Field, 24-Hour Average	µS /cm	Water	TCEQ SOP V1	00212	NA[1]	NA	NA	NA	NA	Field
Specific Conductance, US/CM, Field, 24-Hour Maximum	µS /cm	Water	TCEQ SOP V1	00213	NA[1]	NA	NA	NA	NA	Field
Specific Conductance, US/CM, Field, 24-Hour Minimum	µS /cm	Water	TCEQ SOP V1	00214	NA[1]	NA	NA	NA	NA	Field
Temperature, Water, # of Measurements in 24-Hours	#	Water	TCEQ SOP V1	00221	NA[1]	NA	NA	NA	NA	Field
Temperature, Water (Degrees Centigrade), 24-Hour Average	°C	Water	TCEQ SOP V1	00209	NA[1]	NA	NA	NA	NA	Field
Temperature, Water (Degrees Centigrade), 24-Hour Maximum	°C	Water	TCEQ SOP V1	00210	NA[1]	NA	NA	NA	NA	Field
Temperature, Water (Degrees Centigrade), 24-Hour Minimum	°C	Water	TCEQ SOP V1	00211	NA[1]	NA	NA	NA	NA	Field

[1] Reporting to be consistent with SWQM guidance and based on measurement capability.

References:

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

Table A7.1-C Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
CONVENTIONAL PARAMETERS										
Alkalinity, Total (mg/L as $CaCO_3$)	mg/L	Water	SM 2320 B	00410	20	20	NA	20	NA	RR
Carbon, Total Organic, NPOC (TOC) (mg/L)	mg/L	Water	SM 5310 B	00680	2	1	70-130	20	80-120	RR
Chloride (mg/L as Cl)	mg/L	Water	EPA 300.0	00940	5	10[1]	70-130	20	80-120	RR
Chlorophyll-A, Fluorometric Method, (ug/L)	ug/L	Water	EPA 445.0	70953	3	2	NA	20	80-120	RR
Chlorophyll-A, Spectrophotometric Acid Method, (ug/L)	ug/L	Water	EPA 446.0[3]	32211	3	2	NA	20	80-120	RR
Nitrate Nitrogen, Total (mg/L as N)	mg/L	Water	EPA 300.0	00620	0.05	0.05	70-130	20	80-120	RR
Nitrite Plus Nitrate-N, Total One Lab Determined Value (mg/L as N)	mg/L	Water	EPA 353.2	00630	0.05	0.04	70-130	15	90-110	RR
Nitrogen, Ammonia, Total (mg/L as N)	mg/L	Water	SM 4500-NH3D	00610	0.1	0.05	70-130	20	80-120	RR
Pheophytin-A, Fluorometric Method, (ug/L)	ug/L	Water	EPA 445.0	32213	3	2	NA	NA	NA	RR
Pheophytin-A, Spectrophotometric Acid Method, (ug/L)	ug/L	Water	EPA 446.0[3]	32218	3	2	NA	NA	NA	RR
Phosphorus, Total, Wet Method (mg/L as P)	mg/L	Water	EPA 365.4	00665	0.06	0.02	70-130	20	80-120	RR
Phosphorus, Total, Wet Method (mg/L as P)	mg/L	Water	SM 4500 P E[3]	00665	0.06	0.06	70-130	20	80-120	RR
Residue, Total Dissolved, Unspec. Calculation Based on Conductivity (mg/L)	mg/L	Water	Calculation	70294	NA	NA	NA	NA	NA	RR
Residue, Total Filterable (Dried at 180°C) (mg/L)	mg/L	Water	SM 2540 C	70300	10	50[2]	70-130	20	80-120	RR
Residue, Total Non-Filterable (mg/L)	mg/L	Water	SM 2540 D	00530	4	2.5	70-130	20	80-120	RR
Sulfate (mg/L as SO_4)	mg/L	Water	EPA 300.0	00945	5	10[1]	70-130	20	80-120	RR
Turbidity, Lab Nephelometric Turbidity Units (NTU)	NTU	Water	SM 2130 B	82079	0.5	0.5	70-130	20	80-120	RR

RR – Red River Authority of Texas Notes

[1] The LOQ for chloride and sulfate is higher than the established AWRL since concentrations for these parameters are extremely high in both the Canadian and Red River Basins and values are typically not observed at concentrations below 10 mg/L.

[2] The LOQ for total dissolved solids (TDS) is higher than the established AWRL since concentrations for this parameter are extremely high in both the Canadian and Red River Basins and values are typically not observed at concentrations below 50 mg/L.

[3] Listed as a backup in case instrument error would prevent samples from being analyzed within specified holding times

References:

1. United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
2. 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.)
3. TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012, (RG-415)
4. TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

Table A7.1-D Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
CONVENTIONAL PARAMETERS										
Alkalinity, Total (mg/L as $CaCO_3$)	mg/L	Water	SM 2320 B	00410	20	10	NA	20	NA	LC[1]
Carbon, Total Organic, NPOC (TOC) (mg/L)	mg/L	Water	SM 5310 D	00680	2	0.50	70-130	20	80-120	LC[1]
Chloride (mg/L as Cl)	mg/L	Water	EPA 300.0	00940	5	5	70-130	20	80-120	LC[1]
Chlorophyll-A, Fluorometric Method, (ug/L)	ug/L	Water	EPA 445.0	70953	3	2	NA	20	80-120	LC[1]
Nitrite Plus Nitrate-N, Total One Lab Determined Value (mg/L as N)	mg/L	Water	SM 4500 NO_3 H	00630	0.05	0.02	70-130	20	80-120	LC[1]
Nitrogen, Ammonia, Total (mg/L as N)	mg/L	Water	EPA 350.1	00610	0.1	0.02	70-130	20	80-120	LC[1]
Nitrogen, Kjeldahl, Total (mg/L as N)	mg/L	Water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	LC[1]
Pheophytin-A, Fluorometric Method, (ug/L)	ug/L	Water	EPA 445.0	32213	3	2	NA	NA	NA	LC[1]
Phosphorus, Total, Wet Method (mg/L as P)	mg/L	Water	EPA 365.4	00665	0.06	0.02	70-130	20	80-120	LC[1]
Sulfate (mg/L as SO_4)	mg/L	Water	EPA 300.0	00945	5	5	70-130	20	80-120	LC[1]

LC – Lower Colorado River Authority

[1] Listed as a backup in the event analysis could not be performed by the RR Laboratory.

[2] Listed as a backup in case instrument error would prevent samples from being analyzed within specified holding times

References:

1. United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
2. 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.)
3. TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012, (RG-415)
4. TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

Table A7.1-E Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
CONVENTIONAL PARAMETERS										
Alkalinity, Total (mg/L as $CaCO_3$)	mg/L	Water	SM 2320 B	00410	20	20	NA	20	NA	NM
Bromide (mg/L as Br)	mg/L	Water	EPA 300.0	71870	0.25	0.25	80-120	10	90-110	NM
Carbon, Total Organic, NPOC (TOC) (mg/L)	mg/L	Water	SM 5310 C	00680	2	0.50	70-130	20	80-120	NM
Chemical Oxygen Demand, 0.025N $K_2CR_2O_7$ (mg/L)	mg/L	Water	HACH 8000	00335	10	10	70-130	20	80-120	NM
Chloride (mg/L as Cl)	mg/L	Water	EPA 300.0	00940	5	1	70-130	20	90-110	NM
Chlorophyll-A, Spectrophotometric Acid Method, (ug/L)	ug/L	Water	SM 10200 H	32211	3	3	NA	20	80-120	NM
Nitrate Nitrogen, Total (mg/L as N)	mg/L	Water	EPA 353.2 (Calculation)	00620	0.05	N/A	70-130	20	80-120	NM
Nitrite Nitrogen, Total (mg/L as N)	mg/L	Water	EPA 353.2	00615	0.05	0.02	70-130	20	80-120	NM
Nitrite Plus Nitrate-N, Total One Lab Determined Value (mg/L as N)	mg/L	Water	EPA 353.2	00630	0.05	0.05	70-130	20	80-120	NM
Nitrogen, Ammonia, Total (mg/L as N)	mg/L	Water	EPA 350.1	00610	0.1	0.1	70-130	20	80-120	NM
Nitrogen, Kjeldahl, Total (mg/L as N)	mg/L	Water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	NM
OrthoPhosphate Phosphorus, (Diss. field filter <15 min)	mg/L	Water	EPA 365.3	00671	0.04	0.02	70-130	20	80-120	NM
Pheophytin-A, Spectrophotometric Acid Method, (ug/L)	ug/L	Water	SM 10200 H	32218	3	3	NA	NA	NA	NM
Phosphorus, Total, Wet Method (mg/L as P)	mg/L	Water	EPA 365.3	00665	0.06	0.02	70-130	20	80-120	NM
Residue, Total Dissolved, Unspec. Calculation Based on Conductivity (mg/L)	mg/L	Water	Calculation	70294	NA	NA	NA	NA	NA	NM
Residue, Total Filterable (Dried at 180°C) (mg/L)	mg/L	Water	SM 2540 C	70300	10	10	NA	20	80-120	NM
Residue, Total Non-Filterable (mg/L)	mg/L	Water	SM 2540 D	00530	4	2.5	NA	20	NA	NM
Residue, Volatile Non-Filterable (mg/L)	mg/L	Water	EPA 160.4	00535	4	2.5	NA	NA	NA	NM
Sulfate (mg/L as SO_4)	mg/L	Water	EPA 300.0	00945	5	1	70-130	20	90-110	NM
Turbidity, Lab Nephelometric Turbidity Units (NTU)	NTU	Water	EPA 180.1	82079	0.5	0.1	70-130	20	80-120	NM

NM – North Texas Municipal Water District

References:

1. United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
2. 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.)
3. TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012, (RG-415)
4. TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

Table A7.1-F Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
CONVENTIONAL PARAMETERS										
Turbidity, Lab Nephelometric Turbidity Units (NTU)	NTU	Water	SM 2130 B	82079	0.5	0.5	70-130	20	80-120	SH

SH – City of Sherman

References:

1. United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
2. 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.)
3. TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012, (RG-415)
4. TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

Table A7.1-G Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
BACTERIOLOGICAL PARAMETERS										
E. coli, Colilert[2], IDEXX, Method, MPN/100mL	MPN/100 mL	Water	SM 9223 B	31699	1	1	NA	.5[1]	NA	RR
E. coli, Colilert[2] IDEXX, Holding Time	Hours	Water	NA	31704	NA	NA	NA	NA	NA	RR
Enterococci, Enteroloert, IDEXX, MPN/100 ML[3]	MPN/100 mL	Water	IDEXX Enterolert®	31701	10	10	NA	.5[1]	NA	RR

RR – Red River Authority of Texas Notes

1. 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.
2. *E. coli* samples analyzed by SM 9223-B should always be processed as soon as possible and within eight hours. When transport conditions necessitate delays in delivery longer than six hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.
3. Enterococcus Samples should be diluted 1:10 for all waters.

References:

1. United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
2. 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.)
3. TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012, (RG-415)
4. TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

Table A7.1-H Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
BACTERIOLOGICAL PARAMETERS										
E. coli, Colilert[2], IDEXX, Method, MPN/100mL	MPN/100 mL	Water	IDEXX Colilert®	31699	1	1	NA	.5[1]	NA	NM
E. coli, Colilert[2] IDEXX, Holding Time	Hours	Water	NA	31704	NA	NA	NA	NA	NA	NM

NM – North Texas Municipal Water District Notes

1. 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.
2. *E. coli* samples analyzed by SM 9223-B should always be processed as soon as possible and within eight hours. When transport conditions necessitate delays in delivery longer than six hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

References:

1. United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
2. 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.)
3. TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012, (RG-415)
4. TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

Table A7.1-I Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
BACTERIOLOGICAL PARAMETERS										
E. coli, Colilert[2], IDEXX, Method, MPN/100mL	MPN/100 mL	Water	IDEXX Colilert®	31699	1	1	NA	.5[1]	NA	SH
E. coli, Colilert[2] IDEXX, Holding Time	Hours	Water	NA	31704	NA	NA	NA	NA	NA	SH

SH – City of Sherman Notes

1. 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.
2. *E. coli* samples analyzed by SM 9223-B should always be processed as soon as possible and within eight hours. When transport conditions necessitate delays in delivery longer than six hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

References:

1. United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
2. 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.)
3. TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012, (RG-415)
4. TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

Table A7.1-J Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
METALS IN WATER, DISSOLVED										
Aluminum, Dissolved (ug/L as Al)	ug/L	Water	EPA 200.8	01106	200	4	70-130	20	80-120	LC
			EPA 200.7	01106	200	50	70-130	20	80-120	LC
Arsenic, Dissolved (ug/L as As)	ug/L	Water	EPA 200.8	01000	5	2	70-130	20	80-120	LC
Copper, Dissolved (ug/L as Cu)	ug/L	Water	EPA 200.8	01040	1 for waters < 50 mg/L hardness 3 for waters ≥ 50 mg/L hardness	1	70-130	20	80-120	LC
Hardness, Total, Calculated (mg/L as $CaCO_3$)[1]	mg/L	Water	SM 2340 B	82394	5	1.32	NA	20	80-120	LC
Iron, Dissolved (ug/L as Fe)	ug/L	Water	EPA 200.7	01046	50	50	70-130	20	80-120	LC
Nickel, Dissolved (ug/L as Ni)	ug/L	Water	EPA 200.8	01065	10	1	70-130	20	80-120	LC
Zinc, Dissolved (ug/L as Zn)	ug/L	Water	EPA 200.8	01090	5	5	70-130	20	80-120	LC

LC – Lower Colorado River Authority

[1] Hardness is not used for regulatory purposes but is used to assess metals in water at inland sites (estuarine sites do not require hardness analysis).

References:

1. United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
2. 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.)
3. TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012, (RG-415)
4. TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

Table A7.1-K Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	LOQ Check Standard %Rec	Precision (RPD of LCS/LCSD)	Bias % Rec. of LCS	Lab
METALS IN WATER, DISSOLVED										
Hardness, Total (mg/L as $CaCO_3$)[1]	mg/L	Water	SM 2340 C	00900	5	5	NA	20	80-120	NM
Iron, Total (ug/L as Fe)	ug/L	Water	EPA 200.8	01045	300	200	70-130	20	80-120	NM
Manganese, Total (ug/L as Mn)	ug/L	Water	EPA 200.8	01055	50	1	70-130	20	80-120	NM

NM – North Texas Municipal Water District Notes

[1] Hardness is not used for regulatory purposes but is used to assess metals in water at inland sites (estuarine sites do not require hardness analysis).

