Quality Assurance Project Plan Lavaca-Navidad River Authority (LNRA)

PO 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 2014 to FY 2015

Questions concerning this QAPP should be directed to:

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A1 Approval Page

Texas Commission on Environmental Quality

Water Quality Planning Division

Laurie Curra 8-21-2013

Laurie Curra, Manager Date
Water Quality Monitoring & Assessment Section

Patricia Wise 21 Aug 2013

Patricia Wise, Work Leader Date
Clean Rivers Program

8-22-2013

Allison Fischer Date
Project Quality Assurance Specialist
CRP

Patricia Wise 21 Aug 2013

Patricia Wise Date
Project Manager, CRP
CRP

8/21/13

Nancy Ragland, Team Leader Date
Data Management and Analysis

Monitoring Division

Sharon R. Coleman 08/22/2013

Sharon R. Coleman Date
TCEQ Quality Assurance Manager ~~(Acting)~~

Daniel R. Burke 8/22/2013

Daniel R. Burke Date
Lead CRP Quality Assurance Specialist
Laboratory and Quality Assurance Section

Lavaca-Navidad River Authority (LNRA)

Doug Anders 8/15/13
Doug Anders Date
LNRA Project Manager

Sylvia Balentine 8-2-13
Sylvia Balentine Date
LNRA Quality Assurance Officer

Laboratory

Josephine Longoria 8/12/2013
Josephine Longoria Date
Guadalupe-Blanco River Authority (GBRA)
Laboratory Director

Josephine Longoria 8/12/2013
Josephine Longoria Date
GBRA Quality Assurance Officer

The LNRA will secure written documentation from each sub-tier project participant (e.g., subcontractors, other units of government) stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or added appendices of this plan. Alternatively, additional signature blocks for sub-tier participants may be added to section A1. Signatures in section A1 will eliminate the need for adherence letters to be maintained. The LNRA will maintain this documentation as part of the project's quality assurance records, and will ensure the documentation is available for review. *See sample letter in Attachment 1 of this document.*

A2 Table of Contents

List of Acronyms

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
CAP	Corrective Action Plan
COC	Chain of Custody
CRP	Clean Rivers Program
DMRG	Surface Water Quality Monitoring Data Management Reference Guide, January 2012, or most recent version
DM&A	Data Management and Analysis
EPA	United States Environmental Protection Agency
FY	Fiscal Year
GBRA	Guadalupe-Blanco River Authority
GIS	Geographical Information System
GPS	Global Positioning System
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LNRA	Lavaca-Navidad River Authority
LOD	Limit of Detection
LOQ	Limit of Quantitation
NELAP	National Environmental Lab Accreditation Program
NRA	Nueces River Authority
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
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

A3 Distribution List

Texas Commission on Environmental Quality
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Nueces River Authority consultant
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400 Mann St, Ste 1002
Corpus Christi, TX 78401

GBRA Laboratory
933 E. Court Street
Seguin, Texas 78155

Josephine Longoria, Director
(830) 379-5822

Josephine Longoria, Quality Assurance Officer
(830) 379-5822

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, 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 will ensure the documentation is available for review.

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

TCEQ

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

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

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

Nancy Ragland
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, including coordination and tracking of CRP data sets from initial

submittal through CRP Project Manager review and approval; ensuring that data is reported following instructions in the Surface Water Quality Monitoring Data Management Reference Guide, January 2012, or most current version (DMRG); running automated data validation checks in Surface Water Quality Monitoring Information System (SWQMIS) and coordinating data verification and error correction with CRP Project Managers; generating SWQMIS summary reports to assist CRP Project Managers' data review; identifying data anomalies and inconsistencies; providing training and guidance to CRP and Planning Agencies on technical data issues to ensure that data are submitted according to documented procedures; reviewing QAPPs for valid stream monitoring stations, validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s); developing and maintaining data management-related standard operating procedures (SOPs) for CRP data management; and coordinating and processing data correction requests.

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

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

LAVACA-NAVIDAD RIVER AUTHORITY(LNRA)

Doug Anders
LNRA Project Manager
Responsible for overseeing CRP budget, contract, and implementation.

Sylvia Balentine
LNRA Quality Assurance Officer
Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Ensures monitoring systems audits are conducted to ensure QAPPs are followed by

basin planning agency participants and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures CRP project managers and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ.

Responsible for coordinating the implementation of the QA program. Responsible for writing and maintaining the QAPP and monitoring its implementation. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the 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. Ensures that field staff is properly trained and that training records are maintained. Supervises LNRA field staff. Maintains quality-assured data on LNRA internet sites with help from consultant Rocky Freund.

Chad Kinsfather
LNRA Data Manager
Head of field staff for water quality monitoring and sampling. Maintains boat and sampling equipment. Calibrates equipment for field work. Trains field staff to assist in water monitoring activities. 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.

Nueces River Authority (NRA) Consultant Rocky Freund
Review data for exceedences in LOQs, AWRLs, mins & maxs, tag redundancies, numerical/clerical errors and send data back to LNRA Data Manager with any recommendations or corrections to be made. Maintain remote dedicated server with all water quality data for Lavaca Basin and update as data is submitted to and approved by TCEQ.

