Quality Assurance Project Plan
Sulphur River Basin Authority

911 North Bishop Street, Suite C
Wake Village, TX 75501

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 2024 to FY 2025

Questions concerning this QAPP should be directed to:
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A1 Approval Page

Texas Commission on Environmental Quality

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Grant Bassett, Date Project Quality Assurance Specialist Clean Rivers Program	Jenna Wadman, Project Manager Date Clean Rivers Program
Cathy Anderson, Team Leader Date Data Management and Analysis	

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Sulphur River Basin Authority (SRBA)

Nancy Rose — 08/30/2023
Nancy Rose — Date
SRBA Project Manager

Water Monitoring Solutions, Inc. (WMS)

8/31/2023
Randy Rushin — Date
WMS Project Manager

8/30/2023
Shelby Bessette — Date
WMS Data Manager

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Angela Kilpatrick — Date
WMS Quality Assurance Officer

8/30/2023
Dr. Roy Darville — Date
WMS Data Collection Supervisor

North Texas Municipal Water District (NTMWD)

08/30/2023
Kristen Suprobo — Date
NTMWD Project Manager

08/31/2023
Katie McElroy — Date
NTMWD Quality Assurance Officer

8/30/2023
Robert Huffman — Date
NTMWD Field Supervisor

8/30/2023
Kelly Harden — Date
NTMWD Laboratory Manager

Lower Colorado River Authority Environmental Services Laboratory (LCRA ELS)

Dale Jurecka	8/30/23	Jason Woods	8/30/2023
Dale Jurecka	Date	Jason Woods	Date
LCRA ELS Laboratory Manager		LCRA ELS Project Manager	

08/30/2023	
Angel Mata	Date
LCRA ELS Quality Manager	

A2 Table of Contents

List of Acronyms

AWRL	Ambient Water Reporting Limit
BLOB	Binary Large Object File
BS	Biased to Season monitoring
CAP	Corrective Action Plan
CE	Collecting Entity
COC	Chain of Custody
CRP	Clean Rivers Program
DM	Data Manager
DMRG	Surface Water Quality Monitoring Data Management Reference Guide
DM&A	Data Management and Analysis
DO	Dissolved Oxygen
DUP	Duplicate
EPA	United States Environmental Protection Agency
FY	Fiscal Year
GIS	Geographical Information System
GPS	Global Positioning System
IR	Texas Integrated Report
LCRA ELS	Lower Colorado River Authority Environmental Laboratory Services
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
MPN	Most Probable Number
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MT	Monitoring Type
NELAP	National Environmental Lab Accreditation Program
NM	Collecting Entity Code for North Texas Municipal Water District
NTMWD	North Texas Municipal Water District
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
PM	Project Manager
RT	Routine Monitoring
SE	Submitting Entity
SLOC	Station Location
SOP	Standard Operating Procedure
SRBA	Sulphur River Basin Authority
SU	Submitting Entity Code for Sulphur River Basin Authority
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
TWDB	Texas Water Development Board
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
W	Sample Number Prefix for Sulphur River Basin Authority
WM	Collecting Entity Code for Water Monitoring Solutions, Inc.

WMS	Water Monitoring Solutions, Inc.
WQS	Water Quality Standards
VOA	Volatile Organic Analytes

A3 Distribution List

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The Sulphur River Basin Authority (SRBA) 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, subparticipants, or other units of government. The SRBA will document distribution of the plan and any amendments and appendices, maintain this documentation as part of the project's quality assurance records, and ensure the documentation is available for review.

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

TCEQ

Sarah Whitley
Team Leader, Water Quality Standards and Clean Rivers Program
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 QMP. Enforces corrective action, as required, where QA protocols are not met. Ensures CRP personnel are fully trained.

Jason Natho
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 PM in developing and implementing quality system. Reviews and approves CRP QAPPs, QAPP amendments, and QAPP special appendices. Prepares and distributes annual audit plans. Conducts monitoring systems audits of Planning Agencies. Concurs with 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 audit records for the CRP.

Jenna Wadman
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). Coordinates the review and approval of CRP QAPPs in coordination with the CRP Project Quality Assurance Specialist. Ensures maintenance of QAPPs. Assists CRP Lead QA Specialist in conducting Basin Planning Agency audits. Verifies QAPPs are being followed by contractors and that projects are producing data of known quality. Coordinates project planning with the Basin Planning Agency PM. 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.

Scott Delgado
CRP Data Manager, DM&A Team
Responsible for coordination and tracking of CRP data sets from initial submittal through CRP PM review and approval. Ensures that data are reported following instructions in the Data Management Reference Guide, July 2019 or most current version (DMRG). Runs automated data validation checks in the Surface Water Quality Management Information System (SWQMIS) and coordinates data verification and error correction with CRP PMs. Generates SWQMIS summary reports to assist CRP PM's 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).

Grant Bassett
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. Reviews and approves CRP QAPPs in coordination with other CRP staff. Coordinates documentation and monitors implementation of corrective action for the CRP.

Sulphur River Basin Authority

Nancy Rose
SRBA 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. Conducts monitoring systems audits of WMS to ensure QAPPs are followed. Ensures that sub-participants are qualified to perform contracted work. Ensures CRP PMs and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. 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. Maintains access to quality-assured data on SRBA internet sites. Ms. Rose will provide coordination and cooperation between the project partners, stakeholders, and WMS.

Water Monitoring Solutions, Inc.

WMS contracts with the SRBA to administer the tasks and responsibilities outlined in this QAPP on behalf of the SRBA.

Randy Rushin
WMS Project Manager
Responsible for contact and coordination with SRBA, TCEQ and other entities participating in the Sulphur River Basin Clean Rivers Program activities. Responsible for reviewing and maintaining the QAPP and monitoring its implementation. Responsible for implementing and monitoring CRP requirements in contracts, QAPPs and QAPP amendments and appendices and maintaining records of sub-tier commitment to requirements specified in this QAPP. Responsible for the supervision of all CRP field activities (water quality, biological sampling, and monitoring), including equipment calibration, sampling, sample preservation, fieldwork, sample transport, and chain-of-custody maintenance in compliance with the approved QAPP. Designates WMS staff with subordinate responsibility and oversees task progress and completion of project deliverables. Responsible for performing necessary data analysis and development of conclusions and recommendations in technical deliverables. Supports SRBA to ensure that monitoring systems audits on sub-participants are conducted to verify that QAPP's are followed by the Sulphur River Basin Planning Agency participants; projects are producing data of known quality; CRP PMs and/or QA Specialists are notified of deficiencies and non-conformances, and that issues are resolved; and that data are validated and are acceptable for reporting to the TCEQ. Notifies the SRBA PM of circumstances which may adversely affect the quality of data. Ensures that field staff is properly trained and that training records are maintained.

Angela Kilpatrick
WMS Quality Assurance Officer
Responsible for coordinating the implementation of the QA program. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Responsible for receiving and reviewing project QA records. Coordinates and monitors deficiencies, non-conformances and corrective actions; coordinates and reviews records of data verification and validation.

Shelby Bessette
WMS Data Manager
Responsible for the transfer of basin quality-assured water quality data in a format compatible with SWQMIS. Assists QAO with identifying, receiving, and reviewing project QA records. Assists WMS QAO in coordinating with the TCEQ PM to resolve QA-related issues. Notifies the WMS PM of particular circumstances which may adversely affect the quality of data. Assists QAO with deficiencies, non-conformances and corrective actions;

coordinates and reviews records of data verification and validation. Review data from monitoring events and provide data quality comments to the WMS PM. Responsible for ensuring that field and lab data are properly reviewed and verified.

Dr. Roy Darville
Data Collection Supervisor
Ensures that all field sampling activities are conducted in accordance with this QAPP, reporting to the WMS PM and QAO any deviation from this QAPP, maintaining proper documentation of sampling events, sampling preservation, sampling shipment, and field procedures at designated stations. Responsible for training new field personnel. Responsible for the supervision of all field activities including water quality sampling and monitoring, and including equipment preparation, sampling, sample preservation, fieldwork, sample transport, and chain-of-custody maintenance in compliance with the approved QAPP. Participates in field data collection activities.

North Texas Municipal Water District (NTMWD)

Collects and analyzes specific water quality samples required for their specific operations. Data which are submitted to the SRBA, as identified in Appendix A, Table A7NM.1-A7NM.5 for use in the CRP, will be collected and analyzed under the guidelines set forth by this QAPP.

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

Katie McElroy
NTMWD Quality Assurance Officer
Responsible for coordinating the implementation of the CRP QA program for NTMWD. Responsible for monitoring the implementation of the CRP QAPP. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for identifying, receiving, and maintaining project quality assurance records. Notifies the NTMWD PM of particular circumstances which may adversely affect data quality. Coordinates and maintains records of data verification and validation. Coordinates the research and review of technical QA materials and data related to water quality monitoring system design and analytical techniques. Conducts internal NTMWD monitoring systems audits on project participants to determine compliance with project and program specifications, issues written reports, and follows through on findings.

Robert Huffman
NTMWD Field Supervisor
Responsible for ensuring that field samples and measurements are collected and recorded according to methodologies detailed in *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods,* August 2012 (RG-415). Has primary responsibility to ensure the proper use of CRP field data sheets, field notebooks, proper calibration of equipment and that chain-of-custody forms are correctly completed and received by the laboratory.

Kelly Harden
NTMWD Laboratory Manager
Serves as the primary laboratory contact. Responsible for ensuring that all samples received in the NTMWD Environmental Laboratory do not exceed holding time(s), and that the chain-of-custody has been observed. Ensures that the samples are analyzed in accordance with standard accepted methods as described in this QAPP and laboratory SOP manual. Ensures all results are properly recorded on laboratory data sheets and in the appropriate analytical log books. Responsible for the implementation of the QA program for the NTMWD Environmental Laboratory. Ensures laboratory staff is properly trained. Responsible for distribution of hardcopy and electronic reports to customers.

Lower Colorado River Authority Environmental Laboratory Services (LCRA ELS)

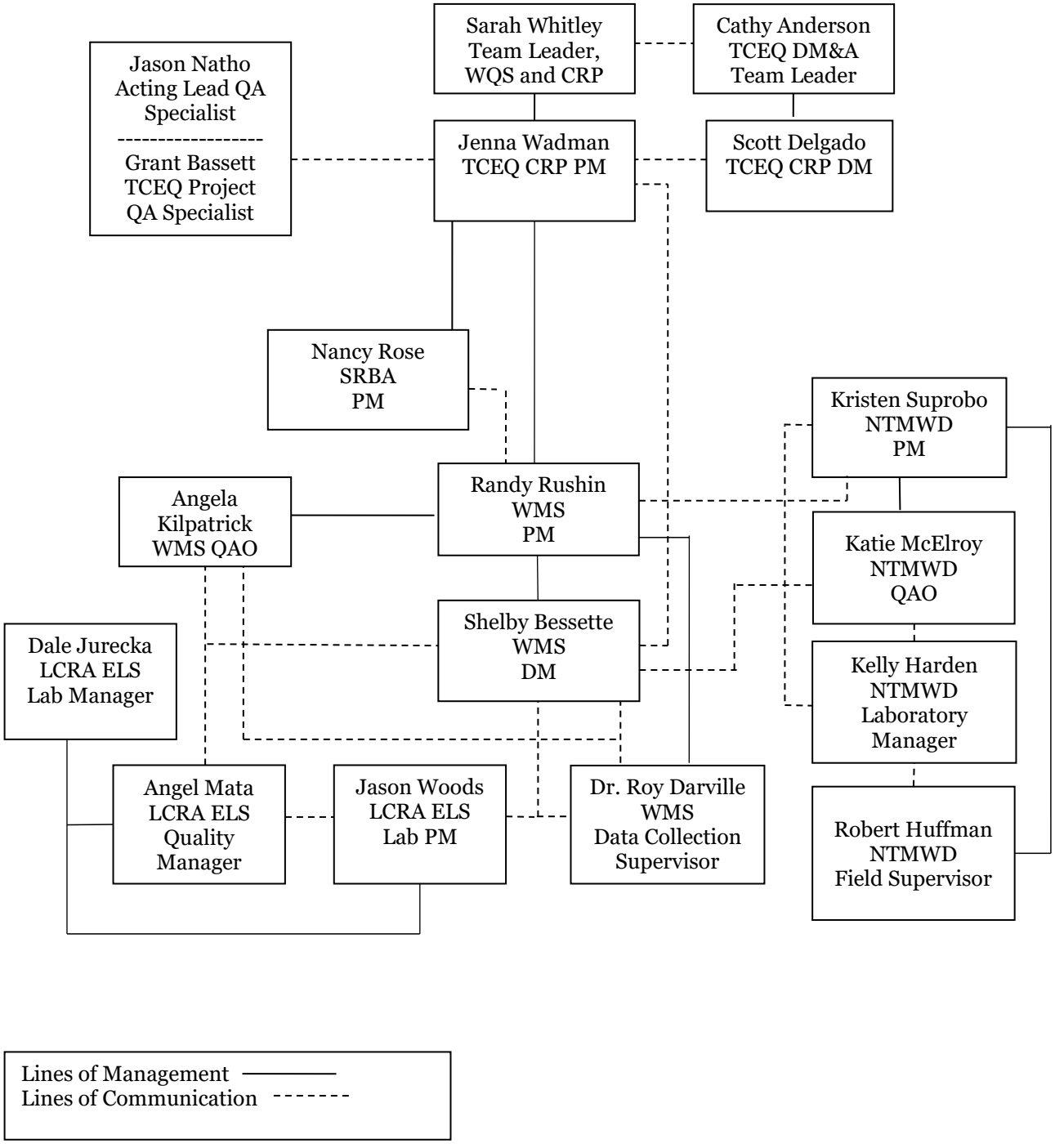
Jason Woods
Laboratory Project Manager
Responsible for analyses performed by LCRA ELS. Responsible for project set up in LIMS. Serves as the primary point of contact for all laboratory activity conducted by LCRA under this QAPP.

Dale Jurecka
Laboratory Manager
Responsible for the overall performance, administration, and reporting of analyses performed by LCRA ELS. Responsible for ensuring that laboratory personnel involved in generating analytical data have adequate training and a thorough knowledge of the QAPP and all SOPs specific to the analysis or task performed and or supervised. Responsible for oversight of all operations, ensuring that all QA/QC requirements are met, and documentation related to the analysis is completely and accurately reported.

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

Project Organization Chart

Figure A4.1. Organization Chart – Lines of Communication



A5 Problem Definition/Background

In 1991, the Texas Legislature passed the Texas Clean River Act (Senate Bill 818) in response to growing concerns that water resource issues were not being pursued in an integrated, systematic manner. The act requires that ongoing water quality assessments be conducted for each river basin in Texas, an approach that integrates water quality issues within the watershed. The CRP legislation mandates that each river authority (or local governing entity) shall submit quality-assured data collected in the river basin to the commission. Quality-assured data in the context of the legislation means data that comply with TCEQ rules for surface water quality monitoring (SWQM) programs, including rules governing the methods under which water samples are collected and analyzed and data from those samples are assessed and maintained. This QAPP addresses the program developed between the SRBA and the TCEQ to carry out the activities mandated by the legislation. The QAPP was developed and will be implemented in accordance with provisions of the TCEQ Quality Management Plan, January 2023 or most recent version (QMP).

The purpose of this QAPP is to clearly delineate SRBA QA policy, management structure, and procedures which will be used to implement the QA requirements necessary to verify and validate the surface water quality data collected. The QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are 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) and water quality standards development, permit decisions, and other program activities 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 2024-2025*.

This Sulphur River Basin water quality monitoring plan was developed to maintain consistent sampling through time and locations, provide data analyzed using consistent detection limits, and address water quality impairments and concerns throughout the basin. Low dissolved oxygen (DO) concentrations and high bacteria are the most common impairments in the Sulphur River Basin shown in the *2022 Texas 303(d) List*. Concerns for low dissolved oxygen concentrations are expressed in the *2022 Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d)*. In most locations, the low DO concentrations are associated with natural low flow conditions.