References:

1. United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
2. 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.)
3. TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012, (RG-415)
4. TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

Red River Authority of Texas
Clean Rivers Program

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

Sample Design Rationale FY 2016

The sample design is based on the legislative intent of the Clean Rivers Program. 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 Authority coordinates closely with the TCEQ and other participants to ensure a comprehensive water monitoring strategy within the Red and Canadian Basins watersheds.

Based on evaluations of previous assessments and screening efforts by the TCEQ and the Authority, the hydrologic subdivisions of each basin have been prioritized according to the level of concern. Utilizing the current *2012 Texas Water Quality Integrated Report*, a priority list was prepared and presented for discussion at the Authority's Annual Coordinated Monitoring Meeting with the other monitoring entities and the TCEQ. This meeting was based on the need to maximize monitoring efforts in an attempt to expend the limited resources as prudently as possible. This approach enables comprehensive monitoring to occur on a rotational reach basis and completely encompasses the basins within the five-year basin management cycle.

Canadian River Basin

Monitoring in the Canadian River Basin will remain the same as in FY 2015 for all participating entities with the following exceptions detailed below.

Texas Commission on Environmental Quality (TCEQ)

The TCEQ Region 1 Office in Amarillo, Texas will make the following change:

Description	Station ID	Change(s)
Kiowa Creek at SH 15	10009	Dropping quarterly monitoring

Red River Authority of Texas

The Authority will make the following change:

Description	Station ID	Change(s)
Kiowa Creek at SH 15	10009	Adding quarterly monitoring

Additional Notes

The Authority is currently working with the Canadian River Municipal Water Authority (CRMWA) to reestablish their participation in the Clean Rivers Program. CRMWA is currently conducting monthly monitoring at two stations on Lake Meredith, Segment 0102.

Red River Basin

Monitoring in the Red River Basin will remain the same as in FY 2015 for all participating entities, with the following exceptions detailed below.

Red River Authority of Texas

The Authority will make the following change:

Description	Station ID	Change(s)
Lake Crook Mid Lake	10137	Dropping quarterly monitoring

Additionally, the Authority will be adding the following stations:

Description	Station ID	Change(s)
Corneliason Creek at FM 1897	10117	Adding quarterly monitoring
Big Pine Creek at FM 410	18513	Adding quarterly monitoring
Mustang Creek at Siebert Road	17504	Adding quarterly monitoring
Deaver Creek at US 82	17503	Adding quarterly monitoring
Middle Fork Pease River NE of Paducah	10169	Adding quarterly monitoring
Middle Fork Pease River at US 62/83	10170	Adding quarterly monitoring
North Fork Red River at FM 2473	10179	Adding quarterly monitoring

City of Sherman

The City of Sherman has no changes for FY2016 and will follow the same monitoring schedule as in FY2015.

North Texas Municipal Water District

The North Texas Municipal Water District will follow the same schedule as in FY 2015 with one exception:

Description	Station ID	Change(s)
Bois d'Arc Creek at FM 2945	21706	Adding monthly monitoring

Texas Commission on Environmental Quality (TCEQ)

TCEQ – Region 1

The TCEQ Region 1 Office in Amarillo, Texas will make the following changes:

Description	Station ID	Change(s)
Lake Mackenzie Near Intake Tower	10188	Dropping metals in water (x2/year)
Lake Mackenzie Near Intake Tower	10188	Increasing to quarterly monitoring
Lake Tanglewood Near Dam	10192	Adding metals in water (x2/year)

TCEQ – Region 3

The TCEQ Region 3 Office in Abilene, Texas will make the following change:

Description	Station ID	Change(s)
North Fork Pease River at US 62/83	10168	Adding quarterly monitoring

TCEQ – Region 5

The TCEQ Region 5 Office in Tyler, Texas will make the following change:

Description	Station ID	Change(s)
Lake Crook Mid Lake	10137	Adding quarterly monitoring

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; and
- systematic, regularly-scheduled short-term monitoring to screen water bodies for issues.

Task Description: **Monitoring Description –** The goal of the Performing Party's Clean Rivers Program monitoring is to provide quality assured data for water bodies throughout both the Canadian and Red River Basins in an effort to promote the accurate assessment of water quality. When possible, the Performing Party strives to accomplish this task by helping to ensure water quality monitoring within every assessment unit of all identified water bodies.

For FY 2016, the Performing Party will monitor and collect water quality samples for analysis from a minimum of 50 stations in the Canadian and Red River Basins. The monitoring schedule will be designed in such a way that a proportionate amount of sites will be visited each month allowing for the monitoring of each site once per quarter of the year.

In FY 2017, the Performing Party will monitor at a similar level of effort as in FY 2016. The actual number of sites, location, frequency, and parameters collected for FY 2017 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 Performing Party's QAPP.

All monitoring procedures and methods will follow the guidelines prescribed in the Performing Party's 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 - The Performing Party will hold an annual Coordinated Monitoring Meeting as described in the CRP Guidance. 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 to the monitoring schedule 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 schedules 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 include all types of monitoring and indicate the number of sampling events and the types of monitoring conducted in the quarter.

Deliverables and Due Dates:

September 1, 2015 through August 31, 2016

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - December 15, 2015; March 15 and June 15, 2016
B. Coordinated Monitoring Meeting - between March 15 and April 30, 2016
C. Coordinated Monitoring Meeting Summary of Changes - within 2 weeks of the meeting
D. Email notification that Coordinated Monitoring Schedule updates are complete - May 31, 2016

September 1, 2016 through August 31, 2017

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - September 15 and December 15, 2016; March 15 and June 15 and August 31, 2017
B. Coordinated Monitoring Meeting - between March 15 and April 30, 2017
C. Coordinated Monitoring Meeting Summary of Changes – within 2 weeks of the meeting
D. Email notification that Coordinated Monitoring Schedule updates are complete - May 31, 2017

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 TCEQ *SWQM Procedures Manual*. 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 in-stream 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.

TABLE B1.1
Sample Design and Schedule - FY 2016

Segment	TCEQ Region	Basin	Site Description	Station ID	Submitting Entity	Collecting Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0101	1	1	CANADIAN RIVER BRIDGE AT US 60-83 AT CANADIAN	10032	RR	RR	RT									4			4	4		4
0101	1	1	CANADIAN RIVER BRIDGE ON SH 70 NORTH OF PAMPA	10033	RR	RR	RT									4			4	4		4
0101A	1	1	DIXON CREEK AT SH 152 WEST OF RR2171 EAST OF BORGER	17045	RR	RR	RT									4			4	4		4
0101A	1	1	DIXON CREEK 150 M UPSTREAM OF HUTCHINSON COUNTY ROAD, UPSTREAM OF CANADIAN RIVER CONFLUENCE NE OF BORGER	10016	RR	RR	RT	2											2	2		2
0101B	1	1	ROCK CREEK 15 M DOWNSTREAM OF CHICKASAW RD BRIDGE IN ELECTRIC CITY NEAR BORGER	10024	RR	RR	RT									4			4	4		4
0101C	1	1	WHITE DEER CREEK AT JEEP TRAIL CROSSING APPROX 0.45 KM EAST OF THE DUNCAN RANCH COMPLEX AT THE END OF HUTCHINSON COUNTY ROAD 26	21174	RR	RR	RT									4			4	4		4
0102A	1	1	BIG BLUE CREEK 250 YDS UPSTREAM OF FM 1913 APPROXIMATELY 21 MI SE OF DUMAS	15270	RR	RR	RT									4			4	4		4
0103	1	1	CANADIAN RIVER BRIDGE AT US 87-287 NORTH OF AMARILLO	10054	RR	RR	RT												4	4		4
0103A	1	1	EAST AMARILLO CREEK 15 METERS UPSTREAM OF CITY OF AMARILLO RIVER ROAD WWTP OUTFALL	10017	RR	RR	RT									4			4	4		4

TABLE B1.1
Sample Design and Schedule - FY 2016

Segment	TCEQ Region	Basin	Site Description	Station ID	Submitting Entity	Collecting Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0103A	1	1	EAST AMARILLO CREEK IMMEDIATELY DOWNSTREAM OF US 287 NORTH OF AMARILLO	10018	RR	RR	RT									4			4	4		4
0103A	1	1	EAST AMARILLO CREEK AT LOOP 335 AND US 287 IN AMARILLO	21024	RR	RR	RT									4			4	4		4
0103A	1	1	THOMPSON PARK LAKE NORTH END OF NORTH LAKE 213 M W OF US 87 FRONTAGE RD AND 1.34 KM NORTH OF NE 24TH ST IN AMARILLO	15775	RR	RR	RT									4			4			4
0103C	1	1	UNNAMED TRIBUTARY OF WEST AMARILLO CREEK AT LOOP 335 EASTBOUND ACCESS ROAD 470 M EAST OF ITS INTERSECTION WITH FM/RM 1061 NORTHWEST OF AMARILLO	17056	RR	RR	RT									4			4	4		4
0104	1	1	WOLF CREEK BRIDGE AT SH 305 NORTH OF LIPSCOMB	10058	RR	RR	RT									4			4	4		4
0104	1	1	WOLF CREEK 50 M UPSTREAM OF FM 1454 APPROXIMATELY 27.4 KM/17 MI EAST OF LIPSCOMB	10059	RR	RR	RT									4			4	4		4
0199B	1	1	KIOWA CREEK AT SH 15 EAST OF DARROUZETT	10009	RR	RR	RT									4			4	4		4
0201D	5	2	BARKMAN CREEK 35 M EAST OF RICHMOND RD OVERPASS/FM 599 0.97 KM NW OF FM 559/HOLLY CREEK ROAD INTERSECTION 11.5KM NW OF TEXARKANA	15059	RR	RR	RT									4			4	4		4
0201A	5	2	MUD CREEK AT US 259 3.1 KM NORTH OF DE KALB	15319	RR	RR	RT	2								4			4	4		4

TABLE B1.1
Sample Design and Schedule - FY 2016

Segment	TCEQ Region	Basin	Site Description	Station ID	Submitting Entity	Collecting Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0202	5	2	RED RIVER DOWNSTREAM LAKE TEXOMA AT US 259 9.3 KM NORTH OF US 259/FM 114 INTERSECTION 21 KM NORTH OF DEKALB	10125	RR	RR	RT									4			4	4		4
0202	5	2	RED RIVER AT NORTHBOUND US 271 IN ARTHUR CITY 0.75 KM NORTH OF FM 197/US 271 INTERSECTION	10126	RR	RR	RT									4			4	4		4
0202	4	2	RED RIVER AT SH 78 355 M NORTHWEST OF FANNIN CR 200/SH 78 INTERSECTION AT TEXAS STATE LINE 10 KM NORTHEAST OF CITY OF RAVENNA	10127	RR	RR	RT									4			4			4
0202	4	2	RED RIVER AT US 75 NORTH OF DENISON	21031	RR	RR	RT									4			4	4		4
0202A	4	2	BOIS D' ARC CREEK AT FM 1396 NORTHWEST OF HONEY GROVE	20167	RR	NM	RT					12				12			12	12		12
0202A	4	2	BOIS D'ARC CREEK AT FM 409 NORTHWEST OF HONEY GROVE	21029	RR	NM	RT					12				12			12	12		12
0202A	4	2	BOIS D ARC CREEK AT FM 898/OAK HILL ROAD 1.4 KM NORTHEAST OF CITY OF WHITEWRIGHT	15036	RR	RR	RT									4			4	4		4
0202A	4	2	BOIS D'ARC CREEK AT SH 78 SOUTH OF BONHAM	18652	RR	RR	RT									4			4	4		4
0202A	4	2	BOIS D'ARC CREEK AT FM 2945 IN FANNIN COUNTY	21706	RR	NM	RT					12				12			12	12		12

TABLE B1.1
Sample Design and Schedule - FY 2016

Segment	TCEQ Region	Basin	Site Description	Station ID	Submitting Entity	Collecting Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0202C	5	2	PECAN BAYOU AT FM 1159 9.62 KM NORTHEAST OF CLARKSVILLE IN RED RIVER COUNTY	16001	RR	RR	RT									4			4	4		4
0202B	4	2	CORNELIASON CREEK AT FM 1897 NORTH OF BELLS	10117	RR	RR	RT									4			4	4		4
0202C	5	2	PECAN BAYOU AT BLANTON CREEK CEMETARY ROAD/RED RIVER CR 2235 11.65 KM NORTH OF CITY OF BAGWELL	14472	RR	RR	RT									4			4	4		4
0202D	5	2	PINE CREEK AT SOUTHBOUND US 271 APPROX 7.8 KM NORTH OF THE CITY OF PARIS PERMIT WQ001012-000 CAMPBELL SOUP SUPPLY COMPANY	10120	RR	RR	RT									4			4	4		4
0202D	5	2	SIX MILE CREEK AT FM 195 NORTHEAST OF PARIS	21298	RR	RR	RT									4			4	4		4
0202E	4	2	DEAN GILBERT LAKE NEAR THE DAM SOUTHWEST OF THE HWY 82 AND FM 1417 INTERSECTION IN SHERMAN TEXAS	21130	RR	SH	RT									4			4			4
0202E	4	2	POST OAK CREEK AT FIRST COUNTY ROAD CROSSING DOWNSTREAM SHERMAN WWTP 0.33 KM SOUTH OF E FM 1417/SH 11 INTERSECTION 5.75 KM SE OF SHERMAN	10114	RR	SH	RT									4			6	6		6
0202E	4	2	POST OAK CREEK AT FM 1417 0.25 KM WEST OF SH 11/FM 1417 INTERSECTION 5.3 KM SOUTHEAST OF SHERMAN	10115	RR	SH	RT									4			6	6		6
0202E	4	2	POST OAK CREEK AT FM 1417 0.95 KM SOUTH OF FM 1417/US 82 INTERSECTION 4.75 KM NORTHWEST OF SHERMAN	17599	RR	SH	RT									2			4	4		4

