Quality Assurance Project Plan
Lavaca Navidad River Authority

P.O. Box 429
Edna, Texas 77957

Clean Rivers Program

Water Quality Planning Division

Texas Commission on Environmental Quality

P.O. Box 13087, MC 234

Austin, Texas 78711-3087

Effective Period: FY 2024 to FY 2025

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

Texas Commission on Environmental Quality

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Sarah Whitley, Team Leader Date
Water Quality Standards and Clean Rivers Program

Grant Bassett, Date
Project Quality Assurance Specialist
Clean Rivers Program

Jenna Wadman, Project Manager Date
Clean Rivers Program

Cathy Anderson, Team Leader Date
Data Management and Analysis

Monitoring Division

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TCEQ Quality Assurance Manager

Jason Natho Date
Acting Lead CRP Quality Assurance Specialist

Lavaca Navidad River Authority

Chadwick Kinsfather 8-31-2023
Chad Kinsfather Date
LNRA Project Manager

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Chad Kinsfather Date
LNRA Quality Assurance Officer

Guadalupe Blanco River Authority Regional Laboratory

08/31/2023
Miliana Hernandez-Santa Date
GBRA Laboratory Lead Analyst

Kylie Gudgell 08-31-2023
Kylie Gudgell Date
GBRA Laboratory Quality Assurance Officer

A2 Table of Contents

List of Acronyms

AWRL	Ambient Water Reporting Limit
CAP	Corrective Action Plan
CE	Collecting Entity
COC	Chain of Custody
CRP	Clean Rivers Program
DMRG	Surface Water Quality Monitoring Data Management Reference Guide
DM&A	Data Management and Analysis
EPA	United States Environmental Protection Agency
FY	Fiscal Year
GIS	Geographical Information System
GPS	Global Positioning System
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
MT	Monitoring Type
NELAP	National Environmental Lab Accreditation Program
QA	Quality Assurance
QM	Quality Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QC	Quality Control
QMP	Quality Management Plan
RT	Routine Monitoring
SE	Submitting Entity
SLOC	Station Location
SOP	Standard Operating Procedure
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TMDL	Total Maximum Daily Load
TCEQ	Texas Commission on Environmental Quality
TNI	The NELAC Institute
TSWQS	Texas Surface Water Quality Standards
VOA	Volatile Organic Analytes
LNRA	Lavaca Navidad River Authority

A3 Distribution List

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

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

TCEQ

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

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

Jenna Wadman
CRP Project Manager
Responsible for the development, implementation, and maintenance of CRP contracts. Tracks, reviews, and approves deliverables. Participates in the development, approval, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Coordinates the review and approval of CRP QAPPs in coordination with the CRP Project Quality Assurance Specialist. Ensures maintenance of QAPPs. Assists CRP Lead QA Specialist in conducting Basin Planning Agency audits. Verifies QAPPs are being followed by contractors and that projects are producing data of known quality. Coordinates project planning with the Basin Planning Agency 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.

Scott Delgado
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, July 2019 or most current version (DMRG). Runs automated data validation checks in the Surface Water Quality Management Information System (SWQMIS) and coordinates data verification and error correction with CRP 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).

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

Lavaca Navidad River Authority

Chad Kinsfather
LNRA Project Manager
Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Ensures monitoring systems audits are conducted to ensure QAPPs are followed by basin planning agency participants and that projects are producing data of known quality. Ensures that subparticipants are qualified to perform contracted work. Ensures CRP project managers and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ. Trains field personnel in proper field sampling techniques and field analysis procedures before new field personnel independently conduct field work.

Chad Kinsfather
LNRA Quality Assurance Officer
Responsible for coordinating the implementation of the QA program. Responsible for writing and maintaining the QAPP and monitoring its implementation. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the TCEQ CRP Project Manager and/or Project QAS to resolve QA-related issues. Makes notes of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective action. Coordinates and maintains records of data verification and validation. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Conducts monitoring systems audits on project participants to determine compliance with project and program specifications, issues written reports, and follows through on findings. Ensures that field staff is properly trained and that training records are maintained.

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

GUADALUPE-BLANCO RIVER AUTHORITY REGIONAL LABORATORY (GBRA)

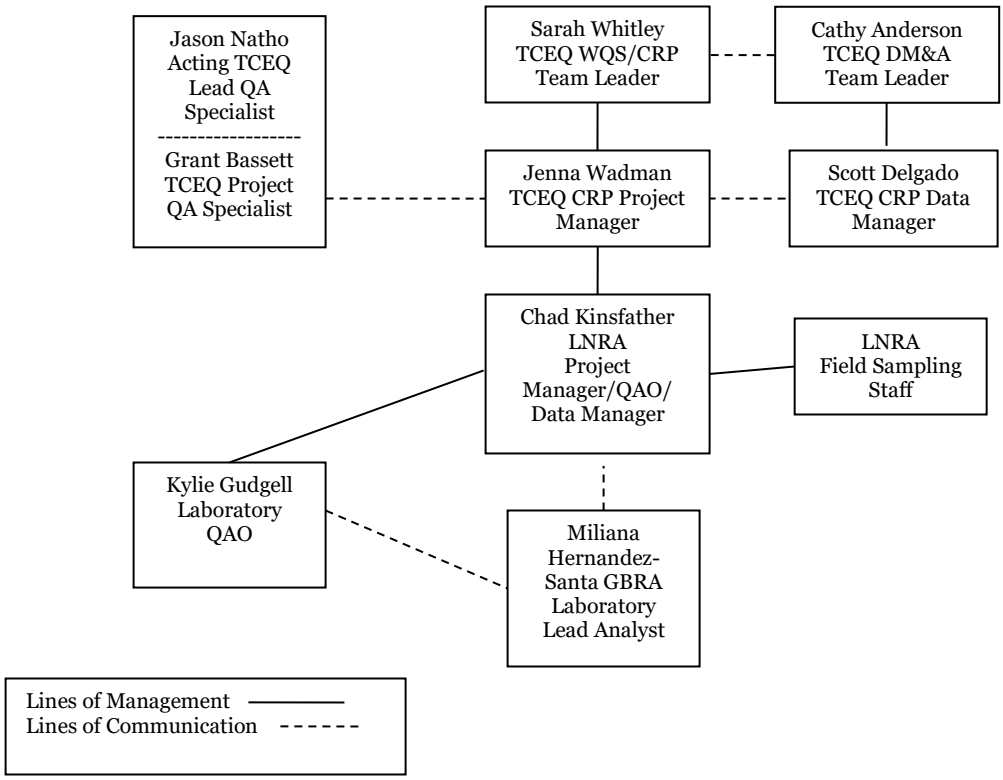
Miliana Hernandez-Santa
GBRA Laboratory Lead Analyst
Performs laboratory analyses and notifies the GBRA QAO of particular circumstances which may adversely affect the quality of data. Performs sample custodial duties. Reviews and verifies laboratory data for integrity, continuity, reasonableness, and validate the lab data against the measurement performance specifications listed in this QAPP.

Kylie Gudgell
GBRA Laboratory QAO

Responsible for coordinating the implementation of the QA program. Responsible for identifying, receiving, and maintaining project QA records. Notifies the LNRA Project Manager of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective action. Coordinates and maintains records of data verification and validation. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Responsible for conducting or hiring an outside party to conduct internal audits annually in compliance with NELAP accreditation requirements.

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 LNRA and the TCEQ to carry out the activities mandated by the legislation. The QAPP was developed and will be implemented in accordance with provisions of the TCEQ Quality Management Plan, January 2023 or most recent version (QMP).

The purpose of this QAPP is to clearly delineate LNRA QA policy, management structure, and procedures which will be used to implement the QA requirements necessary to verify and validate the surface water quality data collected. The QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are of known and documented quality, deemed acceptable for their intended use. This process will ensure that data collected under this QAPP and submitted to SWQMIS have been collected and managed in a way that guarantees its reliability and therefore can be used in water quality assessments, total maximum daily load (TMDL) and water quality standards development, permit decisions, and other program activities deemed appropriate by the TCEQ. Project results will be used to support the achievement of CRP objectives, as contained in the *Clean Rivers Program Guidance and Reference Guide FY 2024-2025*.

