

**Sulphur River Basin Authority
Clean Rivers Program
FY 2008/2009
Quality Assurance Project Plan, QAPP**

**Sulphur River Basin Authority
911 N Bishop Street
Wake Village, Texas 75501**

**Clean Rivers Program
Monitoring Operations Division
Texas Commission on Environmental Quality
P.O. Box 13087, MC 165
Austin, Texas 78711-3087**

Effective Period: FY 2008 to FY 2009

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

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LIST OF ACRONYMS

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
CAR	Corrective Action Report
COC	Chain of Custody
CRP	Clean Rivers Program
DOC	Demonstration of Capability
DQO	Data Quality Objective
EPA	United States Environmental Protection Agency
FY	Fiscal Year
LCS	Laboratory Control Sample (formerly Laboratory Control Standard)
LCSD	Laboratory Control Sample Duplicate (formerly Laboratory Control Standard Duplicate)
LOD	Limit of Detection (formerly Method Detection Limit or MDL)
LOQ	Limit of Quantitation (formerly Reporting Limit)
QA	Quality Assurance
QM	Quality Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QC	Quality Control
QMP	Quality Management Plan
RBP	Rapid Bioassessment Protocol
RWA	Receiving Water Assessment
SOP	Standard Operating Procedure
SRBA	Sulphur River Basin Authority
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System (formerly TRACS)
TMDL	Total Maximum Daily Load
TC	Texarkana College
TCEQ	Texas Commission on Environmental Quality
TSWQS	Texas Surface Water Quality Standards
VOA	Volatile Organic Analytes
WMT	Watershed Management Team
WPL	Wright Patman Lake

A3 DISTRIBUTION LIST

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

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

TCEQ

Laurie Curra CRP Manager

Responsible for TCEQ activities supporting the development and implementation of the Texas Clean Rivers Program. Responsible for verifying that the QMP is followed by CRP staff. Supervises TCEQ CRP staff. Reviews and responds to any deficiencies, nonconformances, or findings related to the area of responsibility. Oversees the development of 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.

Jennifer Delk CRP Project Manager

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

Eric Reese CRP Data Manager

Responsible for coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval. Performs automated data validation routines and coordinates error correction. Provides quality assured data sets to TCEQ Information Resources in compatible formats for uploading to the statewide database. Generates reports to assist CRP Project Managers' data review.

Provides training and guidance to CRP and Planning Agencies on technical data issues. Reviews and approves data-related portions of program QMP and project-specific QAPPs. Develops and maintains 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. Coordinates documentation and implementation of corrective action for the CRP.

SULPHUR RIVER BASIN AUTHORITY

Nancy Rose
Sulphur River Basin Authority Project Manager

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

Mike Buttram
Sulphur River Basin Authority 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 coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the Sulphur River Basin Authority Project Manager of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies, nonconformances and corrective action. Coordinates and maintains records of data verification and validation. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Conducts monitoring systems audits on project participants to determine compliance with project and program specifications, issues written reports, and follows through on findings. Ensures that field staff is properly trained and that training records are maintained. Reviews all data entered into SRBA database and is responsible for the transfer of basin quality-assured water quality data to the TCEQ in a format compatible with SWQMIS (formerly the SWQM portion of the TRACS database).

Patricia Harman

Sulphur Basin Authority Data Manager

Responsible for ensuring that field data are as complete as possible, properly reviewed and verified. Verifies that all laboratory data has the correct holding times and AWRLs, and that the QA documents and COCs are in order. Enters all data into the SRBA database and checks to make certain the entry is correct. Assists the SRBA QA officer in completing the data summary.

Texarkana College

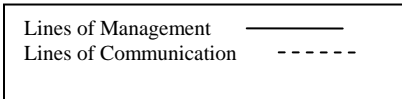
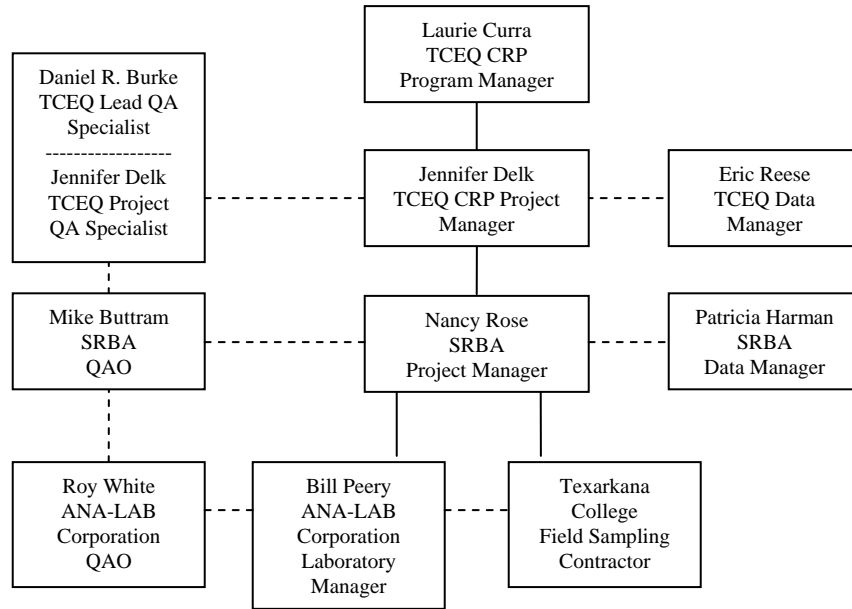
Sulphur River Basin Authority Field Sampling Contractor

Mike Buttram and Patricia Harman of TC are responsible purchasing all field and laboratory equipment and supplies for the SRBA and organizing each monitoring event. This includes maintaining necessary paperwork to support the monitoring activities, instrument calibration and logs, chain of custodies, and direct supervision of all monitoring. TC students will be trained in proper monitoring techniques and assist in most monitoring events, but the students will be under direct supervision. A representative of Texarkana College will regularly take part in TCEQ training events to stay up to date on monitoring procedures.

Other key participants (e.g., contractors/participants, field sampling supervisors) must be listed and the project duties of each should be summarized.

PROJECT ORGANIZATION CHART

Figure A4.1. Organization Chart - Lines of Communication



A5 PROBLEM DEFINITION/BACKGROUND

In 1991, the Texas Legislature passed the Texas Clean River Act (Senate Bill 818) in response to growing concerns that water resource issues were not being pursued in an integrated, systematic manner. The act requires that ongoing water quality assessments be conducted for each river basin in Texas, an approach that integrates water quality issues within the watershed. The CRP legislation mandates that “each river authority (or local governing entity) shall submit quality-assured data collected in the river basin to the commission.” “A 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 SRBA and the TCEQ to carry out the activities mandated by the legislation. The QAPP was developed and will be implemented in accordance with provisions of the *Quality Management Plan for the Clean Rivers Program* (most recent version).

The purpose of this QAPP is to clearly delineate SRBA QA policy, management structure, and procedures which will be used to implement the QA requirements necessary to verify and validate the surface water quality data collected. The QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are scientifically valid and legally defensible. This process will ensure that data collected under this QAPP and submitted to the statewide database 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 2008 -2009.

Over six thousand monitoring events are recorded in the TCEQ database for the Sulphur River Basin with dates ranging as far back 1969. Although this is a wealth of historical information, only the data collected in the five year period from 2001 to 2005 that has been used for assessment will impact this review. This QAPP only details studies relating to three of the seven segments which will further limit its scope. The three segments are:

Segment 0302 Wright Patman Lake (From Wright Patman Lake Dam in Bowie/Cass County to a point 1.5 kilometers downstream of Bassett Creek in Bowie/Cass County, up to the normal pool level of 225 feet)

WPL is large man made lake that was impounded in 1956 by the US Army Corp of Engineers as a flood control project. The lake occupies approximately 19,000 acres of Sulphur River bottom land and has a maximum depth of 40 feet. The average depth is considerably less than the 40 ft maximum and is probably no more than 6 to 8 feet. The depth varies during the year due to the lakes flood control regiment. Water from the lake is utilized in the area as a source of drinking water and to support local industry. The water is characterized as murky with a shallow secchi depth, typically less than half a meter. Major problems with the lake at various times are low DO levels, high pH levels, high chlorophyll concentrations, and related taste and odor problems. These problems have been reflected by WPL being placed on

the 303(d) List for the last few years. WPL was listed on the 303(d) List (December 1999) for dissolved oxygen concentrations that are sometimes lower than the standard established to ensure optimum conditions for aquatic life. These conditions existed near the dam and in the upper regions near Hwy 8. The 303(d) List (August 31, 2000) notes that several areas of the lake fail to meet the dissolved oxygen criterion at times. These areas are the upper reservoir, near the dam, and the upper-middle portion of the lake. The overall priority for this impairment was established as "medium". The pH values are high during certain time periods in the northwestern-most tip, the Elliott Creek arm located northwest of the dam, and the middle-upper portion of the lake. These values were occasionally higher than the criterion established to safeguard general water quality uses. WPL was listed on the 303(d) List (October, 2002) for the "general use" criterion based on high pH in the arm west of the dam and in the northeast corner of the lake and for "aquatic life use" based on the depressed oxygen criterion. The overall impairment is listed as "low". The causes of the impairments are listed as both point and non-point sources. The 2004 Texas 303(d) List (May 13, 2005) is very similar to the 303(d) List (October, 2002), again noting areas of depressed dissolved oxygen and high pH values. The lake has been assigned to category 5c which allows more time for data collection and analysis before a TMDL is scheduled. The DRAFT 2006 Texas 303(d) List (March 19, 2007) is little changed from the previous three lists with low dissolved oxygen and high pH values of concern in the same areas. WPL is important to the local area and is the focus of three of the sites monitored by the SRBA. See Figure 2 for the location of the three sites on WPL.

Segment 0304 Days Creek (From the confluence with Wagoner Creek in Bowie County (Texarkana) to South Stateline where it flows into Arkansas)

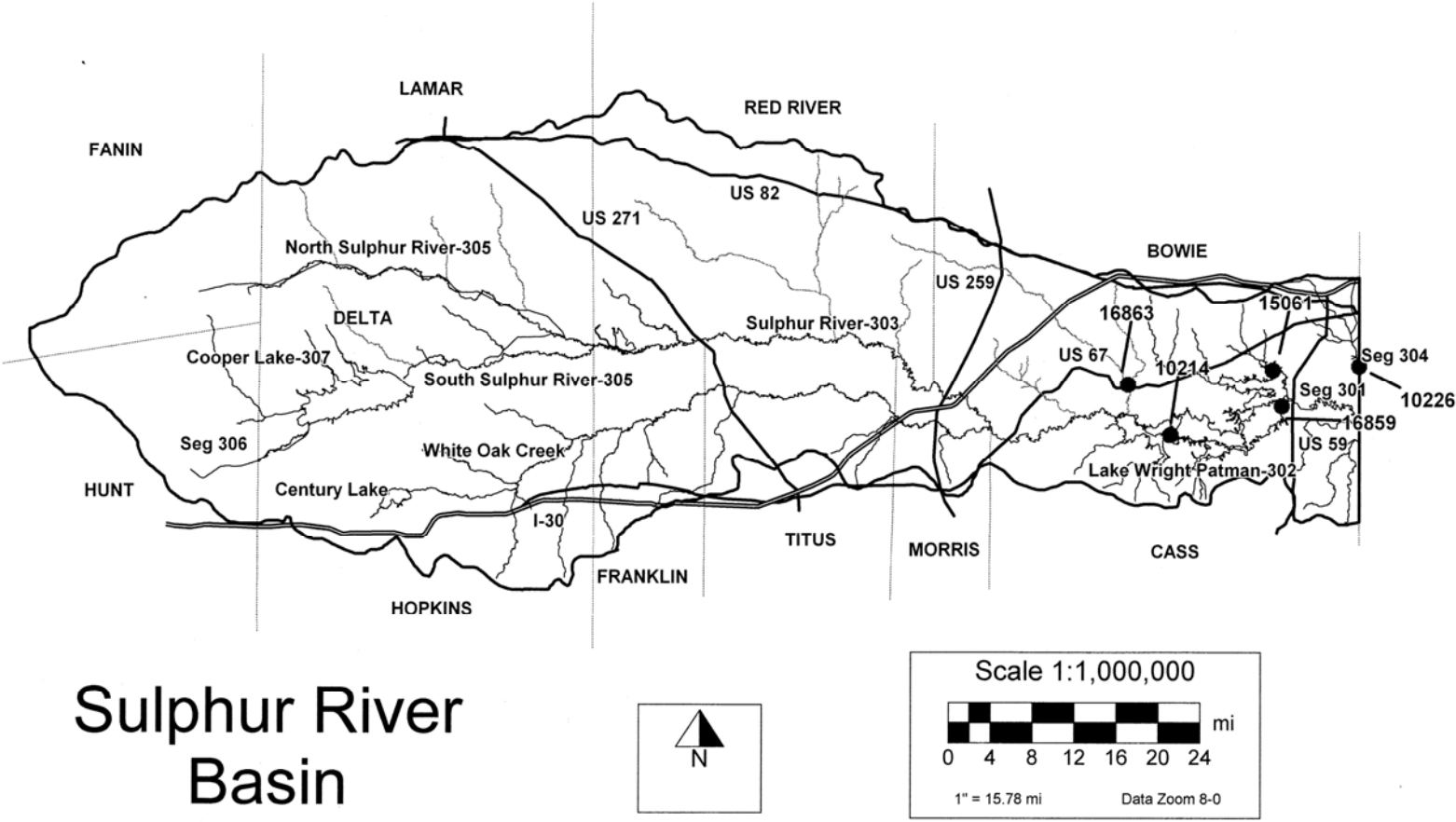
Days Creek is not listed on the 303(d) Lists for the last five years. It drains most of Texarkana and is regularly impacted by high levels of urban runoff. The Stateline site is below the Texarkana Waste Water which adds 8-10 million gallons per day of treated effluent to the stream during normal flow. The site is a fixed/routine site that has been monitored by TCEQ for a number of years. SRBA has picked up this site to relieve the travel and time commitment of TCEQ personnel. See Figure 2 for the location of the fixed/routine site on Days Creek.