TABLE B1.1
Sample Design and Schedule - FY 2016

Segment	TCEQ Region	Basin	Site Description	Station ID	Submitting Entity	Collecting Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0202F	4	2	CHOCTAW CREEK AT SH 11 1.6 KM SOUTHEAST OF FM 1417/SH 11 INTERSECTION 7 KM SOUTHEAST OF SHERMAN	10111	RR	SH	RT									4			6	6		6
0202F	4	2	CHOCTAW CREEK AT LUELLA ROAD 7.3 KM SSE OF SHERMAN FIRST CROSSING UPSTREAM CONFLUENCE WITH POST OAK CREEK	10112	RR	SH	RT									4			6	6		6
0202F	4	2	CHOCTAW CREEK AT US 82 5.07KM DOWNSTREAM OF SH 56 EAST OF SHERMAN	18370	RR	SH	RT									4			6	6		6
0202G	5	2	SMITH CREEK AT SOUTHBOUND US 271 385 M UPSTREAM OF THE CONFLUENCE WITH PINE CREEK 7 KM NORTH OF CITY OF PARIS	17044	RR	RR	RT					4				4			4	4		4
0202G	5	2	SMITH CREEK AT LAMAR CR 31700 NEAR CITY OF PARIS	21026	RR	RR	RT					4				4			4	4		4
0202G	5	2	SMITH CREEK AT LOOP 286/US 82 IN THE CITY OF PARIS	21027	RR	RR	RT					4				4			4	4		4
0202H	5	2	BIG PINE CREEK SOUTH BANK AT FM 410 EAST/NORTH	18513	RR	RR	RT									4			4	4		4
0202I	5	2	LITTLE PINE CREEK AT FM 195	18514	RR	RR	RT									4			4	4		4
0202O	4	2	PICKENS LAKE MID LAKE AT HERMAN BAKER PARK 1.0 KM EAST OF FM 1417 AND 700 M NORTHEAST OF END OF SOUTHRIDGE LANE SOUTHWEST OF SHERMAN	16945	RR	SH	RT									4			4			4

TABLE B1.1
Sample Design and Schedule - FY 2016

Segment	TCEQ Region	Basin	Site Description	Station ID	Submitting Entity	Collecting Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0202J	4	2	SAND CREEK AT SH 56 1.35 KM WEST OF SH 56/US 75 INTERSECTION WEST OF SHERMAN	15446	RR	SH	RT									2			4	4		4
0203	4	2	LAKE TEXOMA NEAR BIG MINERAL ARM 4.1KM EAST OF US 377/OXFORD DRIVE INTERSECTION 1.5 KM E OF WEST SHORE 15 KM NORTHWEST OF POTTSBORO	10130	RR	RR	RT									4			4			4
0202L	4	2	HONEY GROVE CREEK AT FANNIN CR 2770	21030	RR	NM	RT					12				12			12	12		12
0202M	4	2	LAKE BONHAM APPROX 265 METERS NORTH AND 165 METERS EAST OF THE INTERSECTION OF FM 273 AND WESTVIEW DRIVE	21032	RR	NM	RT					12				12			12			12
0202N	5	2	HICKS CREEK APPROX 400 M UPSTREAM OF PINE CREEK CONFLUENCE AT PRIVATE ROAD 1.55 KM EAST OF US 271 10 KM NNE OF THE CITY OF PARIS	10121	RR	RR	RT									4			4	4		4
0202N	5	2	HICKS CREEK AT US 271 11 KM NORTH OF THE CITY OF PARIS	10122	RR	RR	RT									4			4	4		4
0203	4	2	LAKE TEXOMA AT US 377 O.42 KM NORTH OF TEXAS BANK ON US 377 8.05 KM NORTH OF GORDONVILLE	10131	RR	RR	RT									4			4			4
0203	4	2	LAKE TEXOMA-LITTLE MINERAL ARM AT BOAT RAMP AT SIMMONS SHORE IN PRESTON 4.5 KM E OF FM 120 5.5 KM N OF FM 406 12.5 KM NNW OF DENISON	15388	RR	NM	RT					12				12			12			12
0203	4	2	LAKE TEXOMA LITTLE MINERAL ARM SOUTHEAST OF PRESTON SHORE NEAR INTAKE STRUCTURE EQUIDISTANT BETWEEN SHORELINES 1.5 KM EAST OF FM 120	17480	RR	RR	RT									4			4			4

TABLE B1.1
Sample Design and Schedule - FY 2016

Segment	TCEQ Region	Basin	Site Description	Station ID	Submitting Entity	Collecting Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0203	4	2	LAKE TEXOMA 260 METERS DUE WEST FROM LAKE TEXOMA DAM 282 METERS EAST AND 392 METERS NORTH TO THE INTERSECTION OF FM 1310 AND NORTH SH 91 NORTH OF DENISON	20545	RR	NM	RT					12				12			12			12
0203C	4	2	MUSTANK CREEK AT SPALDING ROAD 0.47 KM WEST OF SPALDING ROAD/SIEBERT HILL LANE INTERSECTION 1.75 KM EAST OF SADLER	17504	RR	RR	RT									4			4	4		4
0203D	4	2	DEAVER CREEK AT US 82 EAST OF SADLER	17503	RR	RR	RT									4			4	4		4
0204	3	2	RED RIVER AT US 81 2.1 KM NORTH OF US 81/PARR ROAD INTERSECTION 6.5 KM NORTH OF RINGGOLD	10133	RR	RR	RT									4			4	4		4
0204	3	2	RED RIVER AT FM677 NORTHWEST OF SAINT JO	20168	RR	RR	RT									4			4	4		4
0204B	4	2	MOSS LAKE AT SPILLWAY 130 M WEST OF FM 1201 467 M NORTH OF FISH CREEK DAM INTAKE STRUCTURE 18.25 KM NORTHWEST OF GAINESVILLE	15447	RR	RR	RT									4			4			4
0205	3	2	RED RIVER BRIDGE ON IH 44/US 277/US 281 313 M NORTHEAST OF TEXAS SHORE NEAR MID BRIDGE 4.0 KM NORTHEAST OF CITY OF BURKBURNETT	10134	RR	RR	RT									4			4	4		4
0205	3	2	RED RIVER AT US 183/US 70 N 10.5 KM NORTH NORTHEAST OF OKLAUNION	16733	RR	RR	RT									4			4	4		4
0205A	3	2	WILDHORSE CREEK AT US 281/277/IH44 3.1 KM NORTHEAST OF BURKBURNETT	10096	RR	RR	RT									4			4	4		4

TABLE B1.1
Sample Design and Schedule - FY 2016

Segment	TCEQ Region	Basin	Site Description	Station ID	Submitting Entity	Collecting Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0206	3	2	PRAIRIE DOG TOWN FORK RED RIVER AT SH 6 12.75 KM NORTH OF QUANAH	10135	RR	RR	RT									4			4	4		4
0206A	3	2	GROESBECK CREEK AT SH6 NORTH OF QUANAH	20166	RR	RR	RT									4			4	4		4
0206C	3	2	NORTH GROESBECK CREEK AT FM 1166 NORTHWEST OF QUANAH	21297	RR	RR	RT									4			4	4		4
0207	1	2	LOWER PRAIRIE DOG TOWN FORK RED RIVER AT US 62-83 3.4 KM NORTH OF US 83/RR 2465 INTERSECTION 16 KM NORTH OF CHILDRESS	10136	RR	RR	RT									4			4	4		4
0207	1	2	LOWER PRAIRIE DOG TOWN FORK RED RIVER AT SH 207 10 KM SOUTHWEST OF FM 2272/SH 207 INTERSECTION 30.45 KM SOUTH OF CLAUDE	13637	RR	RR	RT									4			4	4		4
0207	1	2	LOWER PRAIRIE DOG TOWN FORK RED RIVER AT US 70 70 M SOUTHWEST OF THE NORTHERN TIP OF SOUTHBOUND US 70 BRIDGE 26.4 KM NORTH OF TURKEY	16037	RR	RR	RT									4			4	4		4
0207A	1	2	BUCK CREEK AT US 83 1.5 M NORTH OF US 83/SH 256 INTERSECTION 30.7 KM NORTH OF CHILDRESS 16.8 KM SOUTHWEST OF DODSON	15811	RR	RR	RT									4			4	4		4
0207A	1	2	BUCK CREEK IMMEDIATELY UPSTREAM OF RR 1547 IN COLLINGSWORTH COUNTY WEST OF WELLINGTON	20366	RR	RR	RT									4			4	4		4
0210	3	2	FARMERS CREEK RESERVOIR/NOCONA LAKE MID LAKE NEAR DAM 1.3 KM SW OF OAK SHORES ROAD/FM 2953 INTERSECTION 0.36 KM SOUTH OF MID DAM	10139	RR	RR	RT					4				4			4			4

TABLE B1.1
Sample Design and Schedule - FY 2016

Segment	TCEQ Region	Basin	Site Description	Station ID	Submitting Entity	Collecting Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0211	3	2	LITTLE WICHITA RIVER AT FM 2332 0.63 KM UPSTREAM FROM MOUTH AT RED RIVER CONFLUENCE 9.2 KM NORTHWEST OF RINGGOLD	10140	RR	RR	RT									4			4			4
0212	3	2	LAKE ARROWHEAD MID LAKE NEAR DAM 609 M SOUTH OF MID DAM 765 M SE OF LITTLE WICHITA R INTAKE STRUCTURE 14 KM NE OF SCOTLAND	10142	RR	RR	RT									4			4			4
0213	3	2	LAKE KICKAPOO NEAR MID DAM 521 M SOUTH OF NORTH FORK LITTLE WICHITA RIVER INTAKE STRUCTURE 13.8 KM SOUTH OF US 82/SH 25 INTERSECTION	10143	RR	RR	RT									4			4			4
0214	3	2	WICHITA RIVER AT FM 368 325 M NORTH OF FM 368/FM 1206 INTERSECTION 7.38 KM SOUTHWEST OF CITY OF IOWA PARK 9.15 KM NORTH OF HOLLIDAY	10154	RR	RR	RT									4			4	4		4
0214	3	2	WICHITA RIVER AT SH 25 1.3 KM NORTH OF SH 258/SH 25 INTERSECTION 14.5 KM NORTHWEST OF CITY OF HOLLIDAY	10155	RR	RR	RT									4			4	4		4
0214	3	2	WICHITA RIVER AT FM 810 1.25 KM SOUTH OF FM 1740/FM 810 INTERSECTION 9.65 KM WEST OF BYERS	10145	RR	RR	RT									4			4	4		4
0214	3	2	WICHITA RIVER AT END OF EASTLAND LANE 0.75 KM SE OF RIVER ROAD/EASTLAND LANE INTERSECTION 5.5 KM NORTH NORTHEAST OF WICHITA FALLS	10148	RR	RR	RT									4			4	4		4
0214	3	2	WICHITA RIVER AT SH 240 345 M NORTHWEST OF SH 240/EASTSIDE DRIVE/FRONT STREET INTERSECTION IN WICHITA FALLS	10150	RR	RR	RT									4			4	4		4
0214A	3	2	BEAVER CREEK AT FM 2326 2.0 KM SOUTHWEST OF SH 25/FM 2326 INTERSECTION 22 KM NORTHWEST OF HOLLIDAY	15120	RR	RR	RT	2								4			4	4		4

TABLE B1.1
Sample Design and Schedule - FY 2016

Segment	TCEQ Region	Basin	Site Description	Station ID	Submitting Entity	Collecting Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0214A	3	2	BEAVER CREEK AT US 283/US183 2.23 KM SOUTH OF FM 1763/US 283 INTERSECTION 22.1 KM SOUTH SOUTHEAST OF VERNON	15121	RR	RR	RT									4			4	4		4
0214B	3	2	BUFFALO CREEK AT FM 1814/BELL ROAD 3.6 KM SOUTH OF CITY OF IOWA PARK	10097	RR	RR	RT									4			4	4		4
0214B	3	2	BUFFALO CREEK AT COLEMAN PARK ROAD2.95 KM SOUTHWEST OF IOWA PARK 1.7 KM UPSTREAM OF FM 368	16036	RR	RR	RT									4			4	4		4
0214C	3	2	HOLLIDAY CREEK AT HARDING STREET 97 M EAST OF WILLIAMS AVENUE/HARDING STREET INTERSECTION IN WICHITA FALLS	10095	RR	RR	RT									4			4	4		4
0214C	3	2	HOLLIDAY CREEK AT WICHITA FALLS COUNTRY CLUB GOLF COURSE APPROX 120 METERS NORTH AND 10 METERS WEST OF THE INTERSECTION OF BRIDWELL STREET AND 30TH STREET IN WICHITA FALLS	21025	RR	RR	RT									4			4	4		4
0214E	3	2	SOUTH CANAL 80 M DOWNSTREAM OF LAKE DIVERSION SPILLWAY NEAR DUNDEE	18831	RR	RR	RT									4			4	4		4
0214F	3	2	UNNAMED TRIBUTARY OF BUFFALO CREEK AT COLEMAN PARK ROAD DOWNSTREAM OF THE CITY OF IOWA PARK WWTP	21172	RR	RR	RT									4			4	4		4
0215	3	2	DIVERSION LAKE NEAR DAM 0.64 KM NORTHWEST OF SPILLWAY FACE 390 M WEST OF DAM EQUIDISTANT BETWEEN SHORELINES 22.8 KM WEST OF HOLLIDAY	10157	RR	RR	RT									4			4			4
0216	3	2	WICHITA RIVER AT US 183/US 283 NEAR LAKE KEMP DAM 10.7 KM NORTH US 82/US 283 INTERSECTION 9.8 KM NORTH OF MABELLE	10158	RR	RR	RT									4			4	4		4

TABLE B1.1
Sample Design and Schedule - FY 2016

Segment	TCEQ Region	Basin	Site Description	Station ID	Submitting Entity	Collecting Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0217	3	2	LAKE KEMP NEAR DAM 0.80 KM SW OF WATER INTAKE STRUCTURE AT WICHITA RIVER 0.72 KM NORTH OF WILLINGHAM LOOP 1.64 KM WEST OF US 283	10159	RR	RR	RT									4			4			4
0218	3	2	NORTH WICHITA RIVER AT FM 1919 5.25 KM NORTHWEST OF BAYLOR CR 129/FM 1919 INTERSECTION 16.8 KM NORTHWEST OF SEYMOUR	10161	RR	RR	RT									4			4	4		4
0218	3	2	NORTH WICHITA RIVER AT SH 6 19KM SOUTH OF CROWELL AND 7.5 KM NORTH OF TRUSCOTT	10162	RR	RR	RT									4			4	4		4
0218	3	2	NORTH FORK WICHITA RIVER 6 KM DOWNSTREAM OF COTTONWOOD CREEK 2.04KM UPSTREAM OF COTTLE CR 493 NEAR PADUCAH	15119	RR	RR	RT									4			4	4		4
0218A	2	2	MIDDLE WICHITA RIVER 240 M UPSTREAM OF FARRER CREEK 24.25 KM EAST OF US 83/FM 1168 INTERSECTION 30.15 KM NORTHEAST OF GUTHRIE	14900	RR	RR	RT									4			4	4		4
0219	3	2	LAKE WICHITA NEAR MID DAM 376 M SE OF END OF CITY ACCESS RD IN WICHITA FALLS 2.94KM SW OF SOUTHWEST PKWY/LAKE PARK DR INTERSECTION	10163	RR	RR	RT									4			4			4
0220	3	2	PEASE RIVER AT FM 104/RR 104 16.7 KM SOUTH OF KIRKLAND	10167	RR	RR	RT									4			4	4		4
0221	3	2	PEASE RIVER MIDDLE FORK 0.46 KM UPSTREAM FROM CONFLUENCE WITH NORTH FORK 32 KM NORTHEAST OF PADUCAH	10169	RR	RR	RT									4			4	4		4
0221	3	2	PEASE RIVER MIDDLE FORK AT US 62 / US 83 SOUTH OF CHILDRESS	10170	RR	RR	RT									4			4	4		4

