

**Clean Rivers Program
Quality Assurance Project Plan
for the**

Red and Canadian River Basins

Revision 1.0

**Red River Authority of Texas
PO 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 2010 to FY 2011

Questions concerning this quality assurance project plan should be directed to:

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A1 APPROVAL PAGE

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CITY OF SHERMAN

Wayne Kuse 13 Aug 09
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City of Sherman CRP Project Manager

Nathan Whiddon 8-13-09
Nathan Whiddon Date
City of Sherman CRP Quality Assurance Officer

The Red River Authority of Texas will secure written documentation from each sub-tier project participant (e.g., subcontractors, other units of government) stating 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. The Red River Authority of Texas will maintain this documentation as part of the project's quality assurance records, and will ensure the documentation is available for review. (See sample letter in Attachment 1 of this document.)

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LIST OF ACRONYMS

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

A3 DISTRIBUTION LIST

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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

Allison Woodall

CRP Group Leader

Responsible for Texas Commission of Environmental Quality (TCEQ) activities supporting the development and implementation of the Texas Clean Rivers Program (CRP). Responsible for verifying that the 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 program QMP. 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 quality assurance 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.

Natalie Bell

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 quality assurance standards (e.g., Program Guidance, Standard Operating Procedures {SOPs}, QAPPs, QMP). Assists CRP Lead QA Specialist in conducting Red River Authority audits. Verifies QAPPs are being followed by contractors and that projects are producing data of known quality. Coordinates project planning with the Red River Authority 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.

Maria Rafiuly

CRP Data Manager, Data Management and Analysis Group

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 *Surface Water Quality Monitoring Data Management Reference Guide* (February 2009, or most

current version). 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. 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 standard operating procedures for CRP data management.

Jennifer Delk

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 quality assurance 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

James E. Wright

Red River Authority CRP Project Manager

Responsible for implementing and monitoring CRP requirements in contracts, QAPPS, and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Ensures monitoring systems audits are conducted to ensure QAPPS are followed by Red River Authority 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. Ensures ESD staff is properly trained and that training records are maintained. Assists during sample collection events and serves as alternate CRP Sample Custodian.

W. Scott Burns

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. Notifies the Red River Authority Project Manager of particular circumstances which may adversely affect the quality of data. 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. Responsible for validating that data collected are acceptable for reporting to the TCEQ. Serves as alternate CRP Sample Custodian.

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. Coordinates and maintains records of data verification and validation. Maintains quality-assured data on the Authority's internet site.

James J. Quashnock**CRP Laboratory Supervisor**

Responsible for ensuring that all samples received in the Environmental Services Division 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 lab data sheets and in the appropriate analytical log books prior to transmittal to the Quality Assurance Officer. Responsible for the implementation of the QA program for the Authority's Laboratory. Responsible for identifying, and maintaining Laboratory quality assurance records. Serves as Laboratory Sample Custodian.

W. Scott Burns**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, October 2008 (RG-415)*. Serves as CRP Sample Custodian.

Allen M. Pappas**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 **Table A7.1** for use in the CRP, will be collected and analyzed under the guidelines set forth by the QAPP.

Wayne Kuse**CRP Project Manager**

Responsible for implementing and monitoring CRP requirements of the QAPPs, 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 Waste Water 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.

Nathan Whiddon**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 that 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 lab 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, October 2008 (RG-415)*.

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 as a source for specific tests, as identified in **Table A7.1** that the Authority's laboratory cannot perform in-house.

Gary Franklin**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 Environmental Laboratory Manager**

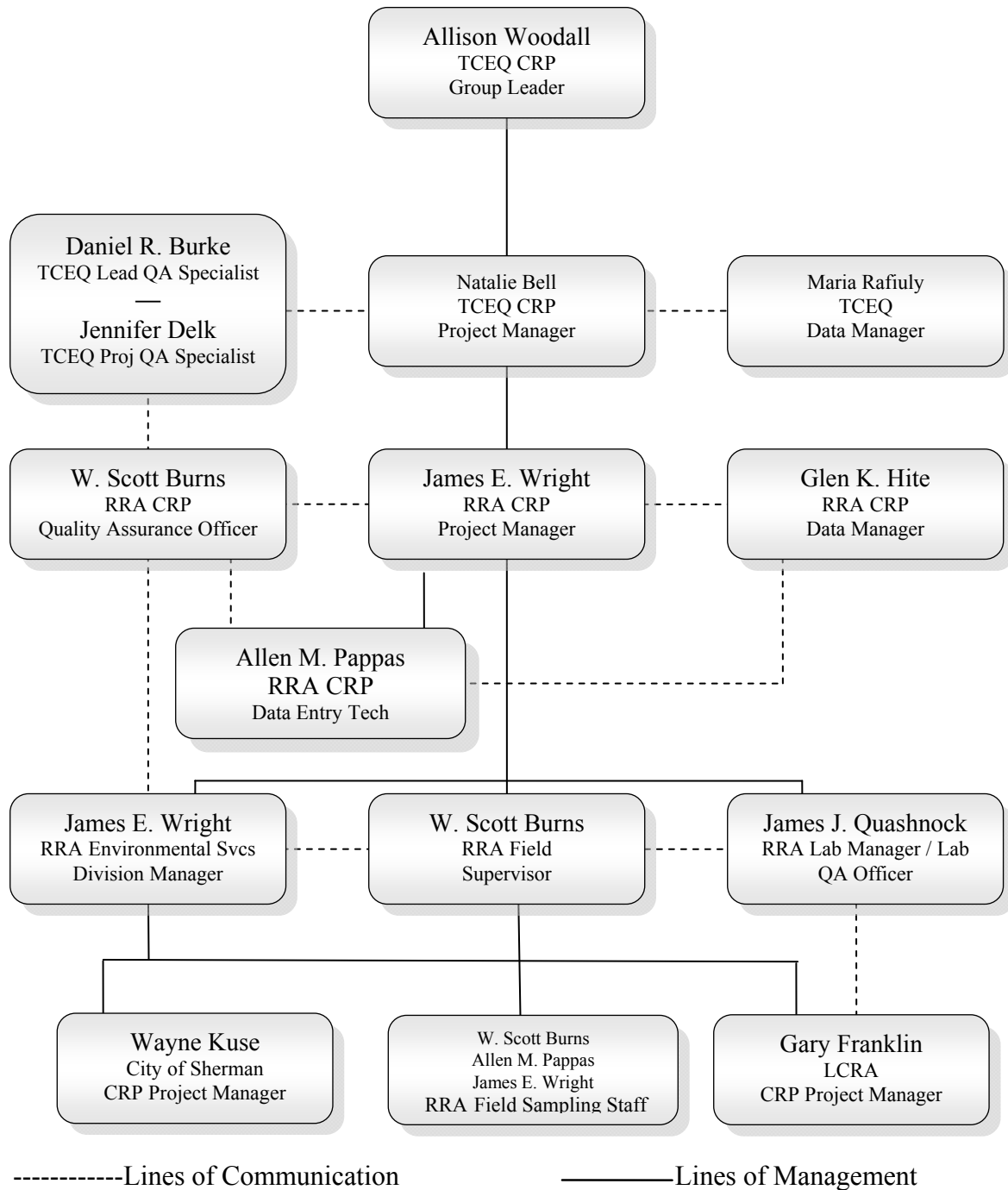
Responsible for overall performance, administration, and reporting of analyses performed by LCRA's Environmental Laboratory Services. Responsible for supervision of laboratory personnel involved in generating analytical data for the Clean Rivers Program. Ensures that laboratory personnel have adequate 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.

Hollis Pantalion**LCRA Environmental Laboratory CRP Quality Assurance Officer**

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

Chart 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 commission rules for surface water quality monitoring 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 of Texas (Authority and/or RRA) and the Texas Commission on Environmental Quality (TCEQ) to carry out the activities mandated by the legislation. The QAPP was developed and will be implemented in accordance with provisions of the *Quality Management Plan for the Clean Rivers Program* (most recent version).

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 which is to be 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 and other programs deemed appropriate by the TCEQ. Project results will be used to support the achievement of Clean Rivers Program objectives as contained in the *Clean Rivers Program Guidance and Reference Guide* FY 2010-2011. The FY 2010 monitoring schedule and QAPP are based on;

- ✓ results from previous Water Quality Assessment Reports, or
- ✓ constituents listed on the 2008 §303(d) List or ,
- ✓ constituents listed on the 2008 Texas Surface Water Quality Inventory or,
- ✓ requests received from the Basins Advisory Committees or,
- ✓ requirements as requested from TCEQ.

Primary concerns in both the Canadian and Red River Basins are depressed dissolved oxygen levels, elevated chloride, nutrient, bacteria and chlorophyll *a* levels, and the lack of water quality data. 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 §303(d) and/or TWQI listings,
- ✓ to collect data needed to meet the needs of TCEQ, and
- ✓ to incorporate Basin Advisory Committees stakeholder requests.

Figure 1 on page 16 illustrates the vicinity of the Canadian and Red River Basins. **Figures 1-1 through 2-5 in Appendix B** identify the Authority’s FY 2010 Monitoring Sites. Under the guidance this QAPP, the City of Sherman, will collect and analyze specific water quality samples from sites around the City of Sherman in 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

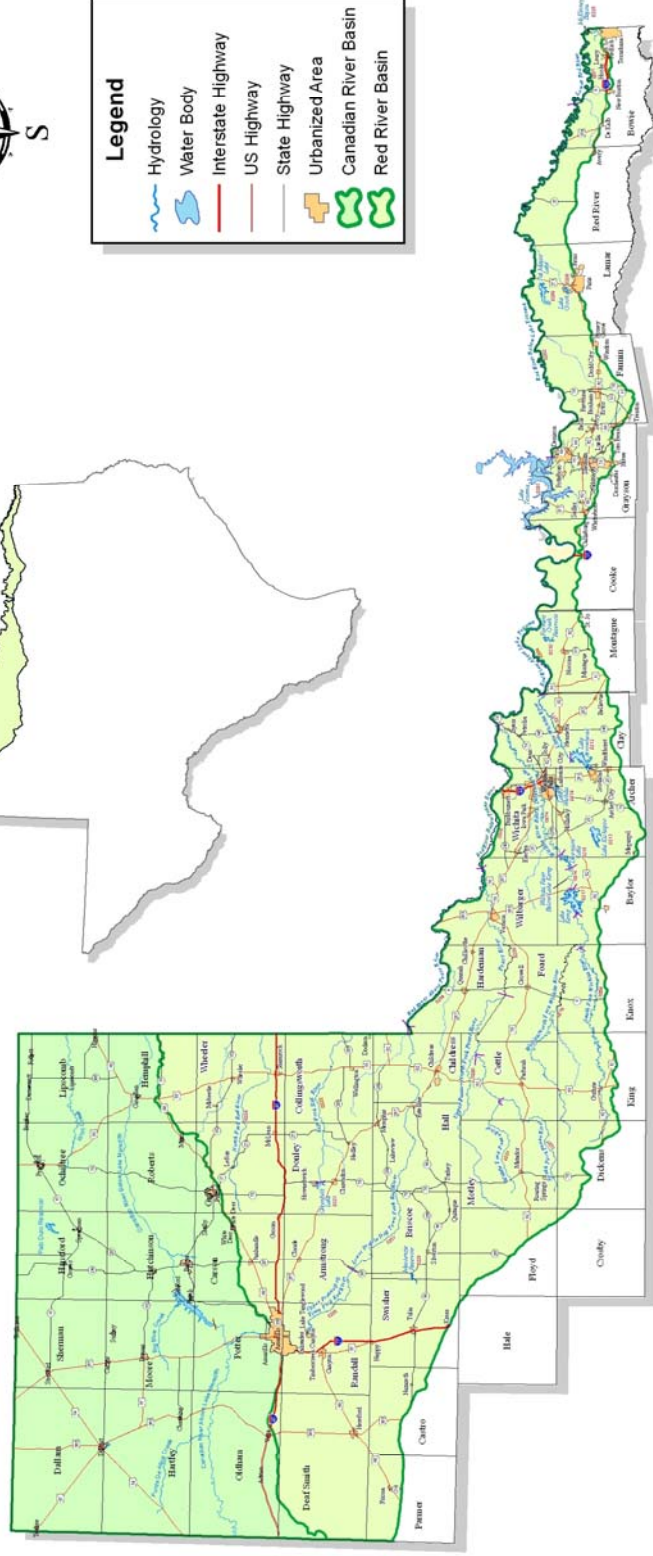
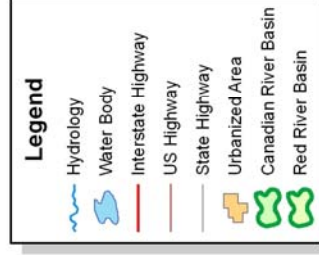


Figure 1

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 Services Laboratory or LCRA for analysis. The City of Sherman will collect and analyze water samples in their respective lab and/or the Authority's Environmental Services Laboratory with the data to be submitted to the Authority on a quarterly or more frequent basis under the QAPP. The parameters to be analyzed by each laboratory are shown in **Table A7.1**.

Depending on the possible sources of contamination and on the primary uses of the water body, annual monitoring will include at a minimum quarterly:

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

In order to provide adequate 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. 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 most recent Texas Water Quality Inventory and 303(d) list,
- 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 2010 the Authority's Reaches of Focus will be;
 - **Canadian ~ Reach I**
 - **Red ~ Reach V**
 - Fiscal Year 2011 the Authority's Reaches of Focus will be;
 - **Canadian ~ Reach II**
 - **Red ~ Reach I**

Canadian River Basin

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 from 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. Another additional source can be oilfield brine from abandoned or improperly plugged wells where the oilfield brines have corroded through old well casings and 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 from runoff from areas where wildlife and livestock have been known to congregate.