Segment 0303b White Oak Creek (unclassified water body) (From the confluence of the Sulphur River north of Naples in Morris County to the upstream perennial portion of the stream east of Sulphur Springs in Hopkins County)

White Oak Creek is a long slow moving stream that drains much of the southern Sulphur Basin prior to flowing into Sulphur River. The lower 50 miles of White Creek is listed on the 303(d) List (August 31, 2000). The dissolved oxygen concentrations are occasionally lower than the criterion established to assure optimum conditions for aquatic life. The overall priority for this impairment was established as "medium". The lower 25 miles and the middle 25 miles near Hwy 271 are listed for the "aquatic life use" criterion based on depressed dissolved oxygen levels. The cause of the impairment is listed as both point and non-point sources. The 2002 Texas 303(d) List (October 1, 2002) indicates that the lower and middle 25 mile segments have depressed dissolved oxygen levels. The category of "5b" and rank of

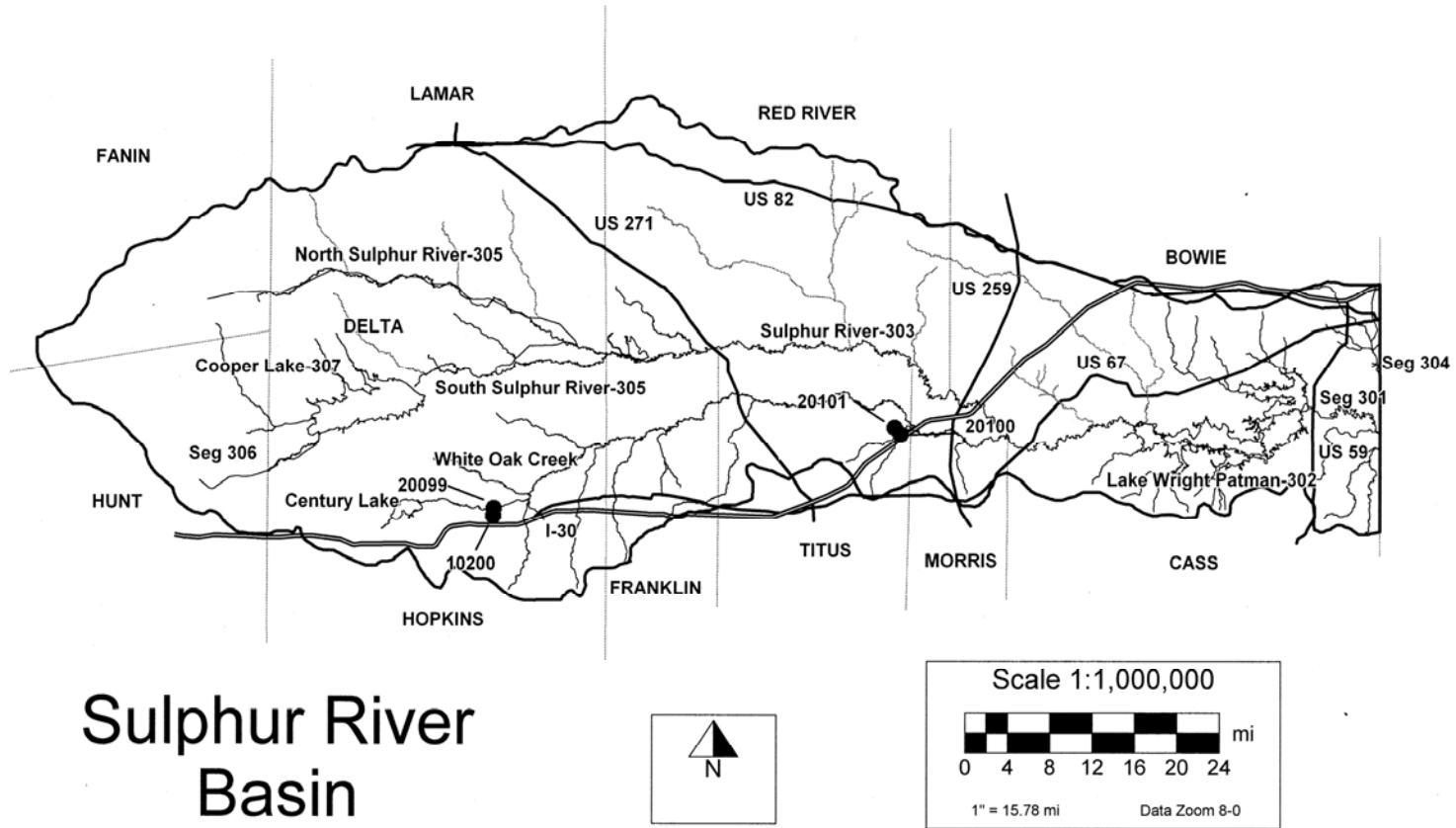
“S” indicate that a review of standards is underway. The 2004 Texas 303(d) List (May 13, 2005) and the DRAFT 2006 Texas 303 (d) List (March 19, 2007) detail similar problems with depressed dissolved oxygen levels and include the upper 25 mile segment. Sites on three tributaries of White Oak Creek and one site on White Oak Creek have been selected for intensive/systematic study by SRBA during FY 2008. These studies will support the review of standards for White Oak Creek. See Figure 3 for the location of the sites on the basin map.

Figure 2 Routine Sites



Sulphur River Basin

Figure 3 Systematic Sites



Sulphur River Basin

A6 PROJECT/TASK DESCRIPTION

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 SRBA Project Manager to the CRP Project Manager electronically. Amendments are effective immediately upon approval by the SRBA Project Manager, the SRBA 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 SRBA Project Manager.

Special Project Appendices

Projects requiring QAPP appendices will be planned in consultation with the SRBA 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 SRBA Project Manager, the SRBA QAO, and the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist and other TCEQ personnel as appropriate. Copies of approved QAPPs appendices will be distributed by the SRBA 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 SRBA 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.

Biological organisms are collected and identified to see if the stream water composition is impacting

the community composition or its integrity. The results of this type study can give an idea of the water quality over a period of time. The diel studies and habitat analyzes are integral parts of biological studies. Low dissolved oxygen level and poor habitat will limit the expectations for the biological community. The SRBA does not currently have the storage capability to meet the biological vouchering requirements specified in the TCEQ Surface Water Quality Monitoring Procedures Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2005 (RG-416). Unknown or unusual fish collected will continue to be vouchered and identified in the lab or submitted for independent identification/verification. The SRBA collection procedure is consistent with TCEQ protocols, and the data will be flagged reported as required by the data management protocols. The diel studies on WPL are an integral part of the study of the depressed dissolved oxygen and high pH values that have placed the lake on the 303(d) lists for a number of years.

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

Table A7.1 - Measurement Performance Specifications

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LOQ CHECK STANDARD %Rec	LAB
Field Parameters										
pH	pH/ units	water	EPA 150.1 and TCEQ SOP, V1	00400	NA*	NA	NA	NA	NA	Field
DO	mg/L	water	SM 4500-O G and TCEQ SOP, V1	00300	NA*	NA	NA	NA	NA	Field
Conductivity	uS/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	NA*	NA	NA	NA	NA	Field
Temperature	B C	water	SM 2550 B and TCEQ SOP V1	00010	NA*	NA	NA	NA	NA	Field
Secchi Depth	meters	water	TCEQ SOP V1	00078	NA*	NA	NA	NA	NA	Field
Days since last significant rainfall	days	NA	TCEQ SOP V1	72053	NA*	NA	NA	NA	NA	Field
Maximum pool width***	meters	water	TCEQ SOP V2	89864	NA*	NA	NA	NA	NA	Field
Maximum pool depth***	meters	water	TCEQ SOP V2	89865	NA*	NA	NA	NA	NA	Field
Pool length***	meters	water	TCEQ SOP, V2	89869	NA*	NA	NA	NA	NA	Field
% pool coverage***	%	water	TCEQ SOP V2	89870	NA*	NA	NA	NA	NA	Field
Total water depth	meters	water	TCEQ SOP V2	82903	NA*	NA	NA	NA	NA	Field
Flow	cfs	water	TCEQ SOP V1	00061	NA*	NA	NA	NA	NA	Field
Flow measurement method	1-gage 2-electric 3-mechanical 4-weir/flume 5-doppler	water	TCEQ SOP V1	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 V1	01351	NA*	NA	NA	NA	NA	Field

Table A7.1 - Measurement Performance Specifications (Continued)

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LOQ CHECK STANDARD %Rec	LAB
Conventional and Bacteriological Parameters										
TSS	mg/L	water	EPA 160.2	00530	4		20	80-120	NA	
TDS, dried at 180 degrees C	mg/L	water	EPA 160.1	70300	10		20	80-120	NA	
Sulfate	mg/L	water	EPA 300.0, Rev. 2.1 (1993)	00945	5		20	80-120	70-130	
Chloride	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5		20	80-120	70-130	
Chlorophyll-a, spectrophotometric method	ug/L	water	EPA 445.0	32211	3		20	80-120	NA	
E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B	31699	1		.5****	NA	NA	
Ammonia-N, total	mg/L	water	EPA 350.1 Rev. 2.0 (1993)	00610	0.1		20	80-120	70-130	
Total Kjeldahl N	mg/L	water	SM 4500-Norg B or C and SM 4500-NH3 B	00625	0.2		20	80-120	70-130	
Nitrate-N, total	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	.05		20	80-120	70-130	
Nitrite-N, total	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	.05		20	80-120	70-130	
Total phosphorus-P	mg/L	water	EPA 365.2	00665	.06		20	80-120	70-130	

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

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

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

**** Based on a range statistic as described in Standard Methods, 20th Edition, Section 9020-B, AQuality Assurance/Quality Control - Intralaboratory Quality Control Guidelines. This criterion applies to bacteriological duplicates with concentrations >10 MPN/100mL or >10 organisms/100mL.

References for Table A7.1:

United States Environmental Protection Agency (USEPA) AMethods 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), AStandard

Methods for the Examination of Water and Wastewater,@ 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003 (RG-415).