GUADALUPE-BLANCO RIVER AUTHORITY LABORATORY (GBRA)

Josephine Longoria
GBRA Laboratory Director and Laboratory QAO
The responsibilities of the lab director include supervision of laboratory, purchasing of equipment, maintaining quality assurance manual for laboratory operations, and supervision of lab safety program. Additionally, the lab director will review and verify all laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validate against the measurement performance specifications listed in Tables A7.1.

Debbie Magin
GBRA Project Manager
Does final quality assurance data management checks on laboratory data.

Project Organization Chart

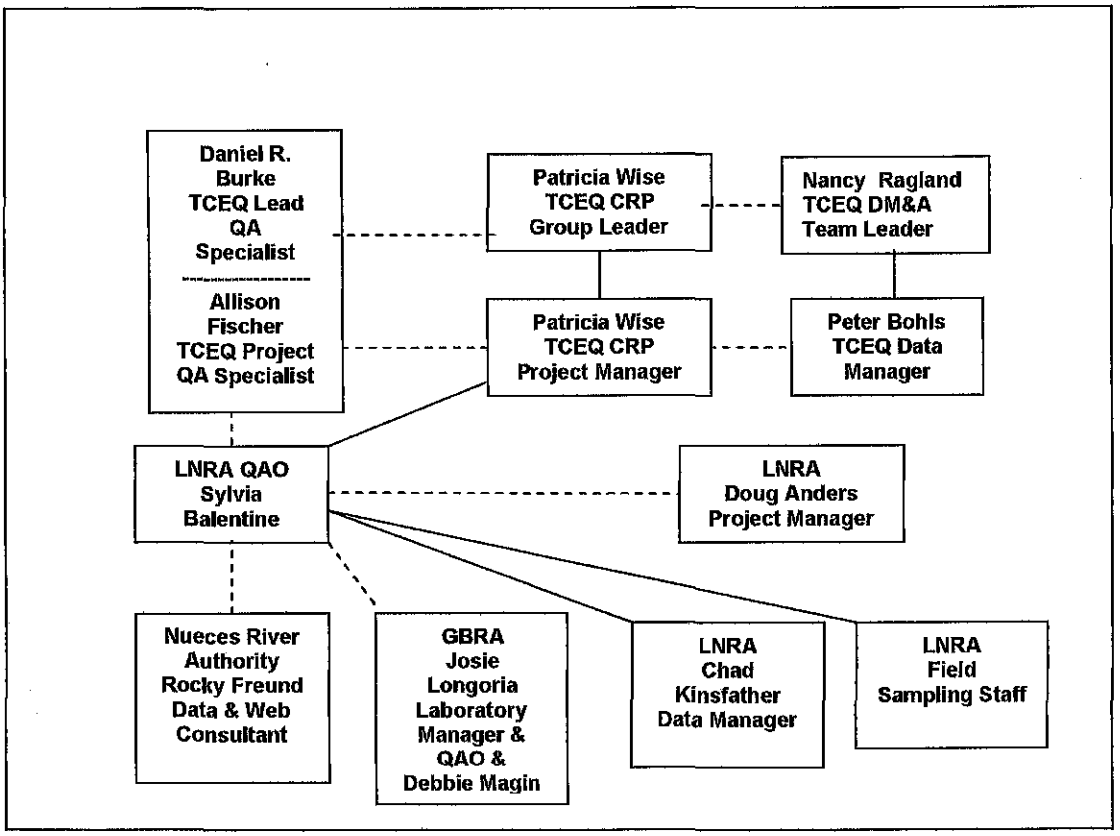


Figure A4.1. Organization Chart - Lines of Communication

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 2013 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 scientifically valid and legally defensible. This process will ensure that data collected under this QAPP and submitted to SWQMIS have been collected and managed in a way that guarantees its reliability and therefore can be used in water quality assessments, total maximum daily load (TMDL) development, establishing water quality standards, making permit decisions and used by other programs deemed appropriate by the TCEQ. Project results will be used to support the achievement of CRP objectives, as contained in the *Clean Rivers Program Guidance and Reference Guide FY 2014 -2015.*

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 Program routinely collects monthly field measurements for surface water quality data. Monitoring includes collection of dissolved oxygen, temperature, pH, specific conductivity, salinity, secchi disk depth (for water clarity), and hydrological data. Quarterly water samples are taken to GBRA Laboratory for analysis of conventional and (at some sites) bacteriological parameters. The program was established to collect, store, and make available water quality data for use by LNRA as well as 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.

The LNRA has collected field measurements in the Basin since 1981. The LNRA Surface Water Quality Monitoring Program under the Clean Rivers Program added conventional and bacteriological analyses to the existing program. Sampling at fixed-station sites includes field measurements, routine water chemistry and bacteriological analyses. The objectives of monitoring these parameters are to detect and describe spatial and temporal changes,

determine impacts of point and nonpoint sources, and assess compliance with water quality standards. Dissolved oxygen, water temperature, and pH are field measurements for which water quality criteria are established for each classified waterbody. 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.

Assessment Area

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

Major cities in the Basin are Edna, Ganado, Hallettsville, Moulton, Schulenburg, Shiner, and Yoakum. The Basin has 188 stream miles. For water quality management purposes, the Basin has been divided into five stream segments (1601, 1602, 1603, 1604, and 1605).