TABLE B1.1
Sample Design and Schedule - FY 2016

Segment	TCEQ Region	Basin	Site Description	Station ID	Submitting Entity	Collecting Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0222	1	2	SALT FORK RED RIVER 80 M DOWNSTREAMM OF US 83 AT SOUTH BANK 11 KM NORTH OF WELLINGTON	10171	RR	RR	RT									4			4	4		4
0224	1	2	NORTH FORK RED RIVER AT US 83 4.25 KM NORTH OF SHAMROCK	10178	RR	RR	RT									4			4	4		4
0224	1	2	NORTH FORK RED RIVER BRIDGE AT FM 2473 SOUTHWEST OF WHEELER	10179	RR	RR	RT									4			4	4		4
0224A	1	2	MCCLELLAN CREEK AT SH 273 0.22 KM SOUTH OF SH 273/HUDGINS ROAD INTERSECTION 10.5 KM NORTH OF CITY OF MCLEAN	10064	RR	RR	RT									4			4	4		4
0226	3	2	SOUTH FORK WICHITA RIVER AT SH 6 6.7 KM NORTH OF BENJAMIN	10185	RR	RR	RT									4			4	4		4
0230	3	2	PEASE RIVER AT US 287 0.91 KM SOUTHEAST OF RR 925/US 287 INTERSECTION 4.6 KM NORTHWEST OF DOWNTOWN VERNON	10166	RR	RR	RT									4			4	4		4
0230	3	2	UPPER PEASE/NORTH FORK PEASE RIVER AT US 283 3 KM NORTH OF VERNON	10165	RR	RR	RT									4			4	4		4
0230A	3	2	PARADISE CREEK AT US 287 3.75 KM EAST OF VERNON	10094	RR	RR	RT									4			4	4		4
0299A	1	2	SWEETWATER CREEK AT RR 592/FM 592 3.33 KM NORTH OF SH 152/RR 592 INTERSECTION 14.15 KM EAST OF WHEELER	10070	RR	RR	RT									4			4	4		4

TABLE B1.1
Sample Design and Schedule - FY 2016

Segment	TCEQ Region	Basin	Site Description	Station ID	Submitting Entity	Collecting Entity	Monitoring Type	24 Hr DO	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metals Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Indicator Bacteria	Inst Flow	Fish Tissue	Field
0299A	1	2	SWEETWATER CREEK AT US 83 6.25 KM NORTH NORTHWEST OF WHEELER	10072	RR	RR	RT									4			4	4		4

Segment: State river segment where station is located

Region: TCEQ Region where station is located
Basin: (1) Canadian (2) Red
Site Description: Description of sampling site
Station ID: TCEQ Station ID numbers

Collecting Entity: Entity conducting surface water quality monitoring

(RR) Red River Authority of Texas
(SH) City of Sherman
(NM) North Texas Municipal Water District

Metals Water: Samples collected by NTMWD will be analyzed by NTMWD. Samples collected by the Authority will be analyzed by LCRA.
Conventional: Samples of nutrients, minerals and dissolved calcium collected and analyzed by laboratory
Ind Bact: Indicator Bacteria
Inst Flow: Instantaneous flow measurement at time of sampling
Field: Parameters measured in the field; i.e. temperature, pH, dissolved oxygen, conductivity, etc.

Critical vs. non-critical measurements

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

Red River Authority of Texas
Clean Rivers Program

Appendix C:
Station Location Maps

Station Location Maps

Maps of stations monitored by the Authority are provided below. The maps were generated by the Authority. 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:

Allen M. Pappas
Red River Authority CRP Project Manager
(940) 723-8697

Figure 1-1

Canadian River Basin
Reach I
FY2016

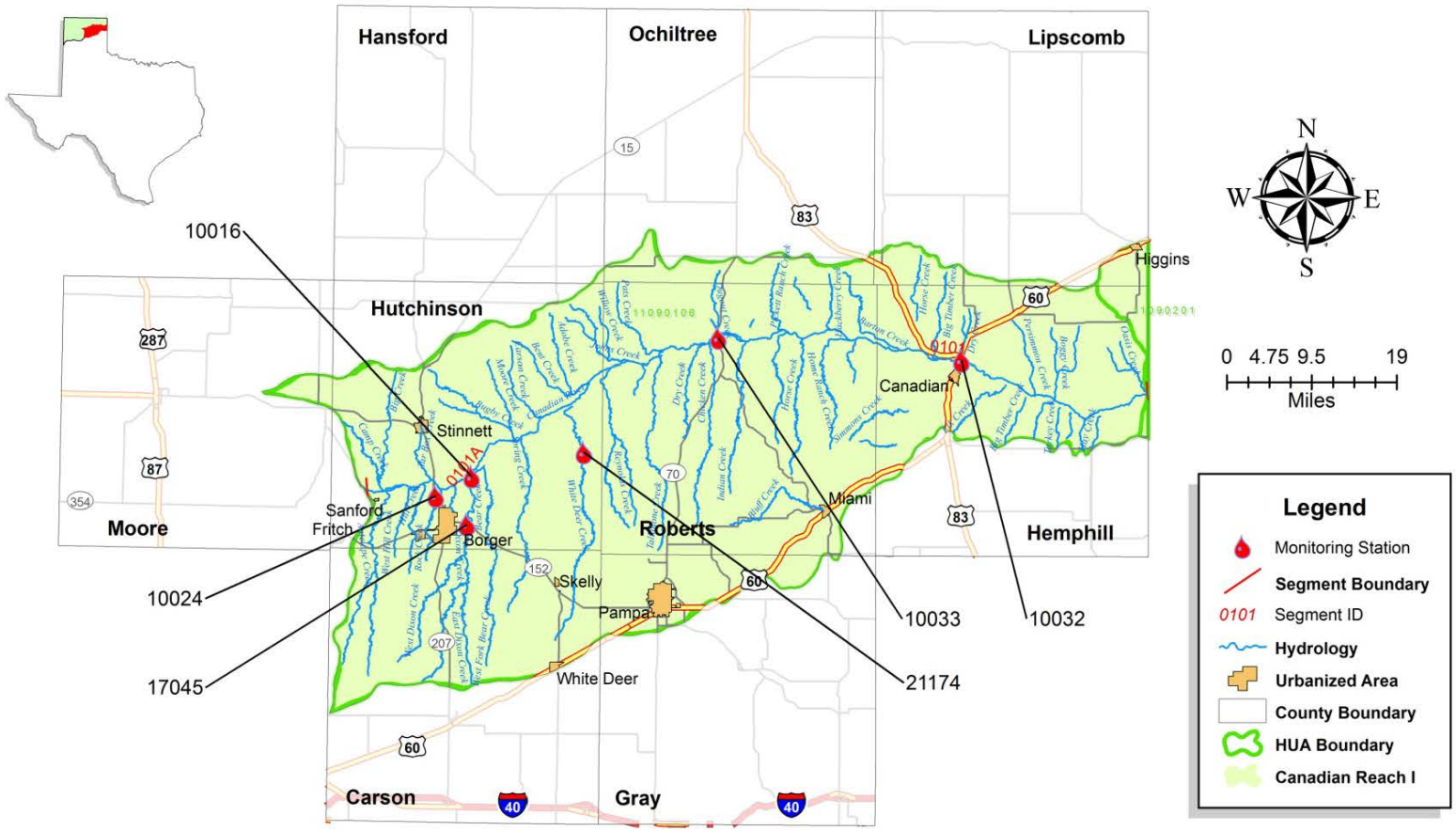


Figure 1-2

Canadian River Basin
Reach II
FY2016

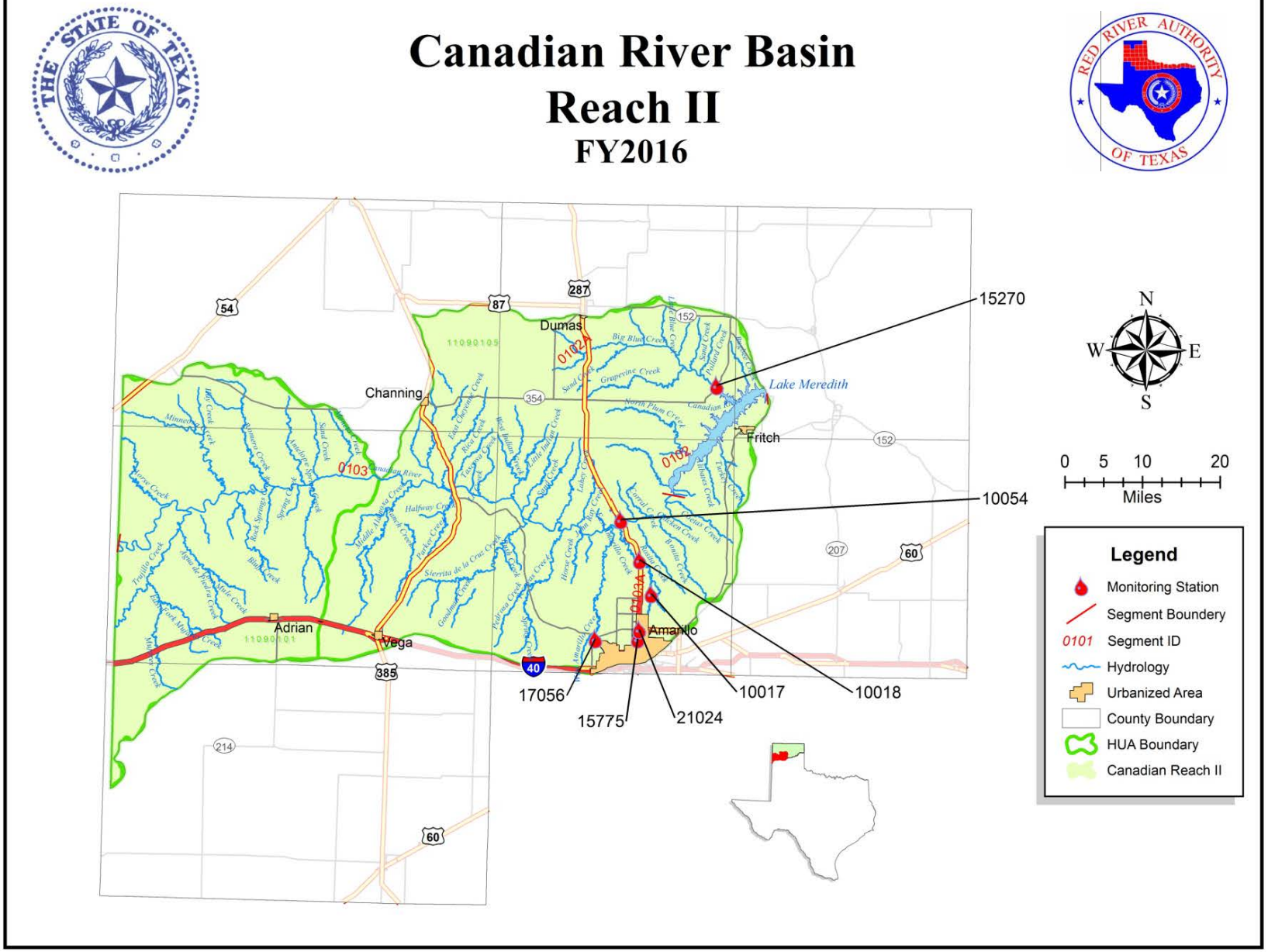


Figure 1-3

Canadian River Basin
Reach III
FY2016

N
W E
S

0 4.75 9.5 19
Miles

Legend

- Monitoring Station
- Segment Boundary
- 0101 Segment ID
- Hydrology
- Urbanized Area
- County Boundary
- HUA Boundary
- Canadian Reach III

This Reach Monitored by TCEQ Field Office.

