Quality Assurance Project Plan
Brazos River Authority

4600 Cobbs Drive
Waco, Texas 76710

Clean Rivers Program

Water Quality Planning Division

Texas Commission on Environmental Quality

P.O. Box 13087, MC 234

Austin, Texas 78711-3087

Effective Period: FY 2020 to FY 2021

Questions concerning this QAPP should be directed to:
Kay Barnes (Brazos River Authority Representative)
Quality Assurance Officer
4600 Cobbs Drive
Waco, Texas 76710
(254) 761-3131
kay.barnes@brazos.org

A1 Approval Page

Texas Commission on Environmental Quality

Water Quality Planning Division

Kyle Girten, Manager — Date
Water Quality Monitoring and Assessment Section

Sarah Eagle, Work Leader — Date
Clean Rivers Program

Kelly Rodibaugh — Date
Project Quality Assurance Specialist
Clean Rivers Program

Howard Barrons — Date
Project Manager
Clean Rivers Program

Cathy Anderson, Team Leader — Date
Data Management and Analysis

Monitoring Division

Sharon Coleman — Date
Acting CRP Lead Quality Assurance Specialist

Brazos River Authority

Jenna Olson 16AUG19
Jenna Olson Date
Brazos River Authority Project Manager

Kay Barnes 16 Aug 2019
Kay Barnes Date
Brazos River Authority Quality Assurance Officer

Laboratory

Ahmed Kadry 16-Aug-19
Ahmed Kadry Date
BRA ES Laboratory Manager

16AUG19
Katherine Lathen Date
BRA ES Laboratory Deputy Quality Assurance Officer

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

A2 Table of Contents

Tags

List of Acronyms

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
BRA	Brazos River Authority
CAP	Corrective Action Plan
CE	Collecting Entity
COC	Chain of Custody
CRP	Clean Rivers Program
DMRG	Surface Water Quality Monitoring Data Management Reference Guide, December 2016, or most recent version
DM&A	Data Management and Analysis
DQAO	Deputy Quality Assurance Officer
EPA	United States Environmental Protection Agency
ES	Environmental Services
ESL	Environmental Services Laboratory
FY	Fiscal Year
GIS	Geographical Information System
GPS	Global Positioning System
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MT	Monitoring Type
NELAP	National Environmental Lab Accreditation Program
QA	Quality Assurance
QM	Quality Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QC	Quality Control
QMP	Quality Management Plan
RT	Routine Monitoring
SE	Submitting Entity
SLOC	Station Location
SOP	Standard Operating Procedure
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TMDL	Total Maximum Daily Load
TCEQ	Texas Commission on Environmental Quality
TNI	The NELAC Institute
TSWQS	Texas Surface Water Quality Standards

A3 Distribution List

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

Howard Barrons, Project Manager
Clean Rivers Program
MC-234
(512) 239-6633

Sharon Coleman
Acting CRP Lead Quality Assurance Specialist
MC-165
(512) 239-6340

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

Brazos River Authority
4600 Cobbs Drive
Waco, Texas 76710

Jenna Olson, Brazos River Authority Project Manager
(254) 761-3149

Kay Barnes, Brazos River Authority Quality Assurance Officer
(254) 761-3131

BRA Environmental Services Laboratory
4600 Cobbs Drive
Waco, Texas 76710

Ahmed Kadry, BRA ES Laboratory Manager
(254) 761-3231

Katherine Lathen, BRA ES Laboratory Deputy Quality Assurance Officer
(254) 761-3244

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

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

TCEQ

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

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

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

Cathy Anderson
Team Leader, Data Management and Analysis (DM&A) Team
Participates in the development, approval, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Ensures DM&A staff perform data management-related tasks.

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

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

BRAZOS RIVER AUTHORITY

Jenna Olson
Brazos River 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 Brazos River Authority participants and that projects are producing data of known quality. Ensures that subparticipants are qualified to perform contracted work. Ensures CRP project managers and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ.

Kay Barnes
Brazos River 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 maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the Brazos River Authority Project Manager of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective action. Coordinates and maintains records of data verification and validation. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Conducts 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.

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

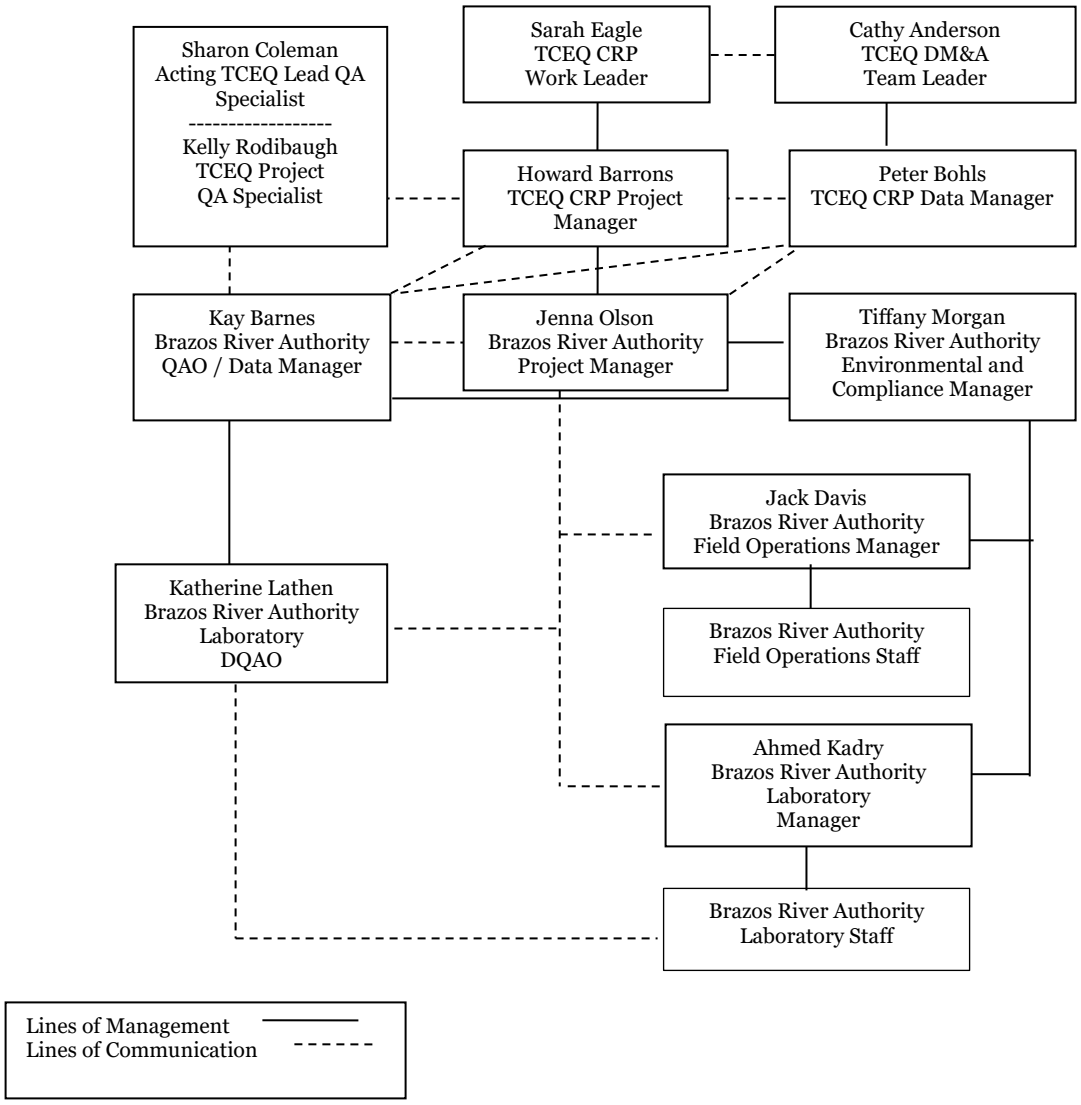
Katherine Lathen
BRA ES Laboratory Deputy Quality Assurance Officer
Assists with the coordination and implementation of the QA program. Responsible for ensuring that field and lab data from the BRA Environmental Services Laboratory are properly reviewed and verified for compliance with BRA SOPs, CRP QAPP, and NELAP. Coordinates and maintains records of data verification and validation. Maintains the daily corrective action process. Conducts laboratory internal audits as detailed in BRA SOPs. Assists with writing and maintaining the QAPP. Responsible for the transfer of basin quality-assured water quality data to the TCEQ in a format compatible with SWQMIS.

Ahmed Kadry, PhD
Brazos River Authority Environmental Services Laboratory Manager
Responsible for initial review and verification of lab data for correctness, completeness, compliance, and consistency with project goals. Coordinates daily lab function. Supervises Laboratory Analysts.

Jack Davis
Brazos River Authority Field Operations Supervisor
Responsible for coordinating field activities to ensure correctness, completeness, compliance, and consistency with project goals. Responsible for supervision of Aquatic Scientists and Field Technicians.

Project Organization Chart

Figure A4.1. Organization Chart - Lines of Communication



A5 Problem Definition/Background

In 1991, the Texas Legislature passed the Texas Clean River Act (Senate Bill 818) in response to growing concerns that water resource issues were not being pursued in an integrated, systematic manner. The act requires that ongoing water quality assessments be conducted for each river basin in Texas, an approach that integrates water quality issues within the watershed. The CRP legislation mandates that each river authority (or local governing entity) shall submit quality-assured data collected in the river basin to the commission. Quality-assured data in the context of the legislation means data that comply with TCEQ rules for surface water quality monitoring (SWQM) programs, including rules governing the methods under which water samples are collected and analyzed and data from those samples are assessed and maintained. This QAPP addresses the program developed between the Brazos River Authority and the TCEQ to carry out the activities mandated by the legislation. The QAPP was developed and will be implemented in accordance with provisions of the TCEQ Quality Management Plan, January 2019 or most recent version (QMP).

The purpose of this QAPP is to clearly delineate Brazos River Authority 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 of known and documented quality, deemed acceptable for their intended use. This process will ensure that data collected under this QAPP and submitted to SWQMIS have been collected and managed in a way that guarantees its reliability and therefore can be used in water quality assessments, total maximum daily load (TMDL) development, establishing water quality standards, making permit decisions and used by other programs deemed appropriate by the TCEQ. Project results will be used to support the achievement of CRP objectives, as contained in the *Clean Rivers Program Guidance and Reference Guide FY 2020 -2021*.

In 1995, the Brazos River Authority designed the Basin Monitoring Program as the major water quality data collection effort in the Brazos River basin. The Program provides a basin-wide approach to the collection of water quality data that encourages input from local Steering Committee members. The Program is designed to provide specific types of water quality data, while providing flexibility to address dynamic water quality issues throughout the basin.

A6 Project/Task Description

This QAPP applies to routine monitoring throughout the Brazos River basin and biological/habitat assessments on selected sites.

The Clean Rivers Program for the Brazos River Basin is designed to collect water quality samples in each designated segment of the basin in concert with the TCEQ Regional personnel. The sampling is conducted on a periodic basis for water quality constituents that the TCEQ and Brazos River Authority use to assess the status of water quality. The information collected through this program is communicated to stakeholders who assist in setting priorities for monitoring locations. When the data show possible water quality concern or stakeholders indicate a concern, the CRP will focus more resources on those areas to collect water quality data and better define the water quality issue.

See Appendix B 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 Brazos River Authority Project Manager to the CRP Project Manager electronically. The Brazos River Authority will submit a completed QAPP Amendment document, including a justification of the amendment, a table of changes, and all pages, sections or attachments affected by the amendment. Amendments are effective

immediately upon approval by the Brazos River Authority Project Manager, the Brazos River Authority QAO, the CRP Project Manager, the CRP Lead QA Specialist, the TCEQ QA Manager or designee, the CRP Project QA Specialist, and additional parties affected by the amendment. Amendments are not retroactive. No work shall be implemented without an approved QAPP or amendment prior to the start of work. Any activities under this contract that commence prior to the approval of the governing QA document constitute a deficiency and are subject to corrective action as described in section C1 of this QAPP. Any deviation or deficiency from this QAPP which occurs after the execution of this QAPP should be addressed through a Corrective Action Plan (CAP). An Amendment may be a component of a CAP to prevent future recurrence of a deviation. Amendments will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by the Brazos River Authority Project Manager. The Brazos River Authority will secure an adherence letter from each sub-tier project participant (e.g., subcontractors, sub-participant, or other units of government) affected by the amendment stating the organization's awareness of and commitment to requirements contained in each amendment to the QAPP. The Brazos River Authority will maintain this documentation as part of the project's QA records, and ensure that the documentation is available for review.

Special Project Appendices

Projects requiring QAPP appendices will be planned in consultation with the Brazos River Authority and the TCEQ Project Manager and TCEQ technical staff. Appendices will be written in an abbreviated format and will reference the Basin QAPP where appropriate. Appendices will be approved by the Brazos River Authority Project Manager, the Brazos River Authority QAO, the Laboratory (as applicable), and the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist and additional parties affected by the Appendix, as appropriate. Copies of approved QAPP appendices will be distributed by the Brazos River Authority to project participants before data collection activities commence. The Brazos River Authority will secure written documentation from each sub-tier project participant (e.g., subcontractors, subparticipants, other units of government) stating the organization's awareness of and commitment to requirements contained in each special project appendix to the QAPP. The Brazos River Authority will maintain this documentation as part of the project's QA records, and ensure that the documentation is available for review.

A7 Quality Objectives and Criteria

The purpose of routine water quality monitoring is to collect surface water quality data that can be used to characterize water quality conditions, identify significant long-term water quality trends, support water quality standards development, support the permitting process, and conduct water quality assessments in accordance with TCEQ's Guidance for Assessing and Reporting Surface Water Quality in Texas, June 2015 or most recent version (https://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/14txir/2014_guidance.pdf). These water quality data, and data collected by other organizations (e.g., United States Geological Survey (USGS), TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

-Brazos River Authority will conduct biological monitoring using specifications found in TCEQ SOP, V1 – Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415) and TCEQ SOP, V2 – Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

The Brazos River Authority will conduct diel water quality monitoring using a systematic approach. The diel monitoring will adhere to the specifications described in the TCEQ SOP V1 – *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods,* 2012 (RG-415).

Ambient Water Reporting Limits (AWRLs)

For surface water to be evaluated for compliance with Texas Surface Water Quality Standards ("TSWQS") and screening levels, data must be reported at or below specified levels. To ensure data are collected at or below these levels, required ambient water reporting limits ("AWRL") have been established. A full listing of AWRLs can be found at https://www.tceq.texas.gov/assets/public/waterquality/crp/QA/awrlmaster.pdf .

The limit of quantitation (LOQ) is the minimum level, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence by the laboratory analyzing the sample. Analytical results shall be reported down to the laboratory's LOQ (i.e., the laboratory's LOQ for a given parameter is its reporting limit) as specified in Appendix A.

The following requirements must be met in order to report results to the CRP:

- The laboratory's LOQ for each analyte must be set at or below the AWRL.
- Once the LOQ is established in the QAPP, that is the reporting limit for that parameter until such time as the laboratory amends the QAPP and lists an updated LOQ.
- The laboratory must demonstrate its ability to quantitate at its LOQ for each analyte by running an LOQ check sample for each analytical batch of CRP samples analyzed.
- When reporting data, no results may be reported below the LOQ stated in this QAPP.
- Measurement performance specifications for LOQ check samples are found in Appendix A.
- Exceptions:
    - Segment 1208 nitrate nitrogen and orthophosphate phosphorus will not meet LOQ requirements due to dilution needed to measure chloride and sulfate.
        - Dilution 1:50, LOQ will be 0.2
        - Dilution 1:20, LOQ will be 0.08
    - When specific conductance reads greater than 3,000 but less than 10,000, BRA ESL uses Colilert-18 media. CRP requires dilution 1:10, requiring an LOQ of 10 MPN/100mls.

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

Precision

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

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

Bias

Bias is the systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value). Bias is a statistical measurement of correctness and includes multiple components of systematic error. Bias is determined through the analysis of LCS and LOQ Check Samples prepared with verified and known amounts of all target analytes in the sample matrix (e.g. deionized water, sand, commercially available tissue) and by calculating percent recovery. Results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for bias are specified in Appendix A.

Representativeness

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

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 as described in this QAPP and in TCEQ guidance. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format as specified in the Data Management Plan Section B10.

Completeness
The completeness of the data is basically a relationship of how much of the data are 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

Before new field personnel independently conduct field work a Senior Aquatic Scientist or the Field Operations Supervisor trains him/her in proper instrument calibration, field sampling techniques, and field analysis procedures. The QA officer or DQAP will document the successful field demonstration. The QA Officer or DQAO will retain documentation of training and the successful field demonstration in the employee's training notebook and will be available during monitoring systems audits.

Contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in section The NELAC Institute Standard (2009) Volume 1, Module 2, Section 4.5.5 (concerning Subcontracting of Environmental Tests).

A9 Documents and Records

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

Table A9.1 Project Documents and Records

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	Brazos River Authority	5 past end of contract period	Paper and Electronic
Field SOPs	Brazos River Authority	Indefinitely	Paper and Electronic
Laboratory Quality Manuals	Brazos River Authority/ Laboratory	Indefinitely	Paper and Electronic
Laboratory SOPs	Brazos River Authority/ Laboratory	Indefinitely	Paper and Electronic
QAPP distribution documentation	Brazos River Authority	5 past end of contract period	Paper and Electronic
Field staff training records	Brazos River Authority	5 past end of contract period	Paper and Electronic
Field equipment calibration/maintenance logs	Brazos River Authority	5 past end of contract period	Paper and Electronic
Field instrument printouts	Brazos River Authority	5 past end of contract period	Paper and Electronic
Field notebooks or data sheets	Brazos River Authority	5 past end of contract period	Paper and Electronic
Chain of custody records	Brazos River Authority	5 past end of contract period	Paper and Electronic
Laboratory calibration records	Laboratory	5 past end of contract period	Electronic
Laboratory instrument printouts	Laboratory	5 past end of contract period	Paper and Electronic
Laboratory data reports/results	Brazos River Authority/ Laboratory	Indefinitely	Electronic
Laboratory equipment maintenance logs	Laboratory	5 past end of contract period	Paper and Electronic
Corrective Action Documentation	Brazos River Authority/ Laboratory	Indefinitely	Paper and Electronic

Laboratory Test Reports

Test/data reports from the laboratory must document the test results clearly and accurately. Routine data reports should be consistent with the TNI Standard (2009), Volume 1, Module 2, Section 5.10 and include the information necessary for the interpretation and validation of data. The requirements for reporting data and the procedures are provided.