The LNRA has collected field measurements in the Lavaca-Navidad River Basin since 1981. The LNRA Surface Water Quality Monitoring Program under the Clean Rivers Program added conventional and bacteriological analyses to the existing program in response to the passage of the Texas Clean Rivers Act (Senate Bill 818) in 1991. The Lavaca-Navidad River Authority intensified its water quality monitoring program to be able to assess water quality conditions within the Lavaca River Basin. The LNRA Surface Water Quality monitoring program includes routine collection of dissolved oxygen, temperature, pH, specific conductivity, salinity, secchi disk depth (to determine water clarity), and hydrological data. This data allows the LNRA to detect and describe spatial and temporal changes, determine impacts of point and nonpoint sources, and assess attainment of water quality standards within the Lavaca-Navidad River Basin. Dissolved oxygen, water temperature, and pH are field measurements for which water quality criteria are established for each classified water body. Conductivity and salinity (in tidally influenced areas) are monitored to estimate the total concentration of dissolved ionic matter, evaluate mixing of fresh and salt water in estuaries, and determine density stratification. Water samples are taken to GBRA Laboratory for analysis of conventional and (at some sites) bacteriological parameters. The LNRA CRP program was established to collect, store, and make available water quality data for use by the LNRA as well as by state and federal water quality managers, cities, consultants, students, and the general public. Samples are collected from stream, reservoir, and tidally-influenced segments to monitor for the attainment of designated uses and numerical criteria. Monitoring is also performed periodically to define water quality and in response to perceived risks of pollution.

<u>Assessment Area</u>

The Lavaca River Basin (Figure A5.1) has an area of 2,309 square miles and includes portions (of almost all in the case of Lavaca County) of six counties (Colorado, DeWitt, Fayette, Jackson, Lavaca and Wharton). In 1990, the population of the affected drainage was 41,751 and it is projected to increase to 63,289 in 2040.

The Lavaca River Basin stretches across 188 river miles and its major cities include Edna, Ganado, Hallettsville, Moulton, Schulenburg, Shiner, and Yoakum. For water quality management purposes, the Lavaca River Basin has been divided into five segments (1601, 1602, 1603, 1604, and 1605) which are then subdivided into assessment units, the smallest geographic area of use support reported in the assessment.

Lavaca River Basin is bounded on the north and east by the Colorado River Basin, on the west by the Guadalupe River Basin, on the southeast by the Colorado-Lavaca Coastal Basin, and on the southwest by the Lavaca-Guadalupe Coastal Basin. About 40 percent of the Lavaca River Basin is drained by the Lavaca River, while the

remaining area is drained by the Navidad River and the Sandy and Mustang Creeks.

The headwaters of the Navidad River rise in the East and West Forks of the Navidad River at an elevation of 440 feet in southern Fayette County. These forks confluence near Oakland at an elevation of 201 feet and then flow southward to Lake Texana. Waters released from Lake Texana flow through the tidal reach of the Navidad River to its confluence with the Lavaca River about two miles east of Vanderbilt in Jackson County. Lake Texana has a permitted diversion of 74,500 acre-feet/year; construction was finished in 1980 by the U.S. Bureau of Reclamation for the purpose of municipal, industrial, fish and wildlife, and recreational uses. The Navidad River above Lake Texana has a drainage area of 1,346 square miles. Headwaters of the Lavaca River originate at an elevation of 470 feet in northwest Lavaca County and flow southeast into Lavaca Bay

The Lavaca River Basin is part of the West Gulf Coast Section of the Coastal Plain physiographic province and includes the Blackland Prairie, Claypan, and Coastal Prairie land-resource areas. In the upper part of the Basin, the Blackland Prairie is a level-to-rolling, well-dissected grassland with rapid drainage. The Claypan area is a gently rolling, moderately dissected post oak-savanna with moderate surface drainage. In the lower Basin, the Coastal Prairie is a nearly level, practically undissected plain with slow surface drainage.

The geology of the upper Lavaca River Basin is underlain by gray clay of the Fleming Formation of Tertiary age which dips gently toward the Gulf of Mexico. Overlying the Fleming Formation are gravel, sand, silt, and clay of the Willis, Lissie, and Beaumont Formations each of which are Pleistocene age formations. Recent alluvium occurs along streams.

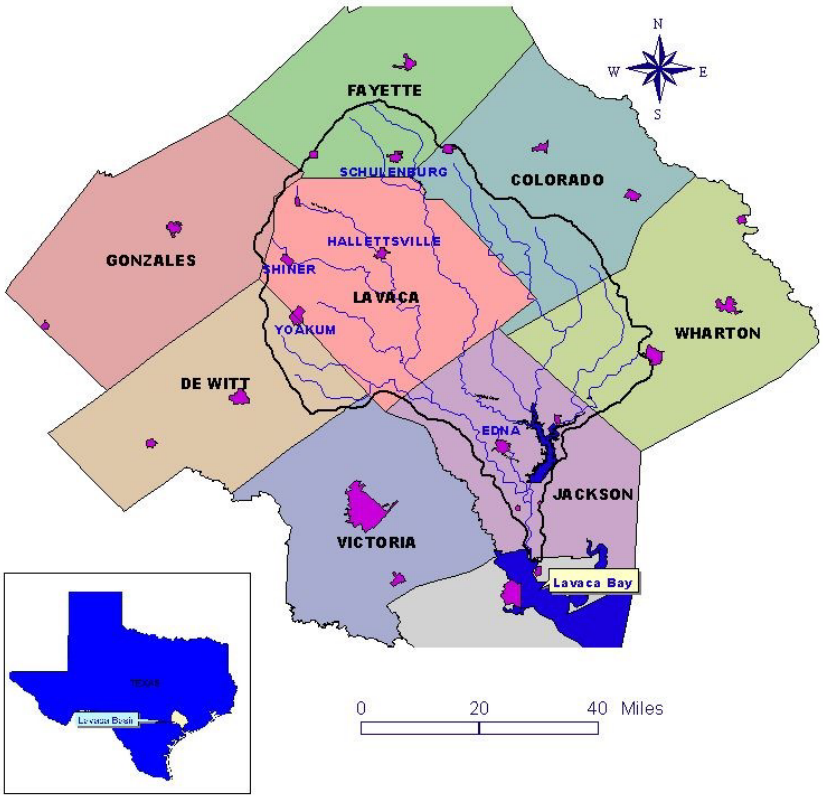
The Lavaca River Basin lies within the warm temperate zone and is classified as humid and subtropical with hot summers. Because of the proximity of the Lavaca River Basin to the Gulf of Mexico and the prevailing southeasterly wind, a marine climate exists throughout spring, summer, fall, and much of the winter season. Mean annual precipitation in the Basin varies from 34 inches along the western boundary to approximately 41 inches along the eastern edge except during recent drought years which the area suffered in 2008-2009 and even worse in 2011. Recent years have seen more typical precipitation events.

Summers are long, hot and humid with little variation in day-to-day weather conditions, except for occasional thunderstorm. Winters are short and mild, moderated by polar air masses which frequently push southward and bring weather to the Basin that alternates from cool, overcast, and drizzly to mild, sunny, and dry conditions. During summer and early fall, the occurrence of tropical disturbances may bring heavy rains or occasional tropical storms or hurricanes.

Segment 1601 is the tidal portion of the Lavaca River from the mouth of the Lavaca Bay up to a point 8.6 kilometers (5.3 miles) downstream of US 59 in Jackson County. Several small tributaries and the Menefee Lakes, Redfish Lake, Swan Lake, Redfish Bayou, and Catfish Bayou are included in this segment. The Redfish and Swan Lakes are important nursery grounds for marine organisms.

Segment 1602 is the Lavaca River above the tidal portion. Many tributaries drain into the Lavaca River; Dry Creek drains wastewater effluent from Edna, Rocky Creek drains wastewater effluent from Shiner, and the Big Brushy and Clarks Creeks drain wastewater effluent from Yoakum. Hallettsville and Moulton wastewater treatment plants dispose of treated wastewater effluent into the main stem of the Lavaca River. The upper Lavaca (1602C) is on the 303d List for dissolved oxygen, AU's 1602_02 and 1602_03 are listed for bacteria, and Rocky Creek is impaired for bacteria.

Figure A5.1. Lavaca River Basin



Segment 1603 is the Navidad River below Lake Texana extending to the confluence of the Lavaca and Navidad Rivers. Water released from Lake Texana flows through Segment 1603 to the Lavaca River and on into the Lavaca Bay.