Figure 1-4

Canadian River Basin
Reach IV
FY2016

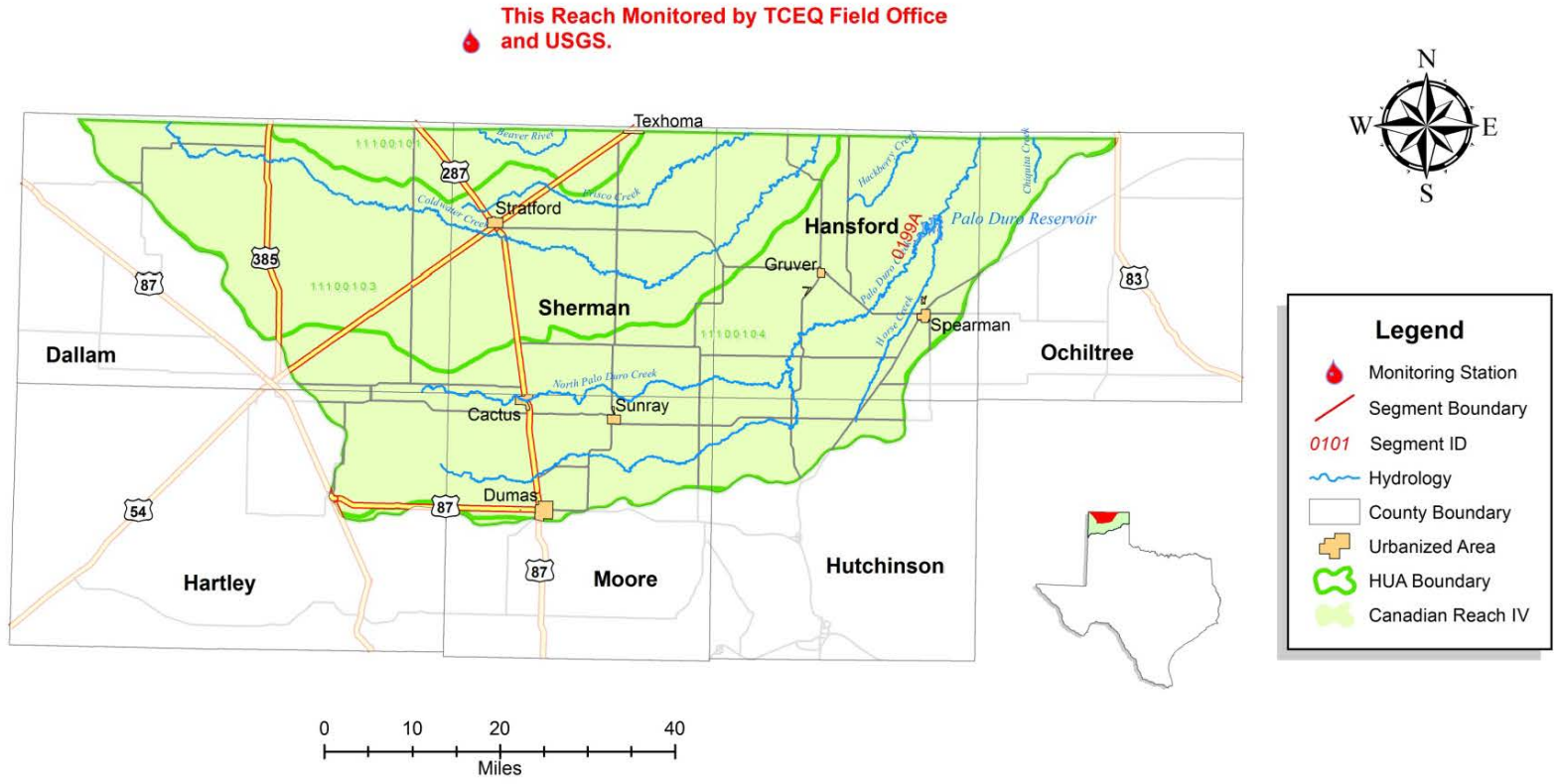


Figure 1-5

Canadian River Basin
Reach V
FY2016

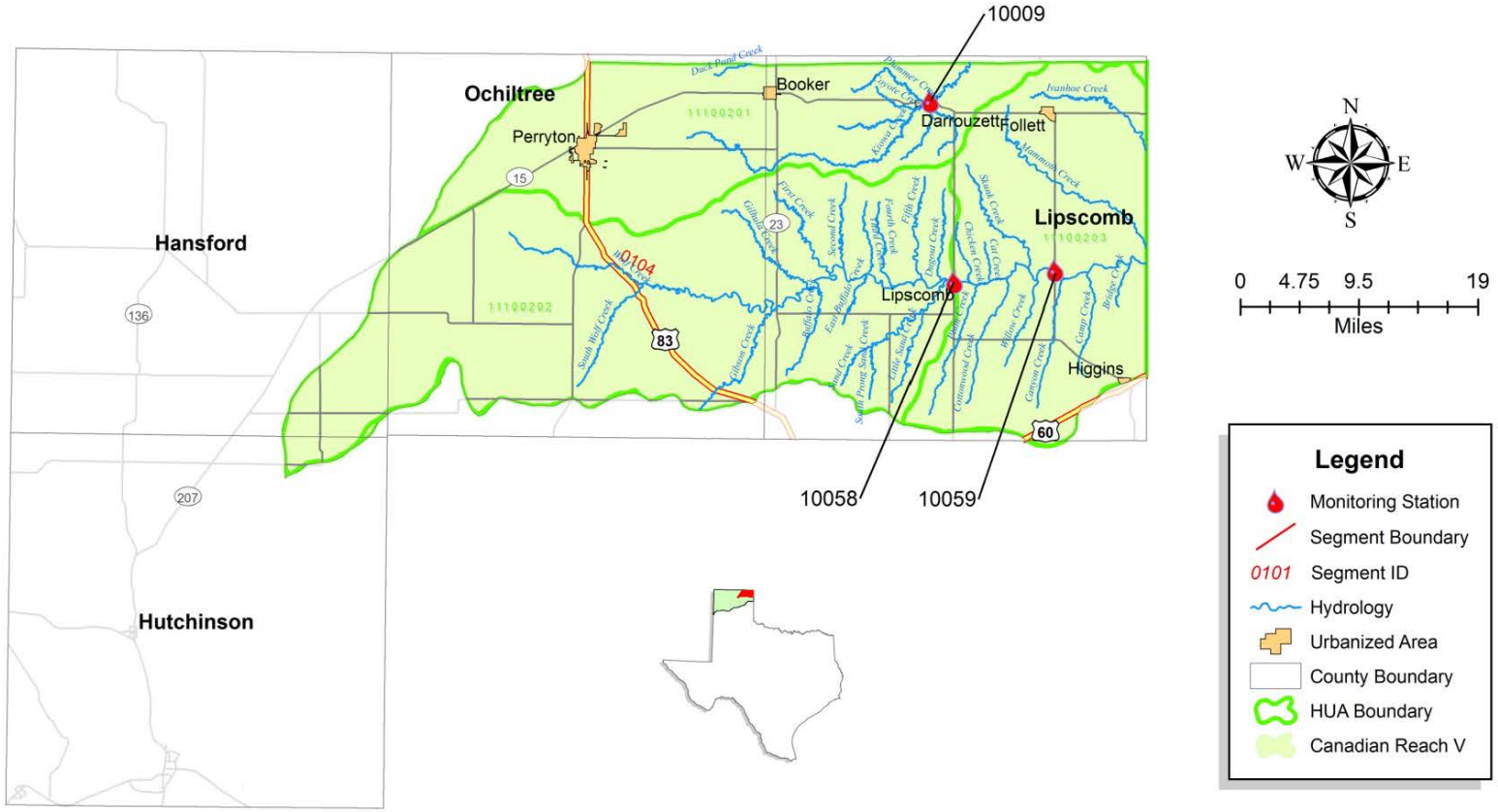
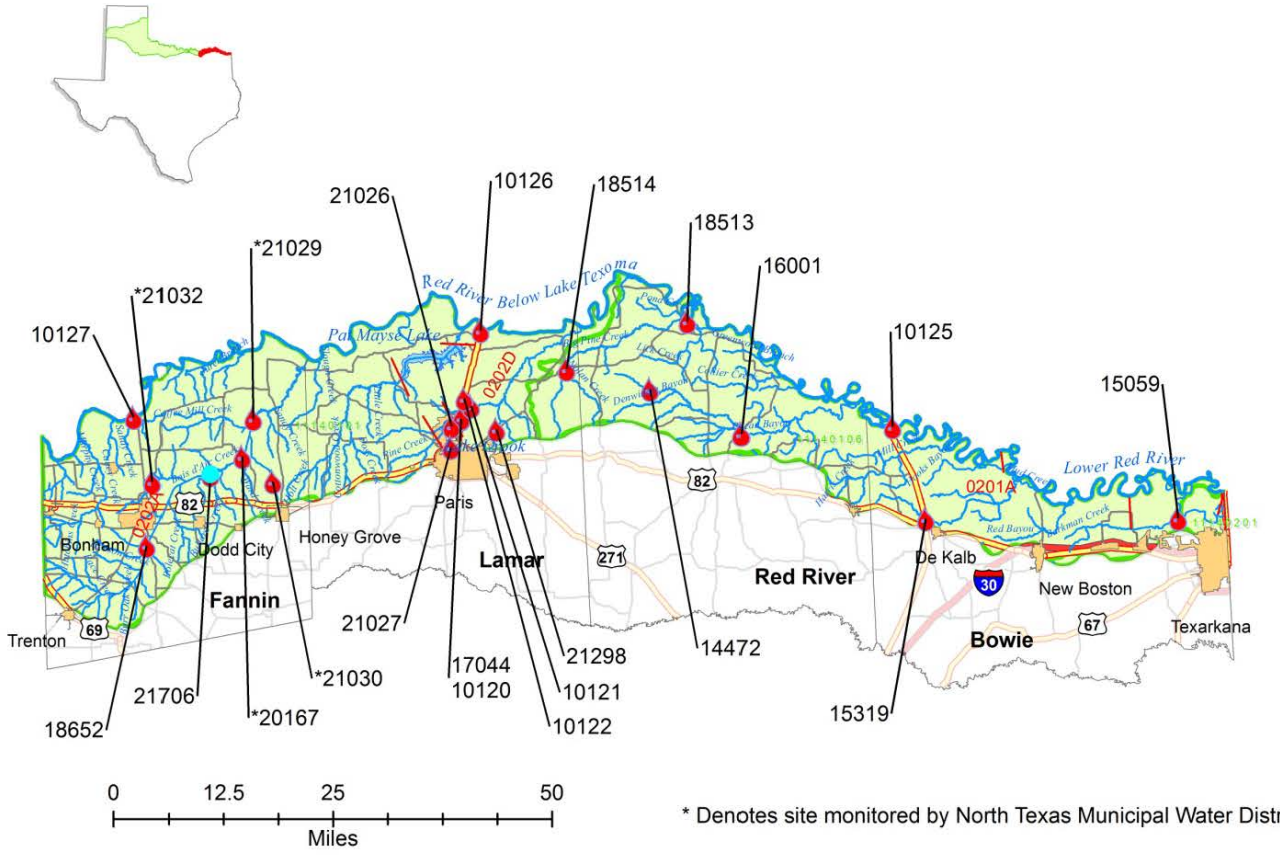


Figure 2-1.1

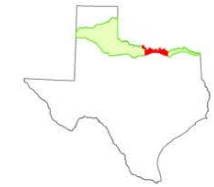
Red River Basin
Lower Reach I
FY2016

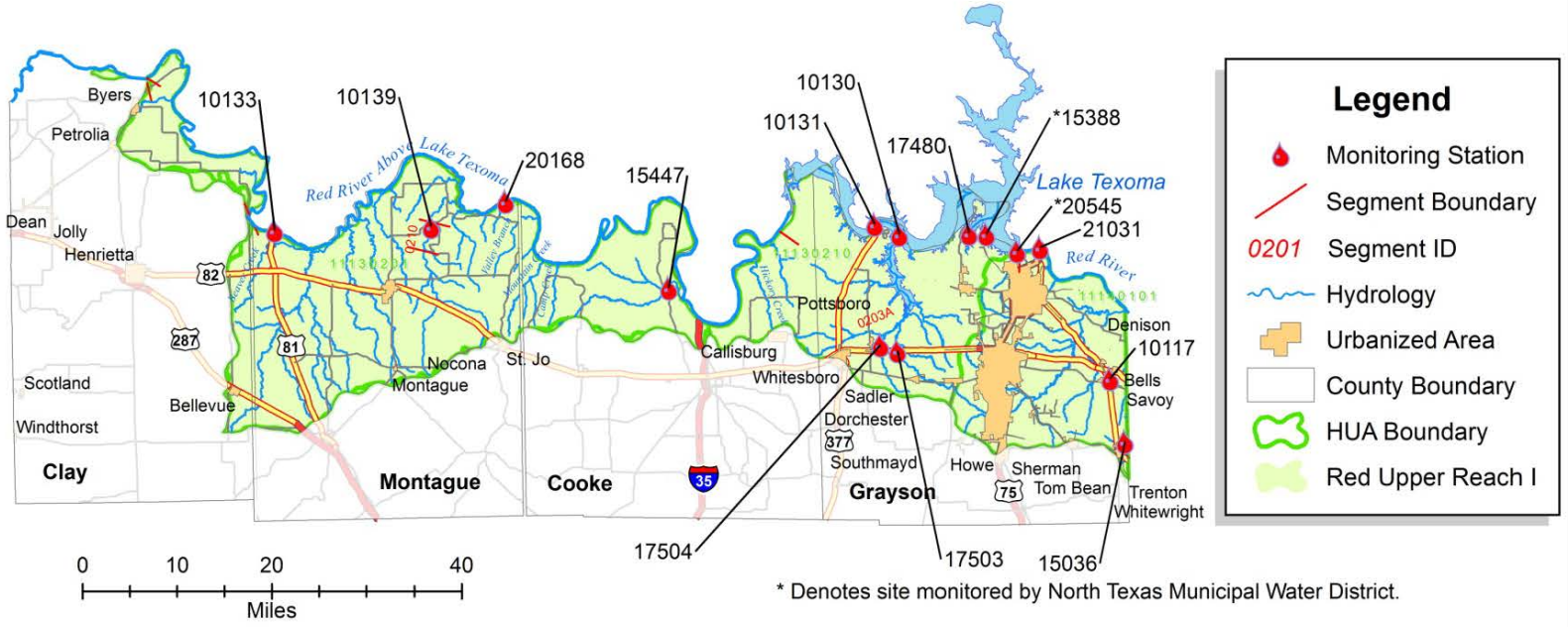


* Denotes site monitored by North Texas Municipal Water District.

Figure 2-1.2

Red River Basin
Upper Reach I
FY2016

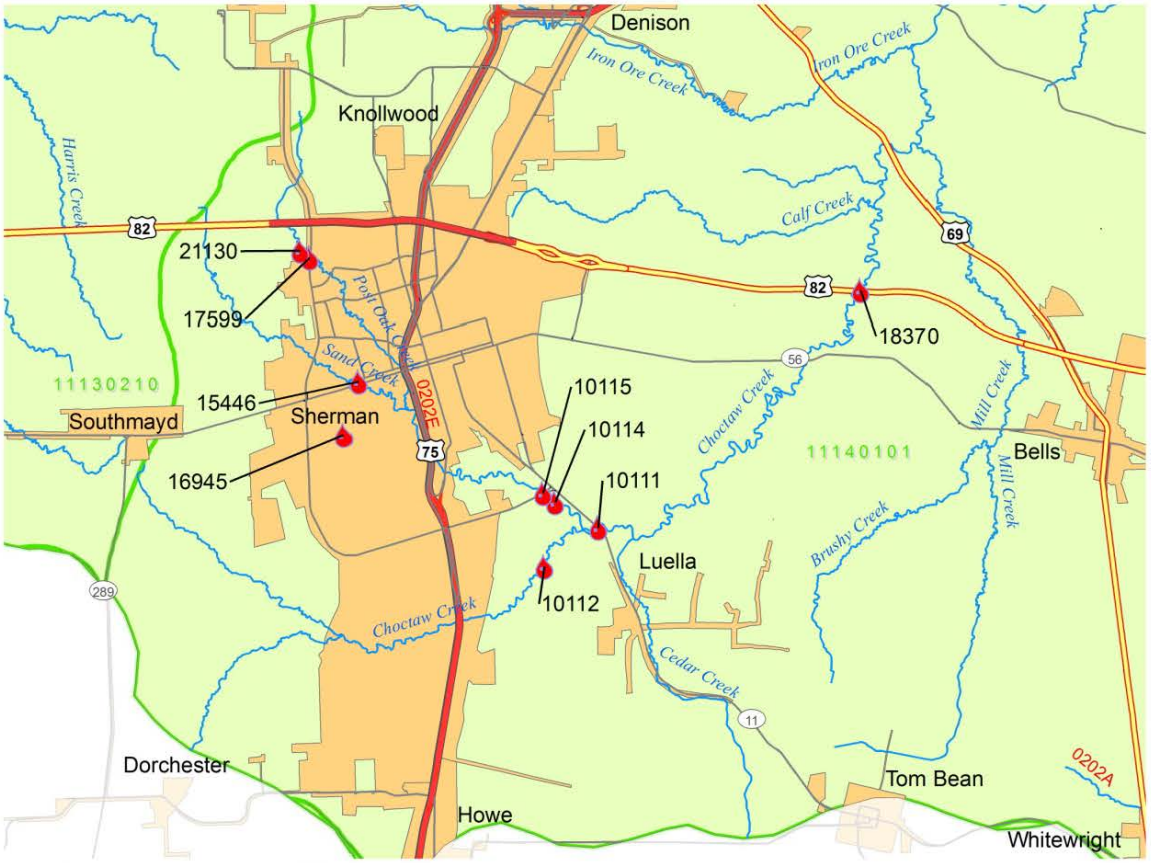




* Denotes site monitored by North Texas Municipal Water District.