When a formal report is required by CRP the Laboratory reports of analytical results performed by the Environmental Services Laboratory will include the following elements:

- Sample Number (LIMS number)
- Site Number
- Date and time of collection
- Sample depth
- Sample Matrix
- Parameter (Storet Code)
- Sample results
- Units of measurement
- Holding time for SM9223-B
- LOQ and LOD (formerly referred to as the reporting limit and the method detection limit, respectively), and qualification of results outside the working range (if applicable)
- Certification of NELAP compliance
- QC Results

- Comments related to sample collection or analysis

Electronic Data

Routine data will be submitted electronically to the TCEQ in the Event/Result file format described in the most current version of the DMRG, which can be found at https://www.tceq.texas.gov/waterquality/data-management/dmrg_index.html. A completed Data Review Checklist and Data Summary (see Appendix F) will be submitted with each data submittal.

Biological data will be submitted electronically to the TCEQ in the ASCII Pipe-Delimited Event text file, ASCII Pipe-Delimited Result text file, README.txt file, and BLOB file format described Chapter 12 TCEQ Partner Agencies and Contractors paragraphs in the most current version of the DMRG, which can be found at https://www.tceq.texas.gov/waterquality/data-management/dmrg_index.html.

B1 Sampling Process Design

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

B2 Sampling Methods

Field Sampling Procedures

Field sampling will be conducted in accordance with the latest versions of the TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2012 (RG-415) and Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416), collectively referred to as "SWQM Procedures". Updates to SWQM Procedures are posted to the Surface Water Quality Monitoring Procedures website (https://www.tceq.texas.gov/waterquality/monitoring/swqm_guides.html), and shall be incorporated into the Brazos River Authority's procedures, QAPP, SOPs, etc., within 60 days of any final published update. Additional aspects outlined in Section B below reflect specific requirements for sampling under CRP and/or provide additional clarification.

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Sample Volume	Holding Time	Matrix	Container	Preservation
Chloride	125 mL*	28 days	Water	New Nalgene Bottle	Ice, cool >0 to 6° C
Sulfate	125 mL*				
Nitrate nitrogen	125 mL*	48 hours			
Ortho-phosphate Phosphorus	125 mL*	Filter within 15 minutes of collection**/48 hours use Storet code 00671			
Ortho-phosphate Phosphorus Lab Filtered	125 mL*	48 hours, if not filtered within 15 minutes use Storet code 70507			
E. coli	100 mL or 250 mL (duplicates)	8 hours#		100 ml sterile IDEXX bottle with Sodium Thiosulfate	Sodium Thiosulfate, Ice, cool >0 to 6° C
Enterococcus	100 mL	8 hours		100 ml sterile IDEXX bottle with Sodium Thiosulfate	Sodium Thiosulfate, Ice, cool >0 to 6° C
TSS	1 L	7 days		LDPE Cubitainer	Ice, cool >0 to 6° C
TDS	500 mL‡	7 days		Brown Nalgene Bottle	
Turbidity	500 mL‡	48 hours			
Chlorophyll a	500 mL‡	48 hours to filter/24 days frozen after filtration			Dark Ice, cool >0 to 6° C before filtration: dark frozen after filtration
Total Phosphorus	250 mL⁋	28 days		Nalgene Bottle	Ice, cool >0 to 6° C H2SO4 to pH 2
Total Kjeldahl Nitrogen	250 mL⁋	28 days			
Ammonia	250 mL⁋	28 days			
Benthic Macro invertebrates	ɕ	Permanent preservation in ethanol	Water	Glass	5% formalin in field, 70% ethanol after washing
Fish	ɕ	7 days in formalin, permanent preservation in ethanol	Water	Glass	10% formalin in field, 70% ethanol

*Ion chromatograph analytes (chloride, nitrate, orthophosphate-phosphorus and sulfate) will be taken from the same 125mL sample after filtration of orthophosphate phosphorus.

** Preservation of Orthophosphate Phosphorus is performed immediately upon collection or within 15 minutes of collection by filtration in the field.

#E.coli samples should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

‡TDS, Turbidity, and Chl *a* are analyzed from a single 500 mL sample for a given monitoring location.

⁋TKN, TP, and Ammonia are analyzed from a single 250 mL sample for each monitoring location.

ɕSample volume is dependent on number of organisms collected.

Sample Containers

Certificates from sample container manufacturers are maintained in the LIMS and on Environmental Services SharePoint by the Brazos River Authority.

- IDEXX sterile 120 and 290 mL bottles are used for bacteria sampling.
- 1 Quart (1L) LDPE Cubitainers are used for TSS sampling.
- 16 oz (500 mL) Brown HDPE bottles are used for chlorophyll *a*, TDS, and Turbidity sampling.
- 8 oz (250 mL) White HDPE bottles are used for TKN, TP, and NH3-N sampling.
- 4 oz (125 mL) White HDPE bottles are used for Cl, SO4, NO3-N, and OPO4-P sampling.

Sample containers used for conventional parameters are purchased pre-cleaned and are disposable from Quality Environmental Containers.

Processes to Prevent Contamination

SWQM Procedures outline the necessary steps to prevent contamination of samples. These include: direct collection into sample containers, when possible.

Documentation of Field Sampling Activities

Field sampling activities are documented on field data sheets as presented in Appendix D. Flow worksheets, aquatic life use monitoring checklists, habitat assessment forms, field biological assessment forms, and records of bacteriological analyses (if applicable) are part of the field data record. The following will be recorded for all visits:

Station ID
Sampling Date
Location
Sampling Depth
Sampling Time
Sample Collector's initials as they appear on the ESL Signature log
Values for all field parameters collected

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

Recording Data

For the purposes of this section and subsequent sections, all field and laboratory personnel follow the basic rules for recording information as documented below:

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

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

Examples of sampling method requirements or sample design deficiencies include but are not limited to such

things as inadequate sample volume due to spillage or container leaks, failure to preserve samples appropriately, contamination of a sample bottle during collection, storage temperature and holding time exceedance, sampling at the wrong site, etc. Any deviations from the QAPP, SWQM Procedures, or appropriate sampling procedures may invalidate data, and require documented corrective action. Corrective action may include for samples to be discarded and re-collected. It is the responsibility of the Brazos River Authority Project Manager, in consultation with the Brazos River Authority QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the CRP Project Manager both verbally and in writing in the project progress reports and by completion of a CAP.

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

B3 Sample Handling and Custody

Sample Tracking

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

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The Chain of Custody (COC) form is a record that documents the possession of the samples from the time of collection to receipt in the laboratory. BRA uses the field data sheet as the COC for routine sampling (See Appendix D). The following list of items matches the field datasheets in Appendix D.

Date and time of collection
Site identification
Sample matrix
Number of containers
Preservative used
Was the sample filtered
Analyses required
Name of collector
Custody transfer signatures and dates and time of transfer
Bill of lading, if applicable

Sample Labeling

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

LIMS sample number (includes the station id and matrix)
Date and time of collection
Sample depth
Initials of Collector

Sample Handling

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.

Samples are collected in the field, filtered or acid preserved as necessary, and stored in coolers on ice. Samples are delivered to the Authority's water quality laboratory in coolers with field data sheets (COC Forms) attached. The laboratory staff examines each sample container for anomalies and ensures that all container information matches the information on the appropriate field data sheet. If the information is present and correct, the lab staff will receive the samples by signing the field data sheet "received by" block and entering the samples into the laboratory information management system (LIMS). At this instant, the samples become the responsibility of the Authority's water quality laboratory.

Internal sample handling, custody, and storage procedures for laboratory are described in the Brazos River Authority's Environmental Laboratory Quality Manual.

Sample Tracking Procedure Deficiencies and Corrective Action

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

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

B4 Analytical Methods

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

Laboratories collecting data under this QAPP must be NELAP-accredited in accordance with 30 TAC Chapter 25. Copies of laboratory QMs and SOPs shall be made available for review by the TCEQ.

Standards Traceability

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

Analytical Method Deficiencies and Corrective Actions

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

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

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

storage in SWQMIS. However, when data is lost, its absence will be described in the data summary report submitted with the corresponding data set, and a corrective action plan (as described in section C1) may be necessary.

B5 Quality Control

Sampling Quality Control Requirements and Acceptability Criteria

The minimum field QC requirements, and program-specific laboratory QC requirements, are outlined in SWQM Procedures. No field QC samples are collected since BRA does not sample for metals or organics under this QAPP. Specific requirements are outlined below.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Batch

A batch is defined as environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same NELAP-defined matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 25 hours. An analytical batch is composed of prepared environmental samples (extract, digestates, or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

Method Specific QC requirements

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

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

Comparison Counting

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

Limit of Quantitation (LOQ)

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

LOQ Check Sample

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

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

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

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

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

Laboratory Control Sample (LCS)

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

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

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

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

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

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

Laboratory Duplicates

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

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

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

For bacteriological parameters, precision is evaluated using the results from laboratory duplicates. Bacteriological duplicates are analyzed on a 10% frequency (or once per preparation batch, whichever is more frequent). Sufficient volume should be collected to analyze laboratory duplicates from the same sample container.

The base-10 logarithms of the results from the original sample and its duplicate are calculated. The absolute value of the difference between the two base-10 logarithms is calculated and compared to the precision criterion in Appendix A.

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

The precision criterion in Appendix A for bacteriological duplicates applies only to samples with concentrations > 10 MPN.

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

Matrix spikes indicate the effect of the sample on the precision and accuracy of the results generated using the selected method. Matrix-specific QC samples indicate the effect of the sample matrix on the precision and accuracy of the results generated using the selected method. The information from these controls is sample/matrix specific and would not normally be used to determine the validity of the entire batch. The frequency of matrix spikes is specified by the analytical method, or a minimum of one per preparation batch, whichever is greater. To the extent possible, matrix spikes prepared and analyzed over the course of the project should be performed on samples from different sites.

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

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

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

Matrix spike recoveries are compared to the same acceptance criteria established for the associated LCS recoveries, rather than the matrix spike recoveries published in the mandated test method. The EPA 1993 methods (i.e. ammonia-nitrogen, ion chromatography, TKN) that establish matrix spike recovery acceptance criteria are based on recoveries from drinking water that has very low interferences and variability and do not represent the matrices sampled in the CRP. If the matrix spike results are outside laboratory-established criteria, there will be a review of all other associated quality control data in that batch. If all of quality control data in the associated batch passes, it will be the decision of the laboratory QAO or Brazos River Authority Project Manager to report the data for the analyte that failed in the parent sample to TCEQ or to determine that the result from the parent sample associated with that failed matrix spike is considered to have excessive analytical variability and does not meet project QC requirements. Depending on the similarities in composition of the samples in the batch, the Brazos River Authority may consider excluding all of the results in the batch related to the analyte that failed recovery.

Method blank

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

The method blank shall be analyzed at a minimum of one per preparation batch. In those instances for which no

separate preparation method is used (e.g., VOA) the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

Quality Control or Acceptability Requirements Deficiencies and Corrective Actions

Sampling QC excursions are evaluated by the Brazos River Authority Project Manager, in consultation with the Brazos River Authority QAO. In that differences in sample results are used to assess the entire sampling process, including environmental variability, the arbitrary rejection of results based on pre-determined limits is not practical. Therefore, the professional judgment of the Brazos River Authority Project Manager and QAO will be relied upon in evaluating results. Notations of blank contamination are noted in the data summaries that accompany data deliverables.

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

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

Additionally, in accordance with CRP requirements and the TNI Standard (Volume 1, Module 2, Section 4.5, Subcontracting of Environmental Tests) when a laboratory that is a signatory of this QAPP finds it necessary and/or advantageous to subcontract analyses, the laboratory that is the signatory on this QAPP must ensure that the subcontracting laboratory is NELAP-accredited (when required) and understands and follows the QA/QC requirements included in this QAPP. This includes that the sub-contracting laboratory utilize the same reporting limits as the signatory laboratory and performs all required quality control analysis outlined in this QAPP. The signatory laboratory is also responsible for quality assurance of the data prior to delivering it to the Brazos River Authority, including review of all applicable QC samples related to CRP data. As stated in section 4.5.5 of the TNI Standard, the laboratory performing the subcontracted work shall be indicated in the final report and the signatory laboratory shall make a copy of the subcontractor's report available to the client (Brazos River Authority) when requested.

B6 Instrument/Equipment Testing, Inspection, and Maintenance

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

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

B7 Instrument Calibration and Frequency

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

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

B8 Inspection/Acceptance of Supplies and Consumables

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

B9 Acquired Data

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

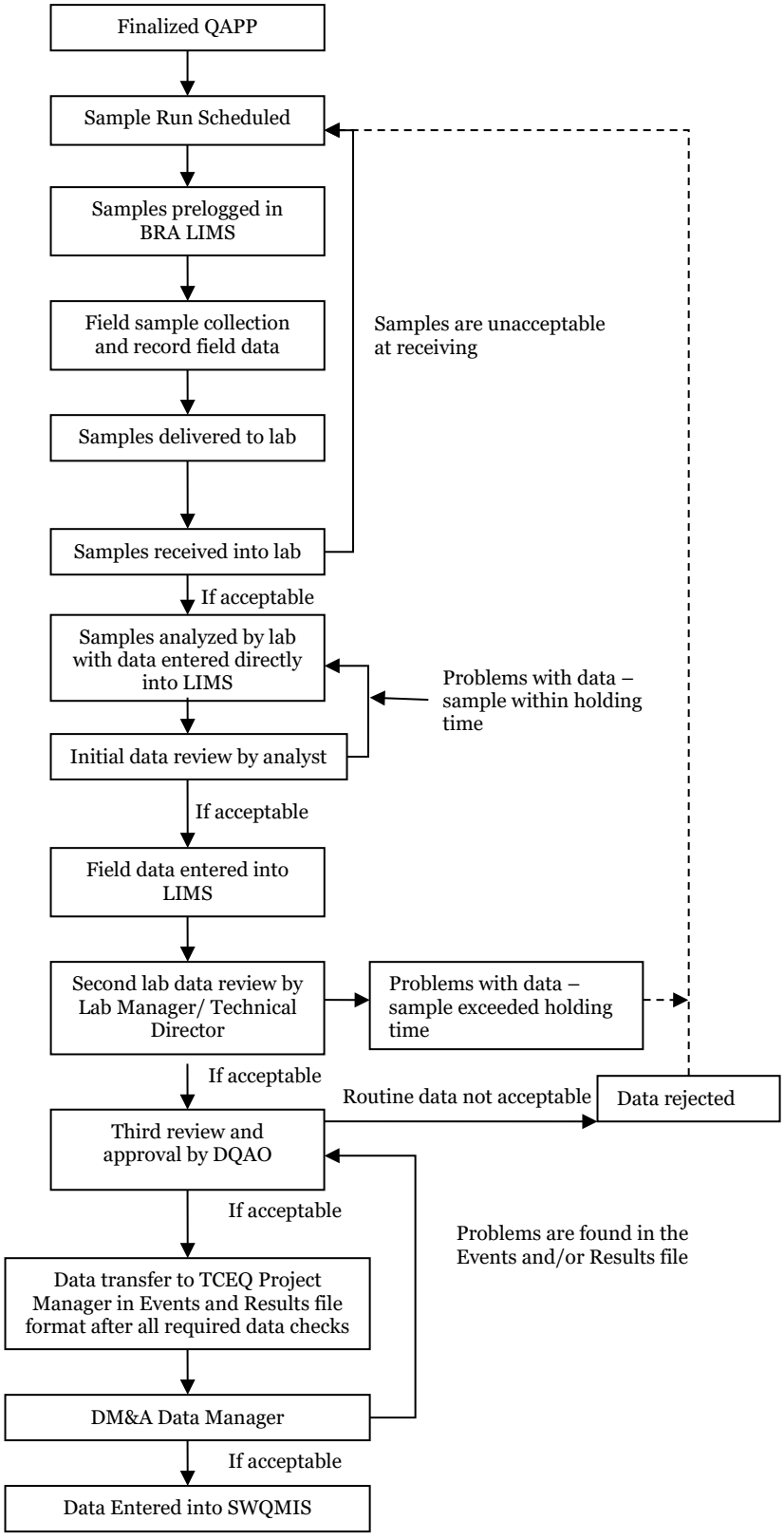
USGS gage station data will be used throughout this project to aid in determining gage height and flow. Rigorous QA checks are completed on gage data by the USGS and the data are approved by the USGS and permanently stored at the USGS. This data will be submitted to the TCEQ under parameter code 00061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

Reservoir stage data are collected every day from the USGS, International Boundary and Water Commission (IBWC), and the United States Army Corps of Engineers (USACE) websites. These data are preliminary and subject to revision. The Texas Water Development Board (TWDB) derives reservoir storage (in acre-feet) from these stage data (elevation in feet above mean sea level), by using the latest rating curve datasets available. These data are published at the TWDB website at http://waterdatafortexas.org/reservoirs/statewide. Information about measurement methodology can be found on the TWDB website. These data will be submitted to the TCEQ under parameter code 00052 Reservoir Stage and parameter code 00053 Reservoir Percent Full.

B10 Data Management

Data Management Process

Figure B10.1



Data Dictionary

Terminology and field descriptions are included in the 2016 DMRG, or most recent version. A table outlining the entities that will be used when submitting data under this QAPP is included below to verify the entity codes included in this QAPP.

Name of Entity	Tag Prefix	Submitting Entity	Collecting Entity
Brazos River Authority	BR	BR	BR

Data Errors and Loss

Laboratory technicians review all data before finalizing data reports. If needed and the sample is still within holding time, the technician will reanalyze samples not meeting QA requirements. The Laboratory Manager reviews all laboratory data following analysis and checks for calculation errors or data entry errors. The Lab Manager performs the second review of field data and the Deputy Quality Assurance Officer performs a third review of all data to determine validity within this QAPP.

Record Keeping and Data Storage

All electronic records are backed-up weekly. Access to protected records is limited to Quality Assurance Officer and Deputy Quality Assurance Officer to prevent unauthorized access or amendment.

Procedure for Records Management

- Identification: Records are uniquely identified.
- Collection: Observations, data and calculations are recorded at the time they are made. When mistakes are made in technical records, each mistake is crossed out with a single line (not erased, made illegible, or deleted) and the correct value entered alongside. Corrections are signed or initialed by the person making the correction. For electronic systems, all changes are tracked by the audit trail or by added notes. When changes are made to technical records for reasons other than for correction of transcription errors, the reason for the change is recorded on the document.
- Storage: All records stored on electronic media are supported by the hardware and software required for retrieval and have hard-copy or write-protected backup copies.
- Filing: Records are filed promptly and in an organized fashion.
- Access: Access to archived information is documented with an access log.
- Disposal: Records are disposed of according to applicable regulation, client request, or after seven years.

Backup/Disaster Recovery

In the event of failure of the data management system, the network can be restored in a matter of a few hours by reloading the archives from network backups. Instrument programs and electronic data are saved to the BRA network servers.

Archives/Data Retention

The BRA IT Department does full network backups of all systems. The servers are replicated to an off site disaster recovery location every four hours, allowing for the servers to be brought back up and running quickly from the disaster recovery site in the event that the server room at the main office is inoperable. In addition, an incremental local network backup of all servers is run every four hours and kept for five days, from which data or the entire server can be restored if needed, as well as a daily incremental backup to our BRA's site disaster recovery location in which thirty days worth of backups are kept. BRA also keeps a third set of incremental backups at a second off site location that is run every two days, of which ninety restore points are kept.