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

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

Amendments to the QAPP

Revisions to the QAPP may be necessary to address incorrectly documented information or to reflect changes in project organization, tasks, schedules, objectives, and methods. Requests for amendments will be directed from the Authority's Project Manager to the CRP Project Manager electronically. Amendments are effective immediately upon approval by the Authority's Project Manager, the Authority's QAO, the Laboratory QAO, the CRP Project Manager, the CRP Lead QA Specialist, and the CRP Project QA Specialist. They will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by the Authority's Project Manager.

Special Project Appendices

Projects requiring QAPP appendices will be planned in consultation with the Authority and the TCEQ Project Manager and TCEQ technical staff. Appendices will be written in an abbreviated format and will reference the basin QAPP, where appropriate. Appendices will be approved by the Authority's Project Manager, the Authority's QAO, the Laboratory QAO, the TCEQ CRP Project

Manager, the TCEQ CRP Project QA Specialist, the TCEQ 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 needed for conducting water quality assessments in accordance with TCEQ's *Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*. These water quality data and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

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

The City of Sherman is a cooperating partner 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 **Table A7.1** located on page 20 of this QAPP and in the text following.

Table A7.1 - 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										
pH	pH/units	Water	TCEQ SOP V-1 and EPA 150.1	00400	NA*	NA	NA	NA	NA	Field
DO	mg/L	Water	TCEQ SOP V-1 SM 4500-O C	00300	NA*	NA	NA	NA	NA	Field
Specific Conductance	μS/cm	Water	TCEQ SOP V-1 SM 2510 B	00094	NA*	NA	NA	NA	NA	Field
Temperature	° C	Water	TCEQ SOP V-1 SM 2550 B	00010	NA*	NA	NA	NA	NA	Field
Secchi Depth	meters	Water	TCEQ SOP V-1	00078	NA*	NA	NA	NA	NA	Field
Days Since Last Significant Rain	Days	NA	TCEQ SOP V-1	72053	NA*	NA	NA	NA	NA	Field
Flow	cfs	Water	TCEQ SOP V-1	00061	NA*	NA	NA	NA	NA	Field
Flow Measurement Method	1 – gage 2 – electric 3 – mechanical 4 – weir/flume 5 – Doppler	Water	TCEQ SOP V-1	89835	NA*	NA	NA	NA	NA	Field
Flow Severity	1 - no flow 2 – low 3 – normal 4 – flood 5 – high 6 - dry	Water	TCEQ SOP V-1	01351	NA*	NA	NA	NA	NA	Field
Flow Estimate	cfs	Water	TCEQ SOP V-1	74069	NA*	NA	NA	NA	NA	Field
Present Weather	1 – clear 2 - ptly cldy 3 – cloudy 4 – rain 5 - other	NA	NA	89966	NA	NA	NA	NA	NA	Field
Water Clarity	1 – excellent 2 – good 3 – fair 4 – poor 5 - other	NA	NA	20424	NA	NA	NA	NA	NA	Field
Water Color	1 – brownish 2 – reddish 3 – greenish 4 – blackish 5 – clear 6 - other	NA	NA	89969	NA	NA	NA	NA	NA	Field
Water Odor	1 – sewage 2 – chemical 3 - rotten egg 4 – musky 5 – fishy 6 – none 7 - other	NA	NA	89971	NA	NA	NA	NA	NA	Field

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
Wind Intensity	1 – calm 2 – slight 3 – moderate 4 – strong	NA	NA	89965	NA	NA	NA	NA	NA	Field
Water Surface	1 – calm 2 – ripples 3 – waves	NA	NA	89968	NA	NA	NA	NA	NA	Field
Turbidity	NTU	Water	SM 2130B	82079	.5	.5	70-130	20	80-120	Field
CONVENTIONAL AND BACTERIOLOGICAL PARAMETERS										
TSS	mg/L	Water	SM 2540 D	00530	4	4	NA	20	NA	RRA
TDS, Dried at 180 Degrees C	mg/L	Water	SM 2540 C	70300	10	10	NA	20	NA	RRA
TDS, calculated	mg/L	Water	Calculation	70294	NA	NA	NA	NA	NA	RRA
Sulfate	mg/L	Water	EPA 300.0	00945	5	10****	70-130	20	80-120	RRA
Chloride	mg/L	Water	EPA 300.0	00940	5	10****	70-130	20	80-120	RRA
Chlorophyll- <i>a</i> , Fluorometric Method	µg/L	Water	EPA 445.0	70953	3	2	NA	20	80-120	LCRA
Pheophytin, Fluorometric Method	µg/L	Water	EPA 445.0	32213	3	2	NA	NA	NA	LCRA
Chlorophyll- <i>a</i> , Spectrophotometric Method (Backup)	µg/L	Water	EPA 446.0	32211	3	2	NA	20	80-120	LCRA
Pheophytin, Spectrophotometric Method (Backup)	µg/L	Water	EPA 446.0	32218	3	2	NA	NA	NA	LCRA
<i>E. coli</i> , IDEXX Colilert***	MPN/100 mL	Water	SM 9223-B	31699	1	1	NA	.5 **	NA	RRA
Holding time, <i>E. coli</i> , IDEXX Colilert ***	Hours	Water	NA	31704	NA	NA	NA	NA	NA	RRA
<i>E. coli</i> , IDEXX Colilert	MPN/100 mL	Water	Colilert® Colilert 18®	31699	1	1	NA	.5 **	NA	SH
Fecal coliform, membrane filtration	org/100mL	Water	SM 9222-D	31616	1	1	NA	.5 **	NA	RRA
Ammonia-N, total	mg/L	Water	SM 4500-NH3D	00610	.1	.1	70-130	20	80-120	RRA
Fluoride, total	mg/L	Water	EPA 300.0	00951	.5	.5	70-130	20	80-120	RRA
Alkalinity, total	mg/L	Water	SM 2320 B	00410	20	20	NA	20	80-120	RRA
COD	mg/L	Water	Hach 8000	00335	10	10	70-130	20	80-120	RRA

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
O-Phosphate-P, Diss. field filter <15 min	mg/L	Water	EPA 300.0	00671	.04	.04	70-130	20	80-120	RRA
Total Phosphorus-P	mg/L	Water	SM 4500-P E	00665	.06	.06	70-130	20	80-120	RRA
Nitrate/nitrite-N, total	mg/L	Water	SM 4500-NO3-H	00630	.04	.02	70-130	20	80-120	LCRA
Nitrate-N	mg/L	Water	EPA 300.0	00620	.04	.02	70-130	20	80-120	RRA
TOC	mg/L	Water	SM 5310B	00680	2.0	2.0	70-130	20	80-120	RRA
VSS	mg/L	Water	EPA 160.4	00535	4	4	NA	20	80-120	RRA
Calcium, dissolved	mg/L	Water	SM 3500CaB	00915	0.5	0.5	70-130	20	80-120	RRA

* Reporting to be consistent with SWQM guidance and based on measurement capability.

** Based on a range statistic as described in Standard Methods, 21st Edition, Section 9020-B, “Quality Assurance/Quality Control – Intra-laboratory Quality Control Guidelines”. This criterion applies to bacteriological duplicates with concentrations >10 MPN/100mL or >10 organisms/100mL.

*** *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 48 hours.

**** TCEQ has granted permission to have an LOQ higher than the established AWRL.

References for Table A7.1:

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

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), "Standard Methods for the Examination of Water and Wastewater," 21st Edition, 2005.

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, October 2008 (RG-415).

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

American Society for Testing and Materials (ASTM) Annual Book of Standards, Vol. 11.02

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

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

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

Precision

Precision is the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. It is a measure of agreement among replicate measurements of the same property, under prescribed similar conditions, and is an indication of random error.

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

Laboratory precision is assessed by comparing replicate analyses of laboratory control samples 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 **Table A7.1**.

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 laboratory control samples and LOQ Check Standards 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 **Table A7.1**.

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 the Clean Rivers Program 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 includes 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

Field personnel receive training in proper sampling and field analysis. Before actual sampling or field analysis occurs, they will demonstrate to the QA Officer (or designee) 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 Section 5.4.4 of the NELAC standards (concerning Review of Requests, Tenders and Contracts).

A9 DOCUMENTS AND RECORDS

The documents and records that describe, specify, report, or certify activities are listed.

Table A9.1 - Project Documents and Records

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

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

¹ LCRA document retention is five years.

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 NELAC standards (Section 5.5.10) and include the information necessary for the interpretation and validation of data. Reports of results of analytical tests performed by the laboratory contain the following elements:

- 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
- Project-specific quality control results to include field split results (as applicable) and RL confirmation (% recovery)

- 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 NELAC compliance on a result by result basis

Electronic Data

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the most current version of the *Surface Water Quality Monitoring Data Management Reference Guide* (http://www.tceq.state.tx.us/compliance/monitoring/water/quality/wdma/dmrg_index.html). A completed Data Review Checklist and Data Summary (see Appendix E) will be submitted with each data submittal.

The City of Sherman will submit their data at least monthly, but no less than quarterly to the Authority in either digital or paper format. Data packets submitted to the Authority will be reviewed for completeness prior to its admission to the CRP data files.

The LCRA Environmental Laboratory is utilized as a contract lab. Results from samples submitted to the LCRA Lab 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 according to procedures documented in the *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, October 2008 (RG-415)* and *Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data (RG-416)*. Additional aspects outlined in **Section B** below reflect specific requirements for sampling under the Clean Rivers Program 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)				
Escherichia coli*, Fecal Coliform	P or G	Sodium Thiosulfate, Cool < 6°C	120mL/290 mL	6 Hours
Conventionals and Minerals (Water)				
Alkalinity, Total	P or G	Cool < 6°C	1.0 L	14 Days
Calcium, Dissolved (EDTA)	P or G	HNO ₃ to pH<2 Field Filtered ⁵	250 mL	6 Months
Solids (TSS, VSS, TDS)	P or G	Cool < 6°C	1.0 L	7 Days
Chloride	P or G	None Required	1.0 L	28 Days
Turbidity	P or G	Cool < 6°C	250 mL	48 Hours
Fluoride, Chloride, Nitrate, O-Phosphorus, Sulfate	P or G	None Required Field Filtered ⁵ , Cool < 6°C	125 mL	48 Hours for Ion Chromatography
Nutrients (Water)				
Ammonia, Total Phosphorus, TOC & COD	P or G	Cool < 6°C, H ₂ SO ₄ to pH<2	500 mL	28 Days
Chlorophyll <i>a</i> and Pheophytin	P or G Opaque ⁶	Unfiltered, Dark, Cool < 6°C	500 mL	48 Hours
		Filtered, Dark, Frozen		28 Days

¹ Polyethylene (P) or Glass (G).

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 Orthophosphorus and dissolved calcium samples are field filtered within 15 minutes of sample collection. DI blanks are run on filter lots to ensure quality control. Individual filters are rinsed with collected sample prior to actual filling of the designated container.

⁶ Chlorophyll *a* and Pheophytin will be collected in brown opaque containers.

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

Sample Containers

Plastic leak proof reusable sample containers are used for conventional parameters. Commercially purchased pre-sterilized plastic containers in 120 and/or 290 mL with sodium thiosulfate are used for collecting bacteriological samples. Amber bottles are used routinely for chlorophyll *a* samples. The sample containers for metals are new, certified glass or plastic bottles, or glass or plastic bottles cleaned and documented according to EPA method 1669. Certificates are maintained in a notebook by the Authority or by the laboratory manager. The sample containers that are re-used are washed according to procedures outlined in the Laboratory QM.

Processes to Prevent Contamination

Procedures outlined in the *TCEQ Surface Water Quality Monitoring Procedures* outline the necessary steps to prevent contamination of samples. These include: direct collection into sample containers, when possible; clean sampling techniques for metals; and certified containers for organics. 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**. The following will be recorded for all visits:

1. Station ID
2. Sampling Date
3. Location
4. Sampling depth
5. Sampling time
6. Sample collector's name and/or initials
7. Values for all field parameters
8. Detailed observational data, including:
 - water appearance
 - weather
 - biological 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 instream 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 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 D). The following list of items matches the COC form in **Appendix D**.

1. Date and time of collection
2. Site identification
3. Sample matrix
4. Number of containers

5. Preservative used
6. Was the sample filtered
7. Analyses required
8. Name of collector
9. Custody transfer signatures and dates and time of transfer
10. 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:

1. Site identification
2. Date and time of collection
3. Preservative added, if applicable
4. Designation of "field-filtered" (*for metals or Ion Chromatograph samples*), as applicable
5. 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, samples scheduled to be collected are assigned an ID number which is recorded in the lab accessions logbook. 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 preservatives as required, which are predetermined by the type of analyses to be conducted.
2. Samples are collected under protocols documented in the TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods, October 2008 (RG-415). Samples are *packed in loose ice in accordance with the preservation* (or – preserved according to) criteria listed in **Table B2.1** of this document
3. The date, time and collector information is completed on the sample container labels and the COC.
4. The ice chests with 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 lab 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 a lab accessions logbook that documents the following information and given a unique identification number. Data added to the accessions logbook include:
 - Current Date
 - Client
 - Lab ID Number
 - Sample ID
 - Sample Source
 - Collected by
 - Collection Date
 - Collection Time
 - Parameters
 - Time Sample Received
 - Preservative
 - Chain of Custody Number
7. The unique ID number assigned to each sample is written on the sample container with a permanent marker.
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 another Laboratory 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 laboratory's name and the shipping COC number will be written in the comment section of the original COC form which will remain at the Authority's laboratory. The samples along with the COC are then packed in an insulated shipping container with ice or in a box depending on the preservation requirements. The shipping container is then sealed, marked with an up-arrow (↑) on all four sides 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 chain-of-custody procedures as described in this QAPP are immediately reported to the Lead Organization Project Manager. These include such items as delays in transfer, resulting in holding time violations; violations of sample preservation requirements; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc. The Authority's Project Manager in consultation with the Authority's QAO will determine if the procedural violation may have compromised the validity of the resulting data. Any failures that have reasonable potential to compromise data validity will invalidate data and the sampling event should be repeated. The resolution of the situation will be reported to the TCEQ CRP Project Manager in the project progress report. Corrective Action Plans (CAPs) will be

prepared by the Lead Organization QAO and submitted to TCEQ CRP Project Manager along with project progress report.