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 Basin is drained by the Lavaca River, while the remaining area is drained by the Navidad River and the Sandy and Mustang Creeks.

Headwaters of the Navidad River rise in the East and West Forks that form at an elevation of 440 feet in southern Fayette County. The forks join 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. Lake Texana has a permitted diversion of 74,500 acre-feet/year and was constructed by the U.S. Bureau of Reclamation for the purpose of municipal, industrial, fish and wildlife, and recreational users. 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 and eventually into Lavaca Bay. The confluence of the Lavaca and Navidad Rivers is about two miles east of Vanderbilt in Jackson County.

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 upper Lavaca 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 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 has suffered in 2008-2009 and even worse in 2011.

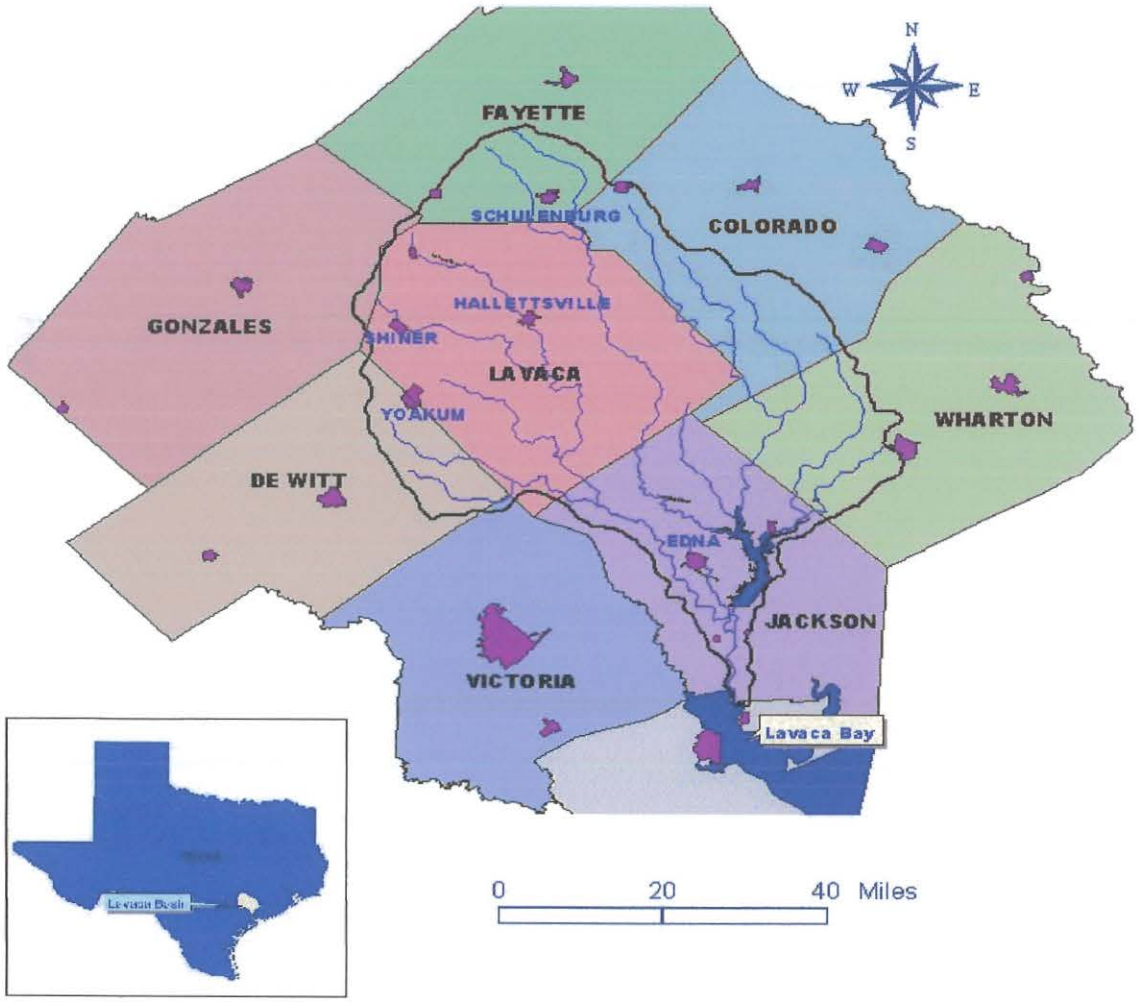


Figure A5.1 – Map of Lavaca Basin

Summers are hot and humid with little variation in day-to-day weather conditions, except for occasional thunderstorms. 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 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, 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 dispose of wastewater effluent into the main stem of the Lavaca River.

Segment 1603 is the Navidad River below Lake Texana extending to the confluence of the Lavaca and Navidad Rivers. The east and west drains along the east and west dikes of Lake Texana drain water into this segment. The east drain has continuous flow year round. The west drain has intermittent flow. Additionally, water released from Lake Texana flows through segment 1603 to the Lavaca River, and on to the Lavaca Bay.

Segment 1604 is Lake Texana. Lake Texana at elevation 44 feet 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 Basin through Jackson, Wharton, Colorado and Lavaca Counties. Flow is augmented by return irrigation from rice fields. The Mustang Creek branches off to the East, West and Middle Mustang and drains a portion of the Basin from the Garwood Irrigation Service Area to Lake Texana. Wastewater effluent from Ganado drains into Lake Texana, wastewater effluent from Louise in Wharton County drains into the East Mustang, and the wastewater effluent from the Sheridan community drains into a 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..