Data Handling, Hardware, and Software Requirements

Water Quality Database (LIMS) - The Authority's laboratory database serves as a repository of water sample tracking and water quality analysis data until all appropriate tests and analyses have been performed and the results have undergone quality control review. The database resides on the Authority's network server, as described above, and is maintained through third party software application named Labvantage by Labvantage Solutions. Information Technology staff maintains the database which is installed on a Microsoft Virtual Server and is hosted locally on a Dell Compellent Data Storage SAN Server Hosting the Labvantage Application as the front end and Microsoft SQL® as the back end. Data input and access to the laboratory water quality database

are restricted by password and network access to the Laboratory Manager, Laboratory Staff, Field Operations Staff, Quality Assurance Officer, Deputy Quality Assurance Officer, and the IT Software Administrator.

Information Resource Management Requirements

Data will be managed in accordance with the TCEQ DMRG, and applicable Brazos River Authority information resource management policies.

GPS equipment may be used as a component of the information required by the Station Location (SLOC) request process for creating the certified positional data that will ultimately be entered into SWQMIS database. Positional data obtained by CRP grantees using a GPS will follow the TCEQ's OPP 8.11 and 8.12 policy regarding the collection and management of positional data. Positional data may be acquired with a GPS and verified with photo interpolation using a certified source, such as Google Earth or Google Maps. The verified coordinates and map interface can then be used to develop a new SLOC.

C1 Assessments and Response Actions

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

Table C1.1 Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	Brazos River Authority	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report
Monitoring Systems Audit of Brazos River Authority	Dates to be determined by TCEQ CRP	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the TCEQ to provide corrective actions
Laboratory Assessment	Dates to be determined by TCEQ	TCEQ Laboratory Assessor	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the TCEQ to provide corrective actions

Corrective Action Process for Deficiencies

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

Corrective Action

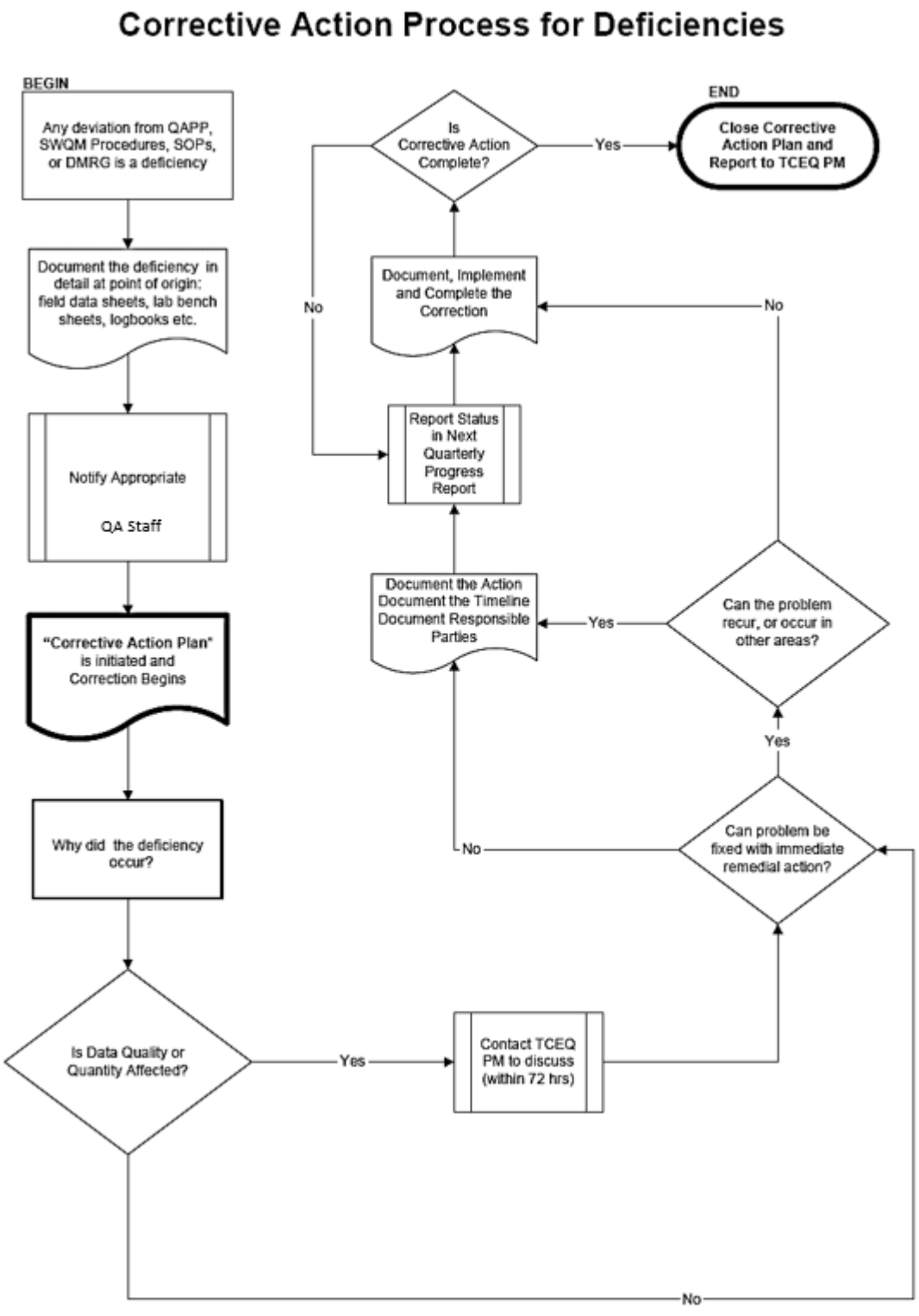
CAPs should:

- Identify the problem, nonconformity, or undesirable situation
- Identify immediate remedial actions if possible
- Identify the underlying cause(s) of the problem
- Identify whether the problem is likely to recur, or occur in other areas

- Evaluate the need for corrective action
- Use problem-solving techniques to verify causes, determine solution, and develop an action plan
- Identify personnel responsible for action
- Establish timelines and provide a schedule
- Document the corrective action

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

Figure C1.1 Corrective Action Process for Deficiencies



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

The Brazos River Authority Project Manager is responsible for implementing corrective actions and tracking deficiencies and corrective actions. Records of audit findings and corrective actions are maintained by the Brazos River Authority Project Manager. Audit reports and associated corrective action documentation will be submitted to the TCEQ with the quarterly progress reports.

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

C2 Reports to Management

Table C2.1 QA Management Reports

Type of Report	Frequency (daily, weekly, monthly, quarterly, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipients
Corrective Action Report	As required	When closed	QAO	BRA CRP Project Manager
Data Completion Report	Monthly	1 week following end of month	DQAO	BRA CRP Project Manager
Internal Audit Reports	Quarterly	First Week of following quarter	DQAO	QAO Environmental Services & Compliance Mgr ESL Mgr
CRP Progress Reports	Quarterly	December 15, 2019 March 15, 2020 June 15, 2020 September 15, 2020 December 15, 2020 March 15, 2021 June 15, 2021 August 31, 2021	Quality Assurance Officer	TCEQ CRP Project Management
Data Summary	As Needed	As Needed	Brazos River Authority Data Manager	TCEQ CRP Project Management

Reports to Brazos River Authority Project Management

BRA does not anticipate reports from outside, non-BRA entities for the FY 20-21 biennium.

Corrective Action Report
Upon request from the BRA CRP Project Manager a Corrective Action Report is created once a Corrective Action has been found effective or not effective. The report includes all of the items found in C1 and can be printed or saved as pdf.

Data Completion Report
The QAO or DQAO reports sampling, analysis, and QA activities to the BRA CRP Project Manager through a monthly data completion report. This report includes:

- Number of samples collected
- Number of samples analyzed per parameter
- Number of acceptable results per parameter
- Number of rejected results per parameter
- Completion percentage by month and year

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

Data Summary

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

Reports by TCEQ Project Management

Contractor Evaluation

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

D1 Data Review, Verification, and Validation

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

D2 Verification and Validation Methods

All field and laboratory data will be reviewed, verified and validated to ensure they conform to project specifications.

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 columns of Table D2.1, respectively. Potential errors are identified by examination of documentation and by manual examination of corollary or unreasonable data; this analysis may be computer-assisted. If a question arises or an error is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues which can be corrected are corrected and documented. If an issue cannot be corrected, the task manager consults with the higher level project management to establish the appropriate course of action, or the data associated with the issue are rejected and not reported to the TCEQ for storage in SWQMIS. Field and laboratory reviews, verifications, and validations are documented.

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

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

Another element of the data validation process is consideration of any findings identified during the monitoring systems audit conducted by the TCEQ CRP Lead Quality Assurance Specialist. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. After the data are reviewed and documented, the Brazos River Authority 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 Brazos River Authority Data Manager with the data in the Data Summary (See Appendix F). All failed QC checks, missing samples, missing analytes, missing parameters, and suspect results should be discussed in the Data Summary.

Table D2.1: Data Review Tasks

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

D3 Reconciliation with User Requirements

Data produced in this project, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be analyzed and reconciled with project data quality requirements. Data which do not meet requirements will not be submitted to SWQMIS nor will be considered appropriate for any of the uses noted in Section A5.

Appendix A: Measurement Performance Specifications (Table A7.1-8)

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

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

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

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

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

Procedures for laboratory analysis must be in accordance with the most recently published edition of Standard Methods for the Examination of Water and Wastewater, 40 CFR 136, or otherwise approved independently. Only data collected that have a valid TCEQ parameter code assigned in Tables A7 are stored in SWQMIS. Any parameters listed in Tables A7 that do not have a valid TCEQ parameter code assigned will not be stored in SWQMIS.

Table A7.1 - Measurement Performance Specifications

TABLE A7.1 Measurement Performance Specifications for Field Parameters					
Field Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	TCEQ SOP V1	00010	Field
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	Field
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)	us/cm	water	TCEQ SOP, V1	00094	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	TCEQ SOP V1	00300	Field
PH (STANDARD UNITS)	s.u	water	TCEQ SOP V1	00400	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	Field
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE	meters	water	TCEQ SOP V2	82903	Field
RESERVOIR STAGE (FEET ABOVE MEAN SEA LEVEL)†	FT ABOVE MSL	water	TWDB	00052	Field
RESERVOIR PERCENT FULL†	% RESERVOIR CAPACITY	water	TWDB	00053	Field
RESERVOIR ACCESS NOT POSSIBLE LEVEL TOO LOW ENTER 1 IF REPORTING	NS	other	TCEQ Drought Guidance	00051	Field
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)**	meters	other	TCEQ SOP V2	89864	Field
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)**	meters	other	TCEQ SOP V2	89865	Field
POOL LENGTH, METERS**	meters	other	TCEQ SOP V2	89869	Field
% POOL COVERAGE IN 500 METER REACH**	%	other	TCEQ SOP V2	89870	Field
WIND INTENSITY (1=CALM,2=SLIGHT,3=MOD.,4=STRONG)	NU	other	NA	89965	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	Field
WATER SURFACE(1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)	NU	water	NA	89968	Field

* Reporting to be consistent with SWQM guidance and based on measurement capability.
** To be routinely reported when collecting data from perennial pools.
† As published by the Texas Water Development Board on their website https://www.waterdatafortexas.org/reservoirs/statewide

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.2 Measurement Performance Specifications for Flow Parameters					
Flow Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	Field
FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	Field

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.3 Measurement Performance Specifications for Conventional Parameters in Water

Conventional Parameters in Water

Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	4	NA	NA	NA	BRA
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	EPA 350.1 Rev. 2.0 (1993)	00610	0.1	0.05	70-130	20	80-120	BRA
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.04*	70-130	20	80-120	BRA
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	BRA
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 365.4	00665	0.06	0.05	70-130	20	80-120	BRA
ORTHOPHOSPHATE PHOSPHORUS,DISS,MG/L,FLDFILT<15MIN	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00671	0.04	0.04*	70-130	20	80-120	BRA
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	5	70-130	20	80-120	BRA
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	5	70-130	20	80-120	BRA
RESIDUE, TOT DISS,UNSPEC CALC BASED ON COND (MG/	mg/L	water	calculation	70294	NA	NA	NA	NA	NA	BRA
RESIDUE,TOTAL FILTRABLE (DRIED AT 180C) (MG/L)	mg/L	water	SM 2540C	70300	10	10	NA	20	80-120	BRA
ORTHOPHOSPHATE PHOSPHORUS,DISS,MG/L,FILTER >15MIN	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	70507	0.04	0.04*	70-130	20	80-120	BRA
CHLOROPHYLL-A, FLUOROMETRIC METHOD, UG/L	µg/L	water	EPA 445.0	70953	3	3	NA	20	80-120	BRA
TURBIDITY,LAB NEPHELOMETRIC TURBIDITY UNITS, NTU	NTU	water	SM 2130B	82079	0.5	0.5	NA	NA	NA	BRA

* Segment 1208 nitrate nitrogen and orthophosphate phosphorus may not meet LOQ requirements due to dilution needed to measure choride and sulfate. Dilution 1:50, LOQ = 0.2 mg/L. Dilution 1:20, LOQ = 0.08 mg/L

References:

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

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

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

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

TABLE A7.4 Measurement Performance Specifications for Bacteriological Parameters in Water

Bacteriological Parameters in Water

Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Log Difference of Duplicates	Bias %Rec. of LCS	Lab
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	IDEXX Laboratories Colilert®	31699	1	1	NA	0.50*	NA	BRA
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	IDEXX Laboratories Colilert®-18	31699	1	10	NA	0.50*	NA	BRA
ENTEROCOCCI, ENTEROLERT, IDEXX, (MPN/100 ML)	MPN/100 mL	water	IDEXX Laboratories Enterolert®	31701	1***	10	NA	0.50*	NA	BRA
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	BRA

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

** E.coli samples analyzed by these methods should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

***Enterococcus Samples should be diluted 1:10 for all waters.

References:

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

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

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

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

TABLE A7.5 Measurement Performance Specifications for 24 Hour Parameters in Water					
24 HourParameters in Water					
Parameter	Units	Matrix	Method	Parameter Code	Lab
TEMPERATURE, WATER (DEGREES CENTIGRADE), 24HR AVG	DEG C	Water	TCEQ SOP V1	00209	BRA Field Staff
WATER TEMPERATURE, DEGREES CENTIGRADE, 24HR MAX	DEG C	Water	TCEQ SOP V1	00210	BRA Field Staff
TEMPERATURE, WATER (DEGREES CENTIGRADE) 24HR MIN	DEG C	Water	TCEQ SOP V1	00211	BRA Field Staff
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR AVG	uS/cm	Water	TCEQ SOP V1	00212	BRA Field Staff
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MAX	uS/cm	Water	TCEQ SOP V1	00213	BRA Field Staff
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MIN	uS/cm	Water	TCEQ SOP V1	00214	BRA Field Staff
PH, S.U., 24HR MAXIMUM VALUE	std. units	Water	TCEQ SOP V1	00215	BRA Field Staff
PH, S.U., 24HR, MINIMUM VALUE	std. units	Water	TCEQ SOP V1	00216	BRA Field Staff
SALINITY, 24-HR, MAXIMUM, PPT	ppt	Water	TCEQ SOP V1	00217	BRA Field Staff
SALINITY, 24-HR, AVERAGE, PPT	ppt	Water	TCEQ SOP V1	00218	BRA Field Staff
SALINITY, 24-HR, MINIMUM, PPT	ppt	Water	TCEQ SOP V1	00219	BRA Field Staff
SALINITY, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00220	BRA Field Staff
WATER TEMPERATURE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00221	BRA Field Staff
SPECIFIC CONDUCTANCE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00222	BRA Field Staff
pH, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00223	BRA Field Staff
DISSOLVED OXYGEN, 24-HOUR MIN. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89855	BRA Field Staff
DISSOLVED OXYGEN, 24-HOUR MAX. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89856	BRA Field Staff
DISSOLVED OXYGEN, 24-HOUR AVG. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89857	BRA Field Staff
DISSOLVED OXYGEN, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	89858	BRA Field Staff

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.6 Measurement Performance Specifications for Biological Habitat					
Biological - Habitat					
Parameter	Units	Matrix	Method	Parameter Code	Lab
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	Water	TCEQ SOP V2	00061	BRA Field Staff
STREAMBED SLOPE (M/KM)	M/KM	Other	NA/Calculation	72051	BRA Field Staff
AVERAGE PERCENTAGE INSTREAM COVER	%	Other	TCEQ SOP V2	84159	BRA Field Staff
STREAM ORDER	NU	Water	TCEQ SOP V2	84161	BRA Field Staff
STREAM TYPE; 1=PERENNIAL 2=INTERMITTENT S/PERENNIAL POOLS 3=INTERMITTENT 4=UNKNOWN	NU	Water	NA/Calculation	89821	BRA Field Staff
RIPARIAN VEGETATION %; LEFT BANK - TREES	%	Other	NA/Calculation	89822	BRA Field Staff
RIPARIAN VEGETATION %; RIGHT BANK - TREES	%	Other	NA/Calculation	89823	BRA Field Staff
RIPARIAN VEGETATION %; LEFT BANK SHRUBS	%	Other	NA/Calculation	89824	BRA Field Staff
RIPARIAN VEGETATION %; RIGHT BANK - SHRUBS	%	Other	NA/Calculation	89825	BRA Field Staff
RIPARIAN VEGETATION %: LEFT BANK - GRASSES OR FORBS	%	Other	NA/Calculation	89826	BRA Field Staff
RIPARIAN VEGETATION %; RIGHT BANK - GRASSES OR FORBS	%	Other	NA/Calculation	89827	BRA Field Staff
RIPARIAN VEGETATION %: LEFT BANK - CULTIVATED FIELDS	%	Other	NA/Calculation	89828	BRA Field Staff
RIPARIAN VEGETATION %: RIGHT BANK - CULTIVATED FIELDS	%	Other	NA/Calculation	89829	BRA Field Staff
RIPARIAN VEGETATION %: LEFT BANK - OTHER	%	Other	NA/Calculation	89830	BRA Field Staff
NUMBER OF LATERAL TRANSECTS MADE	NU	Other	TCEQ SOP V2	89832	BRA Field Staff
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	Other	TCEQ SOP V2	89835	BRA Field Staff
TOTAL NUMBER OF STREAM BENDS	NU	Other	TCEQ SOP V2	89839	BRA Field Staff
NUMBER OF WELL DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89840	BRA Field Staff
NUMBER OF MODERATELY DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89841	BRA Field Staff
NUMBER OF POORLY DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89842	BRA Field Staff
TOTAL NUMBER OF RIFFLES	NU	Other	TCEQ SOP V2	89843	BRA Field Staff
DOMINANT SUBSTRATE TYPE(1=CLAY,2=SILT,3=SAND,4=GRAVEL,5=COBBLE,6=BOULDER,7=BED ROCK,8=OTHER)	NU	Sediment	TCEQ SOP V2	89844	BRA Field Staff
AVERAGE PERCENT OF SUBSTRATE GRAVEL SIZE OR LARGER	%	Other	TCEQ SOP V2	89845	BRA Field Staff
AVERAGE STREAM BANK EROSION (%)	%	Other	TCEQ SOP V2	89846	BRA Field Staff
AVERAGE STREAM BANK SLOPE (DEGREES)	deg	Other	TCEQ SOP V2	89847	BRA Field Staff
HABITAT FLOW STATUS, 1=NO FLOW, 2=LOW,3=MOD,4=HIGH	NU	Other	TCEQ SOP V2	89848	BRA Field Staff
AVERAGE PERCENT TREES AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89849	BRA Field Staff
AVERAGE PERCENT SHRUBS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89850	BRA Field Staff
AVERAGE PERCENT GRASS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89851	BRA Field Staff
AVERAGE PERCENT CULTIVATED FIELDS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89852	BRA Field Staff
AVERAGE PERCENT OTHER AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89853	BRA Field Staff
AVERAGE PERCENTAGE OF TREE CANOPY COVERAGE	%	Other	TCEQ SOP V2	89854	BRA Field Staff
DRAINAGE AREA ABOVE MOST DOWNSTREAM TRANSECT*	km2	Other	TCEQ SOP V2	89859	BRA Field Staff
LENGTH OF STREAM EVALUATED (KM)	KM	Other	NA/Calculation	89860	BRA Field Staff
AVERAGE STREAM WIDTH (METERS)	M	Other	TCEQ SOP V2	89861	BRA Field Staff
AVERAGE STREAM DEPTH (METERS)	M	Other	TCEQ SOP V2	89862	BRA Field Staff
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)	M	Other	TCEQ SOP V2	89864	BRA Field Staff
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)	M	Other	TCEQ SOP V2	89865	BRA Field Staff
AVERAGE WIDTH OF NATURAL RIPARIAN VEGETATION (M)	M	Other	TCEQ SOP V2	89866	BRA Field Staff
AESTHETICS OF REACH(1=WILD 2=NAT. 3=COMM. 4=OFF.)	NU	Other	TCEQ SOP V2	89867	BRA Field Staff
RIPARIAN VEGETATION %: RIGHT BANK - OTHER	%	Other	NA/Calculation	89871	BRA Field Staff
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON LEFT BANK (M)	M	Other	NA/Calculation	89872	BRA Field Staff
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON RIGHT BANK (M)	m	Other	NA/Calculation	89873	BRA Field Staff