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2005 (RG-416)

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

Table A7.1 - Measurement Performance Specifications (Continued)

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LOQ CHECK STANDARD %Rec	LAB***
Flow estimate	cfs	water	TCEQ SOP, V1	74069	NA*	NA	NA	NA	NA	Field
Present Weather	1-clear 2-partly cloudy 3-cloudy 4-rain 5-other	NA	NA	89966	NA	NA	NA	NA	NA	Field
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
E. coli, mTec	org/100mL	water	SM 9213B	31648	1		.5**	NA	NA	

Table A7.1 - Measurement Performance Specifications (Continued)

Benthics - Freshwater - RBA (Qualitative)					
PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	LAB***
Biological Data Reporting Units	1= number of individuals from sub-sample; 2 = number of individuals/ft ² ; 3 = number of individuals/m ² ; 4 = total number in kicknet	Water	TCEQ SOP, V2	89899	NA
Kicknet Effort, area kicked	m ²	Water	TCEQ SOP, V2	89903	NA
Kicknet Effort, minutes kicked	minutes	Water	TCEQ SOP, V2	89904	NA
Snags and Shoreline Sampling Effort, minutes picked	minutes	Water	TCEQ SOP, V2	89905	NA
Number of individuals in benthic RBA sub-sample (∇ 100)	#	Water	TCEQ SOP, V2	89906	NA
Benthic Sampler	1=Surber, 2=Ekman, 3=kicknet, 4=Petersen, 5=Hester-Dendy	Water	TCEQ SOP, V2	89950	NA
Undercut bank at sample point	%	Water	TCEQ SOP, V2	89921	NA
Overhanging brush at sample point	%	Water	TCEQ SOP, V2	89922	NA
Gravel substrate at sample point	%	Water	TCEQ SOP, V2	89923	NA
Sand substrate at sample point	%	Water	TCEQ SOP, V2	89924	NA
Soft bottom at sample point	%	Water	TCEQ SOP, V2	89925	NA
Macrophyte bed at sample point	%	Water	TCEQ SOP, V2	89926	NA
Snags and brush at sample point	%	Water	TCEQ SOP, V2	89927	NA
Bedrock at sample point	%	Water	TCEQ SOP, V2	89928	NA
Benthic Organisms, None Present	NA	Water	TCEQ SOP, V2	90005	NA
Mesh Size, any net or sieve, average bar (diagonal measurement) for benthic collection	cm	NA	TCEQ SOP, V2	89946	NA
Stream Order	#	NA	TCEQ SOP, V1	84161	NA
Ecoregion (Texas Ecoregion Code)	#	NA	TCEQ SOP, V1	89961	NA
Total Taxa Richness, Benthos	#	Water	TCEQ SOP, V2	90055	NA
EPT Index, Abundance	#	Water	TCEQ SOP, V2	90008	NA
Biotic Index (HBI)	NA	Water	TCEQ SOP, V2	90007	NA
Chironomidae	%	Water	TCEQ SOP, V2	90062	NA
Dominant Taxon, Benthos	%	Water	TCEQ SOP, V2	90042	NA
Dominant FFG	%	Water	TCEQ SOP, V2	90010	NA
Predators	%	Water	TCEQ SOP, V2	90036	NA
Ratio of Intolerant:Tolerant taxa, Benthos	NA	Water	TCEQ SOP, V2	90050	NA
Total Trichoptera as Hydropsychidae	%	Water	TCEQ SOP, V2	90069	NA
Non-insect taxa	#	Water	TCEQ SOP, V2	90052	NA
Collector-gatherers	%	Water	TCEQ SOP, V2	90025	NA
Total number as Elmidae	%	Water	TCEQ SOP, V2	90054	NA

Table A7.1 - Measurement Performance Specifications (Continued)

Nekton- Freshwater					
PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	LAB***
Nekton, none captured	NA	Water	TCEQ SOP, V2	98005	NA
Electrofishing effort, duration of shocking	Seconds	Water	TCEQ SOP, V2	89944	NA
Seining effort	# of Hauls	Water	TCEQ SOP, V2	89947	NA
Combined length of seine hauls	meters	Water	TCEQ SOP, V2	89948	NA
Seining effort, duration	minutes	Water	TCEQ SOP, V2	89949	NA
Seine Minimum Mesh Size, net average bar, Nekton	in	Water	TCEQ SOP, V2	89930	NA
Seine Maximum Mesh Size, net average bar, Nekton	in	Water	TCEQ SOP, V2	89931	NA
Net length	meters	Water	TCEQ SOP, V2	89941	NA
Electrofishing method	1 = boat 2 = backpack 3 = tote barge	Water	TCEQ SOP, V2	89943	NA
Area seined	m ²	Water	TCEQ SOP, V2	89976	NA
Stream Order	#	NA	TCEQ SOP, V1	84161	NA
Ecoregion (Texas Ecoregion Code)	#	NA	TCEQ SOP, V1	89961	NA
Total number fish species	#	Water	TCEQ SOP, V2	98003	NA
Total native cyprinid species, fish	#	Water	TCEQ SOP, V2	98032	NA
Total benthic invertivore species, fish	#	Water	TCEQ SOP, V2	98052	NA
Total benthic species, fish	#	Water	TCEQ SOP, V2	98053	NA
Total sunfish species (except bass)	#	Water	TCEQ SOP, V2	98008	NA
Total intolerant fish species	#	Water	TCEQ SOP, V2	98010	NA
Tolerant individuals (excluding Western Mosquitofish), fish	%	Water	TCEQ SOP, V2	98070	NA
Omnivore individuals, fish	%	Water	TCEQ SOP, V2	98017	NA
Invertivore individuals, fish	%	Water	TCEQ SOP, V2	98021	NA
Piscivore individuals, fish	%	Water	TCEQ SOP, V2	98022	NA
Total Individuals seining	#	Water	TCEQ SOP, V2	98039	NA
Total Individuals electroshocking	#	Water	TCEQ SOP, V2	98040	NA
Individuals/seine haul	#	Water	TCEQ SOP, V2	98062	NA
Individuals/minute electroshocking	#	Water	TCEQ SOP, V2	98069	NA
Individuals as non-native species	%	Water	TCEQ SOP, V2	98033	NA
Individuals w/ disease/anomalies	%	Water	TCEQ SOP, V2	98030	NA

Table A7.1 - Measurement Performance Specifications (Continued)

Physical Habitat				
PARAMETER	UNITS	METHOD	PARAMETER CODE	LAB***
Streambed slope over evaluated reach (from USGS map)	NA	TCEQ SOP, V2	72052	NA
Approximate drainage area above the most downstream transect from USGS map	km ²	TCEQ SOP, V2	89859	NA
Stream Order	#	TCEQ SOP, V2	84161	NA
Length of stream	km	TCEQ SOP, V2	89860	NA
Lateral transects made	#	TCEQ SOP, V2	89832	NA
Average stream width	meters	TCEQ SOP, V2	89861	NA
Average stream depth	meters	TCEQ SOP, V2	89862	NA
Instantaneous stream flow	cfs	TCEQ SOP, V2	00061	NA
Flow measurement method	1 = gage 2 = electric 3 = mechanical 4 = weir/flume	TCEQ SOP, V2	89835	NA
Channel Flow Status	1 = no flow 2 = low 3 = moderate 4 = high	TCEQ SOP, V2	89848	NA
Maximum pool width at time of study	meters	TCEQ SOP, V2	89864	NA
Maximum pool depth in study area	meters	TCEQ SOP, V2	89865	NA
Total stream bends	#	TCEQ SOP, V2	89839	NA
Well-defined stream bends	#	TCEQ SOP, V2	89840	NA
Moderately defined stream bends	#	TCEQ SOP, V2	89841	NA
Poorly defined stream bends	#	TCEQ SOP, V2	89842	NA
Riffles	#	TCEQ SOP, V2	89843	NA
Dominant substrate	1 = clay, 2 = silt, 3 = sand, 4 = gravel, 5 = cobble, 6 = boulder, 7 = bedrock, 8 = other	TCEQ SOP, V2	89844	NA
Avg. % of substrate gravel >2mm	%	TCEQ SOP, V2	89845	NA
Avg. % instream cover	%	TCEQ SOP, V2	84159	NA
Stream Cover Types	#	TCEQ SOP, V2	89929	NA
Avg. % stream bank erosion potential	%	TCEQ SOP, V2	89846	NA
Avg. stream bank angle	degrees	TCEQ SOP, V2	89847	NA
Avg. width natural riparian vegetation	meters	TCEQ SOP, V2	89866	NA
Avg. % trees as riparian vegetation	%	TCEQ SOP, V2	89849	NA
Avg. % shrubs as riparian vegetation	%	TCEQ SOP, V2	89850	NA
Avg. % grasses and forbes as riparian vegetation	%	TCEQ SOP, V2	89851	NA
Avg. % cultivated fields as riparian vegetation	%	TCEQ SOP, V2	89852	NA
Avg. % other as riparian vegetation	%	TCEQ SOP, V2	89853	NA
Avg.% tree canopy coverage	%	TCEQ SOP, V2	89854	NA
Overall Aesthetics	1 = wilderness 2 = natural 3 = common 4 = offensive	TCEQ SOP, V2	89867	NA

Physical Habitat				
PARAMETER	UNITS	METHOD	PARAMETER CODE	LAB***
Texas Ecoregion Code	#	TCEQ SOP, V2	89961	NA
Land development impact	1 = unimpacted 2 = low 3 = moderate 4 = high	TCEQ SOP, V2	89962	NA

Table A7.1 - Measurement Performance Specifications (Continued)

24-hour Dissolved Oxygen Monitoring Parameters									
Parameter	Units	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	PRECISION (RPD of LCS/LCSD)	Bias % Rec LCS	LOQ CHECK STANDARD %Rec	Lab***
24-Hr D.O. Avg.	mg/l	TCEQ SOP, V1	89857	NA	NA	NA	NA	NA	field
Max Daily DO	mg/l	TCEQ SOP, V1	89856	NA	NA	NA	NA	NA	field
Min Daily DO	mg/l	TCEQ SOP, V1	89855	NA	NA	NA	NA	NA	field
# DO measurements during 24-Hrs	# meas.	TCEQ SOP, V1	89858	NA	NA	NA	NA	NA	field
24-Hr Avg. water Temperature	B Celsius	TCEQ SOP, V1	00209	NA	NA	NA	NA	NA	field
Max Daily water Temperature	B Celsius	TCEQ SOP, V1	00210	NA	NA	NA	NA	NA	field
Min Daily water Temperature	B Celsius	TCEQ SOP, V1	00211	NA	NA	NA	NA	NA	field
# water temp measurements during 24-Hrs.	# meas.	TCEQ SOP, V1	00221	NA	NA	NA	NA	NA	field
24-Hr Avg. Spec Conductance	uS/cm	TCEQ SOP, V1	00212	NA	NA	NA	NA	NA	field
Max Spec Conductance	uS/cm	TCEQ SOP, V1	00213	NA	NA	NA	NA	NA	field
Min Spec Conductance	uS/cm	TCEQ SOP, V1	00214	NA	NA	NA	NA	NA	field
# Spec Conductance measurements during 24-Hrs.	# meas.	TCEQ SOP, V1	00222	NA	NA	NA	NA	NA	field
Max Daily pH	Standard units	TCEQ SOP, V1	00215	NA	NA	NA	NA	NA	field
Min Daily pH	Standard units	TCEQ SOP, V1	00216	NA	NA	NA	NA	NA	field
# pH measurements during 24-Hrs.	# meas.	TCEQ SOP, V1	00223	NA	NA	NA	NA	NA	field

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

** Based on range statistic as described in Standard Methods, 21st Edition, Section 9020-B, AQuality Assurance/Quality Control - Intralaboratory Quality Control Guidelines.® This criterion applies to bacteriological duplicates with concentrations >10 MPN/100mL or > 10org./100 mL.

References:

TCEQ SOP,V1 - TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003 (RG-415)

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2005 (RG-416)

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

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

United States Environmental Protection Agency (USEPA) Manual #EPA-821-R-9S-027

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. The limit of quantitation (formerly known as the reporting limit) 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 batch of CRP Samples are 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 Section B10.

Completeness

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

A8 SPECIAL TRAINING/CERTIFICATION

New field personnel receive training in proper sampling and field analysis. Before actual sampling or field analysis occurs, they will demonstrate to the 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.