The primary goal of the Sulphur River Basin Clean Rivers Program is to provide the appropriate, quality assured data to allow continuing assessment and management of water quality in the Sulphur River Basin. Objectives of this monitoring program include local participation in the collection and submittal of quality-assured data to provide the TCEQ with reliable information concerning water quality conditions within the basin. Assessment of accurate information provides valuable insight into the nature and source of water quality problems and successes. These assessments, along with sound decisions based on the Texas Surface Water Quality Standards (TSWQS) help in the evaluation of permit requirements with respect to water quality conditions and trends to specific water bodies in the basin. These evaluations, in addition to historical data, are used to support the development of cost-effective water quality management programs. To achieve this goal, a variety of sampling regimens have been implemented including routine water quality grab sampling and diel dissolved oxygen monitoring.

Wright Patman Lake (Segment 0302) was impounded in 1956 by the US Army Corp of Engineers as a flood control project. Wright Patman Lake occupies approximately 19,000 acres of Sulphur River bottom land and tends to be shallow. The depth varies during the year due to the lake's flood control regimen. Wright Patman Lake is a public water source of great importance to the region. Water is treated by Texarkana Water Utilities and International Paper Corporation for general and industrial use. Wright Patman Lake has been listed on the 303(d) list since 2000 for high pH. High pH impairments were removed from the 2022 Integrated Report in all assessment units except AU 0302_12. A Standards review (Category 5b) is the current management strategy.

Two tributary streams to White Oak Creek (Segment 0303B) will be monitored for field parameters, conventionals, bacteria, and flow in FY 2024 on a quarterly basis: Rock Creek (Segment 0303D) and Stouts Creek (Segment 0303F). Stouts Creek showed carry-forward concerns for bacteria, ammonia, and phosphorus in the *2022 Texas Integrated Report* while Rock Creek had concerns for *E. coli*, nitrate, and phosphorus. White Oak Creek is a significant tributary of the Sulphur River (Segment 0303) prior to entering Wright Patman Lake.

Quarterly monitoring for field parameters, conventionals, bacteria, and flow is scheduled in Kickapoo Creek (Segment 0303L). Diels are scheduled to be performed in Stouts Creek and Mustang Creek (Segment 0303P) in FY 2024.

Monitoring in the North Sulphur River (Segment 0305) will be conducted in tributary streams such as Auds Creek (Segment 0305B), Hickory Creek (Segment 0305C), and Big Sandy Creek (Segment 0305D) for field parameters and flow. Both Auds Creek and Big Sandy Creek show carry-forward concerns for habitat and benthic macro-invertebrate communities in the *2022 Integrated Report*. Hickory Creek was not assessed. Prior to FY 2022, sampling had not been conducted in these streams since 2002. Collection of these data are especially important to evaluate changes to water quality prior to the impoundment of the North Sulphur River to create Lake Ralph Hall. Construction of the new reservoir commenced in June 2021 and completion is expected in 2025 or 2026. For FY 2024, aquatic life monitoring will be conducted in the North Sulphur River below the future dam and in Auds Creek to obtain pre-impoundment data.

The North Texas Municipal Water District (NTMWD) will sample the Upper South Sulphur River (Segment 0306) for field parameters, conventionals, bacteria, metals in water, and flow.

The NTMWD will also sample Cooper Lake/Lake Jim Chapman (Segment 0307) and in the Middle Sulphur River (Segment 0307A), a tributary to the reservoir. Samples for field parameters, conventionals, bacteria, and metals in water will be collected by the District at these stations. Lake Jim Chapman is a water supply for the NTMWD and the Cities of Sulphur Springs, Commerce, and Cooper.

A6 Project/Task Description

Assessment and management of water quality within the Sulphur River Basin is dependent on quality-assured data. Water quality monitoring and data collection is a primary function of the Clean Rivers Program. Water quality monitoring in the Sulphur River Basin is made possible through a cooperative program directed by SRBA. WMS assists SRBA in planning, data collection, analysis, and reporting of water quality data.

The monitoring program for the Sulphur River Basin Clean Rivers Program is divided into two major areas: (1) water quality monitoring via routine (RT) station monitoring and (2) monitoring that is biased to season (BS).

Routine (RT) monitoring of physical, chemical, and bacteriological parameters is used primarily to populate SWQMIS with data usable for the assessment of the water bodies in the Sulphur River Basin. A major objective of this monitoring type is to improve the ability to identify trends and water quality changes in the major sub-basins. Reservoir monitoring usually occurs near the dam, mid-lake, and in the major arms that receive contributory surface inflow from rivers and streams. Routine sampling is generally conducted on a quarterly basis to provide information on water quality conditions. For FY 2024, routine sampling will continue without the intentional examination of any particular target environmental condition or event.

Biased-to-season (BS) monitoring is accomplished by collecting DO, pH, conductance, and temperature values over a period of twenty-four hours (diel). To ensure unbiased, seasonally representative data, diel monitoring is allocated to various times of the year over a period of at least two years as described in the Interim Change Document #02_2015_V1 of TCEQ RG-415, *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, Chapter 3.* Diel monitoring will be performed quarterly at two stream stations during FY 2024.

Biased-to-season monitoring also includes performing biological collections and habitat assessment. Biological sampling provides a long-term view of stream health due to the extended life cycle of organisms. Biological monitoring and habitat assessment will be conducted by following the procedures published in *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data*. Sampling for nekton and benthic macroinvertebrates, diel monitoring, and a habitat assessment will be conducted in Auds Creek and in the North Sulphur River during the index and critical periods of FY 2024.

The project design and site selection were chosen by the Coordinated Monitoring Committee with the intention of focusing attention on specific watersheds and water bodies known or suspected to have water quality issues,

based either upon local public concern or assessment unit information contained in the *2022 Texas IR*.

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

Amendments 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 WMS Project Manager (PM) to the CRP PM electronically. WMS on behalf of the SRBA will submit a completed QAPP Amendment document, including a justification of the amendment, a table of changes, and all pages, sections, and attachments affected by the amendment. Amendments are effective immediately upon approval by the WMS PM, the WMS QAO, the CRP PM, 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 will 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 WMS and SRBA PMs. If adherence letters are required, WMS 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 SRBA 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 SRBA, WMS, and the TCEQ PM 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 WMS PM, the WMS QAO, the Laboratory (as applicable), and the CRP PM, 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 WMS to project participants before data collection activities commence. WMS 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 SRBA 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, July 2022 or most recent version (https://www.tceq.texas.gov/downloads/water-quality/assessment/integrated-report-2022/2022-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.

Aquatic Life Monitoring and diel monitoring will be conducted at locations identified in Appendix B. These sampling regimes are considered biased to season. Additional parameters associated with Aquatic Life Monitoring will be included in the final data set but are not listed in Table A7WM.6-9, specifically those for the reporting of taxa inventory.

The measurement performance specifications to support the project purpose for a minimum data set are specified in Appendix A.

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 reporting limits. To ensure data are collected at or below these reporting limits, 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 reporting limit, 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.

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), Matrix Spike/Matrix Spike Duplicate (MS/MSD), or sample/duplicate (DUP) pairs, as applicable. 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 funding availability.

Biological monitoring sites will be selected that best represent conditions (both biological and water quality) of the entire water body. The chosen sites will be accessible and have a good variety of microhabitats to sample, including a mixture of riffles, runs, and pools. Sampling will be avoided in reaches where water quality conditions and hydrology change dramatically over the reach, such as areas with a major tributary or contaminant source.

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 in Section B10.

Completeness

The completeness of the data describes 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

The requirements for obtaining certified positional data using a Global Positioning System (GPS) are located in Section B10, Data Management.

Contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in *The NELAC Institute Standard (2016) Volume 1, Module 2, Section 4.5 (concerning Subcontracting of Environmental Tests)*.

Collection of habitat, benthics, and fish will be in accordance with the *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, Revised May 2014* (or most recent version). Individuals conducting identification of benthic macroinvertebrates and fish have adequate training and education to accurately identify species.

Water Monitoring Solutions, Inc.

Before new field personnel independently conduct field work, WMS PM and/or Data Collection Supervisor will train the individual in proper instrument calibration, field sampling techniques, and field analysis procedures. The QA officer (or designee) will document the successful field demonstration. The QA Officer (or designee) will retain documentation of training and the successful field demonstration in the employee's personnel file and ensure that the documentation will be available during monitoring systems audits.

North Texas Municipal Water District

New field personnel receive training in proper sampling and field analysis. Before actual sampling or field analysis occurs, they will demonstrate to the NTMWD Field Supervisor (or designee appointed by the NTMWD PM) their ability to properly calibrate field equipment, perform field sampling, demonstrate proper sampling technique and analysis procedures. Field personnel training is documented and retained in the personnel file and will be available during a monitoring systems audit.

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
SRBA/WMS			
QAPPs, amendments and appendices	SRBA/WMS**	5	Paper/Electronic
Field SOPs	SRBA/WMS**	5	Paper/Electronic
Laboratory Quality Manuals	LCRA ELS*	5	Paper/Electronic
Laboratory SOPs	LCRA ELS*	5	Paper/Electronic
QAPP distribution documentation	SRBA/WMS**	5	Paper/Electronic
Field staff training records	SRBA/WMS	5	Electronic
Field equipment calibration/maintenance logs	SRBA/WMS**	5	Paper/Electronic
Field instrument printouts	SRBA/WMS	5	Electronic
Field notebooks, data sheets, or electronic field data collection tables	SRBA/WMS**	5	Paper/Electronic
Chain of custody records	SRBA/WMS	5	Electronic
Laboratory calibration records	LCRA ELS*	5	Paper
Laboratory instrument printouts	LCRA ELS*	5	Paper
Laboratory data reports/results	SRBA/WMS/ LCRA ELS*	5	Electronic
Laboratory equipment maintenance logs	LCRA ELS*	5	Paper
Corrective Action Documentation	SRBA/WMS/ LCRA ELS*	5	Electronic
NTMWD			
QAPPs, amendments and appendices	NTMWD	5	Electronic
Field SOPs	NTMWD	5	Electronic
Laboratory Quality Manuals	NTMWD*	5	Electronic
Laboratory SOPs	NTMWD*	5	Electronic
QAPP distribution documentation	NTMWD	5	Electronic
Field staff training records	NTMWD	5	Electronic
Field equipment calibration/maintenance logs	NTMWD	5	Electronic
Field instrument printouts	NTMWD	5	Electronic
Field notebooks, data sheets, or electronic field data collection tables	NTMWD	5	Electronic
Chain of custody records	NTMWD	5	Electronic
Laboratory calibration records	NTMWD*	5	Electronic
Laboratory instrument printouts	NTMWD*	5	Paper/Electronic
Laboratory data reports/results	NTMWD	5	Electronic
Laboratory equipment maintenance logs	NTMWD*	5	Paper/Electronic
Corrective Action Documentation	NTMWD*	5	Electronic

* Laboratory Records must be retained in accordance with the NELAC Standards

**WMS will transfer all paper documents to SRBA annually and will retain electronic copies only.

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 (2016), 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. Test reports include the following:

- Title of report
- Name and address of the laboratory
- Name and address of the client
- A clear identification of the sample(s) analyzed
- Station, date and time of sample collection/receipt
- Identification of method used
- Identification of samples that did not meet QA requirements and why (e.g., holding times exceeded)
- Sample results
- Units of measurement
- Sample matrix
- Dry weight or wet weight (as applicable)
- Sample depth
- Name and title of person authorizing the report
- Project-specific quality control results to include: equipment and field blank results (as applicable)
- Narrative information on QC failures or deviations from requirements that may affect the quality of results or is necessary for verification and validation of data.
- Holding time for *E. coli*.
- 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)
    - Additionally, laboratory control spikes/laboratory control spike duplicates may also be listed under other nomenclature such as laboratory fortified blanks and laboratory fortified blank duplicates depending on the standard report generated by the lab.
- Certification of NELAP compliance
- Clearly identified subcontract laboratory results (as applicable)

The information in test reports will be consistent with the information that is needed to prepare data submittals to TCEQ. Otherwise, reports will be consistent with the TNI Standards and will include any additional information critical to the review, verification, validation, and interpretation of data.

Electronic Data

After field sampling is completed, data sheets and applicable QA documentation such as calibration logs are scanned into a portable document format (pdf) file and electronically transmitted to the WMS PM. Laboratory reports, scanned Chain of Custody (COC) forms, and results are sent electronically by the LCRA ELS PM to the WMS and SRBA PMs. Data from NTMWD is received in the Event/Result file format and is then reviewed by the WMS QA officer prior to submittal to TCEQ. The NTMWD electronic data reporting process is further detailed in Section B2 – Sampling Methods.

The WMS PM compiles and electronically distributes data files to the WMS QAO and WMS DM as they are received. After the data have been verified, validated, and formatted, the WMS DM electronically transfers the files to the WMS PM for review. Upon approval, the WMS DM submits the data files to the TCEQ PM.

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 included with each data submittal. Portions of the Biological Field Data Sheets (Appendix D) will be submitted by WMS to TCEQ in the required BLOB format as described in the DMRG.

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 by WMS and NTMWD 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 SRBA'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

TABLE B2.1 WM					
Parameter	**Minimum Sample Volume**	**Holding Time**	**Matrix**	**Container**	**Preservation** [+]
*E. coli**	125 mL	8 hours	Water	Sterile Plastic	Place in ice to cool to <6 °C with sodium thiosulfate powder
Alkalinity	100 ml	14 days	Water	Plastic	Place in ice to cool to <6 °C but not frozen
Chloride	100 ml	28 days			
Nitrate (N)	150 ml	48 hours			
Nitrite (N)	150 ml	48 hours			
Sulfate	100 ml	28 days			
Total Suspended Solids	400 ml	7 days			
Chlorophyll *a*/ Pheophytin	250 ml	Filter <48 hours and as soon as possible after sample collection; Frozen filters may be stored up to 24 days	Water	Amber Plastic	Dark, place in ice to cool to <6 °C but not frozen prior to filtration
Ammonia	150 ml	28 days	Water	Plastic	1-2 ml H_2SO_4 to pH <2 and cool to <6 °C but not frozen
Total Kjeldahl Nitrogen	200 ml	28 days			
Total Phosphorus	150 ml	28 days			
Total Organic Carbon	200 ml	28 days			
Fish Vouchers	As needed to submerge samples without crowding	NA	NA	Plastic	10% formalin in field, store in formalin for at least one week, soak in fresh water each day for three days, transfer to 50% isopropyl alcohol or 75% ethanol for indefinite storage

TABLE B2.1 WM					
Parameter	**Minimum Sample Volume**	**Holding Time**	**Matrix**	**Container**	**Preservation** [+]
Benthic Macro-invertebrates	As needed to submerge samples without crowding	NA	NA	Plastic	If processing in the field, 70% ethanol or 40% isopropyl alcohol. If processing in the lab immediately after collection, 95% ethanol. If processing in the lab at least a week after collection, 10% formalin. Transfer to 70% ethanol or 40% isopropyl alcohol for indefinite storage

[+] Preservation is performed in the field within 15 minutes of sample collection, except where otherwise indicated.

[*]*E. coli* samples should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

TABLE B2.1 NM					
Parameter	**Minimum Sample Volume**	**Holding Time**	**Matrix**	**Container**	**Preservation** [+]
*E. coli**	100	8 hours*	Water	Sterile Plastic	Place on ice to cool to < 6 °C with sodium thiosulfate powder
Alkalinity	100	14 days	Water	Plastic	Place on ice to cool to < 6 °C but not frozen
Chloride	50	28 days			
Nitrate (N)	50	48 hours			
Nitrite (N)	50	48 hours			
Residue, Total Filtrable	100	7 days			
Residue, Total Nonfiltrable	1000 (Turbidity Dependent)	7 days			
Sulfate	50	28 days			
Turbidity, Lab	250	48 hours			
Chlorophyll *a*/ Pheophytin	1000	Filter <48 hours and as soon as possible after sample collection; Frozen filters may be stored up to 24 days	Water	Amber or opaque Plastic	Dark, place on ice to cool to < 6 °C but not frozen
Nitrite Plus Nitrate, Total (Measured)	100	28 days	Water	Plastic	Add H_2SO_4 to pH < 2, place on ice to cool to < 6 °C but not frozen
Ammonia	100	28 days			
Total Kjeldahl Nitrogen	100	28 days			
Total Phosphorus	100	28 days			
Total Organic Carbon	100	28 days	Water	Plastic	Add H_3PO_4 to pH< 2, place on ice to cool to < 6 °C but not frozen
Hardness, Total	100	6 months if acidified, otherwise 48 hours	Water	Plastic	Add HNO_3 or H_2SO_4 to pH < 2, place on ice to cool to < 6 °C but not frozen
Total Metals	250	6 months	Water	New or 1:1 HNO_3 rinsed Plastic	Lab - add ultra-pure HNO_3 to pH < 2

[+] Preservation is performed in the field within 15 minutes of sample collection, except where otherwise indicated.