Segment 1604 is Lake Texana. Lake Texana, at an elevation of 44 feet above sea level, is a 161,085 acre-foot reservoir with 9,727 surface acres. Drainage flows feeding the lake include Sandy Creek, the Mustang Creeks, Navidad River, and numerous county drains. The Sandy Creek is an intermittent creek draining a large portion of the Lavaca River Basin through Jackson, Wharton, Colorado and Lavaca Counties. Flow is augmented by return irrigation from rice fields. The Mustang Creek branches into the East, West and Middle Mustang Creeks and drains a portion of the Lavaca River Basin from the Garwood Irrigation Service Area to Lake Texana. Wastewater effluent from Ganado Wastewater Treatment Plant (WWTP) drains into Lake Texana, wastewater effluent from Louise WWTP in Wharton County drains into the East Mustang, and the wastewater effluent from the Sheridan community drains into an unnamed ditch, through tributaries and eventually into Sandy Creek.

Segment 1605 is the Navidad River above Lake Texana. Many tributaries drain into the Navidad River. The wastewater effluent from Schulenburg drains into an unnamed tributary of the Navidad River in the northern section of the Basin.

Segment 2453A is the tidal portion of Garcitas Creek from the confluence with Lavaca Bay in Jackson/Victoria County upstream to the confluence with Marcado Creek in Victoria County. Several small tributaries drain into Garcitas Creek including Arenosa Creek to the north. This segment is currently on the 303d List for dissolved oxygen.

A6 Project/Task Description

See Appendix A, Measurement Performance Specifications (Table A7.1) for the laboratory analyses to be covered under this QAPP.

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. Also see Appendix C for water quality monitoring sites map.

In FY 2024, LNRA will monitor 25 sites. 18 sites will be monitored monthly for field data and 19 sites will be monitored quarterly for laboratory conventional parameters. A 24 HR dissolved oxygen (DO) study will take place at three sites; sampling will be scheduled for the critical and non-critical periods. Chlorophyll a will be sampled quarterly at lake sites while TOC will be sampled quarterly at site #15377 to accommodate a stakeholder request.

Amendments to the QAPP

Amendments to the QAPP may be necessary to address incorrectly documented information or to reflect changes in project organization, tasks, schedules, objectives, and methods. Requests for amendments will be directed from the LNRA Project Manager to the CRP Project Manager electronically. LNRA 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 LNRA Project Manager, 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 LNRA Project Manager. If adherence letters are required, the LNRA 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. LNRA 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 LNRA 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 LNRA Project Manager, 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 LNRA to project participants before data collection activities commence. LNRA will secure written documentation from each sub-tier project participant (e.g., subcontractors, subparticipants, other units of government) stating the organization's awareness of and commitment to requirements contained in each special project appendix to the QAPP. LNRA will maintain this documentation as part of the project's QA records and ensure that the documentation is available for review.

A7 Quality Objectives and Criteria

The purpose of routine water quality monitoring is to collect surface water quality data that can be used to characterize water quality conditions, identify significant long-term water quality trends, support water quality standards development, support the permitting process, and conduct water quality assessments in accordance with TCEQ's Guidance for Assessing and Reporting Surface Water Quality in Texas, July 2022 or most recent version (https://www.tceq.texas.gov/downloads/water-quality/assessment/integrated-report-2022/2022-guidance.pdf). These water quality data, and data collected by other organizations (e.g., United States Geological Survey (USGS), TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

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

The 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.

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, the project manager 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 (or other designated location and ensure that the documentation will be available during monitoring systems audits.

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

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

Subcontracting of Environmental Tests).

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	LNRA	7	Paper, electronic
Field SOPs	LNRA	7	Paper, electronic
Laboratory Quality Manuals	GBRA	Perpetual*	Paper, electronic
Laboratory SOPs	GBRA	Perpetual*	Paper, electronic
QAPP distribution documentation	LNRA	7	Paper
Field staff training records	LNRA	7	Paper
Field equipment calibration/maintenance logs	LNRA	7	Paper
Field instrument printouts	LNRA	7	Paper
Field notebooks or data sheets	LNRA	7	Paper
Chain of custody records	LNRA	7	Paper
Laboratory calibration records	GBRA	Perpetual*	Paper, electronic
Laboratory instrument printouts	GBRA	Perpetual*	Paper, electronic
Laboratory data reports/results	LNRA, GBRA	Perpetual*	Paper, electronic
Laboratory equipment maintenance logs	GBRA	Perpetual*	Paper, electronic
Corrective Action Documentation	LNRA, GBRA	7	Paper

*Perpetual means records are maintained for >10 years.

Laboratory Test Reports

Test/data reports from the laboratory must document the test results clearly and accurately. Routine data reports should be consistent with the TNI Standard (2016), Volume 1, Module 2, Section 5.10 and include the information necessary for the interpretation and validation of data. The requirements for reporting data and the procedures are provided. Test reports include the following:

- name and address of GBRA laboratory
- sample number
- sample description
- customer ID number, name and address
- a clear identification of the sample(s) analyzed
- date and time of sample receipt
- date and time of sample collection
- delivery and preservative methods
- sample matrix
- identification of method used
- holding time
- date and time test is run
- identification of samples that did not meet QA requirements and why
- sample results
- units of measurement
- clearly identified subcontract laboratory results (as applicable)
- initials of analyst
- a name and title of person accepting responsibility for the report (Laboratory Director)
- 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)

- %RPD (relative percent difference)
- %REC (percent Recovery of Known Standard)
- Certification of NELAP compliance

Electronic Data

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

The GBRA laboratory provides data to LNRA via e-mail pdf attachments:

- The data is then printed out at LNRA in hard copies used for perusal and data entry into an access database.
- These hard copies are kept in archives at LNRA.

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 LNRA'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	Matrix	Container	Preservation	Sample Volume (mL)	Holding Time
Turbidity	water	1 L plastic	<6° C but >0°C	250	48 hours
Hardness, total	water	1 L plastic	<6° C but >0°C Filter, with H_2SO_4 to pH<2	250	6 months
Nitrate-N	water	1 L plastic	<6° C but >0°C	150	48 hrs
Total suspended solids (TSS)	water	2 L plastic	<6° C but >0°C	400	7 days
Alkalinity, total	water	1 L plastic	<6° C but >0°C	100	14 days
Sulfate	water	1 L plastic	<6° C but >0°C	100	28 days
Chloride	water	1 L plastic	<6° C but >0°C	150	28 days
Total phosphorus	water	1 L plastic	<6° C but >0°C with H_2SO_4<2pH	150	28 days
Total Organic Carbon (TOC)	water	500 ml plastic	<6° C but >0°C with H_2SO_4<2pH	100	28 days
Ammonia – N	water	1 L plastic	<6° C but >0°C with H_2SO_4<2pH	150	28 days
E. coli Idexx Colilert	water	100 ml plastic	<6° C but >0°C	100	8 hrs
Chlorophyll-*a*	water	Amber plastic	Dark and iced (<6° C but >0°C) before filtration; dark and frozen (≤0° C) after filtration.	1000	Filter ≤ 48 hrs then stored frozen for up to 24 days
Total Kjeldahl Nitrogen	water	1 L plastic	<6° C but >0°C with H_2SO_4<2pH	150	28 days

Sample Containers

Certificates from sample container manufacturers are maintained by GBRA Laboratory for the bottles that LNRA obtains from GBRA (Idexx *E. coli*, and TOC) and by LNRA for the other bottles which LNRA purchases directly. Sample bottles needing to be acidified are either pre-treated before taking to the field or treated soon after they are gathered.

- 1 L sample containers are purchased by LNRA pre-cleaned for conventional parameters, except for Chlorophyll-a and 2 L bottles, which are cleaned by LNRA for reuse.
- The Chlorophyll-a bottles and 2 L bottles are cleaned by the LNRA staff with the following procedure: 1) wash containers with tap water and Alconox -laboratory detergent, 2) triple rinse with hot tap water, and 3) triple rinse with deionized water.
- Plastic jars are obtained from the GBRA laboratory for TOC samples.
- 100 mL pre-cleaned and sterilized bacterial bottles are obtained from the GBRA laboratory for Idexx Colilert *E. coli* samples. These bacterial bottles are certified and documentation is maintained by GBRA. *E. coli* bottles are not pre-treated with Sodium Thiosulfate as that is used to neutralize chlorine. Our sites are not contaminated with chlorine, i.e. not directly downstream of wastewater plants.
- The conventional, TOC, and bacterial bottles are not re-used.