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 (yrs)	Format
QAPPs, amendments and appendices	SRBA	7	<i>Paper/Electronic</i>
Field SOPs	TC	7	<i>Paper</i>
Laboratory Quality Manuals	ANA-LAB	NELAC (5 yr)	<i>Paper/Electronic</i>
Laboratory SOPs	ANA-LAB	NELAC (5 yr)	<i>Paper/Electronic</i>
QAPP distribution documentation	SRBA	7	<i>Paper</i>
Field staff training records	SRBA	7	<i>Paper</i>
Field equipment calibration/maintenance logs	TC	7	<i>Paper</i>
Field instrument printouts	TC	7	<i>Paper</i>
Field notebooks or data sheets	TC	7	<i>Paper</i>
Chain of custody records	SRBA/TC ANA-LAB	7 NELAC (5 yr)	<i>Paper/Electronic</i> <i>Paper/Electronic</i>
Laboratory calibration records	ANA-LAB	NELAC (5 yr)	<i>Paper/Electronic</i>
Laboratory instrument printouts	ANA-LAB	NELAC (5 yr)	<i>Electronic</i>
Laboratory data reports/results	SRBA/TC ANA_LAB	7/7 NELAC (5 yr)	<i>Paper/Electronic</i> <i>Paper/Electronic</i>
Laboratory equipment maintenance logs	ANA-LAB	NELAC (5 yr)	<i>Paper</i>
Corrective Action Documentation	SRBA ANA-LAB	7 NELAC (5 yr)	<i>Paper/Electronic</i> <i>Electronic</i>

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. The requirements for reporting data and the procedures are provided.

Test reports from the laboratory will document the test results clearly and accurately. The test report will include the information necessary for the interpretation and validation of data and will include the following:

- \$ 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
- \$ 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); equipment, trip, and field blank results (as applicable); and 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
- \$ 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.

Electronic Data

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the CRP Guidance. A completed Data Summary (see example in Appendix E) will be submitted with each data submittal.

Field data in paper format is checked to see that it meets the current SOP, passes tests for reasonableness, and to make certain that it is within the limits specified for the parameter. Data from the laboratory is received by the SRBA in both paper and electronic form. The laboratory data in paper format is reviewed to see that it meets the QAPP requirements and is reasonable. The data is entered into the SRBA database by Patti Harman, SRBA Data Manager, and reviewed by Mike Buttram, SRBA QAO. Using an Access database, the data is compiled in the Event/Result format required by TCEQ. This data is exported and saved as "text" files. These "text" files are sent as email attachments to Ms Jennifer Delk of TCEQ and to Nancy Rose of SRBA. A completed Data Summary (see example in Appendix E) will be submitted with each data submittal.

B1 SAMPLING PROCESS DESIGN

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

B2 SAMPLING METHODS

Field Sampling Procedures

Field sampling will be conducted according to procedures documented in the *TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003.(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.

Sample volume, container types, minimum sample volume, preservation requirements, and holding time requirements.

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Matrix	Container	Preservation*	Sample Volume	Holding Time
TSS	Water	Plastic or Glass Bottles	Cool to 4 °C, dark	400 mL	7 days
TDS	Water	Plastic or Glass Bottles	Cool to 4 °C, dark	250 mL	7 days
Chloride	Water	Plastic or Glass Bottles	Cool to 4 °C, dark	100 mL	28 days
Sulfate	Water	Plastic or Glass Bottles	Cool to 4 °C, dark	100 mL	28 days
Nitrate-N	Water	Plastic or Glass Bottles	Cool to 4 °C, dark	150 mL	48 hours
Nitrite-N	Water	Plastic or Glass Bottles	Cool to 4 °C, dark	150 mL	48 hours
Ammonia-N	Water	Plastic or Glass Bottles Pre-acidified with 1-2 ml H ₂ SO ₄	1-2mL conc. H ₂ SO ₄ to pH<2 and cool to 4 °C, dark	250 mL	28 days
Total Phosphorus	Water	Plastic or Glass Bottles Pre-acidified with 1-2 ml H ₂ SO ₄	Pre -acidified with 1-2mL conc. H ₂ SO ₄ to pH<2 and cool to 4 °C, dark	250 mL	28 days

Chlorophyll a	Water	Amber Glass Bottles	Cool to 4 °C, dark	100 mL	Filter <= 48 hours Filters may be stored frozen up to 30 days
<i>E. coli</i> , IDEXX Colilert	Water	Plastic (sterile)**	Cool to 4 °C, dark	200 mL	30 hours
Benthic macroinvertebrates & fish	Tissue	Plastic or glass	70% ethyl alcohol or 70% isopropyl alcohol, or add formaldehyde to produce a 5-10% formalin solution. Store in dark and away from extremes of hot and cold.	Variable	5 years

*Preservation is performed within 15-minutes of collection.

** Certified by IDEXX

Sample Containers

Sample containers are supplied by ANA-LAB and documentation is maintained by ANA-LAB. The containers have blank labels with barcodes prepared by ANA-LAB and already contain acid where required. Amber glass bottles supplied by ANA-LAB are used routinely for chlorophyll samples. Bottles for *E. coli* collection are supplied by IDEXX and contain sodium thiosulfate powder. The IDEXX bottles are obtained from ANA-LAB and certification documentation is maintained by ANA-LAB. No bottles are reused.

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/signature
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.

Deficiencies, Nonconformances and Corrective Action Related to Sampling Requirements

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies which affect data quantity and/or quality and render the data unacceptable or indeterminate. Deficiencies related to sampling methods requirements include, but are not limited to, such things as sample container, volume, and preservation variations, improper/inadequate storage temperature, holding-time exceedances, and sample site adjustments.

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the SRBA Project Manager. The SRBA

Project Manager will notify the SRBA QAO of the potential nonconformance. The SRBA QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The SRBA Project Manager, in consultation with the SRBA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore is not a valid nonconformance, the NCR will be completed accordingly and the NCR closed. If it is determined a nonconformance does exist, the SRBA Project Manager in consultation with SRBA QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the contractor QAO by completion of a Corrective Action Report.

Corrective Action Reports (CARs) document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) to prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and the means by which completion of each corrective action will be documented. CARs 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 both verbally and in writing.

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 was filtered
7. Analyses required
8. Name of collector
9. Custody transfer signatures and dates and time of transfer
10. Bill of lading

Sample Labeling

Samples from the field are labeled on a label with an indelible marker. The label is applied to the bottle by the laboratory and has a bar code to aid the laboratory to maintain control of the sample. Label information when complete includes:

1. Site identification
2. Date and time of collection
3. Preservative added, if applicable
4. Designation of “field-filtered” as applicable
5. Sample type (i.e., analysis(es)) to be performed

Sample Handling

The principle of sample custody is simply being able to account for sample integrity from the moment the portion of water, soil, waste, etc. is placed in a sample container until all analytical tests have been completed and any remaining sample is discarded. Documentation that will verify these actions will be a joint effort of the sampling team, the sample transporter, and the laboratory staff and involve chain-of-custody (COC) sheets and field data sheets. Copies of the COC forms and field data sheets can be found in Appendix D.

Field personnel will be responsible for recording all data and relevant observations on the field data sheet and COC sheets. Transportation of samples to ANA-LAB is provided by ANA-LAB. Personnel from ANA-LAB pick the samples up directly from the TC sampling team. Transfer of samples to laboratory personnel is indicated on COC forms. Standard operating procedures for the handling of samples at ANA-LAB are detailed in the Login Sample SOP and Sample Tracking SOP of ANA-LAB. Problems encountered during transportation or with the samples on arrival at the lab are documented on the COC form. Samples not documented properly will not be accepted for by analysis by ANA-LAB receiving personnel.

Sample bottles used in the testing procedures are supplied by ANA-LAB. The bottles are supplied pre-labeled with bar codes. Once the bar code is entered into the ANA_LAB computer system the labels indicate how the bottles will be used and the analytical procedures to be performed on the contents in accordance with the QAPP. The bottles are pre-acetified by ANA-LAB as required by analytical methods. TC personnel complete much of the label information prior to going into the field and group them by putting the bottles for each site in a plastic bag. The sampling time is added to the label in the field. The bottles are returned to the plastic bag and packed in ice. The sample times are recorded on the field data sheets. The COCs are completed when ANA-LAB personnel pick up the samples from TC personnel. The samples are checked at the laboratory to make certain that the temperature and pH meet QAPP requirements and that holding times are met. The internal handling of the samples by ANA-LAB is detailed in the Laboratory Quality Manual and SOPs of ANA-LAB.

Deficiencies, Nonconformances and Corrective Action Related to Chain-of-Custody

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies which affect data quantity and/or quality and render the data unacceptable or indeterminate. Deficiencies related to chain-of-custody include but are not limited to delays in transfer, resulting in holding time violations; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc.

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the SRBA Project Manager. The SRBA Project Manager will notify the SRBA QAO of the potential nonconformance. The SRBA QAO will initiate a Nonconformance Report (NCR) to document the deficiency. The SRBA Project Manager, in consultation with SRBA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore is not a valid nonconformance, the NCR will be completed accordingly and the NCR closed. If it is determined a nonconformance does exist, the SRBA Project Manager in consultation with the SRBA QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the SRBA QAO by completion of a Corrective Action Report.

Corrective Action Reports (CARs) document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) to prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and the means by which completion of each corrective action will be documented. CARs 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 both verbally and in writing.

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 *TCEQ Surface Water Quality Monitoring Procedures*, 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.

Deficiencies, Nonconformances and Corrective Action Related to Analytical Methods

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies which affect quantity and/or quality and render the data unacceptable or indeterminate. Deficiencies related to field and laboratory measurement systems include but are not limited to instrument malfunctions, blank contamination, quality control sample failures, etc.

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the SRBA Project Manager. The SRBA Project Manager will notify the SRBA QAO of the potential nonconformance. The SRBA QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The SRBA Project Manager, in consultation with SRBA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore is not a valid nonconformance, the NCR will be completed accordingly and the NCR closed. If it is determined a nonconformance does exist, the SRBA Project Manager in consultation with the SRBA QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the SRBA QAO by completion of a Corrective Action Report.

Corrective Action Reports (CARs) document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) to prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and, the means by which completion of each corrective action will be documented. CARs 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 both verbally and in writing.

The TCEQ has determined that analyses associated with the remark codes “holding time exceedances,” “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.

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 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. Field split samples are sent to the laboratory during each quarterly monitoring with a minimum of one split for each ten sample sets.

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

$$RPD = (X1 - X2) / ((X1 + X2) / 2)$$

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 RL) were measured and analytical variability can be eliminated as a factor, than variability in field split results will primarily be used as a trigger for discussion with field staff to ensure samples are being handled in the field correctly. Some individual sample results may be invalidated based on the examination of all extenuating information. The information derived from field splits is generally considered to be event specific and would not normally be used to determine the validity of an entire batch; however, some batches of samples may be invalidated depending on the situation. Professional judgment during data validation will be relied upon to interpret the results and take appropriate action. The qualification (i.e., invalidation) of data will be documented on the Data Summary. Deficiencies will be addressed as specified in this section under Deficiencies, Nonconformances, and Correction Action related to Quality Control.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

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 Clean Rivers Program samples are analyzed. 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 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. A batch is defined as 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.

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 multipeak responses.

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

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 batch. A batch is defined as 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.

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 batch whichever is greater. A batch is defined as 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. The information from these controls is sample/matrix specific and is not used to determine the validity of the entire batch. 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 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 blank is carried through the complete sample preparation and analytical procedure. 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.

Deficiencies, Nonconformances and Corrective Action Related to Quality Control

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP. Nonconformances are deficiencies which affect data quantity and/or quality and render the data unacceptable or indeterminate. Deficiencies related to quality control include but are not limited to field and laboratory quality control sample failures.

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the SRBA Project Manager. The SRBA Project Manager will notify the SRBA QAO of the potential nonconformance. The SRBA QAO will initiate a Nonconformance Report (NCR) to document the deficiency.

The SRBA Project Manager, in consultation with SRBA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore is not a valid nonconformance, the NCR will be completed accordingly and the NCR closed. If it is determined a nonconformance does exist, the SRBA Project Manager in consultation with the SRBA QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the SRBA QAO by completion of a Corrective Action Report.

Corrective Action Reports (CARs) document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) to prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and, the means by which completion of each corrective action will be documented. CARs 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 both verbally and in writing.

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

Items for use in monitoring and laboratory are ordered from various sources as needed. Calibration standards are obtained directly from ANA-LAB. The items are examined to make certain these meet TCEQ specifications and they are dated with the date of arrival. Standards and chemicals that are out of date as specified in the QAMs are not used in quality assured work. Items for use in E. coli monitoring are obtained directly from IDEXX, dated, and maintained in minimal amounts. The invoice for purchase of supplies and consumables are maintained in a logbook. Standards are traceable. Ana-Lab specifies in its QM how its laboratory-related supplies and consumables are maintained.