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

B4 ANALYTICAL METHODS

The analytical methods, associated matrices, and performing laboratories are listed in **Table A7.1** of Section A7. The authority for analysis methodologies under the Clean Rivers Program is derived from the TSWQS (§§307.1 - 307.10) in that data generally are generated for comparison to those standards and/or criteria. The Standards state that "Procedures for laboratory analysis will be in accordance with the most recently published edition of *Standard Methods for the Examination of Water and Wastewater*, the latest version of the *SWQM Procedures, Volume 1: Physical Methods for Water, Sediment, and Tissue*, 40 CFR 136, or other reliable procedures acceptable to the Executive Director."

Laboratories collecting data under this QAPP are compliant with the NELAC standards. 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 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 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 “holding time exceedance”, “sample received unpreserved”, “estimated value”, etc. may have unacceptable measurement uncertainty associated with them. This will immediately disqualify analyses from submittal to SWQMIS. Therefore, data with these types of problems should not be reported to the TCEQ. Additionally, any data collected or analyzed by means other than those stated in the QAPP, or data suspect for any reason should not be submitted for loading and storage in SWQMIS.

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

The minimum Field QC Requirements are outlined in the *TCEQ Surface Water Quality Monitoring Procedures*. 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 the contamination from field sources such as airborne materials, containers, and preservatives. 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 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 split - A field split is a single sample subdivided by field staff immediately following collection and submitted to the laboratory as two separately identified samples according to procedures specified in the *SWQM Procedures*. Split samples are preserved, handled, shipped, and analyzed identically and are used to assess variability in all of these processes. Field splits apply to conventional samples only and are collected on a 10 % basis or one per sampling event, whichever is more frequent.

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

$$\text{RPD} = |(X_1 - X_2) / \{(X_1 + X_2) / 2\} * 100|$$

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

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 NELAC-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. 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.

Limit of Quantitation (LOQ) – The laboratory will analyze a calibration standard (if applicable) at the LOQ on each day calibrations are performed. In addition, an LOQ check standard will be analyzed with each analytical batch. Calibrations including the standard at the LOQ will meet the calibration requirements of the analytical method or corrective action will be implemented.

LOQ Check Standard – An LOQ check standard 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 standard is spiked into the sample matrix at a level less than or near the LOQ for each analyte for each analytical batch of CRP samples run.

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

The percent recovery of the LOQ check standard is calculated using the following equation in which %R is percent recovery, SR is the sample result, and SA is the reference concentration for the check standard:

$$\%R = SR/SA * 100$$

Measurement performance specifications are used to determine the acceptability of LOQ Check Standard analyses as specified in **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 mid point 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 multippeak 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; SR is the measured result; and SA is the true result:

$$\%R = SR/SA * 100$$

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

Laboratory Duplicates – A laboratory duplicate is prepared by taking aliquots of a sample from the same container under laboratory conditions and processed and analyzed independently. A laboratory control sample duplicate (LCSD) is prepared in the laboratory by splitting aliquots of an LCS. Both samples are carried through the entire preparation and analytical process. LCSDs are used to assess precision and are performed at a rate of one per preparation batch.

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

$$RPD = |(X_1 - X_2)| / \{(X_1 + X_2) / 2\} * 100$$

A bacteriological duplicate is considered to be a special type of laboratory duplicate and applies when bacteriological samples are run in the field as well as in the lab. Bacteriological duplicate

analyses are performed on samples from the sample bottle on a 10% basis. Results of bacteriological duplicates are evaluated by calculating the logarithm of each result and determining the range of each pair.

Measurement performance specifications are used to determine the acceptability of duplicate analyses-as specified in **Table A7.1**. The specifications for bacteriological duplicates in **Table A7.1** apply to samples with concentrations > 10 org./100mL.

Laboratory equipment blank - Laboratory equipment blanks are prepared at the laboratory where collection materials for metals sampling equipment are cleaned between uses. These blanks document that the materials provided by the laboratory are free of contamination. The QC check is performed before the metals sampling equipment is sent to the field. The analysis of laboratory equipment blanks should yield values less than the LOQ. Otherwise, the equipment should not be used.

Matrix spike (MS) –Matrix spikes are prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Percent recovery of the known concentration of added analyte is used to assess accuracy of the analytical process. The spiking occurs prior to sample preparation and analysis. Spiked samples are routinely prepared and analyzed at a rate of 10% of samples processed, or one per preparation batch whichever is greater. The information from these controls is sample/matrix specific and is not used to determine the validity of the entire batch. To the extent possible, matrix spikes prepared and analyzed over the course of the project should be performed on samples from different sites. The MS is spiked at a level less than or equal to the midpoint of the calibration or analysis range for each analyte. Percent recovery (%R) is defined as 100 times the observed concentration, minus the sample concentration, divided by the true concentration of the spike.

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 laboratory shall document the calculation for %R. The percent recovery of the matrix spike is calculated using the following equation in which %R is percent recovery, SSR is the observed spiked sample concentration, SR is the sample result, and SA is the reference concentration of the spike added:

$$\%R = (SSR - SR)/SA * 100$$

Measurement performance specifications for matrix spikes are not specified in this document. The laboratory will refer to specific SOPs for matrix spike recovery limits.

The results are compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, the laboratory shall determine the internal criteria and document the method used to establish the limits. For matrix spike results outside established criteria, corrective action shall be documented or the data reported with appropriate data qualifying codes.

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 or 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 (example: volatiles in water) 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 Lead Organization Project Manager, in consultation with the Lead Organization 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 Project Manager and QAO will be relied upon in evaluating results. Rejecting sample results based on wide variability is a possibility. Field blanks for trace elements and trace organics are scrutinized very closely. Field blank values exceeding the acceptability criteria may automatically invalidate the sample, especially in cases where high blank values may be indicative of contamination which may be causal in putting a value above the standard. Notations of field split excursions and blank contamination are noted in the quarterly report and the final QC Report. Equipment blanks for metals analysis are also scrutinized very closely.

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

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

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

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

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

B7 INSTRUMENT CALIBRATION AND FREQUENCY

Field equipment calibration requirements are contained in the *TCEQ Surface Water Quality Monitoring Procedures*. Post-calibration error limits and the disposition resulting from error are adhered to. Data not meeting post-error limit requirements invalidate associated data collected subsequent to the pre-calibration and are not submitted to the TCEQ.

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

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

The Authority, LCRA, and the City of Sherman purchase supplies as needed for their labs. 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 NON-DIRECT MEASUREMENTS

This QAPP does not include the use of routine data obtained from non-direct measurement sources. Only data collected directly under this QAPP is submitted to the SWQMIS database.

B10 DATA MANAGEMENT

Data Management Process

See **Appendix F** – Red River Authority Data Management Plan

Data Errors and Loss

See **Appendix F** – Red River Authority Data Management Plan

Record Keeping and Data Storage

See **Appendix F** – Red River Authority Data Management Plan

Data Handling, Hardware, and Software Requirements

See **Appendix F** – Red River Authority Data Management Plan

Information Resource Management Requirements

See **Appendix F** – Red River Authority Data Management Plan

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	Red River Authority	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report
Monitoring Systems Audit of Red River Authority	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 Subparticipants	Once during the contract cycle	Red River Authority	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the Red River Authority. PA will report problems to TCEQ in 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	Red River Authority	Required to pass two out of three PT's annually to maintain certifications	Proficiency Providers Report results to TCEQ
Internal Audits, Oversight, etc.	Quarterly	Red River Authority	Monitoring of the Lab Quality status to ensure requirements are being met	Quarterly Report, in House

Corrective Action Process for Deficiencies

Deficiencies are any deviation from the QAPP, SWQM Procedures Manual, SOPs, or Data Management Reference Guide. Deficiencies may invalidate resulting data and may require corrective action. Corrective action may include for samples to be discarded and re-collected. Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff. 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).

Corrective Action

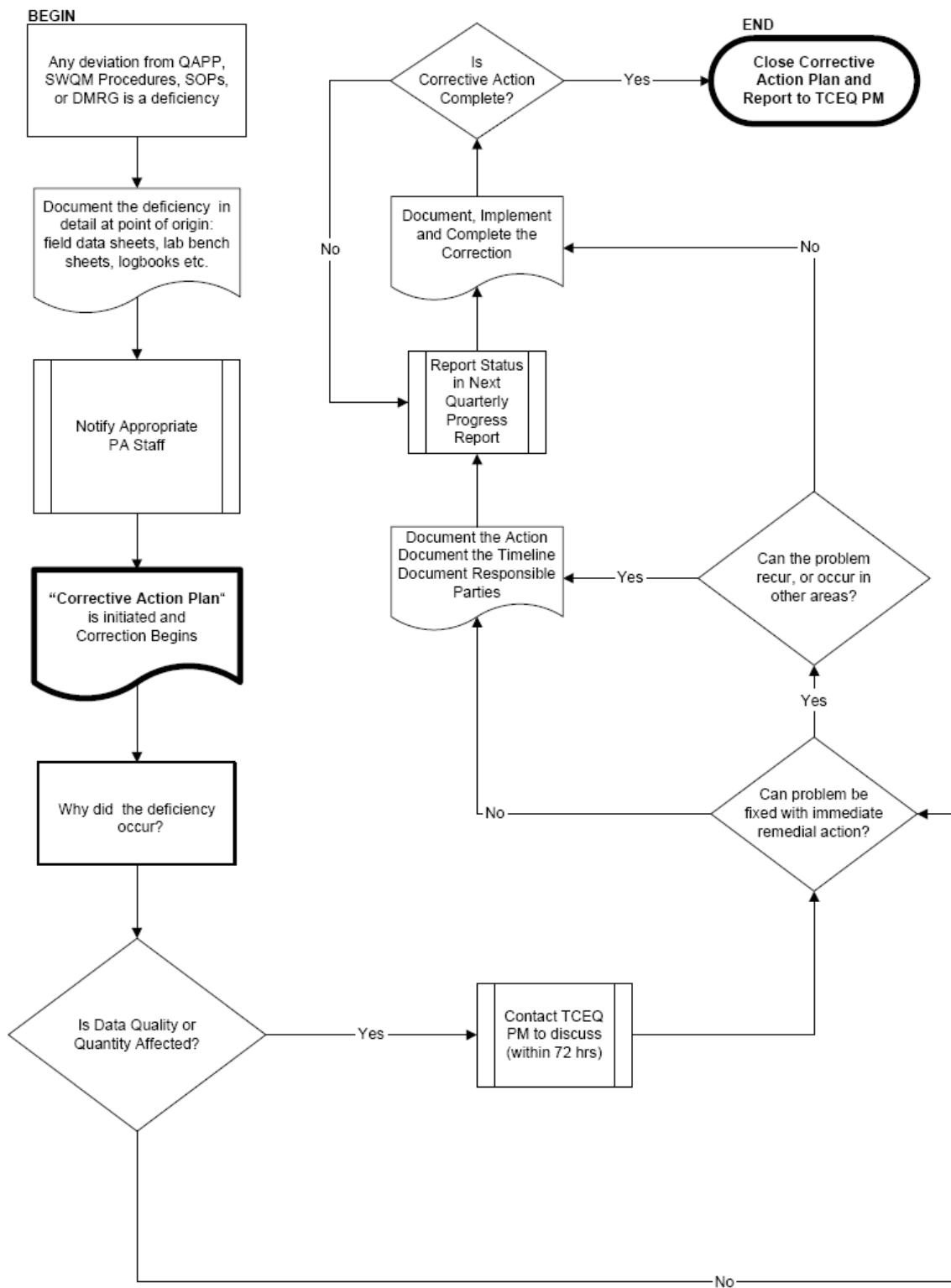
Corrective Action Plans (CAPs) should:

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

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

Figure C1.1 Corrective Action Process for Deficiencies

Corrective Action Process for Deficiencies



Status of Corrective Action Plans will be included with quarterly progress reports. In addition, significant conditions (i.e., situations 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 corrective actions. Records of audit findings and corrective actions are maintained by the Authority's 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 CRP QMP and in agreements in contracts between participating organizations.

C2 REPORTS TO MANAGEMENT

Reports to Red River Authority Project Management

The Authority's Project Manager will be kept apprised of all project status, results of assessments and any significant QA issues as they occur. Additionally, written reports (if necessary) 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, and status of corrective actions; 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 Review Checklist and Summary – Contains basic identifying information about the data set and comments regarding inconsistencies and errors identified during data verification and validation steps or problems with data collection efforts (e.g. Deficiencies).

Reports by TCEQ Project Management

Contractor Evaluation - The 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 document.

Data review, verification, and validation will be performed using self-assessments and peer and management review as appropriate to the project task. The data review tasks to be performed by field and laboratory staffs are listed in the first two columns of **Table D2.1**, respectively. Potential errors are identified by examination of documentation and by manual (*or computer-assisted*) examination of corollary or unreasonable data. 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 E**) covers three main types of review: data format and structure, data quality review, and documentation review. The Data Review Checklist is transferred with the water quality data submitted to the TCEQ to ensure that the review process is being performed.

Another element of the data validation process is consideration of any findings identified during the monitoring systems audit conducted by the TCEQ CRP Lead Quality Assurance Specialist. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. After the data are reviewed and documented, the Authority's 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 Data Manager with the data. This information is communicated to the TCEQ by the Authority in the Data Summary (See **Appendix E**).