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.

Amendments to the QAPP

Revisions to the QAPP may be necessary to address incorrectly documented information or to reflect changes in project organization, tasks, schedules, objectives, and methods. Requests for amendments will be directed from the LNRA QAO to the CRP Project Manager electronically. The Basin Planning Agency will submit a completed QAPP Amendment document, including a justification of the amendment, a table of changes, and all pages, sections or attachments affected by the amendment. Amendments are effective immediately upon approval by the LNRA Project Manager, the LNRA QAO, the CRP Project Manager, the CRP Lead QA Specialist, the CRP Project QA Specialist, and additional parties affected by the amendment. Amendments are not retroactive. No work shall be implemented without an approved QAPP or amendment prior to the start of work. Any activities under this contract that commence prior to the approval of the governing QA document constitute a deficiency and are subject to corrective action as described in section C1 of this QAPP. Any deviation or deficiency from this QAPP which occurs after the execution of this QAPP should be addressed through a Corrective Action Plan (CAP). An Amendment may be a component of a CAP to prevent future recurrence of a deviation. Amendments will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by the LNRA QAO. The LNRA QAO will secure written documentation from each sub-tier project participant (e.g., subcontractors, other units of government) stating the organization's awareness of and commitment to requirements contained in each amendment to the QAPP. The LNRA QAO 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 LNRA QAO, the Laboratory (as applicable), and the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist and other TCEQ personnel, as appropriate. Copies of approved QAPP appendices will be distributed by the LNRA to project participants before data collection activities commence.

A7 Quality Objectives and Criteria

The purpose of routine water quality monitoring is to collect surface water quality data 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 *2012 Guidance for Assessing and Reporting Surface Water Quality in Texas* or the most recent version located at http://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/12twqi/2012_guidance.pdf 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: Table A7.1 and in the text following.

Ambient Water Reporting Limits (AWRLs)
The AWRL establishes the reporting specification at or below which data for a parameter must be reported to be compared with freshwater screening criteria. The AWRLs specified in Appendix A Table A7.1 are the program-defined reporting specifications for each analyte and yield data acceptable for the TCEQ's water quality assessment. A full listing of AWRLs can be found at http://www.tceq.state.tx.us/compliance/monitoring/crp/qa/index.html. The limit of quantitation (LOQ) is the minimum level, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The following requirements must be met in order to report results to the CRP:

- The laboratory's LOQ for each analyte must be at or below the AWRL as a matter of routine practice
- The laboratory must demonstrate its ability to quantitate at its LOQ for each analyte by running an LOQ check sample for each analytical batch of CRP samples analyzed.

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

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

Field splits are used to assess the variability of sample handling, preservation, and storage, as well as the analytical process, and are prepared by splitting samples in the field. Control limits for field splits are defined in Section B5.

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

Bias
Bias is a statistical measurement of correctness and includes multiple components of systematic error. A measurement is considered unbiased when the value reported does not differ from the true value. Bias is determined through the analysis of 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, the sampling of all pertinent media according to TCEQ SOPs, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Routine data collected under CRP for water quality assessment are considered to be spatially and temporally representative of routine water quality conditions. Water Quality data are collected on a routine frequency and are separated by approximately even time intervals. At a minimum, samples are collected over at least two seasons (to include inter-seasonal variation) and over two years (to include inter-year variation) and 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 total representation of the water body will be tempered by the potential funding for complete representativeness.

Comparability
Confidence in the comparability of routine data sets for this project and for water quality assessments is based on the commitment of project staff to use only approved sampling and analysis methods and QA/QC protocols in accordance with quality system requirements and as described in this QAPP and in TCEQ SOPs. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format as specified in the Data Management Plan Section B10.

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

A8 Special Training/Certification

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

The requirements for Global Positioning System (GPS) certification are located in Section B10, Data Management.

Contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in section The NELAC Institute (TNI) Volume 1 Module 2, Section 4.5.5 (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. Add other types of project documents and records as appropriate.

Table A9.1 Project Documents and Records

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	LNRA, TCEQ	7	Paper, electronic
Field SOPs	LNRA	Perpetual	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

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 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.

- 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
- date and time test was 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 NELAC compliance

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

- The data is then printed out at LNRA in hard copies used for perusal and data entry.
- These hard copies of reports are kept in archives of LNRA.

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 (http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wdma/dmrg_index.html) A completed Data Summary (see Appendix F) and Validator Report will be submitted with each data submittal.