TABLE A7.6 Measurement Performance Specifications for Biological Habitat					
Biological - Habitat					
AVAILABLE INSTREAM COVER HQI SCORE: 4=ABUNDANT 3=COMMON 2=RARE 1=ABSENT	NU	Other	NA/Calculation	89874	BRA Field Staff
BOTTOM SUBSTRATE STABILITY HQI SCORE: 4=STABLE 3=MODERATELY STABLE 2=MODERATELY UNSTABLE 1=UNSTABLE	NU	Other	NA/Calculation	89875	BRA Field Staff
NUMBER OF RIFFLES HQI SCORE: 4=ABUNDANT 3=COMMON 2=RARE 1=ABSENT	NS	Other	NA/Calculation	89876	BRA Field Staff
DIMENSIONS OF LARGEST POOL HQI SCORE: 4=LARGE 3=MODERATE 2=SMALL 1=ABSENT	NU	Other	NA/Calculation	89877	BRA Field Staff
CHANNEL FLOW STATUS HQI SCORE: 3=HIGH 2=MODERATE 1=LOW 0=NO FLOW	NU	Other	NA/Calculation	89878	BRA Field Staff
BANK STABILITY HQI SCORE: 3=STABLE 2=MODERATELY STABLE 1=MODERATELY UNSTABLE 0=UNSTABLE	NU	Other	NA/Calculation	89879	BRA Field Staff
CHANNEL SINUOSITY HQI SCORE: 3=HIGH 2=MODERATE 1=LOW 0=NONE	NU	Other	NA/Calculation	89880	BRA Field Staff
RIPARIAN BUFFER VEGETATION HQI SCORE: 3=EXTENSIVE 2=WIDE 1=MODERATE 0=NARROW	NU	Other	NA/Calculation	89881	BRA Field Staff
AESTHETICS OF REACH HQI SCORE: 3=WILDERNESS 2=NATURAL AREA 1=COMMON SETTING 0=OFFENSIVE	NU	Other	NA/Calculation	89882	BRA Field Staff
HQI TOTAL SCORE	NU	Other	NA/Calculation	89883	BRA Field Staff
REACH LENGTH OF STREAM EVALUATED (M)	m	Other	NA/Calculation	89884	BRA Field Staff
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888	BRA Field Staff
NUMBER OF STREAM COVER TYPES	NU	Other	TCEQ SOP V2	89929	BRA Field Staff
LAND DEVELOP IMPACT (1=UNIMP,2=LOW,3=MOD,4=HIGH)	NU	Other	TCEQ SOP V2	89962	BRA Field Staff

* From USGS map.

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-**416).**

TABLE A7.7 Measurement Performance Specifications for Biological Benthics					
Biological - Benthics					
Parameter	Units	Matrix	Method	Parameter Code	Lab
STREAM ORDER	NU	Water	TCEQ SOP, V1	84161	BRA Field Staff
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888	BRA Field Staff
RAPID BIOASSESSMENT PROTOCOLS BENTHIC MACROINVERTEBRATE IBI SCORE	NS	Other	NA/Calculation	90081	BRA Field Staff
BENTHIC DATA REPORTING UNITS (1=NUMBER OF INDIVIDUALS IN SUB-SAMPLE, 2=NUMBER OF INDIVIDUALS/FT2, 3=NUMBER OF INDIVIDUALS/M2, 4=TOTAL NUMBER OF INDIVIDUALS IN SAMPLE)	NU	Other	TCEQ SOP V2	89899	BRA Field Staff
KICKNET EFFORT,AREA KICKED (SQ.METER)	m2	Other	TCEQ SOP V2	89903	BRA Field Staff
KICKNET EFFORT,MINUTES KICKED (MIN.)	min.	Other	TCEQ SOP V2	89904	BRA Field Staff
DEBRIS/SHORELINE SAMPLING EFFORT, MINUTES	min.	Other	TCEQ SOP V2	89905	BRA Field Staff
NUMBER OF INDIVIDUALS IN BENTHIC SAMPLE	NU	Other	TCEQ SOP V2	89906	BRA Field Staff
UNDERCUT BANK AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89921	BRA Field Staff
OVERHANGING BRUSH AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89922	BRA Field Staff
GRAVEL BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89923	BRA Field Staff
SAND BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89924	BRA Field Staff
SOFT BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89925	BRA Field Staff
MACROPHYTE BED AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89926	BRA Field Staff
SNAGS AND BRUSH AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89927	BRA Field Staff
BEDROCK STREAMBED AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89928	BRA Field Staff
MESH SIZE, ANY NET OR SIEVE, AVERAGE BAR (CM)	cm	Other	TCEQ SOP V2	89946	BRA Field Staff
BENTHIC SAMPLE COLLECTION METHOD (1=SURBER, 2=EKMAN, 3=KICKNET, 4=PETERSON, 5=HESTER DENDY, 6=SNAG, 7=HESS)	NU	Other	TCEQ SOP V2	89950	BRA Field Staff
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961	BRA Field Staff
AREA OF SNAG SURFACE SAMPLED (SQ.MT)	m2	Other	TCEQ SOP V2	89975	BRA Field Staff
BENTHOS ORGANISMS -NONE PRESENT (0=NONE PRESENT)	NS	Other	TCEQ SOP V2	90005	BRA Field Staff
HILSENHOFF BIOTIC INDEX (HBI)	NU	Other	TCEQ SOP V2	90007	BRA Field Staff
NUMBER OF EPT INDEX	NU	Other	TCEQ SOP V2	90008	BRA Field Staff
DOMINANT BENTHIC FUNCTIONAL FEEDING GRP, % OF INDIVIDUALS	%	Other	TCEQ SOP V2	90010	BRA Field Staff
BENTHIC GRAZERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90020	BRA Field Staff
BENTHIC GATHERERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90025	BRA Field Staff
BENTHIC FILTERERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90030	BRA Field Staff
BENTHIC PREDATORS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90036	BRA Field Staff
DOMINANT TAXON, BENTHOS PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90042	BRA Field Staff
RATIO OF INTOLERANT TO TOLERANT TAXA, BENTHOS	NU	Other	TCEQ SOP V2	90050	BRA Field Staff
NUMBER OF NON-INSECT TAXA	NU	Other	TCEQ SOP V2	90052	BRA Field Staff
ELMIDAE, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90054	BRA Field Staff
TOTAL TAXA RICHNESS, BENTHOS	NU	Other	TCEQ SOP V2	90055	BRA Field Staff
NUMBER OF DIPTERA TAXA	NU	Other	TCEQ SOP V2	90056	BRA Field Staff
NUMBER OF EPHEMEROPTERA TAXA	NU	Other	TCEQ SOP V2	90057	BRA Field Staff
TOTAL NUMBER OF INTOLERANT TAXA, BENTHOS	NU	Other	TCEQ SOP V2	90058	BRA Field Staff
EPT, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90060	BRA Field Staff
CHIRONOMIDAE, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90062	BRA Field Staff
PERCENT OF TOTAL TRICHOPTERA INDIVIDUALS AS HYDROPSYCHIDAE	%	Other	TCEQ SOP V2	90069	BRA Field Staff
TOTAL # OF BENTHIC GENERA IN SAMPLE	NU	Other	TCEQ SOP V3	90011	BRA Field Staff
BENTHIC SHREDDERS (% OF COMMUNITY)	%	Other	TCEQ SOP V2	90035	BRA Field Staff
TOTAL # OF FAMILIES IN BENTHIC SAMPLE	NU	Other	TCEQ SOP V2	90012	BRA Field Staff
TOLERANT BENTHOS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90066	BRA Field Staff

TABLE A7.7 Measurement Performance Specifications for Biological Benthics					
Biological - Benthics					
DOMINANT 3 TAXA, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90067	BRA Field Staff

References:

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

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

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

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

TABLE A7.8 Measurement Performance Specifications for Biological - Nekton					
Biological - Nekton					
Parameter	Units	Matrix	Method	Parameter Code	Lab
STREAM ORDER	NU	Water	TCEQ SOP V1	84161	BRA Field Staff
NEKTON TEXAS REGIONAL IBI SCORE	NS	Other	NA/Calculation	98123	BRA Field Staff
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888	BRA Field Staff
SEINE, MINIMUM MESH SIZE, AVERAGE BAR, NEKTON,IN	IN	Other	TCEQ SOP V2	89930	BRA Field Staff
SEINE, MAXIMUM MESH SIZE, AVG BAR, NEKTON,INCH	IN	Other	TCEQ SOP V2	89931	BRA Field Staff
NET LENGTH (METERS)	M	Other	TCEQ SOP V2	89941	BRA Field Staff
ELECTROFISHING METHOD 1=BOAT 2=BACKPACK 3=TOTEBARGE	NU	Other	TCEQ SOP V2	89943	BRA Field Staff
ELECTROFISH EFFORT, DURATION OF SHOCKING (SEC)	SEC	Other	TCEQ SOP V2	89944	BRA Field Staff
SEINING EFFORT (# OF SEINE HAULS)	NU	Other	TCEQ SOP V2	89947	BRA Field Staff
COMBINED LENGTH OF SEINE HAULS (METERS)	M	Other	TCEQ SOP V2	89948	BRA Field Staff
SEINING EFFORT, DURATION (MINUTES)	MIN	Other	TCEQ SOP V2	89949	BRA Field Staff
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961	BRA Field Staff
AREA SEINED (SQ METERS)	M2	Other	TCEQ SOP V2	89976	BRA Field Staff
NUMBER OF SPECIES, FISH	NU	Other	TCEQ SOP V2	98003	BRA Field Staff
NEKTON ORGANISMS-NONE PRESENT (0=NONE PRESENT)	NS	Other	TCEQ SOP V2	98005	BRA Field Staff
TOTAL NUMBER OF SUNFISH SPECIES	NU	Other	TCEQ SOP V2	98008	BRA Field Staff
TOTAL NUMBER OF INTOLERANT SPECIES, FISH	NU	Other	TCEQ SOP V2	98010	BRA Field Staff
PERCENT OF INDIVIDUALS AS OMNIVORES, FISH	%	Other	TCEQ SOP V2	98017	BRA Field Staff
PERCENT OF INDIVIDUALS AS INVERTIVORES, FISH	%	Other	TCEQ SOP V2	98021	BRA Field Staff
PERCENT OF INDIVIDUALS AS PISCIVORES, FISH	%	Other	TCEQ SOP V2	98022	BRA Field Staff
PERCENT OF INDIVIDUALS WITH DISEASE OR ANOMALY	%	Other	TCEQ SOP V2	98030	BRA Field Staff
TOTAL NUMBER OF NATIVE CYPRINID SPECIES	NU	Other	TCEQ SOP V2	98032	BRA Field Staff
PERCENT INDIVIDUALS AS NON-NATIVE FISH SPECIES (% OF COMMUNITY)	%	Other	TCEQ SOP V2	98033	BRA Field Staff
TOTAL NUMBER OF INDIVIDUALS SEINING	NU	Other	TCEQ SOP V2	98039	BRA Field Staff
TOTAL NUMBER OF INDIVIDUALS ELECTROFISHING	NU	Other	TCEQ SOP V2	98040	BRA Field Staff
TOTAL NUMBER OF BENTHIC INVERTIVORE SPECIES	NU	Other	TCEQ SOP V2	98052	BRA Field Staff
TOTAL NUMBER OF BENTHIC FISH SPECIES	NU	Other	TCEQ SOP V2	98053	BRA Field Staff
NUMBER OF INDIVIDUALS PER SEINE HAUL	NU	Other	TCEQ SOP V2	98062	BRA Field Staff
NUMBER OF INDIVIDUALS PER MINUTE ELECTROFISHING	NU	Other	TCEQ SOP V2	98069	BRA Field Staff
PERCENT INDIVIDUALS AS TOLERANT FISH SPECIES (EXCLUDING WESTERN MOSQUITOFISH)	%	Other	TCEQ SOP V2	98070	BRA Field Staff
TOTAL NUMBER OF SUCKER SPECIES	NU	Other	TCEQ SOP V2	98009	BRA Field Staff
PERCENT OF INDIVIDUALS AS HYBRIDS	%	Other	TCEQ SOP V2	98024	BRA Field Staff
TOTAL NUMBER OF INDIVIDUALS IN SAMPLE, FISH	NU	Other	TCEQ SOP V2	98023	BRA Field Staff
PERCENT OF INDIVIDUALS AS TOLERANTS, FISH	%	Other	TCEQ SOP V2	98016	BRA Field Staff
TOTAL NUMBER OF DARTER SPECIES	NU	Other	TCEQ SOP V2	98004	BRA Field Staff

References:

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

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.

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

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

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

Objectives: Water quality monitoring will focus on the characterization of a variety of locations and conditions. This will include a combination of the following:

- planning and coordinating basin-wide monitoring;
- routine, regularly-scheduled monitoring to collect long-term information and support statewide assessment of water quality; and
- systematic, regularly-scheduled short-term monitoring to screen water bodies for issues.

Task Description: The Performing Party will conduct water quality monitoring and provide details in the quarterly progress reports as prescribed in the FY2020-2021 CRP Guidance.

The Performing Party will complete the following subtasks:

Monitoring Description — The Performing Party will monitor a minimum of 108 stations per year. The sampling frequency and the types of parameter groups that are currently planned for collection in FY 2020 include: 30 monthly stations for field, select conventional parameters, and bacteria; 69 quarterly stations for field, select conventional parameters, and bacteria; two quarterly stations for bacteria only; and seven bi-annual stations for field, select conventional and bacteria. The above monitoring will be routine monitoring with the objectives of collecting surface water data needed for conducting water quality assessments and identifying water quality trends.

For FY2021, the Performing Party will monitor at a similar level of effort as in FY2020. The actual number of sites, location, frequency, and parameters collected for FY 2021 will be included in the Performing Party's QAPP Appendix B update.

All monitoring will be completed in accordance with the Performing Party QAPP, the TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods (RG-415) and the TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416).

Coordinated Monitoring Meeting — The Performing Party will hold an annual coordinated monitoring meeting as described in the FY2020-2021 CRP Guidance. Qualified monitoring organizations will be invited to attend the working meeting in which monitoring needs and purposes will be discussed segment by segment and station by station. Information from participants and stakeholders will be used to select stations and parameters that will enhance overall water quality monitoring coverage, eliminate duplication of effort, and address basin priorities. A summary of the changes to the monitoring schedule will be provided to the participants within two weeks of the meeting. Changes to the monitoring schedule will be entered into the statewide Coordinated Monitoring Schedule (http://cms.lcra.org) and communicated to meeting attendees. Changes to monitoring schedules that occur during the year will be entered into the Coordinated Monitoring Schedule and communicated to meeting attendees.

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

Deliverables and Dues Dates:

September 1, 2019 through August 31, 2020

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report — December 15, 2019; March 15 and June 15, 2020
B. Coordinated Monitoring Meeting — between March 15 and April 30, 2020
C. Coordinated Monitoring Meeting Summary of Changes — within 2 weeks of the meeting
D. Email notification that Coordinated Monitoring Schedule updates are complete — May 31, 2020

September 1, 2020 through August 31, 2021

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report — September 15 and December 15, 2020; March 15 and June 15 and August 31, 2021
B. Coordinated Monitoring Meeting — between March 15 and April 30, 2021
C. Coordinated Monitoring Meeting Summary of Changes — within 2 weeks of the meeting
D. Email notification that Coordinated Monitoring Schedule updates are complete — May 31, 2021

Appendix B Sampling Process Design and Monitoring Schedule (plan)

Sample Design Rationale FY 2020

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

The following changes or additions from FY2019 have been made to the monitoring schedule. These changes have come about because of concerns or requests of steering committee members or monitoring entities.

- **Segment 1202 – Brazos River Below Navasota River**
  BRA is dropping station 11848 due to station accessibility safety. Will still have coverage for 1202_03 with station 21816 monthly RT monitoring.

- **Segment 1259 – Leon River Above Belton Lake**
  BRA will add 11925 for CRP ALM

Site Selection Criteria

This data collection effort involves monitoring routine water quality using procedures that are consistent with the TCEQ SWQM program. Some general guidelines are followed when selecting sampling sites, as outlined below, and discussed thoroughly in SWQM Procedures, Volumes I and II. Overall consideration is given to accessibility and safety. All monitoring activities have been developed in coordination with the CRP Steering Committee and with the TCEQ. The site selection criteria specified are those the TCEQ would like considered to produce data which is complementary to that collected by the state and which may be used in assessments, etc.