Processes to Prevent Contamination

SWQM Procedures outline the necessary steps to prevent contamination of samples, including: direct collection into sample containers, when possible. Field QC samples (identified in Section B5) are collected to verify that contamination has not occurred.

Documentation of Field Sampling Activities

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

- Station ID
- Sampling Date
- Location
- Sampling Depth
- Sampling Time
- Sample Collector's name
- Values for all field parameters collected

Additional notes containing detailed observational data not captured by field parameters may include:

- Water appearance
- Weather
- Biological activity
- Recreational activity
- Unusual odors
- Pertinent observations related to water quality or stream uses
- Watershed or instream activities
- Specific sample information
- Missing parameters

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 LNRA Project Manager/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

1. Day 1 conventional samples are collected by field supervisor/staff and placed on ice in the field.
2. Samples needing preservative are dosed with 1.5 ml of sulfuric acid to lower the pH below 2.
3. At the end of the sampling day, samples are segregated into appropriate ice chests according to preservative method (ice or acid). All samples are then covered in ice and stored in the LNRA lab.
4. Day 2 sampling sites include conventionals and *E. coli*. These are collected by field supervisor/staff and placed on ice in the field.
5. Samples needing preservative are dosed with 1.5 ml of sulfuric acid to lower the pH below 2.
6. Samples are transported to GBRA Regional Laboratory by LNRA personnel immediately after day 2 samples are collected to meet *E. coli* holding times.
7. Samples are released to GBRA Regional Laboratory staff and chain of custodies signed.
8. GBRA lab handling procedures may be found in their Quality Systems Standard Operating Procedure.

Sample Tracking Procedure Deficiencies and Corrective Action

All deficiencies associated with COC procedures, as described in this QAPP, are immediately reported to the LNRA 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 LNRA Project Manager/QAO will determine if the procedural violation may have compromised the validity of the resulting data. Any failures that have reasonable potential to compromise data validity will invalidate data and the sampling event should be repeated. The resolution of the situation will be reported to the TCEQ CRP Project Manager in the project progress report. CAPs will be prepared by the Lead Organization QAO and submitted to TCEQ CRP Project Manager along with project progress report.

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

B4 Analytical Methods

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

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

Standards Traceability

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

Analytical Method Deficiencies and Corrective Actions

Deficiencies in field and laboratory measurement systems involve, but are not limited to such things as instrument malfunctions, failures in calibration, blank contamination, quality control samples outside QAPP-defined limits, etc. In many cases, the field technician or lab analyst will be able to correct the problem. If the

problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, then it is conveyed to the applicable Laboratory Supervisor, who will make the determination and notify the LNRA 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 LNRA Project Manager. The LNRA 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. Specific requirements are outlined below. Field QC sample results are submitted with the laboratory data report (see Section A9.).

Field Split

Field splits are no longer required by the Clean Rivers Program, but LNRA still finds them to be useful as a check on both field sampling and laboratory techniques. A field split is a single sample subdivided by field staff immediately following collection and submitted to the laboratory as two separately identified samples. Split samples are preserved, handled, shipped, and analyzed identically, and are used to assess variability in all of these processes. Field splits apply to conventional samples only and are collected at one site each quarterly sampling event, i.e. in January, April, July and October each year. To the extent possible, field splits prepared and analyzed over the course of the project should be performed on samples from different sites.

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

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

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

In the event of a field split QC failure the single sample associated with the split may need to be qualified as not meeting project QC requirements, and these qualified data will not be reported to the TCEQ. Field split results are not reported to SWQMIS.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Batch

A batch is defined as environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same NELAP-defined matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An analytical batch is composed of prepared environmental samples (extract, digestates, or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

Method Specific QC requirements

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

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

Comparison Counting

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

Limit of Quantitation (LOQ)

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

LOQ Sediment and Tissue Samples

When considering LOQs for solid samples and how they apply to results, two aspects of the analysis are considered: (1) the LOQ of the sample, based on the real world in which moisture content and interferences affect the result, and (2) the LOQ in the QAPP, which is a value less than or equal to the AWRL based on an idealized sample with zero % moisture.

The LOQ for a solid sample is based on the lowest non-zero calibration standard (as are those for water samples), the moisture content of the solid sample, and any sample concentration or dilution factors resulting from sample preparation or clean-up.

To establish solid-phase LOQs to be listed in Appendix A of the QAPP, the laboratory will adjust the concentration of the lowest non-zero calibration standard for the amount of sample extracted, the final extract volume, and moisture content (assumed to be zero % moisture). Each calculated LOQ will be less than or equal to the AWRL on the dry-weight basis to satisfy the AWRL requirement for sediment and tissue analyses. When data are reviewed for consistency with the QAPP, they are evaluated based on this requirement. Results may not appear to meet the AWRL requirement due to high moisture content, high concentrations of non-target analytes necessitating sample dilution, etc. These sample results will be submitted to the TCEQ with an explanation on the data summary as to why results do not appear to meet the AWRL requirement.

LOQ Check Sample

An LOQ check sample consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of

the measurement system at the lower limits of analysis. The LOQ check sample is spiked into the sample matrix at a level less than or equal to the LOQ published in Appendix A of this QAPP, for each analyte for each analytical batch of CRP samples run. If it is determined that samples have exceeded the high range of the calibration curve, samples should be diluted or run on another curve. For diluted or high concentration samples run on batches with calibration curves that do not include the LOQ published in Appendix A of this QAPP, a check sample will be run at the low end of the calibration curve.

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

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

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

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

Laboratory Control Sample (LCS)

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

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

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

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

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

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

Laboratory Duplicates

A laboratory duplicate is an aliquot taken from the same container as an original sample under laboratory conditions and processed and analyzed independently. A laboratory duplicate is achieved by preparing 2 separate aliquots of a sample, LCS, or matrix spike. Both samples are carried through the entire preparation and analytical process. Laboratory duplicates are used to assess precision and are performed at a rate of one per preparation batch.

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

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

If the precision criterion is exceeded, the data are not acceptable for use under this project and are not reported to TCEQ. Results from all samples associated with that failed duplicate (usually a maximum of 10 samples) are

considered to have excessive analytical variability and are qualified as not meeting project QC requirements.

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

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

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

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

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

Matrix spike

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

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

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

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

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

Matrix spike recoveries are compared to the acceptance criteria published in the mandated test method. If the matrix spike results are outside established criteria, the data for the analyte that failed in the parent sample is not acceptable for use under this project and will not be reported to TCEQ. The result from the parent sample associated with that failed matrix spike will be considered to have excessive analytical variability and will be qualified by the laboratory as not meeting project QC requirements. Depending on the similarities in composition of the samples in the batch, the LNRA 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 LNRA Project Manager/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 LNRA Project Manager/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 QAO. The Laboratory QAO will discuss the failure with the LNRA Project Manager. If applicable, the LNRA 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 LNRA, 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 (LNRA) 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 by the LNRA Project Manager/QAO 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

LNRA staff carefully inspect supplies and consumables before acceptance. Laboratory QM states lab procedures for inspection and acceptance of 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.

Reservoir stage data are collected every day from the LNRA Reservoir Operations division. This data is acquired every morning at 0800 at the inlet to the spillway by measurement with a wire weight. Reservoir percent full is derived by using reservoir stage and comparing to known capacity tables given to LNRA by the TWDB after lake survey. These data will be submitted to the TCEQ under parameter code 00052 Reservoir Stage and parameter code 00053 Reservoir Percent Full.

