Quality Assurance Project Plan Northeast Texas Municipal Water District

P. O. Box 955
Hughes Springs, Texas 75656

Clean Rivers Program

Water Quality Planning Division

Texas Commission on Environmental Quality

P.O. Box 13087, MC 234

Austin, Texas 78711-3087

Effective Period: FY 2020 to FY 2021

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

Texas Commission on Environmental Quality

Water Quality Planning Division

9/9/19

Kyle Girten, Manager Date
Water Quality Monitoring and Assessment Section

9/9/19

Sarah Eagle, Work Leader Date
Clean Rivers Program

9/9/2019

Kelly Rodibaugh, Date
Project Quality Assurance Specialist
Clean Rivers Program

9/9/19

Rebecca DuPont, Project Manager Date
Clean Rivers Program

9/9/2019

Cathy Anderson, Team Leader Date
Data Management and Analysis

Monitoring Division

9/9/2019

Sharon Coleman Date
TCEQ Quality Assurance Manager

9/9/2019

Sharon Coleman Date
Acting Lead CRP Quality Assurance Specialist

Northeast Texas Municipal Water District

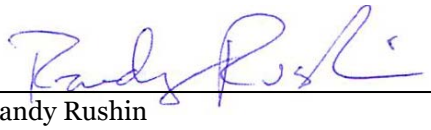
Walt Sears, Jr.
General Manager

9-6-19
Date

Robert Speight
Project Manager

9-6-2019
Date

Water Monitoring Solutions, Inc.

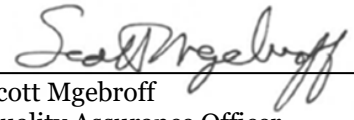


8/29/2019

Randy Rushin — Date
Project Manager

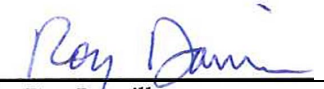
8/29/2019

Dave Bass — Date
Data Manager



8/30/2019

Scott Mgebroff — Date
Quality Assurance Officer



8/29/19

Dr. Roy Darville — **Date**
Data Collection Supervisor

Lower Colorado River Authority Environmental Services Laboratory (LCRA ELS)

Dale Jurecka 9/3/19
Dale Jurecka Date
LCRA ELS Laboratory Manager

09/03/19
Angel Mata Date
LCRA ELS Quality Manager

9/03/19
Jason Woods Date
LCRA ELS Project Manager

Sub-tier participants (e.g., subcontractors, sub-participants, or other units of government) will sign the QAPP, indicating the organization's awareness of, and commitment to requirements contained in this quality assurance project plan and any amendments or added appendices of this plan. Signatures in section A1 will eliminate the need for adherence letters to be maintained. If adherence letters are preferred, the Northeast Texas Municipal Water District will secure written documentation from each sub-tier project participant (e.g., subcontractors, sub-participants, or other units of government) stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or added appendices of this plan. The Northeast Texas Municipal Water District will maintain this documentation as part of the project's quality assurance records and will ensure the documentation is available for review.

A2 Table of Contents

List of Acronyms

AU	Assessment Unit
AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
BS	Biased to Season Monitoring
CAP	Corrective Action Plan
CE	Collecting Entity
CLI	Caddo Lake Institute
COC	Chain of Custody
CRP	Clean Rivers Program
DMRG	Surface Water Quality Monitoring Data Management Reference Guide, most recent version
DM&A	Data Management and Analysis
DQO	Data Quality Objective
EPA	United States Environmental Protection Agency
FY	Fiscal Year
GIS	Geographical Information System
GPS	Global Positioning System
IR	*Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d)*
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
MT	Monitoring Type
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
NETMWD	Northeast Texas Municipal Water District
PM	Project Manager
QA	Quality Assurance
QM	Quality Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QC	Quality Control
QMP	Quality Management Plan
RT	Routine Monitoring
SE	Submitting Entity
SLOC	Station Location
SOP	Standard Operating Procedure
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TMDL	Total Maximum Daily Load
TCEQ	Texas Commission on Environmental Quality
TNI	The NELAC Institute
TSWQS	Texas Surface Water Quality Standards
VOA	Volatile Organic Analytes
WMS	Water Monitoring Solutions, Inc.
WWTP	Wastewater Treatment Plant

A3 Distribution List

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

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Scott Mgebroff, WMS Quality Assurance Officer
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Dr. Roy Darville, WMS Data Collection Supervisor
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LCRA Environmental Services Laboratory
3505 Montopolis Drive
Austin, Texas 78744

Jason Woods, LCRA ELS Project Manager
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Angel Mata, LCRA ELS Quality Manager
(877) 362-5272

Caddo Lake Institute
400 Edwards Street
Shreveport, Louisiana 71101

Laura-Ashley Overdyke
318-541-6923

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

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

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

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

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

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

Northeast Texas Municipal Water District

Walt Sears, Jr.
Northeast Texas Municipal Water District General Manager
Mr. Sears is the General Manager of NETMWD and is a member of the Steering Committee for the Cypress Creek Basin Clean Rivers Program. Mr. Sears will provide coordination and cooperation between the project partners, stakeholders, and WMS.

Robert Speight
Northeast Texas Municipal Water District 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 by the Cypress Creek basin planning agency participants and that projects are producing data of known quality. Ensures that sub-participants are qualified to perform contracted work. Ensures CRP project managers and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ. Maintains quality-assured data on NETMWD internet sites.

Water Monitoring Solutions, Inc.

WMS contracts with the Northeast Texas Municipal Water District to administer the tasks and responsibilities outlined in this QAPP on behalf of the NETMWD.

Randy Rushin
WMS Project Manager
Responsible for contact and coordination with NETMWD, TCEQ and other entities participating in the Cypress Creek 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 NETMWD to ensure that monitoring systems audits on sub-participants are conducted to verify that QAPP's are followed by the Cypress Creek Basin Planning Agency participants; projects are producing data of known quality; subcontractors are qualified to perform contracted work; CRP project managers 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 NETMWD Project Manager of circumstances which may adversely affect the quality of data. Responsible for maintaining records of QAPP distribution, including appendices and amendments. 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. Ensures that field staff is properly trained and that training records are maintained.

Scott Mgebroff
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. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Coordinates and monitors deficiencies, non-conformances and corrective actions; coordinates and reviews records of data verification and validation.

Dave Bass
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. Responsible for coordinating with the TCEQ QAS 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 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 the supervision of all field activities conducted by Caddo Lake Institute (CLI), 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.

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.

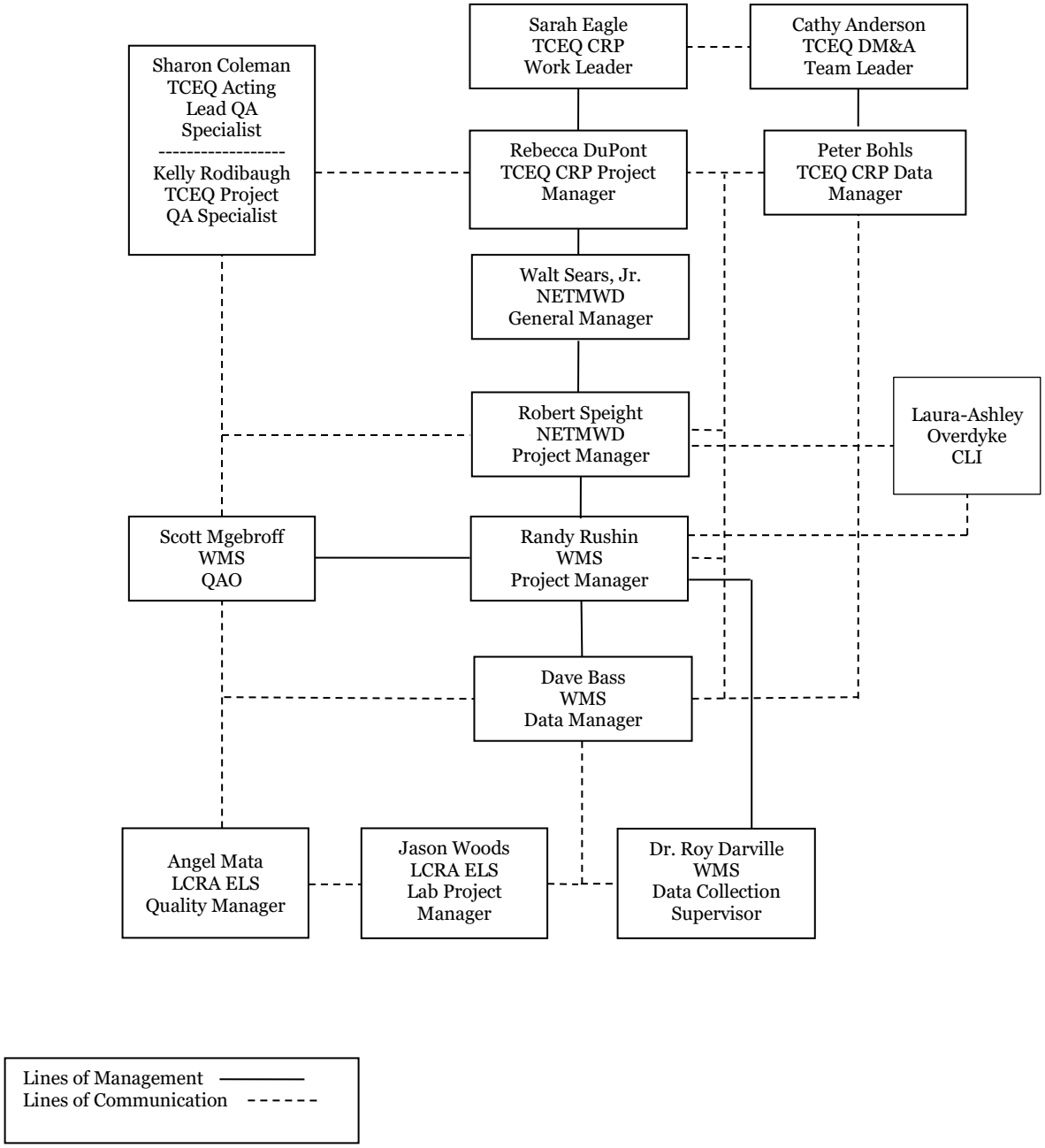
Caddo Lake Institute (CLI) Laura-Ashley Overdyke

Project Manager

Responsible for setting CLI's monitoring program objectives and ensuring that the collection field data meet CLI's monitoring program objectives. Responsible for ensuring that CLI staff follow all TCEQ SWQM procedures during instrument calibration and field data collection, and that they follow the NETMWD CRP QAPP during instrument calibration and field data collection. Responsible for ensuring that field data are reported on the appropriate forms and are transferred to the WMS Project Manager. Responsible for ensuring that instrument calibration failures and departures from the TCEQ SWQM Procedures manual and NETMWD CRP QAPP are reported to the NETMWD and WMS Project Managers.

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 NETMWD and the TCEQ to carry out the activities mandated by the legislation. The QAPP was developed and will be implemented in accordance with provisions of the TCEQ Quality Management Plan, January 2019 or most recent version (QMP).

The purpose of this QAPP is to clearly delineate NETMWD 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 2020 -2021*.

The Cypress Creek Basin in Texas consists of three major watersheds converging at the lowermost segment of Big Cypress Creek (Segment 0402). The four largest reservoirs in the basin are Caddo Lake (Segment 0401), Lake O' the Pines (Segment 0403), Lake Bob Sandlin (Segment 0408), and Lake Cypress Springs (Segment 0405). These four reservoirs are impoundments of Big Cypress Creek and are designated for use as public water supplies. Four smaller reservoirs (Monticello, Welch, Ellison Creek, and Johnson Creek) have been constructed on tributary streams to be used primarily as cooling ponds for steam-electric power plants. While shoreline development has been permitted only around Lake Cypress Springs, recreational and retirement housing construction continues within the small watersheds draining directly into Lake Bob Sandlin, Lake O' the Pines and Caddo Lake.

The Cypress Creek Basin water quality monitoring program has been established to collect surface water samples within the basin and to provide longitudinal water quality data for continuing evaluation of water quality. Previous efforts of other monitoring agencies have established reliable and useful data for evaluation under the SWQM water quality screening procedures. Monitoring data has been collected at gage locations within each of the ten segments of the Cypress Creek Basin since 1981.

This Cypress Creek 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 occur in stream and marginal reservoir habitats throughout the Cypress Creek Basin. All segments except 0408 (Lake Bob Sandlin) have reaches on the *Draft 2016 Texas 303(d) List*, or for which concerns about low DO concentrations are expressed in the *Draft 2016 Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d) (IR)*. In most locations, the low DO concentrations are associated with natural low flow conditions and high levels of photosynthesis and respiration.

Marginal and backwater habitats in Caddo Lake, as in Lake O' the Pines, occasionally exhibit DO concentrations below the segment criterion for support of aquatic life. However, these episodes are not generally accompanied by large daily changes in DO concentrations, and often reflect relatively constant, low concentrations throughout a 24-hour sample period. Caddo Lake has a lower nutrient load than Lake O' the Pines, and consequently does not support intense algal production during summer conditions. It is more likely in Caddo Lake that an intense oxygen demand is produced from the sediments during summer conditions, primarily from the decomposition of rooted plants mass-produced with the help of nutrients in the sediment. The Draft 2016 IR also includes a review of the DO levels in Caddo Lake which highlighted a pattern of lower DO in the upper end of the lake.

Assessment units in segments 0402, 0404, 0406, 0407, 0409 and 0410 have concerns for, or are listed as impaired for bacteria levels. In 2011, data collection was completed for a collaborative effort to assess sources for the listings in 0404 (Big Cypress Creek), 0404B (Tankersley Creek), and 0404C (Hart Creek). This approach to assessing bacteria loading is one option to consider in the other listed watersheds in the basin. A similar bacteria study was conducted in South Lilly Creek in 2016.