Table D2.1 - Data Review

Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	1,2		
Field QC samples collected for all analytes as prescribed in the TCEQ <i>SWQM Procedures Manual</i>	1		
Standards and reagents traceable		2,3	
Chain of custody complete/acceptable	1	2,3	
NELAC Accreditation is current		2,3,5	
Sample preservation and handling acceptable	1	2,3	
Holding times not exceeded	1	2,3	
Collection, preparation, and analysis consistent with SOPs and QAPP	1	2,3	
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	
QC results meet performance and program specifications		2,3	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		2,3	
Results, calculations, transcriptions checked	1	2,3	2,4
Laboratory bench-level review performed		3	
All laboratory samples analyzed for all parameters		2,3	
Corollary data agree		2,3	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	2,4, 6
Depth reported correctly	1		2,4, 6
TAG IDs correct			2,4, 6
TCEQ ID number assigned	1		2,4
Valid parameter codes			2,4, 6
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	2,4, 6
Absence of transcription error confirmed	1	2,3	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 QC results attached to data review checklist			2,4
Verified data log submitted			4,5
10% of data manually reviewed			2,4

1. W. Scott Burns, RRA Field Supervisor
4. Glen K. Hite, RRA Data Manager

2. W. Scott Burns, RRA QAO
5. James E. Wright, RRA Project Mgr.

3. James J. Quashnock, RRA Lab Supervisor
6. Allen M. Pappas, Data Entry Technician

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 Inventory and 303(d) List* in accordance with TCEQ's *Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*, and for TMDL development, stream standards modifications, and permit decisions as appropriate. Data which do not meet requirements will not be submitted to SWQMIS nor will be considered appropriate for any of the uses noted above.

Appendix A:
Task 3 Workplan

TASK 3: WATER QUALITY MONITORING

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

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

Task

Description: **Monitoring Description** - For FY 2010 and FY 2011, the Authority will monitor and collect water quality samples for analysis from a minimum of 41 stations in the Canadian and Red River Basins. Eleven of the stations are located in the Canadian River Basin with the remaining stations located in the Red River Basin. Each site will be visited a minimum of four times per year for the collection of field data along with conventional and indicator bacteria water samples. Flow will be measured at 33 sites. 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 season of the year.

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

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

Changes to monitoring that occur during the course of the year will be entered into the statewide database on the Internet and communicated to meeting attendees.

Progress Report

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

Deliverables

& Dues Dates: September 1, 2009 through August 31, 2010

- A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - December 15, 2009; March 15 and June 15, 2010
- B. Coordinated Monitoring Meeting - between March 15 and April 30, 2010
- C Coordinated Monitoring Meeting Summary of Changes - 2 weeks after meeting
- D. Email notification that Coordinated Monitoring Schedule updates are complete - May 31, 2010

September 1, 2010 through August 31, 2011

- A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - September 15 and December 15, 2010; March 15, June 15 and August 31, 2011
- B. Coordinated Monitoring Meeting - between March 15 and April 30, 2011
- C Coordinated Monitoring Meeting Summary of Changes - 2 weeks after meeting
- D. Email notification that Coordinated Monitoring Schedule updates are complete - May 31, 2011

**Red River Authority of Texas
Clean Rivers Program**

FY 2010/2011 QAPP

**Appendix B
Sampling Process Design and Monitoring Schedule (Plan)**

Appendix B Sampling Process Design and Monitoring Schedule (Plan)

Sample Design Rationale FY 2010

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 305(b) assessment, 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 watershed.

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 Texas Water Quality Inventory (TWQI), a priority list is prepared and presented for discussion at the Authority's Annual Coordinated Monitoring Meeting with the other monitoring entities and the TCEQ. This meeting is based on the need to maximize monitoring efforts in an attempt to expend the limited resources as prudently as possible. The results of the priority ranking are presented for approval at a meeting of the Basin Advisory Committees. This approach enables comprehensive monitoring to occur on a rotational reach basis and completely encompasses the basins within the five-year basin management cycle, limited only by the availability of funds.

Canadian River Basin

The monitoring sites for the Canadian River basin will, for the most part, remain the same as in FY 2009 for all participating entities. This is due to the lack of water present at other non-monitored stations. The only exception is the addition of one 24 Hr DO at Palo Duro Reservoir (Site 10005) to be collected by the TCEQ Water Quality Monitoring Team.

Red River Basin

The monitoring sites for the Red River basin will also primarily remain the same as in FY 2009 for all participating entities for the same reason as mentioned above. The following exceptions are noted:

Red River Authority of Texas

- 1) The Authority will not monitor the Wichita River at FM 810 (Site 10145) due to current monitoring by TCEQ, Region 3. They will collect the 4 conventional and bacteria samples, previously collected by the Authority, while collecting other samples at this site. This will reduce duplication of effort and preserve financial resources.
- 2) The Authority will exclude flow at the Wichita River at SH 25 (Site 10155) due to heavy siltation in the past two years. This siltation was caused by very high flows after flooding by heavy rainfall events. Several attempts have been made to find alternative flow sites nearby; however, wading is not possible due to footing sinking to over ankle depth. In addition, several large boulders and debris from bridge repairs cause unsafe wading conditions. After discussing this issue with TCEQ,

it was determined that the Authority will report flow severity at those sites where flow cannot be measured.

City of Sherman

The City of Sherman will continue to monitor the same sites as in FY 2009. It is their intention to add more conventional parameters, such as ortho-phosphorous and chlorophyll a, when they are able.

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 the TCEQ Surface Water Quality Monitoring Procedures, Volume 1 (RG-415). 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.

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% of the total reservoir acres, but not more than 5,120 acres.
3. Routine monitoring sites are selected to maximize stream coverage or basin coverage. Very long segments may require more stations. As a rule of thumb, stream segments between 25 and 50 miles long require two stations, and longer than 50 miles require three or more depending on the existence of areas with significantly different sources of contamination or potential water quality concerns. Major hydrological features, such as the confluence of a major tributary or an instream dam, may also limit the spatial extent of an assessment based on one station.
4. Because historical water quality data can be very useful in assessing use attainment or impairment, it may be best to use sites that are on current or past monitoring schedules.
5. All classified segments (including reservoirs) should have at least one routine monitoring site that adequately characterizes the water body, and should be coordinated with the TCEQ or other qualified monitoring entities reporting routine data to TCEQ.
6. Routine monitoring sites may be selected to bracket sources of pollution, influence of tributaries, changes in land uses, and hydrological modifications.
7. Sites should be accessible. When possible, stream sites should have a USGS or IBWC stream flow gauge. If not, it should be possible to conduct flow measurement during routine visits.

Monitoring Tables and maps for fiscal year 2010 are presented on the following pages.

TABLE B1.1
Sample Design and Schedule
FY 2010

Segment	TCEQ Region	Basin	Site Description	Station ID	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	Rock Creek at Bridge in Electric City near Borger	10024	RR	RT									4			4	4		4
0101	1	1	Canadian River Bridge at US 60-83 at Canadian	10032	RR	RT									4			4	4		4
0101	1	1	Canadian River Bridge on SH 70 North of Pampa	10033	RR	RT									4			4	4		4
0101	1	1	White Deer Creek at Jeep Trail Crossing on Duncan Ranch	18195	RR	RT									4			4	4		4
0102	1	1	Big Blue Creek Approx. 250 yds. Upstream of FM 1913	15270	RR	RT									4			4	4		4
0103	1	1	Unnamed Tributary of West Amarillo Creek at Loop 335	17056	RR	RT									4			4	4		4
0103	1	1	East Amarillo Creek at US 287 North of Amarillo	10018	RR	RT									4			4	4		4
0103	1	1	Canadian River Bridge at US 87-287 North of Amarillo	10054	RR	RT												4	4		4
0103	1	1	Thompson Park Lake North End West Bank in Amarillo	15775	RR	RT									4			4			4
0104	1	1	Wolf Creek Bridge at SH 305 North of Lipscomb	10058	RR	RT									4			4	4		4
0104	1	1	Wolf Creek at FM 1454 East of Lipscomb	10059	RR	RT									4			4	4		4
0202	4	2	Choctaw Creek at SH 11, Southeast of Sherman	10111	SH	RT									4			6	6		6
0202	4	2	Choctaw Creek at Luella Rd.	10112	SH	RT									4			6	6		6
0202	4	2	Post Oak Creek at First County Rd Crossing below Sherman STP	10114	SH	RT									4			6	6		6
0202	4	2	Post Oak Creek at FM 1417 Southeast of Sherman	10115	SH	RT									4			6	6		6
0202	5	2	Pine Creek at US 271 North of Paris	10120	RR	RT									4			4	4		4
0202	5	2	Red River at US 259 North of DeKalb	10125	RR	RT									4			4	4		4
0202	5	2	Red River at US 271 at Arthur City	10126	RR	RT									4			4	4		4
0202	4	2	Red River at SH 78 North of Bonham	10127	RR	RT									4			4			4
0202	4	2	Sand Creek at SH 56 West of Sherman	15446	SH	RT									2			2	2		2
0202	5	2	Pecan Bayou at FM 1159 Northeast of Clarksville	16001	RR	RT									4			4	4		4
0202	5	2	Smith Creek at US 271 North of Paris	17044	RR	RT									4			4	4		4
0202	4	2	Post Oak Creek at FM 1417 Northwest of Sherman	17599	SH	RT									2			2	2		2
0202	4	2	Choctaw Creek at US 82 East of Sherman	18370	SH	RT									4			6	6		6
0202	4	2	Bois D' Arc Creek at SH 78 South of Bonham	18652	RR	RT									4			4	4		4
0202	4	2	Bois D' Arc Creek at FM 1396 Northwest of Honey Grove	20167	RR	RT									4			4	4		4
0203	4	2	Lake Texoma Big Mineral Arm	10130	RR	RT									4			4			4
0203	4	2	Lake Texoma at US 377 North of Gordonville	10131	RR	RT									4			4			4
0203	4	2	Lake Texoma at South End of Denison Dam	15440	RR	RT									4			4			4
0203	4	2	Lake Texoma Little Mineral Arm	17480	RR	RT									4			4			4
0204	3	2	Red River at US 81, 4.5 Mi North of Ringgold	10133	RR	RT									4			12	12		12
0204	3	2	Red River at FM 677 Northwest of Saint Jo	20168	RR	RT									4			12	12		12
0205	3	2	Red River Bridge on US 277-281 Northeast of Burkburnett	10134	RR	RT									4			12	12		12

TABLE B1.1
Sample Design and Schedule
FY 2010

Segment	TCEQ Region	Basin	Site Description	Station ID	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
0207	1	2	Lower Prairie Dog Town Fork Red River Bridge at US 62-83	10136	RR	RT									4			4	4		4
0207	1	2	Lower Prairie Dog Town Fork Red River at SH 207	13637	RR	RT									4			4	4		4
0211	3	2	Little Wichita River Bridge on FM 2332	10140	RR	RT									4			12			12
0214	3	2	Buffalo Creek at FM 1814	10097	RR	RT									4			12	12		12
0214	3	2	Wichita River at FM 368	10154	RR	RT									4			12	12		12
0214	3	2	Wichita River at SH 25	10155	RR	RT									4			12			12
0214	3	2	Beaver Creek at FM 2326, 10.5 Km North of Kamay	15120	RR	RT									4			12	12		12
0214	3	2	Beaver Creek at US 283/183 Approx 18.2 Km South of Vernon	15121	RR	RT									4			4			4
0220	3	2	Pease River Bridge on FM 104 South of Kirkland	10167	RR	RT									4			4	4		4
0222	1	2	Salt Fork Red River Bridge at US 83 North of Wellington	10171	RR	RT									4			4	4		4
0224	1	2	McClellan Creek at SH 273 22.5 Km (14 Mi) North of McLean	10064	RR	RT									4			4	4		4
0224	1	2	North Fork Red River Bridge at US 83 North of Shamrock	10178	RR	RT									4			4	4		4
0230	3	2	Paradise Creek at US 287 East of Vernon	10094	RR	RT									4			4	4		4
0230	3	2	Pease River at US 287 Bridge, 3 Mi. NW of Downtown Vernon	10166	RR	RT									4			4	4		4
0299	1	2	Sweetwater Creek SH 152 Southeast of Mobeetie	10074	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

Sampling Entity: Entity conducting water quality monitoring
(RR) Red River Authority
(SH) City of Sherman

Monitoring Type: (RT) Routing water quality sampling
Conventional: Samples of nutrients, minerals and dissolved calcium collected and analyzed by a lab
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.