B1 Sampling Process Design

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

B2 Sampling Methods

Field Sampling Procedures

Field sampling will be conducted in accordance with the latest versions of the *TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods, 2012.(RG-415)* and *Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data (RG-416)*, collectively referred to as "SWQM Procedures". Updates to SWQM Procedures are posted to the Surface Water Quality Monitoring Procedures website: (http://www.tceq.texas.gov/waterquality/monitoring/swqm_procedures.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	Holding Time
Turbidity	water	1 L plastic	Cool, 4°C	250	48 hrs
Hardness, total	water	1 L plastic	Filter, 2ml H_2SO_4 to pH<2	250	6 months
Nitrate-N	water	1 L plastic	Cool, 4°C	150	48 hrs
Total suspended solids (TSS)	water	2 L plastic	Cool, 4°C	400	7 days
Alkalinity, total	water	1 L plastic	Cool, 4°C	100	14 days
Sulfate	water	1 L plastic	Cool, 4°C	100	28 days
Chloride	water	1 L plastic	Cool, 4°C	150	28 days
Total phosphorus	water	1 L plastic	Cool, 4 degrees C with H_2SO_4<2pH	150	28 days
Total Organic Carbon (TOC)	water	glass	Cool, 4 degrees C with H_2SO_4<2pH	100	28 days
Ammonia – N	water	1 L plastic	Cool, 4 degrees C with H_2SO_4<2pH	150	28 days
E.coli Idexx Colilert	water	100 mL plastic	Cool, 4°C	100	8 hrs
Chlorophyll-*a*	water	Amber plastic	Dark and iced before filtration; dark and frozen after filtration.	1000	Filter within 48 hrs/ Hold 28 days
Total Kjeldahl Nitrogen	Water	1 L plastic	Cool, 4 degrees 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 (Chlorophyll-a, 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 and 2L Sample containers are purchased by LNRA pre-cleaned for conventional parameters.
- Glass jars are obtained from the GBRA laboratory for Total Organic Carbon 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.
- Amber plastic bottles (also obtained from GBRA) are used routinely for chlorophyll-a samples. These amber bottles are cleaned by GBRA and returned to LNRA for re-use.

Processes to Prevent Contamination

Procedures outlined in SWQM Procedures outline the necessary steps to prevent contamination of samples. These include: direct collection into sample containers, when possible; use of certified containers for organics; and clean sampling techniques for metals. Field QC samples (identified in Section B5) are collected to verify that contamination has not occurred.

Documentation of Field Sampling Activities

Field sampling activities are documented on field data sheets as presented in Appendix D. 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. Parameters which are preferred by the SWQM and Water Quality Standards Programs are highlighted in the shell A7 document. The following will be recorded for all visits:

Station ID
Sampling Date and Time
Location
Sampling Depth
Sample Collector's initials
Lake elevation (as applicable)
Lake % full (as applicable)
Last significant rainfall
Flow severity, salinity, and secchi depth (as applicable)
Primary Contact Recreational activity
Values for all field parameters

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

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
- Changes are made 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 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.

1. Name, address, contact information for LNRA (customer)
2. Temp °C
3. Date and time of collection
4. Sample matrix
5. Sample volume
6. Site identification (or Sample name/Description)
7. TCEQ I.D. #
8. Grab or composite
9. Analysis requested
10. GBRA sample I.D.
11. Bottle I.D.#
12. pH
13. Preservation
14. Custody transfer signatures and dates and time of transfer
15. Number of containers
16. Name of collector

Sample Labeling

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

1. Site identification
2. Date of collection
3. Preservative added, if applicable
4. Sampling entity (LNRA)

Sample Handling

The principle of sample custody is being able to account for the sample's integrity from the moment the portion of water is placed in a sample container until all analytical tests have been completed and any remaining sample is discarded. This means that proper sample custody is a joint effort of the sampling crew, the sample transporter, and the laboratory staff.

The chain of custody (COC) record (Appendix D) documents change of possession and requires that the sample container have the same station number inked onto the sample container as written on the data sheet. The chain of custody record is signed by the sample collector, and name is printed on COC. These records have provisions for adding the information discussed in comments 1 through 5 below.

1. Site and location and point of collection establish where the particular sample became official.

2. Time and date of collection establishes the start of the chain-of-custody clock. The date of shipment adds to this information.

3. The collection signature establishes the first person with responsibility for the sample's custody.

4. The presence or absence of added preservatives establishes that the sample will not be significantly altered before arrival at the laboratory due to microbial or chemical or physical actions.

5. Analyses requested are listed on the COC.

The sheet has special places for signatures and printed names and times to monitor changes in possession of the sample. This is the actual documentation of chain-of-custody. It begins with the sample collector and ends with the laboratory's designated sample custodian.

Sample integrity must also be protected by preventing sample contamination, whether intentional or accidental, after the sample is placed in a container. The containers used by the LNRA are purchased pre-cleaned.

Chain-of-custody documents accompany each sample for transfer of pertinent information. LNRA transports the samples with COC documents to the GBRA laboratory. Samples are transported by LNRA staff who are cognizant of holding time considerations, and samples are continuously within LNRA's custody until they are received by the laboratory. The GBRA laboratory has a designated sample custodian who examines arriving samples for proper documentation, and proper preservation. The custodian accepts delivery by signing the final portion of the official chain-of-custody, and a copy of the COC is given to LNRA's QAO. The sample custodian attaches a special laboratory sample number to the sheet and the same number to the sample container and enters the receipt of the sample into a laboratory sample inventory logbook. This book notes the date of receipt, the date of completion, and the corresponding sheet number. Any possible information which could identify the source of the sample is now traceable using the inventory logbook which is maintained solely by the sample custodian. GBRA maintains the records of sample handling according to their quality assurance SOPs.