Figure 2-1.3

Red River Basin
Upper Reach I
(Sites Monitored by City of Sherman)
FY2016



N
W E
S

Legend

- Monitoring Station
- Segment Boundary
- 0201 Segment ID
- Hydrology
- Urbanized Area
- County Boundary
- HUA Boundary
- Red Upper Reach I

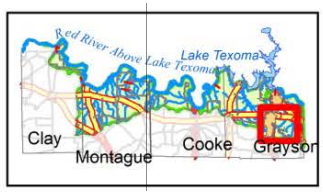


Figure 2-2

Red River Basin
Reach II
FY2016

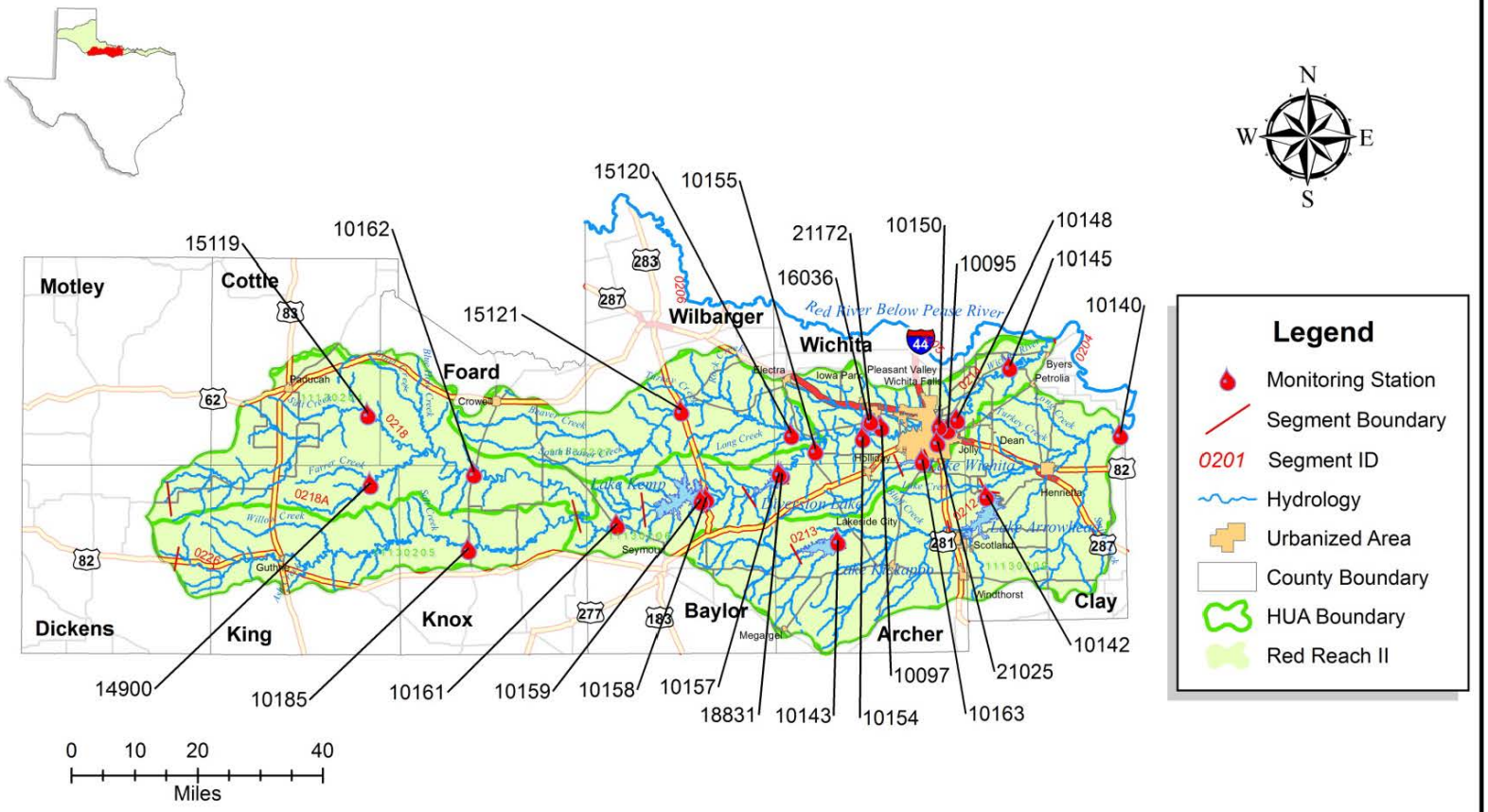
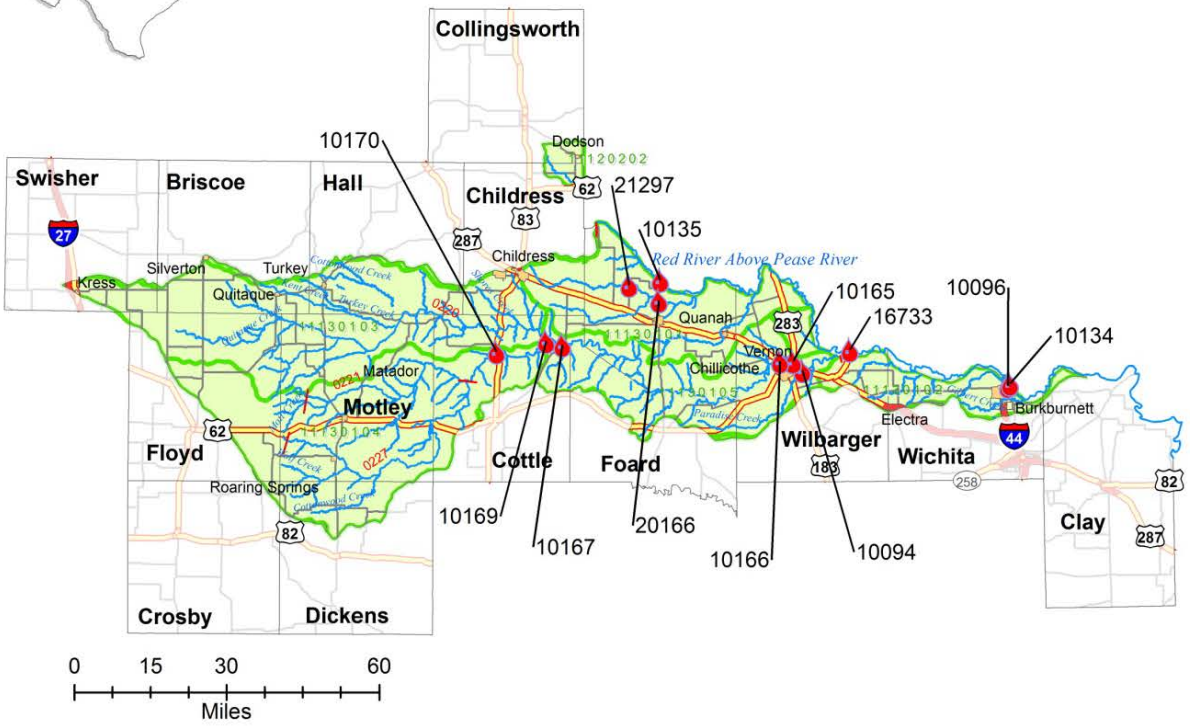


Figure 2-3

Red River Basin
Reach III
FY2016



Legend

- Monitoring Station
- Segment Boundary
- 0201 Segment ID
- Hydrology
- Urbanized Area
- County Boundary
- HUA Boundary
- Red Reach III

Figure 2-4

Red River Basin
Reach IV
FY2016

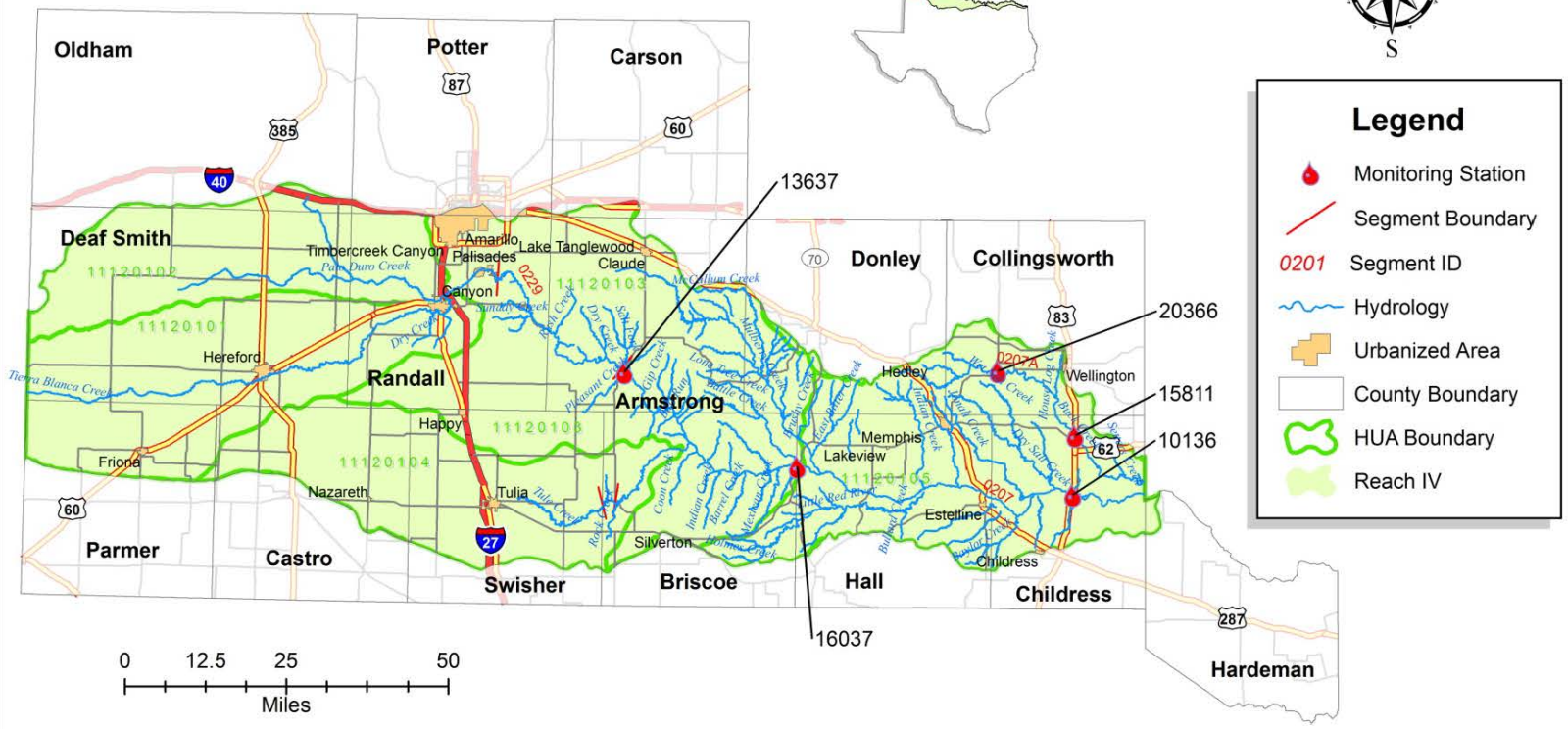
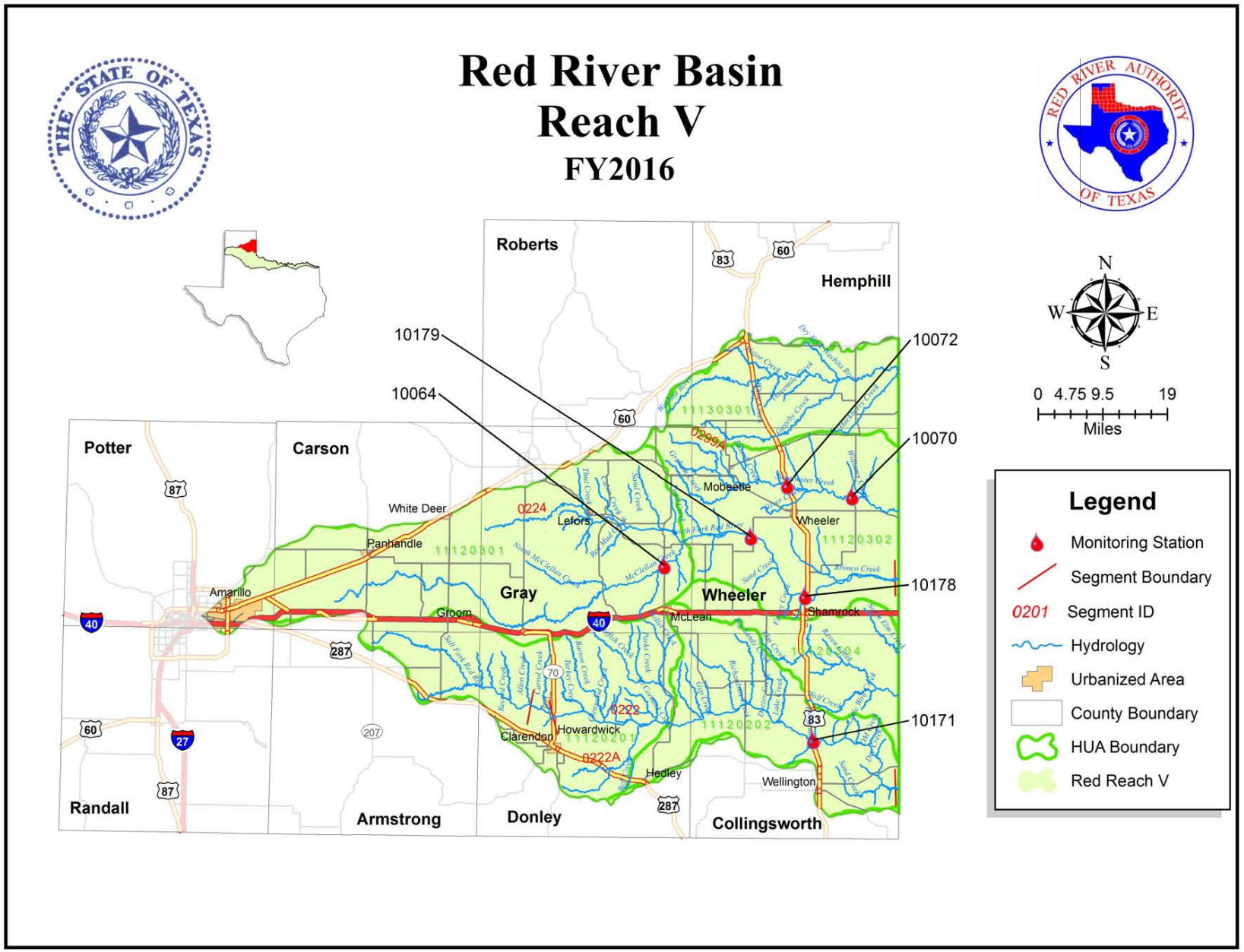