Canadian River Basin Reach I FY2010

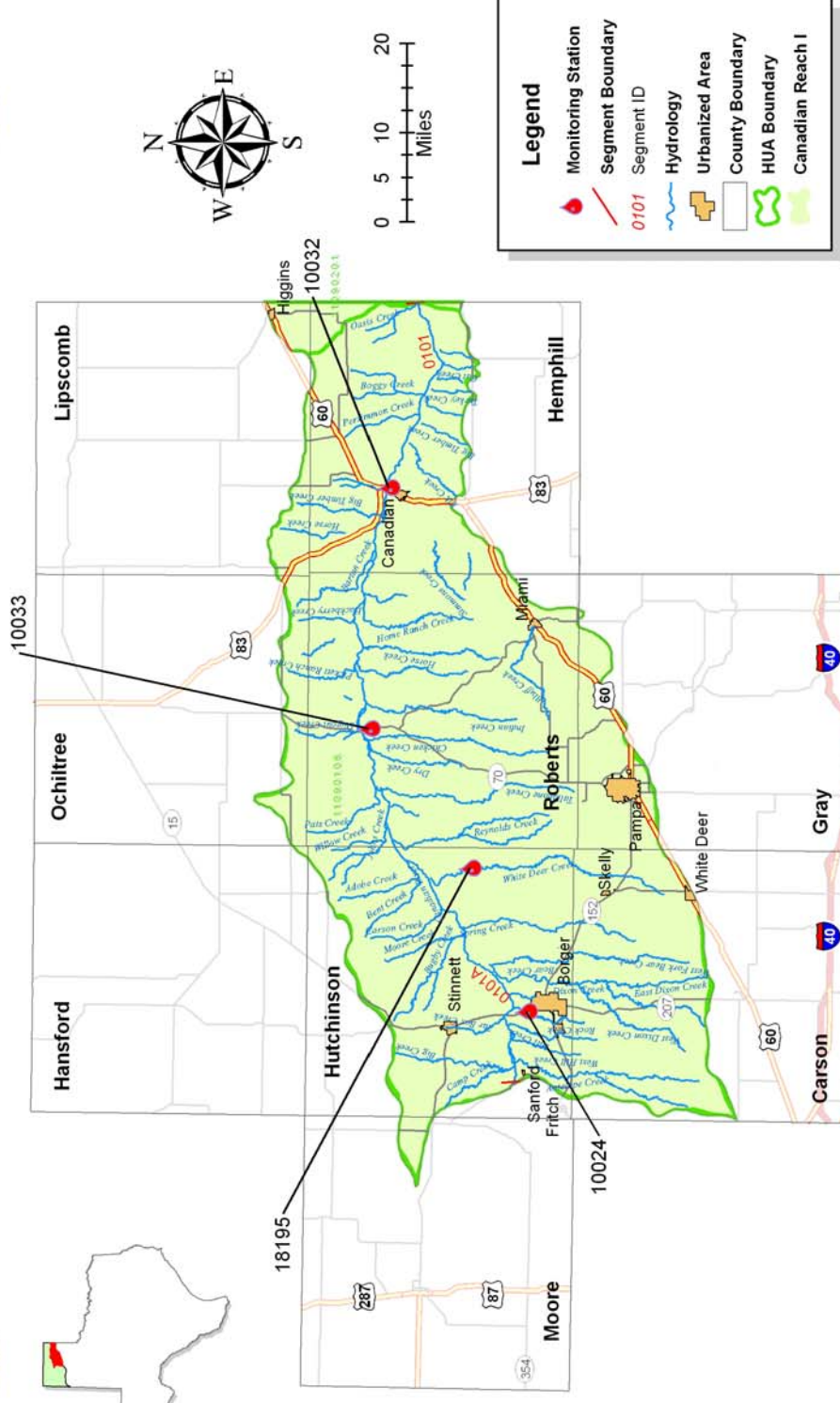


Figure 1-1



Canadian River Basin

Reach II

FY2010

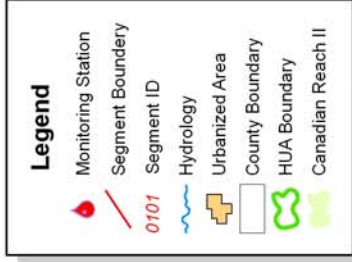
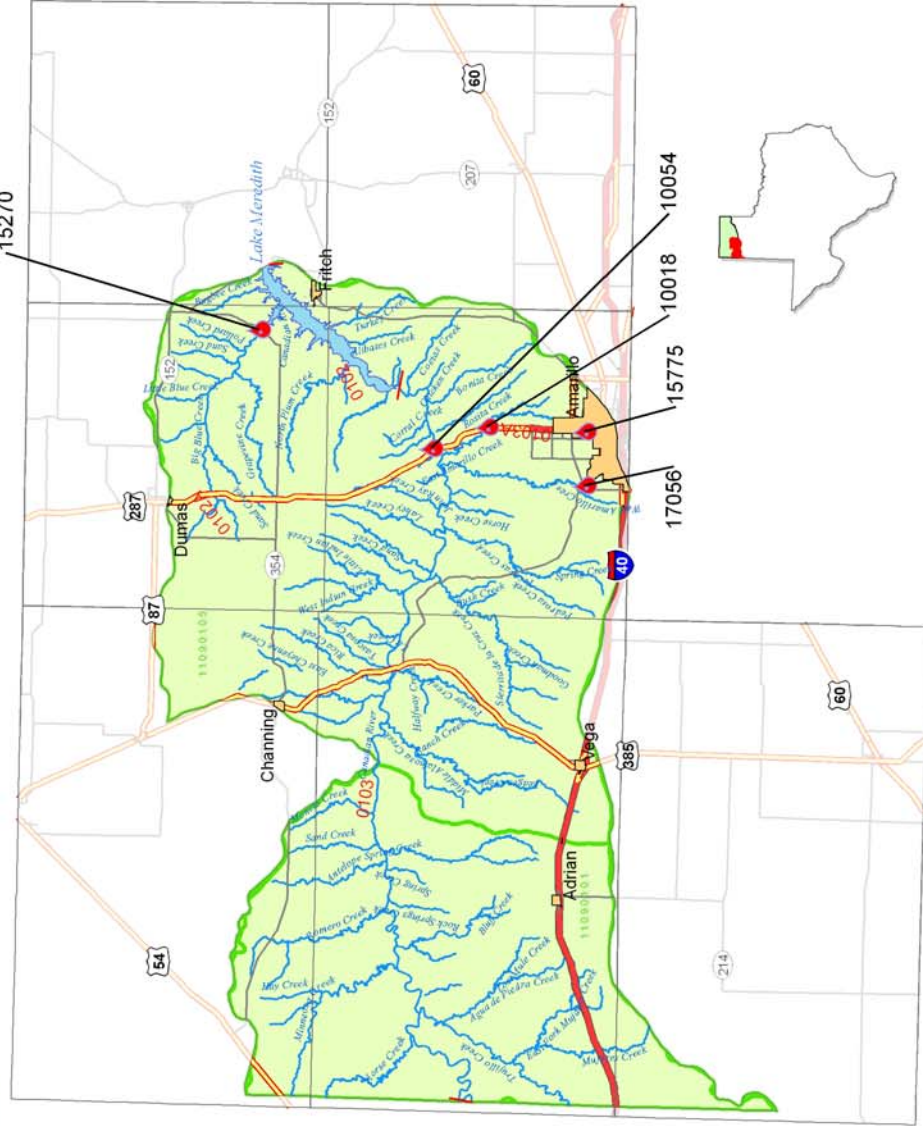
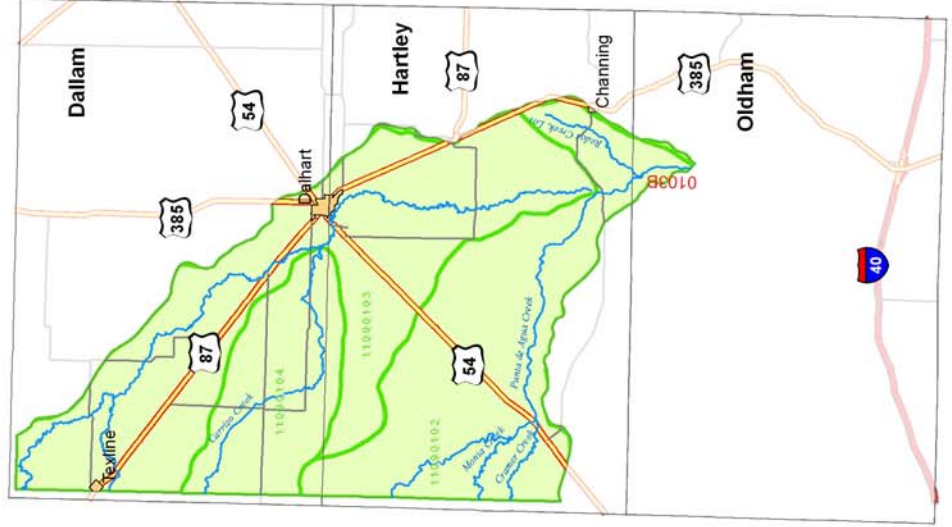


Figure 1-2



Canadian River Basin Reach III FY2010



This Reach Monitored by TCEQ Field Office.

Figure 1-3



Canadian River Basin Reach IV FY2010



 This Reach Monitored by TCEQ Field Office and USGS.

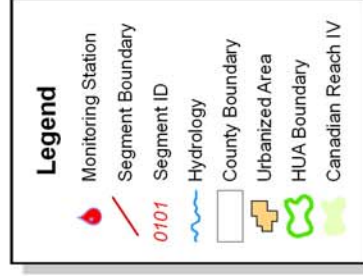
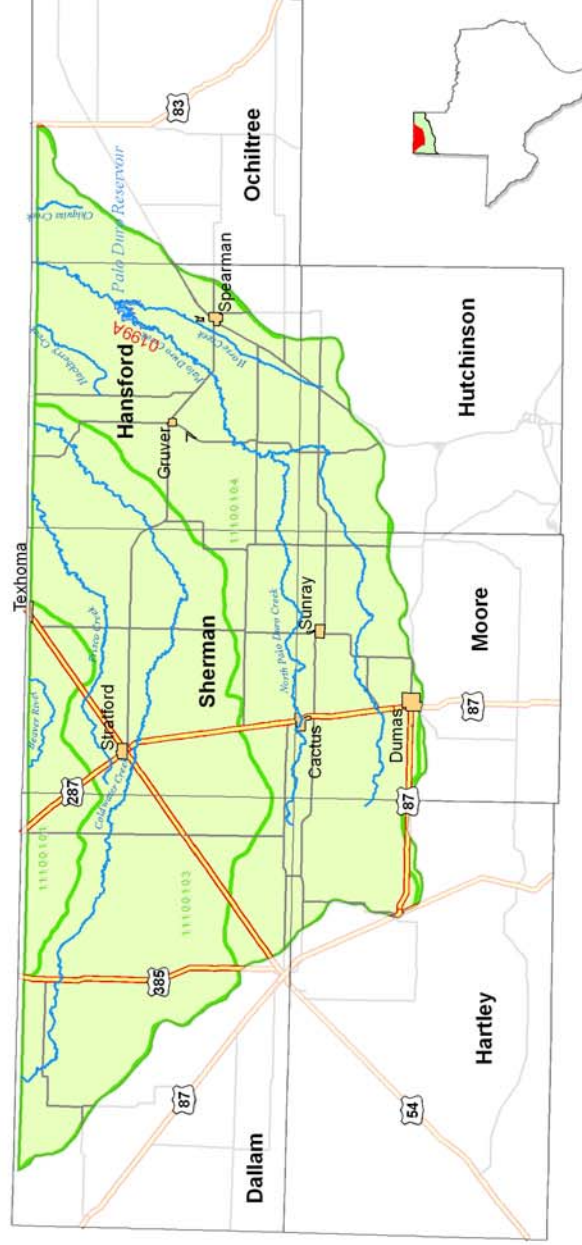