B9 NON-DIRECT MEASUREMENTS

This QAPP does not include the use of routine data obtained from non-direct measurement sources.

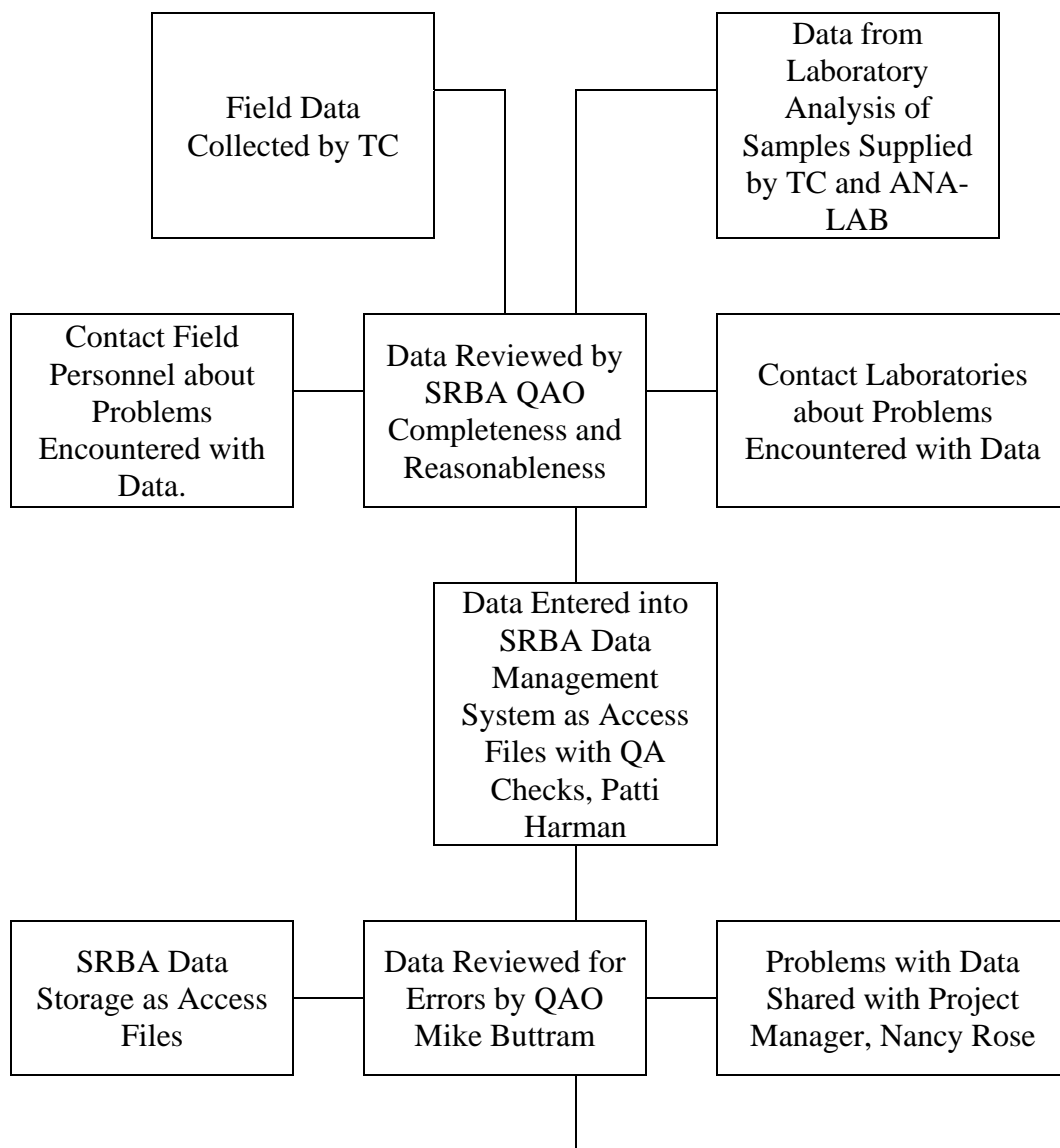
B10 DATA MANAGEMENT

Data Management Process

The data management functions of the SRBA are many. Probably the most important, is to gather raw data that is collected from field monitors and laboratories and prepare it for entry into the TCEQ database as “quality assured data”. The data comes to the data management team on field data sheets and laboratory report forms. The field data sheets are prepared by the data manager. The data sheets contain much of the data that is required by the TCEQ. However, a significant amount of data, such as storet codes, etc, is already stored in the Microsoft Access 2000 interface used for data entry. The field and laboratory data are inspected to see that all holding times have been met and that the parameters reported are reasonable. When problems with the data set are found, the field data monitors are usually contacted directly to see if the problem can be corrected. Laboratories are contacted by telephone or email. Problems that cannot be corrected are detailed on the Data Summary and the data is entered in the SRBA database only as a comment with the appropriate notation. Outliers are documented and confirmed. The field data and laboratory results are entered into a corresponding or “look alike” Access data entry form. The form is capable of carrying out many functions to assist in the data entry. Storet codes are automatically entered. The form checks data as it is entered to see if it is in an appropriate type of entry or if a number is within certain limits. The person doing the data entry visually inspects the data sheet. The form checks the data for errors as it is entered into the database and gives prompts. In a number of the cases the form can carry out numerous complex and repetitive calculations that aid in building certain required parameters. After

the SRBA database files are completed, a set of queries are used to build Microsoft database files that have the “event” and “result” structure required by the TCEQ. These files are inspected visually and inspected by computer for entry errors, omissions, and file duplication. After the “event” and “results” files are deemed correct by the Data Manager and QA Officer, they are converted into a “|” delimited text format and electronically submitted to the TCEQ for inclusion into SWQMIS. The required Data Summary is mailed to the TCEQ CRP Project Manager. Figure 5 details the data management procedures. The original field data sheets and copies of the laboratory reporting forms are maintained in a field data book at TC. The information is entered into the SRBA database when it is collected and reports are created to meet TCEQ requirements. The time period for this process is kept as short as possible with the limiting factor being the laboratory water chemistry analytical report. The time period is generally two to three weeks for completion. The electronic files are available from TCEQ, the SRBA webpage, the SRBA offices, and TC.

Figure 4 Flow Sheet For SRBA Data Management Procedures



Event and Results
Files Prepared in
Access and
Converted to Text
Files for transfer to
TCEQ

Event and Result Files in Text
Format Delivered to CRP
Project Manager, Jennifer
Delk

Data Errors and Loss

The field data sheets and the computer data entry screen look exactly the same. They are compared for completeness of data entry. The computer form can be printed out and compared to the data sheets where the entries can be validated manually. The computer form checks to see if many of the parameters are within TCEQ limits, and the form is capable of catching many entry errors. The data is analyzed visually in tabular form to catch obvious errors in format. When the data is transferred to TCEQ is checked for obvious errors of format and for completeness by the CRP Data Manager and the CRP Project Manager. See Appendix C for examples of data forms and Appendix E for the Data Summary Form.

Record Keeping and Data Storage

Computer generated field data sheet similes are printed and filed in a data notebook along with all original field data sheets, laboratory reports, chain of custody forms, laboratory QA information, and information about duplicates. This notebook represents a complete hard copy of all data collected. The SRBA data files are maintained in two formats. The data, as entered into the Access forms, is maintained and can be recovered as sets of data exactly as entered. Data in this format is easily recovered and reviewed without much effort, but the database to accomplish this is not very efficient in terms of memory required. The files are also maintained in an Access database that is similar to the “event” and “results” files required by the TCEQ. These are somewhat more difficult to utilize but very efficient in terms of the memory required. Data files in either of the formats are available from the SRBA either electronically or on CD-ROMs. Requests should be made to Mr. Nancy Rose of the SRBA. The data as submitted to the TCEQ is entered into the state database after is approved. The quality assured data from this database is made available on the SRBA web page maintained by HDR Associates. The web address is SULPHURR.org

Data Handling, Hardware, and Software Requirements

SRBA uses Microsoft Access as its database software. All database files are delivered to the TCEQ as ASCII text files that are generated from Access files. A significant amount of effort is expended with the production of GIS related documents. ArcView software by ESRI is utilized in the production of maps. GPS information about monitoring sites is used to locate the sites on maps and in the field. Maps are generated locally using TCEQ data files downloaded from the TCEQ website. Basins 3.0 by the EPA and the Street Atlas USA 7.0 by DeLorme are used as aids in certain instances. HDR does some map work for the SRBA. Much of the work done requires that reports be written and presentations be produced. All word processing activities are produced in Microsoft Word 2000. Microsoft Power Point is utilized as the presentation software. Word Perfect Office 2002 is also available. This package includes Word Perfect 10, Quattro Pro 10, and Paradox 10 for use as needed. Any computer system capable of handling the Microsoft 2000 Office Professional Edition and Arc View 9 and equipped with a RW CD burner and modem is acceptable. Of course a fast computer and more storage space on the hard drive is better.

Information Resource Management Requirements

All datasets collected under this QAPP are submitted to the TCEQ PM for review and approval. The datasets are refined where necessary to meet TCEQ requirements. When the data is accepted as “quality assured” and loaded into the TCEQ database, the data management requirements have been met. 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. The Clean Rivers Program grantees do not create TCEQ certified locational data using Global Positioning System (GPS) equipment. GPS equipment may be used as a component of the information required by the Station Location (SLOC) request process, but TCEQ staff are

responsible for creating the certified locational data that will ultimately be entered into the TCEQ's Surface Water Quality Monitoring database. Any information developed by Clean Rivers Program grantees using a Geographic Information System (GIS) will be used solely to meet deliverable requirements and will not be submitted to the TCEQ as a certified data set. Because the Clean Rivers Program grantees do not create certified locational data, TCEQ's OPP 8.11 and 8.12 do not apply.

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	SRBA PM	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report
Monitoring Systems Audit of Basin Planning Agency	Dates to be determined by TCEQ CRP	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the TCEQ to address corrective actions
Monitoring Systems Audit of Program Sub-participants	Once per contract period	SRBA QAO	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the SRBA. PM 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

Corrective Action

The SRBA Project Manager is responsible for implementing and tracking corrective action resulting from audit findings outlined in the audit report. Records of audit findings and corrective actions are maintained by both the CRP and the SRBA 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 SRBA Project Management

The SRBA QAO will verify to the SRBA PM that the work under this QAPP has been completed and that the appropriate data has been compiled and is available for use. This includes:

- Field data sheets, notes, and photos

- Field instrument reading print outs
- COC forms
- Laboratory results, including QA testing
- Reports of all significant QA issues pertaining to sampling, field measurements, laboratory analyses, or data compilation

The SRBA QAO and the SRBA Data Manager will make all datasets/reports to the TCEQ staff available to the SRBA Project Manager. The SRBA PM is responsible for communication of all TCEQ reports to the SRBA QAO regarding quality assurance issues. Reports are submitted on a quarterly basis.

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 SRBA's activities for each task; reports monitoring status, problems, delays, and corrective actions; and outlines the status of each task's deliverables.

Monitoring Systems Audit Report and Response - Following any audit performed by the SRBA, a report of findings, recommendations and response is sent to the TCEQ in the quarterly progress report.

Reports by TCEQ Project Management

Contractor Evaluation - The SRBA 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 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 for entry into SWQMIS.

D2 VERIFICATION AND VALIDATION METHODS

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

Data review, verification, and validation will be performed using self-assessments and peer and management review as appropriate to the project task. The data review tasks to be performed by field and laboratory staff are listed in the first two sections of Table D2, respectively. Potential errors are identified by examination of documentation and by manual 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 higher level project management to establish the appropriate course of action, or the data associated with the issue are rejected. 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 is performed by the SRBA 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.

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 SRBA 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 Basin SRBA Data Manager with the data. This information is communicated to the TCEQ by the SRBA in the Data Summary.