[*]*E. coli* samples should always be processed as soon as possible and incubated no later than 8 hours from time of

collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

Sample Containers

Certificates from sample container manufacturers are maintained in a notebook by the LCRA ELS and NTMWD Environmental Laboratory. All sample containers will be provided by the LCRA ELS to WMS will be purchased pre-cleaned and disposable. LCRA will ensure that all containers requiring preservatives are added prior to shipment from the LCRA ELS to WMS. No bottles will be reused for water quality sampling. The bacteriological sample containers are the 120 and 290 mL bottles from IDEXX. Brown polyethylene bottles are provided for chlorophyll-a sampling.

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

Sample containers for biological monitoring will be plastic, leak-proof, high density polyethylene, wide-mouth bottles in various sizes. The appropriate size will be used to adequately store and preserve samples without crowding.

Processes to Prevent Contamination

SWQM Procedures outline the necessary steps to prevent contamination of samples, including: direct collection into sample containers, when possible; use of certified containers for organics; triple rinsing equipment such as buckets used for sample collection with ambient water or deionized water when the use of ambient water for rinsing is not feasible; and clean sampling techniques for metals. Field QC samples (identified in Section B5) are collected to verify that contamination has not occurred.

Documentation of Field Sampling Activities

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

- Station ID
- Sampling Date
- Location
- Sampling Depth
- Water Column Depth
- Sampling Time
- Sample Collector's name and signature
- Values for all field parameters collected
- Additional notes containing detailed observational data not captured by field parameters may include:
    - 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

Examples of field data sheets to be used during biological monitoring are shown in Appendix D. Additional forms for biological monitoring data reporting as described in Appendix C of the *TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data*, 2014 (RG-416), are also located in Appendix D. Nekton samples will be identified and separated by collection type – seining and/or electroshocking – and will include associated metadata.

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.

NTMWD uses electronic data capture in the field and delivers data to WMS in the event/result file format described in the DMRG.

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. In such cases, WMS and NTMWD field staff will immediately report the deficiency to the WMS PM. It is the responsibility of the WMS PM, in consultation with the WMS QAO and SRBA PM, 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 PM 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 COC form is a record that documents the possession of the samples from the time of collection to receipt in the laboratory. The following information concerning the sample is recorded on the COC form (See Appendix E). The following list of items matches the COC form in Appendix E.

- Date and time of collection
- Site identification
- Sample matrix
- Number of containers
- Preservative used
- Was the sample filtered*
- Analyses required
- Name of collector

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

* NTMWD does not indicate sample filtration.

Sample Labeling

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

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

Sample Handling

WMS

The WMS DM (or designee) will notify LCRA ELS prior to each sampling event with information regarding the expected sampling date and number of sample containers required. The LCRA ELS will deliver all sample containers, ice chests, and appropriate chain-of-custody forms to a pre-determined location prior to each sampling event. The containers provided by LCRA ELS, will be certified new, supplied with correct preservatives, and labeled accordingly. Quality control for sample containers will be provided by LCRA ELS.

The WMS Data Collection Supervisor will be responsible for ensuring that samples are collected using approved TCEQ methods. A Chain-of-Custody form will be completed for each sample collected during the sampling event. Samples will be shipped to LCRA ELS or arrangements will be made with LCRA ELS for sample pick up at a pre-determined location after each day's sampling event is completed to assure that the chain-of-custody forms are correctly filled out and signed. The LCRA ELS transfer custodian will also see that the samples arrive within holding time constraints. LCRA ELS will have a sample custodian who examines all arriving samples for proper documentation, and proper preservation. This custodian will accept delivery by signing the final portion of the chain-of-custody form. The sample custodian will log and monitor the progress of the samples through the analysis stage. Internal sample handling, custody, and storage procedures are described in LCRA ELS's Quality Manual(s).

NTMWD

Field personnel will be responsible for recording all data and relevant observations on the electronic field data sheet and COC sheets. Transportation of samples to NTMWD Laboratory is provided by field personnel. Transfer of samples to laboratory personnel is indicated on COC forms. Standard operating procedures for the handling of samples at NTMWD Laboratory are detailed in the NTMWD Sample Receiving Operations Manual (OM). Problems encountered during transportation or with the samples on arrival at the lab are documented on the COC form. Samples not documented properly will not be accepted for analysis by NTMWD Laboratory personnel. Sample bottles used in the testing procedures are supplied by NTMWD Laboratory. The bottles are supplied with labels. Upon receipt, the labels indicate the analytical methods and parameters for each bottle. Based on the needed parameters, the NTMWD Laboratory will perform analytical procedures on the contents in accordance with the applicable SOPs and this QAPP. The bottles are pre-preserved by NTMWD Laboratory as required by analytical methods, with the exception being total metals which is allowed by the method. Field personnel complete the label information at sampling and pack the samples in ice. The COCs are completed when field personnel return to the office. The samples are checked at the laboratory to make certain that the temperature and pH meet QAPP requirements and that holding times are met. The internal handling of the samples by the NTMWD Laboratory is detailed in the Laboratory Quality Systems Manual and SOPs of the NTMWD Laboratory.

Sample Tracking Procedure Deficiencies and Corrective Action

All deficiencies associated with COC procedures by WMS or NTMWD, as described in this QAPP, are immediately reported to the WMS and SRBA PMs. 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. Any deficiencies will be communicated from the field (WMS, NTMWD) or laboratory staff (ELS, NTMWD) to that organization's PM. That organization's PM will forward information about the deficiencies to the WMS and SRBA PMs. The WMS PM in consultation with the WMS QAO and SRBA PM 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 PM in the project progress report. CAPs will be prepared by the WMS QAO in coordination with the WMS PM, and submitted to TCEQ CRP PM 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 organization's laboratory supervisor (ELS, NTMWD), who will make the determination and notify the WMS 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 WMS PM. The WMS PM, in consultation with the WMS QAO and SRBA PM, will make the determination to issue a CAP. The WMS QAO will include this information in a CAP. The WMS PM will submit the CAP with the Progress Report which is sent to the TCEQ CRP PM.

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. Specific requirements are outlined below. Field blanks are only collected by NTMWD for metals sampling. Acceptability of field QC samples for NTMWD metals samples are indicated in the Data Review Checklist (Appendix F).

Field blank

Field blanks are required for total metals-in-water samples when collected without sample equipment (i.e., as grab samples). For other types of samples, they are optional. A field blank is prepared in the field by filling a clean container with pure deionized water and appropriate preservative, if any, for the specific sampling activity being undertaken. Field blanks are used to assess contamination from field sources, such as airborne materials, containers, or preservatives. Field blanks for total metals-in-water samples will be collected at a frequency of one per day of sampling. Only those samples collected on dates with associated field blanks collected on the same day will be submitted to TCEQ.

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

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

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 24 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 in this section (e.g., sample duplicates, surrogates, internal standards, continuing calibration samples, interference check samples, positive control, negative control, and media blank), are run 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 will 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. The analyst(s) will 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 and is performed 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 and is performed 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 achieved by preparing 2 separate 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 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:

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

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.

For bacteriological parameters, precision is evaluated using the results from laboratory duplicates. Bacteriological duplicates are analyzed at 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.

$$|\text{Log A} - \text{Log B}| = \text{Log Range}$$

If the difference in logarithms is greater than the precision criterion, 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

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 acceptance criteria published in the mandated test method. If the matrix spike results are outside established criteria, the data for the analyte that failed in the parent sample is not acceptable for use under this project and will not be reported to TCEQ. The result from the parent sample associated with that failed matrix spike will be considered to have excessive analytical variability and will be qualified by the laboratory as not meeting project QC requirements. Depending on the similarities in composition of the samples in the batch, the SRBA 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 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 WMS and SRBA PMs, in consultation with the WMS 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 WMS PM and WMS QAO will be relied upon in evaluating results. Field blanks for trace elements and trace organics are scrutinized very closely. Field blank values exceeding the acceptability criteria will automatically invalidate the sample. 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 failure is reported to the appropriate laboratory's manager. The laboratory QM or QAO will discuss the failure with the organization's PM. The WMS PM, in consultation with the WMS QAO and SRBA PM, will make the determination to issue a CAP. The WMS QAO will include this information in a CAP. The WMS PM will submit the CAP with the Progress Report which is sent to the TCEQ CRP PM.

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 utilizes 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 WMS and SRBA, 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 SRBA, 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. Equipment maintenance is the responsibility of the operator at both WMS and NTMWD.

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 errors 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.

NTMWD calibration procedures are detailed in their YSI EXO1 Multiparameter Sonde SOP #38-067 (Revision 0.0, Effective 5/27/2022). Due to the size of their region, the frequency of monitoring, and the number of sondes used, NTMWD has found it necessary and beneficial to maintain standards in a clean calibration reservoir that is sealed between calibrations for up to a week to control cost and waste. Because of the chemically stable nature of the specific conductance and pH standards used for field sonde calibrations, the secondary source checks for specific conductance and pH 7, the TCEQ defined QC limits, and the SOP requirement to replace the standard if any QC failures occur, the NTMWD procedures have been determined to meet or exceed the SWQM Procedures. SOP #38-067 will be available upon request.

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

B8 Inspection/Acceptance of Supplies and Consumables

Supplies and consumables which affect the quality of the sampling and analysis programs are specified and approved for use by the LCRA ELS Quality Manager or NTMWD Laboratory Manager. Those items include, but are not limited to: sample bottles, calibration gases, reagents, hoses, materials for decontamination of sampling equipment, deionized water, and potable water. Sample containers are either new and purchased precleaned to EPA specifications or are cleaned to appropriate specifications by the laboratory. Calibration gases are purchased having known concentrations, and the documentation is maintained on file by the laboratory managers. Reagents are analytical grade or better. Hoses and sampling equipment are made of impervious materials that are suited for the materials being sampled. Deionized water used for rinsing sampling equipment between samples, is typically obtained from the laboratory, and is shown to be free of contamination through daily conductivity testing; monthly bacteria, pH, and residual Chlorine testing; and annual heavy metals testing. Refer to the laboratory QMs for all laboratory related items.

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, 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.

Precipitation data are obtained from USGS precipitation gauges located throughout the watershed. Data from the USGS gauge located nearest to the monitoring station will be used. These data will be submitted to the TCEQ under parameter codes 72053 Days Since Precipitation Event and 82554 Rainfall in 7 Days Inclusive Prior to Sampling.

B10 Data Management

Data Management Process

The SRBA CRP Database will be maintained and updated with data obtained from the SRBA CRP (routine and systematic stations, special studies, and flow studies). The process described below summarizes these procedures and guidelines.

All data to be stored in the SWQMIS will be submitted in the format specified in the latest version of the SWQM Data Management Reference Guide.

Water quality data collected through this monitoring program will be introduced into the SRBA database by either manual entry, or digital electronic files by the WMS DM. In each case, the data will be screened to ensure (1) transcription accuracy, and (2) that the data meets the quality criteria for that data type (e.g., were holding times exceeded, were reporting limits met) prior to its submission to the TCEQ CRP PM.

This data management process will be used as guidance for the collection, quality assurance and archiving of all data collected pursuant to the CRP. This plan has been developed after a full assessment of the human, data, and computer resource needs of the CRP as appropriate for the SRBA. It is anticipated that the types of data to be collected and archived in the future may change, as future data retrieval, analysis and presentation needs may change.

With respect to the management of data generated in the Sulphur River Basin CRP, the process begins with field sampling and ends with the data users with a typical line of transmission as follows:

1. Field Sampling
2. Sample Custodian
3. Lab Analyst
4. LCRA ELS, WMS PM, or NTMWD PM
5. WMS PM
6. WMS DM
7. WMS QAO
8. Transfer of Data to SRBA PM and TCEQ CRP PM
9. TCEQ CRP PM transfers data to TCEQ CRP DM
10. TCEQ CRP DM loads data into SWQMIS Production environment.

LCRA ELS

After the LCRA ELS PM has received data from the lab analyst, the PM screens the data to ensure accuracy and that the data meets the quality criteria for that data type. The LCRA ELS Quality Manager validates the analytical data by comparing the various quality control measurements and by recalculating a random selection of the results produced by each analyst submitting data. The LCRA ELS PM, using the lab's standard reporting format, will provide results to the SRBA and WMS PMs. The analytical laboratory will retain files of all quality

assurance verifications for five years in accordance with NELAP and make them available for inspection on request.

Field and flow data are submitted to the WMS PM, are validated by the WMS QAO, and are included in data deliverables to the TCEQ by the WMS DM.

Scanned field forms and copies of COC forms will be sent by the WMS PM to the WMS DM and WMS QAO for data screening and quality assurance and data formatting. This information will be quality checked by the WMS DM by comparing it with the appropriate CRP monitoring schedule to verify that the correct stations have been sampled, that the correct sets of measurements and samples have been collected, and that calibration procedures have been correctly applied. The WMS DM will be responsible for the review of all field and laboratory-generated data for consistency with QA criteria, for accuracy of data entry, and for timely transfer to TCEQ. The WMS DM will also be responsible for ensuring that all field reports, calibration records, and general information is maintained and properly filed.

Upon completion of the review and entry into an electronic file, the WMS DM sends the file to the WMS QAO for review. The WMS QAO reviews all data recorded on the field sheets, calibration logs, and from the laboratory against the electronic file. The WMS QAO notifies the WMS DM of any discrepancies. The WMS PM will perform a secondary review at the request of the WMS QAO. Upon approval by the WMS QAO, the WMS DM converts the quality-assured data into pipe-delimited text format which is submitted to the TCEQ PM for review. The TCEQ PM will submit the file to the TCEQ DM for review and loading into the SWQMIS database. Once these procedures have been completed, copies of all data reports and QA records (both paper and electronic) will be transferred from WMS to SRBA and retained for the periods described in Table A9.1.

Data will only be excluded from the SRBA data set files if it is determined to be erroneous or is found to have been collected in a manner that does not follow the TCEQ guidelines for data procurement. The WMS DM will alert the WMS PM to any abnormalities or apparent outliers. The WMS PM in consultation with the WMS QAO and SRBA PM will evaluate the data and determine if any statistical tests need to be performed to further evaluate the data. The suspect data will be recorded in the DM's QC data log, noting the reason for its exclusion. A summary will be provided in the data summary report, as well as any appropriate corrective actions.

Paper copies of all field sheets and calibration logs are maintained at the WMS offices in Sulphur Springs, Texas and transferred annually to the SRBA office where they are stored for the required duration defined in Table A9.1. Requests for data should be made to the SRBA PM.

NTMWD

Records managed by NTMWD are maintained electronically in the WIMS (Water Information Management System) and LIMS (Laboratory Information Management System). A minimum of 10% of the files are inspected by the NTMWD QAO and PM and a test user validator report is produced to verify that the format is correct, and that the dataset is reasonable. The NTMWD QAO converts the event/result files into the required format for inclusion in SWQMIS and transfers it to the WMS QAO and WMS DM. The WMS DM checks the test user validator report to see that it is reasonable based on the expected data and the data summary report. The WMS QAO reviews the data files, SWQMIS Validator Report, and the Data Summary. The Data Summary details missing or problem data. If changes are necessary, the WMS QAO notifies the NTMWD QAO for correction. Once complete, the WMS DM emails the data files, SWQMIS Validator Report, and the Data Summary to the TCEQ PM for further validation checks and approval for inclusion into SWQMIS.

Data Dictionary

Terminology and field descriptions are included in the 2019 DMRG, or most recent version. A table outlining the entities that will be used when submitting data under this QAPP is included below for the purpose of verifying which entity codes are included in this QAPP.

Monitoring Entity	Tag Prefix	Submitting Entity	Collecting Entity
Sulphur River Basin Authority	W	SU	
North Texas Municipal Water District	W	SU	NM
Water Monitoring Solutions, Inc.	W	SU	WM

Data Errors and Loss

The WMS PM, WMS QAO, and SRBA PM will be responsible for determining what data, if any, will be excluded from the SRBA CRP Database. For NTMWD, the NTMWD QAO and NTMWD laboratory manager will initially review any questions concerning analytical data. If a modification of the data originally reported is deemed necessary, documentation of the original data, the question concerning that data and the modified data along with the copies of the data change will be saved electronically. For WMS, the WMS QAO and LCRA ELS QM will initially review any questions concerning analytical data. If a modification of the data originally reported is deemed necessary, documentation of the original data, the question concerning that data and the modified data along with the copies of the data change will be saved electronically.