Figure 2-5


Red River Basin
Reach V
FY2016
THE STATE OF TEXAS
RED RIVER AUTHORITY OF TEXAS
Roberts
Hemphill
Potter
Carson
Gray
Wheeler
Randall
Armstrong
Donley
Collingsworth
10179
10064
10072
10070
10178
10171
White Deer
Panhandle
Amarillo
Groom
Lefors
Mobeetie
Wheeler
McLean
Shamrock
Clarendon
Howardwick
Hedley
Wellington
0224
0222
0222A
0299A
11130301
11120301
11120302
11120202
11120201
N
W
E
S
0 4.75 9.5 19
Miles
Legend
Monitoring Station
Segment Boundary
0201 Segment ID
Hydrology
Urbanized Area
County Boundary
HUA Boundary
Red Reach V

Red River Authority of Texas
Clean Rivers Program

Appendix D:
Field Data Sheets

RED RIVER AUTHORITY OF TEXAS
STREAM
CRP FIELD DATA REPORTING FORM

Date:	Station Location:		TCEQ Site ID:
Time:	Basin/Reach/Segment:	HUA No.	RRA Tag No:
County:	Monitoring Type:	QAO:	DE:
RRA Laboratory ID #:		Stream Width (ft):	Section Width (ft):
Chain of Custody #:		Time Start:	Time End:
Tech(s): Print/Sign			

Parameter Code	Sample Collection Depth _____Meters			Section Midpoint	Section Depth (ft)	Velocity (ft/S)	Discharge (CFS)
00010		Water Temp (°C)	1				
00094		Conductivity (uS/cm)	2				
00300		Dissolved Oxygen (mg/L)	3				
00400		pH (Standard Units)	4				
01351		Flow Severity 1 – No Flow 2 – Low Flow 3 – Normal 4 – Flood 5 – High 6 - Dry	5				
			6				
			7				
00061		Flow (CFS)	8				
74069		Flow Estimate (CFS)	9				
89835		Flow Measurement Method 1 – Gauge 2 – Electronic 3 – Mechanical 4 – Weir/Flume 5 – Doppler	10				
			11				
20424		Water Clarity 1 – Excellent 2 – Good 3 – Fair 4 – Poor	12				
			13				
89969		Water Color 1 – Brown 2 – Reddish 3 – Green 4 – Black 5 – Clear 6 - Other*	14				
			15				
89971		Water Odor 1 – Sewage 2 – Oily/Chem 3 – Rotten Eggs 4 – Musky 5 – Fishy 6 – None 7 – Other*	16				
			17				
00021		Air Temperature (° Fahrenheit)	18				
89966		Weather 1 – Clear 2 – Partly Cloudy 3 – Cloudy 4 – Rain 5 – Other*	19				
			20				
89965		Wind Condition 1 – Calm 2 – Slight 3 – Moderate 4 – Strong Direction	Tech taking flow: Tech recording measurements: Tech calculating flow:				Total Flow in CFS
72053		Significant Precip. (< or > Days)					
00078		Transparency, Secchi Disc (m)	Comments and details/descriptions for parameter codes marked other*:				
89978		Primary Contact Observed Act. # of people observed 0 – 10 >10					
89979		Evidence of Prim. Contact Rec. 0 – Not Observed 1 – Observed					

MEASUREMENT COMMENTS AND FIELD OBSERVATIONS

Biological Activities:

Aquatic Vegetation:

Terrestrial Vegetation:

Aquatic Animals:

Terrestrial Animals:

Aquatic Insects:

Terrestrial Insects:

Left Bank:

Right Bank:

Watershed Activities:

Water Quality/Stream Use:

Specific Sample Info:

Missing Parameters:

Notes:

Drought Parameters (if applicable)	Parameter Code	Result
Maximum Pool Width (m)	89864	
Maximum Pool Depth (m)	89865	
Pool Length (m)	89869	
Percent Pool Coverage in a 500 (m) Reach	89870	

Revision 052013 – (RRACRPSFDS-003)

RED RIVER AUTHORITY OF TEXAS
LAKE / RESERVOIR
CRP FIELD DATA REPORTING FORM

Date:	Station Location:		TCEQ Site ID:
Time:	Basin/Reach/Segment:	HUA No.	RRA Tag No:
County:	Monitoring Type:	QAO:	DE:
RRA Laboratory ID #:		Total Depth (m):	Total Measurements:
Chain of Custody #:		Time Start:	Time End:
Tech(s): Print/Sign			

Parameter Code	Sample Collection Depth _____Meters		Sample Depth (m)	Temp (°C)	pH (s. u.)	D.O. (mg/L)	Conductivity (uS/cm)
20424		Water Clarity 1 – Excellent 2 – Good 3 – Fair 4 – Poor					
89965		Wind Condition 1 – Calm 2 – Slight 3 – Moderate 4 – Strong Direction _____					
89966		Weather 1 – Clear 2 – Partly Cloudy 3 – Cloudy 4 – Rain 5 – Other*					
89968		Water Surface 1 – Calm 2 – Ripple 3 – Wave 4 – Whitecap					
89969		Water Color 1 – Brown 2 – Reddish 3 – Green 4 – Black 5 – Clear 6 - Other*					
89971		Water Odor 1 – Sewage 2 – Oily/Chem 3 – Rotten Eggs 4 – Musky 5 – Fishy 6 – None 7 – Other*					
00078		Transparency, Secchi Disk (m)					
72053		Significant Precip. (< or > Days)					
00021		Air Temperature (° Fahrenheit)					
00051		Reservoir Access Not Possible					
00052		Reservoir Stage (TWDB Website)					
00053		Reservoir Percent Full (TWDB Website)					
00054		Reservoir Storage (TWDB Website)					
82903		Depth Bottom of Water Body (m)					
89978		Primary Contact Observed Act. # of people observed 0 – 10 > 10					
89979		Evidence of Prim. Contact Rec. 0 – Not Observed 1 – Observed					

Comments and details/descriptions for parameter codes marked other*:

MEASUREMENT COMMENTS AND FIELD OBSERVATIONS

Biological Activities:

Aquatic Vegetation:

Terrestrial Vegetation:

Aquatic Animals:

Terrestrial Animals:

Aquatic Insects:

Terrestrial Insects:

Watershed Activities:

Water Body Uses Observed:

Specific Sample Info:

Missing Parameters:

Notes:

Revision 122013 – (RRACRPLFDS-004)

RED RIVER AUTHORITY OF TEXAS
24 Hour Monitoring
CRP FIELD DATA REPORTING FORM

Date:	Station Location:		TCEQ Site ID:
Time:	Basin/Reach/Segment:	HUA No.	RRA Tag No:
County:	Monitoring Type:	QAO:	DE:
RRA Laboratory ID #:		Stream Width (ft):	Section Width (ft):
Chain of Custody #:		Time Start:	Time End:
Tech(s): Print/Sign			

Parameter Code	Sample Collection Depth _____Meters			Section Midpoint	Section Depth (ft)	Velocity (ft/S)	Discharge (CFS)
			1				
00010		Water Temp (°C)	2				
00094		Conductivity (uS/cm)	3				
00300		Dissolved Oxygen (mg/L)	4				
00400		pH (Standard Units)	5				
01351		Flow Severity 1 – No Flow 2 – Low Flow 3 – Normal 4 – Flood 5 – High 6 - Dry	6				
			7				
00061		Flow (CFS)	8				
74069		Flow Estimate (CFS)	9				
89835		Flow Measurement Method 1 – Gauge 2 – Electronic 3 – Mechanical 4 – Weir/Flume 5 – Doppler	10				
			11				
20424		Water Clarity 1 – Excellent 2 – Good 3 – Fair 4 – Poor	12				
			13				
89969		Water Color 1 – Brown 2 – Reddish 3 – Green 4 – Black 5 – Clear 6 - Other*	14				
			15				
89971		Water Odor 1 – Sewage 2 – Oily/Chem 3 – Rotten Eggs 4 – Musky 5 – Fishy 6 – None 7 – Other*	16				
			17				
00021		Air Temperature (° Fahrenheit)	18				
89966		Weather 1 – Clear 2 – Partly Cloudy 3 – Cloudy 4 – Rain 5 – Other*	19				
			20				
89965		Wind Condition 1 – Calm 2 – Slight 3 – Moderate 4 – Strong Direction	Tech taking flow: Tech recording measurements: Tech calculating flow:				Total Flow in CFS
72053		Significant Precip. (< or > Days)					
00078		Transparency, Secchi Disc (m)	Comments and details/descriptions for parameter codes marked other*:				
89978		Primary Contact Observed Act. # of people observed 0 – 10 >10	7Q2 For Site: Does Flow Meet/Exceed 7Q2 Criteria: Yes / No				
89979		Evidence of Prim. Contact Rec. 0 – Not Observed 1 – Observed					

24 HOUR MEASUREMENT RESULTS SUMMARY

Parameter Description	Parameter Code	Result
Dissolved Oxygen (mg/L), 24-Hour Minimum	89855	
Dissolved Oxygen (mg/L), 24-Hour Maximum	89856	
Dissolved Oxygen (mg/L), 24-Hour Average	89857	
Dissolved Oxygen (mg/L), 24-Hour # of Measurements	89858	
Water Temperature (°C), 24-Hour Minimum	00211	
Water Temperature (°C), 24-Hour Maximum	00210	
Water Temperature (°C), 24-Hour Average	00209	
Specific Conductance (uS/cm), 24-Hour Minimum	00214	
Specific Conductance (uS/cm), 24-Hour Maximum	00213	
Specific Conductance (uS/cm), 24-Hour Average	00212	
pH (S.U.), 24-Hour Minimum	00216	
pH (S.U.), 24-Hour Maximum	00215	
MISSING PARAMETERS		
NOTES		

Revision 052013 – (RRACRPSFDS-003)

NORTH TEXAS MUNICIPAL WATER DISTRICT
STREAM
CRP FIELD DATA REPORTING FORM

Date:	Station Location:		TCEQ Site ID:
Time:	Basin/Reach/Segment:	HUA No.	RRA Tag No:
County:	Monitoring Type:	QAO:	DE:
NM Laboratory ID #:		Stream Width (ft):	Section Width (ft):
Chain of Custody #:		Time Start:	Time End:
Tech(s): Print/Sign			

Parameter Code	Sample Collection Depth _____Meters			Section Midpoint	Section Depth (ft)	Velocity (ft/S)	Discharge (CFS)
			1				
00010		Water Temp (°C)	2				
00094		Conductivity (uS/cm)	3				
00300		Dissolved Oxygen (mg/L)	4				
00400		pH (Standard Units)	5				
01351		Flow Severity 1 – No Flow 2 – Low Flow 3 – Normal 4 – Flood 5 – High 6 – Dry	6				
			7				
00061		Flow (CFS)	8				
74069		Flow Estimate (CFS)	9				
89835		Flow Measurement Method 1 – Gauge 2 – Electronic 3 – Mechanical 4 – Weir/Flume 5 – Doppler	10				
			11				
20424		Water Clarity 1 – Excellent 2 – Good 3 – Fair 4 – Poor	12				
			13				
89969		Water Color 1 – Brown 2 – Reddish 3 – Green 4 – Black 5 – Clear 6 - Other*	14				
			15				
89971		Water Odor 1 – Sewage 2 – Oily/Chem 3 – Rotten Eggs 4 – Musky 5 – Fishy 6 – None 7 – Other*	16				
			17				
00021		Air Temperature (° Fahrenheit)	18				
89966		Weather 1 – Clear 2 – Partly Cloudy 3 – Cloudy 4 – Rain 5 – Other*	19				
			20				
89965		Wind Condition 1 – Calm 2 – Slight 3 – Moderate 4 – Strong Direction	Tech taking flow: Tech recording measurements: Tech calculating flow:				Total Flow in CFS
72053		Significant Precip. (< or > Days)					
00078		Transparency, Secchi Disc (m)	Comments and details/descriptions for parameter codes marked other*:				
89978		Primary Contact Observed Act. # of people observed 0 – 10 >10					
89979		Evidence of Prim. Contact Rec. 0 – Not Observed 1 – Observed					

MEASUREMENT COMMENTS AND FIELD OBSERVATIONS

Biological Activities:	
Aquatic Vegetation:	
Terrestrial Vegetation:	
Aquatic Animals:	
Terrestrial Animals:	
Aquatic Insects:	
Terrestrial Insects:	
Left Bank:	
Right Bank:	
Watershed Activities:	
Water Quality/Stream Use:	
Specific Sample Info:	
Missing Parameters:	
Notes:	

Drought Parameters (if applicable)	Parameter Code	Result
Maximum Pool Width (m)	89864	
Maximum Pool Depth (m)	89865	
Pool Length (m)	89869	
Percent Pool Coverage in a 500 (m) Reach	89870	