Except for nitrate, nutrient concentrations in streams rarely exceed TCEQ screening levels. However, total phosphorus and total nitrogen concentrations in streams throughout the Cypress Creek Basin are usually at levels that can result in excessive algal growth under low flow conditions or in impoundments. The heaviest loads have been observed originating from the Tankersley Creek watershed, and to a lesser extent, from other tributary watersheds in the upper part of the basin, for example, Prairie and Lilly Creeks, and the tributaries to Lake Cypress Springs and Lake Bob Sandlin. Some phosphorus and a large proportion of the nitrogen load is lost during transport in Big Cypress Creek from the vicinity of Mount Pleasant and Pittsburg to the headwaters of Lake O' the Pines, presumably through biological activity and trapping in the floodplain.

Low pH values, toxicity in water and sediments, and mercury in fish tissues appear to be phenomena associated with the lower portion of the Cypress Creek Basin. The lower basin coincides with predominantly acid soils and forested watersheds that result in "soft", acidic waters of relatively low buffering capacity. Those conditions, coupled with the intense biological activity associated with a warm, shallow, eutrophic environment are thought to be conducive to the mobilization of heavy metals, such as mercury, into aquatic food chains.

Despite the widespread occurrence of low DO concentrations, elevated nutrient and bacteria levels and other water quality problems, biological communities in streams throughout the Cypress Creek Basin continue to exhibit the abundance, trophic structure (the mixture of herbivores, detritivores and predators), and diversity appropriate to, or better than, that expected based on the quality of the habitat at those locations. To the extent that low DO concentrations are associated with low flow conditions, it is likely that aquatic communities in the Cypress Creek Basin are, to some extent, adapted to tolerate conditions that occur at least occasionally during summer conditions even in minimally disturbed streams.

The primary goal of the Cypress Creek Basin Clean Rivers Program is to provide the appropriate, quality assured data to allow continuing assessment and management of water quality in the Cypress Creek 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, diel dissolved oxygen monitoring, and biological and habitat assessments. Routine water quality grab sampling has been an ongoing effort over the years; however, this type of sampling provides only a short term view of water quality in an area; especially for streams and rivers-where flow conditions and water quality can change rapidly. Due to the dynamic nature of these systems, specific acute water quality issues may be missed due to sample timing. For example, stormwater runoff may not be captured by routinely scheduled quarterly grab sampling. Biological monitoring provides a more long-term view of water quality in these systems. Biological monitoring consists of fish and benthic macroinvertebrates which are identified and evaluated to determine if the assigned aquatic life use is being met. Since biological populations respond predictably to water quality issues, issues that may not be captured in a water quality grab sample may be identified. For example, in a system that frequently receives discharges of poor water quality, the species present will typically be more tolerant of poor water quality. However, in a system that does not receive such discharges, the biological community may contain higher number of intolerant species to poor water quality; and therefore, may indicate that the system generally maintains good water quality. As a result, biological monitoring can be used to determine the level of aquatic life use the system can sustain as well as the associated standards that are appropriate for the system.

A6 Project/Task Description

Assessment and management of water quality within the Cypress Creek 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 Cypress Creek Basin is made possible through a cooperative program directed by NETMWD. Program participants assisting NETMWD in planning, data collection, analysis, and reporting of water quality data include WMS, and Caddo Lake Institute (CLI). The Clean Rivers Program Steering Committee members, basin partners and affiliates include Pilgrim's Pride Corporation, Franklin County Water District, Titus County Fresh Water District #1, US Steel Tubular Products, Luminant, and the USGS.

The monitoring program for the Cypress Creek 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 Cypress Creek 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 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. In addition to routine monitoring conducted by WMS on behalf of NETMWD, field and (when applicable) flow data are provided by CLI. For FY 2020, 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). BS monitoring is conducted with no less than one-half and no more than two-thirds of the monitoring occurring in the index period, and no less than one fourth and no more than one-third will be collected in the critical period. Index and critical period is determined following the definition published in *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, Chapter 2*. In FY2020, diel monitoring will be performed at four stations with a similar effort expected in FY 2021.

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 and a habitat assessment will be conducted at one station in Tankersley Creek during the index and critical periods of FY 2020 and FY 2021.

The project design and site selection was 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 TCEQ *Draft 2016 Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d)*.

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

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

Amendments to the QAPP

Revisions to the QAPP may be necessary to address incorrectly documented information or to reflect changes in project organization, tasks, schedules, objectives, and methods. Requests for amendments will be directed from the NETMWD Project Manager to the CRP Project Manager electronically. The Basin Planning Agency 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 NETMWD Project Manager, the WMS Project Manager, the WMS QAO, the CRP Project Manager, the CRP Lead QA Specialist, the TCEQ QA Manager or designee, the CRP Project QA Specialist, and additional parties affected by the amendment. Amendments are not retroactive. No work shall be implemented without an approved QAPP or amendment prior to the start of work. Any activities under this contract that commence prior to the approval of the governing QA document constitute a deficiency and are

subject to corrective action as described in section C1 of this QAPP. Any deviation or deficiency from this QAPP which occurs after the execution of this QAPP 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 NETMWD Project Manager. If adherence letters are required, the NETMWD 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 Basin Planning Agency 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 NETMWD and the TCEQ Project Manager and TCEQ technical staff. Appendices will be written in an abbreviated format and will reference the Basin QAPP where appropriate. Appendices will be approved by the NETMWD Project Manager, the WMS Project Manager the WMS QAO, the Laboratory (as applicable), and the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist and additional parties affected by the Appendix, as appropriate. Copies of approved QAPP appendices will be distributed by the NETMWD Project Manager to project participants before data collection activities commence. The WMS Project Manager will secure written documentation from each sub-tier project participant (e.g., subcontractors, sub-participants, other units of government) stating the organization's awareness of and commitment to requirements contained in each special project appendix to the QAPP. The Basin Planning Agency will maintain this documentation as part of the project's QA records, and ensure that the documentation is available for review.

A7 Quality Objectives and Criteria

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

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 Tables A7.7 to A7.9, 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

Before new field personnel independently conduct field work, WMS PM and/or Data Collection Supervisor trains him/her 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.

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

A9 Documents and Records

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

Table A9.1 Project Documents and Records

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	NETMWD/WMS**	7	Paper/Electronic
Field SOPs	NETMWD/WMS**	7	Paper/Electronic
Laboratory Quality Manuals	LCRA ELS*	5	Paper/Electronic
Laboratory SOPs	LCRA ELS*	5	Paper/Electronic
QAPP distribution documentation	NETMWD/WMS**	7	Paper/Electronic
Field staff training records	NETMWD/WMS**	5	Paper/Electronic
Field equipment calibration/maintenance logs	WMS**/CLI	5	Electronic/Paper
Field instrument printouts	WMS**/CLI	5	Electronic/Paper
Field notebooks or data sheets	WMS**/CLI	5	Electronic/Paper
Chain of custody records (See Appendix D for Tracking Logs for Benthics and Fish)	NETMWD/WMS**	7	Electronic
Laboratory calibration records	LCRA ELS*	5	Paper
Laboratory instrument printouts	LCRA ELS*	5	Paper
Laboratory data reports/results	NETMWD/WMS**/ LCRA ELS*	5	Paper/Electronic/Paper
Laboratory equipment maintenance logs	LCRA ELS*	5	Paper
Corrective Action Documentation	NETMWD/CLI+/WMS**/ LCRA ELS*	5	Paper/Electronic/Paper

*Laboratory Records must be retained in accordance with the NELAC Standards
**WMS will transfer all paper documents to NETMWD annually and will retain electronic copies only.
+ WMS will retain CLI Corrective Action Documentation

Laboratory Test Reports

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

- 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)
- Certification of NELAP compliance

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 (by WMS or CLI), 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 Project Manager. Laboratory reports and results are sent electronically by the LCRA ELS to the NETMWD Project Manager and WMS Project Manager.

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

Data are submitted electronically to the TCEQ in the Event/Result file format described in the most current version of the SWQM DMRG, most recent version, which can be found at https://www.tceq.texas.gov/waterquality/data-management/dmrg_index.html. A completed Data Review Checklist and Data Summary (see Appendix F) will be submitted with each data submittal. Portions of the Biological Monitoring Reporting Packet (Appendix D) will be submitted by NETMWD to TCEQ in the required BLOB format as described in the SWQM DMRG, most recent version.

B1 Sampling Process Design

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

B2 Sampling Methods

Field Sampling Procedures

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

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Sample Volume	Holding Time	Matrix	Container	Preservation
TSS	400 ml	7 days	Water	New Plastic or New Cubitainer	Cool to < 6 °C, dark
Alkalinity	100 ml	14 days	Water		
Sulfate	100 ml	28 days	Water		
Chloride	100 ml	28 days	Water		
Nitrate (N)	150 ml	48 hrs	Water		
Nitrite (N)	150 ml	48 hrs	Water		
Ammonia	150 ml	28 days	Water	New Plastic or New Cubitainer	1-2 ml conc. H_2SO_4 to pH <2 and cool to < 6 °C, dark
Total Phosphorus	150 ml	28 days	Water		
TKN	200 ml	28 days	Water		
TOC	100 ml	28 days	Water		
Chlorophyll *a*/ Pheophytin	1000 ml	≤ 48 hrs Unfiltered 24 days Filtered	Water	New Amber Plastic	Dark and ice before filtration; Dark and frozen after filtration
E. coli +	125 ml	8 hours	Water	Plastic (sterile)	Cool to < 6 °C, dark sample container with sodium thiosulfate powder
Fish Vouchers	As needed to submerge samples without crowding	7 days in Formalin, indefinite for isopropyl alcohol or ethanol	Fish	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
Benthics	As needed to submerge samples without crowding (no more than ½ full)		Benthics	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

+*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. All sample containers will be provided by the LCRA ELS and will be purchased pre-cleaned and disposable. All containers will have preservatives added prior to shipment from the LCRA ELS.

- The bacteriological sample containers are the 120 and 290 mL bottles from IDEXX.
- Brown polyethylene bottles are provided for chlorophyll-a sampling.

No bottles will be reused for water quality sampling.

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; 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. Field data sheets are submitted by WMS and CLI. Flow worksheets, aquatic life use monitoring checklists, habitat assessment forms, field biological assessment forms, and records of bacteriological analyses (if applicable) are part of the field data record. The following will be recorded for all visits:

- Station ID
- Sampling Date
- Location
- Sampling Depth
- Sampling Time
- Sample Collector's name and signature
- Values for all field parameters collected
- Notes containing detailed observational data not captured by field parameters, including;
- Water appearance
- Weather
- Biological 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 Aquatic Life Use 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.

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

Examples of sampling method requirements or sample design deficiencies include but are not limited to such things as inadequate sample volume due to spillage or container leaks, failure to preserve samples appropriately, contamination of a sample bottle during collection, storage temperature and holding time exceedance, sampling at the wrong site, etc. Any deviations from the QAPP, SWQM Procedures, or appropriate sampling procedures may invalidate data, and require documented corrective action. Corrective action may include for samples to be discarded and re-collected. It is the responsibility of the WMS Project Manager, in consultation with the 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 Project Manager both verbally and in writing in the project progress reports and by completion of a CAP.

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

B3 Sample Handling and Custody

Sample Tracking

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

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The Chain of Custody (COC) form is a record that documents the possession of the samples from the time of collection to receipt in the laboratory. The following information concerning the sample is recorded on the COC form (See Appendix E). The following list of items matches the COC form in Appendix E.

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

Sample Labeling

Samples from the field are 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

The WMS Data Manager 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 used will be provided by LCRA ELS, will be pre-cleaned with proper techniques, supplied with correct preservatives, and labeled accordingly. Quality control for sample containers will be provided by LCRA ELS.

The 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 in order 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).

Sample Tracking Procedure Deficiencies and Corrective Action

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

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

B4 Analytical Methods

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

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

Standards Traceability

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

Analytical Method Deficiencies and Corrective Actions

Deficiencies in field and laboratory measurement systems involve, but are not limited to such things as instrument malfunctions, failures in calibration, blank contamination, quality control samples outside QAPP-defined limits, etc. In many cases, the field technician or lab analyst will be able to correct the problem. If the problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, then it is conveyed to the applicable Laboratory Supervisor, who will make the determination and notify the WMS PM and 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 NETMWD Project Manager. The WMS and NETMWD Project Manager will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ CRP Project Manager.

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

The TCEQ has determined that analyses associated with qualifier codes (e.g., "holding time exceedance," "sample received unpreserved," "estimated value") may have unacceptable measurement uncertainty associated with them. This will immediately disqualify analyses from submittal to SWQMIS. Therefore, data with these types of problems should not be reported to the TCEQ. Additionally, any data collected or analyzed by means other than those stated in the QAPP, or data suspect for any reason should not be submitted for loading and storage in SWQMIS. However, when data is lost, its absence will be described in the data summary report submitted with the corresponding data set, and a corrective action plan (as described in section C1) may be necessary.

B5 Quality Control

Sampling Quality Control Requirements and Acceptability Criteria

The minimum field QC requirements, and program-specific laboratory QC requirements, are outlined in SWQM Procedures. None of the parameters covered in this QAPP require the collection of field QC samples.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Batch

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

Method Specific QC requirements

QC samples, other than those specified later this section (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:

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

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.

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

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

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

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

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

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

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

Matrix spike recoveries are compared to the 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 NETMWD 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 Project Manager, 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 NETMWD Project Manager, WMS Project Manager, and WMS QAO will be relied upon in evaluating results.

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 Laboratory Quality Manager. The Laboratory Quality Manager will discuss the failure with the NETMWD Project Manager and WMS Project Manager. If applicable, the WMS Project Manager will include this information in a CAP and submit with the Progress Report which is sent to the TCEQ CRP Project Manager.

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

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

B6 Instrument/Equipment Testing, Inspection, and Maintenance

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

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

B7 Instrument Calibration and Frequency

Field equipment calibration requirements are contained in the SWQM Procedures. Post-calibration check error limits and the disposition resulting from 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.

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

B8 Inspection/Acceptance of Supplies and Consumables

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

B9 Acquired Data

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

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

Reservoir stage data are collected every day from the USGS 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 code 72053 Days Since Precipitation Event.

B10 Data Management

Data Management Process

The NETMWD Cypress Creek Basin CRP Database will be maintained and updated with data obtained from the Cypress Creek Basin CRP monitoring program (routine and systematic stations, special studies, and flow studies). All data results will be maintained electronically in accordance with procedures and guidelines described in the Cypress Creek Basin Clean Rivers Program Data Management Plan. The process described below summarizes these procedures and guidelines.