The WMS DM produces data files in Microsoft Excel formats, and transfers to the pipe-delimited text file format before submitting the data to the TCEQ. The file format utilized involves the established event and result file formats. Presently, the WMS DM manually reviews all data for the established minimum, maximum, AWRL limits set for each parameter by the TCEQ, and LOQ limits set for each parameter by the lab.

First, any values flagged during review will be checked against the laboratory report to see if there are transcription errors. If the values are correct, then an e-mail querying the validity of the value reported will be sent to the laboratory. Values that are verified as correct by the laboratory will be flagged as outliers within the data set. In addition to the review check, a minimum 10% check is done on all data sets by the WMS QAO prior to their conversion to text files. A data review checklist and data summary form (Appendix F) will be included with the submittal of the completed data set. This summary form includes data information and comments specific to the data set. File transfer and checking is initially the responsibility of the WMS QAO, and secondarily the WMS DM.

Preparation of data files is dependent on the use of forms and checklists, some of which are available in the appendices of this QAPP. These documents include: 1) Field documentation which contains all instrument calibration/standards records, field measurements, and site characteristics (Appendix D), 2) Field notes, 3) Laboratory documentation including analyst's comments on the condition of the sample and progress of the analysis, raw data, instrument printouts, results of calibration, QA checks, external and internal standards records, and SOPs, and 4) COC forms (Appendix E).

Examples of data deliverable forms and checklists can be found in Appendix F. Refer to QAPP Appendices as appropriate for Field and Laboratory Data Sheets, the Data Summary, etc.

Record Keeping and Data Storage

All data files and GIS data layers will be stored on the SRBA server and WMS computers. This includes all data files submitted to SRBA and/or WMS by NTMWD. A full backup of all WMS files is completed weekly and stored in a cloud-based server and on external drives. Electronic data and reports will be submitted to SRBA after the end of each quarter. All paper documents are scanned upon receipt and the paper documents are transferred to the SRBA annually. In addition, all data files and reports concerning the project are available to the PM at TCEQ. All data generated by NTMWD is also stored electronically in the NTMWD WIMS and LIMS.

The disaster recovery procedure consists of reinstalling the operation system and software either from the original software media, or from a disaster recovery CD that has been created and stored on site. Electronic files will be replaced from the weekly backup files.

Data Handling, Hardware, and Software Requirements

All data are stored on Microsoft Windows© based computers and manipulated using the Microsoft Office suite of programs. Files may be saved to Adobe Acrobat Portable Document Format (PDF) for storage. Laboratory data will be housed in Chemware© Horizon LIMS. Once reports are generated, PDF and Microsoft Excel copies will be delivered to the WMS PM. Lab data will be forwarded by the WMS PM to the WMS DM for QA checks. The WMS DM will transcribe and format the data per the most current version of the SWQM Data Management Reference Guide.

All field data except flow collected by WMS are recorded on paper field sheets. After collection, the documents are scanned and converted to PDF format. These files are then transferred to the WMS PM for archiving and

distribution to the WMS QAO and WMS DM as above. All field data collected by NTMWD are recorded electronically.

When flow is measured using the FlowTracker2, the system-generated file provides the total flow for each event. This information is saved as an external document in PDF format.

Information Resource Management Requirements

The information management specifications include TCEQ as well as SRBA and WMS internal information management controls. The TCEQ has the following data specification requirements: the Surface Water Quality Monitoring Data Management Reference Guide (DMRG) and GIS Policy (TCEQ OPP 8.11). Note that GPS certification is not required for positional data that will be used for photo interpolation in the Station Location (SLOC) request process.

Data will be managed in accordance with the TCEQ DMRG (most recent revision), and applicable SRBA 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 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	SRBA	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report
Monitoring Systems Audit of SRBA	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 provide corrective actions response to the TCEQ
Monitoring Systems Audit of Program Subparticipants	One audit of WMS prior to the expiration of the QAPP	SRBA	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	WMS will have 30 days to respond in writing to the SRBA PM. The SRBA PM will report problems to TCEQ in Progress Report.
Monitoring Systems Audit of Program Sub-participants	One audit of NTMWD prior to the expiration of the QAPP	WMS	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	NTMWD will have 30 days to respond in writing to WMS PM. The WMS PM will report problems to the SRBA PM in Progress Report. The SRBA PM will report problems to TCEQ in Progress Report.
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 provide corrective actions response to the TCEQ

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 samples to be discarded and re-collected. Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff, are communicated to the SRBA and WMS PMs (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 WMS PM, in consultation with the SRBA PM and WMS 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 PM both verbally and in writing in quarterly progress reports and by completion of a CAP.

Corrective Action

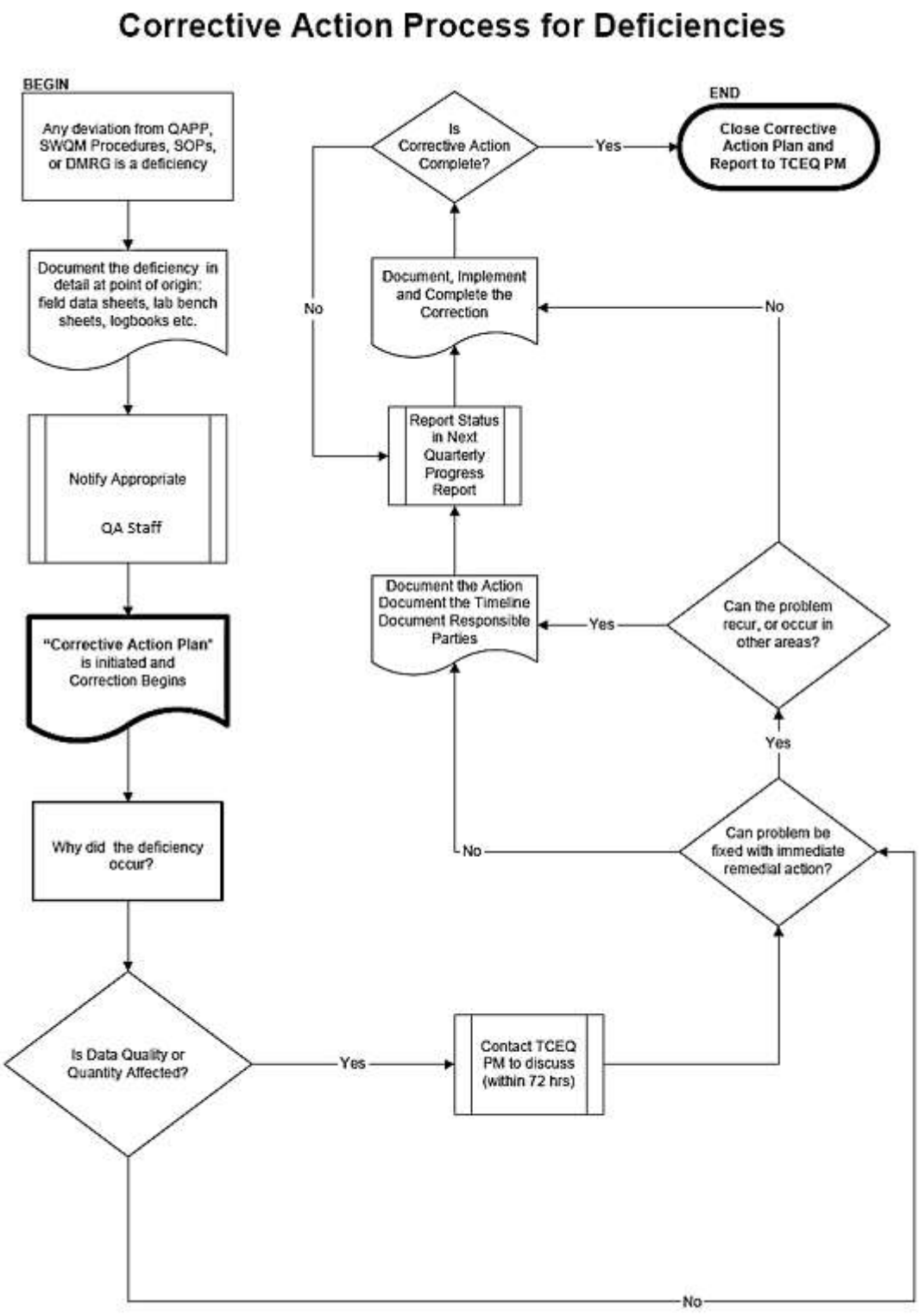
CAPs should:

- Identify the problem, nonconformity, or undesirable situation
- Identify immediate remedial actions if possible
- Identify the underlying cause(s) of the problem
- Describe the programmatic impact
- Identify whether the problem is likely to recur, or occur in other areas
- Assist in determining the need for corrective action and actions to prevent reoccurrence
- Employ 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 and action(s) to prevent reoccurrence

A flow chart has been developed to facilitate the process (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 WMS PM is responsible for ensuring that corrective actions have been implemented and tracks deficiencies and corrective actions. Records of audit findings and corrective actions are maintained by the WMS PM. 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
Non-Conformance	As needed	As needed	Field or Laboratory Staff WMS PM or QAO	SRBA PM TCEQ CRP PM
Monitoring Summary	Quarterly	By the 15th day of the month following the end of the quarter	WMS PM	SRBA PM TCEQ CRP PM
Monitoring Summary	Quarterly	By the 15th day of the month following the end of the quarter	NTMWD PM	WMS QAO SRBA PM
CRP Progress Report	Quarterly	December 15, 2023 March 15, 2024 June 15, 2024 September 15, 2024 December 15, 2024 March 15, 2025 June 15, 2025 August 15, 2025	WMS PM	SRBA PM TCEQ CRP PM
Monitoring Systems Audit Report of WMS	Once per biennium	With the following Quarterly Progress Report	SRBA PM	TCEQ CRP PM
Monitoring Systems Audit Report of NTMWD	Once per biennium	With the following Quarterly Progress Report	WMS PM	TCEQ CRP PM

Reports to SRBA Project Management

Each quarter, the WMS QAO will review QA laboratory results and field sheets. Reports with any corrective actions that occurred will be sent quarterly to the SRBA PM for review. The WMS QAO will then review and transmit these reports to the SRBA PM and TCEQ PM for their review. The LCRA ELS PM will submit data and QA/QC reports within 30 days of the receipt of samples for analysis to the SRBA and WMS PM. NTMWD will submit data packets including event/result text files, validator reports, and data review checklists to the WMS QAO and DM on a quarterly basis. After review by the WMS QAO and/or DM, this data will be submitted to the SRBA PM. For Aquatic Life Use monitoring, field forms will be transferred to the SRBA by WMS. The Biological Field Data Sheets (Appendix D) will be completed and submitted to the SRBA along with the event/result text and BLOB files.

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. The completed Biological Field Data Sheets (Appendix D) will be submitted to TCEQ in the formats required for event/result text and BLOB files.

Progress Report

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

Monitoring Systems Audit Report and Response

WMS will audit sub-participants (i.e. NTMWD) once per biennium. Following any audit performed by WMS, a report of findings, recommendations and response is sent to SRBA for review and inclusion with the quarterly progress report. SRBA will audit WMS once per biennium. Following any audit performed, a report of findings, recommendations and response will be sent to the TCEQ in the quarterly progress report.

Data Summary

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

Reports by TCEQ Project Management

Contractor Evaluation

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

D1 Data Review, Verification, and Validation

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

D3 Reconciliation with User Requirements

Data produced in this project, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be analyzed and reconciled with project data quality requirements. Data 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 A7WM.1-9 and A7NM.1-5)

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

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 A7WM.1 Measurement Performance Specifications for SRBA (data collected by WMS)					
Field Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
TEMPERATURE, WATER (DEGREES CENTIGRADE) *	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	Field
TEMPERATURE, AIR (DEGREES CENTIGRADE)	DEG C	air	NA	00020	Field
RESERVOIR ACCESS NOT POSSIBLE LEVEL TOO LOW ENTER 1 IF REPORTING	NS	other	TCEQ Drought Guidance	00051	Field
RESERVOIR STAGE (FEET ABOVE MEAN SEA LEVEL) **	FT ABOVE MSL	water	TWDB	00052	Field
RESERVOIR PERCENT FULL**	% RESERVOIR CAPACITY	water	TWDB	00053	Field
TRANSPARENCY, SECCHI DISC (METERS)*	meters	water	TCEQ SOP V1	00078	Field
SPECIFIC CONDUCTANCE, FIELD (US/CM @ 25C) *	µs/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	Field
OXYGEN, DISSOLVED (MG/L) *	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	Field
PH (STANDARD UNITS) *	s.u.	water	EPA 150.1and 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
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 DIRECTION (1=N, 2=S, 3=E, 4=W, 5=NE, 6=SE, 7=NW, 8=SW)	NU	other	NA	89010	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
WATER COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OTHER	NU	water	NA	89969	Field
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGGS, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER (WRITE IN COMMENTS))	NU	water	NA	89971	Field
OXYGEN, DISSOLVED (PERCENT OF SATURATION)	% SAT	water	TCEQ SOP V1	00301	Field
WATER CLARITY, 1=EXCELLENT 2=GOOD 3=FAIR 4=POOR	NU	water	NA	20424	Field
RAINFALL IN 7 DAYS INCLUSIVE PRIOR TO SAMP. (IN)	IN	Other	NA	82554	Field

* Reporting to be consistent with SWQM guidance and based on measurement capability.
** As published by the Texas Water Development Board on their website https://www.waterdatafortexas.org/reservoirs/statewide
*** To be routinely reported when collecting data from perennial pools.
References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.
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 A7WM.2 Measurement Performance Specifications for SRBA (data collected by WMS)

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=H igh,6=Dry	NU	water	TCEQ SOP V1	01351	Field
STREAM FLOW ESTIMATE (CFS)	cfs	Water	TCEQ SOP V1	74069	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
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.
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 A7WM.3 Measurement Performance Specifications for SRBA (data collected by WMS)										
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**
ALKALINITY, TOTAL (MG/L AS CACO3)	mg/L	water	SM 2320 B	00410	20	20	NA	20	NA	LCRA ELS
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540 D	00530	5	1	NA	NA	NA	LCRA ELS
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	EPA 350.1 Rev. 2.0 (1993)	00610	0.1	0.02	70-130	20	80-120	LCRA ELS
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.02	70-130	20	80-120	LCRA ELS
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.02	70-130	20	80-120	LCRA ELS
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2 Rev. 2.0 (1993)	00625	0.2	0.2	70-130	20	80-120	LCRA ELS
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 365.4	00665	0.06	0.02	70-130	20	80-120	LCRA ELS
CARBON, TOTAL ORGANIC, NPOC (TOC), MG/L	mg/L	water	SM 5310 C	00680	2	0.5	NA	NA	NA	LCRA ELS
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	5	70-130	20	80-120	LCRA ELS
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	5	70-130	20	80-120	LCRA ELS
PHEOPHYTIN-A UG/L FLUOROMETRIC METHOD	µg/L	water	EPA 445.0	32213	3	2	NA	NA	NA	LCRA ELS
CHLOROPHYLL-A, FLUOROMETRIC METHOD, UG/L	µg/L	water	EPA 445.0	70953	3	2	NA	20	80-120	LCRA ELS

References:

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

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.

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 A7WM.4 Measurement Performance Specifications for SRBA (data collected by WMS)										
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	SM 9223-B[xx]	31699	1	1	NA	0.5[x]	NA	LCRA ELS
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	LCRA ELS

[x] 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.

[xx] *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.