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

Monitoring Sites for FY 2020

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
BRAZOS RIVER 70 METERS DOWNSTREAM OF US 90A IN RICHMOND	11846	1202	12	12	BR	BR	RT	12	12	12	12					
BRAZOS RIVER AT FM 1458 NEAR SAN FELIPE	21816	1202	12	12	BR	BR	RT	12	12	12	12					
BRAZOS RIVER AT FM 1462 EAST BANK 4 MILES EAST OF WOODROW AND 7.4 MILES WEST OF ROSHARON	16355	1202	12	12	BR	BR	RT	12	12	12	12					
BRAZOS RIVER AT US 290 6.5 MILES NORTHWEST OF HEMPSTEAD	11850	1202	12	12	BR	BR	RT	12	12	12	12					
ALLENS CREEK AT FM 1458 NORTH OF WALLIS	11577	1202H	12	12	BR	BR	BS	2	2		2	2	2	2	2	
ALLENS CREEK AT FM 1458 NORTH OF WALLIS	11577	1202H	12	12	BR	BR	RT	4	4	4						
ALLENS CREEK AT MIXVILLE RD SOUTH OF SEALY	21753	1202H	12	12	BR	BR	RT	4	4	4						
ALLENS CREEK APPROX 480 METERS EAST AND 165 METERS NORTH OF THE INTERSECTION OF SH 36 AND REDEEMER WAY RD AND 4.0 KM NW OF WALLIS	21621	1202H	12	12	BR	BR	BS	2	2		2	2	2	2	2	
BESSIES CREEK AT FM 1093 EAST OF FULBROOK ROAD AND SW OF FULSHEAR	21814	1202I	12	12	BR	BR	RT	4	4	4						
BRAZOS RIVER 20 M OFF NORTH BANK AT FM 200 NORTHEAST OF GLEN ROSE	20213	1204	12	4	BR	BR	RT	12	12	12	12					
LAKE GRANBURY AT FM 51 NORTH OF GRANBURY 265 METERS WEST AND 69 METERS	11862	1205	12	4	BR	BR	RT	12	12	12						

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
NORTH OF INTERSECTION OF FM 51 AND SIESTA COURT																
Lake Granbury immediately upstream of Atchison Topeka and Santa Fe Railroad 110 meters upstream of US377/East Pearl Street East of Granbury	20307	1205	12	4	BR	BR	RT	12	12	12						
LAKE GRANBURY NEAR DAM 102 METERS WEST AND 56 METERS NORTH OF NORTHERN EDGE OF DAM SITE AC USGS 322227097412101	11860	1205	12	4	BR	BR	RT	12	12	12						
BRAZOS RIVER AT FM 4 NORTH OF PALO PINTO	11864	1206	12	4	BR	BR	RT	12	12	12	12					
BRAZOS RIVER AT US 281 SOUTH OF MINERAL WELLS	11863	1206	12	4	BR	BR	RT	2	2	2						In support of the 79th TX Legislature's SB 1354
BRAZOS RIVER IMMEDIATELY DOWNSTREAM OF SOUTH SH 16	18748	1206	12	4	BR	BR	RT	2	2	2	2					In support of the 79th TX Legislature's SB 1354
BRAZOS RIVER IMMEDIATELY UPSTREAM FM 1189 SOUTH OF DENNIS	13543	1206	12	4	BR	BR	RT	12	12	12	12					
BRAZOS RIVER SOUTH BANK 1.74 KM DOWNSTREAM OF US 281 IN PALO PINTO COUNTY	18745	1206	12	4	BR	BR	RT	2	2	2						In support of the 79th TX Legislature's SB 1354
PALO PINTO CREEK IMMEDIATELY DOWNSTREAM OF FM 129 SOUTH OF BRAZOS	11074	1206D	12	4	BR	BR	RT	2	2	2						In support of the 79th TX Legislature's SB 1354
POSSUM KINGDOM RESERVOIR DEEP ELM CREEK ARM 597 METERS NORTH AND 880 METERS WEST OF	11868	1207	12	4	BR	BR	RT	12	12	12						

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
INTERSECTION OF ANTHONY LOOP AND LEFTYS COURT																
POSSUM KINGDOM RESERVOIR NEAR DAM 696 METERS WEST AND 221 METERS SOUTH OF NORTHERN EDGE OF DAM	11865	1207	12	4	BR	BR	RT	12	12	12						
POSSUM KINGDOM RESERVOIR NEAR END OF FM 2951 67 METERS NORTH AND 864 METERS WEST OF INTERSECTION OF FM 2951 AND SANBAR ROAD	11867	1207	12	4	BR	BR	RT	12	12	12						
POSSUM KINGDOM RESERVOIR NEAR JOHNSON BEND 437 METERS NORTH AND 429 METERS WEST OF INTERSECTION OF HELLS GATE LOOP AND HELLS POINT RD	11866	1207	12	4	BR	BR	RT	12	12	12						
BRAZOS RIVER 72 METERS DOWNSTREAM OF SH 67 2.0 MILES NE OF SOUTH BEND 2.81 KM DOWNSTREAM FROM THE CONFLUENCE WITH CLEAR FORK BRAZOS R	13641	1208	12	3	BR	BR	RT	12	12	12	12					
BRAZOS RIVER AT US 183/US 277 AT SEYMOUR	11871	1208	12	3	BR	BR	RT	12	12	12	12					
NAVASOTA RIVER AT GRIMES CR 162 5 MILES WEST OF FM 244 BETWEEN IOLA AND CARLOS	16398	1209	12	9	BR	BR	RT	4	4	4						

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
NAVASOTA RIVER IMMEDIATELY DOWNSTREAM OF SH 30 EAST OF COLLEGE STATION	11875	1209	12	9	BR	BR	RT	4	4	4						
NAVASOTA RIVER IMMEDIATELY DOWNSTREAM OF SH 6 NORTH OF NAVASOTA	11873	1209	12	9	BR	BR	RT	4	4	4						
NAVASOTA RIVER IMMEDIATELY DOWNSTREAM OF US 79 BETWEEN EASTERLY AND MARQUEZ	11877	1209	12	9	BR	BR	RT	4	4	4	4					
CARTERS CREEK 44 METERS DOWNSTREAM OF BIRD POND ROAD SOUTHEAST OF COLLEGE STATION 2 MILES SOUTH OF SH 30	11785	1209C	12	9	BR	BR	RT	4	4	4						
GIBBONS CREEK EAST 25 M UPSTREAM OF FM 244	18800	1209I	12	9	BR	BR	RT	4	4	4						
NAVASOTA RIVER AT US 84 3.5 MILES UPSTREAM OF LAKE MEXIA	16391	1210A	12	9	BR	BR	RT	4	4	4						
YEGUA CREEK 377 METERS DOWNSTREAM OF FM 50 SOUTH OF CLAY	11880	1211	12	9	BR	BR	RT	4	4	4						
LITTLE RIVER AT MILAM CR 227/E 21ST ST NORTHEAST OF CAMERON	22084	1213	12	9	BR	BR	RT	12	12	12	12					
LITTLE RIVER IMMEDIATELY DOWNSTREAM OF SH 95 NEAR LITTLE RIVER ACADEMY	13546	1213	12	9	BR	BR	RT	4	4	4	4					
STILLHOUSE HOLLOW LAKE IN PLEASANT BRANCH COVE 4.28 KM DOWNSTREAM OF CHAPARRAL ROAD CROSSING	20051	1216	12	9	BR	BR	RT	4	4	4						

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
STILLHOUSE HOLLOW LAKE IN TRIMMIER CREEK COVE NEAR CONFLUENCE OF LITTLE TRIMMIER CREEK 310 M S AND 462 E OF SCHRADER DR END	18753	1216	12	9	BR	BR	RT	4	4	4						
STILLHOUSE HOLLOW LAKE MID-LAKE AT LAMPASAS RIVER ARM APPROX 60 METERS UPSTREAM OF STILLHOUSE HOLLOW ROAD/FM 3481	11895	1216	12	9	BR	BR	RT	4	4	4						
STILLHOUSE HOLLOW LAKE NEAR DAM 441 METERS SOUTH AND 302 METERS WEST OF NORTHERN EDGE OF DAM SITE AC USGS 310129097315901	11894	1216	12	9	BR	BR	RT	4	4	4						
PLEASANT BRANCH AT FOOTBRIDGE IN PURSER PARK APPROX 63 METERS DOWNSTREAM OF MOUNTAIN LION RD CROSSING IN HARKER HEIGHTS	21689	1216A	12	9	BR	BR	RT	4		4						
TRIMMIER CREEK IMMEDIATELY UPSTREAM OF CHAPARRAL ROAD WEST OF FM 3481	18754	1216A	12	9	BR	BR	RT	4	4	4						
UNNAMED TRIBUTARY OF TRIMMIER CREEK APPROX 60 METERS EAST OF PROSPECTOR TRAIL AND MUSTANG TRAIL INTERSECTION IN HARKER HEIGHTS	21690	1216A	12	9	BR	BR	RT	4		4						
ROCKY CREEK AT FM 963 AND APPROXIMATELY 1.26 KM UPSTREAM OF LAMPASAS RIVER NEAR OAKALLA	11724	1217A	12	11	BR	BR	RT	4	4	4						

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
NOLAN CREEK IMMEDIATELY UPSTREAM OF US 190 EAST OF NOLANVILLE	11907	1218	12	9	BR	BR	RT	4	4	4						
LITTLE NOLAN CREEK IMMEDIATELY DOWNSTREAM OF US190 BUSINESS AND 2.06 KILOMETERS UPSTREAM OF THE CONFLUENCE WITH SOUTH NOLAN CREEK IN KILLEEN TEXAS	21437	1218C	12	9	BR	BR	RT	4	4	4						
BELTON LAKE 629M NORTH AND 157M EAST OF THE BOAT RAMP AT WESTCLIFF PARK	20835	1220	12	9	BR	BR	RT	4	4	4						
BELTON LAKE IN OWL CREEK ARM 313 M NORTH AND 265 M WEST OF BOAT RAMP AT OWL CREEK PARK	18798	1220	12	9	BR	BR	RT	4	4	4						
BELTON RESERVOIR COWHOUSE CREEK ARM 88 METERS NORTH AND 954 METERS EAST OF THE INTERSECTION OF NOLAN CREEK ROAD AND LIBERTY HILL ROAD	11922	1220	12	9	BR	BR	RT	4	4	4						
BELTON RESERVOIR LEON RIVER ARM NEAR HEADWATERS 626 METERS N AND 288 METERS W OF INTERSECTION OF KUIKENDALL RD AND MC GREGOR PARK RD	11923	1220	12	9	BR	BR	RT	4	4	4						
BELTON RESERVOIR NEAR DAM 81 METERS NORTH AND 17 METERS WEST OF SOUTHERN EDGE OF DAM	11921	1220	12	9	BR	BR	RT	4	4	4						

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
COWHOUSE CREEK 71 METERS DOWNSTREAM OF FM 116 SOUTHWEST OF GATESVILLE	11805	1220A	12	9	BR	BR	RT	4	4	4	4					
LEON RIVER 18 METERS UPSTREAM OF CORYELL CR 183 NORTHEAST OF LEVITA	11929	1221	12	9	BR	BR	RT	4	4	4						
LEON RIVER AT HAMILTON COUNTY ROAD 109	18781	1221	12	3	BR	BR	RT	4	4	4						
LEON RIVER AT HAMILTON CR 203 NORTH OF HAMILTON	20905	1221	12	9	BR	BR	RT	12	12	12						
LEON RIVER AT HAMILTON CR 431 1.6 KM DOWNSTREAM OF SH 36 SOUTHWEST OF JONESBORO	11930	1221	12	9	BR	BR	RT	12	12	12						
LEON RIVER IMMEDIATELY DOWNSTREAM OF US 67/ US 377 DOWNSTREAM LAKE PROCTOR	11934	1221	12	3	BR	BR	RT	12	12	12	12					
RESLEY CREEK AT COMANCE CR 394 740 METERS UPSTREAM OF THE CONFLUENCE WITH THE LEON RIVER	11808	1221A	12	3	BR	BR	RT	4	4	4						
RESLEY CREEK AT FM 2823 WEST OF CARLTON C704	17377	1221A	12	3	BR	BR	RT	4	4	4						
SOUTH LEON RIVER 20 M DOWNSTREAM OF SH 36 EAST OF GUSTINE	11817	1221B	12	3	BR	BR	RT	4	4	4						
PECAN CREEK AT SH 22 EAST OF HAMILTON	17547	1221C	12	9	BR	BR	RT	4	4	4						
PLUM CREEK 10 M DOWNSTREAM OF CORYELL CR 106 NEAR LEVITA	18405	1221E	12	9	BR	BR	RT	4	4	4						

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
CORYELL CREEK 51 METERS DOWNSTREAM OF FM 107 1.9 KM UPSTREAM OF THE CONFLUENCE WITH THE LEON RIVER	11804	1221G	12	9	BR	BR	RT	4	4	4						
PROCTOR LAKE COPPERAS CREEK ARM 460 METERS NORTH AND 2.04 KILOMETERS EAST OF INTERSECTION OF COMANCE CR 410A AND COMANCHE CR 407	11937	1222	12	3	BR	BR	RT	2	2	2						
PROCTOR LAKE IN LEON AND SABANA RIVER ARM 2.43 KM NORTH AND 1.23 KM EAST OF INTERSECTION OF COMANCHE CR 424 AND FM 2318	11936	1222	12	3	BR	BR	RT	2	2	2						
PROCTOR LAKE NEAR DAM FLOODGATE 911 METERS NORTH AND 940 METERS EAST OF INTERSECTION OF FM 2861 AND COMANCHE CR 418C	11935	1222	12	3	BR	BR	RT	2	2	2						
NORTH BOSQUE RIVER AT COOPERS CROSSING ROAD WEST OF CHINA SPRING	11951	1226	12	9	BR	BR	RT	4	4	4						
MERIDIAN CREEK AT SH 6 2.5 MILES NORTHWEST OF CLIFTON	14908	1226C	12	9	BR	BR	RT	4	4	4						
NOLAN RIVER 75 METERS UPSTREAM OF FM 933 IN BLUM	11967	1227	12	9	BR	BR	RT	4	4	4	4					
NOLAN RIVER IMMEDIATELY UPSTREAM OF FM 916 WEST OF RIO VISTA	11971	1227	12	4	BR	BR	RT	4	4	4						
PALUXY RIVER LOW WATER CROSSING OFF OF VAN ZANDT ROAD NEAR SH 144 IN GLEN ROSE	20232	1229	12	4	BR	BR	RT	4	4	4						

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
BRAZOS RIVER AT SH 105 WEST OF NAVASOTA	12030	1242	12	9	BR	BR	RT	12	12	12						
BRAZOS RIVER AT SH 21 11 MILES NORTHEAST OF CALDWELL	15767	1242	12	9	BR	BR	RT	12	12	12	12					
BRAZOS RIVER IMMEDIATELY DOWNSTREAM OF FM 413 NORTHEAST OF ROSEBUD	12032	1242	12	9	BR	BR	RT	12	12	12	12					
BRAZOS RIVER IMMEDIATELY UPSTREAM OF SH 6 SOUTHEAST OF WACO	12038	1242	12	9	BR	BR	RT	12	12	12	12					
COTTONWOOD BRANCH AT INDUSTRIAL BLVD WEST OF FM 2818 IN BRYAN	17597	1242B	12	9	BR	BR	RT	4	4	4	4					
COTTONWOOD BRANCH AT THE CONFLUENCE WITH STILL CREEK 50 METERS DOWNSTREAM OF SH 21	17598	1242B	12	9	BR	BR	RT	4	4	4						
STILL CREEK AT FM 2818 WEST OF BRYAN	17378	1242C	12	9	BR	BR	RT	4	4	4						
STILL CREEK AT SH 21 WEST OF BRYAN	16882	1242C	12	9	BR	BR	RT	4	4	4						
THOMPSONS CREEK IMMEDIATELY UPSTREAM OF SILVERHILL ROAD 765 METERS UPSTREAM OF SH 47 WEST OF BRYAN	16396	1242D	12	9	BR	BR	RT	4	4	4						
LITTLE BRAZOS RIVER IMMEDIATLEY UPSTREAM OF SH 21 WEST OF BRYAN	11591	1242E	12	9	BR	BR	RT	4	4	4	4					
POND CREEK AT FM 2027 4.0 KILOMETERS SOUTH OF BAILEYVILLE	16406	1242F	12	9	BR	BR	RT	4	4	4						

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
DEER CREEK IMMEDIATELY DOWNSTREAM OF SH 320 WEST OF MARLIN	11723	1242J	12	9	BR	BR	RT	4	4	4						
SALADO CREEK 75 METERS DOWNSTREAM OF FM 2268 IN SALADO	12051	1243	12	9	BR	BR	RT	4	4	4						
BRUSHY CREEK AT WILLIAMSON CR 129/ENGERMAN LANE	12059	1244	12	11	BR	BR	RT	4	4	4						
BRUSHY CREEK IMMEDIATELY DOWNSTREAM OF CHISHOLM TRAIL ROAD	12068	1244	12	11	BR	BR	RT	4	4	4						
BRUSHY CREEK IMMEDIATELY DOWNSTREAM OF FM 685	12060	1244	12	11	BR	BR	RT	4	4	4						
WASP CREEK AT SH 317 APPROXIMATELY 0.8 KM SOUTH OF CRAWFORD	18802	1246E	12	9	BR	BR	RT	4	4	4						
GRANGER LAKE IN SAN GABRIEL RIVER ARM NEAR HEADWATERS 7.22 KILOMETERS DOWNSTREAM OF SH 95	12096	1247	12	11	BR	BR	RT	4	4	4						
GRANGER LAKE IN WILLIS CREEK ARM 960 METERS NORTH AND 1.91 KM EAST OF INTERSECTION OF WILLIAMSON CR 348 AND CR 389	12097	1247	12	11	BR	BR	RT	4	4	4						
GRANGER LAKE NEAR DAM 1.44 KILOMETERS NORTH AND 190 METERS WEST OF SOUTHERN EDGE OF DAM	12095	1247	12	11	BR	BR	RT	4	4	4						
Willis Creek at Williamson CR 236 west of Granger 635 meters east of the intersection of Williamson CR 335 and Williamson CR 326	20305	1247A	12	11	BR	BR	RT	4	4	4						