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

Additional water quality data collected through this monitoring program will be introduced into the NETMWD database by either manual entry, or digital electronic files by the WMS Data Manager. 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

Project Manager.

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 Cypress Creek Basin. 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 Cypress Creek Basin CRP monitoring program (i.e., monitoring conducted by WMS and by CLI), 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 Project Manager
5. WMS Project Manager
6. WMS Data Manager
7. WMS Quality Assurance Officer
8. Transfer of Data to TCEQ CRP Project Manager
9. TCEQ CRP Project Manager transfers data to TCEQ CRP Data Manager
10. TCEQ CRP Data Manager loads data into SWQMIS Production environment.

After the laboratory supervisor has received data from the lab analyst, the supervisor 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 Project Manager, using the lab's standard reporting format, will provide results to the WMS Project Manager. 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 by CLI to the WMS PM, are validated by the WMS QAO, and are included in data deliverables to the TCEQ by the WMS Data Manager.

Scanned field forms and copies of Chain of Custody forms will be sent by the WMS Project Manager to the WMS Data Manager for data screening and quality assurance and data formatting. This information will be quality checked by the WMS Data Manager 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 Data Manager 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 Data Manager 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 Data Manager 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 Data Manger 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 Data Manager converts the quality-assured data into pipe-delimited text format which is submitted to the TCEQ Project Manager for review. The TCEQ Project Manager will submit the file to the TCEQ Data Manager 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 NETMWD and retained for the periods described in Table A9.1.

Data will only be excluded from the NETWMD 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 Data Manager will alert the WMS Project Manager to any abnormalities or apparent outliers. The WMS Project Manager in consultation with the WMS QAO and NETMWD Project Manager 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 Data Manager'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 NETMWD office in Hughes Springs, Texas for the required duration defined in Table A9.1. Requests for data should be made to the NETMWD Project Manager.

Data Dictionary

Terminology and field descriptions are included in the SWMQ DMRG, 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.

Table B10.1 Data Dictionary

Name of Monitoring Entity	Tag Prefix	Submitting Entity	Collecting Entity
Caddo Lake Institute	CY	NT	CL
Northeast Texas Municipal Water District	CY	NT	
Water Monitoring Solutions, Inc.	CY	NT	WM

Data Errors and Loss

The WMS Project Manager and NETMWD Project Manager will be responsible for determining what data, if any, will be excluded from the NETMWD Cypress Creek Basin CRP Database. The WMS Project Manager and LCRA ELS Quality 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 entered in the WMS Data Manager's data log and saved electronically.

The WMS Data Manager 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 Data Manager 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.

Care must be taken to ensure that all Excel files exported are in pipe-delimited text format (following the guidelines in the SWQM DMRG, most recent version) to ensure correct transfer of all information. After the conversion of any database files into another format, a ten-percent check of the transferred files occurs. File transfer and checking is initially a responsibility of the WMS QAO, and secondarily the WMS Data Manager.

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) Chain of Custody 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 NETMWD server and WMS computers. A full backup of all WMS files is completed weekly and stored in a cloud-based server. Electronic data and reports will be submitted to NETMWD at the end of each quarter. All paper documents are scanned upon receipt and then transferred to NETMWD annually. In addition, all data files and reports concerning the project are available to the Project Manager at TCEQ.

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

Laboratory data will be housed in LCRA ELS's Chemware© Horizon LIMS. Once reports are generated, portable document format (pdf) copies will be delivered to the WMS PM. Lab data will be forwarded by the WMS PM to the WMS QAO for QA checks and the WMS DM for transcription and formatting per the most current version of the SWQM Data Management Reference Guide.

Field data is collected on paper field sheets. After collection, the documents are converted to portable document format (pdf). These files are sent to the WMS PM for archiving and distributed to the WMS QAO and WMS DM as above.

All data is stored on stored on Microsoft Windows© based computers and manipulated using the Microsoft Office suite of programs.

Information Resource Management Requirements

The information management specifications include TCEQ as well as NETMWD, WMS, and CLI internal information management controls. The TCEQ has the following data specification requirements: the Surface Water Quality Monitoring Data Management Reference Guide (DMRG), most recent version, GIS Policy (TCEQ OPP 8.11) and GPS Policy (TCEQ OPP 8.12). 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 SWQM DMRG, most recent revision, and applicable NETMWD information resource management policies.

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

C1 Assessments and Response Actions

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

Table C1.1 Assessments and Response Requirements

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Status Monitoring Oversight, etc.	Continuous	NETMWD	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report

Monitoring Systems Audit of Basin Planning Agency	Dates to be determined by TCEQ QA	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the TCEQ to provide corrective actions
Monitoring Systems Audit of Program Sub-participants	One audit per sub-participant (i.e. WMS, CLI) prior to the expiration of the QAPP	NETMWD	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to NETMWD. . The NETWMD 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 respond in writing to the TCEQ to provide corrective actions

Corrective Action Process for Deficiencies

Deficiencies are any deviation from the QAPP, SWQM Procedures, or other applicable guidance. Deficiencies may invalidate resulting data and require corrective action. Repeated deficiencies should initiate a CAP. Corrective action for deficiencies may include for samples to be discarded and re-collected. Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff, are communicated to the NETMWD and WMS Project Managers (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 Project Manager, in consultation with the 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 Project Manager both verbally and in writing in quarterly progress reports and by completion of a CAP.

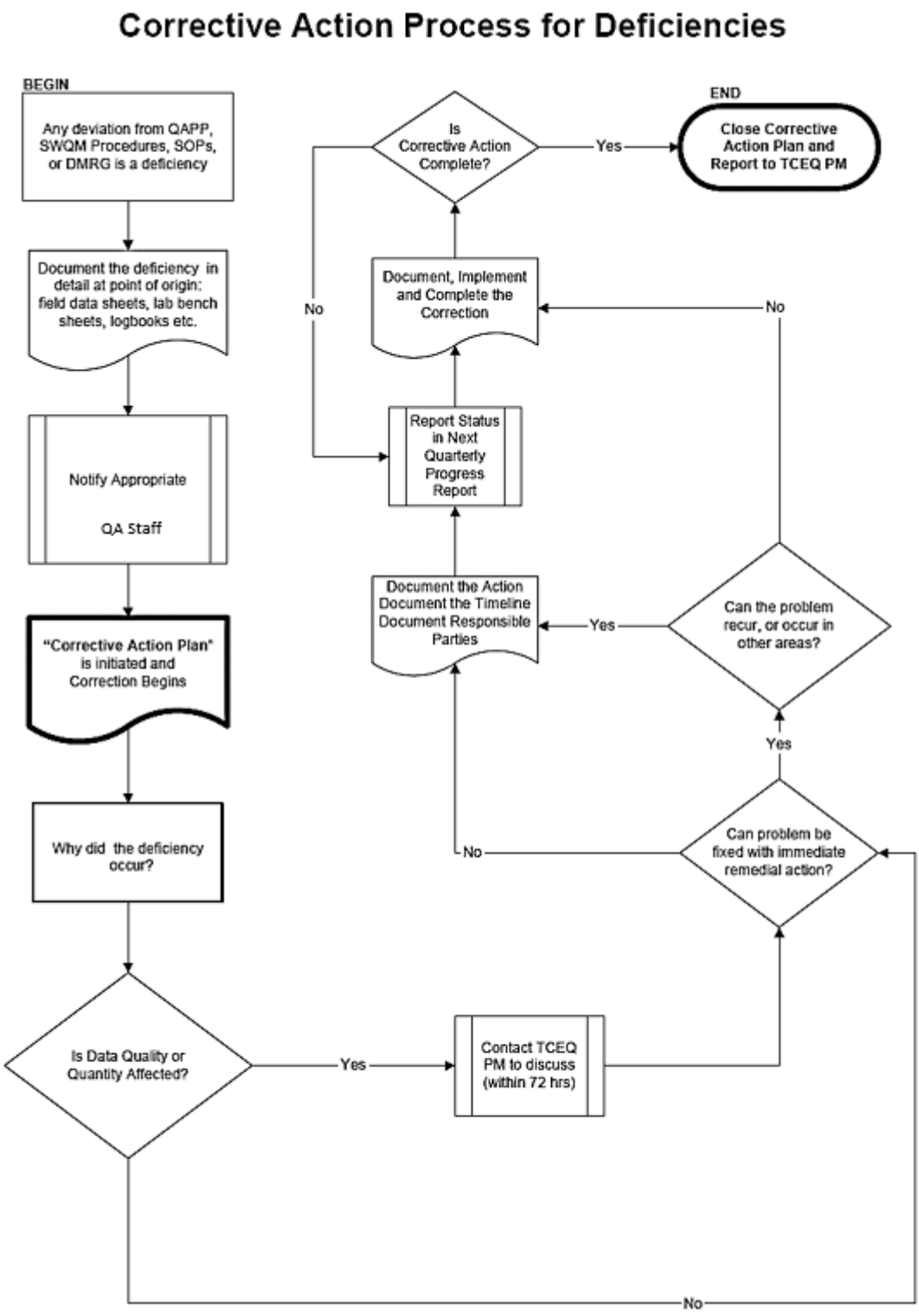
Corrective Action

CAPs should:

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

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 Project Manager 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 WMS Project Manager. Audit reports and associated corrective action documentation will be submitted to the TCEQ with the quarterly progress reports.

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

C2 Reports to Management

Table C2.1 QA Management Reports

Type of Report	Frequency (daily, weekly, monthly, quarterly, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipients
Non-Conformance	As needed	As needed	WMS PM	NETMWD PM TCEQ CRP PM
Monitoring Summary	Quarterly	By the 15th day of the month following the end of the quarter	WMS PM	NETMWD PM TCEQ CRP PM
CRP Progress Report	Quarterly	December 15, 2019 March 15, 2020 June 15, 2020 September 15, 2020 December 15, 2020 March 15, 2021 June 15, 2021 August 31, 2021	WMS PM	NETMWD PM TCEQ CRP PM
Data Summary	Three times per year	By the contracted due date	WMS DM	NETMWD PM TCEQ CRP PM
Monitoring Systems Audit Report	Once per biennium	Within 30 days of Audit completion	NETMWD PM	TCEQ CRP PM
Contractor Evaluations	Once per biennium	Within 30 days of Evaluation completion	TCEQ CRP PM	NETMWD PM

Reports to NETMWD Project Management

Each quarter, WMS QAO will review QA laboratory results and field sheets. Reports with any corrective actions that occurred will be sent to the WMS PM for review. The WMS PM will communicate with the NETMWD PM and will include corrective actions in the quarterly report. NETMWD will then review and transmit these reports to TCEQ for their review. The CLI will report any non-conformances, such as instrument or calibration issues, to the WMS PM. The LCRA ELS will submit data and QA/QC reports within 30 days of the receipt of samples for analysis to the NETMWD and WMS PM. For Aquatic Life Use monitoring, field forms will be transferred to NETMWD by WMS. The Biological Monitoring Reporting Packet (Appendix D) will be completed and submitted to NETMWD 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. In addition, the completed Biological Monitoring Reporting Packet (Appendix D) will be submitted by NETMWD in the formats required for event/result text and BLOB files. Upon NETMWD approval, WMS will submit the data to TCEQ for acceptance into SWQMIS.

Progress Report

Summarizes WMS's and the NETMWD'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

The NETMWD will audit sub-participants (i.e. WMS, CLI) once per biennium. Following any audit performed by the NETMWD, a report of findings, recommendations and response is sent to the TCEQ in the quarterly progress report.

Data Summary

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

Reports by TCEQ Project Management

Contractor Evaluation

The NETMWD 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 Data Manager and QAO. Data review, verification, and validation tasks to be performed on the data set include, but are not limited to, the confirmation of laboratory and field data review, evaluation of field QC results, additional evaluation of anomalies and outliers, analysis of sampling and analytical gaps, and confirmation that all parameters and sampling sites are included in the QAPP.

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

Another element of the data validation process is consideration of any findings identified during the monitoring systems audit conducted by the TCEQ CRP Lead Quality Assurance Specialist. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. After the data are reviewed and documented, the WMS Project Manager validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

If any requirements or specifications of the CRP are not met, based on any part of the data review, the responsible party should document the nonconforming activities and submit the information to the WMS Data Manager with the data in the Data Summary (See Appendix F). All failed QC checks, missing samples, missing analytes, missing parameters, and suspect results should be discussed in the Data Summary.

Table D2.1: Data Review Tasks

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

Data to be Verified	Field Task	Laboratory Task	WMS Data Management Task
Field instrument pre- and post-calibration check results within limits			WMS DM
Verified data log submitted			WMS QAO, WMS PM
10% of data manually reviewed			WMS 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 A7.1-A7.9

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

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

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

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

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

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

TABLE A7.1 Measurement Performance Specifications for NETMWD (data collected by WMS and CLI)					
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)*	us/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
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
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE	meters	water	TCEQ SOP V2	82903	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=OT	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

* 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

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, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.2 Measurement Performance Specifications for NETMWD (data collected by WMS and CLI)

Flow Parameters					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	Field
FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	Field
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, 23rd Edition, 2017.
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TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.3 Measurement Performance Specifications for NETMWD (data collected by WMS)										
Conventional Parameters in Water										
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**TCEQ AWRL**	**LOQ**	**LOQ Check Sample %Rec**	**Precision (RPD)**	**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, 23rd Edition, 2017.

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

TABLE A7.4 Measurement Performance Specifications for NETMWD (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**	31699	1	1	NA	0.50*	NA	LCRA ELS
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	LCRA ELS

* This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.
** E.coli samples analyzed by these methods should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.

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, 23rd Edition, 2017.
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TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.5 Measurement Performance Specifications for NETMWD (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	uS/cm	Water	TCEQ SOP V1	00212	Field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MAX	uS/cm	Water	TCEQ SOP V1	00213	Field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MIN	uS/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, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

TABLE A7.6 Measurement Performance Specifications for NETMWD (data collected by WMS)					
Biological - Habitat					
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

TABLE A7.6 Measurement Performance Specifications for NETMWD (data collected by WMS)					
Biological - Habitat					
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**Lab**
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
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

* From USGS map.