Revision 052013 – (RRACRPSFDS-003)

NORTH TEXAS MUNICIPAL WATER DISTRICT
LAKE / RESERVOIR
CRP FIELD DATA REPORTING FORM

Date:	Station Location:		TCEQ Site ID:
Time:	Basin/Reach/Segment:	HUA No.	RRA Tag No:
County:	Monitoring Type:	QAO:	DE:
NM Laboratory ID #:		Total Depth (m):	Total Measurements:
Chain of Custody #:		Time Start:	Time End:

Parameter Code	Sample Collection Depth _____Meters		Tech(s): Print/Sign	Sample Depth (m)	Temp (°C)	pH (s. u.)	D.O. (mg/L)	Conductivity (uS/cm)
20424		Water Clarity 1 – Excellent 2 – Good 3 – Fair 4 – Poor						
89965		Wind Condition 1 – Calm 2 – Slight 3 – Moderate 4 – Strong Direction _____						
89966		Weather 1 – Clear 2 – Partly Cloudy 3 – Cloudy 4 – Rain 5 – Other*						
89968		Water Surface 1 – Calm 2 – Ripple 3 – Wave 4 – Whitecap						
89969		Water Color 1 – Brown 2 – Reddish 3 – Green 4 – Black 5 – Clear 6 - Other*						
89971		Water Odor 1 – Sewage 2 – Oily/Chem 3 – Rotten Eggs 4 – Musky 5 – Fishy 6 – None 7 – Other*						
00078		Transparency, Secchi Disk (m)						
72053		Significant Precip. (< or > Days)						
00021		Air Temperature (° Fahrenheit)						
00051		Reservoir Access Not Possible						
00052		Reservoir Stage (TWDB Website)						
00053		Reservoir Percent Full (TWDB Website)						
00054		Reservoir Storage (TWDB Website)						
82903		Depth Bottom of Water Body (m)						
89978		Primary Contact Observed Act. # of people observed 0 – 10 > 10						
89979		Evidence of Prim. Contact Rec. 0 – Not Observed 1 – Observed						

Comments and details/descriptions for parameter codes marked other*:

MEASUREMENT COMMENTS AND FIELD OBSERVATIONS

Biological Activities:

Aquatic Vegetation:

Terrestrial Vegetation:

Aquatic Animals:

Terrestrial Animals:

Aquatic Insects:

Terrestrial Insects:

Watershed Activities:

Water Body Uses Observed:

Specific Sample Info:

Missing Parameters:

Notes:

Revision 122013 – (RRACRPLFDS-004)

CITY OF SHERMAN
STREAM
CRP FIELD DATA REPORTING FORM

Date:	Station Location:		TCEQ Site ID:
Time:	Basin/Reach/Segment:	HUA No.	RRA Tag No:
County:	Monitoring Type:	QAO:	DE:
COS Laboratory ID #:		Stream Width (ft):	Section Width (ft):
Chain of Custody #:		Time Start:	Time End:
Tech(s): Print/Sign			

Parameter Code	Sample Collection Depth _____Meters			Section Midpoint	Section Depth (ft)	Velocity (ft/S)	Discharge (CFS)
			1				
00010		Water Temp (°C)	2				
00094		Conductivity (uS/cm)	3				
00300		Dissolved Oxygen (mg/L)	4				
00400		pH (Standard Units)	5				
01351		Flow Severity 1 – No Flow 2 – Low Flow 3 – Normal 4 – Flood 5 – High 6 - Dry	6				
			7				
00061		Flow (CFS)	8				
74069		Flow Estimate (CFS)	9				
89835		Flow Measurement Method 1 – Gauge 2 – Electronic 3 – Mechanical 4 – Weir/Flume 5 – Doppler	10				
			11				
20424		Water Clarity 1 – Excellent 2 – Good 3 – Fair 4 – Poor	12				
			13				
89969		Water Color 1 – Brown 2 – Reddish 3 – Green 4 – Black 5 – Clear 6 - Other*	14				
			15				
89971		Water Odor 1 – Sewage 2 – Oily/Chem 3 – Rotten Eggs 4 – Musky 5 – Fishy 6 – None 7 – Other*	16				
			17				
00021		Air Temperature (° Fahrenheit)	18				
89966		Weather 1 – Clear 2 – Partly Cloudy 3 – Cloudy 4 – Rain 5 – Other*	19				
			20				
89965		Wind Condition 1 – Calm 2 – Slight 3 – Moderate 4 – Strong Direction	Tech taking flow: Tech recording measurements: Tech calculating flow:				Total Flow in CFS
72053		Significant Precip. (< or > Days)					
00078		Transparency, Secchi Disc (m)	Comments and details/descriptions for parameter codes marked other*:				
89978		Primary Contact Observed Act. # of people observed 0 – 10 >10					
89979		Evidence of Prim. Contact Rec. 0 – Not Observed 1 – Observed					

MEASUREMENT COMMENTS AND FIELD OBSERVATIONS

Biological Activities:

Aquatic Vegetation:

Terrestrial Vegetation:

Aquatic Animals:

Terrestrial Animals:

Aquatic Insects:

Terrestrial Insects:

Left Bank:

Right Bank:

Watershed Activities:

Water Quality/Stream Use:

Specific Sample Info:

Missing Parameters:

Notes:

Drought Parameters (if applicable)	Parameter Code	Result
Maximum Pool Width (m)	89864	
Maximum Pool Depth (m)	89865	
Pool Length (m)	89869	
Percent Pool Coverage in a 500 (m) Reach	89870	

Revision 052013 – (RRACRPSFDS-003)

CITY OF SHERMAN
LAKE / RESERVOIR
CRP FIELD DATA REPORTING FORM

Date:	Station Location:		TCEQ Site ID:
Time:	Basin/Reach/Segment:	HUA No.	RRA Tag No:
County:	Monitoring Type: *RT*	QAO:	DE:
COS Laboratory ID #:		Total Depth (m):	Total Measurements:
Chain of Custody #:		Time Start:	Time End:
Tech(s): Print/Sign			

Parameter Code	Sample Collection Depth _____Meters		Sample Depth (m)	Temp (°C)	pH (s. u.)	D.O. (mg/L)	Conductivity (uS/cm)
20424		Water Clarity 1 – Excellent 2 – Good 3 – Fair 4 – Poor					
89965		Wind Condition 1 – Calm 2 – Slight 3 – Moderate 4 – Strong Direction _____					
89966		Weather 1 – Clear 2 – Partly Cloudy 3 – Cloudy 4 – Rain 5 – Other*					
89968		Water Surface 1 – Calm 2 – Ripple 3 – Wave 4 – Whitecap					
89969		Water Color 1 – Brown 2 – Reddish 3 – Green 4 – Black 5 – Clear 6 - Other*					
89971		Water Odor 1 – Sewage 2 – Oily/Chem 3 – Rotten Eggs 4 – Musky 5 – Fishy 6 – None 7 – Other*					
00078		Transparency, Secchi Disk (m)					
72053		Significant Precip. (< or > Days)					
00021		Air Temperature (° Fahrenheit)					
00051		Reservoir Access Not Possible					
00052		Reservoir Stage (TWDB Website)					
00053		Reservoir Percent Full (TWDB Website)					
00054		Reservoir Storage (TWDB Website)					
82903		Depth Bottom of Water Body (m)					
89978		Primary Contact Observed Act. # of people observed 0 – 10 > 10					
89979		Evidence of Prim. Contact Rec. 0 – Not Observed 1 – Observed					

Comments and details/descriptions for parameter codes marked other*:

MEASUREMENT COMMENTS AND FIELD OBSERVATIONS

Biological Activities:

Aquatic Vegetation:

Terrestrial Vegetation:

Aquatic Animals:

Terrestrial Animals:

Aquatic Insects:

Terrestrial Insects:

Watershed Activities:

Water Body Uses Observed:

Specific Sample Info:

Missing Parameters:

Notes:

Revision 122013 – (RRACRPLFDS-004)

Red River Authority of Texas
Clean Rivers Program

Appendix E:
Chain of Custody Forms

Chain of Custody Record

Laboratory Use Only: COC#

Red River Authority of Texas
Environmental Services Laboratory
PO Box 240, Wichita Falls, TX 76307-0240
3000 Hammon Rd. Wichita Falls, TX 76310-7500
Phone: 940-723-1717 • Fax: 940-723-6529
Website: www.rra.texas.gov • Email: lab@rra.texas.gov

Report Information		
Company Name:		
Address:		
City:	State:	Zip:
Contact Name:		
Phone:	Fax:	
Email:		

Billing Information (If different from above)		
Address:		
City:	State:	Zip:
Contact Name:		
Phone:	Fax:	

Project Information
Priority: ❑ Normal ❑ 50% Rush ❑ 100% Rush
Project Name:
Project Location:
Sampler Name:
PO Number or Reference:

Matrix Codes: D = Drinking Water N = Non-Potable Water S = Solids O = Other _____
Preservation Codes: 1 = None 2 = HNO_3 3 = H_2SO_4 4 = HCl 5 = NaOH 6 = Ice 7 = Other _____

LABORATORY USE ONLY	Sample Description	Date(s) Collected	Time(s) Collected	Matrix Code	# of Containers	Pres. Code	(C)omp / (G)rab	Analysis Requested								

RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME	Special Instructions / Comments:
RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME	
RELINQUISHED BY	DATE	TIME	RECEIVED BY	DATE	TIME	

Client:	North Texas Municipal Water District	North Texas Municipal Water District Chain of Custody Record	Work Order Number:
Address:	505 E. Brown St.	Sampler(s):	Project: Clean Rivers Program
	Wylie, TX 75098	Sampler(s) Signatures:	
Contact Name:	Brooke Noack		PAGE: 1 of 1

Sample ID	TCEQ ID	Lab Sample Number	Sample Type	Sampling Date	Sampling Time	Cont.(1) 2L HDPE Unpreserved Iced	Cont.(2) 250ml HDPE Unpreserved Iced	Cont.(3) 500ml HDPE H2SO4 Iced	Cont.(4) 125ml HDPE H3PO4 Iced	Cont.(5) 250ml HDPE HNO3 (Lab) Iced	Cont.(6) 100ml Bacti Na2S2O3 Iced	Cont.(7) 500ml HDPE Unpreserved Iced	Cont. (8) 2L HDPE Unpreserved Iced	Cont.(9) 100ml Poly-Carbonate Lugols Iced

[A = TSS, VSS] [B = SO4,Cl, Br,TDS] [C = Hardness, NH3, NO3/NO2, T-PO4, TKN, COD] [D = TOC] [E = Total Fe, Total Mn] [F = E-Coli] [G =Alk, Turbidity, O-PO4, NO2] [H = Chlorophyll a /Pheophytin a] [I = phytoplankton]

Notes/Comments:

Relinquished By (signature):	Time:	Date:	Received By (signature):	Time:	Date:
Relinquished By (signature):	Time:	Date:	Received By (signature):	Time:	Date:

Note: * indicates the sample matrix - aqueous

Version 2.0 Created 7/8/15

Chain of Custody Record

City of Sherman Utilities Lab	Report Options	Turn Around Time	Customer Comments or Special Instructions
288 Post Oak Road Sherman, Texas 75090 Phone: (903) 892-7287 Fax: (903) 868-2535	• ❑• Will pick-up results • ❑• Please e-mail results • ❑• Please phone results • ❑• Please fax results • ❑• Please mail results	• ❑• Normal • ❑• Expedite _____% • ❑• Other: (Specify) _____	

Payment Method		Payment Receipt Information	Chain of Custody #
• ❑• Submit Invoice	• ❑• Pay Prior To Analyses With: • ❑• Cash ❑ Check ❑ Credit Card	(Lab Use Only)	(Lab Use Only)

Customer Information			Project Information (complete if different than customer information)		
Customer Name:		Contact:	Project Name:		Project #:
Customer Address:			Project Address:		Contact:
City, State, Zip:		Phone #:	City, State, Zip		Phone #:
Fax #:	E-mail:		Water System ID#:	Wastewater System ID#:	

Sample # (Lab Use Only)	Sample Collection Information						Bottle Information		Drinking Water Sampling Information (if applicable)										Analyses Requested											
									Chlorine Results			Type of Sample Collected						Water Source													
	Sample ID	Date Collected	Time Collected	Sample Type	Sample Matrix	Sample Preservation	# of bottles	Type of Bottles	Residual (mg/l)	Free	Total	Distribution	Raw	Special	Construction	Repeat	Well	Surface												

Sample Custody Documentation					
Sampler's Name: *(Print/Signature)*	# of bottles collected:	Relinquished by: *(Signature)*	# of bottles relinquished:	Date/Time Relinquished:	
Received for lab by: *(Print/Signature)*	# of bottles received:	Date/Time Received:	Lab Comments:		

Sample Type(s): **G** - Grab, **TC** - Time Composite, **FC** - Flow Composite
Preservation: **Refrig** - Refrigerated, **Ice** - Iced down, **None** - Ambient, H_2SO_4 - Sulfuric Acid

Sample Matrix: **W** - Drinking Water, **WW** - Wastewater, **NP** - Non-Potable, **SL** - Sludge
Type of Bottles: **P** - Plastic, **G** - Glass

Revision 1.4 - 03/15/10

Form: COC-01

Red River Authority of Texas
Clean Rivers Program

Appendix F:
Data Review and Checklist Summary

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.

Data Format and Structure	✔, ✘ 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?	
Data Quality Review	✔, ✘ 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? Example: Is ortho-phosphorus less than total phosphorus? Example: Are dissolved metal concentrations less than or equal to total metals? Example: Is the minimum 24 hour DO less than the maximum 24 hour DO? Example: 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?	
Documentation Review	✔, ✘ 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 files’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: _____

Comments
Please explain in the table below any data discrepancies discovered during data review including: Inconsistencies with LOQs.

Failures in sampling methods 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)

Parameter	Tag Ids Affected	Type of Problem	Reason for Problem	Percent Loss*	Corrective Action (Y/N/SOP)
pH	XL12345	Post calibration	Equipment failure	4%	SOP
pH	XL12346	Post calibration	Forgot to write in log	4%	N
TKN	XL12351-XL12353	Laboratory analysis	LOQ Check Sample failed	10%	Y
TOC	XL12345-XL12350	Exceeded hold time	Sample received late in day and not set up next day.	10%	Y
Zinc	XL12365	Field equipment blank	Possible contamination	4%	N

*** Percent Loss = # Data Points Lost / # Data Points Expected for that parameter in the data set.**