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.
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 A7WM.5 Measurement Performance Specifications for SRBA (data collected by WMS)					
24 Hour Parameters in Water					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
TEMPERATURE, WATER (DEGREES CENTIGRADE), 24HR AVG	DEG C	Water	TCEQ SOP V1	00209	Field
WATER TEMPERATURE, DEGREES CENTIGRADE, 24HR MAX	DEG C	Water	TCEQ SOP V1	00210	Field
TEMPERATURE, WATER (DEGREES CENTIGRADE) 24HR MIN	DEG C	Water	TCEQ SOP V1	00211	Field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR AVG	µS/cm	Water	TCEQ SOP V1	00212	Field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MAX	µS/cm	Water	TCEQ SOP V1	00213	Field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MIN	µS/cm	Water	TCEQ SOP V1	00214	Field
PH, S.U., 24HR MAXIMUM VALUE	std. units	Water	TCEQ SOP V1	00215	Field
PH, S.U., 24HR, MINIMUM VALUE	std. units	Water	TCEQ SOP V1	00216	Field
WATER TEMPERATURE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00221	Field
SPECIFIC CONDUCTANCE, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	00222	Field
pH, # OF MEASUREMENTS IN 24- HRS	NU	Water	TCEQ SOP V1	00223	Field
DISSOLVED OXYGEN, 24-HOUR MIN. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89855	Field
DISSOLVED OXYGEN, 24-HOUR MAX. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89856	Field
DISSOLVED OXYGEN, 24-HOUR AVG. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89857	Field
DISSOLVED OXYGEN, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	89858	Field

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.
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 A7WM.6 Measurement Performance Specifications for SRBA (data collected by WMS)					
Habitat Parameters for Aquatic Life Monitoring					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	Water	TCEQ SOP V2	00061	Field
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888	Field
STREAM TYPE; 1=PERENNIAL 2=INTERMITTENT S/PERENNIAL POOLS 3=INTERMITTENT 4=UNKNOWN	NU	Water	NA/Calculation	89821	Field
STREAMBED SLOPE (M/KM)	M/KM	Other	NA/Calculation	72051	Field
AVERAGE PERCENTAGE INSTREAM COVER	%	Other	TCEQ SOP V2	84159	Field
STREAM ORDER	NU	Water	TCEQ SOP V2	84161	Field
NUMBER OF LATERAL TRANSECTS MADE	NU	Other	TCEQ SOP V2	89832	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	Other	TCEQ SOP V2	89835	Field
TOTAL NUMBER OF STREAM BENDS	NU	Other	TCEQ SOP V2	89839	Field
NUMBER OF WELL DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89840	Field
NUMBER OF MODERATELY DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89841	Field
NUMBER OF POORLY DEFINED STREAM BENDS	NU	Other	TCEQ SOP V2	89842	Field
TOTAL NUMBER OF RIFFLES	NU	Other	TCEQ SOP V2	89843	Field
DOMINANT SUBSTRATE TYPE (1=CLAY, 2=SILT, 3=SAND, 4=GRAVEL, 5=COBBLE, 6=BOULDER, 7=BEDROCK, 8=OTHER)	NU	Sediment	TCEQ SOP V2	89844	Field
AVERAGE PERCENT OF SUBSTRATE GRAVEL SIZE OR LARGER	%	Other	TCEQ SOP V2	89845	Field
AVERAGE STREAM BANK EROSION (%)	%	Other	TCEQ SOP V2	89846	Field
AVERAGE STREAM BANK SLOPE (DEGREES)	deg	Other	TCEQ SOP V2	89847	Field
HABITAT FLOW STATUS, 1=NO FLOW, 2=LOW,3=MOD,4=HIGH	NU	Other	TCEQ SOP V2	89848	Field
AVERAGE PERCENT TREES AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89849	Field
AVERAGE PERCENT SHRUBS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89850	Field
AVERAGE PERCENT GRASS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89851	Field
AVERAGE PERCENT CULTIVATED FIELDS AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89852	Field
AVERAGE PERCENT OTHER AS RIPARIAN VEGETATION	%	Other	TCEQ SOP V2	89853	Field
AVERAGE PERCENTAGE OF TREE CANOPY COVERAGE	%	Other	TCEQ SOP V2	89854	Field
DRAINAGE AREA ABOVE MOST DOWNSTREAM TRANSECT^	km2	Other	TCEQ SOP V2	89859	Field
REACH LENGTH OF STREAM EVALUATED (M)	m	Other	NA/Calculation	89884	Field
AVERAGE STREAM WIDTH (METERS)	M	Other	TCEQ SOP V2	89861	Field
AVERAGE STREAM DEPTH (METERS)	M	Other	TCEQ SOP V2	89862	Field
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)***	M	Other	TCEQ SOP V2	89864	Field
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)***	M	Other	TCEQ SOP V2	89865	Field
AVERAGE WIDTH OF NATURAL RIPARIAN VEGETATION (M)	M	Other	TCEQ SOP V2	89866	Field
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON LEFT BANK (M)	M	Other	NA/Calculation	89872	Field
AVERAGE WIDTH OF NATURAL RIPARIAN BUFFER ON RIGHT BANK (M)	m	Other	NA/Calculation	89873	Field
AESTHETICS OF REACH (1=WILD 2=NAT. 3=COMM. 4=OFF.)	NU	Other	TCEQ SOP V2	89867	Field
NUMBER OF STREAM COVER TYPES	NU	Other	TCEQ SOP V2	89929	Field
LAND DEVELOP IMPACT (1=UNIMP,2=LOW,3=MOD,4=HIGH)	NU	Other	TCEQ SOP V2	89962	Field
RIPARIAN VEGETATION %; LEFT BANK - TREES	%	Other	NA/Calculation	89822	Field
RIPARIAN VEGETATION %; RIGHT BANK - TREES	%	Other	NA/Calculation	89823	Field
RIPARIAN VEGETATION %; LEFT BANK SHRUBS	%	Other	NA/Calculation	89824	Field
RIPARIAN VEGETATION %; RIGHT BANK - SHRUBS	%	Other	NA/Calculation	89825	Field
RIPARIAN VEGETATION %: LEFT BANK - GRASSES OR FORBS	%	Other	NA/Calculation	89826	Field
RIPARIAN VEGETATION %; RIGHT BANK - GRASSES OR FORBS	%	Other	NA/Calculation	89827	Field
RIPARIAN VEGETATION %: LEFT BANK - CULTIVATED FIELDS	%	Other	NA/Calculation	89828	Field
RIPARIAN VEGETATION %: RIGHT BANK - CULTIVATED FIELDS	%	Other	NA/Calculation	89829	Field
RIPARIAN VEGETATION %: LEFT BANK – OTHER	%	Other	NA/Calculation	89830	Field
RIPARIAN VEGETATION %: RIGHT BANK - OTHER	%	Other	NA/Calculation	89871	Field

Habitat Parameters for Aquatic Life Monitoring					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
AVAILABLE INSTREAM COVER HQI SCORE: 4=ABUNDANT 3=COMMON 2=RARE 1=ABSENT	NU	Other	NA/Calculation	89874	Field
BOTTOM SUBSTRATE STABILITY HQI SCORE: 4=STABLE 3=MODERATELY STABLE 2=MODERATELY UNSTABLE 1=UNSTABLE	NU	Other	NA/Calculation	89875	Field
NUMBER OF RIFFLES HQI SCORE: 4=ABUNDANT 3=COMMON 2=RARE 1=ABSENT	NS	Other	NA/Calculation	89876	Field
DIMENSIONS OF LARGEST POOL HQI SCORE: 4=LARGE 3=MODERATE 2=SMALL 1=ABSENT ***	NU	Other	NA/Calculation	89877	Field
CHANNEL FLOW STATUS HQI SCORE: 3=HIGH 2=MODERATE 1=LOW 0=NO FLOW	NU	Other	NA/Calculation	89878	Field
BANK STABILITY HQI SCORE: 3=STABLE 2=MODERATELY STABLE 1=MODERATELY UNSTABLE 0=UNSTABLE	NU	Other	NA/Calculation	89879	Field
CHANNEL SINUOSITY HQI SCORE: 3=HIGH 2=MODERATE 1=LOW 0=NONE	NU	Other	NA/Calculation	89880	Field
RIPARIAN BUFFER VEGETATION HQI SCORE: 3=EXTENSIVE 2=WIDE 1=MODERATE 0=NARROW	NU	Other	NA/Calculation	89881	Field
AESTHETICS OF REACH HQI SCORE: 3=WILDERNESS 2=NATURAL AREA 1=COMMON SETTING 0=OFFENSIVE	NU	Other	NA/Calculation	89882	Field
HQI TOTAL SCORE	NU	Other	NA/Calculation	89883	Field
LENGTH OF STREAM EVALUATED (KM)	KM	Other	NA/Calculation	89860	Field
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961	Field
POOL LENGTH, METERS***	meters	other	TCEQ SOP V2	89869	Field
% POOL COVERAGE IN 500 METER REACH***	%	other	TCEQ SOP V2	89870	Field
NO FLOW ISOLATED POOL: LARGEST POOL MAX WIDTH (M)***	M	Other	NA/Calculation	89908	Field
NO FLOW ISOLATED POOL: LARGEST POOL MAX LENGTH (M)***	M	Other	NA/Calculation	89909	Field
NO FLOW ISOLATED POOL: LARGEST POOL MAX DEPTH (M)***	M	Other	NA/Calculation	89910	Field
NO FLOW ISOLATED POOL: SMALLEST POOL MAX DEPTH (M)***	M	Other	NA/Calculation	89911	Field
NO FLOW ISOLATED POOL: SMALLEST POOL MAX WIDTH (M)***	M	Other	NA/Calculation	89912	Field
NO FLOW ISOLATED POOL: SMALLEST POOL MAX LENGTH (M)***	M	Other	NA/Calculation	89913	Field
NO FLOW ISOLATED POOLS: NUMBER OF POOLS EVALUATED ***	NU	Other	NA/Calculation	89914	Field

^ From USGS map.
*** To be reported when collecting data from perennial pools.

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.
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 A7WM.7 Measurement Performance Specifications for SRBA (data collected by WMS)					
Quantitative Benthic Parameters for Aquatic Life Monitoring					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
STREAM ORDER	NU	Water	TCEQ SOP, V1	84161	Field
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888	Field
QUANTITATIVE PROTOCOLS REGIONAL BENTHIC MACROINVERTEBRATE IBI SCORE	NS	Other	NA/Calculation	90085	Field
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	Field
UNDERCUT BANK AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89921	Field
OVERHANGING BRUSH AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89922	Field
GRAVEL BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89923	Field
SAND BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89924	Field
SOFT BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89925	Field
MACROPHYTE BED AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89926	Field
SNAGS AND BRUSH AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89927	Field
BEDROCK STREAMBED AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89928	Field
MESH SIZE, ANY NET OR SIEVE, AVERAGE BAR (CM)	cm	Other	TCEQ SOP V2	89946	Field
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	Field
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961	Field
BENTHOS ORGANISMS -NONE PRESENT (0=NONE PRESENT)	NS	Other	TCEQ SOP V2	90005	Field
BENTHIC GRAZERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90020	Field
BENTHIC GATHERERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90025	Field
BENTHIC FILTERERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90030	Field
TOTAL TAXA RICHNESS, BENTHOS	NU	Other	TCEQ SOP V2	90055	Field
NUMBER OF DIPTERA TAXA	NU	Other	TCEQ SOP V2	90056	Field
NUMBER OF EPHEMEROPTERA TAXA	NU	Other	TCEQ SOP V2	90057	Field
TOTAL NUMBER OF INTOLERANT TAXA, BENTHOS	NU	Other	TCEQ SOP V2	90058	Field
EPT, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90060	Field
CHIRONOMIDAE, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90062	Field
BENTHIC SHREDDERS (% OF COMMUNITY)	%	Other	TCEQ SOP V2	90035	Field
TOTAL # OF FAMILIES IN BENTHIC SAMPLE	NU	Other	TCEQ SOP V2	90012	Field
TOLERANT BENTHOS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90066	Field
DOMINANT 3 TAXA, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90067	Field
TOTAL # OF BENTHIC GENERA IN SAMPLE	NU	Other	TCEQ SOP V2	90011	Field
Species Enumeration	#	Benthics	NA/Calculation	Various	WMS

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.
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 A7WM.8 Measurement Performance Specifications for SRBA (data collected by WMS)					
Qualitative Benthic Parameters for Aquatic Life Monitoring					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
STREAM ORDER	NU	Water	TCEQ SOP, V1	84161	Field
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888	Field
RAPID BIOASSESSMENT PROTOCOLS BENTHIC MACROINVERTEBRATE IBI SCORE	NS	Other	NA/Calculation	90081	Field
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	Field
KICKNET EFFORT, MINUTES KICKED (MIN.)	min.	Other	TCEQ SOP V2	89904	Field
NUMBER OF INDIVIDUALS IN BENTHIC SAMPLE	NU	Other	TCEQ SOP V2	89906	Field
UNDERCUT BANK AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89921	Field
OVERHANGING BRUSH AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89922	Field
GRAVEL BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89923	Field
SAND BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89924	Field
SOFT BOTTOM AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89925	Field
MACROPHYTE BED AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89926	Field
SNAGS AND BRUSH AT COLLECTION POINT (%)	%	Other	TCEQ SOP V2	89927	Field
BEDROCK STREAMBED AT COLLECTION POINT (%)	%	Sediment	TCEQ SOP V2	89928	Field
MESH SIZE, ANY NET OR SIEVE, AVERAGE BAR (CM)	cm	Other	TCEQ SOP V2	89946	Field
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	Field
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961	Field
BENTHOS ORGANISMS -NONE PRESENT (0=NONE PRESENT)	NS	Other	TCEQ SOP V2	90005	Field
HILSENHOFF BIOTIC INDEX (HBI)	NU	Other	TCEQ SOP V2	90007	Field
NUMBER OF EPT INDEX	NU	Other	TCEQ SOP V2	90008	Field
DOMINANT BENTHIC FUNCTIONAL FEEDING GRP, % OF INDIVIDUALS	%	Other	TCEQ SOP V2	90010	Field
BENTHIC GATHERERS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90025	Field
BENTHIC PREDATORS, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90036	Field
DOMINANT TAXON, BENTHOS PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90042	Field
RATIO OF INTOLERANT TO TOLERANT TAXA, BENTHOS	NU	Other	TCEQ SOP V2	90050	Field
NUMBER OF NON-INSECT TAXA	NU	Other	TCEQ SOP V2	90052	Field
ELMIDAE, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90054	Field
TOTAL TAXA RICHNESS, BENTHOS	NU	Other	TCEQ SOP V2	90055	Field
CHIRONOMIDAE, PERCENT OF INDIVIDUALS	%	Other	TCEQ SOP V2	90062	Field
PERCENT OF TOTAL TRICHOPTERA INDIVIDUALS AS HYDROPSYCHIDAE	%	Other	TCEQ SOP V2	90069	Field
TOTAL # OF BENTHIC GENERA IN SAMPLE	NU	Other	TCEQ SOP V2	90011	Field
BENTHIC SHREDDERS (% OF COMMUNITY)	%	Other	TCEQ SOP V2	90035	Field
TOTAL # OF FAMILIES IN BENTHIC SAMPLE	NU	Other	TCEQ SOP V2	90012	Field
DIP NET EFFORT, AREA SWEPT (SQ. METER)	m2	Other	TCEQ SOP V2	89902	Field
KICKNET EFFORT, AREA KICKED (SQ. METER)	m2	Other	TCEQ SOP V2	89903	Field
Species Enumeration	#	Benthics	NA/Calculation	Various	WMS