B10 Data Management

Data Management Process

Data Path

1. Field data is stored in the data logger and on paper in the field notebook.
2. Data logger files are downloaded and printed out to keep in permanent hard copy files.
3. Quarterly conventional analyses hard copy reports are received from GBRA laboratory.
4. LNRA CRP Project Manager/QAO/Data Manager check GBRA data reports for completeness, holding times, minimums, maximums, AWRLs, LOQs, etc. and run numeric (RPD) comparisons of field splits.
5. Data is hand-entered into the LNRA Water Quality Access database; flow, reservoir elevation, reservoir percent full, and secchi disk data are added to results from the field notebook.
6. Data entry is 100% checked by Project/Data Manager.
7. Lab reports and field print outs are kept in LNRA permanent archives—electronic copies are stored in SharePoint infrastructure on the LNRA cloud.
8. The LNRA Water Quality Access database is backed up onto LNRA network in a dedicated file.
9. At least three times annually data is submitted to TCEQ for inclusion in SWQMIS. The LNRA Data Manager exports data from the LNRA Water Quality Access database and ensures proper formatting. The text files are loaded into SWQMIS Test Environment.
10. Changes are made according to Test Environment results and reran to ensure accuracy. When no errors are found a Validator Report is prepared.
11. Data (1 events file, 1 results file), Data Summary, Data Review Check List, and Validator Report are e-mailed to the CRP Project Manager.
12. The CRP TCEQ Project Manager checks over the data files and contacts LNRA QAO with any needed changes and then sends approved data files to TCEQ Data Manager.
13. The TCEQ Data Manager reviews the data for consistency with the QAPP and for reasonableness & then reports these results to the CRP Project Manager. The CRP Project Manager approves the loading of the data and the TCEQ Data Manager loads the data into SWQMIS.

Data Dictionary

Terminology and field descriptions are included in the 2019 DMRG, or most recent version.

Name of Entity	Tag Prefix	Submitting Entity	Collecting Entity
Lavaca-Navidad River Authority (LNRA)	LN	LN	LN

Data Errors and Loss

After data from each sampling site has been entered into the LNRA Access water quality database, the entries are carefully checked for accuracy by the Data Manager. At least three times annually this data is converted into pipe-delimited text files of Events and Results and reviewed by the LNRA QAO for format, exceedances in AWRLs, mins and maxs, LOQs, tag redundancies, missing data, and numerical/clerical errors. The LNRA QAO then runs the data through the SWQMIS program and takes care of any corrections needing to be made. The data is once again run through SWQMIS for a revised Validator Report. The LNRA QAO records any problem that might affect the data, including data loss or any dry sites, on the Data Summary which is sent electronically along with the final Validator Report to the TCEQ CRP Project Manager for review with each data set.

Record Keeping and Data Storage

Field results data acquired with YSI multi-parameter probes are downloaded from the datalogger into KOR software, a hard copy is printed out and kept on file. Data is then hand-typed into the Access water quality database; other data, e.g. Secchi disk depth and flow, are added to the electronic files from field notes. The forms used for field notes and for flow calculations appear in Appendix D. Quarterly conventional sample results from the GBRA laboratory are e-mailed to LNRA and then printed out in a hard-copy report format. Copies of lab data and field data are kept in LNRA permanent file. These results are also stored in SharePoint infrastructure on the LNRA network. Data is retained according to the schedule in Table A9.1.

Data Handling, Hardware, and Software Requirements

The LNRA utilizes an array of data gathering, processing, and output hardware. Data gathering for monitoring and control operations utilizes field located instruments such as flow meters, precipitation gages, pressure transducers and radar equipment that are linked to the Authority's main offices through radio transmitters. LNRA utilizes YSI multi-parameter datasondes to gather field data. The data is hand-entered into field log books, downloaded onto a PC from the datalogger, hard copies are printed and kept on file. Both field and conventional laboratory analyses results are entered into an Access water quality database running on Windows platform. The Access water quality database is backed up onto the LNRA network system. The Access files are exported as pipe-delimited text files for submittal to the TCEQ. ESRI's Arcview and ArcGis are the software used for the GIS database. The computers used by the LNRA CRP staff have internet access in order to facilitate transmission of data and information to and from TCEQ via electronic mail.

Information Resource Management Requirements

Backup/Disaster Recovery – Data compiled via sampling and monitoring are stored in an Access database and are backed up onto a USB flash drive and stored in the LNRA archives vault. Data is stored on the LNRA network in a dedicated file and on the LNRA Project Manager's computer. Hard copy of this data is available in case of system failure. Full data recovery could be accomplished in a few work weeks from the network files or USB flash drive.

LNRA water quality data is also stored in the State's water quality database SWQMIS (Surface Water Quality Monitoring Information System). A link to SWQMIS is provided on LNRA's web site.

TCEQ-approved Lavaca Basin water quality data is available to the public via the LNRA web site @ www.LNRA.org. From the home page one can choose "Water", from the water quality page choose "Water Quality", and then choose "Water Quality Database" from the list of options on that page. A link to the Coordinated Monitoring Schedule, hosted and maintained by the Lower Colorado River Authority (LCRA), is located under "Water Quality Links" on the LNRA web site.

Archives/Data Retention - Complete data set submittals are retained on-site by the LNRA for a retention period specified in the A9.1 of the current QAPP. Each data set submitted to the TCEQ is stored on both the LNRA Project Manager's/QAO's computer. Data will be managed in accordance with the TCEQ DMRG, July 2019 or most recent version, and applicable LNRA information resource management policies.

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

C1 Assessments and Response Actions

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

Table C1.1 Assessments and Response Requirements

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

Corrective Action Process for Deficiencies

Deficiencies are any deviation from the QAPP, SWQM Procedures, or other applicable guidance . Deficiencies may invalidate resulting data and require corrective action. Repeated deficiencies should initiate a CAP. Corrective action for deficiencies may include 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 LNRA Project Manager (or other appropriate staff) and should be subject to periodic review so their responses can be uniform, and their frequency tracked. It is the responsibility of the LNRA Project Manager/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.

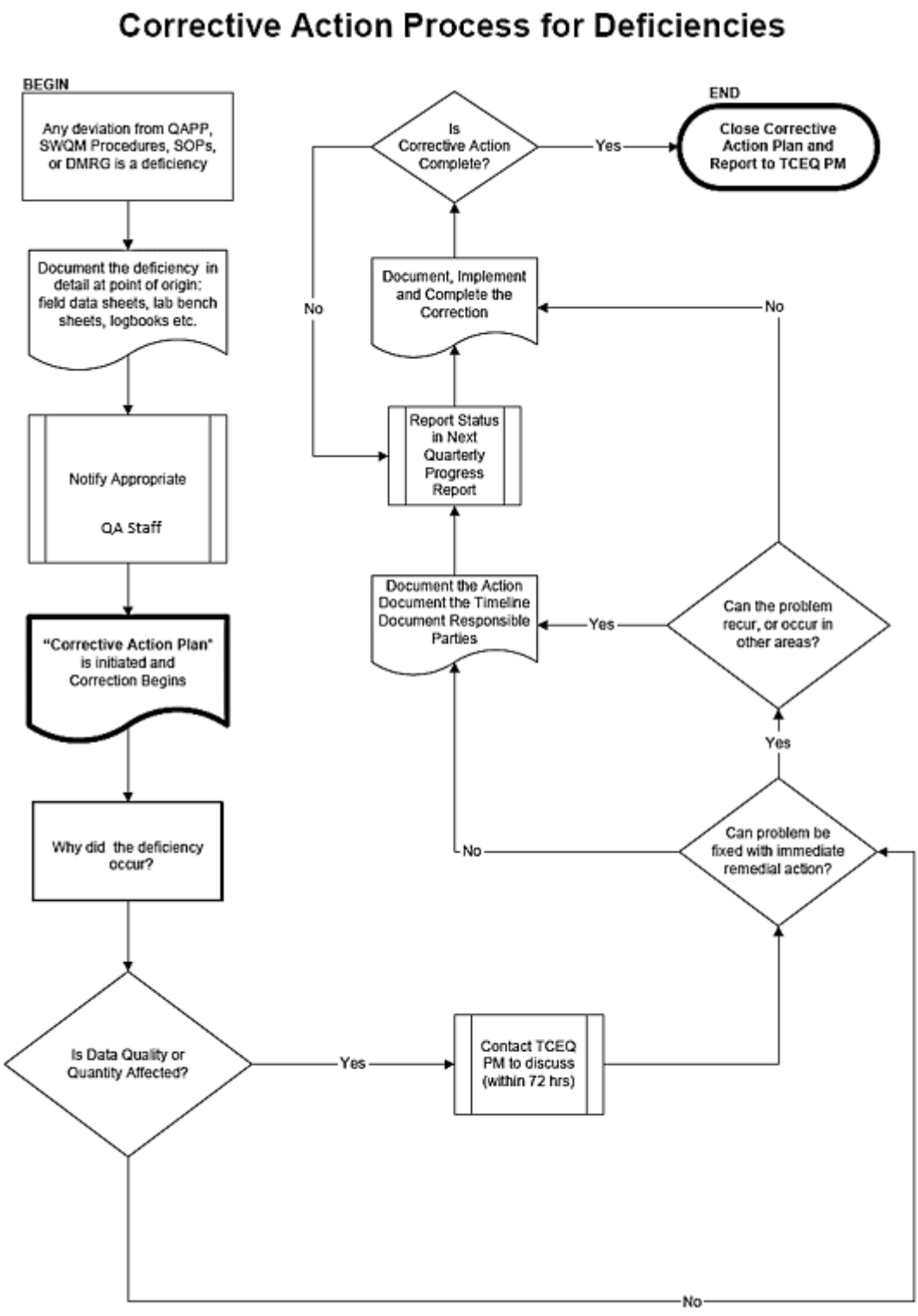
Corrective Action

CAPs should:

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

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

Figure C1.1 Corrective Action Process for Deficiencies



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

The LNRA 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 the LNRA 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 Report	As Needed	As Needed	LNRA CRP Data Manager and GBRA Laboratory Staff	LNRA CRP Project Manager and GBRA Laboratory Management as appropriate
CRP Progress Reports	Quarterly	December 15, 2023 March 15, 2024 June 15, 2024 September 15, 2024 December 15, 2024 March 15, 2025 June 15, 2025 August 15, 2025	LNRA CRP Project Manager	TCEQ CRP Project Management
Monitoring Systems Audit Report and Response	As Needed	As Needed	LNRA CRP QAO	TCEQ CRP Project Management
Data Summary	As Needed	As Needed	LNRA Data Manager	TCEQ CRP Project Management

Reports to LNRA Project Management

The LNRA Project/Data Manager reviews the laboratory reports of water quality analyses for any QA/QC issues.

Reports to TCEQ Project Management

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

Progress Report

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

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

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

Table D2.1: Data Review Tasks

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

Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)			Project Mgr/QAO	
Field instrument pre- and post-calibration check results within limits			Project Mgr/QAO	Project Mgr/QAO
10% of data manually reviewed			Project Mgr/QAO	Project Mgr/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 A7.1-4)

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 LNRA FY 2024-2025 QAPP

Conventional Parameters in Water

Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
ALKALINITY, TOTAL (MG/L AS CACO3)	mg/L	water	SM 2320B	00410	20	20	NA	20	NA	GBRA
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540D	00530	5	1**	NA	NA	NA	GBRA
NITROGEN, AMMONIA, TOTAL (MG/L AS N)	mg/L	water	EPA 350.1 Rev. 2.0 (1993)	00610	0.1	0.1	70-130	20	80-120	GBRA
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	70-130	20	80-120	GBRA
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2,Rev 2, August 1993	00625	0.2	0.2	70-130	20	80-120	GBRA
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 365.3	00665	0.06	0.02	70-130	20	80-120	GBRA
CARBON, TOTAL ORGANIC, NPOC (TOC), MG/L	mg/L	water	SM 5310 C	00680	2	0.5	NA	NA	NA	GBRA
HARDNESS, TOTAL (MG/L AS CACO3)*	mg/L	water	SM 2340 C	00900	5	5	NA	20	80-120	GBRA
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	1	70-130	20	80-120	GBRA
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	1	70-130	20	80-120	GBRA
CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH	ug/L	water	SM 10200 H.	32211	3	1	NA	20	80-120	GBRA
TURBIDITY, LAB NEPHELOMETRIC TURBIDITY UNITS, NTU	NTU	water	SM 2130B	82079	0.5	0.5	NA	NA	NA	GBRA

*Hardness is not used for regulatory purposes but is used to assess metals in water at inland sites (estuarine sites do not require hardness analysis).
**TSS LOQ is based on the volume of sample used.
References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022. TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

TABLE A7.2 Measurement Performance Specifications for LNRA FY 2024-2025 QAPP

Bacteriological Parameters in Water

Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	Idexx Laboratories Colilert-18	31699	1	1	NA	0.5*	NA	GBRA

* 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.

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

TABLE A7.3 Measurement Performance Specifications for LNRA FY 2024-2025 QAPP

Flow Parameters

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

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

TABLE A7.4 Measurement Performance Specifications for LNRA FY 2024-2025 QAPP					
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
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
SALINITY - PARTS PER THOUSAND	PPT	water	SM 2520 and TCEQ SOP V1	00480	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
RESERVOIR ACCESS NOT POSSIBLE LEVEL TOO LOW ENTER 1 IF REPORTING	NS	other	TCEQ Drought Guidance	00051	Field
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)*	meters	other	TCEQ SOP V2	89864	Field
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)*	meters	other	TCEQ SOP V2	89865	Field
POOL LENGTH, METERS*	meters	other	TCEQ SOP V2	89869	Field
% POOL COVERAGE IN 500 METER REACH*	%	other	TCEQ SOP V2	89870	Field

* To be routinely reported when collecting data from perennial pools.
† As recorded by LNRA.
References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 24th Edition, 2022.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

TABLE A7.5 Measurement Performance Specifications for LNRA FY 2024-2025 QAPP					
24 Hour Parameters in Water					
Parameter	Units	Matrix	Method	Parameter Code	Lab
DISSOLVED OXYGEN, 24-HOUR MIN. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89855	field
DISSOLVED OXYGEN, 24-HOUR MAX. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89856	field
DISSOLVED OXYGEN, 24-HOUR AVG. (MG/L) MIN. 4 MEA	mg/l	Water	TCEQ SOP V1	89857	field
DISSOLVED OXYGEN, # OF MEASUREMENTS IN 24-HRS	NU	Water	TCEQ SOP V1	89858	field

References:

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

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

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

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

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

Appendix B: Task 3 Work Plan & Sampling Process Design and Monitoring Schedule (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 monitor sites throughout the Lavaca River Basin to document water quality and identify potential issues.

The Performing Party will complete the following subtasks:

Monitoring Description - In FY 2024, the Performing Party will monitor a minimum of twenty-three (23) sites. A minimum of eighteen (18) of these sites will be monitored monthly and four (4) will be monitored quarterly for field data. A minimum of nineteen (19) sites will be monitored quarterly for laboratory conventional parameters. A 24-hour dissolved oxygen (DO) study will take place at two sites.. Specific locations, parameters, and sampling frequencies will be provided in the basin wide CRP QAPP for FY2024-2025.

In FY 2025, the Performing Party will monitor at a similar level of effort as in FY 2024. The actual number of sites, location, frequency, and parameters collected for FY 2025 will be based on priorities identified at the Basin Steering Committee and Coordinated Monitoring meetings and will be included in the amended Appendix B of the QAPP.

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

Coordinated Monitoring Meeting - The Performing Party will hold an annual coordinated monitoring meeting as described in the FY2024-2025 CRP Guidance. Qualified monitoring organizations will be invited to attend the working meeting in which monitoring needs and purposes will be discussed segment by segment and station by station. Information from participants and stakeholders will be used to select stations and parameters that will enhance overall water quality monitoring coverage, eliminate duplication of effort, and address basin priorities. A summary of the changes to the monitoring schedule will be provided to the participants within two weeks of the meeting. Changes to the monitoring schedule will be entered into the statewide 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. All requirements related to meetings will be followed and required meetings will be conducted in-person or via TCEQ approved virtual format.

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

Deliverables and Dues Dates:

September 1, 2023 through August 31, 2024

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

B. Coordinated Monitoring Meeting - between March 15 and April 30,2024
C. Coordinated Monitoring Meeting Summary of Changes - within 2 weeks of the meeting
D. Email notification that Coordinated Monitoring Schedule updates are complete - May 31, 2024

September 1, 2024 through August 31, 2025

A. Conduct water quality monitoring, submit monitoring activities report, summarize activities, and submit with progress report- September 15 and December 15, 2024; March 15 and June 15 and August 15, 2025
B. Coordinated Monitoring Meeting - between March 15 and April 30,2025
C. Coordinated Monitoring Meeting Summary of Changes – within 2 weeks of the meeting
D. Email notification that Coordinated Monitoring Schedule updates are complete - May 31, 2025

Sample Design Rationale FY 2024

The sample design is based on the legislative intent of CRP. Under the legislation, the Basin Planning Agencies have been tasked with providing data to characterize water quality conditions in support of the Texas Water Quality Integrated Report, and to identify significant long-term water quality trends. Based on Steering Committee input, achievable water quality objectives and priorities and the identification of water quality issues are used to develop work plans which are in accord with available resources. As part of the Steering Committee process, the LNRA coordinates closely with the TCEQ and other participants to ensure a comprehensive water monitoring strategy within the watershed. LNRA will add a 24 hour dissolved oxygen site (17883) outside of the Basin for this biennium at the request of TCEQ to aid in data collection. Field and 24 hour dissolved oxygen data will be collected at site 17883.