Table D2: Data Review Tasks

Field Data Review	Responsibility
Field data reviewed for conformance with data collection, sample handling and chain of custody, analytical and QC requirements	SRBA DM
Post-calibrations checked to ensure compliance with error limits	SRBA QAO
Field data calculated, reduced, and transcribed correctly	SRBA DM
Laboratory Data Review	
Laboratory data reviewed for conformance with data collection, sample handling and chain of custody, analytical and QC requirements to include documentation, holding times, sample receipt, sample preparation, sample analysis, project and program QC results, and reporting	ANA-LAB SRBA DM
Laboratory data calculated, reduced, and transcribed correctly	ANA-LAB SRBA DM
LOQs consistent with requirements for Ambient Water Reporting Limits.	ANA-LAB SRBA DM
Analytical data documentation evaluated for consistency, reasonableness and/or improper practices	ANA-LAB SRBA DM
Analytical QC information evaluated to determine impact on individual analyses	ANA-LAB SRBA DM
All laboratory samples analyzed for all parameters	ANA-LAB SRBA DM
Data Set Review	
The test report has all required information as described in Section A9 of the QAPP	SRBA QAO
Confirmation that field and laboratory data have been reviewed	SRBA QAO
Data set (to include field and laboratory data) evaluated for reasonableness and if corollary data agree	SRBA QAO
Outliers confirmed and documented	SRBA QAO
Field QC acceptable (e.g., field splits and trip, field and equipment blanks)	SRBA QAO
Sampling and analytical data gaps checked and documented	SRBA QAO
Verification and validation confirmed. Data meets conditions of end use and are reportable	SRBA PM

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**

Sulphur River Basin Authority Clean Rivers Program
FY 2008/2009 QAPP - Appendix B Monitoring Schedule for FY 2008

Appendix B Sampling Process Design and Monitoring Schedule (plan)

Sample Design Rationale

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 SRBA coordinates closely with the TCEQ and other participants to ensure a comprehensive water monitoring strategy within the watershed.

The SRBA monitoring program in FY 2008 has two primary objectives:

- Characterize major water bodies on an on going basis to determine if the water quality is suitable for designated uses. A fixed/routine monitoring program is to fulfill this objective.
- Screen significant tributaries periodically to determine if there are previously unidentified, localized water quality problems or if tributary inflows may be adversely affecting the quality of major water bodies. An intensive/systematic monitoring program is used to fulfill this objective.

Five of the sites selected are in the fixed/routine category. Four involve the study of WPL and its tributary, Anderson Creek, and the fifth site is on Days Creek. The following is a discussion of the fixed/routine sites:

Segment 0302 Wright Patman Lake (From Wright Patman Lake Dam in Bowie/Cass County to a point 1.5 kilometers downstream of Bassett Creek in Bowie/Cass County, up to the normal pool level of 225 feet)

WPL is large man made lake that was impounded in 1956 by the US Army Corp of Engineers as a flood control project. The lake occupies approximately 19,000 acres of Sulphur River bottom land and has a maximum depth of 40 feet. The average depth is considerably less than the 40 ft maximum and is probably no more than 6 to 8 feet. The depth varies during the year due to the lakes flood control regiment. Water from the lake is utilized in the area as a source of drinking water and to support local industry. The water is characterized as murky with a shallow secchi depth, typically less than half a meter. Major problems with the lake at various times are low DO levels, high pH levels, high chlorophyll concentrations, and related taste and odor problems. These problems have been reflected by WPL being placed on the 303(d) List for the last few years. WPL was listed on the 303(d) List (December 1999) for dissolved oxygen concentrations that are sometimes lower that the standard established to ensure optimum conditions for aquatic life. These conditions existed near the dam and in the upper regions near Hwy 8. The 303(d) List (August 31, 2000) notes that several areas of the lake fail to meet the dissolved oxygen criterion at times. These areas are the upper reservoir, near the damn, and the upper-middle portion of the lake. The overall priority for this impairment was established as "medium". The pH values are high during certain time periods in the northwestern-most tip, the Elliott Creek arm located northwest of the damn, and the middle-upper portion of the lake. These values were occasionally higher than the criterion established to safeguard general water quality uses. WPL was listed on the 303(d) List (October, 2002) for the "general use" criterion based on high pH in the arm west of the dam and in the northeast corner of the lake and for "aquatic life use" based on the depressed oxygen criterion. The overall impairment is listed as "low". The causes of the impairments are listed as both point and non-point sources. The 2004 Texas 303(d) List (May 13, 2005) is very similar to the 303(d) List (October, 2002), again noting areas of depressed dissolved oxygen and high pH values. The lake has been assigned to category 5c which allows

more time for data collection and analysis before a TMDL is scheduled. The DRAFT 2006 Texas 303(d) List (March 19, 2007) is little changed from the previous three lists with low dissolved oxygen and high pH values of concern in the same areas. WPL is important to the local area and is the focus of three of the sites monitored by the SRBA. See Figure 2 for the location of the three sites on WPL.

Segment 0304 Days Creek (From the confluence with Wagoner Creek in Bowie County (Texarkana) to South Stateline where it flows into Arkansas)

Days Creek is not listed on the 303(d) Lists for the last five years. It drains most of Texarkana and is regularly impacted by high levels of urban runoff. The Stateline site is below the Texarkana Waste Water which adds 8-10 million gallons per day of treated effluent to the stream during normal flow. The site is a fixed/routine site that has been monitored by TCEQ for a number of years. SRBA has picked up this site to relieve the travel and time commitment of TCEQ personnel. See Figure 2 for the location of the fixed/routine site on Days Creek.

Four of the sites selected are in the intensive/systematic category. Three of the sites are on tributaries of White Oak Creek, and the fourth is on the upper reaches of White Oak Creek. The following is a discussion of the intensive/systematic sites:

Segment 0303b White Oak Creek (unclassified water body) (From the confluence of the Sulphur River north of Naples in Morris County to the upstream perennial portion of the stream east of Sulphur Springs in Hopkins County)

White Oak Creek is a long slow moving stream that drains much of the southern Sulphur Basin prior to flowing into Sulphur River. The lower 50 miles of White Creek is listed on the 303(d) List (August 31, 2000). The dissolved oxygen concentrations are occasionally lower than the criterion established to assure optimum conditions for aquatic life. The overall priority for this impairment was established as "medium". The lower 25 miles and the middle 25 miles near Hwy 271 are listed for the "aquatic life use" criterion based on depressed dissolved oxygen levels. The cause of the impairment is listed as both point and non-point sources. The 2002 Texas 303(d) List (October 1, 2002) indicates that the lower and middle 25 mile segments have depressed dissolved oxygen levels. The category of "5b" and rank of "S" indicate that a review of standards is underway. The 2004 Texas 303(d) List (May 13, 2005) and the DRAFT 2006 Texas 303 (d) List (March 19, 2007) detail similar problems with depressed dissolved oxygen levels and include the upper 25 mile segment. Sites on three tributaries of White Oak Creek and one site on White Oak Creek have been selected for intensive/systematic study by SRBA during FY 2008. The three tributaries are Horse Creek, Smackover Creek and Rock Creek. These studies will support the review of standards for White Oak Creek. See Figure 4 for the location of the sites on the basin map.

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

Monitoring Sites

Monitoring Tables for fiscal year 2008 are presented on the following page.

Monitoring Sites for FY 2008

The sample design for surface water quality monitoring is shown in Table B1.1 below.

Table B1.1 Sample Design and Schedule, FY 2008

Segment	Region	Site Description	Station ID	Monitoring Resp (1)	Monitoring Type (2)	24 HR	Aquatic Habitat	Benthics	Nekton (3)	Conventional (4)	Indicator Bacteria (5)	Inst Flow	Field (6)
302	5	WRIGHT PATMAN LAKE AT SH 8 BOWIE COUNTY	10214	SU/TC	BS	4							
302	5	WRIGHT PATMAN LAKE AT SH 8 BOWIE COUNTY	10214	SU/TC	RT					4	4		6
302	5	WRIGHT PATMAN LAKE AT NORTH SHORE	15061	SU/TC	BS	4							
302	5	WRIGHT PATMAN LAKE AT NORTH SHORE	15061	SU/TC	RT					4	4		6
302	5	WRIGHT PATMAN LAKE ADJACENT TO IP INTAKE	16859	SU/TC	BS	4							
302	5	WRIGHT PATMAN LAKE ADJACENT TO IP INTAKE	16859	SU/TC	RT					4	4		6
302	5	ANDERSON CREEK AT BOWIE CR 4126	16863	SU/TC	RT					4	4	4	4
303b	5	ROCK CREEK AT FM 69.8 IN HOPKINS COUNTY	10200	SU/TC	BS	2	2	2					
303b	5	ROCK CREEK AT FM 69.8 IN HOPKINS COUNTY	10200	SU/TC	RT					4	4	4	4
303b	5	HORSE CREEK AT TITUS CR 3445	20100	SU/TC	BS	2	2	2					
303b	5	HORSE CREEK AT TITUS CR 3445	20100	SU/TC	RT					4	4	4	4
303b	5	SMACKOVER CREEK AT TITUS CR 34458	20101	SU/TC	BS	2	2	2					
303b	5	SMACKOVER CREEK AT TITUS CR 3445FM 69.8	20101	SU/TC	RT					4	4	4	4
303b	5	WHITE OAK CREEK AT FM 69 IN HOPKINS COUNTY	20099	SU/TC	BS	2	2	2					
303b	5	WHITE OAK CREEK AT FM 69 IN HOPKINS COUNTY	20099	SU/TC	RT					4	4	4	4
304		DAYS CREEK AT STATELINE RD IN BOWIE COUNTY	10226	SU/TC	RT					4	4	4	4

(1) SU=Sulphur River Basin Authority, TC=Texarkana College

(2) RT=Routine, BS=Biased-Season

(3) Can not meet vouchering requirement at this time

(4) Conventionals = TSS, TDS, sulfate, chloride, chlorophyll-a, pheophytin, ammonia, nitrate-N, nitrite-N, and total phosphate-P

(5)E. coli

(5)Field = pH, DO, conductivity, temperature, Secchi depth, and observations

Critical vs. non-critical measurements

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

**Appendix C:
Field Data Sheets**

**Appendix D:
Chain-of-Custody Forms**

**Appendix E:
Data Summary**

ATTACHMENT 1

Example Letter to Document Adherence to the QAPP

TO: (name)
(organization)

FROM: (name)
(organization)

Please sign and return this form by (date) to:

(address)

I acknowledge receipt of the “QAPP Title, Revision Date”. I understand the document(s) describe quality assurance, quality control, data management and reporting, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

Signature

Date

Copies of the signed forms should be sent by the Basin Planning Agency to the TCEQ CRP Project Manager within 60 days of TCEQ approval of the QAPP.

ATTACHMENT 2 Additional Parameters

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LOQ CHECK STANDARD %Rec	LAB***
Flow estimate	cfs	water	TCEQ SOP, V1	74069	NA*	NA	NA	NA	NA	Field
Present Weather	1-clear 2-partly cloudy 3-cloudy 4-rain 5-other	NA	NA	89966	NA	NA	NA	NA	NA	Field
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
Tidal Stage	1-low 2-falling 3-slack 4-rising 6-high	NA	NA	89972	NA	NA	NA	NA	NA	Field
Turbidity	NAU	water	SM 2130B	82079	.5		NA	NA	NA	
Alkalinity, total	mg/L	water	SM 2320B	00410	20		20	NA	NA	
BOD, 5-day	mg/L	water	SM 5210B	00310	2		NA	NA	NA	
COD	mg/L	water	SM 5220C	00335	10		20	80-120	70-130	
Calcium, total	mg/L	water	SM 3500-Ca B	00916	.5		20	80-120	70-130	
E. coli, mTec	org/100mL	water	SM 9213B	31648	1		.5**	NA	NA	
E. coli, MF Partition Procedure	org/100mL	water	SM 9222G	31700	1		.5**	NA	NA	
T. Coliform	org/100mL	water	SM 9222 B	31501	1		.5**	NA	NA	
Enterococcus, MF	org/100mL	water	EPA 1600	31649	1		.5**	NA	NA	
Hardness, total (calculated; sum of total Ca+total Mg)	mg/L	water	SM 2340-B	82394	NA		NA	NA	NA	
Iron, total	ug/L	water	SM3111B or C	01045	300		20	80-120	70-130	
Magnesium, total	mg/L	water	SM3111 B or C	00927	.5		20	80-120	70-130	
Manganese, total	ug/L	water	SM 3111B	01055	50		20	80-120	70-130	
Nitrite-N	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	.05		20	80-120	70-130	
Oil and grease, Freon extraction	mg/L	water	SM 5520B	00556	5		NA	NA	NA	
TOC	mg/L	water	SM 5310 B, C, or D	00680	2.0		NA	NA	NA	

PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	AWRL	Limit of Quantitation (LOQ)	PRECISION (RPD of LCS/LCSD)	BIAS %Rec. of LCS	LOQ CHECK STANDARD %Rec	LAB***
Aluminum, dis.	ug/L	water	EPA 200.7 Rev 4.4 (1994)	01106	200		20	80-120	70-130	
Arsenic, dis.	ug/L	water	EPA 200.8 Rev 4.4 (1994)	01000	5		20	80-120	70-130	
Cadmium, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01025	.1 for waters <50 mg/L hardness ----- .3 for waters ≥50 mg/L hardness		20	80-120	70-130	
Chromium, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01030	10		20	80-120	70-130	
Copper, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01040	1 for waters <50 mg/L hardness ----- 3 for waters ≥50 mg/L hardness		20	80-120	70-130	
Lead, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01049	.1 for waters <85 mg/L hardness ----- 1 for waters ≥85 mg/L hardness		20	80-120	70-130	
Mercury, total	ug/L	water	EPA 1631	71960	.006		20	80-120	70-130	
Nickel, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01065	10		20	80-120	70-130	
Selenium, total	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01147	2		20	80-120	70-130	
Silver, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01075	.5		20	80-120	70-130	
Zinc, dis.	ug/L	water	EPA 200.8 Rev 5.4 (1998)	01090	5		20	80-120	70-130	

Note: Not all sample parameters are addressed in the QAPP shell. If they are to be included, please use 65-135% as the bias limit in Table A7 for metals-in-solid samples (i.e., sediment and tissue); 65-135% as the bias limit in Table A7 for organics-in-water sample parameters; and 60 - 140% as the bias limit in Table A7 for organics-in-solid samples (i.e., sediment and tissue).