Figure 1-4



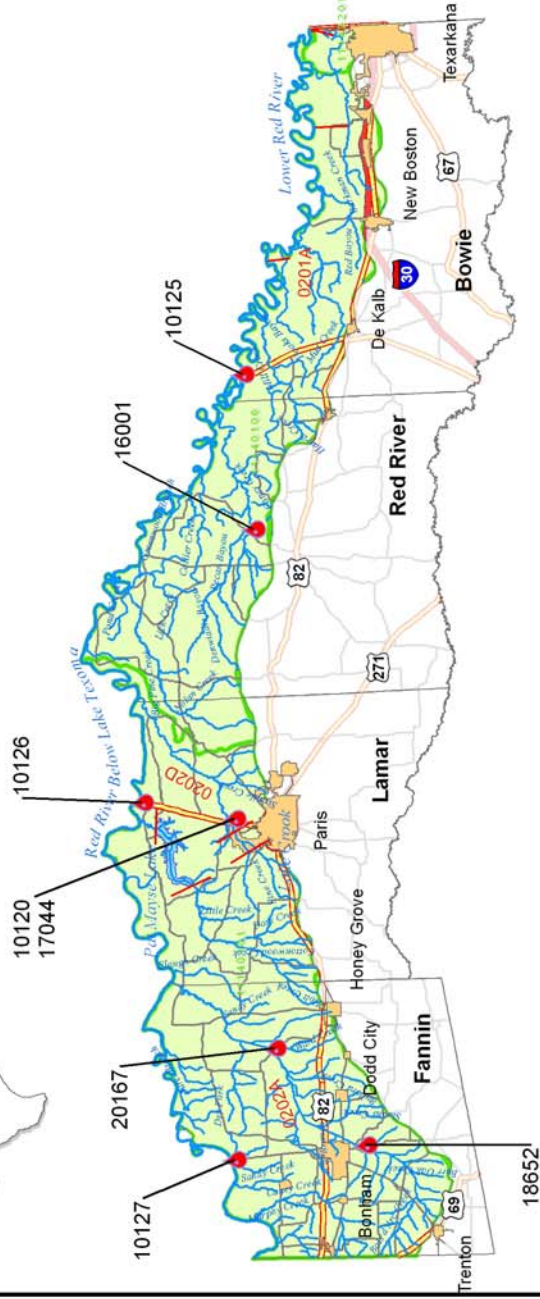
Canadian River Basin Reach V FY2010



Figure 1-5



Red River Basin Lower Reach I FY2010



Monitoring Station

Segment Boundary

Segment ID

Hydrology

Urbanized Area

County Boundary

HUA Boundary

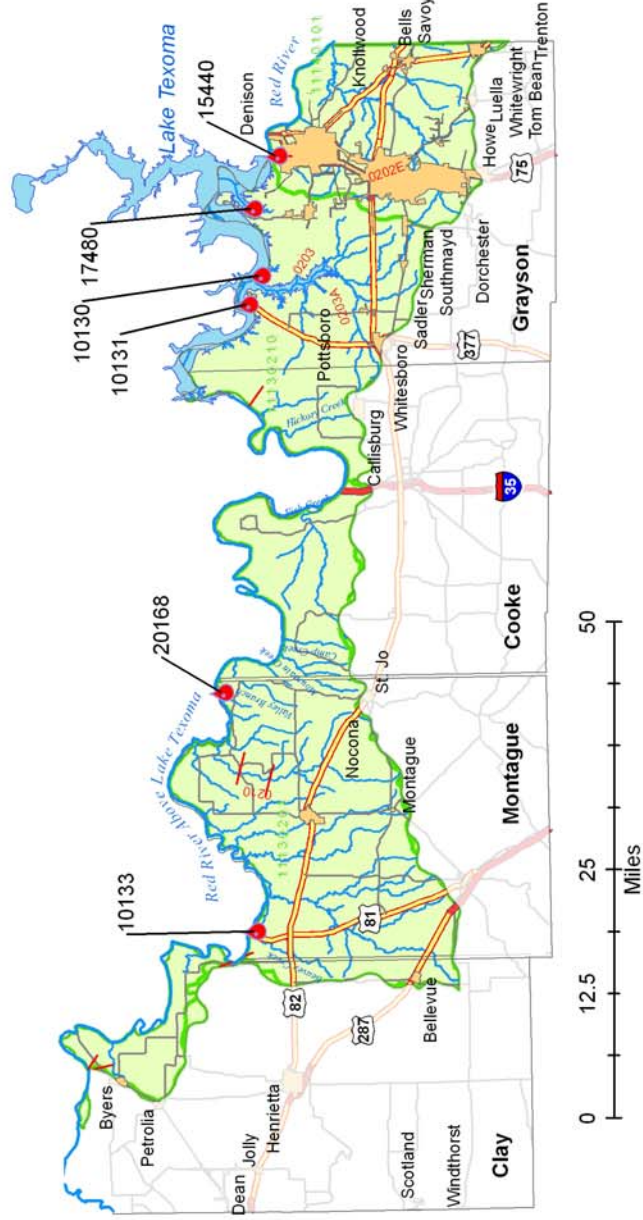
Red Lower Reach I



Figure 2-1.1



Red River Basin Upper Reach I FY2010



Monitoring Station

Segment Boundary

Segment ID

Hydrology

Urbanized Area

County Boundary

HUA Boundary

Red Upper Reach I

Figure 2-1.2



Red River Basin Upper Reach I (Sites Monitored by City of Sherman) FY2010

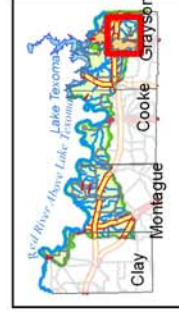
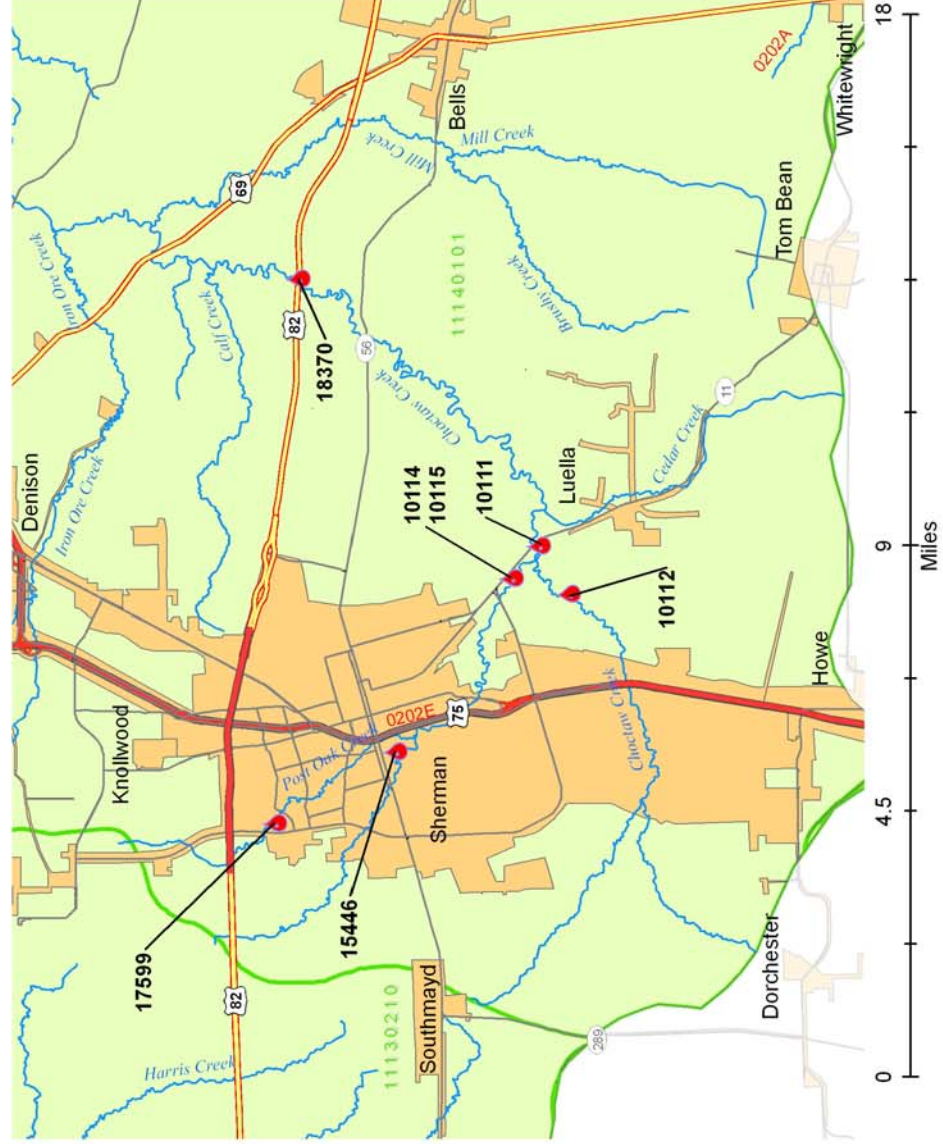
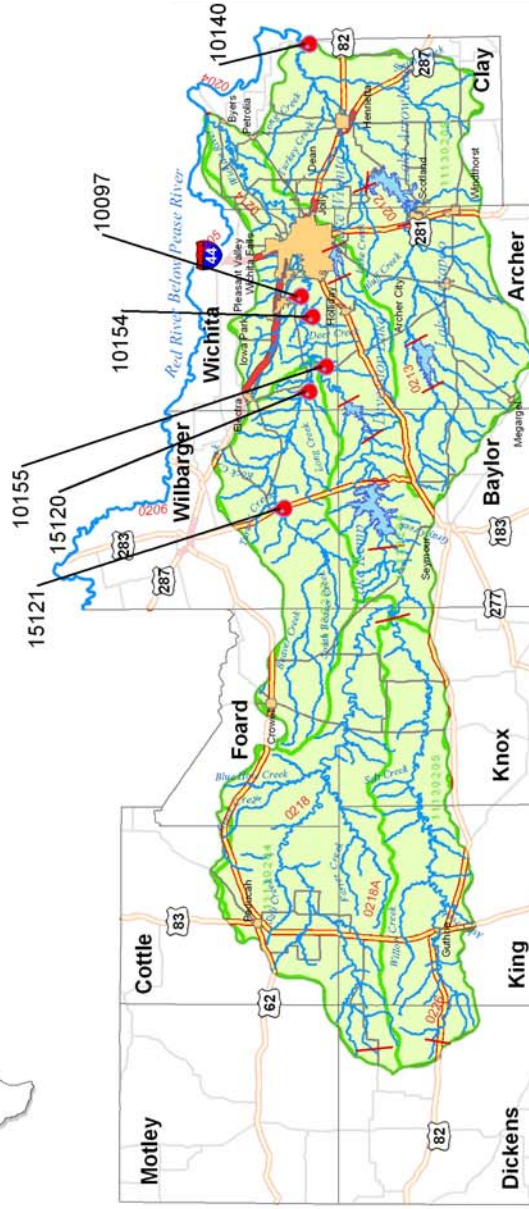


Figure 2-1.3



A vertical number line labeled "Miles" with tick marks at 0, 15, 30, and 60.

Figure 2-2



Red River Basin Reach III FY2010

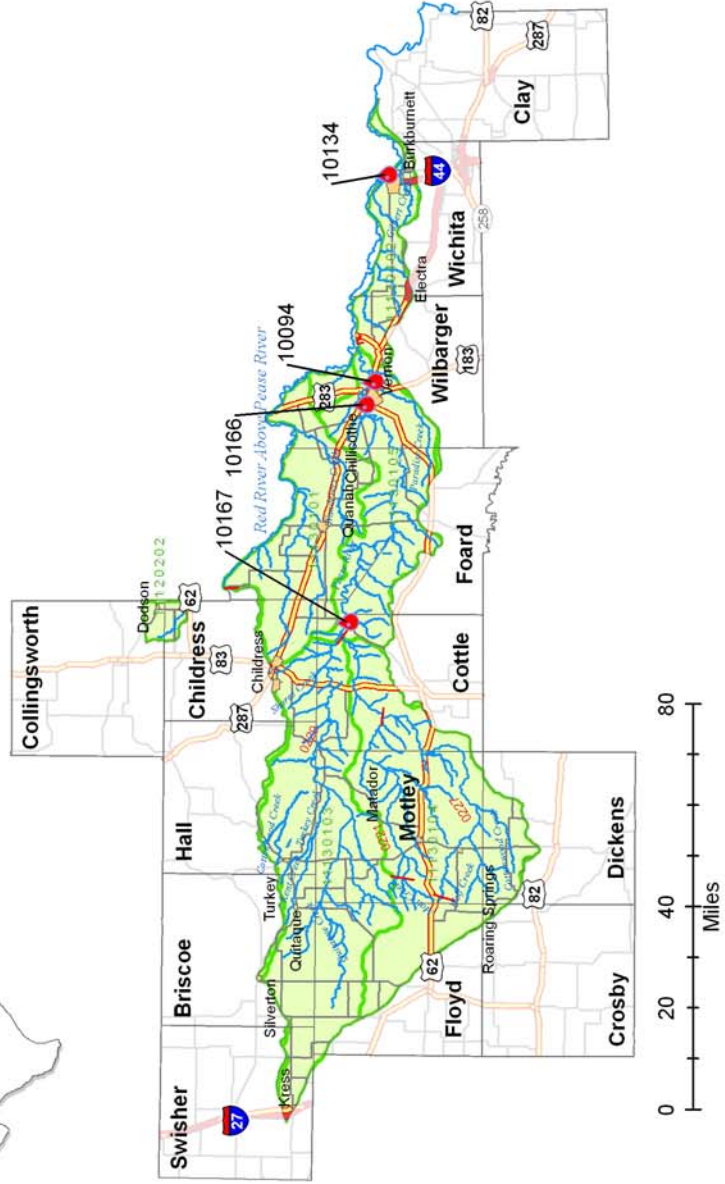


Figure 2-3



Red River Basin Reach IV FY2010

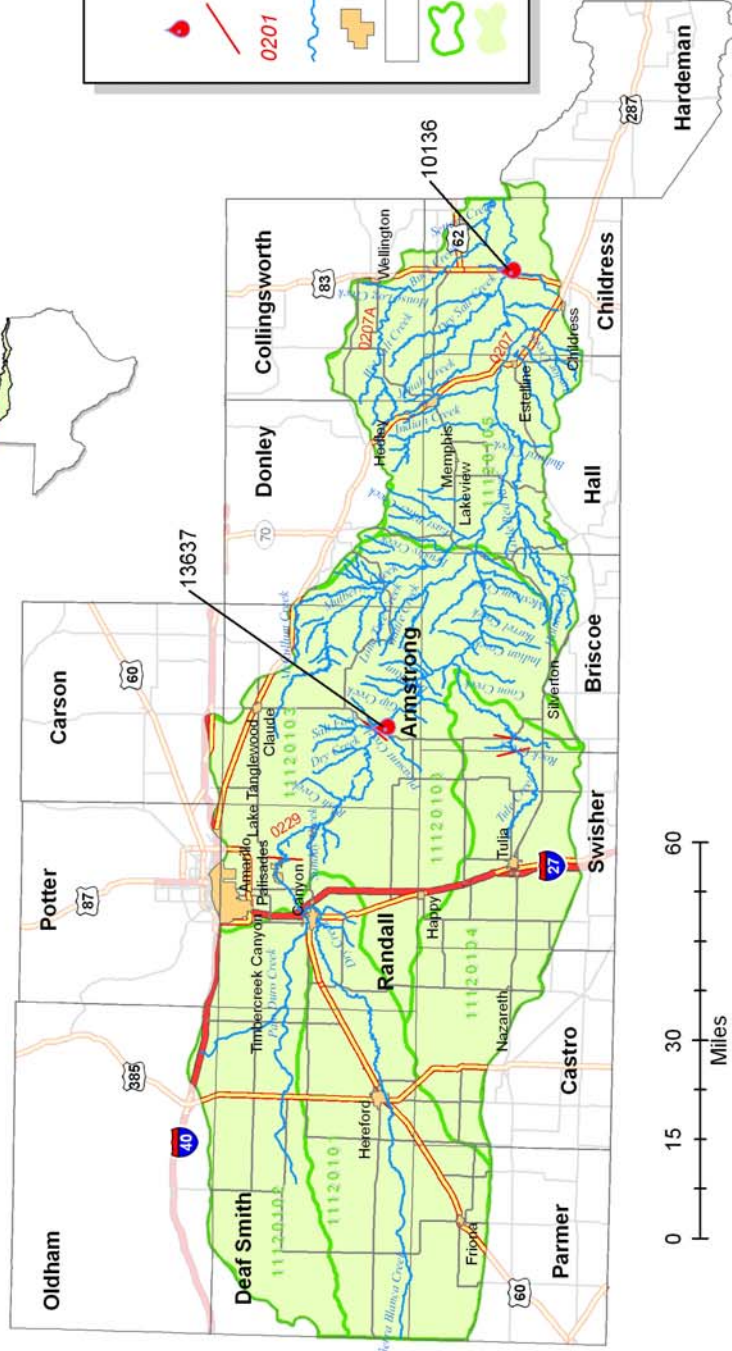
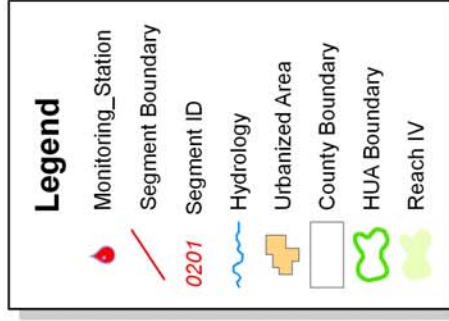
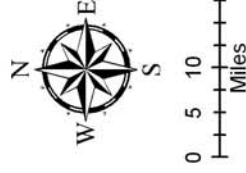