Site Selection Criteria

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

1. Locate stream sites so that samples can be safely collected from the centroid of flow. Centroid is defined as the midpoint of that portion of stream width which contains 50 percent of the total flow. If multiple potential sites on a stream segment are appropriate for monitoring, choose one that would best represent the water body, and not a site that displays unusual conditions or contaminant source(s). Avoid backwater areas or eddies when selecting a stream site.
2. At a minimum for reservoirs, locate sites near the dam (reservoirs) and in the major arms. Larger reservoirs might also include stations in the middle and upper (riverine) areas. Select sites that best represent the water body by avoiding coves and back water areas. A single monitoring site is considered representative of 25 percent of the total reservoir acres, but not more than 5,120 acres.
3. Monitoring sites are selected to maximize stream coverage or basin coverage. Very long segments may require more stations. As a rule of thumb, stream segments between 25 and 50 miles long require two stations, and longer than 50 miles require three or more depending on the existence of areas with significantly different sources of contamination or potential water quality concerns. Major hydrological features, such as the confluence of a major tributary or an instream dam, may also limit the spatial extent of an assessment based on one station.
4. Because historical water quality data can be very useful in assessing use attainment or impairment, it may be best to use sites that are on current or past monitoring schedules.
5. All classified segments (including reservoirs) should have at least one Monitoring site that adequately characterizes the water body, and monitoring should be coordinated with the TCEQ or other qualified monitoring entities reporting routine data to TCEQ.
6. Monitoring sites may be selected to bracket sources of pollution, influence of tributaries, changes in land uses, and hydrological modifications.
7. Sites should be accessible. When possible, stream sites should have a USGS or IBWC stream flow gauge. If not, it should be possible to conduct flow measurement during routine visits.

Monitoring Sites for FY 2024

Table B1.1 Sample Design and Schedule, FY 2024

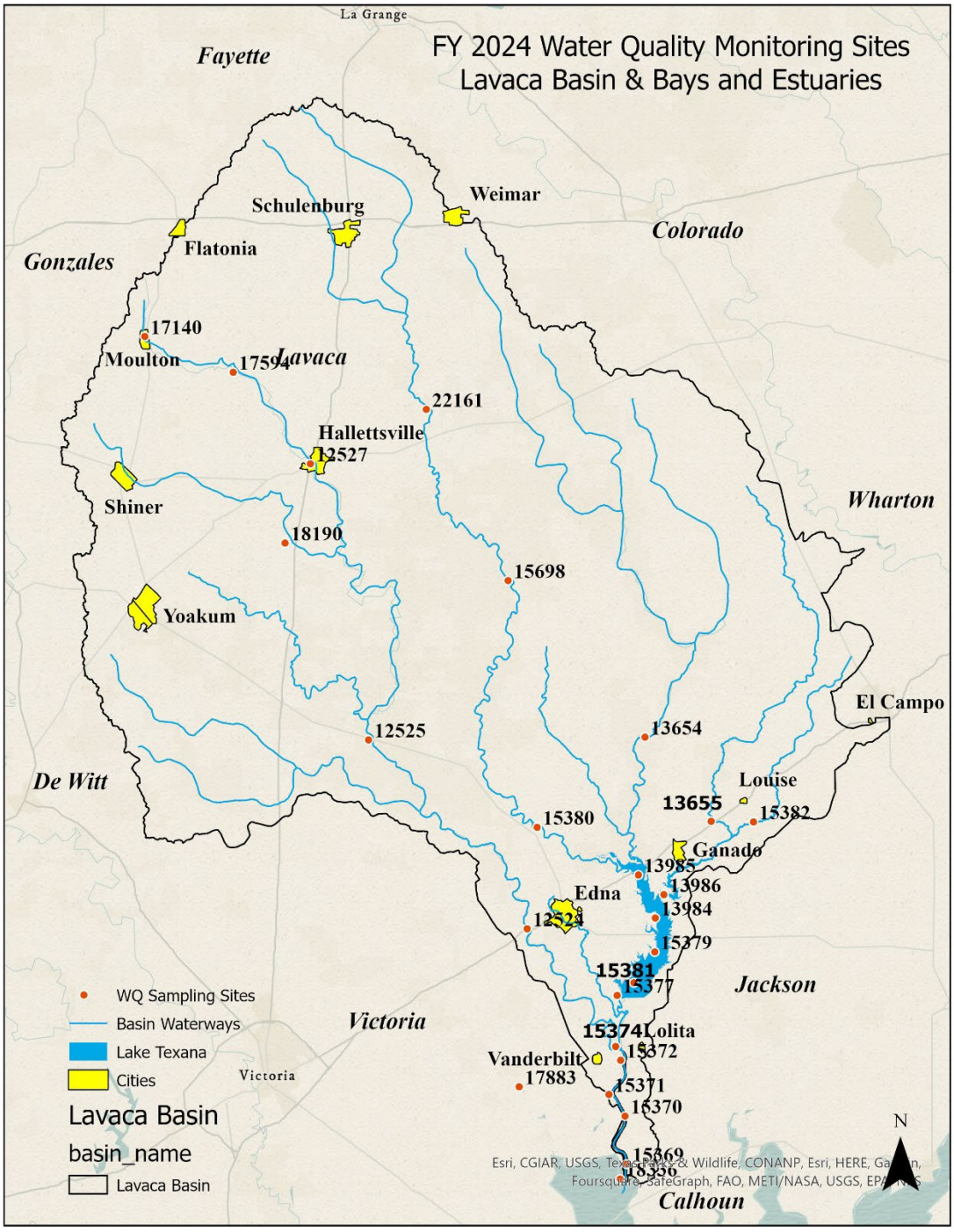
Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	24 HR DO	Field	Conv	Bacteria	Flow	Comments
LAVACA RIVER MID CHANNEL 2.05 KM S OF CONFLUENCE WITH CATFISH BAYOU NEAR MOUTH OF LAVACA BAY IN S JACKSON COUNTY	18336	1601	16	14	LN	LN	RT		12	4			Formerly site #14720--moved upstream
LAVACA RIVER TIDAL 3.50 MI DOWNSTREAM OF SH 616 AND 740 M UPSTREAM OF MENEFEE BAYOU AT MOBILE DOCK	15371	1601	16	14	LN	LN	RT		12				
LAVACA RIVER TIDAL AT FRELS BOAT RAMP MID CHANNEL 50M UPSTREAM OF FRELS RD APPROX 1.1KM DOWNSTREAM OF FM 616 BETWEEN VANDERBILT AND LOLITA	15372	1601	16	14	LN	LN	RT		12				
CATFISH BAYOU EAST BANK 30 M FROM CONFLUENCE OF SWAN LAKE APPROXIMATELY 2.5 MI NORTH OF POINT COMFORT	15369	1601A	16	14	LN	LN	RT		12				
REDFISH BAYOU MID CHANNEL 30 M UPSTREAM OF LAVACA RIVER APPROXIMATELY 6 MI NORTH POINT COMFORT	15370	1601B	16	14	LN	LN	RT		12				
LAVACA RIVER AT SH 111 60 M DOWNSTREAM OF SH 111 SE OF YOAKUM	12525	1602	16	14	LN	LN	RT		12	4	4	12	
LAVACA RIVER AT UPSTREAM BRIDGE ON US 59 SOUTHWEST OF EDNA	12524	1602	16	14	LN	LN	RT		12	4	4	12	
LAVACA RIVER AT US ALT 90/US HWY 77 IN HALLETTSVILLE	12527	1602	16	14	LN	LN	RT		4	4	4	4	
LAVACA RIVER AT FM 532, 0.2 MI WEST OF MOULTON	17140	1602C	16	14	LN	LN	RT	6	6			**6**	
LAVACA RIVER 3.62 KM NE OF WITTING ON FM 1295 IN SEGMENT 1602C.	17594	1602C	16	14	LN	LN	RT	6	4	4	4	10	4 Flow for quarterlies, and 6 flow for 24HR DO
ROCKY CREEK IMMEDIATELY UPSTREAM OF LAVACA CR 387 APPROXIMATELY 5.3 MI SOUTH OF HALLETTSVILLE ON US77 AND .92 MI WEST ON CR 387	18190	1602B	16	14	LN	LN	RT		4	4	4	**4**	Electric fence has been removed so flow will be taken at this site.
NAVIDAD RIVER TIDAL MID CHANNEL 30 M UPSTREAM OF LAVACA RIVER CONFLUENCE APPROX 170 M UPSTREAM OF FM 616 BETWEEN VANDERBILT AND LOLITA	15374	1603	16	14	LN	LN	RT		12	4			
LAKE TEXANA 2 KM UPSTREAM OF SH 111 EAST OF EDNA USGS SITE CC	13984	1604	16	14	LN	LN	RT		12	4	4		Chlorophyll a is collected quarterly
LAKE TEXANA MID LAKE IN OLD NAVIDAD RIVER CHANNEL APPROX 1.75 KM N OF DAM 2.56 KM EAST OF LNRA BOAT DOCK IN SOUTHWEST ARM	15381	1604	16	14	LN	LN	RT		12	4			Chlorophyll a is collected quarterly
LAKE TEXANA MUSTANG CREEK ARM 1.5 KM UPSTREAM OF CONFL. WITH MAIN LAKE AT MUSTANG CREEK RECREATION AREA SOUTH OF GANADO USGS SITE EC	13986	1604	16	14	LN	LN	RT		12	4	4		Chlorophyll a is collected quarterly
LAKE TEXANA NEAR EAST BANK 1.81 KM S AND 100 M E OF SANDY CREEK CONFLUENCE SOUTH OF US 59 BETWEEN EDNA AND GANADO/USGS SITE DC	13985	1604	16	14	LN	LN	RT		12	4	4		Chlorophyll a is collected quarterly
LAKE TEXANA NEAR SPILLWAY INLET 400 M NORTH AND 435 M EAST OF PALMETTO DAM CENTERPOINT	15377	1604	16	14	LN	LN	RT		12	4			Chlorophyll a and TOC are collected quarterly