References:

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

TABLE A7.7 Measurement Performance Specifications for NETMWD (data collected by WMS)					
Biological - Benthics (Quantitative)					
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

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

TABLE A7.8 Measurement Performance Specifications for NETMWD (data collected by WMS)					
Biological - Benthics (Qualitative)					
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 V3	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

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

TABLE A7.9 Measurement Performance Specifications for NETMWD (data collected by WMS)					
Biological - Nekton					
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

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

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

WORK Plan TASK 3: WATER QUALITY MONITORING

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

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

Task Description: The Performing Party will 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 Cypress Creek Basin Steering Committee and through the Coordinated Monitoring process, a minimum of eleven routine stations will be monitored quarterly for field parameters, flow (where applicable), bacteria, and conventional water chemistry by the Performing Party. Field parameters and flow (when possible) will be collected at a minimum of three stations per quarter. 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 four stations.

Biological monitoring will be conducted at one or more stations per year in FY 2020 and 2021. Aquatic Life Use sampling for fish and benthics will be performed along with measurements for stream flow and habitat analysis. Collections will be made in the index and critical periods of each fiscal year. Two diel monitoring events will be completed as part of Aquatic Life Use studies. One diel will be conducted in the index period and one diel event in the critical period. Data will be summarized and submitted for inclusion into the SWQMIS database.

In FY 2021, a similar monitoring effort is expected. Changes to the monitoring schedule will be made after considering input from the Basin Steering Committee, and through the Coordinated Monitoring Process. The specific locations, parameters, and sampling frequencies for FY 2021 will be provided in the Cypress Creek Basin QAPP Appendix B monitoring schedule.

Special Study Monitoring - In FY2020 only, the Performing Party will conduct short-term monitoring for sulfate in Big Cypress Creek. Monitoring will be conducted monthly at a minimum of four stations for one year and field parameters and flow (when possible) will be measured at the time of sample collection. All monitoring will be completed in accordance with the Performing Party QAPP, the TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods (RG-415) and the TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416).

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

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

Deliverables and Dues Dates:

September 1, 2019 through August 31, 2020

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

September 1, 2020 through August 31, 2021

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

Appendix B Sampling Process Design and Monitoring Schedule (plan)

Sample Design Rationale FY 2020

The sample design is based on the legislative intent of CRP. Under the legislation, the Basin Planning Agencies have been tasked with providing data to characterize water quality conditions in support of the Texas Water Quality Integrated Report, and to identify significant long-term water quality trends. Based on Steering Committee input, achievable water quality objectives and priorities and the identification of water quality issues are used to develop work plans which are in accord with available resources. As part of the Steering Committee process, the NETMWD 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 Cypress 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.

During FY 2020, 19 routine stations will be monitored and 24-hour diel monitoring will be performed at three stations. Aquatic life monitoring will be conducted at one station. The results from data collected at these monitoring stations 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 Cypress Creek 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 water quality samples will be analyzed for total suspended solids, total dissolved solids, alkalinity, sulfate, chloride, total phosphorus, ammonia nitrogen, nitrate nitrogen, nitrite nitrogen, total Kjeldahl nitrogen, total organic carbon, chlorophyll-*a* and pheophytin. Bacteriological samples will also be collected for laboratory analysis and will consist of *E. coli* to be collected during all conditions encountered.

The following changes have been made to the FY 2020 monitoring schedule. These changes are a result of concerns or requests made by Cypress Creek Basin steering committee members and/or monitoring entities.

1. Station 10288 - CADDO LAKE IN GOOSE PRAIRIE SOUTH OF STAR DITCH 500 M SOUTHEAST OF END OF FM 2198: Added quarterly monitoring of Field Parameters, Conventionals, and Bacteria at the request of CLI to be collected by WMS.
2. Station 14236 - CLINTON LAKE 165 METERS NORTH AND 1.09 KILOMETERS EAST TO THE INTERSECTION OF CYPRESS VILLAGE ROAD AND CYPRESS VILLAGE SOUTH AT CHANNEL MARKER C111 NEAR CADDO LAKE: Added quarterly monitoring of Field Parameters, Conventionals, and Bacteria at the request of CLI to be collected by WMS.
3. Station 16458 - BIG CYPRESS CREEK NEAR GREASY CK (N. Roach Property): Added quarterly monitoring of Field Parameters, Conventionals, and Bacteria to be collected by WMS. This station is the only accessible point in the lower portion of Big Cypress Creek.

4. Station 10261 - TANKERSLEY CREEK AT FM3417 5.7 KM SOUTH OF MOUNT PLEASANT: Added Aquatic Life Use monitoring to be conducted by WMS at the request of NETMWD to evaluate sulfate and nitrate concerns on the biota of the stream.
5. Station 22151 - BIG CYPRESS CREEK AT CR SW 3170: Added to monitoring schedule for diel monitoring, flow, and field monitoring at the request of TCEQ to be conducted by WMS.
6. Station 10319 - JAMES/JIMS BAYOU BRIDGE ON MARION CR 3312 NE OF SMITHLAND: Site has been removed from the monitoring schedule due to access issues. There are enough data at this station and monitoring is occurring at another station in the AU.
7. Station 10244 - BLACK CYPRESS BAYOU AT COUNTY ROAD 3.7 MILES NORTHWEST OF BEREA: Diel monitoring at this site has been removed from monitoring schedule. There are enough diels at this station to assess the water body. The diel monitoring effort has been moved to Station 21551 in segment 0405A.

WMS will perform all monitoring activities except monthly routine monitoring of field parameters at five stations in Caddo Lake and one in Big Cypress Creek which will be collected by the CLI. CLI will collect monthly field parameters in Caddo Lake at mid-lake (Station 10283), Caddo Lake at Harrison Bayou (Station 10286), Caddo Lake in Goose Prairie, South of Star Ditch (Station 10288), Clinton Lake at Channel Marker C111 Near Caddo Lake (Station 14236), Caddo Lake near shore at end of FM 2198 at Dwight Shellman's Property SE of Uncertain (Station 15249), and on Big Cypress Creek at Caddo Lake State Park (Station 15022). WMS will collect quarterly conventional and bacteria samples at Station 10283, Station 10288, Station 15249, Station 14236.

Biased to Season Monitoring

Diel monitoring will be conducted four times throughout the year. No less than one-half and no more than two-thirds of the samples will be collected in the index period, and no less than one-fourth and no more than one-third will be collected in the critical period. Diel monitoring includes quarterly sampling on Prairie Creek at FM 557 (Station 15386), Little Cypress Creek at FM 134 (Station 10331), and Big Cypress Creek at CR SW 3170 (Station 22151). Flow will be measure at all wade-able stream stations or will be obtained from a nearby USGS gaging station.

Aquatic Life Use monitoring will be conducted once during the index period and once during the critical period in FY 2020 and FY 2021. Monitoring will be conducted at Tankersley Creek at FM 3417 (Station 10261). Habitat, benthic macroinvertebrates, and nekton will be assessed in addition to the collection of Field Parameters, Flow, and Diel monitoring.

Site Selection Criteria

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

1. Locate stream sites so that samples can be safely collected from the centroid of flow. Centroid is defined as the midpoint of that portion of stream width which contains 50 percent of the total flow. If multiple potential sites on a stream segment are appropriate for monitoring, choose one that would best represent the water body, and not a site that displays unusual conditions or contaminant source(s). Avoid backwater areas or eddies when selecting a stream site.
2. At a minimum for reservoirs, locate sites near the dam (reservoirs) and in the major arms. Larger reservoirs might also include stations in the middle and upper (riverine) areas. Select sites that best represent the water body by avoiding coves and back water areas. A single monitoring site is considered representative of 25 percent of the total reservoir acres, but not more than 5,120 acres.
3. Monitoring sites are selected to maximize stream coverage or basin coverage. Very long segments may require more stations. As a rule of thumb, stream segments between 25 and 50 miles long require two stations, and longer than 50 miles require three or more depending on the existence of areas with significantly different sources of contamination or potential water quality concerns. Major hydrological features, such as the confluence of a major tributary or an instream dam, may also limit the spatial extent of an assessment based on one station.
4. Because historical water quality data can be very useful in assessing use attainment or impairment, it may be

best to use sites that are on current or past monitoring schedules.

5. All classified segments (including reservoirs) should have at least one monitoring site that adequately characterizes the water body, and monitoring should be coordinated with the TCEQ or other qualified monitoring entities reporting routine data to TCEQ.
6. Monitoring sites may be selected to bracket sources of pollution, influence of tributaries, changes in land uses, and hydrological modifications.
7. Sites should be accessible. When possible, stream sites should have a USGS or IBWC stream flow gauge. If not, it should be possible to conduct flow measurement during routine visits.

Monitoring Sites for FY 2020

Table B1.1 Sample Design and Schedule, FY 2020

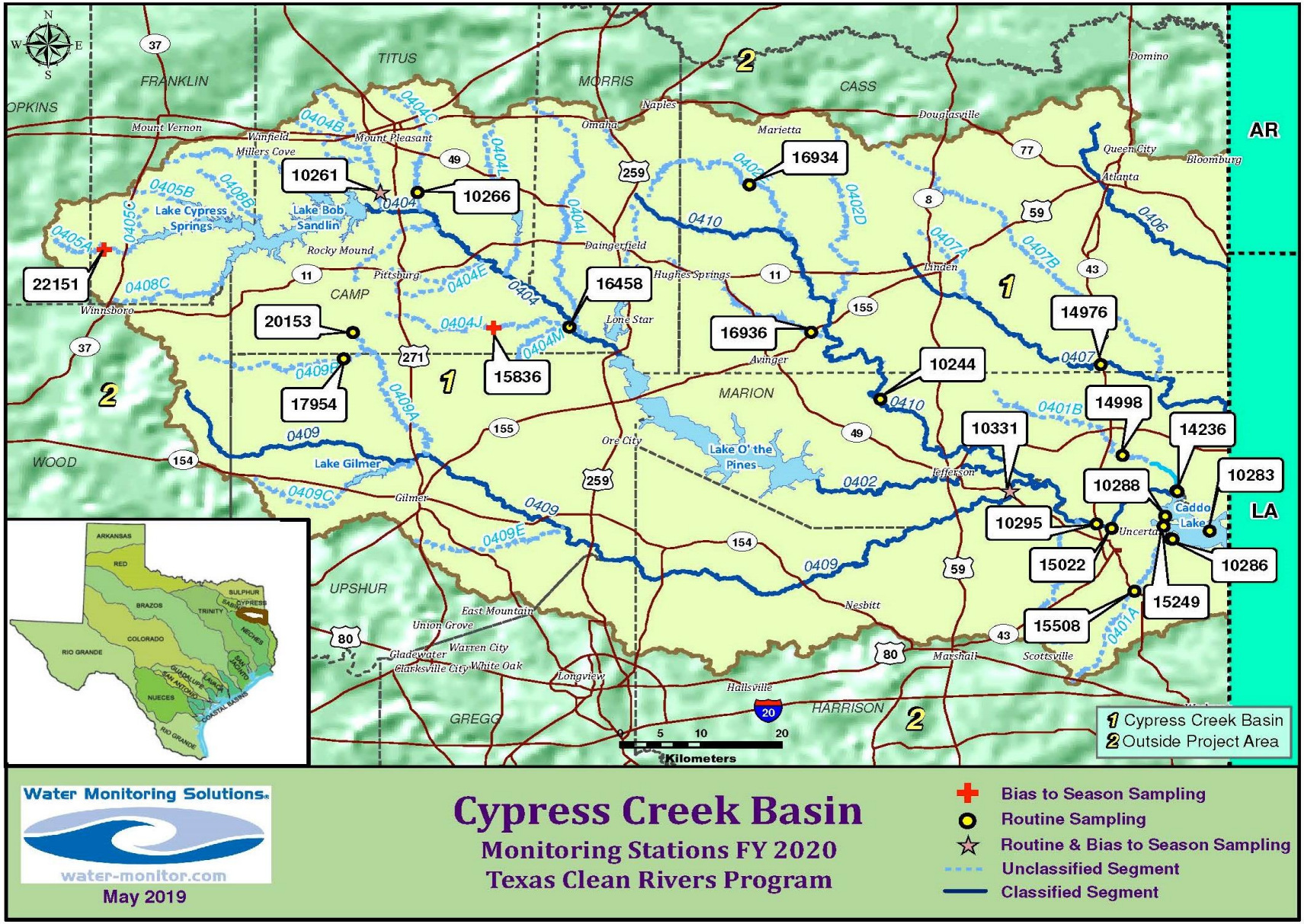
Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
Segment 0401 Caddo Lake															
CADDO LAKE 0.25 MI NE OF THE MOUTH OF HARRISON BAYOU AND 0.35 MI EAST OF LONG POINT	10286	0401_02	05	NT	CL	RT	11								CLI Monthly Sampling Program
CADDO LAKE IN GOOSE PRAIRIE SOUTH OF STAR DITCH 500 M SOUTHEAST OF END OF FM 2198	10288	0401_03	05	NT	CL	RT	11								CLI Monthly Sampling Program
CADDO LAKE IN GOOSE PRAIRIE SOUTH OF STAR DITCH 500 M SOUTHEAST OF END OF FM 2198	10288	0401_03	05	NT	WM	RT	4	4	4						
CADDO LAKE MID LAKE 1.8 KM SOUTH OF END OF FM 727 1.9 KM NORTHWEST OF COLLIERS LAUNCH CAMS707	10283	0401_01	05	NT	CL	RT	11								CLI Monthly Sampling Program
CADDO LAKE MID LAKE 1.8 KM SOUTH OF END OF FM 727 1.9 KM NORTHWEST OF COLLIERS LAUNCH CAMS707	10283	0401_01	05	NT	WM	RT	4	4	4						
CADDO LAKE NEAR SHORE AT END OF FM 2198 AT DWIGHT SHELLMANS PROPERTY SE OF UNCERTAIN	15249	0401_07	05	NT	CL	RT	11								CLI Monthly Sampling Program
CADDO LAKE NEAR SHORE AT END OF FM 2198 AT DWIGHT SHELLMANS PROPERTY SE OF UNCERTAIN	15249	0401_07	05	NT	WM	RT	4	4	4						
CLINTON LAKE 165 METERS NORTH AND 1.09 KILOMETERS EAST TO THE INTERSECTION OF CYPRESS VILLAGE ROAD AND CYPRESS VILLAGE SOUTH AT CHANNEL MARKER C111 NEAR CADDO LAKE	14236	0401_05	05	NT	CL	RT	11								CLI Monthly Sampling Program
CLINTON LAKE 165 METERS NORTH AND 1.09 KILOMETERS EAST TO THE INTERSECTION OF CYPRESS VILLAGE ROAD AND CYPRESS VILLAGE SOUTH AT CHANNEL MARKER C111 NEAR CADDO LAKE	14236	0401_05	05	NT	WM	RT	4	4	4						
HARRISON BAYOU AT FM 134 4 MI SOUTH OF KARNACK	15508	0401A_01	05	NT	WM	RT	4	4	4	4					
KITCHEN CREEK AT MARION CR3416 APPROXIMATELY 10 MI E. OF JEFFERSON AND 2.5 MI S OF INTERSECTION OF CR3416 AND SH49 EAST OF SMITHLAND	14998	0401B_01	05	NT	WM	RT	4								

Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Comments
Segment 0402 Big Cypress Creek below Lake O' the Pines															
BIG CYPRESS CREEK APPROX 1.2KM DOWNSTREAM OF SH43 AT CADDO LAKE STATE PARK BOAT RAMP	15022	0402_01	05	NT	CL	RT	11			11					CLI Monthly Sampling Program
BIG CYPRESS CREEK AT SH 43 NORTH OF KARNACK	10295	0402_01	05	NT	WM	RT	4	4	4	4					
HUGHES CREEK AT SH155 APPROX 6KM NE OF AVINGER	16936	0402B_01	05	NT	WM	RT	4								Too deep to wade for flow
KELLEY CREEK AT FM250 APPROX 15KM NE OF HUGHES SPRINGS	16934	0402E_01	05	NT	WM	RT	4			4					
Segment 0404 Big Cypress Creek below Lake Bob Sandlin															
BIG CYPRESS CREEK NEAR GREASY CK (N. Roach Property)	16458	0404_01	05	NT	WM	RT	4	4	4						
TANKERSLEY CREEK AT FM3417 5.7 KM SOUTH OF MOUNT PLEASANT	10261	0404B_01	05	NT	WM	RT	4	4	4	4					
TANKERSLEY CREEK AT FM3417 5.7 KM SOUTH OF MOUNT PLEASANT	10261	0404B_01	05	NT	WM	BS	2			2	2	2	2	2	ALU monitoring
HART CREEK AT TITUS COUNTY ROAD SE 12 3.8 KM UPSTREAM OF BIG CYPRESS CREEK CONFLUENCE SOUTH OF MOUNT PLEASANT	10266	0404C_01	05	NT	WM	RT	4	4	4	4					
PRAIRIE CREEK AT FM 557 7.4 MI SW OF PITTSBURG	15836	0404J_01	05	NT	WM	BS	4			4	4				
Segment 0405 Lake Cypress Springs															
BIG CYPRESS CREEK AT CR SW 3170	22151	0405A_01	05	NT	WM	BS	4			4	4				
Segment 0407 James' Bayou															
JIMS BAYOU AT SH43 APPROXIMATELY 12 MI NE OF JEFFERSON AND 1.0 MI SOUTH OF KILDARE JUNCTION ON SH43	14976	0407_01	05	NT	WM	RT	4	4	4	4					
Segment 0409 Little Cypress Creek															
LITTLE CYPRESS CREEK AT FM 134 NW OF BALDWIN SE OF JEFFERSON	10331	0409_01	05	NT	WM	BS	4			4	4			-	Flow from USGS gage at US 59
LITTLE CYPRESS CREEK AT FM 134 NW OF BALDWIN SE OF JEFFERSON	10331	0409_01	05	NT	WM	RT	4	4	4	4					Flow from USGS gage at US 59
LILLY CREEK AT FM 556 APPROXIMATELY 1.04 KM SOUTHWEST OF HICKORY HILL IN CAMP COUNTY TEXAS	20153	0409A_01	05	NT	WM	RT	4	4	4						Too deep to wade for flow
SOUTH LILLY CREEK AT FM 2454 1.8 KM SOUTH OF THE INTERSECTION WITH FM 556 AND SOUTHWEST OF PITTSBURG	17954	0409B_01	05	NT	WM	RT	4	4	4	4					
Segment 0410 Black Cypress Creek															
BLACK CYPRESS BAYOU AT COUNTY ROAD 3.7 MILES NORTHWEST OF BEREA	10244	0410_02	05	NT	WM	RT	4	4	4	4					Flow will be measured when wadeable

Appendix C: Station Location Maps

Station Location Maps

Maps of stations monitored by the NETMWD 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.


Water Monitoring Solutions
water-monitor.com
May 2019
Cypress Creek Basin
Monitoring Stations FY 2020
Texas Clean Rivers Program
Bias to Season Sampling
Routine Sampling
Routine & Bias to Season Sampling
Unclassified Segment
Classified Segment
1 Cypress Creek Basin
2 Outside Project Area
Kilometers
10261
10266
16934
22151
16458
20153
15836
17954
16936
10244
14976
14998
14236
10331
10288
10283
10295
15022
10286
15249
15508
0404
0404A
0404B
0404C
0404D
0404E
0404I
0404J
0404M
0405A
0405B
0405C
0407
0407A
0407B
0408B
0408C
0409
0409A
0409B
0409C
0409E
0401A
0401B
0402
0402D
0406
0410
Lake Cypress Springs
Lake Bob Sandlin
Lake Gilmer
Lake O' the Pines
Caddo Lake
AR
LA
TITUS
MORRIS
CASS
FRANKLIN
CAMP
MARION
WOOD
UPSHOR
GREGG
HARRISON

Appendix D: Field Data Sheets

Water Monitoring Solutions

Cypress Creek Basin Clean Rivers Program
Reservoir 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):					

Water Level:	Present Weather:	Wind Intensity	Wind Direction		Water Surface
Below Normal	Clear	Calm	N	S	Calm
Normal	Partly Cloudy	Slight	E	W	Ripple
Above Normal	Cloudy	Moderate	NE	SE	Waves
	Rain	Strong	NW	SW	Whitecap

Reservoir Stage (ft.)	Reservoir % Full	Sediment Odor:		Water Odor:		Water Color:		Water Clarity:	
		None	Sewage	Sewage	Oily/ Chemical	Brown	Red	Poor	Good
		Musky	Other:	Rotten Eggs	Musky	Green	Black	Fair	Excellent
		Fishy		Fishy	None Other	Clear	Other		

Sample Depth (m)	Water Temp °C	DO % sat	DO mg/L	pH	Sp. Cond µS/cm	Total Depth (m):	Secchi (m)	Air Temp °C	Photos Taken
0.3									
1.0									
2.0									
3.0						% Cloud Coverage		% Aquatic Plant Coverage	
4.0									
5.0									
6.0									

Observed Uses:
Adjacent Land Use:
Observations: (stream flow [if any], debris in water, canopy coverage, obvious signs of eutrophication, etc.):

Parameters:	Field		Conventionals		*E. coli*		

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Cypress Creek Basin Clean Rivers Program
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	pH	Sp. Cond µS/cm	Secchi (m)	Air Temp °C	Sample Depth (m)	Photos Taken

Evidence of Flow Fluctuations:
Observed Stream Uses:
Adjacent Land Use:
Channel Obstructions/Modifications:
Observations: (stream flow [if any], debris in water, canopy coverage, obvious signs of eutrophication, etc.):

Parameters:	Field		Conventionals		*E. coli*		

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STREAM FLOW (DISCHARGE) MEASUREMENT FORM

Stream: ______________________ **Date:** ____________

Station Description: ______________________

Time Begin: ____________ **Time End:** ____________ **Meter Type:** Marsh McBirney

Observers: ____________ **Stream Width*:** ____________ **Section Width:** ____________

Observations: Measurements taken from left right to left right bank above below the bridge crossing

Section midpoint (ft)	Section depth (ft)	Observational Depth (ft)	Velocity At Point (ft/sec)	Velocity Average (ft/sec)	Area WxD (ft^2)	Flow VxA (cfs)
$m^3/s \times 35.3 = ft^3/s$				**Total Flow (Discharge) (3Q)**		

Make a minimum of 10 measuremetns when the total width is >5.0 feet, 20 measurements preferred.

Measure at 60% of depth from surface where <2.5 feet deep. Measure at 20% and 80% of depth in waters >2.5feet.

Water Monitoring Solutions

Discharge Measurement Summary

Date Generated: Tue Feb 15 2011

File Information

File Name	17954.215.WAD
Start Date and Time	2011/02/15 10:43:26

Site Details

Site Name	FM 2454
Operator(s)	RUSHIN

System Information

Sensor Type	FlowTracker
Serial #	P3026
CPU Firmware Version	3.7
Software Ver	2.11

Units (English Units)

Distance	ft
Velocity	ft/s
Area	ft^2
Discharge	cfs

Discharge Uncertainty

Category	ISO	Stats
Accuracy	1.0%	1.0%
Depth	0.1%	1.7%
Velocity	0.9%	4.9%
Width	0.1%	0.1%
Method	1.9%	-
# Stations	2.2%	-
Overall	**3.2%**	**5.2%**

Summary

Averaging Int.	20	# Stations	23
Start Edge	REW	Total Width	33.600
Mean SNR	27.9 dB	Total Area	47.130
Mean Temp	50.50 °F	Mean Depth	1.403
Disch. Equation	Mid-Section	Mean Velocity	0.0899
		Total Discharge	**4.2354**

Measurement Results

St	Clock	Loc	Method	Depth	%Dep	MeasD	Vel	CorrFact	MeanV	Area	Flow	%Q
0	10:43	2.00	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0
1	10:43	3.50	0.6	0.570	0.6	0.228	0.0755	1.00	0.0755	0.855	0.0645	1.5
2	10:44	5.00	0.6	0.950	0.6	0.380	0.0997	1.00	0.0997	1.425	0.1421	3.4
3	*10:44*	*6.50*	*0.6*	*1.150*	*0.6*	*0.460*	*0.1115*	*1.00*	*0.1115*	*1.725*	*0.1924*	*4.5*
4	10:45	8.00	0.6	1.300	0.6	0.520	0.0942	1.00	0.0942	1.950	0.1836	4.3
5	10:46	9.50	0.6	1.430	0.6	0.572	0.1270	1.00	0.1270	2.145	0.2724	6.4
6	10:47	11.00	0.6	1.550	0.6	0.620	0.1171	1.00	0.1171	2.325	0.2723	6.4
7	10:47	12.50	0.6	1.500	0.6	0.600	0.1519	1.00	0.1519	2.250	0.3418	8.1
8	10:48	14.00	0.6	1.600	0.6	0.640	0.1381	1.00	0.1381	2.400	0.3315	7.8
9	10:49	15.50	0.6	1.620	0.6	0.648	0.1073	1.00	0.1073	2.430	0.2607	6.2
10	10:49	17.00	0.6	1.620	0.6	0.648	0.1161	1.00	0.1161	2.430	0.2822	6.7
11	10:50	18.50	0.6	1.620	0.6	0.648	0.0755	1.00	0.0755	2.430	0.1834	4.3
12	10:51	20.00	0.6	2.150	0.6	0.860	0.1188	1.00	0.1188	3.225	0.3830	9.0
13	10:52	21.50	0.6	2.100	0.6	0.840	0.1027	1.00	0.1027	3.150	0.3235	7.6
14	10:52	23.00	0.6	2.000	0.6	0.800	0.0912	1.00	0.0912	3.000	0.2736	6.5
15	10:53	24.50	0.6	2.200	0.6	0.880	0.0607	1.00	0.0607	3.300	0.2003	4.7
16	10:54	26.00	0.6	1.800	0.6	0.720	0.0886	1.00	0.0886	2.700	0.2392	5.6
17	10:55	27.50	0.6	1.700	0.6	0.680	0.0902	1.00	0.0902	2.550	0.2301	5.4
18	*10:55*	*29.00*	*0.6*	*1.500*	*0.6*	*0.600*	*0.0121*	*1.00*	*0.0121*	*2.250*	*0.0273*	*0.6*
19	10:56	30.50	0.6	1.270	0.6	0.508	0.0171	1.00	0.0171	1.905	0.0325	0.8
20	*10:57*	*32.00*	*0.6*	*1.070*	*0.6*	*0.428*	*0.0000*	*1.00*	*0.0000*	*1.605*	*0.0000*	*0.0*
21	*10:58*	*33.50*	*0.6*	*0.600*	*0.6*	*0.240*	*-0.0010*	*1.00*	*-0.0010*	*1.080*	*-0.0011*	*0.0*
22	10:58	35.60	None	0.000	0.0	0.0	0.0000	1.00	0.0000	0.000	0.0000	0.0

Rows in italics indicate a QC warning. See the Quality Control page of this report for more information.