Benthics - Freshwater - Quantitative					
PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	LAB***
Biological Data Reporting Units	1= number of individuals from subsample; 2 = number of individuals/ft ² ; 3 = number of individuals/m ² ; 4 = total number in kicknet	Water	TCEQ SOP, V2	89899	NA
Surber Sampler Effort, area sampled	m ²	Water	TCEQ SOP, V2	89901	NA
Ekman Sampler Effort, area sampled	m ²	Water	TCEQ SOP, V2	89935	NA
Petersen Sampler Effort, area sampled	m ²	Water	TCEQ SOP, V2	89934	NA
Hester-Dendy Duration	days	Water	TCEQ SOP, V2	89933	NA
Benthic Sampler	1=Surber, 2=Ekman, 3=kicknet, 4=Petersen, 5=Hester-Dendy	Water	TCEQ SOP, V2	89950	NA
Area of snag surface sampled	m ²	Water	TCEQ SOP, V2	89975	NA
Undercut bank at sample point	%	Water	TCEQ SOP, V2	89921	NA
Overhanging brush at sample point	%	Water	TCEQ SOP, V2	89922	NA
Gravel substrate at sample point	%	Water	TCEQ SOP, V2	89923	NA
Sand substrate at sample point	%	Water	TCEQ SOP, V2	89924	NA
Soft bottom at sample point	%	Water	TCEQ SOP, V2	89925	NA
Macrophyte bed at sample point	%	Water	TCEQ SOP, V2	89926	NA
Snags and brush at sample point	%	Water	TCEQ SOP, V2	89927	NA
Bedrock at sample point	%	Water	TCEQ SOP, V2	89928	NA
Benthic Organisms, None Present	NA	Water	TCEQ SOP, V2	90005	NA
Mesh Size, any net or sieve, average bar (diagonal measurement) for benthic collection	cm	NA	TCEQ SOP, V2	89946	NA
Stream Order	#	NA	TCEQ SOP, V1	84161	NA
Ecoregion (Texas Ecoregion Code)	#	NA	TCEQ SOP, V1	89961	NA
Total Taxa Richness, Benthos	#	Water	TCEQ SOP, V2	90055	NA
Diptera Taxa	#	Water	TCEQ SOP, V2	90056	NA
Ephemeroptera Taxa	#	Water	TCEQ SOP, V2	90057	NA
Intolerant Taxa, Benthos	#	Water	TCEQ SOP, V2	90058	NA
Individuals as EPT Taxa	%	Water	TCEQ SOP, V2	90060	NA
Chironomidae	%	Water	TCEQ SOP, V2	90062	NA
Tolerant Taxa, Benthos	%	Water	TCEQ SOP, V2	90066	NA
Grazers	%	Water	TCEQ SOP, V2	90020	NA
Gatherers	%	Water	TCEQ SOP, V2	90025	NA
Filterers	%	Water	TCEQ SOP, V2	90030	NA
Dominance (3 Taxa)	%	Water	TCEQ SOP, V2	90067	NA

Benthics - Freshwater - RBA (Qualitative)					
PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	LAB***
Biological Data Reporting Units	1= number of individuals from sub-sample; 2 = number of individuals/ft ² ; 3 = number of individuals/m ² ; 4 = total number in kicknet	Water	TCEQ SOP, V2	89899	NA
Kicknet Effort, area kicked	m ²	Water	TCEQ SOP, V2	89903	NA
Kicknet Effort, minutes kicked	minutes	Water	TCEQ SOP, V2	89904	NA
Snags and Shoreline Sampling Effort, minutes picked	minutes	Water	TCEQ SOP, V2	89905	NA
Number of individuals in benthic RBA sub-sample (∇ 100)	#	Water	TCEQ SOP, V2	89906	NA
Benthic Sampler	1=Surber, 2=Ekman, 3=kicknet, 4=Petersen, 5=Hester-Dendy	Water	TCEQ SOP, V2	89950	NA
Undercut bank at sample point	%	Water	TCEQ SOP, V2	89921	NA
Overhanging brush at sample point	%	Water	TCEQ SOP, V2	89922	NA
Gravel substrate at sample point	%	Water	TCEQ SOP, V2	89923	NA
Sand substrate at sample point	%	Water	TCEQ SOP, V2	89924	NA
Soft bottom at sample point	%	Water	TCEQ SOP, V2	89925	NA
Macrophyte bed at sample point	%	Water	TCEQ SOP, V2	89926	NA
Snags and brush at sample point	%	Water	TCEQ SOP, V2	89927	NA
Bedrock at sample point	%	Water	TCEQ SOP, V2	89928	NA
Benthic Organisms, None Present	NA	Water	TCEQ SOP, V2	90005	NA
Mesh Size, any net or sieve, average bar (diagonal measurement) for benthic collection	cm	NA	TCEQ SOP, V2	89946	NA
Stream Order	#	NA	TCEQ SOP, V1	84161	NA
Ecoregion (Texas Ecoregion Code)	#	NA	TCEQ SOP, V1	89961	NA
Total Taxa Richness, Benthos	#	Water	TCEQ SOP, V2	90055	NA
EPT Index, Abundance	#	Water	TCEQ SOP, V2	90008	NA
Biotic Index (HBI)	NA	Water	TCEQ SOP, V2	90007	NA
Chironomidae	%	Water	TCEQ SOP, V2	90062	NA
Dominant Taxon, Benthos	%	Water	TCEQ SOP, V2	90042	NA
Dominant FFG	%	Water	TCEQ SOP, V2	90010	NA
Predators	%	Water	TCEQ SOP, V2	90036	NA
Ratio of Intolerant:Tolerant taxa, Benthos	NA	Water	TCEQ SOP, V2	90050	NA
Total Trichoptera as Hydropsychidae	%	Water	TCEQ SOP, V2	90069	NA
Non-insect taxa	#	Water	TCEQ SOP, V2	90052	NA
Collector-gatherers	%	Water	TCEQ SOP, V2	90025	NA
Total number as Elmidae	%	Water	TCEQ SOP, V2	90054	NA

Nekton- Freshwater					
PARAMETER	UNITS	MATRIX	METHOD	PARAMETER CODE	LAB***
Nekton, none captured	NA	Water	TCEQ SOP, V2	98005	NA
Electrofishing effort, duration of shocking	Seconds	Water	TCEQ SOP, V2	89944	NA
Seining effort	# of Hauls	Water	TCEQ SOP, V2	89947	NA
Combined length of seine hauls	meters	Water	TCEQ SOP, V2	89948	NA
Seining effort, duration	minutes	Water	TCEQ SOP, V2	89949	NA
Seine Minimum Mesh Size, net average bar, Nekton	in	Water	TCEQ SOP, V2	89930	NA
Seine Maximum Mesh Size, net average bar, Nekton	in	Water	TCEQ SOP, V2	89931	NA
Net length	meters	Water	TCEQ SOP, V2	89941	NA
Electrofishing method	1 = boat 2 = backpack 3 = tote barge	Water	TCEQ SOP, V2	89943	NA
Area seined	m ²	Water	TCEQ SOP, V2	89976	NA
Stream Order	#	NA	TCEQ SOP, V1	84161	NA
Ecoregion (Texas Ecoregion Code)	#	NA	TCEQ SOP, V1	89961	NA
Total number fish species	#	Water	TCEQ SOP, V2	98003	NA
Total native cyprinid species, fish	#	Water	TCEQ SOP, V2	98032	NA
Total benthic invertivore species, fish	#	Water	TCEQ SOP, V2	98052	NA
Total benthic species, fish	#	Water	TCEQ SOP, V2	98053	NA
Total sunfish species (except bass)	#	Water	TCEQ SOP, V2	98008	NA
Total intolerant fish species	#	Water	TCEQ SOP, V2	98010	NA
Tolerant individuals (excluding Western Mosquitofish), fish	%	Water	TCEQ SOP, V2	98070	NA
Omnivore individuals, fish	%	Water	TCEQ SOP, V2	98017	NA
Invertivore individuals, fish	%	Water	TCEQ SOP, V2	98021	NA
Piscivore individuals, fish	%	Water	TCEQ SOP, V2	98022	NA
Total Individuals seining	#	Water	TCEQ SOP, V2	98039	NA
Total Individuals electroshocking	#	Water	TCEQ SOP, V2	98040	NA
Individuals/seine haul	#	Water	TCEQ SOP, V2	98062	NA
Individuals/minute electroshocking	#	Water	TCEQ SOP, V2	98069	NA
Individuals as non-native species	%	Water	TCEQ SOP, V2	98033	NA
Individuals w/ disease/anomalies	%	Water	TCEQ SOP, V2	98030	NA

Physical Habitat				
PARAMETER	UNITS	METHOD	PARAMETER CODE	LAB***
Streambed slope over evaluated reach (from USGS map)	NA	TCEQ SOP, V2	72052	NA
Approximate drainage area above the most downstream transect from USGS map	km ²	TCEQ SOP, V2	89859	NA
Stream Order	#	TCEQ SOP, V2	84161	NA
Length of stream	km	TCEQ SOP, V2	89860	NA
Lateral transects made	#	TCEQ SOP, V2	89832	NA
Average stream width	meters	TCEQ SOP, V2	89861	NA
Average stream depth	meters	TCEQ SOP, V2	89862	NA
Instantaneous stream flow	cfs	TCEQ SOP, V2	00061	NA
Flow measurement method	1 = gage 2 = electric 3 = mechanical 4 = weir/flume	TCEQ SOP, V2	89835	NA
Channel Flow Status	1 = no flow 2 = low 3 = moderate 4 = high	TCEQ SOP, V2	89848	NA
Maximum pool width at time of study	meters	TCEQ SOP, V2	89864	NA
Maximum pool depth in study area	meters	TCEQ SOP, V2	89865	NA
Total stream bends	#	TCEQ SOP, V2	89839	NA
Well-defined stream bends	#	TCEQ SOP, V2	89840	NA
Moderately defined stream bends	#	TCEQ SOP, V2	89841	NA
Poorly defined stream bends	#	TCEQ SOP, V2	89842	NA
Riffles	#	TCEQ SOP, V2	89843	NA
Dominant substrate	1 = clay, 2 = silt, 3 = sand, 4 = gravel, 5 = cobble, 6 = boulder, 7 = bedrock, 8 = other	TCEQ SOP, V2	89844	NA
Avg. % of substrate gravel >2mm	%	TCEQ SOP, V2	89845	NA
Avg. % instream cover	%	TCEQ SOP, V2	84159	NA
Stream Cover Types	#	TCEQ SOP, V2	89929	NA
Avg. % stream bank erosion potential	%	TCEQ SOP, V2	89846	NA
Avg. stream bank angle	degrees	TCEQ SOP, V2	89847	NA
Avg. width natural riparian vegetation	meters	TCEQ SOP, V2	89866	NA
Avg. % trees as riparian vegetation	%	TCEQ SOP, V2	89849	NA
Avg. % shrubs as riparian vegetation	%	TCEQ SOP, V2	89850	NA
Avg. % grasses and forbes as riparian vegetation	%	TCEQ SOP, V2	89851	NA
Avg. % cultivated fields as riparian vegetation	%	TCEQ SOP, V2	89852	NA
Avg. % other as riparian vegetation	%	TCEQ SOP, V2	89853	NA
Avg. % tree canopy coverage	%	TCEQ SOP, V2	89854	NA
Overall Aesthetics	1 = wilderness 2 = natural 3 = common 4 = offensive	TCEQ SOP, V2	89867	NA
Texas Ecoregion Code	#	TCEQ SOP, V2	89961	NA
Land development impact	1 = unimpacted	TCEQ SOP, V2	89962	NA