Figure 2-4



Red River Basin Reach V FY2010



Legend

Monitoring_Station

Segment Boundary

Segment ID

Hydrology

Urbanized Area

County Boundary

HUA Boundary

Red Reach V

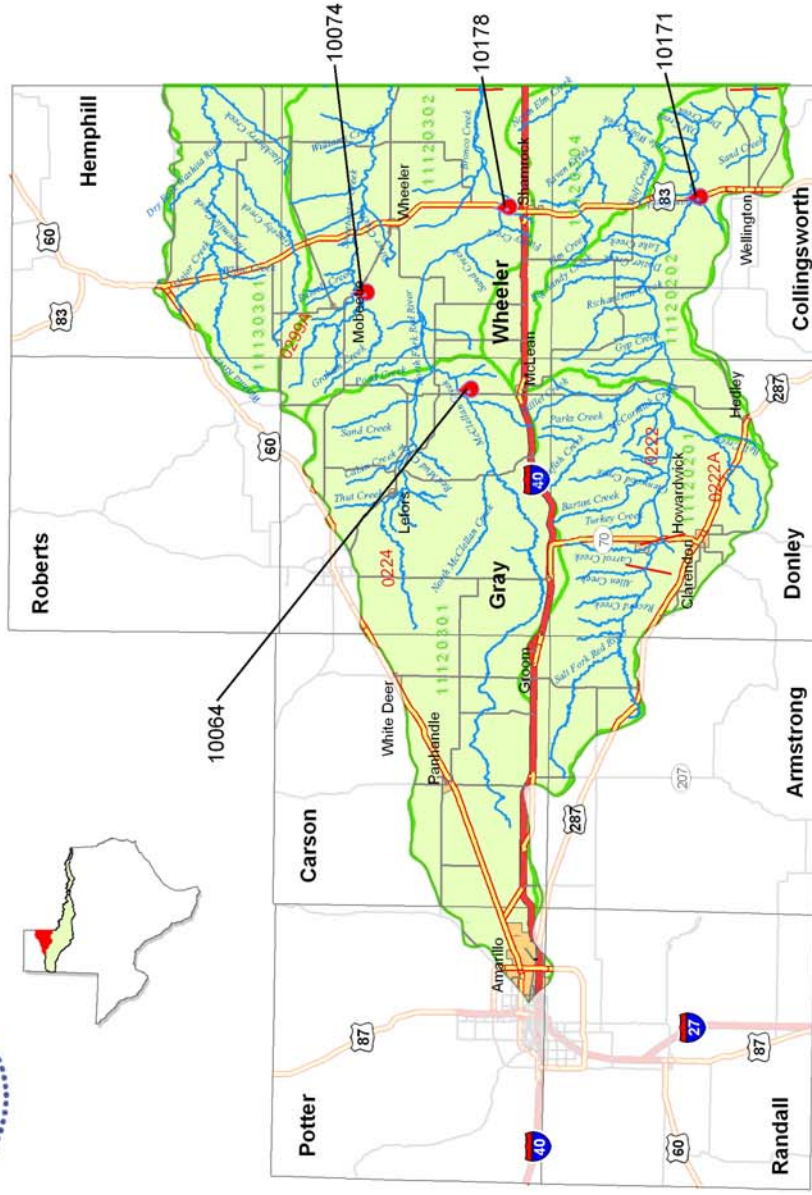


Figure 2-5

Appendix C

Field Data Sheets



RED RIVER AUTHORITY OF TEXAS FIELD DATA REPORTING FORM



Date:		Station Location:			TCEQ Site ID:	
Time:		Basin/Reach/Segment:	HUA No.		RRA Tag No:	
County:		(82903) Monitoring Type:	QAO:		DE:	
Red River ID #:			Stream Width: (ft)		Section Width: (ft)	
Chain of Custody #:			Time Start:		Time End:	
Tech(s):				Section Midpoint	Section Depth	Velocity
Storet Code	Sample Collection Depth _____ Meters		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			
89835		Flow Measurement Method 1 – Gauge 2 – Electronic 3 – Mechanical 4 – Weir/Flume 5 – Doppler	9			
			10			
20424		Water Clarity 1 – Excellent 2 – Good 3 – Fair 4 – Poor 5 – Other*	11			
			12			
89969		Water Color 1 – Brown 2 – Reddish 3 – Green 4 – Black 5 – Clear 6 – Other	13			
			14			
89971		Water Odor 1 – Sewage 2 – Oily/Chem 3 – Rotten Eggs 4 – Musky 5 – Fishy 6 – None 7 – Other*	15			
			16			
00021		Air Temperature (° Fahrenheit)	17			
89966		Weather 1 – Clear 2 – Partly Cloudy 3 – Cloudy 4 – Rain 5 – Other*	18			
			19			
89965		Wind Condition 1 – Calm 2 – Slight 3 – Moderate 4 – Strong Direction _____	20			
72053		Significant Precip. (< or > Days)	Total Flow in CFS			
Comments:						

MEASUREMENT COMMENTS AND FIELD OBSERVATIONS

Storet Code	
00078	Secchi Disk Reading (Meters)
89968	<div style="display: flex; justify-content: space-between;"> <div>Water Surface:</div> <div>1 – Calm 2 – Ripples 3 - Waves</div> </div>
	Lab Turbidity (NTU):
	<i>E. coli</i> (MPN / 100 mL):
	Fecal Coliform (# / 100 mL):
	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: <i>Lab Turbidity, E. coli, and Fecal Coliform results are reported from RRA's ESD Laboratory Parameter Result Sheet.</i>	



Red River Authority of Texas



YSI Calibration Log – Instrument:						Date:	Time:
Site (Where Calibrated):		Technician(s):				Barometric Pressure Uncorrected: (mb)	
Calibration Values	Actual (Read before Calibration) (All Temps °C)	Sonde (Read After Calibration) (All Temps °C)		Post Cal. Values Date: _____ Time: _____		Barometer Reading: Calibration Constants and Ranges	Record Constants or Values (mm/Hg)
		Temp	Value	Temp	Value		
Sp.Cond. _____ uS/cm						Conductivity Cell (4.5 to 5.5)	
pH 7 (Exp.)						pH 7 (0 ± 50 mV)	
pH 10 (Exp.)						pH 10 (-130 to -230 mV)	
DO (mg/L)						DO Charge (25 to 75)	
DO (%)						DO Gain (0.7 to 1.5)	
Battery Voltage						DO Membrane Changed?	
Notes and Comments: (YSI Sonde 600 XLM-O with YSI 650 MDS Logger)						Yes	No
						(If yes, wait 8 hours before final calibration)	
Equipment Maintenance:							

Appendix D

Chain-of-Custody Forms

0008301

PO Box 240, Wichita Falls TX 76307-0240
3000 Hammon Rd, Wichita Falls, TX 76310-7500
Phone: 940-723-1717 • Fax 940-723-6529

[illegible]

Appendix E

Data Review Checklist and 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. Only the Data Summary is required to be submitted with the data sets.

Data Format and Structure	✓, ✗, or N/A
A. Are there any duplicate <i>Tag Id</i> numbers in the Events file?	
B. Do the <i>Tag</i> prefixes correctly represent the entity providing the data?	
C. Have any <i>Tag Id</i> numbers been used in previous data submissions?	
D. Are TCEQ station location (SLOC) numbers assigned?	
E. Are sampling <i>Dates</i> in the correct format, MM/DD/YYYY with leading zeros?	
F. Are the sampling <i>Times</i> based on the 24 hour clock (e.g. 13:04) with leading zeros?	
G. Is the <i>Comment</i> field filled in where appropriate (e.g. unusual occurrence, sampling problems, unrepresentative of ambient water quality)?	
H. <i>Submitting Entity</i> , <i>Collecting Entity</i> , and <i>Monitoring Type</i> codes used correctly?	
I. Are the sampling dates in the <i>Results</i> file the same as the one in the <i>Events</i> file for each <i>Tag Id</i> ?	
J. Are values represented by a valid parameter code with the correct units?	
K. Are there any duplicate parameter codes for the same <i>Tag Id</i> ?	
L. Are there any invalid symbols in the <i>Greater Than/Less Than (GT/LT)</i> field?	
M. Are there any <i>Tag Ids</i> in the <i>Results</i> file that are not in the <i>Events</i> file or vice versa?	
Data Quality Review	✓, ✗, or N/A
A. Are all the “less-than” values reported at the LOQ? If no, explain in the Data Summary.	
B. Have the outliers been verified and a "1" placed in the <i>Verify_flg</i> field?	
C. Have checks on correctness of analysis or data reasonableness been performed? e.g.: Is ortho-phosphorus less than total phosphorus? Are dissolved metal concentrations less than or equal to total metals? Is the minimum 24 hour DO less than the maximum 24 hour DO? Do the values appear to be consistent with what is expected for that site?	
D. Have at least 10% of the data in the data set been reviewed against the field and laboratory data sheets?	
E. Are all parameter codes in the data set listed in the QAPP?	
F. Are all stations in the data set listed in the QAPP?	
Documentation Review	✓, ✗, or N/A
A. Are blank results acceptable as specified in the QAPP?	
B. Were control charts used to determine the acceptability of field duplicates?	
C. Was documentation of any unusual occurrences that may affect water quality included in the <i>Event</i> table's <i>Comments</i> field?	
D. 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.	
E. 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.	
F. Was the laboratory's NELAC Accreditation current for analysis conducted?	

✓ = Yes ✗ = No N/A = Not applicable

DATA SUMMARY

Data Set Information

Data Source: _____.

Date Submitted: _____.

Tag_id Range: _____.

Date Range: _____.

Comments:

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

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

☐ 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 Data Review Checklist.

Planning Agency Data Manager: _____.

Date: _____.

Appendix F
Red River Authority of Texas
Data Management Plan

RED RIVER AUTHORITY OF TEXAS

DATA MANAGEMENT PLAN

PERSONNEL

Management

Pursuant to the Authority's General Administrative Policy, § 1, 2, 4 and 7; personnel assigned to General Administration are responsible for applying professional management practices and established internal controls to ensure the integrity and safeguard(ing) of all data associated with various Authority business activities. Leadership is provided by key administrative personnel under guidance of the Board Adopted Administrative Policy relevant to each division, department, function or level of interactivity.

Program Organizational Chart

An Organizational Chart depicts the level of administration and responsibility for the operative management of data. Concise guidance and specific component accountability is achieved under the referenced organizational diagram. Revisions of the program are selectively implemented as necessary. Classification of personnel is based on a skill and/or expertise level required to perform the assigned tasks. Refer to **Chart 1**, in the front of this QAPP, for details of the program organizational chart.

Training

Continual training and instruction is provided, enabling management and staff to expand capacity and enhance skills in an effort to maintain the highest degree of accuracy and performance feasible. Performance is measured both individually and as a group, providing guidance for necessary continuing education programs and the basis for personnel career advancement, which ultimately improves unit efficiency and effectiveness.

The Authority employs an interactive data management team, which is multi-functionally cross-trained to perform under the guidance of the Authority's Administrative Policy and Procedures Manual. All data management personnel are provided continuing education, both formal and informal, to maintain proficiency with dynamic hardware, software and application protocols.

Hardware Considerations

Data management occurs within the framework of a Local Area Network (LAN) utilizing a Windows 2003 Server configured as follows: Dual Intel Xeon Processors 3.06 GHz, 512k Cache, 533Mhz Front Side Bus, 1.0 GBDDR SDRAM, two 73 GBSCSI Hard drives connected via Hardware Raid 1. Workstation minimum configurations are as follows: Pentium IV class processors running at 3.2 GHz or higher, 80 GB Hard Drive, 512 Mb Ram, Windows XP SP3 OS. The LAN, Server and workstations are maintained by the IT Systems 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 2003 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 Office 2002 and Microsoft Office 2003 for general word processing, presentations graphics and subsidiary data management and analysis. AutoCAD 2000 and ArcGIS 9 are used for high end graphics and the Geographical Information System (GIS). StatSoft Statistica 5.5 for Windows is the primary statistical analysis software applied to processed data. Microsoft Excel 2003 is utilized as subsidiary analysis software and to maintain compatibility with other entities.

Data Dictionary

Terminology and field descriptions are included in the SWQM Data Management Reference Guide, most recent version. For the purposes of verifying which source codes are included in this QAPP, a table outlining the codes that will be used when submitting data under this QAPP is included below. Submitting Entity specifies the entity responsible for the sampling (Red River Authority of Texas), while Collecting Entity indicates the actual entity collecting the samples in the field. If needed, this table will be resubmitted with amendments to the QAPP that involve the addition of other monitoring entities under the QAPP.

Name of Monitoring Entity	Submitting Entity	Collecting Entity
Red River Authority of Texas	RR	RR
City of Sherman	RR	SH

Information Resource Management Requirements

Data will be managed in accordance with the TCEQ Surface Water Quality Monitoring Data Management Reference Guide and applicable Basin Planning Agency information resource management policies.