Sample Tracking Procedure Deficiencies and Corrective Action

All deficiencies associated with COC procedures, as described in this QAPP, are immediately reported to the Lead Organization 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 in consultation with the LNRA 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 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 that produce analytical data under this QAPP must be NELAP accredited. Copies of laboratory QMs and SOPs are available for review by the TCEQ.

Standards Traceability

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

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 GBRA Laboratory Supervisor, who will make the determination and notify the LNRA QAO. 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 QAO. The Lead Organization 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 the 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.

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

A field split is a single sample subdivided by field staff immediately following collection, and submitted to the laboratory as two separately identified samples, according to procedures specified in the SWQM Procedures. Split samples are preserved, handled, shipped, and analyzed identically, and are used to assess variability in all of these processes. Field splits apply to conventional samples only and are collected on a 10% basis. To the extent possible, field splits prepared and analyzed over the course of the project should be performed on samples from different sites. The frequency requirement for field splits is specified in the SWQM Procedures.

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 (i.e., > 5 times the LOQ) were measured and analytical variability can be eliminated as a factor, than variability in field split results will primarily be used as a trigger for discussion with field staff to ensure samples are being handled in the field correctly. Some individual sample results may be invalidated based on the examination of all extenuating information. The information derived from field splits is generally considered to be event specific and would not normally be used to determine the validity of an entire batch; however, some batches of samples may be invalidated depending on the situation. Professional judgment during data validation will be relied upon to interpret the results and take appropriate action. The qualification, or invalidation, of data will be documented on the Data Summary. Deficiencies will be addressed as specified in this section under Quality Control or Acceptability Requirements Deficiencies and Corrective Actions.

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.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Batch

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

Method Specific QC requirements

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

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

Comparison Counting

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

Limit of Quantitation (LOQ)

The laboratory will analyze a calibration standard (if applicable) at the LOQ published in Appendix A, Table A7, 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 7.1 will meet the calibration requirements of the analytical method or corrective action will be implemented.

LOQ Check Sample

An LOQ check sample consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The LOQ check sample is spiked into the sample matrix at a level less than or near the LOQ published in Appendix A, Table A7, 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

samples run on batches with calibration curves that do not include the LOQ published in Appendix A, Table A7, a check sample will be run at the low end of the calibration curve.

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

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

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

Measurement performance specifications are used to determine the acceptability of LOQ Check Sample analyses as specified in Appendix A Table A7.1.

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

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

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

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

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

Measurement performance specifications are used to determine the acceptability of LCS analyses as specified in Appendix A Table A7.1.

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

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

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

For bacteriological parameters, precision is evaluated using the results from laboratory duplicates. Bacteriological duplicates are run on a 10% frequency (or once per sampling run, whichever is more frequent). These duplicates are collected in sufficient volume for analysis of the sample (with dilutions) and its laboratory duplicate from the same container. The GBRA laboratory procedure for *E. coli* lab duplicates follows:

Ecoli:
When analyzing a duplicate sample
-Pour 50mls of sample (with a sterile graduated cylinder) into a 120 bottle without sodium thiosulfate.
-bring both samples up to volume (100mls) with e.coli dilution water. Label bottles appropriately.
-ready for analysis

Use the following equation to find the result of a duplicate:

$$\frac{X1 + X2}{\text{Total volume of dups}} \quad (100)$$

X= result in MPN of duplicate one and duplicate two

Use the following equation to find logarithmic comparisons:

$$\text{Log Range} = \text{ABS}(\log(\text{dup1}) - \log(\text{dup 2}))$$

Log Range must be <0.5 for it to be reportable to the Clean Rivers Program.

The precision criterion in Appendix A Table A7.1 for bacteriological duplicates applies only to samples with concentrations > 10 MPN/100mL.

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

Matrix spikes indicate the effect of the sample on the precision and accuracy of the results generated using the selected method. 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 Basin Planning Agency may consider excluding all of the results in the batch related to the analyte that failed recovery.

Method blank

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

The method blank shall be analyzed at a minimum of one per preparation batch. In those instances for which no separate preparation method is used (e.g., VOA) the batch shall be defined as environmental samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples.

Quality Control or Acceptability Requirements Deficiencies and Corrective Actions

Sampling QC excursions are evaluated by the Lead Organization Project Manager, in consultation with the Lead Organization 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 and QAO will be relied upon in evaluating results. Rejecting sample results based on wide variability is a possibility. Notations of field split excursions and blank contamination are noted in the quarterly report and the final QC Report.

Laboratory measurement quality control failures are evaluated by the laboratory staff. The disposition of such failures and the nature and disposition of the problem is reported to the GBRA Laboratory QAO. The Laboratory QAO will discuss with the LNRA QAO. If applicable, the LNRA QAO 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.

B6 Instrument/Equipment Testing, Inspection, and Maintenance

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

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

B7 Instrument Calibration and Frequency

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

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

B8 Inspection/Acceptance of Supplies and Consumables

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

B9 Acquired Data

Non-directly measured data, secondary data, or acquired data involves the use of data collected under another project, and collected with a different intended use than this project. The acquired data still meets the quality requirements of this project, and is defined below.

The following data source(s) will be used for this project:

USGS gage station data will be used for this project to aid in determining gage height and flow. Rigorous QA checks are completed on gage data by the USGS and the data is approved by the USGS and permanently stored at the USGS. This data will be submitted to the TCEQ under parameter code 00061 Flow, Instantaneous.