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
SAN GABRIEL/NORTH FORK SAN GABRIEL RIVER AT WILLIAMSON CR 366 4.84 KILOMETERS UPSTREAM OF SH 95	12099	1248	12	11	BR	BR	RT	4	4	4						
SAN GABRIEL/NORTH FORK SAN GABRIEL RIVER IMMEDIATELY DOWNSTREAM OF SH 29 EAST OF GEORGETOWN	12102	1248	12	11	BR	BR	RT	4	4	4						
SAN GABRIEL/NORTH FORK SAN GABRIEL RIVER NORTH FORK IMMEDIATELY DOWNSTREAM OF IH 35 IN GEORGETOWN	12108	1248	12	11	BR	BR	RT	4	4	4						
BERRY CREEK IMMEDIATELY DOWNSTREAM OF FM 971 2 MILES EAST OF IH 35	13496	1248A	12	11	BR	BR	RT	4	4	4						
MANKINS BRANCH AT WILLIAMSON CR 100 IMMEDIATELY UPSTREAM OF THE CONFLUENCE WITH THE SAN GABRIEL RIVER	13497	1248C	12	11	BR	BR	RT	4	4	4						
LAKE GEORGETOWN NEAR DAM 68 METERS NORTH AND 88 METERS EAST OF SOUTHWEST EDGE OF DAM	12111	1249	12	11	BR	BR	RT	4	4	4						
LAKE GEORGETOWN NEAR HEADWATERS IN THE NORTH SAN GABRIEL ARM 305 METERS SOUTH AND 1.05 KILOMETERS WEST FROM THE INTERSECTION OF WILLIAMSON CR 262 AND PARK ROAD 8	12113	1249	12	11	BR	BR	RT	4	4	4						

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
SOUTH FORK SAN GABRIEL RIVER 1.44 KM NORTH AND 1.80 KM WEST OF THE INTERSECTION OF WEIR RANCH ROAD AND LEANDER RANCH ROAD / RR 2243 AT WEIR PIT ROCK QUARRY IN WILLIAMSON COUNTY	20309	1250	12	11	BR	BR	RT	4	4	4	4					
SOUTH FORK SAN GABRIEL RIVER AT RONALD REAGAN BLVD NE OF LEANDER	21739	1250	12	11	BR	BR	RT	4	4	4	4					
SOUTH FORK SAN GABRIEL RIVER AT US 183	12116	1250	12	11	BR	BR	RT	4	4	4	4					
LAKE LIMESTONE AT CONFLUENCE OF NAVASOTA RIVER AND BIG CREEK ARMS 1.33 KM S AND 1.39 KM EAST OF INTERSECTION OF LCR 752 AND 3D RCH RD	12125	1252	12	9	BR	BR	RT	12	12	12						
LAKE LIMESTONE AT FM 3371 696 METERS NORTH AND 430 METERS EAST OF INTERSECTION OF FM 3371 AND PARK 2 RD SITE DC USGS 312622096224201	13970	1252	12	9	BR	BR	RT	12	12	12						
LAKE LIMESTONE IN LAMBS CREEK ARM 2.19 KILOMETERS DOWNSTREAM OF FM 1512 NEAR LCR 893	12124	1252	12	9	BR	BR	RT	12	12	12						
LAKE LIMESTONE NEAR DAM 572 METERS NORTH AND 2.28 KILOMETERS EAST OF INTERSECTION OF WINDING WAY ROAD AND BRAZOS RIVER AUTHORITY ROAD	12123	1252	12	9	BR	BR	RT	12	12	12						

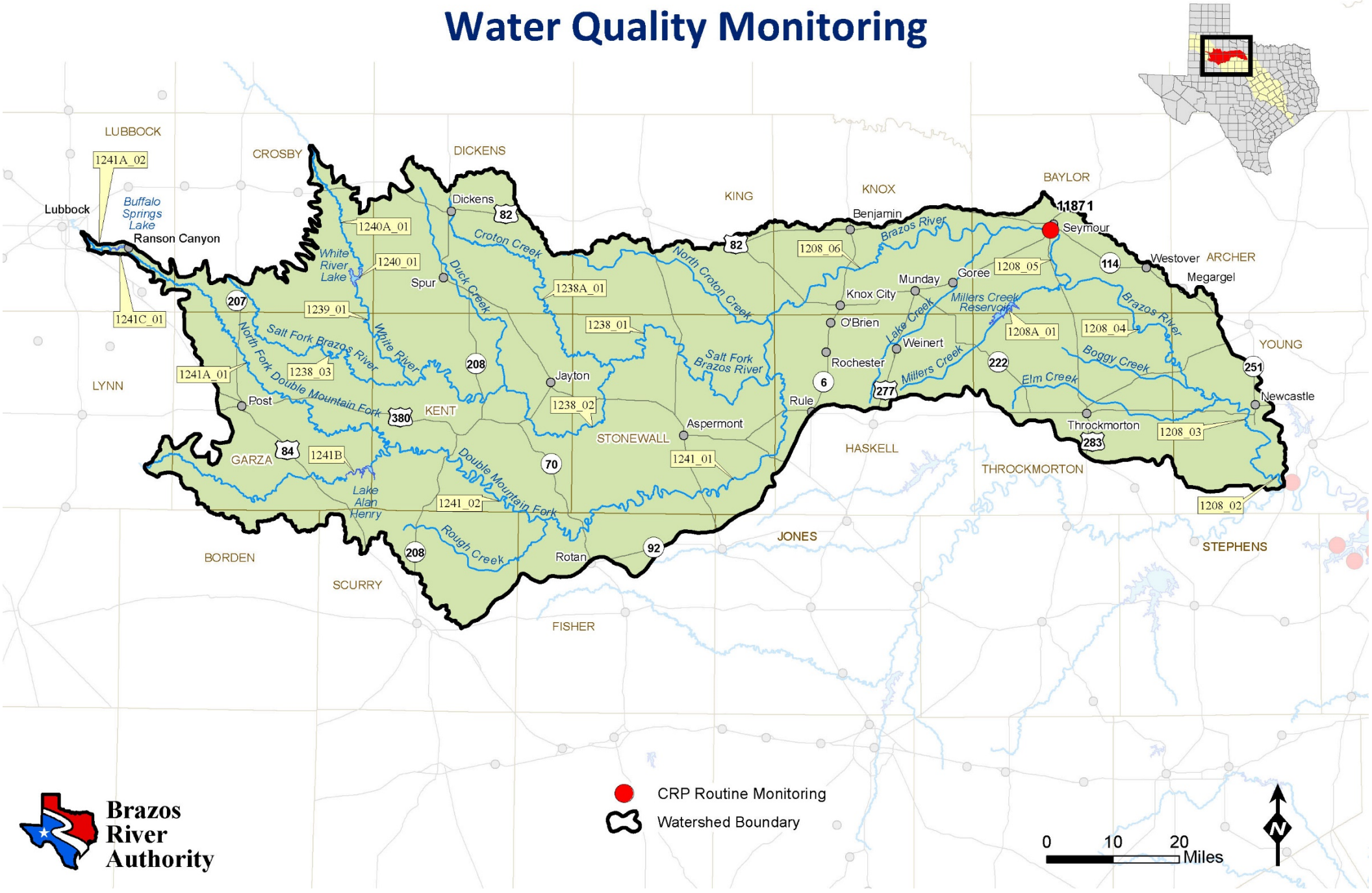
Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
UPPER NAVASOTA RIVER 81 METERS DOWNSTREAM OF SH 164 EAST OF GROESBECK	12126	1253	12	9	BR	BR	RT	4	4	4						
AQUILLA CREEK IMMEDIATELY UPSTREAM OF FM 933 NORTHWEST OF WACO	11593	1256A	12	9	BR	BR	RT	4	4	4						
BRAZOS RIVER IMMEDIATELY UPSTREAM OF FM 2114 SOUTHEAST OF LAGUNA PARK	12044	1257	12	9	BR	BR	RT	12	12	12	12					
LEON RIVER IMMEDIATELY DOWNSTREAM OF FM 1829 SOUTHEAST OF NORTH FORT HOOD	11925	1259	12	9	BR	BR	BS	2	2		2	2	2	2	2	
LEON RIVER IMMEDIATELY DOWNSTREAM OF FM 1829 SOUTHEAST OF NORTH FORT HOOD	11925	1259	12	9	BR	BR	RT	12	12	12						

Appendix C: Station Location Maps

Station Location Maps

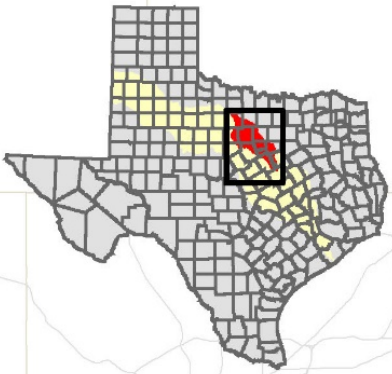
Maps of stations monitored by the Brazos River Authority are provided below. The maps were generated by the Brazos River Authority. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact Jenna Olson at (254) 761-3149

Watershed of the Salt and Double Mountain Forks of the Brazos River
FY20
Water Quality Monitoring

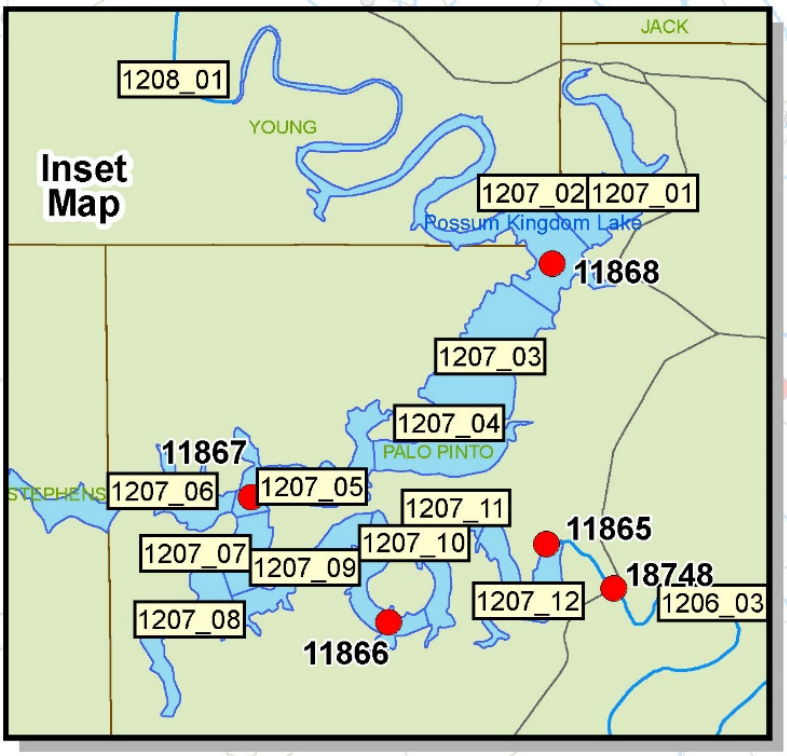


Brazos River Authority

Upper Watershed of the Brazos River
FY20 Water Quality Monitoring



CRP Routine Monitoring
Watershed Boundary

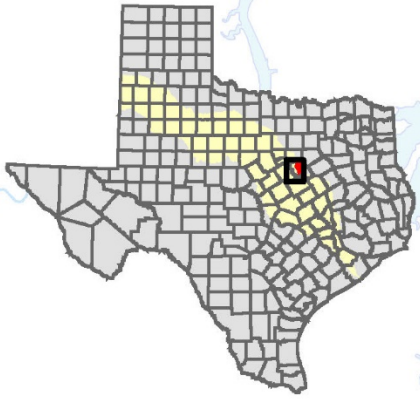


ARCHER
Olney
79
114
YOUNG
251
1231_01
JACK
Bryson
Lake Graham
16
Graham
1208_01
13641
Brazos River
281
See Inset Map
Graford
Brazos River
337
11864
Mineral Wells
Lake Mineral Wells
1206E_01
PARKER
Cool
1206B_01
STEPHENS
PALO PINTO
Palo Pinto
Millsap
Rock Creek
Caddo
180
1206_02
1230_01
11074
Brazos
18745
11863
13543
1206_01
1205H_01
16
Palo Pinto Creek
Lake Palo Pinto
1205B_01
1205E_02
1205E_01
Palo Pinto Creek
Gordon
1206D_01
1206A_01
1205_01
Kickapoo Creek
1230A_01
Strawn
Mingus
Lipan
1205C_01
1206A_02
1205_02
1205A_02
20
11862
Joshua
1205G_01
Godley
Ranger
ERATH
1206A_01
HOOD
1205_02
20307
1205A_01
Keene
JOHNSON
Tolar
1205D_01
1205_04
1229_03
Paluxy River
11860
Cleburne
1229A_01
1205_03
Lake Pat Cleburne
1204_02
1228_01
1227A_01
377
Squaw Creek Reservoir
EASTLAND
1229_02
20232
20213
11971
Rio Vista
1227B_01
Stephenville
67
Glen Rose
Dam Creek
1204A_01
1227_02
1229_01
SOMERVELL
North Bosque River
Mustang Creek
Brazos River
1204_01
11967
1227_01
Blum
1203_06
Walnut Springs
1203_05
220
1203_04
22
HILL
Morgan
Steele Creek
144
Whitney
1203A_01
1203_02
Lake Whitney
1203_03
BOSQUE
1203_01
12044
1257_01
6
China Springs
MCLENNAN