Global Positioning System (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 the TCEQ's SWQMIS database. Positional data obtained by the Clean Rivers Program grantees using a Global Positioning System 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 station location.

Data Management Plan Implementation

The Data Manager is responsible for implementation of the plan when any new data is received for storage and analysis or when existing data inventories are retrieved for a specific task. The Data Manager provides supervision of all tasks relating to management of data contained in the system, either in hard copy or electronic format. On-line data inventories are maintained on a dedicated volume of the LAN for access by other staff members and technicians performing specialized tasks. Final quality controlled field data sheets or datasets are assembled with the lab reports and chain-of-custody reports for inclusion into a three-ring binder. Original records (field and laboratory data sheets and chain of custodies) are maintained in Room 103 of the Authority's Administrative Offices.

There are a minimum of five stages of quality assurance and quality control (QA/QC) that the data is subjected to from the point of entry into the data management processing system through publication and storage. During each stage of QA/QC, the data are visually checked and/or electronically screened in accordance with a detailed QA/QC protocol to ensure that the highest data integrity is maintained. The QA/QC process returns either a pass or fails result in which case the data are returned for corrective actions or passes on to the next processing steps. A QA/QC log and/or report is generated to verify the completed processes applied to the data and show responsibility for the person or persons managing the data in support of each assigned task. The Quality Assurance Officer is responsible for performing all control processes and initializing the completed process. The Data Manager validates the QA/QC process prior to data entry or importation of data in the primary database structure.

Refer to the Quality Assurance Protocols in **Sections D1, D2 and D3** of this QAPP and the attached Data Management Schematic for details of the QA/QC stages applied during the processing path of data throughout the Data Management System.

Quality Assurance Quality Control

Refer to **Sections D1, D2 and D3** of this QAPP.

Data Errors and Loss

All field and laboratory data sheets are reviewed for errors and omissions upon completion. Data is entered into the Authority's CRP Database directly from laboratory and field data sheets as soon as possible, upon completion to reduce errors. Data entry checks are

completed ($\geq 10\%$ verification) and data entry forms built into the Authority's CRP Database perform automated format verification of data entered for each parameter to reduce errors. All CRP Database files are converted to pipe delimited ASCII files and archived after submission to TCEQ.

Migration/Transfer/Conversion

Data to be imported into a database, either from hard copy for manual data entry or in digital format for electronic entry, follows the conversion protocol best suited for the application and to comply with the structure of the host database design. In most cases, ASCII delimited text is the common migration format of choice.

Any new data for entry in the database management system (DBMS) not already in an acceptable format is converted to ASCII delimited text for importation. ASCII is the common medium for data archival and security and is utilized to maintain compatibility with all other format types, especially as new databases are introduced. An ASCII text editor is utilized to read the data file and determine its basic format, remove dead space, and arrange the fields in the most desirable edit order. These steps are accomplished in the data screening and preparatory processing stages where individual specifications are prepared for each different dataset to be included in the DBMS. Working with a copy of the data file, the conversion processing stage consists of the following defined procedures:

1. Separate data file into subsidiary blocks by predefined table specifications;
2. Normalize the table(s) by key field group relationships;
3. Set form and table assignments;
4. Arrange field order per table;
5. Add field and record delimiters as needed; and
6. Apply QA/QC review and log.

Table blocks may then be arranged to comply with the host database structure configuration to facilitate importation without error. Preferred field/record delimiters are installed and a test import to the host database structure is performed with a sampling of actual data for QA/QC review purposes.

BACKUP/DISASTER RECOVERY

1. Archives/Data file Backups

Copies of data files are retained on-line for comparison and edification with two duplicates of each data file stored off-site on 4mm data tape. The copies are logged with one remanded to a fireproof vault and the other is remanded to senior staff members for off-site storage until they are one month old. They are then stored in a fireproof safe located on-site until they are rotated through recycling of the backup data tape. Alternating tape backups are made weekly and stored off-site for safety against hazards that may affect the Authority's offices.

2. Disaster Recovery

Restoration of individual data files and source programs may be obtained from duplicates contained on tape and stored off-line. A control duplicate of the CRP data volume contained on the LAN file server is stored on CD(s) that 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; tape backup, CD-ROM, and retained indefinitely on-site by the Authority and off-site for a retention period specified in the original QAPP document.

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 together with a backup copy and kept off-line, off premises, and in a secure environment. All data files are retained in their original media and format without modification. Copies are utilized for initial conversion, formatting and importation to the interim database structure for continued processing.

INFORMATION DISSEMINATION

1. Public Access

Multimedia editorials and educational programs to be distributed throughout the watersheds will be made available through the information resources library and the Authority's Internet site as funds permit. Final quality assured data contained in the primary database structure is linked to the website for ready access of the most current data available. The Data Management Program is flexible enough to provide a vast amount of relevant information through other public information programs produced by the Authority for use in public schools and the general public through public forums and meetings.

2. Internet

An Internet Web Site is hosted by the Authority and dedicated to the CRP to provide the public with timely updates of Authority projects and programs. Select datasets and other products are also made available. This site is in a continuous state of modification to provide the most current information available. The CRP home page provides current information on the assessment process and over five years of water quality monitoring data. This information may be retrieved by county, basin reach, hydrologic unit area, segment, or by station number. An information repository is being expanded to include technical summaries, intensive survey reports, priority watershed studies and other publications relevant to the CRP that may also be of interest to the general public. Data links are maintained to other similar sites of interest.

3. Reporting

The Authority produces externally available reports, such as the Biennial Regional Assessment of Water Quality, Annual Financial Report, Project Summary Reports, newsletters, and Program Reports relevant to all major programs or projects to which the Authority is engaged. Summaries of published CRP reports are made available on the Authority's website in the Public Information Repository section.

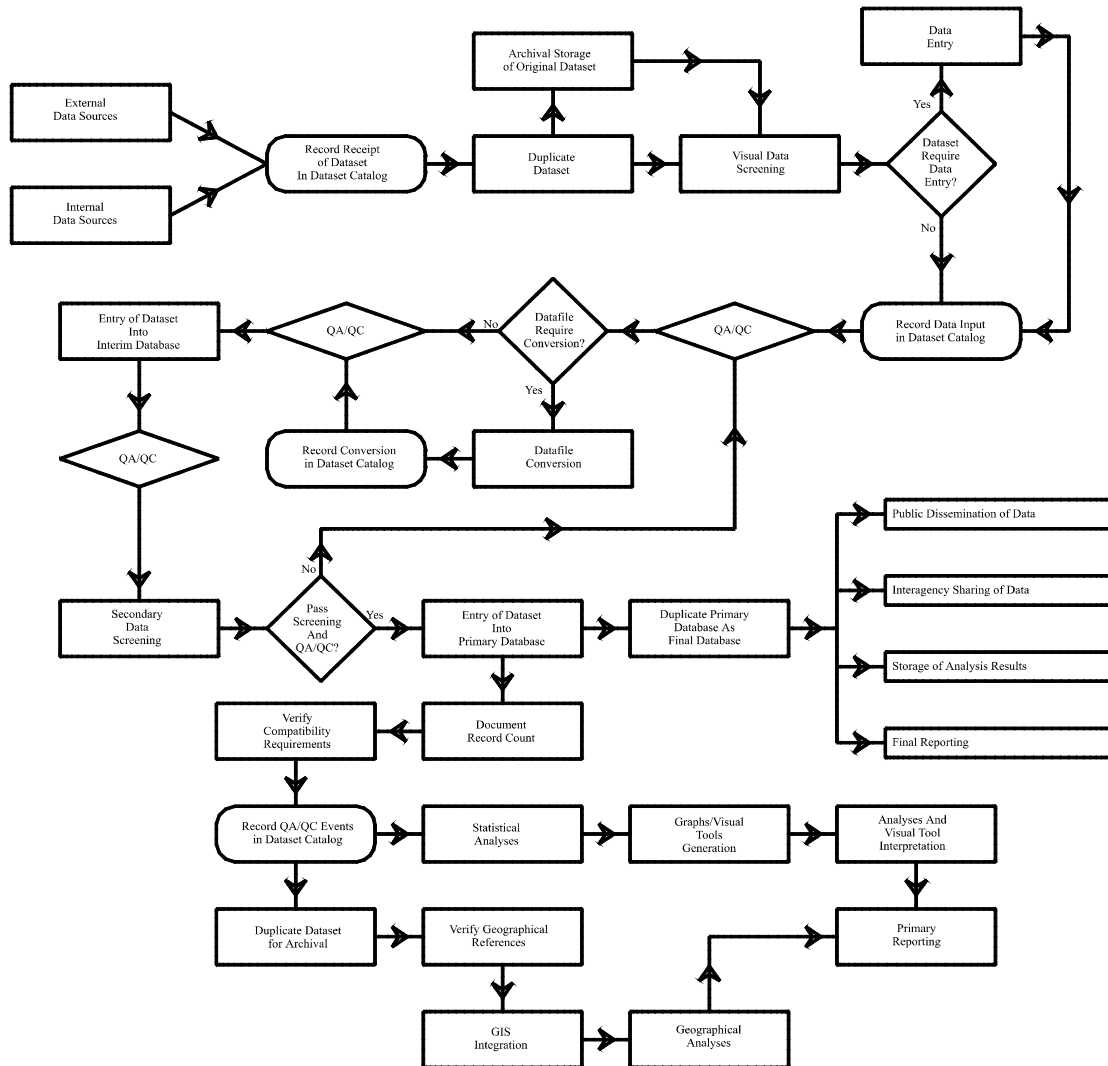
INTER-AGENCY DATA SHARING

Software packages today provide features and conversion utilities that allow nearly universal translation of digital data files. The Authority keeps on hand a number of software products with extensive data translation functions to ensure that any user request for data in nearly any format can be met.

Data Management Schematic

Data Path Profile

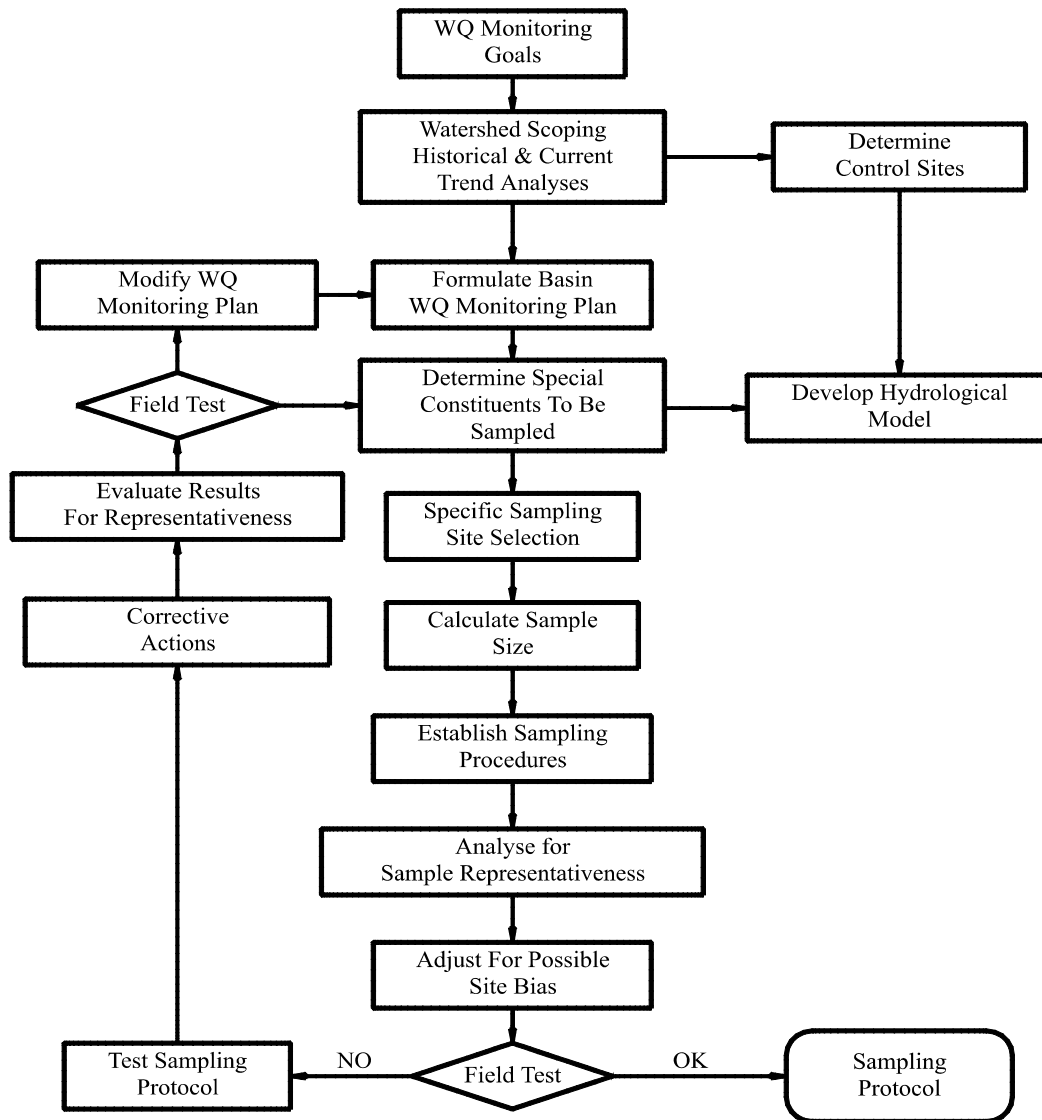
Chart 2



WATER QUALITY MONITORING

Monitoring Protocol

Chart 3



WATER QUALITY MONITORING **Sampling Protocol** **Chart 4**