Water Monitoring Solutions

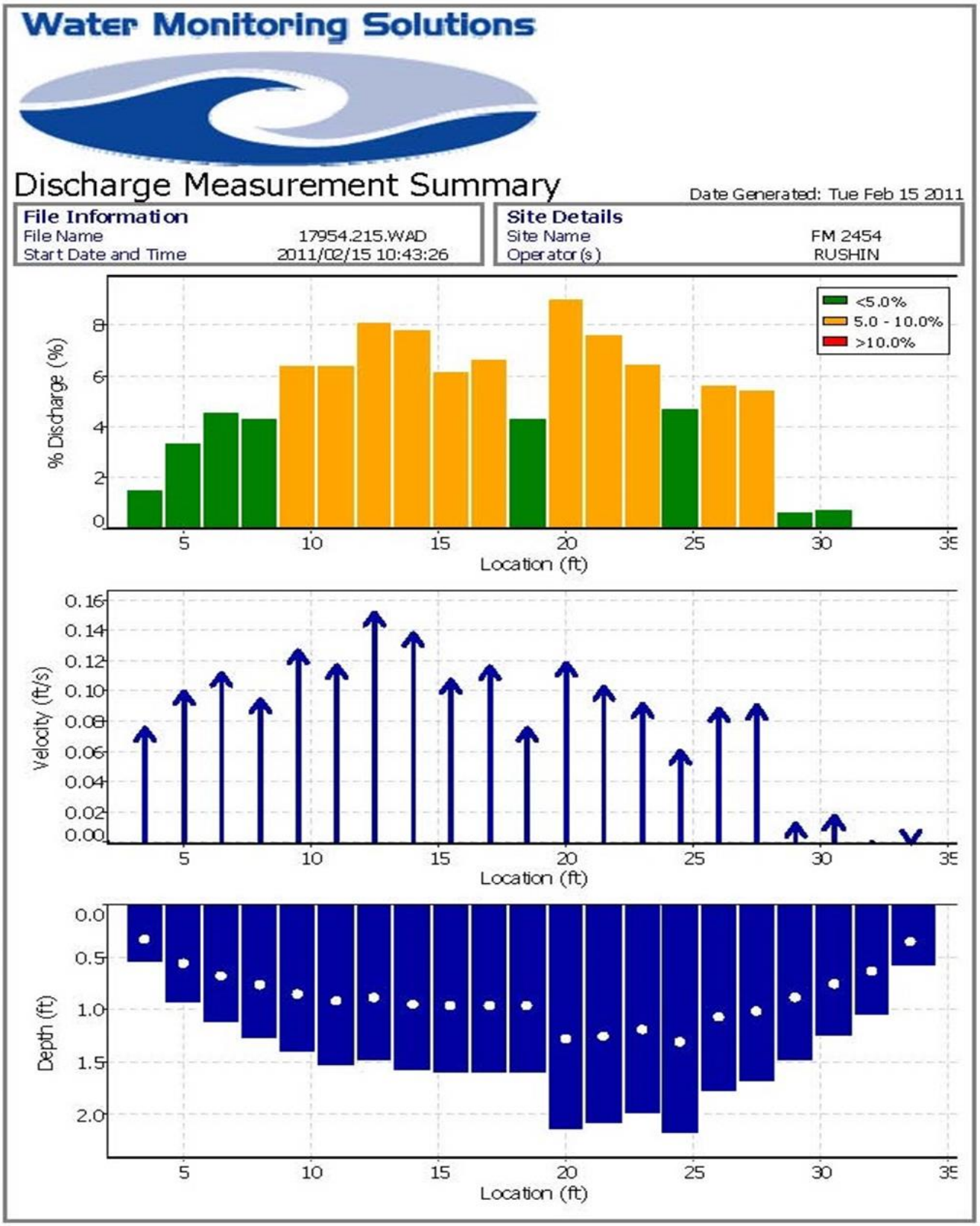
Discharge Measurement Summary

Date Generated: Tue Feb 15 2011

File Information		Site Details	
File Name	17954.215.WAD	Site Name	FM 2454
Start Date and Time	2011/02/15 10:43:26	Operator(s)	RUSHIN

Quality Control

St	Loc	%Dep	Message
3	6.50	0.6	High SNR variation during measurement: 13.8,13.3
18	29.00	0.6	SNR (41.9) is different from typical SNR (27.9)
		0.6	High SNR variation during measurement: 10.8,7.7
20	32.00	0.6	SNR (45.3) is different from typical SNR (27.9)
21	33.50	0.6	SNR (48.3) is different from typical SNR (27.9)


Water Monitoring Solutions
Discharge Measurement Summary
Date Generated: Tue Feb 15 2011
File Information
File Name 17954.215.WAD
Start Date and Time 2011/02/15 10:43:26
Site Details
Site Name FM 2454
Operator(s) RUSHIN
<5.0%
5.0 - 10.0%
>10.0%
% Discharge (%)
Location (ft)
Velocity (ft/s)
Location (ft)
Depth (ft)
Location (ft)

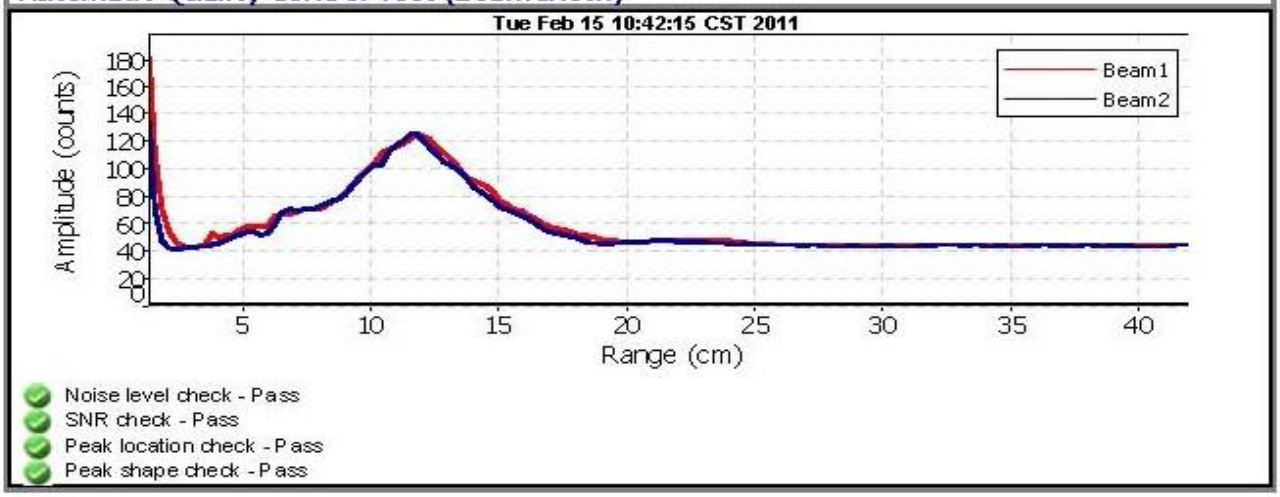
Water Monitoring Solutions

Discharge Measurement Summary

Date Generated: Tue Feb 15 2011

File Information		Site Details	
File Name	17954.215.WAD	Site Name	FM 2454
Start Date and Time	2011/02/15 10:43:26	Operator(s)	RUSHIN

Automatic Quality Control Test (BeamCheck)



- Noise level check - Pass
- SNR check - Pass
- Peak location check - Pass
- Peak shape check - Pass

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Fish-Collection Data

Scientific-Collection Permit No.	SPR-0116-004						
Water body:*				Date:*		Time:*	
Location:*							
Station ID				County*			
Weather				Lat/Long			
Secchi depth (m)		Flow (cfs)		Avg Depth (m)		Max depth (m)	
Water temp (0.3m)		DO (0.3m)		Spec cond (0.3m)		pH (0.3m)	
Collectors:**							
Gear Used							
Boat-mounted Electrofisher	Low Range:	N/A		High Range:		AC or DC?	
	Pulses/sec:			% on:			
	Amps (A):			Duration (sec):			
Backpack Electrofisher	Voltage (v):				Frequency (pps)		
	Pulse width (msec):				Duration (sec)		
Gill net	Mesh size:	N/A	Length:		Duration of set:		
Trawl	Width:	N/A	No. hauls		Duration of haul:		
Seine	Length:		No. hauls		Duration of haul:		
Cast net	Diameter:	N/A	No. casts		or Duration of casting:		
Other (specify)							
Habitat(s) sampled:							
Observations/comments:							

* Required information when reporting fish-collection data to the Texas Parks and Wildlife Department. Holders of scientific-collection permits are required to submit an annual collection summary to the TPWD.

** Collectors must be listed in Appendix I of the scientific-collection permit. Each permit contains detailed requirements.

TCEQ-20233 (rev. 07/18/2014)

TCEQ SPECIES-COLLECTION REPORT

Permittee Name(s):	John Rushin		Scientific Collection Permit Number:			SPR-0116-004	
Common Name *or* Scientific Name	Date of Collection	County *or* Location Where Collected	No. Caught and Released	No. Collected (live take)	No. Salvaged	No. Incidental Mortalities	Disposition of Specimens
Signature of Permittee:			Date:				

TCEQ-20234 (rev. 07/18/2014)

TCEQ SPECIES-COLLECTION REPORT

Permittee Name(s):	John Rushin		Scientific Collection Permit Number:			SPR-0116-004	
Common Name *or* Scientific Name	Date of Collection	County *or* Location Where Collected	No. Caught and Released	No. Collected (live take)	No. Salvaged	No. Incidental Mortalities	Disposition of Specimens

If specimens were donated, please attach list of recipients of all donated specimens.

Definitions:

No. Caught and Released—self-explanatory; No. Collected (live take)—number kept to ID in lab or as voucher specimens; No. Salvaged—number counted as a result of a fish kill, by-catch, etc.; No. Incidental Mortalities—number killed during collection activities; Disposition of Specimens—self-explanatory

TCEQ-20234 (rev. 07/18/2014)

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. 07/15/2014)

Part I - Stream Physical Characteristics Worksheet (continued)

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

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)

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

Lab ID#:

Client PO:

Project:	NETMWD East	**Client:**	Northeast Texas Municipal Water District
Collector:		**Contact:**	
Event#:		**Phone:**	

Report To: Roy Darville
East Texas Baptist University
1 Tiger Drive
Biology Bldg.
Marshall, TX 75670

Invoice To: Robert Speight
Northeast Texas Municipal Water
P.O. Box 955
Hughes Springs, TX 75656

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	250STERL	500APU	1LPU	125STERL	250PHSO4	250APU	250PHNO3	250PU	5310-ATOC	365.4AM	9223-A-30	445.0AM	350.1AM	2320-AM	200.7AM	2540-AMTSS	300.0AM-48	2340-AM	351.2AM	
1	15249			AQ			1	1	1		1		1	1	X	X	X	X	X	X	X	X	X	X	X	
2	15508			AQ					1	1	1	1	1	1	X	X	X	X	X	X	X	X	X	X	X	
3	10321			AQ					1	1	1	1	1	1	X	X	X	X	X	X	X	X	X	X	X	
4	14976			AQ					1	1	1	1	1	1	X	X	X	X	X	X	X	X	X	X	X	
5	10283			AQ					1	1	1	1	1	1	X	X	X	X	X	X	X	X	X	X	X	
6	10244			AQ					1	1	1	1	1	1	X	X	X	X	X	X	X	X	X	X	X	
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.

Appendix F: Data Review Checklist and Summary Shells

Data Review Checklist

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

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

Data Summary

Data Set Information

Data Source: _____

Date Submitted: _____

Tag_id Range: _____

Date Range: _____

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

Planning Agency Data Manager: _____ Date: _____

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

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

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

Discrepancies or missing data 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

ATTACHMENT 1 Example Letter to Document Adherence to the QAPP

TO: Laura-Ashley Overdyke
Caddo Lake Institute

FROM: Robert Speight
Northeast Texas Municipal Water District

RE: Northeast Texas Municipal Water District Fiscal Year 2020-21 CRP QAPP

Please sign and return this form by (date) to:
P. O. Box 955
Hughes Springs, Texas 75656

I acknowledge receipt of the "Cypress Creek Basin FY 2020 – 2021 QAPP". I understand the document(s) describe quality assurance, quality control, data management and reporting, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria. My signature on this document signifies that I have read and approved the document contents pertaining to my program. Furthermore, I will ensure that all staff members participating in CRP activities will be required to familiarize themselves with the document contents and adhere to them as well.

_____

Laura-Ashley Overdyke Date

Copies of the signed forms should be sent by the Northeast Texas Municipal Water District to the TCEQ CRP Project Manager within 60 days of TCEQ approval of the QAPP.

Appendix G: Lake O' the Pines Diel Study

SS-A1 Approval Page

As described in Section A1 of the basin-wide QAPP.

SS-A2 Table of Contents

As described in Section A2 of the basin-wide QAPP.

List of Acronyms

As described in Section A2 of the basin-wide QAPP.

SS-A3 Distribution List

As described in Section A3 of the basin-wide QAPP.

SS-A4 PROJECT/TASK ORGANIZATION

As described in Section A4 of the basin-wide QAPP.

SS-A5 Problem Definition/Background

NETMWD currently operates two continuous water quality monitors which are deployed in Lake O' the Pines. One is located above the headwaters of the reservoir in Big Cypress Creek at US 259. The other is located at the NETMWD intake in AU 0403_03. The sondes collect DO, pH, total algae, and other parameters. Data generated by these continuous monitors are used for NETMWD purposes only and are not submitted to TCEQ for inclusion in SWQMIS. Rather, data from the sondes can be used to make general assertions about primary productivity and demonstrate DO and pH diel ranges in the upper portion of the reservoir.

In order to characterize the water quality of the lower portion of the reservoir, additional information is needed. To this end, a diel study is needed to identify DO and pH ranges. The data generated by the diel study will be compared with the continuous monitoring data in the upper portion of the reservoir and with the quarterly data collected by TCEQ Region 5.

SS-A6 Project/Task Description

Diels will be performed at two stations in Lake O' the Pines. One station will be located at in AU 0403_02 at the City of Longview intake (station 22172) and in AU 0403_01 near a public swimming area near the dam (station 22173). Diels will be collected over two years and will be targeted to the summer months when most high pH results have been measured. Data from these sampling events will be submitted to TCEQ for inclusion in the SWQMIS database, but are not intended for assessment purposes. These results will be used to determine whether future study is needed. A special study data summary report will be prepared at the end of FY 2021 and submitted to TCEQ.

Amendments to the QAPP

Amendments to Appendix G 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 to the CRP Project Manager electronically. Amendments are effective immediately upon approval by the NETWMD Project Manager, WMS Project Manager, the WMS QAO, the CRP Project Manager, the CRP Lead QA Specialist, the CRP Project QA Specialist, and additional parties affected by the amendment. Amendments are not retroactive. No work shall be implemented without an approved Appendix G or amendment to Appendix G 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 the basin-wide QAPP. Any deviation or deficiency from this

Appendix which occurs after the execution of this QAPP should be addressed through a Corrective Action Plan (CAP). An Amendment may be a component of a CAP to prevent future recurrence of a deviation. Amendments will be incorporated into Appendix G by way of attachment and distributed to personnel on the distribution list by the WMS Project Manager.