N
0 10 20
Miles

Brazos River Authority

Aquilla Creek Watershed
FY20
Water Quality Monitoring



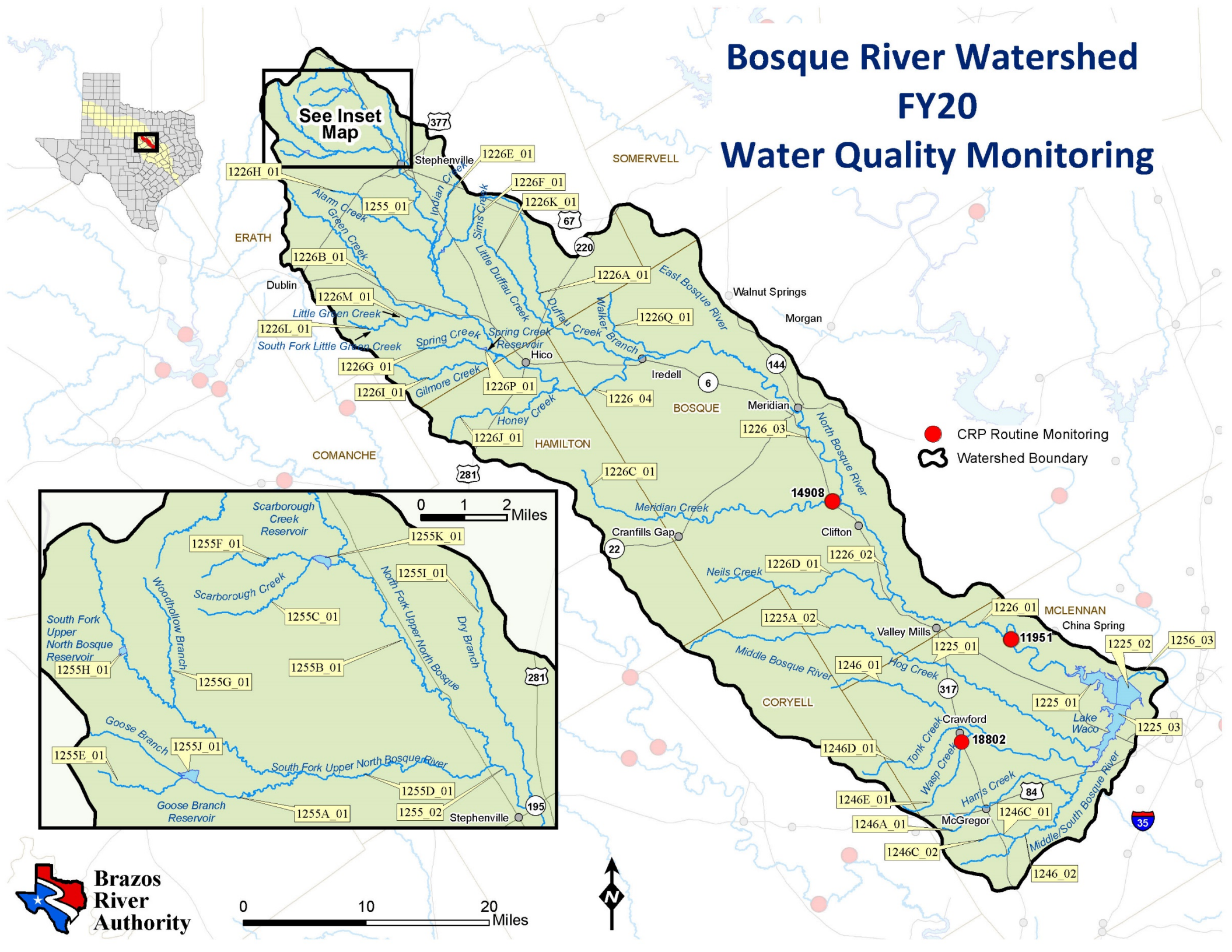
CRP Routine Monitoring Station

Watershed Boundary

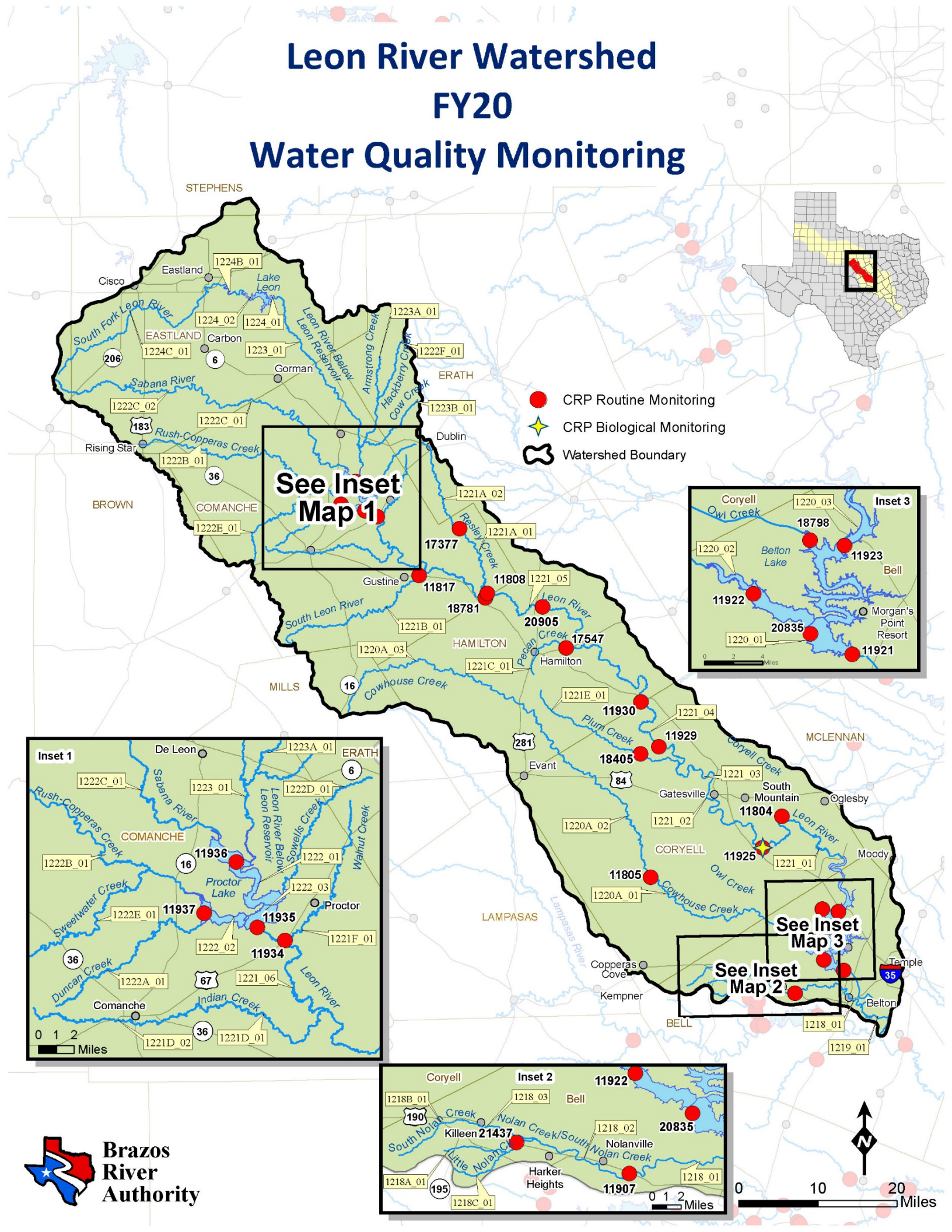
Brazos River Authority

0 5 10 Miles

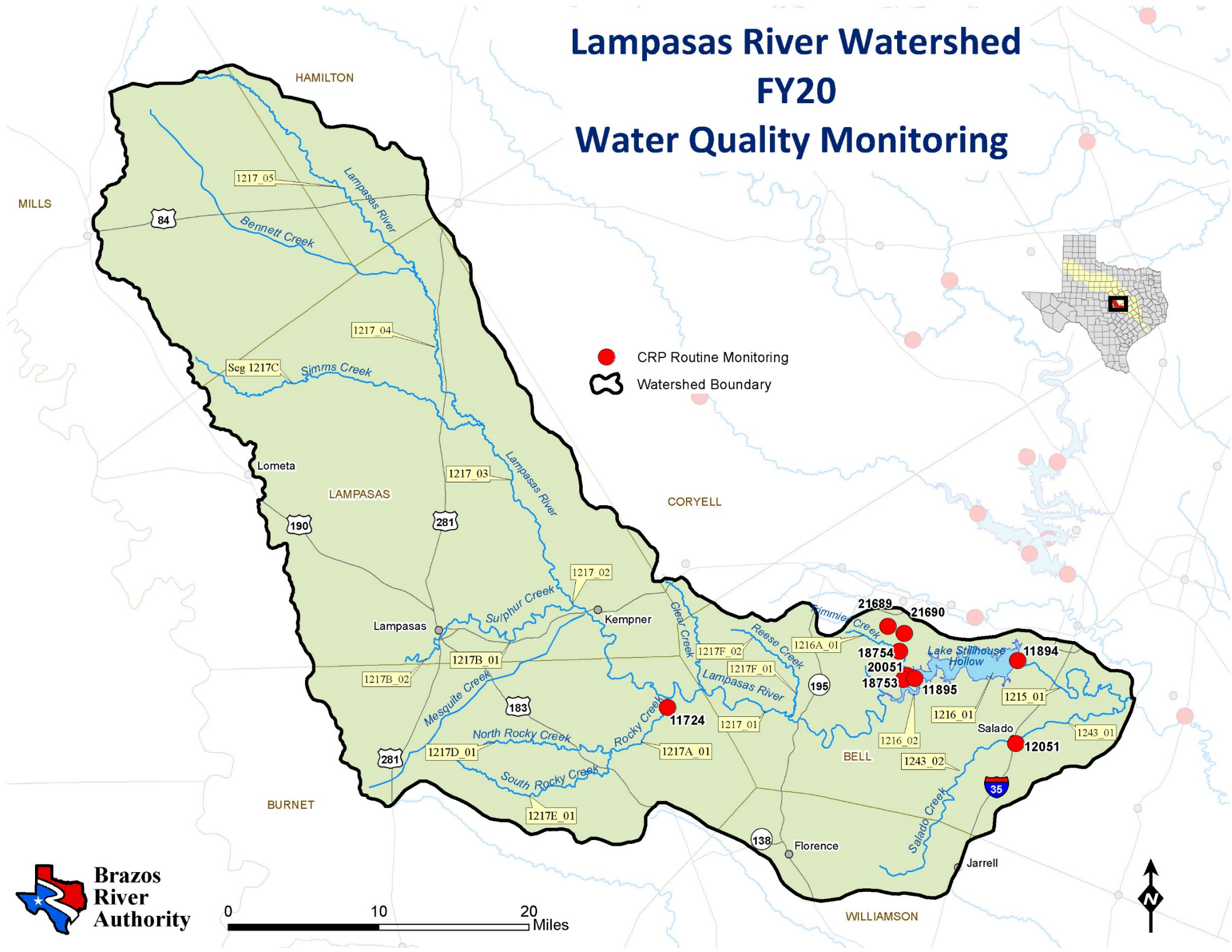
N


Bosque River Watershed
FY20
Water Quality Monitoring
See Inset Map
Stephenville
SOMERVELL
ERATH
COMANCHE
HAMILTON
BOSQUE
MCLENNAN
CORYELL
Dublin
Hico
Iredell
Meridian
Walnut Springs
Morgan
Clifton
Cranfills Gap
Valley Mills
China Spring
Crawford
McGregor
Lake Waco
Spring Creek Reservoir
Scarborough Creek Reservoir
Goose Branch Reservoir
South Fork Upper North Bosque Reservoir
1226H_01
1226E_01
1226F_01
1226K_01
1255_01
1226B_01
1226M_01
1226L_01
1226G_01
1226I_01
1226P_01
1226J_01
1226A_01
1226Q_01
1226_04
1226_03
1226C_01
1226_02
1226D_01
1226_01
1225A_02
1225_01
1225_02
1225_03
1256_03
1246_01
1246D_01
1246E_01
1246A_01
1246C_01
1246C_02
1246_02
1255F_01
1255K_01
1255I_01
1255C_01
1255B_01
1255G_01
1255H_01
1255J_01
1255E_01
1255D_01
1255A_01
1255_02
14908
11951
18802
CRP Routine Monitoring
Watershed Boundary
Alarm Creek
Green Creek
Indian Creek
Sims Creek
Little Duffau Creek
Duffau Creek
Walker Branch
East Bosque River
Little Green Creek
South Fork Little Green Creek
Spring Creek
Gilmore Creek
Honey Creek
Meridian Creek
North Bosque River
Neils Creek
Middle Bosque River
Hog Creek
Tonk Creek
Wasp Creek
Harris Creek
Middle/South Bosque River
Scarborough Creek
Woodhollow Branch
North Fork Upper North Bosque
Dry Branch
South Fork Upper North Bosque River
Goose Branch
0 1 2 Miles
0 10 20 Miles
Brazos River Authority
377
67
220
144
6
281
22
317
84
195
35

Leon River Watershed
FY20
Water Quality Monitoring

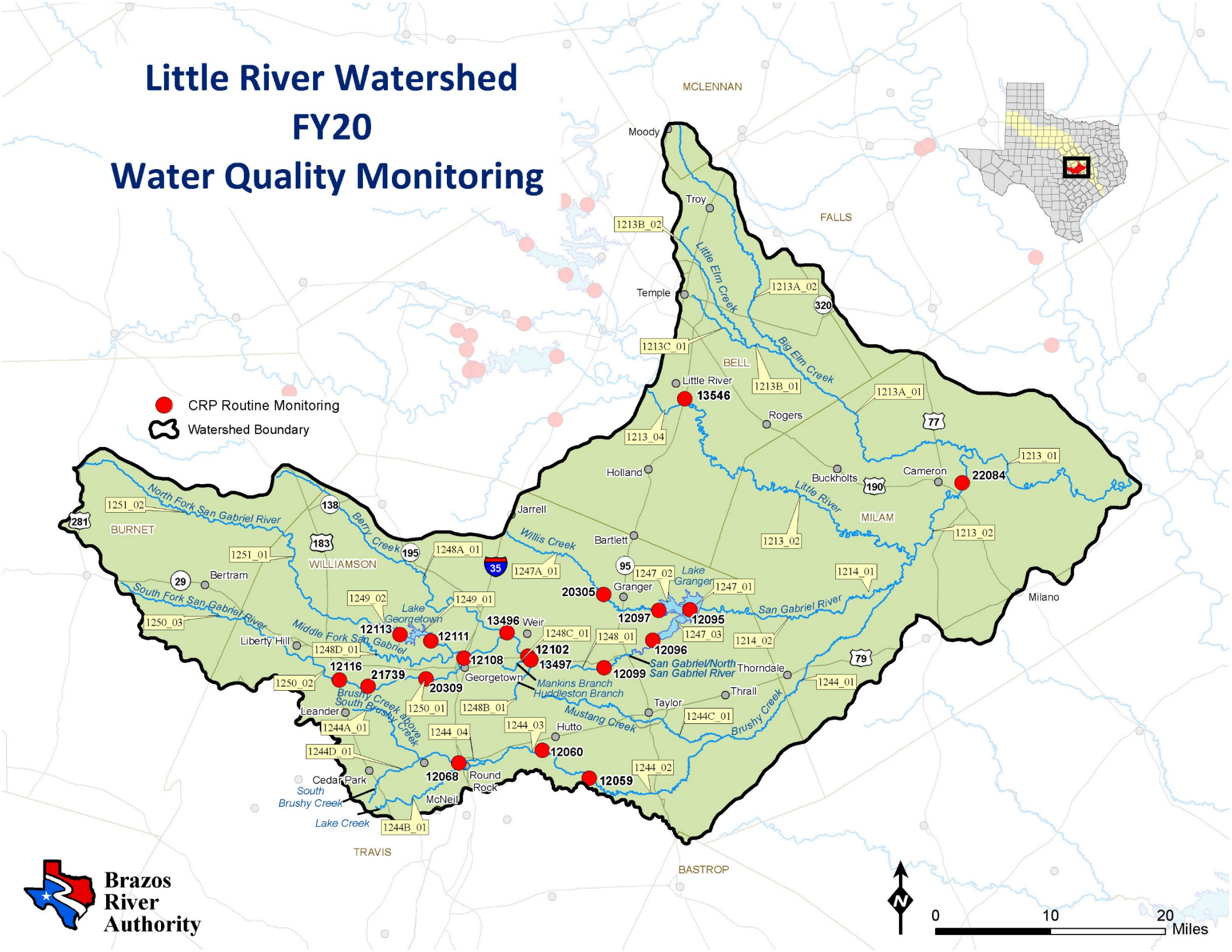


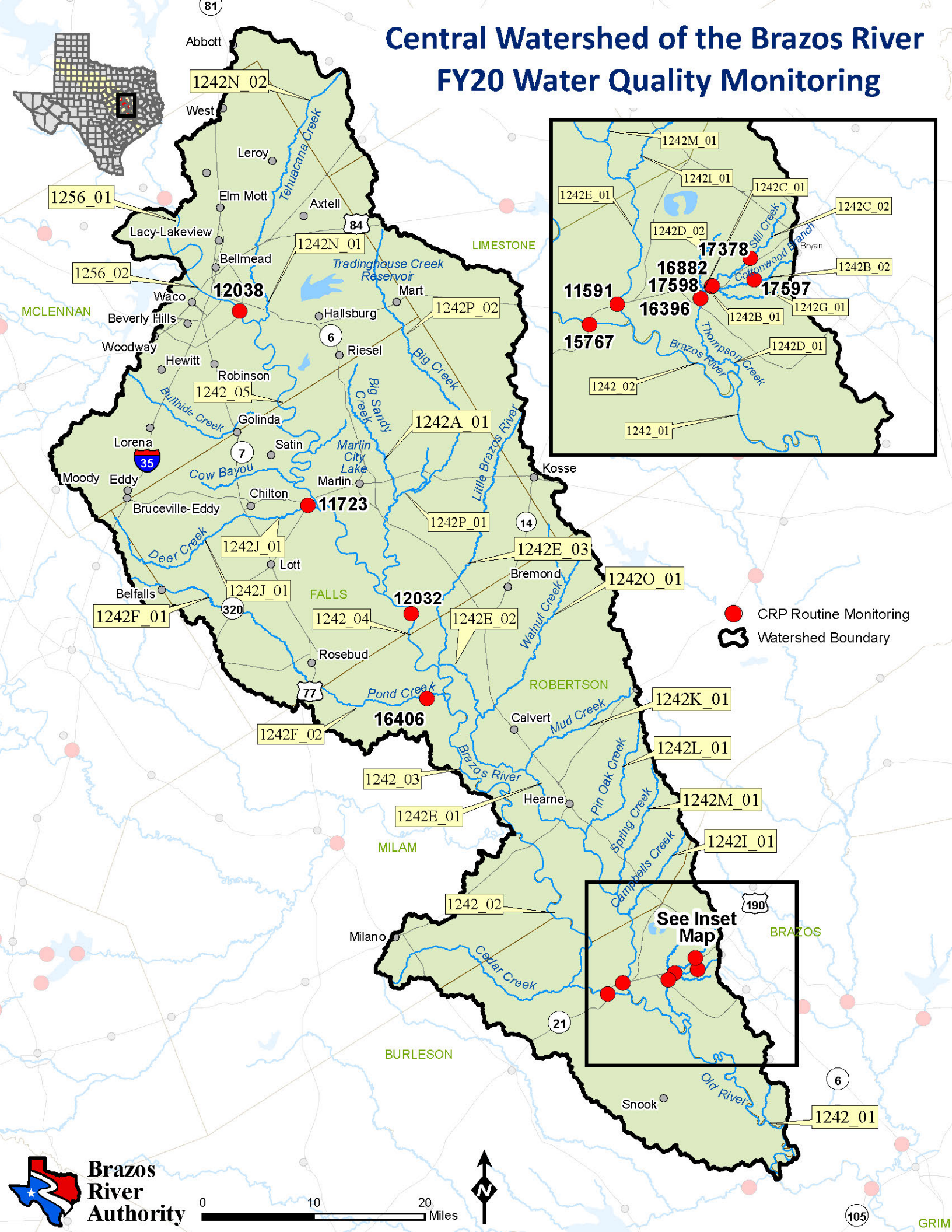
Lampasas River Watershed
FY20
Water Quality Monitoring