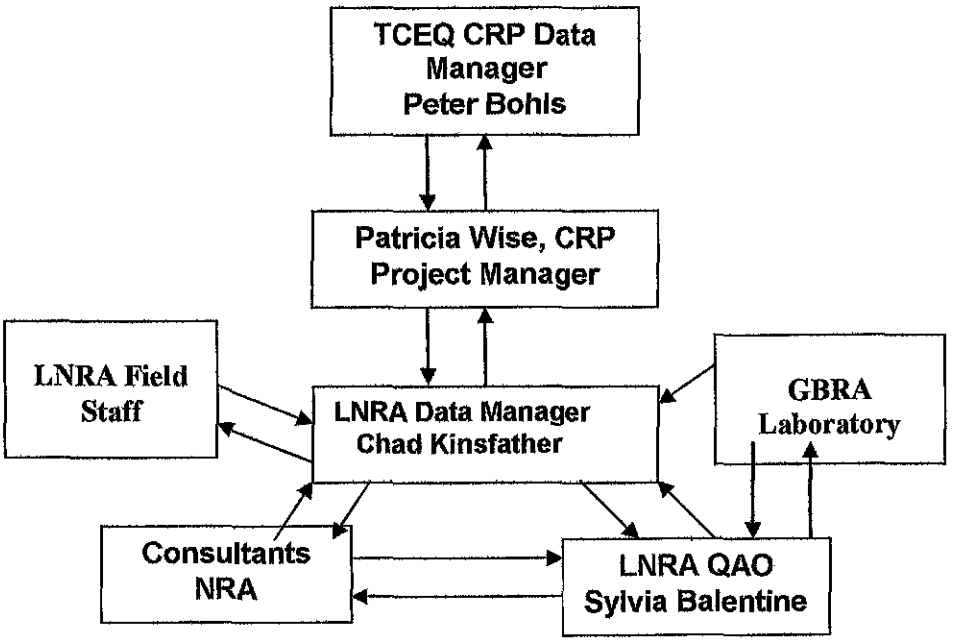
Reservoir stage data are collected every day from the United States Geological Survey (USGS), International Boundary and Water Commission (IBWC), and the Unites States Army Corps of Engineers (USACE) websites. These data are preliminary and subject to revision. The Texas Water Development Board (TWDB) derives reservoir storage (in acre-feet) from these stage data (elevation in feet above mean sea level), by using the latest rating curve datasets available. These data are published at the TWDB website at http://waterdatafortexas.org/reservoirs/statewide. The web application uses real time gaged observations 7 AM reading each day (or closest reading available) from 119 major reservoirs to approximate daily storage for each reservoir, as well as daily total storage for water planning regions, river basins and the state of Texas. These instantaneous data are updated to mean daily data for all previous days. 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

Personnel involved in administering and maintaining the data management system are structured as a team. This team includes the TCEQ, the LNRA and its consultants. The TCEQ provides general oversight, specifies the needs of the program and assessments, and provides technical guidance and assistance. The LNRA serves as the local program sponsor for the Lavaca River Basin and a clearinghouse for public outreach or inquiries. Within the LNRA's staff, the QAO coordinates and administers resources for the analysis, data management, and outreach activities. The QAO coordinates with the GBRA laboratory, oversees quality assurance of all data, and coordinates with consultants at the Nueces River Authority (NRA) who serve as both data quality assurance and web consultants for the LNRA. The LNRA QAO also manages the GIS database. The Data Manager is responsible for efficient day to day operations including data collection, data entry, data quality assurance, data management, and data reporting. This data management team is depicted in the graphic below:

Figure B10.1 - LNRA DATA MANAGEMENT ORGANIZATION



The data management process is illustrated in the flow path below and described in further detail in the following sections.

Data Path

Field data stored in data logger and on paper in field notebook >>>

Data logger files downloaded to computer and printed out to keep in permanent hard copy files >>>

Quarterly conventional analyses hard copy report received from GBRA laboratory >>>

QAO and Data Manager check GBRA data reports for completeness, holding times, mins, maxs, AWRLs, LOQs, etc. >>> numeric (RPD) comparisons of field splits >>>

Data is hand entered into Access water quality database and flow and secchi disk data are added to results from field notebook >>>

Data entry is 100% checked by Data Manager and 10% by QAO >>>

Lab report copies are kept in LNRA permanent archives and originals are kept in water quality department—data also stored on laserfiche in the LNRA network database >>>

Water quality Access database is backed up onto a compact disk and stored in LNRA archives vault. In addition, data is saved on LNRA network in a dedicated file. >>>

At least three times annually data is submitted to TCEQ for inclusion in SWQMIS. Data Manager exports period of record data from database and properly formats. QAO checks data file. Data then is e-mailed to Data Management consultant at Nueces River Authority. Consultant checks data for mins, maxs, format, redundancies, matching event and results, tag numbers, etc. Data is run through SWQMIS to get a Validator Report and any errors are reported to LNRA>>>

Consultant sends recommendations to LNRA re: any errors, and changes are made to both data submittal file and to Access database by Data Manager and 100% checked by QAO >>>

Data (1 events file, 1 results file) is e-mailed to CRP Project Manager at TCEQ, and Data Summary is scanned and e-mailed with data. Validator Report from SWQMIS is also sent along with the data. >>>

CRP Project Manager checks over data and contacts LNRA QAO with any needed changes and then sends data to TCEQ Data Manager.>>>

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.>>>

Once data is approved by TCEQ the Events & Results files are sent to NRA consultant who enters the new data into on-line LNRA Water Quality database posted on the LNRA web site. This way data becomes available to the public and is available to LNRA in a user-friendly format for queries.