SS-A7 Quality Objectives and Criteria

The main objective of this Special Study is to identify DO and pH ranges in two assessment units within Lake O' the Pines. In addition, these data will be compared with data from two continuous monitoring stations in Lake O' the Pines and with quarterly data collected by TCEQ Region 5. The data analysis will be used to characterize the watershed in a future Basin Highlights Report.

The measurement performance specifications to support the project objectives are specified in Table SS-A7.1.

Table SS-A7.1 - Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	Lab
Field Parameters					
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)	us/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
RESERVOIR STAGE (FEET ABOVE MEAN SEA LEVEL)*	FT ABOVE MSL	water	TWDB	00052	Field
RESERVOIR PERCENT FULL*	% RESERVOIR CAPACITY	water	TWDB	00053	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 COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OT	NU	water	NA	89969	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
24 Hour Parameters in Water					
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	uS/cm	Water	TCEQ SOP V1	00212	Field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MAX	uS/cm	Water	TCEQ SOP V1	00213	Field
SPECIFIC CONDUCTANCE, US/CM, FIELD, 24HR MIN	uS/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

Parameter	Units	Matrix	Method	Parameter Code	Lab
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 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, 23rd Edition, 2017. TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415). TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).					

Ambient Water Reporting Limits (AWRLs)

Not applicable for this Appendix.

Precision

Not applicable for this Appendix.

Bias

Not applicable for this Appendix.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. Diels will be collected over two years (to include inter-year variation) and will be targeted to the summer months when most high pH results have been measured. Diels will be targeted for sunny weather when rain is not expected.

Comparability

As described in Section A7 of the basin-wide QAPP.

Completeness

As described in Section A7 of the basin-wide QAPP.

SS-A8 Special Training/Certification

As described in section A7 of the basin-wide QAPP.

SS-A9 Documents and Records

As described in Section A9 of the basin-wide QAPP. The same field forms, documents, records, and the same parties as the basin-wide QAPP will be involved in this Special Study.

SS-B1 Sampling Process Design

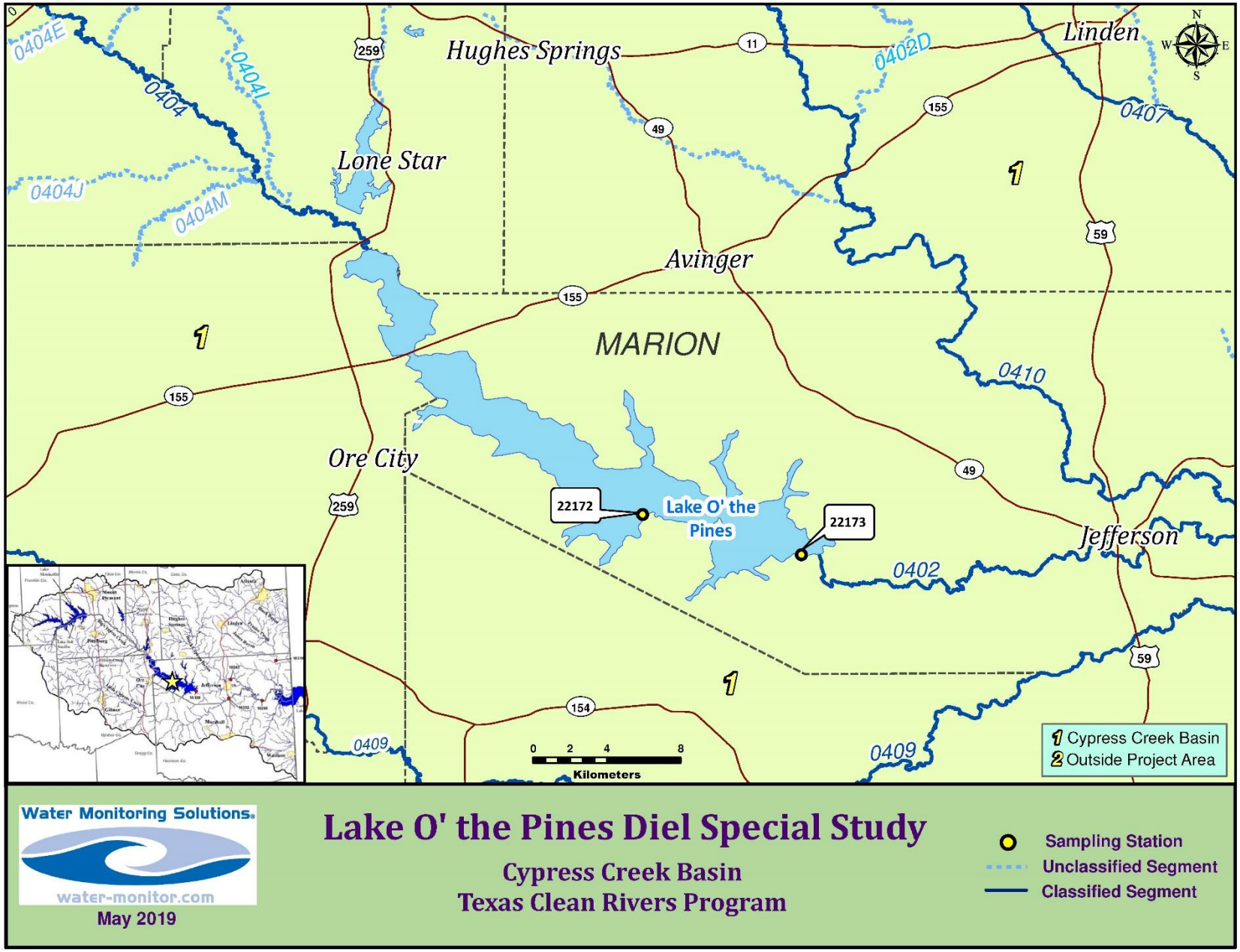
The data collection design is summarized in Table SS-B1 (Sampling Sites and Monitoring Frequencies) and Figure SS-B1 (Sample Site Maps).Diels will be conducted in FY 2020 and FY 2021.

Table B1.1 Sample Design and Schedule, FY 2020 and FY 2021

Segment 0403 Lake O' the Pines									
Site Description	**Station ID**	**Waterbody ID**	**Region**	**SE**	**CE**	**MT**	**Field**	**24 HR DO**	**Comments**
LAKE O THE PINES 81 METERS NORTH OF CITY OF LONGVIEW WATER INTAKE	22172	0403_02	05	NT	WM	**BSWD**	4	4	4 diels in FY 2020 and in FY 2021
LAKE O THE PINES AT SWIMMING AREA NEAR DAM	22173	0403_01	05	NT	WM	**BSWD**	4	4	4 diels in FY 2020 and in FY 2021

Figure SS-B1. Sampling Site Map

Maps of stations to be monitored by the NETMWD 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.


Hughes Springs
Linden
Lone Star
Avinger
MARION
Ore City
Jefferson
Lake O' the Pines
22172
22173
0404E
0404
0404I
0404J
0404M
0402D
0407
0410
0402
0409
259
11
49
155
59
154
1
N
S
E
W
0 2 4 8
Kilometers
1 Cypress Creek Basin
2 Outside Project Area
Water Monitoring Solutions
water-monitor.com
May 2019
Lake O' the Pines Diel Special Study
Cypress Creek Basin
Texas Clean Rivers Program
Sampling Station
Unclassified Segment
Classified Segment

Sample Design Rationale and Site Selection Criteria

Continuous monitoring is conducted by NETMWD at two locations within Lake O' the Pines. DO, pH, and total algae data are collected and used to make general assertions about primary productivity and demonstrate DO and pH diel ranges. In order to better characterize the watershed for discussion in the FY 2022 Basin Highlights Report, diels will be collected at two sites over two years (to include inter-year variation) and will be targeted to the summer months when most high pH results have been measured. The resultant data will be compared to the continuous monitoring data and quarterly data collected by TCEQ Region 5. The results of the special study will help determine future monitoring priorities in Lake O' the Pines.

Site selection rationale is listed below.

Station 22172 in AU 0403_02 at the City of Longview intake. The sonde will be deployed from a buoy marking the water intake zone. This site was selected due to its location within the AU, proximity to the shore, ability to deploy to the sonde at 0.3 meter depth, and relative security of the sonde during the deployment.

Station 22173 in AU 0403_01 near a public swimming area near the dam. The sonde will be deployed from a buoy identifying the swimming area. This site was selected due to its location within the AU, proximity to the shore, and ability to deploy to the sonde at 0.3 meter depth.

SS-B2 Sampling Methods

Field Sampling Procedures

As described in Section B2 of the basin-wide QAPP.

Documentation of Field Sampling Activities

As described in Section B2 of the basin-wide QAPP.

Recording Data

As described in Section B2 of the basin-wide QAPP.

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

As described in Section B2 of the Basin-wide QAPP

SS-B3 Sample Handling and Custody

No samples will be collected for laboratory analysis as part of this special study. Therefore, Chain-of-Custody, Sample Labeling, Sample Handling, and Sample Tracking Procedure Deficiencies and Corrective Action will not be necessary.

SS-B4 Analytical Methods

The analytical methods and associated matrices for field and diel parameters are listed in Table SS-A7.1 of section SS-A7.

Standards Traceability

All standards used in the field 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 measurement systems involve, but are not limited to such things as instrument malfunctions, failures in calibration, etc. In many cases, the field technician will be able to correct the problem. If the problem is resolvable by the field technician, then they will document the problem on the field data sheet and complete the analysis. If the problem is not resolvable, then it is conveyed to WMS PM. The WMS PM and WMS QAO will make the determination 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 NETMWD Project Manager. The WMS and NETMWD Project Manager will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ CRP Project Manager.

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

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.

SS-B5 Quality Control

Sampling Quality Control Requirements and Acceptability Criteria

The minimum field QC requirements are outlined in SWQM Procedures.

No samples will be collected for laboratory analysis as part of this special study. Therefore, Laboratory Measurement Quality Control Requirements and Acceptability Criteria and Quality Control or Acceptability Requirements Deficiencies and Corrective Actions will not be necessary.

SS-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.

SS-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.

SS-B8 Inspection/Acceptance of Supplies and Consumables

No special requirements for acceptance are specified for field sampling supplies and consumables.

SS-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:

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 closest to the monitoring station will be used. These data will be submitted to the TCEQ under parameter code 72053 Days Since Precipitation Event.

SS-B10 Data Management

As described in Section B10 of the basin-wide QAPP as it applies to field data collection only. No samples will be collected for laboratory analysis for this special study.

Data Dictionary

Terminology and field descriptions are included in the SWQM DMRG, 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.

Name of Entity	Tag Prefix	Submitting Entity	Collecting Entity
Water Monitoring Solutions, Inc.	CY	NT	WM

SS-C1 Assessments and Response Actions

As described in Section C1 of the basin-wide QAPP.

Corrective Action

As described in Section C1 of the basin-wide QAPP.

SS-C2 Reports to Management

Reports to NETMWD Project Management

Each quarter in which diels are conducted, the WMS QAO will review results and field sheets. Reports with any corrective actions that occurred will be sent to NETMWD for review. NETMWD will then review and transmit these reports annually to TCEQ for their review.

Reports to TCEQ Project Management

All reports detailed in this section are contract deliverables and are transferred to the TCEQ in accordance with contract requirements.

Progress Report

As described in Section C2 of the basin-wide QAPP.

Data Summary

As described in Section C2 of the basin-wide QAPP.

Reports by TCEQ Project Management

As described in Section C2 of the basin-wide QAPP.

SS-D1 Data Review, Verification, and Validation

All field and diel 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 SS-A7 of this Appendix. Only those data which are supported by appropriate quality control data and meet the measurement performance specifications defined for this project will be evaluated.

SS-D2 Verification and Validation Methods

As described in Section D2 of the basin-wide QAPP.

SS-D3 Reconciliation with User Requirements

As described in Section D3 of the basin-wide QAPP.

Appendix H: Tankersley and Big Cypress Creek Sulfate Study

SS-A1 Approval Page

As described in Section A1 of the basin-wide QAPP.

SS-A2 Table of Contents

As described in Section A2 of the basin-wide QAPP.

List of Acronyms

As described in Section A2 of the basin-wide QAPP.

SS-A3 Distribution List

As described in Section A3 of the basin-wide QAPP.

SS-A4 PROJECT/TASK ORGANIZATION

As described in Section A4 of the basin-wide QAPP.

SS-A5 Problem Definition/Background

Segment 0404 Big Cypress Creek below Lake Bob Sandlin and Segment 0404B Tankersley Creek were found to be impaired for sulfate in the 2014 IR. This impairment continued into the Draft 2018 IR. Tankersley Creek Segment 0404B runs north to south near US 271 west of Mount Pleasant and receives effluent from the Pilgrim's Pride WWTP. It confluences with Big Cypress Creek Segment 0404 approximately 3 kilometers downstream of the Lake Bob Sandlin dam. It is believed that impairments for sulfate in Segment 0404 arise from sulfates entering from Segment 0404B. This special study will attempt to determine the source of sulfate in these water bodies and determine future monitoring priorities.

SS-A6 Project/Task Description

Field parameters, flow, and sulfate will be collected from three sites along Tankersley Creek Segment 0404B and one site on Big Cypress Creek Segment 0404. Ten samples will be collected in FY 2020 and two samples will be collected in FY 2021. Samples will be collected at Tankersley Creek at FM 899 (Station 10264), Tankersley Creek at FM 127 (10263), Tankersley Creek at FM 24147 (Station 10261), and Big Cypress Creek at US 271 (Station 10310). Since station 10261 is a quarterly routine monitoring station, only six sulfate samples will be collected at this station as part of the special study

Amendments to the QAPP

Amendments to Appendix H 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 to the CRP Project Manager electronically. Amendments are effective immediately upon approval by the NETWMD Project Manager, WMS Project Manager, the WMS QAO, the CRP Project Manager, the CRP Lead QA Specialist, the CRP Project QA Specialist, and additional parties affected by the amendment. Amendments are not retroactive. No work shall be implemented without an approved Appendix H or amendment to Appendix H 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 the basin-wide QAPP. Any deviation or deficiency from this Appendix which occurs after the execution of this QAPP should be addressed through a Corrective Action Plan (CAP). An Amendment may be a component of a CAP to prevent future recurrence of a deviation. Amendments will be incorporated into Appendix H by way of attachment and distributed to personnel on the distribution list by the WMS Project Manager.