Physical Habitat				
PARAMETER	UNITS	METHOD	PARAMETER CODE	LAB***
	2 = low 3 = moderate 4 = high			

24-hour Dissolved Oxygen Monitoring Parameters									
Parameter	Units	Method	Parameter Code	AWRL	Limit of Quantitation (LOQ)	PRECISION (RPD of LCS/LCSD)	Bias % Rec LCS	LOQ CHECK STANDARD %Rec	Lab***
24-Hr D.O. Avg.	mg/l	TCEQ SOP, V1	89857	NA	NA	NA	NA	NA	field
Max Daily DO	mg/l	TCEQ SOP, V1	89856	NA	NA	NA	NA	NA	field
Min Daily DO	mg/l	TCEQ SOP, V1	89855	NA	NA	NA	NA	NA	field
# DO measurements during 24-Hrs	# meas.	TCEQ SOP, V1	89858	NA	NA	NA	NA	NA	field
24-Hr Avg. water Temperature	B Celsius	TCEQ SOP, V1	00209	NA	NA	NA	NA	NA	field
Max Daily water Temperature	B Celsius	TCEQ SOP, V1	00210	NA	NA	NA	NA	NA	field
Min Daily water Temperature	B Celsius	TCEQ SOP, V1	00211	NA	NA	NA	NA	NA	field
# water temp measurements during 24-Hrs.	# meas.	TCEQ SOP, V1	00221	NA	NA	NA	NA	NA	field
24-Hr Avg. Spec Conductance	uS/cm	TCEQ SOP, V1	00212	NA	NA	NA	NA	NA	field
Max Spec Conductance	uS/cm	TCEQ SOP, V1	00213	NA	NA	NA	NA	NA	field
Min Spec Conductance	uS/cm	TCEQ SOP, V1	00214	NA	NA	NA	NA	NA	field
# Spec Conductance measurements during 24-Hrs.	# meas.	TCEQ SOP, V1	00222	NA	NA	NA	NA	NA	field
Max Daily pH	Standard units	TCEQ SOP, V1	00215	NA	NA	NA	NA	NA	field
Min Daily pH	Standard units	TCEQ SOP, V1	00216	NA	NA	NA	NA	NA	field
# pH	# meas.	TCEQ SOP,	00223	NA	NA	NA	NA	NA	field

measurements during 24-Hrs.		V1							
24-Hr Salinity Avg	ppt	TCEQ SOP, V1	00218	NA	NA	NA	NA	NA	field
Max Daily Salinity	ppt	TCEQ SOP, V1	00217	NA	NA	NA	NA	NA	field
Min Daily Salinity	ppt	TCEQ SOP, V1	00219	NA	NA	NA	NA	NA	field
# salinity measurement during 24-Hrs	# meas.	TCEQ SOP, V1	00220	NA	NA	NA	NA	NA	field

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

** Based on range statistic as described in Standard Methods, 21st Edition, Section 9020-B, A Quality Assurance/Quality Control - Intralaboratory Quality Control Guidelines. @ This criterion applies to bacteriological duplicates with concentrations >10 MPN/100mL or > 10org./100 mL.

*** Laboratory should be specified where applicable.

References:

TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003 (RG-415)

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2005 (RG-416)

United States Environmental Protection Agency (USEPA) A 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), A Standard Methods for the Examination of Water and Wastewater, @ 20th Edition, 1998. (Note: the 21st may be used if it becomes available)

United States Environmental Protection Agency (USEPA) Manual #EPA-821-R-9S-027

ATTACHMENT 3: Preferred Program Codes

PROGRAM CODE (MONITORING TYPE)

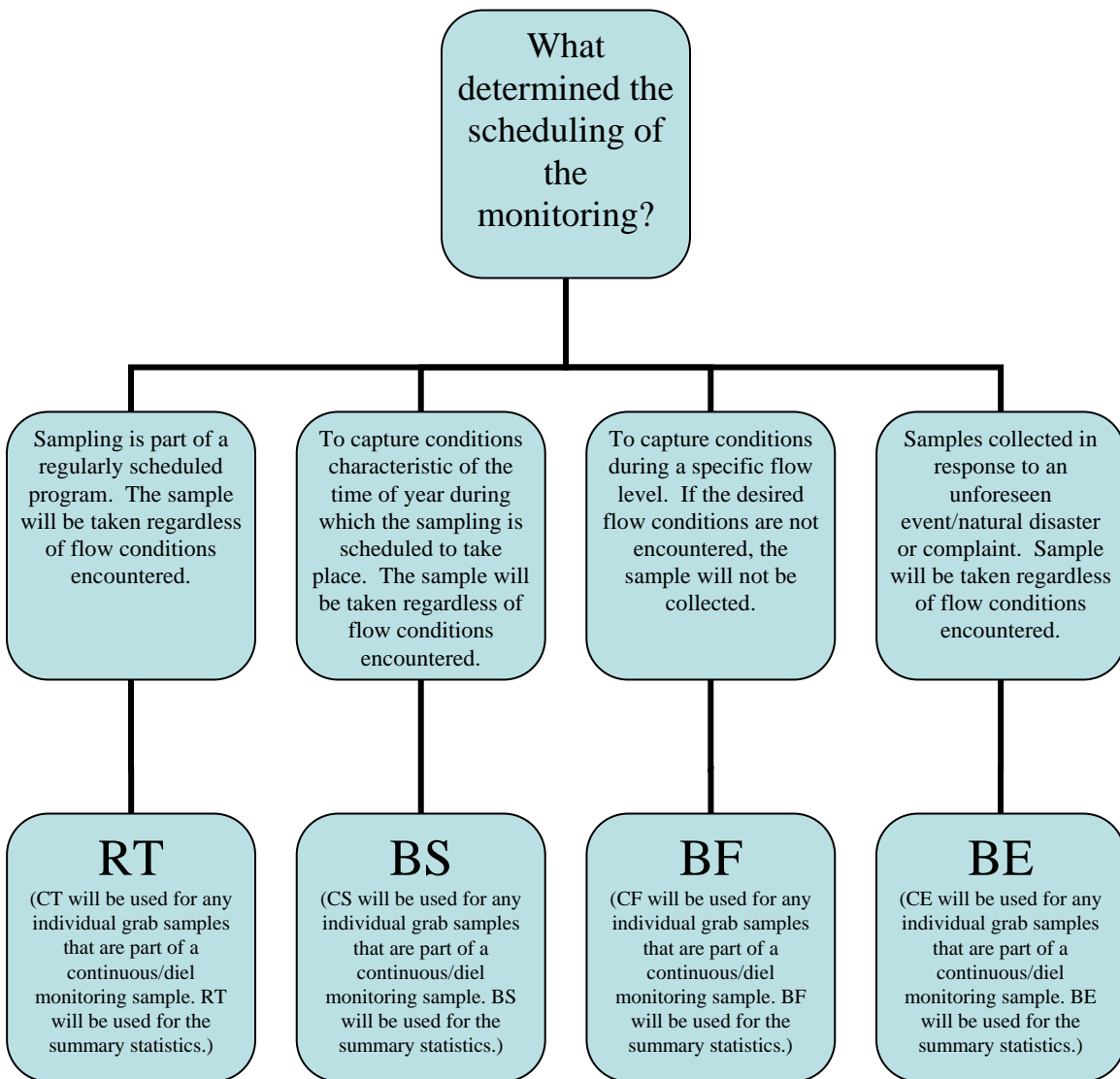
Program Code	Definition
RT	<u>Routine</u> -- Monitoring not intentionally targeted toward any environmental condition or event.
BS	<u>Biased-Season</u> -- Monitoring targeted toward a certain time of year (for example, critical or index period).
BF	<u>Biased-Flow</u> -- Monitoring targeted toward certain flow conditions (for example, runoff events).
BE	<u>Biased-Event</u> -- Monitoring targeted toward a specific event (for example, fish kill or spill).
CT ¹	<u>Continuous-Routine</u> -- Continuous monitoring not intentionally targeted toward any environmental condition (the summary statistics are coded RT).
CS ¹	<u>Continuous-Season</u> -- Continuous monitoring targeted toward a certain time of year (the summary statistics are coded BS).
CF ¹	<u>Continuous-Flow</u> -- Continuous monitoring targeted toward certain flow conditions (the summary statistics are coded BF).
CE ¹	<u>Continuous-Event</u> -- Continuous monitoring targeted toward a specific event (the summary statistics are coded BE).
CQ ¹	<u>Continuous-QA</u> -- Continuous monitoring QA samples.
CD	<u>Continuous Data</u> -- data submitted via LEADS (monitoring intent not characterized)
QA	<u>Quality Assurance</u> -- QA samples.

¹Continuous monitoring samples include CWQMN and the individual grab samples that are collected during continuous sonde deployments such as 24-hr DO monitoring.

The use of the following Program Codes will be discontinued on 9/1/2007: BN, CM, DI, FL, IS, NA, NI, NS, RG, RS, RW, SS, TI, TN, TQ, TS, XS, XR.

The new Program Codes are designed to answer the main question of bias in sampling, so the decision of what code to use is determined by any targeting of the sampling:

- “RT” samples are scheduled in advance without intentionally trying to target any certain environmental condition. The sample is collected regardless of the conditions encountered.
- “BS” samples are scheduled for a certain time of year because the sample is meant to capture the conditions characteristic of that time of year. The sample will be taken regardless of the flow condition encountered.
- “BF” samples cannot be precisely scheduled in advance because they target a certain flow condition that must be present in order for the sample to be taken.
- “BE” samples are not typically scheduled in advance, but are reactive to an emergency condition.



EXAMPLES

RT

- Regularly scheduled (quarterly, monthly, weekly) planned monitoring where the sample will be taken regardless of environmental conditions encountered.
- Sampling to support a certain project AS LONG AS the monitoring is not targeting an environmental or temporal condition.
- Sampling at stations on a rotational or systematic basis AS LONG AS the monitoring is not targeting an environmental or temporal condition.
- The summary statistics of 24hr monitoring that is NOT purposefully scheduled for a certain time of year (for example, scheduled monthly).
- Biological sampling NOT purposefully scheduled for a certain time of year (for example, quarterly).
- Sampling on an intermittently flowing waterbody or spring scheduled for those time periods when flow is likely to be encountered NOT because conditions during those time periods are trying to be captured.
- Routine monitoring on tidal waterbodies.
- Most fish tissue sampling.
- Most sediment sampling.
- Flow monitoring studies with regularly scheduled sampling events.

BS

- The summary statistics of 24hr monitoring that is purposefully scheduled for a certain time of year (for example, critical/index periods). Reporting of the individual grabs that make up the 24hr event would be CS.
- Biological sampling purposefully scheduled for a certain time of year (for example, critical/index periods).
- WLEs/RWAs scheduled to try to capture conditions during the index or critical periods.
- Habitat studies.
- ALA/ALM/UAAAs that target the critical period.

BF

- Monitoring under a study designed to collect samples during runoff events.
- A water rights study that targets flows below 7Q2 (that is, the sample is only taken if flow is below 7Q2).
- A study of a tidal waterbody that targeted at specific tidal conditions.

BE – Usually not previously planned

- Fish kill investigation.
- Monitoring in response to a significant natural disaster (for example, hurricane) to capture conditions directly caused by the disaster.
- Sampling spills.
- Complaint investigations.