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.
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 A7WM.9 Measurement Performance Specifications for SRBA (data collected by WMS)					
Nekton Parameters for Aquatic Life Monitoring					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
STREAM ORDER	NU	Water	TCEQ SOP V1	84161	Field
NEKTON TEXAS REGIONAL IBI SCORE	NS	Other	NA/Calculation	98123	Field
BIOLOGICAL DATA	NS	Other	NA/Calculation	89888	Field
SEINE, MINIMUM MESH SIZE, AVERAGE BAR, NEKTON, IN	IN	Other	TCEQ SOP V2	89930	Field
SEINE, MAXIMUM MESH SIZE, AVG BAR, NEKTON, INCH	IN	Other	TCEQ SOP V2	89931	Field
NET LENGTH (METERS)	M	Other	TCEQ SOP V2	89941	Field
ELECTROFISHING METHOD 1=BOAT 2=BACKPACK 3=TOTEBARGE	NU	Other	TCEQ SOP V2	89943	Field
ELECTROFISH EFFORT, DURATION OF SHOCKING (SEC)	SEC	Other	TCEQ SOP V2	89944	Field
SEINING EFFORT (# OF SEINE HAULS)	NU	Other	TCEQ SOP V2	89947	Field
COMBINED LENGTH OF SEINE HAULS (METERS)	M	Other	TCEQ SOP V2	89948	Field
SEINING EFFORT, DURATION (MINUTES)	MIN	Other	TCEQ SOP V2	89949	Field
ECOREGION LEVEL III (TEXAS ECOREGION CODE)	NU	Other	TCEQ SOP V1	89961	Field
AREA SEINED (SQ METERS)	M2	Other	TCEQ SOP V2	89976	Field
NUMBER OF SPECIES, FISH	NU	Other	TCEQ SOP V2	98003	Field
NEKTON ORGANISMS-NONE PRESENT (0=NONE PRESENT)	NS	Other	TCEQ SOP V2	98005	Field
TOTAL NUMBER OF SUNFISH SPECIES	NU	Other	TCEQ SOP V2	98008	Field
TOTAL NUMBER OF INTOLERANT SPECIES, FISH	NU	Other	TCEQ SOP V2	98010	Field
PERCENT OF INDIVIDUALS AS OMNIVORES, FISH	%	Other	TCEQ SOP V2	98017	Field
PERCENT OF INDIVIDUALS AS INVERTIVORES, FISH	%	Other	TCEQ SOP V2	98021	Field
PERCENT OF INDIVIDUALS AS PISCIVORES, FISH	%	Other	TCEQ SOP V2	98022	Field
PERCENT OF INDIVIDUALS WITH DISEASE OR ANOMALY	%	Other	TCEQ SOP V2	98030	Field
TOTAL NUMBER OF NATIVE CYPRINID SPECIES	NU	Other	TCEQ SOP V2	98032	Field
PERCENT INDIVIDUALS AS NON-NATIVE FISH SPECIES (% OF COMMUNITY)	%	Other	TCEQ SOP V2	98033	Field
TOTAL NUMBER OF INDIVIDUALS SEINING	NU	Other	TCEQ SOP V2	98039	Field
TOTAL NUMBER OF INDIVIDUALS ELECTROFISHING	NU	Other	TCEQ SOP V2	98040	Field
TOTAL NUMBER OF BENTHIC INVERTIVORE SPECIES	NU	Other	TCEQ SOP V2	98052	Field
TOTAL NUMBER OF BENTHIC FISH SPECIES	NU	Other	TCEQ SOP V2	98053	Field
NUMBER OF INDIVIDUALS PER SEINE HAUL	NU	Other	TCEQ SOP V2	98062	Field
NUMBER OF INDIVIDUALS PER MINUTE ELECTROFISHING	NU	Other	TCEQ SOP V2	98069	Field
PERCENT INDIVIDUALS AS TOLERANT FISH SPECIES (EXCLUDING WESTERN MOSQUITOFISH)	%	Other	TCEQ SOP V2	98070	Field
TOTAL NUMBER OF SUCKER SPECIES	NU	Other	TCEQ SOP V2	98009	Field
PERCENT OF INDIVIDUALS AS HYBRIDS	%	Other	TCEQ SOP V2	98024	Field
TOTAL NUMBER OF INDIVIDUALS IN SAMPLE, FISH	NU	Other	TCEQ SOP V2	98023	Field
PERCENT OF INDIVIDUALS AS TOLERANTS, FISH	%	Other	TCEQ SOP V2	98016	Field
TOTAL NUMBER OF DARTER SPECIES	NU	Other	TCEQ SOP V2	98004	Field
Species Enumeration	#	Nekton	NA/Calculation	Various	Field

References:

United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.
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 A7NM.1 Measurement Performance Specifications for SRBA (data collected by NTMWD)					
Field Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
TEMPERATURE, WATER (DEGREES CENTIGRADE)*	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	Field
TEMPERATURE, AIR (DEGREES CENTIGRADE)	DEG C	air	NA	00020	Field
TRANSPARENCY, SECCHI DISC (METERS)*	meters	water	TCEQ SOP V1	00078	Field
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)*	µs/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	Field
OXYGEN, DISSOLVED (MG/L)*	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	Field
PH (STANDARD UNITS)*	s.u	water	EPA 150.1 and 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 Storage (Acre-Feet) **	Acre-Feet	water	TWDB	00054	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
WIND DIRECTION (1=N, 2=S, 3=E, 4=W, 5=NE, 6=SE, 7=NW, 8=SW)	NU	other	NA	89010	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
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGGS, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER (WRITE IN COMMENTS))	NU	water	NA	89971	Field
WATER CLARITY, 1=EXCELLENT 2=GOOD 3=FAIR 4=POOR	NU	water	TCEQ SOP V1	20424	Field
WATER COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OTHER	NU	water	NA	89969	Field

* Reporting to be consistent with SWQM guidance and based on measurement capability.
** As published by the Texas Water Development Board on their website https://www.waterdatafortexas.org/reservoirs/statewide
*** To be routinely reported when collecting data from perennial pools.
References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.
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 A7NM.2 Measurement Performance Specifications for SRBA (data collected by NTMWD)					
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=H igh,6=Dry	NU	water	TCEQ SOP V1	01351	Field
STREAM FLOW ESTIMATE (CFS)	cfs	Water	TCEQ SOP V1	74069	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
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.
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 A7NM.3 Measurement Performance Specifications for SRBA (data collected by NTMWD)										
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**
ALKALINITY, TOTAL (MG/L AS CACO3)	mg/L	water	SM 2320 B	00410	20	20	NA	20	NA	NTMWD
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540 D	00530	5	2.5	NA	20	NA	NTMWD
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	EPA 350.1	00610	0.1	0.1	70-130	20	80-120	NTMWD
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 353.2 or 300.0	00615	0.05	0.02	70-130	20	80-120	NTMWD
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 or Calculation	00620	0.05	0.02 0.05	70-130	20	80-120	NTMWD
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	NTMWD
NITRITE PLUS NITRATE, TOTAL ONE LAB DETERMINED VALUE (MG/L AS N)	mg/L	water	EPA 353.2	00630	0.05	0.05	70-130	20	80-120	NTMWD
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 365.1 or 365.3	00665	0.06	0.02	70-130	20	80-120	NTMWD
CARBON, TOTAL ORGANIC, NPOC (TOC), MG/L	mg/L	water	SM 5310 C	00680	2	0.5	70-130	20	80-120	NTMWD
HARDNESS, TOTAL (MG/L AS CACO3)*	mg/L	water	SM 2340 C	00900	5	5	NA	20	80-120	NTMWD
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0	00940	5	1	70-130	20	90-110	NTMWD
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0	00945	5	1	70-130	20	90-110	NTMWD
CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH	µg/L	water	SM 10200 H	32211	3	3	70-130	20	80-120	NTMWD
PHEOPHYTIN-A UG/L SPECTROPHOTOMETRIC ACID. METH.	µg/L	water	SM 10200 H	32218	3	3	NA	NA	NA	NTMWD
RESIDUE, TOTAL FILTRABLE (DRIED AT 180C) (MG/L)	mg/L	water	SM 2540 C	70300	10	10	NA	20	80-120	NTMWD
TURBIDITY,LAB NEPHELOMETRIC TURBIDITY UNITS, NTU	NTU	water	SM 2130 B	82079	0.5	0.1	70-130	20	80-120	NTMWD

*Hardness is not used for regulatory purposes but is used to assess metals in water at inland sites (estuarine sites do not require hardness analysis).
References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.
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 A7NM.4 Measurement Performance Specifications for SRBA (data collected by NTMWD)										
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 [xx]	31699	1	1	NA	0.5[x]	NA	NTMWD
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	NTMWD

[x] 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.

[xx] 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.

References:

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

U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136

American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.

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).

NM – North Texas Municipal Water District Notes

1. This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.
2. E. coli samples analyzed by SM 9223-B should always be processed as soon as possible and within eight hours. When transport conditions necessitate delays in delivery longer than six hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

References:

1. United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
2. American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)
3. TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, 2012 (RG-415).
4. TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

TABLE A7NM.5 Measurement Performance Specifications for SRBA (data collected by NTMWD)										
Total Metals in Water										
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**TCEQ AWRL**	**LOQ**	**LOQ Check Sample %Rec**	**Log Difference of Duplicates**	**Bias %Rec. of LCS**	**Lab**
IRON, TOTAL (µg/L AS FE)	µg/L	Water	EPA 200.8	01045	300	200	70-130	20	80-120	NTMWD
MANGANESE, TOTAL (µg/L AS MN)	µg/L	Water	EPA 200.8	01055	50	1	70-130	20	80-120	NTMWD

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, 24th Edition, 2022.

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.
- Systematic, regularly scheduled short-term monitoring to screen water bodies for issues.

Task Description: The Performing Party will make the basin-wide water quality monitoring plan its primary focus for the biennium.

The Performing Party will complete the following subtasks:

Monitoring Description – Based upon the input from the Sulphur River Basin Steering Committee and through the Coordinated Monitoring process, a minimum of ten routine stations will be monitored quarterly for field parameters, flow (where applicable), bacteria, and conventional water chemistry by the Performing Party in FY 2024. Diel studies consisting of pH, dissolved oxygen, conductivity, and temperature, along with instantaneous flow measurements (when possible) and field observations will be conducted four times per year at a minimum of two stations. Aquatic Life Monitoring will be conducted on at least one station in FY 2024. Additional details concerning the monitoring activities conducted by the Performing Party are outlined in the FY 2024-2025 QAPP.

In FY 2025, a similar monitoring effort is anticipated. Changes to the monitoring schedule will be made after considering input from the Sulphur River Basin Steering Committee, and through the Coordinated Monitoring Process. The specific locations, parameters, and sampling frequencies for FY 2025 will be provided in the Sulphur River Basin QAPP Appendix B monitoring schedule.

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 FY2024-2025 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 CMS (http://cms.lcra.org) and communicated to meeting attendees. Changes to monitoring schedules that occur during the year will be entered into the CMS and communicated to meeting attendees. All requirements related to meetings will be followed and required meetings will be conducted in-person or via TCEQ approved virtual format.

Monitoring Activities - Each progress report will include a description of activities including all types of monitoring performed, number of sampling events, and the types of monitoring conducted in the quarter. The Performing Party will complete and submit a monitoring activities report as an attachment to the progress report.

Deliverables and Due Dates:

September 1, 2023 through August 31, 2024

A. Conduct water quality monitoring, submit monitoring activities report, summarize activities, and submit with progress report – December 15, 2023; March 15 and June 15, 2024

B. Coordinated Monitoring Meeting – between March 15 and April 30, 2024

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, 2024

September 1, 2024 through August 31, 2025

A. Conduct water quality monitoring, submit monitoring activities report, summarize activities, and submit with progress report – September 15 and December 15, 2024; March 15 and June 15 and August 15, 2025

B. Coordinated Monitoring Meeting – between March 15 and April 30, 2025

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, 2025

Sample Design Rationale FY 2024

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

The goal of this portion of the Clean Rivers Program is to provide the appropriate, quality assured data to allow continuing assessment and management of water quality in the Sulphur River Basin. The Long-Term Goals of the Clean Rivers Program include the following:

- Establish a long-term monitoring program for the basin,
- Focus on and provide for local participation in monitoring,
- Provide reliable information to the public to enhance awareness and knowledge of water quality conditions in the basin,
- Monitor and evaluate water quality trends,
- Identify the nature and source of water quality problems that result in impairments,
- Evaluate the applicability of State Surface Water Quality Criteria to specific water bodies in the basin,
- Evaluate permit requirements with respect to water quality conditions and trends in the basins, and,
- Provide data to support the development of cost-effective water quality management programs.

For WMS in FY 2024, thirteen routine stations will be monitored, and 24-hour diel monitoring will be performed at two stations on a quarterly basis. Aquatic life monitoring will be conducted at two stations.

For NTMWD in FY 2024, four routine stations will be monitored on a monthly basis.

All results will be submitted to the TCEQ for inclusion in the SWQMIS database.

Routine Monitoring

Routine monitoring stations are situated to provide long term water quality data at locations draining major sub-watershed and important river segment reaches within the Sulphur River Basin. The primary objective of collecting comparable water quality data over a substantial period of time is to identify temporal trends and to differentiate water quality characteristics, impairments and possible causes over discrete sub-watershed areas.

Parameters to be measured or sampled are listed in Tables A7 in Appendix A. Field parameters and conventional water samples for laboratory analysis will be collected regardless of the conditions encountered. Field parameters include the measurements of water temperature, DO, specific conductance, pH, and transparency. Conventional laboratory samples will be analyzed for total suspended solids, alkalinity, sulfate, chloride, total phosphorus, ammonia nitrogen, nitrate nitrogen, nitrite nitrogen, total Kjeldahl nitrogen, total organic carbon, pheophytin, and chlorophyll *a*. Bacteriological samples will be collected for laboratory analysis and will consist of *E. coli* to be collected during all conditions encountered.

WMS will perform all monitoring activities shown in this document and on the Coordinated Monitoring Schedule identified by WM as the collecting entity (CE) in Table B1.1. NTMWD will perform all monitoring activities identified by NM as the collecting entity (CE) in Table B1.1.

Biased to Season Monitoring

Diel monitoring will be conducted by WMS at two stream stations. Diel monitoring includes sampling on Stouts Creek at US 67 (Station 18189) and Mustang Creek at Hwy 37 (Station 21695). Flow will be measured at all wadable stream stations or will be obtained from a nearby USGS gaging station.

Aquatic Life Monitoring will be conducted once during the Index period and once during the Critical period in FY 2024 and FY 2025. In FY 2024, monitoring will be conducted in Auds Creek at FM 1184 (Station 10197) and in the North Sulphur River at FM 38 (Station 17613). Habitat assessment, benthic macroinvertebrates, and nekton will be assessed. Field parameters, flow, and diel data will be obtained during the monitoring events.

The following changes have been made to the FY 2024 monitoring schedule. These changes are a result of concerns or requests made by Sulphur River Basin steering committee members and/or monitoring entities.

1. Station 21701 BIG CREEK AT FM 2149 was added to the monitoring schedule in FY 2023 as a result of additional funding being made available to address the DO impairment. This site has been removed for FY 2024.
2. Station 21699 ELLIOTT CREEK AT FM 991 IN BOWIE COUNTY was added to the monitoring schedule in FY 2023 because of additional funding being made available to address the DO impairment. Diel monitoring has been removed and conventionals and bacteria have been added for FY 2024.
3. Station 18844 NORTH SULPHUR RIVER AT FANNIN COUNTY ROAD FM 3735 3.09 KM UPSTREAM OF FM 68 aquatic life monitoring, field, conventionals, bacteria, and flow monitoring have been removed since the site is intermittent.
4. Station 10197 AUDS CREEK AT FM 1184 S OF PARIS aquatic life monitoring has been added.

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.