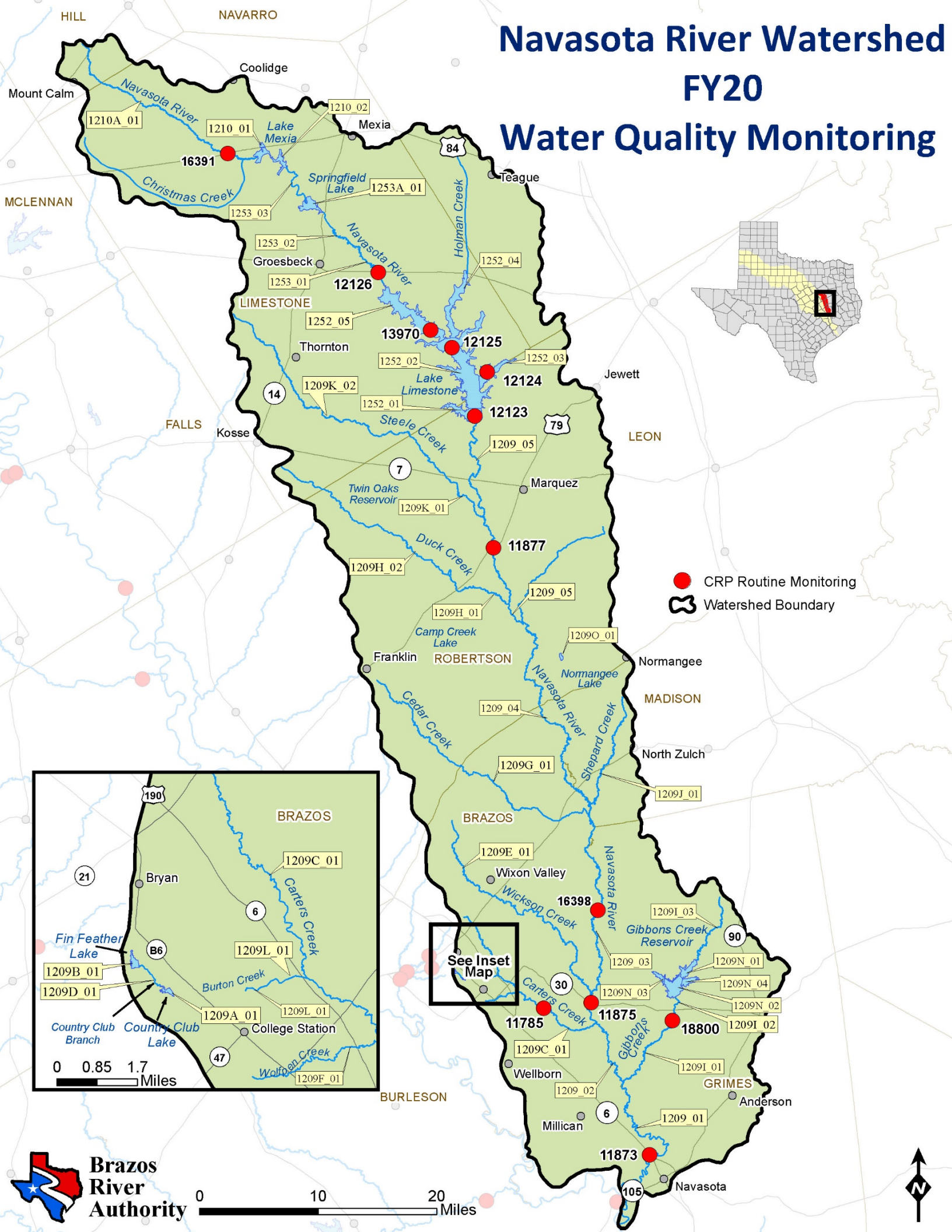


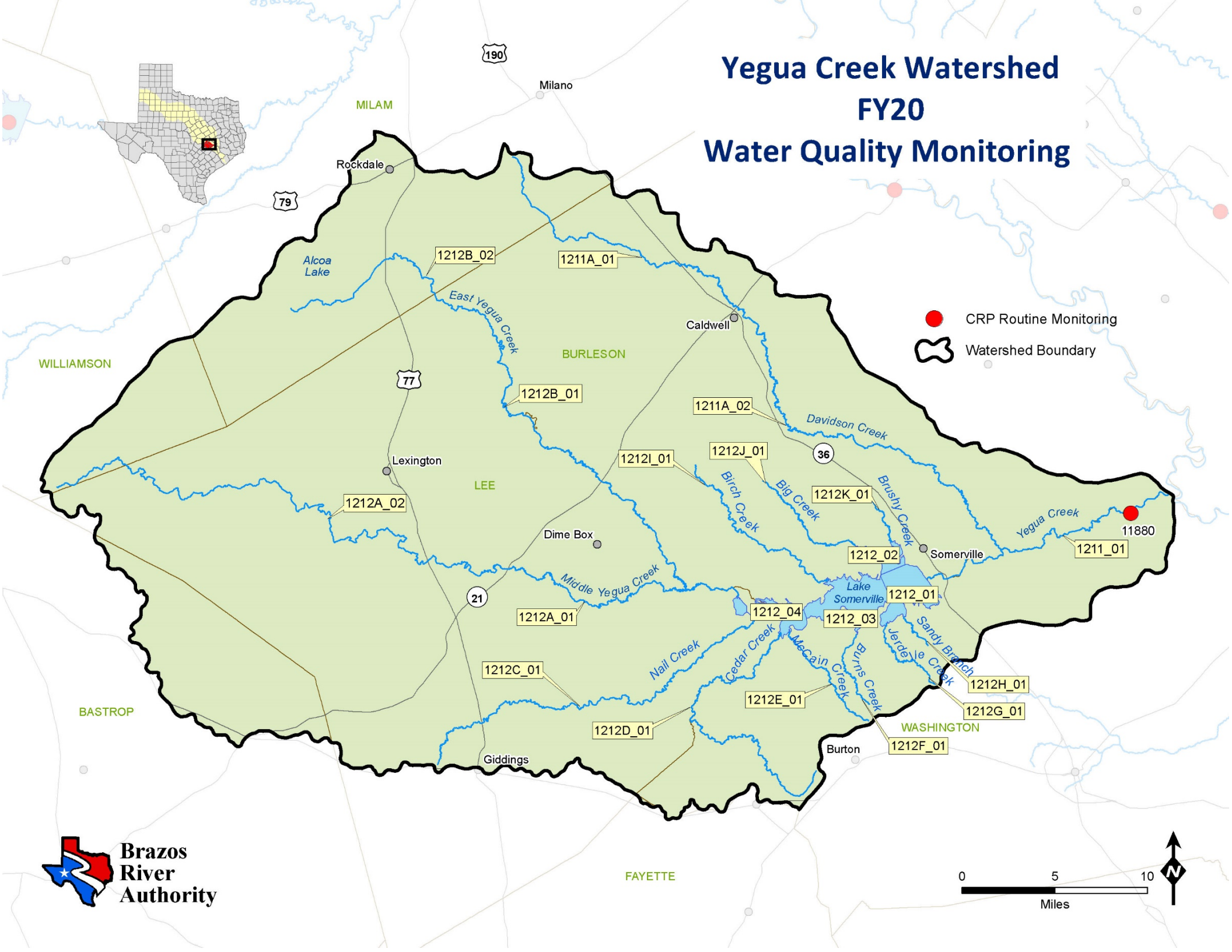
Brazos River Authority

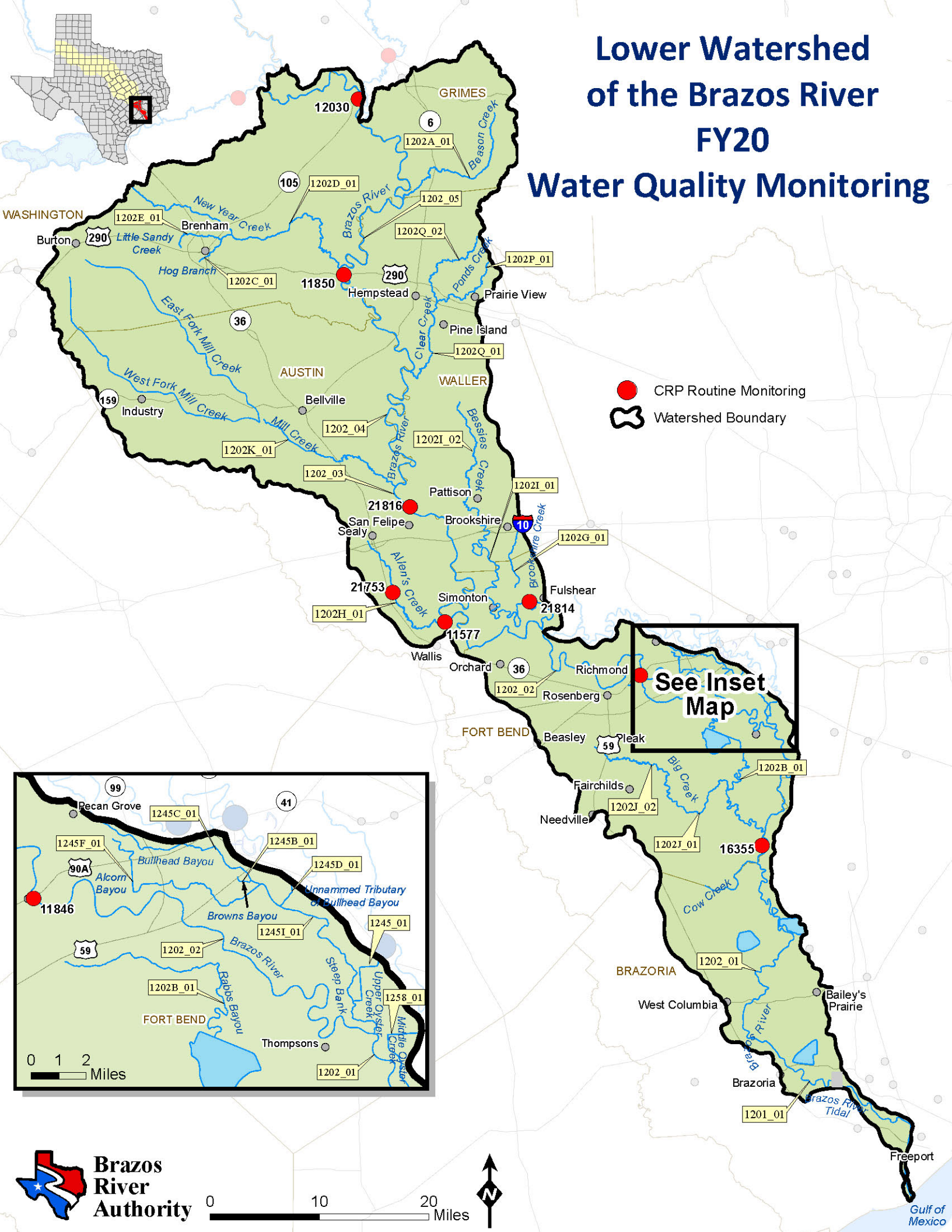
Little River Watershed
FY20
Water Quality Monitoring




Central Watershed of the Brazos River
FY20 Water Quality Monitoring
Abbott
1242N_02
West
Leroy
Tehuacana Creek
1256_01
Elm Mott
Axtell
Lacy-Lakeview
84
1242N_01
LIMESTONE
Bellmead
Tradinghouse Creek Reservoir
1256_02
12038
Waco
Mart
MCLENNAN
Beverly Hills
Hallsburg
1242P_02
6
Woodway
Riesel
Hewitt
Big Creek
Robinson
1242_05
Big Sandy Creek
Bullhide Creek
Golinda
1242A_01
Lorena
Satin
Marlin City Lake
Little Brazos River
7
35
Kosse
Moody
Eddy
Cow Bayou
Marlin
Chilton
11723
Bruceville-Eddy
1242P_01
14
Deer Creek
1242J_01
1242E_03
Lott
Bremond
1242O_01
Belfalls
1242J_01
FALLS
12032
320
1242F_01
1242_04
1242E_02
Walnut Creek
Rosebud
ROBERTSON
77
Pond Creek
1242K_01
16406
Calvert
Mud Creek
1242F_02
1242L_01
Brazos River
1242_03
Pin Oak Creek
Hearne
1242M_01
1242E_01
Spring Creek
MILAM
1242I_01
Campbells Creek
1242_02
190
See Inset Map
BRAZOS
Milano
Cedar Creek
21
BURLESON
Old River
6
Snook
1242_01
105
GRIM
CRP Routine Monitoring
Watershed Boundary
1242M_01
1242I_01
1242C_01
1242E_01
1242C_02
1242D_02
Still Creek
17378
Bryan
Cottonwood Branch
16882
1242B_02
17598
17597
11591
16396
1242G_01
1242B_01
15767
Thompson Creek
Brazos River
1242D_01
1242_02
1242_01
Brazos River Authority
0
10
20
Miles
N


Navasota River Watershed
FY20
Water Quality Monitoring
HILL
NAVARRO
MCLENNAN
LIMESTONE
FALLS
LEON
ROBERTSON
MADISON
GRIMES
BRAZOS
BURLESON
Coolidge
Mount Calm
Mexia
Teague
Groesbeck
Thornton
Kosse
Jewett
Marquez
Franklin
Normangee
North Zulch
Wixon Valley
Wellborn
Millican
Anderson
Navasota
Bryan
College Station
Navasota River
Christmas Creek
Lake Mexia
Springfield Lake
Holman Creek
Lake Limestone
Steele Creek
Twin Oaks Reservoir
Duck Creek
Camp Creek Lake
Normangee Lake
Cedar Creek
Shepard Creek
Wickson Creek
Gibbons Creek Reservoir
Carters Creek
Gibbons Creek
Fin Feather Lake
Burton Creek
Country Club Branch
Country Club Lake
Wolfpen Creek
1210A_01
1210_01
1210_02
16391
1253_03
1253A_01
1253_02
1253_01
12126
1252_04
1252_05
13970
12125
1252_02
1252_03
12124
1209K_02
1252_01
12123
1209_05
1209K_01
11877
1209H_02
1209_05
1209H_01
1209O_01
1209_04
1209G_01
1209J_01
1209E_01
16398
1209I_03
1209_03
1209N_01
1209N_04
1209N_03
1209N_02
1209I_02
11875
18800
11785
1209C_01
1209I_01
1209_02
1209_01
11873
1209C_01
1209L_01
1209B_01
1209D_01
1209A_01
1209F_01
See Inset Map
CRP Routine Monitoring
Watershed Boundary
0 0.85 1.7 Miles
0 10 20 Miles
Brazos River Authority


Yegua Creek Watershed
FY20
Water Quality Monitoring
CRP Routine Monitoring
Watershed Boundary
Milano
MILAM
Rockdale
Caldwell
BURLESON
WILLIAMSON
Lexington
LEE
Dime Box
Somerville
Lake Somerville
BASTROP
Giddings
FAYETTE
WASHINGTON
Burton
Alcoa Lake
East Yegua Creek
Davidson Creek
Birch Creek
Big Creek
Brushy Creek
Yegua Creek
Middle Yegua Creek
Nail Creek
Cedar Creek
McCain Creek
Burns Creek
Jerde Creek
Sandy Branch
1212B_02
1211A_01
1212B_01
1211A_02
1212J_01
1212I_01
1212K_01
1212A_02
11880
1211_01
1212_02
1212_01
1212_04
1212_03
1212A_01
1212C_01
1212H_01
1212E_01
1212G_01
1212D_01
1212F_01
190
79
77
36
21
Brazos River Authority
0
5
10
Miles
N


Lower Watershed of the Brazos River FY20 Water Quality Monitoring
CRP Routine Monitoring
Watershed Boundary
See Inset Map
12030
11850
21816
21753
11577
21814
16355
11846
1202A_01
1202D_01
1202_05
1202Q_02
1202P_01
1202Q_01
1202C_01
1202E_01
1202_04
1202I_02
1202K_01
1202_03
1202I_01
1202G_01
1202H_01
1202_02
1202B_01
1202J_02
1202J_01
1202_01
1201_01
1245C_01
1245B_01
1245D_01
1245F_01
1245I_01
1245_01
1258_01
GRIMES
WASHINGTON
AUSTIN
WALLER
FORT BEND
BRAZORIA
Brenham
Burton
Hempstead
Prairie View
Pine Island
Bellville
Industry
Pattison
Brookshire
San Felipe
Sealy
Fulshear
Simonton
Wallis
Orchard
Richmond
Rosenberg
Beasley
Pleak
Fairchilds
Needville
West Columbia
Bailey's Prairie
Brazoria
Freeport
Pecan Grove
Thompsons
Gulf of Mexico
Brazos River
New Year Creek
Little Sandy Creek
Hog Branch
East Fork Mill Creek
West Fork Mill Creek
Mill Creek
Beason Creek
Ponds Creek
Clear Creek
Bessies Creek
Brookshire Creek
Allen's Creek
Big Creek
Cow Creek
Bullhead Bayou
Alcorn Bayou
Unnammed Tributary of Bullhead Bayou
Browns Bayou
Rabbs Bayou
Steep Bank
Upper Oyster Creek
Middle Oyster Creek
Brazos River Tidal
0 1 2 Miles
Brazos River Authority
0 10 20 Miles
N

Appendix D: Field Data Sheets also serving as Chain of Custody Forms

BRAZOS RIVER AUTHORITY
FIELD DATA SHEETS FOR SAMPLES COLLECTED FOLLOWING SWQM VOL.I

LIMS#:

SITE ID: 21814

SITE NAME: Bessie's Creek at FM 1093 SW of Fulshear

DATE:

TIME:

COLLECTORS: Baack Byrge Grimm Johnson

RUN: Allens Creek

SONDE SN# 205 206 207 221 559 792 794 939

STORET Code		Description
89966		SKIES: 1=CLEAR, 2=PT/CLOUDY, 3=CLOUDY, 4=RAIN
89965		WIND: 1=CALM, 2=SLIGHT, 3=MOD, 4=STRONG
00078		TRANSPARENCY, SECCHI DISC (METERS)
89861		AVG STREAM WIDTH (METERS)
89926		AQUATIC VEGETATION @ COLLECTION SITE (PERCENT)
89978		NUMBER OF PEOPLE OBSERVED PERFORMING PRIMARY CONTACT RECREATION
89979		EVIDENCE OF PRIMARY CONTACT RECREATION: OBSERVED (1) NOT OBSERVED (0)
01351		FLOW SEVERITY: 1=NO FLOW, 2=LOW, 3=NORMAL, 4=FLOOD, 5=HIGH, 6=DRY
89835	-	FLOW METHOD: 1=USGS, 2=MARSH MCBIRNEY, 3=MECH, 4=WEIR/FLUE, 5=DOPPLER
00061		STREAM FLOW INSTANTANEOUS (CFS)
72053		DAYS SINCE LAST SIGNIFICANT PRECIPITATION (DAYS)

Sample Type: Grab Matrix : Surface Water

Bottle ID	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Test	Anions[1]	TSS	Turbidity Chl a	*E.coli*	TKN/TP[2] NH_3[2]

	Temp	D.O.	Specific Conductance	pH	Salinity	DO	Cl Res
	(ºC)	(mg/L)	(µs/cm)	(s.u.)	(ppt)	(% Sat.)	(mg/L)
DEPTH	00010	00300	00094	00400	00480	00301	
Surface 0.3m							

COMMENTS

[1]Field Filtered [2]Preserved with H_2SO_4 All Samples collected preserved on ice.

Receiver's Signature **Form Completed by:**

Time of Receipt: **Date of Receipt:**

Tag ID: **Lab Manager Review:** **QA Review:**

BRAZOS RIVER AUTHORITY
FIELD DATA SHEETS FOR SAMPLES COLLECTED FOLLOWING SWQM VOL.I

LIMS#:

SITE ID: 11921

SITE NAME: Belton Lake at Dam

DATE:

TIME:

COLLECTORS: Baack Byrge Grimm Johnson

RUN: Belton

SONDE SN# 205 206 207 221 559 792 794 939

STORET Code		Description
89966		SKIES: 1=CLEAR, 2=PT/CLOUDY, 3=CLOUDY, 4=RAIN
89965		WIND: 1=CALM, 2=SLIGHT, 3=MOD, 4=STRONG
89968		WATER SURFACE (1=Calm,2=Ripple,3=Wave,4=Whitecaps)
00078		TRANSPARENCY, SECCHI DISC (METERS)
89926		AQUATIC VEGETATION @ COLLECTION SITE (PERCENT)
00051		RESERVOIR ACCESS NOT POSSIBLE LEVEL TOO LOW
72053		DAYS SINCE LAST SIGNIFICANT PRECIPITATION (DAYS)
00052		RESERVOIR STAGE (feet above msl)
00053		RESERVOIR PERCENT FULL

Sample Type: Grab Matrix : Surface Water

Bottle ID	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Test	Anions[1]	TSS	TDS Turbidity Chl a	*E.coli*	TKN/TP[2] NH_3[2]

		Temp	D.O.	Specific Conductance	pH	Salinity	DO	
	Depth	(ºC)	(mg/L)	(µs/cm)	(s.u.)	(ppt)	(% Sat.)	
LIMS #	(m)	00010	00300	00094	00400	00480	00301	Other
0	0.3							

COMMENTS

[1]Field Filtered [2]Preserved with H_2SO_4 All Samples collected preserved on ice. 1ft = 0.3048m

Receiver's Signature **Form Completed by:**

Time of Receipt: **Date of Receipt:**

Tag ID: **Lab Manager Review:** **QA Review:**

Appendix E: Data Review Checklist and Summary Shells

Data Review Checklist

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

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

Data Summary

Data Summary

Data Source: **Brazos River Authority – LabVantage LIMS Database**

Date Submitted: _____

Tag ID Ranges: _____

Date Range: _____

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

Brazos River Authority Data Manager: _____ **Date:** _____

Please explain in the table below any data discrepancies discovered during data review including:
- Inconsistencies with LOQs
- Failures in sampling methods and/or laboratory procedures that resulted in data that could not be reported to the TCEQ (indicate items for which the Corrective Action Process has been initiated and send *Corrective Action Status Report* with the applicable Progress Report).

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

- **Discrepancies or missing data:**

Test	Parameter	Data Points Expected	Additional Data Points	Stations Dry, Pooled, or inaccessible (no data)	Data Points Rejected or not recorded	Data Points Submitted	Percent Data Loss for this Dataset
Water Temperature	00010						
Lake Inaccessible	00051						
Reservoir Stage	00052						
Reservoir Per Cent Full	00053						
Flow	00061						
Transparency	00078						
Specific conductance	00094						
DO	00300						
pH	00400						
TSS	00530						
Nitrate nitrogen	00620						
TKN	00625						
TP	00665						
Orthophosphate P	00671						
Chloride	00940						

Test	Parameter	Data Points Expected	Additional Data Points	Stations Dry, Pooled, or inaccessible (no data)	Data Points Rejected or not recorded	Data Points Submitted	Percent Data Loss for this Dataset
Sulfate	00945						
Flow Severity	01351						
E. coli	31699						
Enterococcus	31701						
TDS	70300						
Chl *a*	70953						
Days Since Precip	72053						
Turbidity	82079						
Flow measurement method	89835						
Average Stream Width	89861						
Maximum Pool Width	89864						
Pool Length	89869						
Macrophyte Bed at Collection Point (%)	89926						
Wind Intensity	89965						
Present Weather	89966						
Water Surface	89968						

* Percent Loss = # Data Points Lost / # Data Points Expected for that parameter in the data set * 100%.

Discrepancy explanations

1	
2	
3	
4	
5	
6	

Discrepancies or missing data for the listed tag ID

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