SS-A7 Quality Objectives and Criteria

The main objective of this Special Study is to identify the potential sources of sulfates in Tankersley Creek Segment 0404B and in Big Cypress Creek Segment 0404. Data collected under this special study Appendix be used to evaluate the sources of sulfate and its concentration downstream of US 271. Monthly data collected by TCEQ in Big Cypress Creek at SH 11 (station 10308) and in Big Cypress Creek at US 259 (station 13631) will be used as a comparison with the results from the upper portion of the watershed.

The measurement performance specifications to support the project objectives are specified in Table SS-A7.1.

Table SS-A7.1 - Measurement Performance Specifications

Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS	Lab
Field Parameters										
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	NA	NA	NA	NA	NA	Field
TEMPERATURE, AIR (DEGREES CENTIGRADE)	DEG C	Air	NA	00020	NA	NA	NA	NA	NA	NA
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	NA	NA	NA	NA	NA	Field
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	NA	NA	NA	NA	NA	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	NA	NA	NA	NA	NA	Field
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	NA	NA	NA	NA	NA	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	NA	NA	NA	NA	NA	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	NA	NA	NA	NA	NA	Field
WATER SURFACE (1=CALM,2=RIPPLE,3=WAVE,4=WHITECAP)	NU	water	NA	89968	NA	NA	NA	NA	NA	Field
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=ROTTEN EGGS, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER (WRITE IN COMMENTS))	NU	water	NA	89971	NA	NA	NA	NA	NA	Field
WATER COLOR 1=BRWN 2=RED 3=GRN 4=BLCK 5=CLR 6=OT	NU	water	NA	89969	NA	NA	NA	NA	NA	Field
WIND DIRECTION (1=N, 2=S, 3=E, 4=W, 5=NE, 6=SE, 7=NW, 8=SW)	NU	other	NA	89010	NA	NA	NA	NA	NA	Field
WIND INTENSITY (1=CALM,2=SLIGHT,3=MOD.,4=STRONG)	NU	other	NA	89965	NA	NA	NA	NA	NA	Field
Flow Parameters										
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	NA	NA	NA	NA	NA	Field
FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	NA	NA	NA	NA	NA	Field
STREAM FLOW ESTIMATE (CFS)	cfs	Water	TCEQ SOP V1	74069	NA	NA	NA	NA	NA	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	NA	NA	NA	NA	NA	Field
Conventional Parameters in Water										
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

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

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, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

Ambient Water Reporting Limits (AWRLs)

As described in Section A7 of the basin-wide QAPP

Precision

As described in Section A7 of the basin-wide QAPP

Bias

As described in Section A7 of the basin-wide QAPP.

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. Samples will be collected on a routine monthly basis over one 12 month period, with 10 samples being collected in FY 2020, and two samples being collected in FY 2021.

Comparability

As described in Section A7 of the basin-wide QAPP.

Completeness

As described in Section A7 of the basin-wide QAPP.

SS-A8 Special Training/Certification

As described in section A7 of the basin-wide QAPP.

SS-A9 Documents and Records

As described in Section A9 of the basin-wide QAPP. The same field forms, documents, records, laboratory reports and the same parties as the basin-wide QAPP will be involved in this Special Study.

SS-B1 Sampling Process Design

The data collection design is summarized in Tables SS-B1.1 and SS-B1.2 (Sampling Sites and Monitoring Frequencies) and Figure SS-B1 (Sample Site Maps).

Table B1.1 Sample Design and Schedule, FY 2020

Segment 0404 Big Cypress Creek below Lake Bob Sandlin									
Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	Field	Conv	Flow
BIG CYPRESS CREEK AT US 271 6.9 KM NORTH OF PITTSBURG	10310	0404_02	05	NT	WM	RTSI	10	10	10
TANKERSLEY CREEK AT FM 899	10264	0404B_01	05	NT	WM	RTSI	10	10	10
TANKERSLEY CREEK AT FM 127	10263	0404B_01	05	NT	WM	RTSI	10	10	10
TANKERSLEY CREEK AT FM3417 5.7 KM SOUTH OF MOUNT PLEASANT	10261	0404B_01	05	NT	WM	RTSI	6*	6*	6*

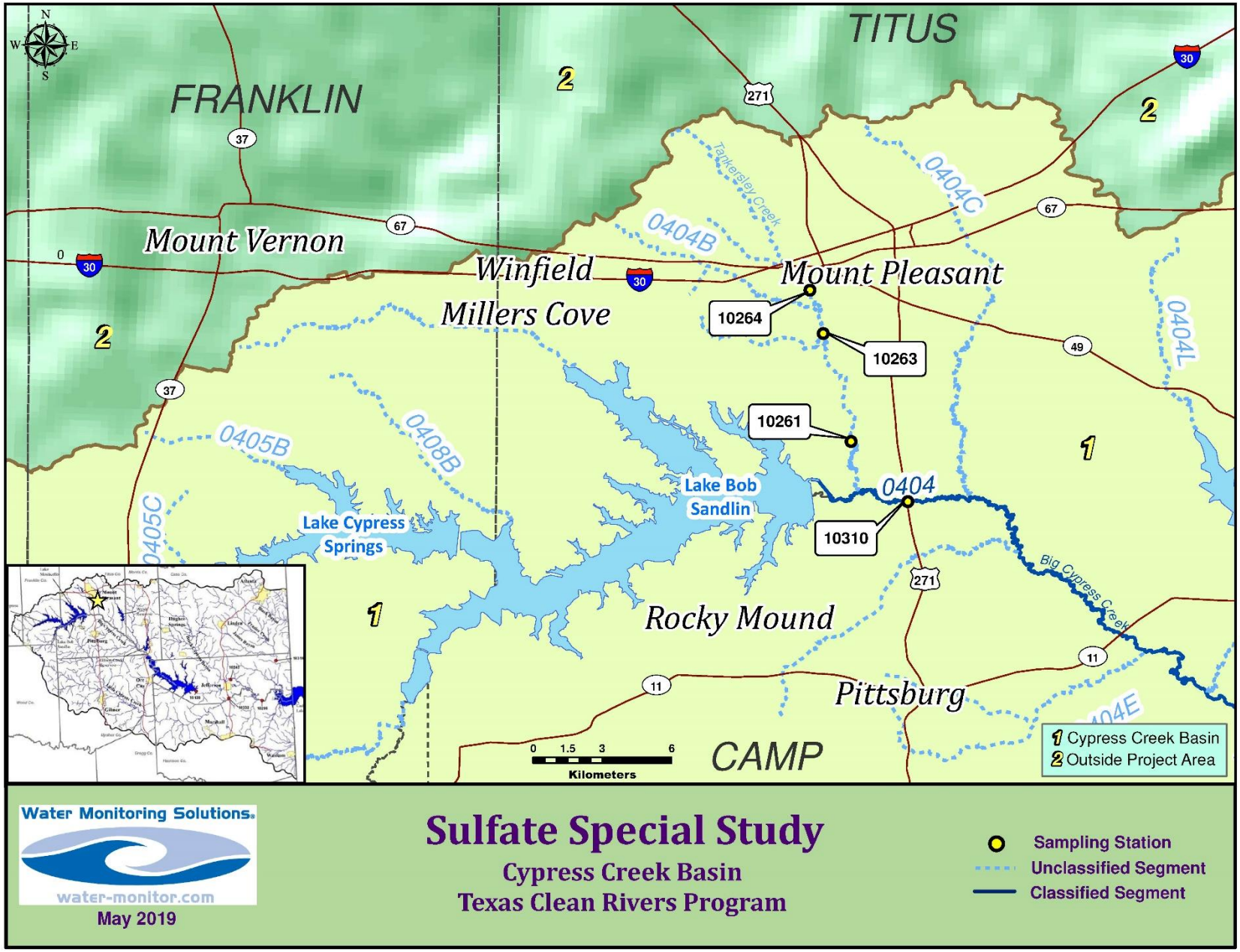
**- Sulfate data from four routine quarterly samples will be used in the evaluation of station 10261.*

Table B1.2 Sample Design and Schedule, FY 2021

Segment 0404 Big Cypress Creek below Lake Bob Sandlin									
Site Description	Station ID	Waterbody ID	Region	SE	CE	MT	Field	Conv	Flow
BIG CYPRESS CREEK AT US 271 6.9 KM NORTH OF PITTSBURG	10310	0404_02	05	NT	WM	RTSI	2	2	2
TANKERSLEY CREEK AT FM 899	10264	0404B_01	05	NT	WM	RTSI	2	2	2
TANKERSLEY CREEK AT FM 127	10263	0404B_01	05	NT	WM	RTSI	2	2	2
TANKERSLEY CREEK AT FM3417 5.7 KM SOUTH OF MOUNT PLEASANT	10261	0404B_01	05	NT	WM	RTSI	2	2	2

Figure SS-B1. Sampling Site Map

Maps of stations monitored by the NETMWD 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.


TITUS
FRANKLIN
Mount Vernon
Winfield
Millers Cove
Mount Pleasant
10264
10263
10261
10310
0404
0404B
0404C
0404L
0405B
0405C
0408B
Tankersley Creek
Lake Bob Sandlin
Lake Cypress Springs
Big Cypress Creek
Rocky Mound
Pittsburg
CAMP
1
2
0 1.5 3 6
Kilometers
1 Cypress Creek Basin
2 Outside Project Area
Water Monitoring Solutions
water-monitor.com
May 2019
Sulfate Special Study
Cypress Creek Basin
Texas Clean Rivers Program
Sampling Station
Unclassified Segment
Classified Segment

Sample Design Rationale and Site Selection Criteria

Samples will be collected at three sites along Tankersley Creek Segment 0404B and at one site on Big Cypress Creek Segment 0404 below the confluence with Tankersley Creek. Samples will be collected over one 12 month period on a routine schedule with 10 samples to be collected in FY 2020 and two samples to be collected in FY 2021.

Site selection rationale is listed below.

Station 10264 – Tankersley Creek at FM 899: This station is intended to provide uninfluenced background data. It is located above a large tributary (Dragoo Creek Segment 0404O) and the Pilgrim's Pride WWTP.

Station 10263 – Tankersley Creek at FM 127: This station is located immediately downstream of the Pilgrim's Pride WWTP.

Station 10261 – Tankersley Creek at FM 3417: This is the most downstream accessible station on Tankersley Creek and located above the confluence with Big Cypress Creek.

Station 10310 – Big Cypress Creek at US 271: This station is downstream of the confluence with Tankersley Creek and receives releases from Lake Bob Sandlin (Segment 0408).

SS-B2 Sampling Methods

Field Sampling Procedures

As described in Section B2 of the basin-wide QAPP.

Sample volume, container types, minimum sampling volume, preservation requirements, and holding time requirements

As described in Section A9 of the basin-wide QAPP.

Table SS-B2. Sample Storage, Preservation, and Handling Requirements

Parameter	Sample Volume	Holding Time	Matrix	Container	Preservation
Sulfate	100 ml	28 days	Water	New Plastic or New Cubitainer	Cool to < 6 ^{o}C, dark

Sample Containers

As described in Section B2 of the basin-wide QAPP.

Processes to Prevent Contamination

As described in Section B2 of the basin-wide QAPP.

Documentation of Field Sampling Activities

As described in Section B2 of the basin-wide QAPP.

Recording Data

As described in Section B2 of the basin-wide QAPP.

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

As described in Section B2 of the Basin-wide QAPP.

SS-B3 Sample Handling and Custody

Chain-of–Custody

As described in Section B3 of the basin-wide QAPP.

Sample Labeling

As described in Section B3 of the basin-wide QAPP.

Sample Handling

As described in Section B3 of the basin-wide QAPP.

Sample Tracking Procedure Deficiencies and Corrective Action

As described in Section B3 of the basin-wide QAPP.

SS-B4 Analytical Methods

The analytical methods, associated matrices, and performing laboratories are listed in Table SS-A7.1 of section SS-A7. 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 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." Copies of laboratory SOPs are retained by the LCRA ELS Laboratory and are available for review by the TCEQ. Laboratory SOPs are consistent with EPA requirements, as specified in the method.

Standards Traceability

As described in Section B4 of the basin-wide QAPP.

Analytical Method Deficiencies and Corrective Actions

As described in Section B4 of the basin-wide QAPP.

SS-B5 Quality Control

Sampling Quality Control Requirements and Acceptability Criteria

As described in Section B4 of the basin-wide QAPP.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

As described in Section B5 of the basin-wide QAPP.

Quality Control or Acceptability Requirements Deficiencies and Corrective Actions

As described in Section B5 of the basin-wide QAPP.

SS-B6 Instrument/Equipment Testing, Inspection, and Maintenance

As described in Section B6 of the basin-wide QAPP.

SS-B7 Instrument Calibration and Frequency

As described in Section B7 of the basin-wide QAPP.

SS-B8 Inspection/Acceptance of Supplies and Consumables

As described in Section B8 of the basin-wide QAPP.

SS-B9 Acquired Data

As described in Section B9 of the basin-wide QAPP.

SS-B10 Data Management

As described in Section B10 of the basin-wide QAPP.

Data Dictionary

Terminology and field descriptions are included in the SWQM DMRG, 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.

Name of Entity	Tag Prefix	Submitting Entity	Collecting Entity
Water Monitoring Solutions, Inc.	CY	NT	WM

SS-C1 Assessments and Response Actions

As described in Section C1 of the basin-wide QAPP.

Corrective Action

As described in Section C1 of the basin-wide QAPP.

SS-C2 Reports to Management

Reports to NETMWD Project Management

As described in Section C2 of the basin-wide QAPP.

Reports to TCEQ Project Management

As described in Section C2 of the basin-wide QAPP.

Reports by TCEQ Project Management

As described in Section C2 of the basin-wide QAPP.

SS-D1 Data Review, Verification, and Validation

As described in Section D1 of the basin-wide QAPP.

SS-D2 Verification and Validation Methods

As described in Section D2 of the basin-wide QAPP.

SS-D3 Reconciliation with User Requirements

As described in Section D3 of the basin-wide QAPP.