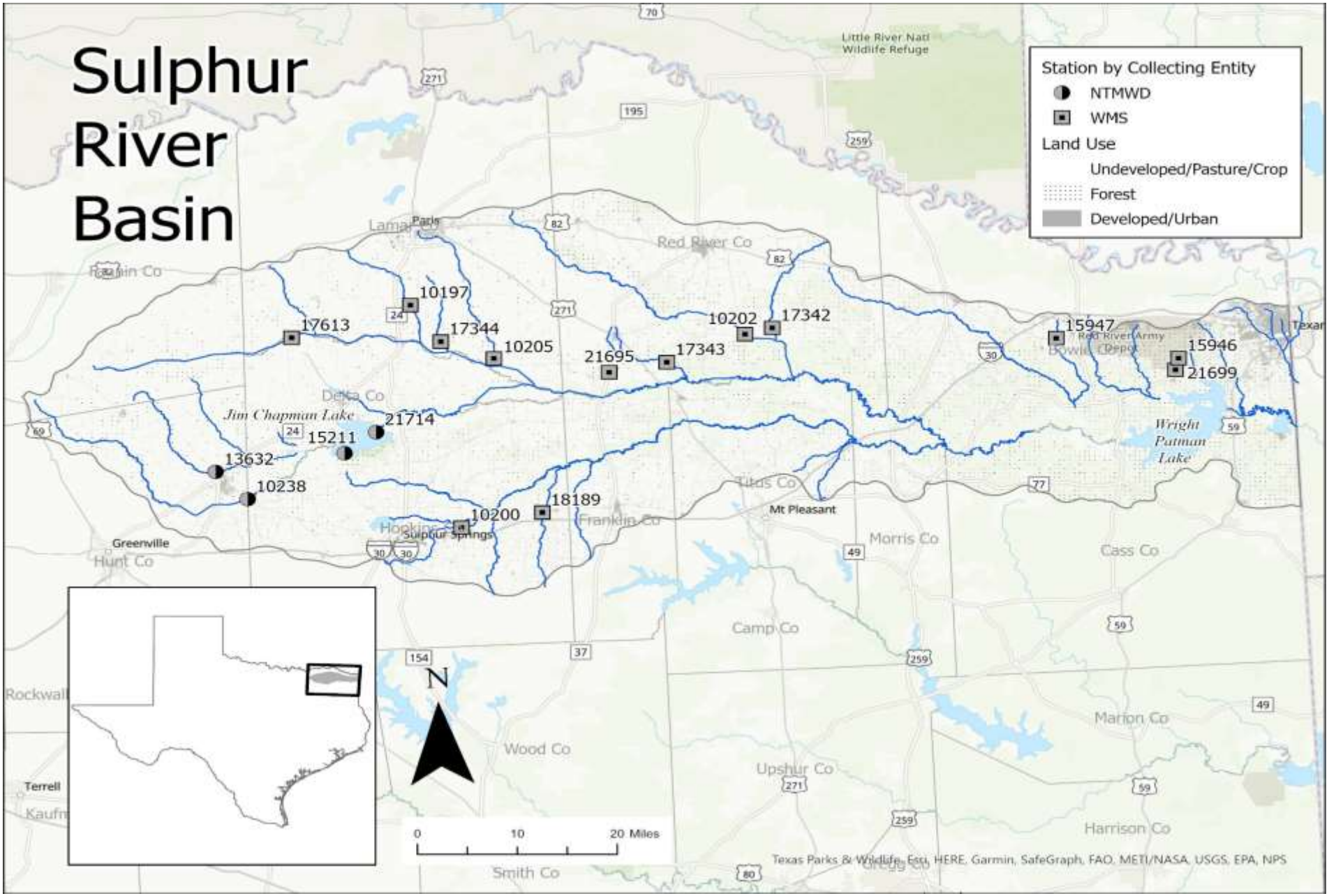
Monitoring Sites for FY 2024

Table B1.1 Sample Design and Schedule, FY 2024

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	Aq.Habitat	Benthic	Nekton	Metals in Water
RICE CREEK AT FM 1840 WEST OF BOSTON	15947	0302E	03	05	SU	WM	RT	4			4					
ELLIOTT CREEK AT FM 991 IN BOWIE COUNTY	21699	0302H	03	05	SU	WM	RT	4	4	4	4					
EAST FORK ELLIOTT CREEK AT FM991 APPROX 3.6KM NNE OF REDWATER	15946	0302I	03	05	SU	WM	RT	4			4					
ROCK CREEK AT FM 69 8.0 KM UPSTREAM OF CONFLUENCE WITH WHITE OAK CREEK NORTHEAST OF SULPHUR SPRINGS	10200	0303D	03	05	SU	WM	RT	4	4	4	4					
STOUTS CREEK AT US HIGHWAY 67 HOPKINS COUNTY	18189	0303F	03	05	SU	WM	BS	4			4	4				
STOUTS CREEK AT US HIGHWAY 67 HOPKINS COUNTY	18189	0303F	03	05	SU	WM	RT	4	4	4	4					
CUTHAND CREEK AT FM 1487 EAST OF BOGATA 230 M UPSTREAM OF FM 1487	10202	0303J	03	05	SU	WM	RT	4	4	4	4					
LITTLE MUSTANG CREEK AT RED RIVER CR 1410 SOUTHEAST OF BOGATA	17343	0303K	03	05	SU	WM	RT	4	4	4	4					
KICKAPOO CREEK AT FM 412 SOUTH OF ANNONA	17342	0303L	03	05	SU	WM	RT	4	4	4	4					
MUSTANG CREEK AT HIGHWAY 37 IN RED RIVER COUNTY	21695	0303P	03	05	SU	WM	BS	4			4	4				
MUSTANG CREEK AT HIGHWAY 37 IN RED RIVER COUNTY	21695	0303P	03	05	SU	WM	RT	4	4	4	4					
NORTH SULPHUR RIVER NEW CHANNEL AT FM 38 NORTHWEST OF BEN FRANKLIN	17613	0305	03	05	SU	WM	RT	4	4	4	4					
NORTH SULPHUR RIVER NEW CHANNEL AT FM 38 NORTHWEST OF BEN FRANKLIN	17613	0305	03	05	SU	WM	BS	2			2	2	2	2	2	
AUDS CREEK AT FM 1184 S OF PARIS	10197	0305B	03	05	SU	WM	BS	2			2	2	2	2	2	
AUDS CREEK AT FM 1184 S OF PARIS	10197	0305B	03	05	SU	WM	RT	4	4	4	4					
HICKORY CREEK AT FM 1498 SOUTH OF PARIS	17344	0305C	03	05	SU	WM	RT	4			4					
BIG SANDY CREEK AT FM 1497 WEST OF BOGATA	10205	0305D	03	05	SU	WM	RT	4	4	4	4					
SOUTH SULPHUR RIVER AT STATE HWY 11 SOUTHEAST OF COMMERCE	10238	0306	03	04	SU	NM	RT	12	12	12	12					12
COOPER LAKE MID LAKE APPROX 100 METERS NORTH OF NORTH TEXAS MUNICIPAL WATER SUPPLY DISTRICTS INTAKE STRUCTURE NORTH OF PEERLESS	15211	0307	03	05	SU	NM	RT	12	12	12						12
JIM CHAPMAN LAKE / COOPER LAKE MAIN BODY APPROX 100 METERS NORTH AND 2.08 KILOMETERS WEST OF THE DAM GATE STRUCTURE	21714	0307	03	05	SU	NM	RT	12	12	12						12
MIDDLE SULPHUR RIVER AT SH 11 1.5 MI UPSTREAM FROM WILLOW CREEK 1.5 MI NORTH OF COMMERCE	13632	0307A	03	04	SU	NM	RT	12	12	12	12					12

Appendix C: Station Location Maps

Maps of stations monitored by the SRBA, WMS, and NTMWD are provided below. The maps were generated by WMS. 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 Water Monitoring Solutions, Inc. at 903-439-4741.


Sulphur River Basin
Station by Collecting Entity
NTMWD
WMS
Land Use
Undeveloped/Pasture/Crop
Forest
Developed/Urban
10197
17613
17344
10205
10202
17342
21695
17343
15947
15946
21699
21714
15211
13632
10238
18189
10200
Jim Chapman Lake
Wright Patman Lake
Mt Pleasant
Sulphur Springs
Greenville
Red River Co
Delta Co
Hunt Co
Franklin Co
Titus Co
Morris Co
Cass Co
Camp Co
Wood Co
Upshur Co
Marion Co
Harrison Co
Smith Co
Rockwall
Terrell
Little River Natl Wildlife Refuge
N
0 10 20 Miles
Texas Parks & Wildlife, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS

Appendix D: Field Data Sheets

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Basin:
FY:
QTR:

Stream Field Form

Station ID:		Date:	Time:
Station Location:			
Sample(s) Collected By:			
Days Since Last Rain:	Total Rainfall - 7 Days Inclusive Prior to Sampling (Inches):		

Stream Type:	Present Weather:	Wind Intensity	Wind Direction	Aesthetics:
perennial	Clear	Calm	N S	Wilderness
intermittent w/ perennial pools	Partly Cloudy	Slight	E W	Natural
	Cloudy	Moderate	NE SE	Common
intermittent	Rain	Strong	NW SW	Offensive

Flow (cfs):	Flow Severity:	Water Odor:	Water Color:	Water Clarity:
	No Flow Flood	Sewage Oily/ Chemical	Brown Red	Poor Good
Flow Method:	Low Flow High	Rotten Eggs Musky	Green Black	Fair Excellent
	Normal Dry	Fishy None Other	Clear Other	

Flow Est. cfs	Water Temp °C	DO % sat	DO mg/L	Sp. Cond µS/cm	pH s.u.	Secchi m	Air Temp °C	Sample Depth m	Water Column Depth m

Observations: (Pools, debris in water, signs of eutrophication, observed uses, land use, etc.):

	Field		Conventionals		*E. coli*		

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Discharge Measurement Summary

File Information

File name	Slc_20210329-085644.ft
Start date and time	3/29/2021 8:37 AM
Calculations engine	FlowTracker2
Data collection mode	Discharge

Discharge Summary

Start time	3/29/2021 8:38:59 AM	End time	3/29/2021 8:56:03 AM
# Stations	22	Avg interval	20
Mean depth	1.176 ft		
Mean velocity	0.3680 ft/s	Total width	26.100 ft
Mean SNR	45 dB	Total area	30.7000 ft²
Mean temp	57.993 °F	Total discharge	11.2976 ft³/s

System Information

Sensor type	Top Setting
Handheld serial number	FT2H1915001
Probe serial number	FT2P1817003
Probe firmware	1.30
Handheld software	1.6

Site Details

Site name	Slc
Site number	54
Operator(s)	Rushin
Comment	

Discharge Uncertainty

Category	ISO	IVE
Accuracy	1.0%	1.0%
Depth	0.1%	1.7%
Velocity	0.3%	1.8%
Width	0.1%	0.1%
Method	1.8%	
# Stations	2.3%	
Overall	3.1%	2.7%

Discharge Settings

Discharge equation	Mid Section
Discharge uncertainty	IVE
Discharge reference	Measured

Station Warning Settings

Station discharge caution		%
Station discharge warning	10.00	%
Maximum depth change	50.00	%
Maximum spacing change	100.00	%

Summary overview

No changes were made to this file
Quality control warnings

Data Collection Settings

Salinity	0.000	PSS-78
Temperature		°F
Sound speed		ft/s
Mounting correction	0.00	%

Quality Control Settings

SNR threshold	10	dB
Standard error threshold	0.0328	ft/s
Spike threshold	10.00	%
Maximum velocity angle	20.0	deg
Maximum tilt angle	5.0	deg


Discharge chart
Station discharge (ft³/s)
0
0.2
0.4
0.6
0.8
26 24 22 20 18 16 14 12 10 8 6 4 2
ft
Velocity chart
Velocity (ft/s)
0
0.1
0.2
0.3
0.4
26 24 22 20 18 16 14 12 10 8 6 4 2
ft
Depth chart
Depth (ft)
0
0.5
1.0
1.5
2.0
26 24 22 20 18 16 14 12 10 8 6 4 2
ft

Measurement results

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Samples	Velocity (ft/s)	Correction	Mean Velocity (ft/s)	Area (ft^2)	Flow (ft^3/s)	%Q	
0	8:38 AM	1.000	None	0.000	0.0000	0.000	0	0.0000	1.0000	0.1215	0.0000	0.0000	0.00	✓
1	8:39 AM	3.000	0.6	0.400	0.6000	0.240	40	0.1215	1.0000	0.1215	0.8000	0.0972	0.86	✓
2	8:40 AM	5.000	0.6	1.100	0.6000	0.660	40	0.2070	1.0000	0.2070	2.2000	0.4554	4.03	✓
3	8:41 AM	7.000	0.6	1.200	0.6000	0.720	40	0.3640	1.0000	0.3640	2.4000	0.8735	7.73	✓
4	8:42 AM	9.000	0.6	1.100	0.6000	0.660	40	0.3934	1.0000	0.3934	1.6500	0.6491	5.75	✓
5	8:42 AM	10.000	0.6	1.000	0.6000	0.600	40	0.4695	1.0000	0.4695	1.0000	0.4695	4.16	✓
6	8:43 AM	11.000	0.6	1.100	0.6000	0.660	40	0.4740	1.0000	0.4740	1.1000	0.5214	4.61	✓
7	8:44 AM	12.000	0.6	1.100	0.6000	0.660	40	0.4117	1.0000	0.4117	1.1000	0.4529	4.01	✓
8	8:45 AM	13.000	0.6	1.100	0.6000	0.660	40	0.3921	1.0000	0.3921	1.1000	0.4313	3.82	✓
9	8:46 AM	14.000	0.6	1.300	0.6000	0.780	40	0.4434	1.0000	0.4434	1.3000	0.5764	5.10	✓
10	8:47 AM	15.000	0.6	1.300	0.6000	0.780	40	0.3653	1.0000	0.3653	1.3000	0.4749	4.20	✓
11	8:47 AM	16.000	0.6	1.500	0.6000	0.900	40	0.3748	1.0000	0.3748	1.5000	0.5621	4.98	✓
12	8:48 AM	17.000	0.6	1.650	0.6000	0.990	40	0.3731	1.0000	0.3731	1.6500	0.6156	5.45	✓
13	8:49 AM	18.000	0.6	1.700	0.6000	1.020	40	0.4061	1.0000	0.4061	1.7000	0.6904	6.11	✓
14	8:50 AM	19.000	0.6	1.700	0.6000	1.020	40	0.4120	1.0000	0.4120	1.7000	0.7003	6.20	✓
15	8:50 AM	20.000	0.6	1.850	0.6000	1.110	40	0.4268	1.0000	0.4268	1.8500	0.7895	6.99	✓
16	8:51 AM	21.000	0.6	1.900	0.6000	1.140	40	0.4207	1.0000	0.4207	1.9000	0.7994	7.08	✓
17	8:52 AM	22.000	0.6	1.800	0.6000	1.080	40	0.4395	1.0000	0.4395	1.8000	0.7911	7.00	✓
18	8:53 AM	23.000	0.6	1.700	0.6000	1.020	40	0.3415	1.0000	0.3415	1.7000	0.5806	5.14	✓
19	8:54 AM	24.000	0.6	1.400	0.6000	0.840	40	0.2919	1.0000	0.2919	1.4000	0.4086	3.62	✓
20	8:55 AM	25.000	0.6	1.000	0.6000	0.600	40	0.2312	1.0000	0.2312	1.5500	0.3584	3.17	✓
21	8:56 AM	27.100	None	0.000	0.0000	0.000	0	0.0000	1.0000	0.2312	0.0000	0.0000	0.00	✓

Quality control warnings

St#	Time	Location (ft)	Method	Depth (ft)	%Depth	Measured Depth (ft)	Warnings
21	8:56 AM	27.100	None	0.000	0.0000	0.000	Stn Spacing > QC,Water Depth > QC

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Fish Collection Data Sheet

Date		Time		Segment #	
Station ID		Station Description			
County		Lat/Long			
Flow (cfs)	Water Temp ºC	DO % sat	DO mg/L	Sp. Cond µS/cm	pH s.u.
Flow Method	Secchi m	Air Temp ºC	Avg Depth m	Min depth m	Max depth m
Permittee Name			Permit #		
Collectors					
Backpack Electrofisher					
Start Time		End Time		Voltage (v)	
Pulse width (msec)		Duration (sec)		Frequency (pps)	
Comments					
Seine					
Start Time		End Time		No. hauls	
Seine Length (ft.)		Mesh Size (in.)		Duration of hauls	
Comments					
Weather					
Habitat Type(s) sampled					
Observations					

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Collectors:

ELECTROSHOCK / SEINE

County	Station #	Location			Start Time	End Time
Common Name *or* Scientific Name	Length in mm - up to 20 inviduals (circle vouchers)		Total # Collected	# Released	# Live Take / Vouchers	# Incidental Mortalities / Anomalies
Permittee	Signature		Permit #			Date

Benthic Collection Data Sheet

Date		**Start Time**		**End Time**	
Station ID		**Station Description**			
County		**Segment #**			
Collectors					
Sample Tracking Log Number					
Benthic Sampler Type (circle)	**Surber**	**Ekman**	**Kicknet**	**Petersen**	**Hester-Dendy**
Kicknet - area kicked (m^2)			**Mesh size (cm)**		
Dip-net - area swept (m^2)			**Kicknet - minutes kicked**		
Shallowest Depth (m)				**Deepest Depth (m)**	
Habitat Type(s) sampled					
Undercut bank (%)			**Overhanging brush (%)**		
Gravel substrate (%)			**Sand substrate (%)**		
Soft bottom (%)			**Bedrock (%)**		
Macrophyte bed (%)			**Snags and brush (%)**		
Observations					