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	24 HR DO	Field	Conv	Bacteria	Flow	Comments
LAKE TEXANA RIVER CHANNEL 3.693 KM DOWNSTREAM OF SH 111 NEAR BRACKENRIDGE PLANTATION RECREATION	15379	1604	16	14	LN	LN	RT		12	4	4		Chlorophyll a is collected quarterly
EAST MUSTANG CREEK AT FM 647 3 MI SOUTH OF LOUISE	15382	1604A	16	12	LN	LN	RT		12	4		12	
WEST MUSTANG CREEK AT US 59 30 M DOWNSTREAM OF NORTHBOUND US 59 3.6 MI EAST OF GANADO 2.1 MI UPSTREAM FROM MIDDLE MUSTANG CREEK	13655	1604B	16	14	LN	LN	RT		12	4		12	
SANDY CREEK AT FM 710 20 M UPSTREAM OF FM 710 9.1 MI NW OF LOUISE 0.9 MI UPSTREAM FROM GOLDENROD CREEK	13654	1604C	16	14	LN	LN	RT		12	4		12	
NAVIDAD RIVER AT FM 530 17 MI SE OF HALLETTSVILLE	15698	1605	16	14	LN	LN	RT		4	4		4	
NAVIDAD RIVER AT LAVACA CR 142, 2.89 KM NORTH OF SUBLIME	22161	1605	16	14	LN	LN	RT		4	4	4	4	
NAVIDAD RIVER AT JACKSON CR 401 5 MI NORTH OF EDNA	15380	1605	16	14	LN	LN	RT		12	4		12	
GARCITAS CREEK TIDAL NEAR SOUTH BANK APPROX. 3.07 KM UPSTREAM OF FM 616	17883	2453A	24	14	LN	LN	RT	6	6				

Appendix C: Station Location Maps

Station Location Maps

Maps of stations monitored by the LNRA are provided below. The maps were generated by the LNRA. 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 Chad Kinsfather at (361) 782-5229.



Appendix D: Field Data Sheets

Lavaca Navidad River Authority
Surface Water Quality Field Data Sheet

Station ID: _____Sampling Time: _____Sampling Date:_____ TCEQ #_____Collector: _____Weather_____
Location Description: _____Lake elevation_____
Lake % full:_____Last rainfall:_____

Depth: _____DO: _____DO%: _____Flow (cfs)_____
Temp: _____ pH: _____SpCond: _____
Flow Severity: _____Salinity: _____Secchi_____
Other Observational Data: _____
_____
_____

Station ID: _____Sampling Time: _____Sampling Date:_____ TCEQ #_____Collector: _____Weather_____
Location Description: _____Lake elevation_____
Lake % full:_____Last rainfall:_____

Depth: _____DO: _____DO%: _____Flow (cfs)_____
Temp: _____ pH: _____SpCond: _____
Flow Severity: _____Salinity: _____Secchi_____
Other Observational Data: _____
_____
_____

Station ID: _____Sampling Time: _____Sampling Date:_____ TCEQ #_____Collector: _____Weather_____
Location Description: _____Lake elevation_____
Lake % full:_____Last rainfall:_____

Depth: _____DO: _____DO%: _____Flow (cfs)_____
Temp: _____ pH: _____SpCond: _____
Flow Severity: _____Salinity: _____Secchi_____
Other Observational Data: _____
_____

Stream Flow (Discharge) Measurement Form

Stream: _____ Date: _____

Station Description: _____

Time Begin: _____ Time End: _____ Meter Type: _____

Observers: _____ Stream Width*: _____ Section Width (W): _____

Observations: _____

Section Midpoint (ft) (m)	Section Depth (ft) (m) (cm) (D)	Observational Depth** (ft)(m)	Velocity (V)		Flow (Q) (m^3/s) (ft^3/s) Q = (W)(D)(V)
			At Point (ft/s)(m/s)	Average (ft/s)(m/s)	

m^3/s x 35.3 = ft^3/s

Total Flow (Discharge)(3Q) (ft^3/s)	

Appendix E: Chain of Custody Forms

GUADALUPE-BLANCO RIVER AUTHORITY LABORATORY
CHAIN OF CUSTODY

GBRA LAB
333 E. Court Street, Seguin, TX 78155
Phone: (830) 379-5822 Fax: (830) 379-[illegible]

Customer Information

Customer Acct.#: 420311
RUSH Analysis : _____ by EOB (Additional Fees Apply)
Name: LNRA
Billing Address:
Address: PO BOX 429, EDNA, TX 77957
Fax #:
Phone #: 361-782-5229
Email 1: CKINSFATHER@LNRA.ORG
Thermometer #:
Email 2:
Receipt Temp (°C) Observed / Corrected: /
Chlorine Strip GBRA Reagent #
Chlorine : Absent/ Present
Ice: Yes / No (Circle One)
pH Paper GBRA Reagent #:
# of Containers:
Condition of Containers (Intact): Yes / No (Circle One)
Residual Chlorine (Total/Free) Results:

Date Collected	Time Collected	Matrix: WW=Wastewater, DW=Drinking Water, SW=Surface Water, S=Soil/Solid, O=Other	Sz Vol. P=Plastic G=Glass	Sample Name/Description	Preservation ID (PID#)/ TCEQ ID Number	Grab / Comp.	Analysis Requested	GBRA Sample ID	pH	Type of Preservative	Rush sample (2x, 3x, 4x)
/ /											

Sampler Signature:

Sampler Name (Print):
Released by (Sampler): Date/Time: Transferred To: Date/Time:
Released From: Date/Time: Received By: Date/Time:
Released From: Date/Time: Received By: Date/Time:
Released From: Date/Time: Received By: Date/Time:

NOTES / COMMENTS / SHIP TO:

Rush Fees:
24 hour TAT/ Holiday Fee=4X Price
48 hour TAT=3X Price
3-5 days TAT = 2X Price

Notes: $=Metals sent to subcontracted lab *= pH tested at subcontracted lab. _____

QM Appendix C–GBRA COC Form

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