P.O. Box 1132 Sulphur Springs, TX 75483 903-439-4741 www.water-monitor.com

Part I - Stream Physical Characteristics Worksheet

Observers:		Date:		Time:	
Weather conditions:					
Stream:				Segment ID:	
Site Location:				Reach length:	
Observed stream uses:					
Stream type (circle one):	perennial	or	intermittent with perennial pools		
Stream bends:	No. well defined		No. moderately defined		No . poorly defined
Aesthetics (circle one):	(1) wilderness	(2) natural	(3) common	(4) offensive	
Channel obstructions or modifications:				No. riffles	
Channel flow status (circle one):	high	moderate	low	no flow	

Riparian vegetation (%	Left bank	Right bank	Maximum pool depth:		Maximum pool width:
Trees			Notes:		
Shrubs					
Grasses or forbs					
Cultivated fields					
Other					

Site map:

TCEQ 20156-A (Rev. 07/18/2014)

Page 2 of 3

Part I - Stream Physical Characteristics Worksheet (continued)

Date:		Stream name:																					
Location of transect		Stream width (m)	Left bank slope (°)	LB erosion potential (%)	Thalweg depth:		Stream Depths (m) at Points Across Transect											RB erosion potential (%)	Right Bank Slope (°)				
		Habitat type (circle one)		Dominant substrate type			Dominant types riparian vegetation:											% Gravel or larger	Tree canopy (%)				
		Riffle	Run				Left bank:												Total				
		Glide	Pool				Right bank:												CL				
Macrophytes (circle one)		Algae (circle one)		Width of natural buffer (m)		Instream cover types												% Instream cover	CR				
Abundant	Commmon	Abundant	Commmon	LB	RB														LB				
Rare	Absent	Rare	Absent																RB				

Location of transect		Stream width (m)	Left bank slope (°)	LB erosion potential (%)	Thalweg depth:		Stream Depths (m) at Points Across Transect											RB erosion potential (%)	Right Bank Slope (°)				
		Habitat type (circle one)		Dominant substrate type			Dominant types riparian vegetation:											% Gravel or larger	Tree canopy (%)				
		Riffle	Run				Left bank:												Total				
		Glide	Pool				Right bank:												CL				
Macrophytes (circle one)		Algae (circle one)		Width of natural buffer (m)		Instream cover types												% Instream cover	CR				
Abundant	Commmon	Abundant	Commmon	LB	RB														LB				
Rare	Absent	Rare	Absent																RB				

Location of transect		Stream width (m)	Left bank slope (°)	LB erosion potential (%)	Thalweg depth:		Stream Depths (m) at Points Across Transect											RB erosion potential (%)	Right Bank Slope (°)				
		Habitat type (circle one)		Dominant substrate type			Dominant types riparian vegetation:											% Gravel or larger	Tree canopy (%)				
		Riffle	Run				Left bank:												Total				
		Glide	Pool				Right bank:												CL				
Macrophytes (circle one)		Algae (circle one)		Width of natural buffer (m)		Instream cover types												% Instream cover	CR				
Abundant	Commmon	Abundant	Commmon	LB	RB														LB				
Rare	Absent	Rare	Absent																RB				

TCEQ 20156-A (Rev. 4-13-2005)

Page 3 of 3

Part I - Stream Physical Characteristics Worksheet (continued)

Date:		Stream name:	

Location of transect	Stream width (m)	Left bank slope (°)	LB erosion potential (%)	Thalweg depth: Stream Depths (m) at Points Across Transect												RB erosion potential (%)	Right Bank Slope (°)

Habitat type (circle one)		Dominant substrate type	Dominant types riparian vegetation:		% Gravel or larger	Tree canopy (%)	
Riffle	Run		Left bank:			Total	
Glide	Pool		Right bank:			CL	

Macrophytes (circle one)		Algae (circle one)		Width of natural buffer (m)		Instream cover types		% Instream cover	CR	
Abundant	Common	Abundant	Common	LB	RB				LB	
Rare	Absent	Rare	Absent						RB	

Location of transect	Stream width (m)	Left bank slope (°)	LB erosion potential (%)	Thalweg depth: Stream Depths (m) at Points Across Transect												RB erosion potential (%)	Right Bank Slope (°)

Habitat type (circle one)		Dominant substrate type	Dominant types riparian vegetation:		% Gravel or larger	Tree canopy (%)	
Riffle	Run		Left bank:			Total	
Glide	Pool		Right bank:			CL	

Macrophytes (circle one)		Algae (circle one)		Width of natural buffer (m)		Instream cover types		% Instream cover	CR	
Abundant	Common	Abundant	Common	LB	RB				LB	
Rare	Absent	Rare	Absent						RB	

Location of transect	Stream width (m)	Left bank slope (°)	LB erosion potential (%)	Thalweg depth: Stream Depths (m) at Points Across Transect												RB erosion potential (%)	Right Bank Slope (°)

Habitat type (circle one)		Dominant substrate type	Dominant types riparian vegetation:		% Gravel or larger	Tree canopy (%)	
Riffle	Run		Left bank:			Total	
Glide	Pool		Right bank:			CL	

Macrophytes (circle one)		Algae (circle one)		Width of natural buffer (m)		Instream cover types		% Instream cover	CR	
Abundant	Common	Abundant	Common	LB	RB				LB	
Rare	Absent	Rare	Absent						RB	

TCEQ 20156-A (Rev. 07/18/2014)

TCEQ Fish Sample Tracking Log

Sample tracking log #:		TCEQ Station ID:		
Location description:				
Collector(s):				
Identifier(s):				
Dates				
Collected	Entered into Log	Transferred to EtOH	Identified	
Methods				
Seine hauls	Electrofish (secs.)	Gill net duration	Other	

Sample tracking log #:		TCEQ Station ID:		
Location description:				
Collector(s):				
Identifier(s):				
Dates				
Collected	Entered into Log	Transferred to EtOH	Identified	
Methods				
Seine hauls	Electrofish (secs.)	Gill net duration	Other	

Sample tracking log #:		TCEQ Station ID:		
Location description:				
Collector(s):				
Identifier(s):				
Dates				
Collected	Entered into Log	Transferred to EtOH	Identified	
Methods				
Seine hauls	Electrofish (secs.)	Gill net duration	Other	

Sample tracking log #:		TCEQ Station ID:		
Location description:				
Collector(s):				
Identifier(s):				
Dates				
Collected	Entered into Log	Transferred to EtOH	Identified	
Methods				
Seine hauls	Electrofish (secs.)	Gill net duration	Other	

TCEQ-20235 (rev. 07/18/2014)

TCEQ Benthic Macroinvertebrate Sample Tracking Log

Sample tracking log number:
Name of collector:
TCEQ Station ID:
Location description:
Date of collection:
Date entered in sample tracking log:
Date identification started:
Date identification completed:
Method of collection:

Sample tracking log number:
Name of collector:
TCEQ Station ID:
Location description:
Date of collection:
Date entered in sample tracking log:
Date identification started:
Date identification completed:
Method of collection:

Sample tracking log number:
Name of collector:
TCEQ Station ID:
Location description:
Date of collection:
Date entered in sample tracking log:
Date identification started:
Date identification completed:
Method of collection:

TCEQ-20231 (rev 7/18/2014)

TCEQ Fish Laboratory Bench Sheet	
Sample tracking log number:	
Name of identifier:	
Location of collection:	Method of collection:
Date of collection:	
Date entered in sample tracking log:	
Date identification/enumeration started:	
Date identification/enumeration completed:	

Scientific Name	Number of Individuals

TCEQ-20232 (rev. 07/18/2014)

TCEQ Benthic Macroinvertebrate Laboratory Bench Sheet	
Sample tracking log number:	
Name of identifier:	
Location of collection:	Method of collection:
Date of collection:	
Date entered in sample tracking log:	
Date identification/enumeration started:	
Date identification/enumeration completed:	

Scientific Name	Number of Individuals

TCEQ-20232 (rev. 7/18/2014)

North Texas Municipal Water District
Stream
CRP Field Data Reporting Form

Date:		Station Location:		TCEQ Site ID:	
Time:		Basin/Segment:		Technicians (Print/Sign):	
County:		Monitoring Type:			
NM Laboratory ID #:		Stream Width (ft):		Section Width (ft):	
Chain of Custody #:		Time Start:		Time End:	

Parameter Code		Parameter		Section Midpoint	Section Depth (ft)	Velocity (ft/S)	Discharge (CFS)
00010		Water Temp (°C)	1				
00094		Conductivity (uS/cm)	2				
00300		Dissolved Oxygen (mg/L)	3				
00400		pH (Standard Units)	4				
01351		Flow Severity 1- No Flow 2-Low Flow 3 - Normal 4 - Flood 5 - High 6 - Dry	5				
			6				
00061		Flow (CFS)	7				
74069		Flow Estimate	8				
89835		Flow Measurement Method 1 - Gauge 2 - Electronic 3 - Mechanical 4 - Weir/Flume 5 - Doppler	9				
			10				
20424		Water Clarity 1 - Excellent 2 - Good 3 - Fair 4 - Poor 5 - Other*	11				
			12				
89969		Water Color 1 - Brown 2 - Reddish 3 - Green 4 - Black 5 - Clear 6 - Other*	13				
			14				
89971		Water Odor 1 - Sewage 2 - Oily/Chem 3 - Rotten Egg 4 - Musky 5 - Fishy 6 - None 7 - Other*	15				
			16				
00020		Air Temperature (° Celsius)	17				
89966		Weather 1 - Clear 2 - Partly Cloudy 3 - Cloudy 4 - Rain 5 - Other*	18				
			19				
89965		Wind Direction:	20				
		1 - Calm 2 - Slight 3 - Moderate 4 - Strong	Tech Taking Flow:				Total Flow (CFS)
72053		Significant Precipitation (Days)					
00078		Transparency, Secchi Disk (m)					
89978	NA	Primary Contact Observed Act # of people observed 0-10 >10	Comments and details/description for parameter codes marked other*:				
89979	NA	Evidence of Primary Contact Rec 1 - Observed 0 - Not observed					

Measurement Comments and Field Observations		
Biological Activities:		
Aquatic Vegetation:		
Terrestrial Vegetation:		
Aquatic Animals:		
Terrestrial Animals:		
Aquatic Insects:		
Terrestrial Insects:		
Left Bank:		
Right Bank:		
Water Shed Activities:		
Water Quality/ Stream Use:		
Specific Sample Info:		
Missing Parameters:		
Notes:		
Sonde Depth in Air (m):		
Drought Conditions:		
Drought Parameters (if applicable)	Parameter Code	Result
Maximum Pool Width (m)	89864	
Maximum Pool Depth (m)	89865	
Pool Length (m)	89869	
% Pool Coverage in a 500 m Reach	89870	

Date:		Station Location:		TCEQ Site ID:	
Final Review					
Final Review					

North Texas Municipal Water District
Reservoir
CRP Field Data Reporting Form

Date:		Station Location:		TCEQ Site ID:	
Time:		Basin/Segment:		Technicians (Print/Sign):	
County:		Monitoring Type:			
NM Laboratory ID #:		Total Depth (m):		Total Measurements:	
Chain of Custody #:		Time Start:		Time End:	

Parameter Code		Parameter	Sample Depth (m)	Temp. (°C)	pH (s.u.)	D.O (mg/L)	Conductivity (uS/cm)
20424		Water Clarity 1 - Excellent 2 - Good 3 - Fair 4 - Poor 5 - Other*					
89969		Water Color 1 - Brown 2 - Reddish 3 - Green 4 - Black 5 - Clear 6 - Other*					
89971		Water Odor 1 - Sewage 2 - Oily/Chem 3 - Rotten Egg 4 - Musky 5 - Fishy 6 - None 7 - Other*					
00020		Air Temperature (° Celsius)					
89966		Weather 1 - Clear 2 - Partly Cloudy 3 - Cloudy 4 - Rain 5 - Other*					
89965		Wind Direction: 1 - Calm 2 - Slight 3 - Moderate 4 - Strong					
72053		Significant Precipitation (Days)					
00078		Transparency, Secchi Disk (m)					
00051		Reservoir Access Not Possible					
00052		Reservoir Stage (TWDB Website)					
00053		Reservoir Percent Full (TWDB Website					
00054		Reservoir Storage (TWDB Website)					
82903		Depth of Bottom of Water Body (m)					
89978	NA	Primary Contact Observed Act # of people observed 0-10 >10					
89979	NA	Evidence of Primary Contact Rec 1 - Observed 0 - Not observed					
89968		Water Surface 1-Calm 2-Ripple 3-Wave 4-Whitecap					

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

Measurement Comments and Field Observations	
Biological Activities:	
Aquatic Vegetation:	
Terrestrial Vegetation:	
Aquatic Animals:	
Terrestrial Animals:	
Aquatic Insects:	
Terrestrial Insects:	
Water Shed Activities:	
Water Quality/ Stream Use:	
Specific Sample Info:	
Missing Parameters:	
Notes:	
Sonde Depth in Air (m):	
Drought Conditions:	

Date:		Station Location:		TCEQ Site ID:	
Final Review					
Final Review					

Appendix E: Chain of Custody Forms

Environmental Laboratory Services
The Solution Lab

LCRA Environmental Laboratory Services
Request for Analysis Chain-of-Custody Record

LCRA - Environmental Lab
3505 Montopolis Dr.
Austin, TX 78744

Phone: (512) 356-6022 or 1-800-776-5272
Fax: (512) 356-6021
https://els.lcra.org

Project:	SRBA CRP	**Client:**	Sulphur River Basin Authority
Collector:		**Contact:**	
Event#:		**Phone:**	

Report To: Nancy Rose, Sulphur River Basin Authority, 911 N. Bishop, Ste C, Wake Village, TX 75501

Invoice To: Nancy Rose, Sulphur River Basin Authority, 911 N. Bishop, Ste C, Wake Village, TX 75501

Lab ID#:

Client PO:

LAB USE ONLY	Sample ID *	Collected *		Matrix*	Container(s) Type/Preservative/Number *										Requested Analysis *											
		Date*	Time * HH:MM	AQ = Aqueous S = Solid T = Tissue DW =Drinking Water	COMPOSITE Y/N	FILTERED Y/N	250/PHSO4	250PU							365.4AM	300.0AM-48	S-351.2AM	350.1AM								
1	21699			AQ			2	1							X	X	X	X								
2	10200			AQ			2	1							X	X	X	X								
3	18189			AQ			2	1							X	X	X	X								
4	10202			AQ			2	1							X	X	X	X								
5	17343			AQ			2	1							X	X	X	X								
6																										
7																										

Transfers	Relinquished By	Date/Time	Received By	Date/Time	Cooler Temp.				Client Special Instructions
					#	T#	Obs.	Corr.	
1									
2					1				
3					2				Lab Use Only:

Note: Relinquishing sample(s) and signing the COC, client agrees to accept and is bound by the ELS Standard Terms and Conditions. All fields with an asterisk (*) are required to be completed.

NTMWD Chain of Custody Record

Comp. Sx. Beg/End Date/Time ____________________

Sample Collector Name(s) ____________________

Work Order Number: ____________
Project: ____________
Reviewed By: ____________

Version 1.0

Page ___ **of** ___

Effluent Residual Chlorine

________ mg/L

Date	Time	Type	Sx. Num	Sample Name

Temperature IR#

Cooler Info

C #	Temp C Obs	Temp C Cor	Cr ID	On Ice Y / N
1				
2				
3				
4				
5				
6				

Preservation

Chk./Adj. By

pH Strips:N ______

Items Adjusted

to pH < 2

Reagent:N ______

ID	pHi	ID	pHi

to pH > 10

Reagent:N ______

ID	pHi	ID	pHi

Relinquished by:	Date	Time	Received by:	Relinquished by:	Date	Time	Received by:	Relinquished by:	Date	Time	Received by:

Relinquished by:	Date	Time	Received for Laboratory by:		Date	Time	Remarks:

Legend:FC=Flow Composite, Obs.=Observed, Cor.=Corrected

C:36-702R:0.0:06/27/22

Appendix F: Data Review Checklist and Summary Shells

Data Review Checklist

This checklist is to be used by the SRBA 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 Set Information

Data Source: _____

Date Submitted: _____

Tag_id Range: _____

Date Range: _____

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

WMS 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 SU and collecting entity WM and NM. This is field and lab data that was collected by Water Monitoring Solutions, Inc. (WM) and North Texas Municipal Water District (NM). Laboratory analyses were performed by the LCRA ELS and North Texas Municipal Water District Laboratory. The following tables explain discrepancies or missing data as well as calculated data loss.

Discrepancies or missing data for the listed tag ID:

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

Data Loss

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