NRA Web consultant downloads any changes to SWQMIS every month into LNRA on-line data base. This way LNRA and SWQMIS databases remain in synch, and this is how LNRA gets the data from TCEQ Region 14 for Lavaca Bay. Any data corrections are synchronized this way.

Data Dictionary

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

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 ASCII text files of Events and Results, checked by QAO, and sent to a consultant at Nueces River Authority (NRA) who reviews the data for format, exceedances in AWRLs, mins and maxs, LOQs, tag redundancies, and numerical/clerical errors. The consultant runs the data through the SWQMIS program and sends LNRA any error reports and the Validator Report. The LNRA Data Manager and QAO take care of any corrections needing to be made, and the data is once again run through SWQMIS for a revised Validator Report. Once all this is completed, the data is electronically transferred to CRP Project Manager at TCEQ, in an ASCII text file format. The LNRA Data Manager and QAO record any problems that might affect the data, including data loss, on the Data Summary which is also sent electronically along with the final Validator Report to the TCEQ CRP Project Manager for review with each data set. CRP Project Manager carefully reviews the data, and once she has approved the data she sends it along to TCEQ Data Manager to enter into SWQMIS. Once the data is approved for upload at TCEQ, the LNRA QAO sends the final Events and Results files to the NRA web consultant who enters that data into the LNRA on-line water quality database that is accessed via the LNRA web site.

Record Keeping and Data Storage

Field results data acquired with YSI multi-parameter probes are downloaded from datalogger into EcoWatch software on a PC, and a hard copy is printed out and kept on file. Data is then hand-typed into the Access water quality database, and 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 are kept in LNRA permanent files, and originals are kept in CRP department files. These lab results are also stored in laserfiche in the LNRA network. This data also is hand-typed into the Access water quality database by the Data Manager.

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, and the data is also downloaded into a PC from the datalogger, and 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 7 platform. The Access water quality database is also backed up onto the LNRA network system. The Access files are exported as ASCII 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 compact discs and stored in the LNRA archives vault. Data is also stored on the LNRA network in a dedicated file and on the QAO's computer. Hard copy of this data is also always available in case of system failure. Full data recovery could be accomplished within a few work weeks from the network files or compact disk archives. Additionally, historic and TCEQ-approved water quality data for the Lavaca Basin is stored off-site in a dedicated server by the Nueces River Authority consultants. This data can be accessed on-line by both LNRA and the public.

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 @ http://www.LNRA.org. From the home page one can choose "Water Quality" from the "Programs" pull-down menu, and then choose "LNRA Water Quality Database" from the list of options on that page. This will connect the user to the remote dedicated server maintained by the Nueces River Authority. This server contains the historic database of all existing water quality data for the Lavaca Basin, as well as current data which has been TCEQ-approved, and this site is updated monthly with any changes in the state SWQMIS water quality database. USGS data for Lavaca Basin is also stored in this database along with TCEQ data from Lavaca Bay. The public can query this database either via the map interface provided or via Site number, County or Segment number. When one queries via county name or via Segment number, a list appears which gives a description and location of each site in the county or Segment with the SWQM (Surface Water Quality Monitoring) site number. Once a site has been chosen one may query by parameter via a pull-down menu of parameters (with the parameter storet codes) provided on the right side of page, or by sampling event dates provided in a pull-down menu on the left side of page. Also under "Water Quality" on the web site are a map of current monitoring sites and a link to the State on-line Coordinated Monitoring Schedule.

The public is also welcome to contact LNRA for water quality data of interest to them, and LNRA will provide the data or will provide assistance with navigating through the LNRA web site to obtain data. The public is invited to the annual Basin-wide Steering Committee Meeting where a review of recent water quality data and an explanation of current and future water monitoring activities are presented.

Archives/Data Retention - Complete original data sets are archived on permanent media in hard copy and retained on-site by the LNRA for a retention period specified in the current QAPP. Each data set submitted to the TCEQ is stored on the QAO's computer hard drive.

Data will be managed in accordance with the DMRG, and applicable Basin Planning Agency information resource management policies.

GPS equipment may be used as a component of the information required by the Station Location (SLOC) request process for creating the certified positional data that will ultimately

be entered into SWQMIS database. Positional data obtained by CRP grantees using a GPS will follow the TCEQ's OPP 8.11 and 8.12 policy regarding the collection and management of positional data. All positional data entered into SWQMIS will be collected by a GPS certified individual with an agency approved GPS device to ensure that the agency receives reliable and accurate positional data. Certification can be obtained in any of three ways: completing a TCEQ training class, completing a suitable training class offered by an outside vendor, or by providing documentation of sufficient GPS expertise and experience. Contractors must agree to adhere to relevant TCEQ policies when entering GPS-collected data.

In lieu of entering certified GPS coordinates, 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 Basin Planning Agency	Dates to be determined by TCEQ CRP	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the TCEQ to address corrective actions
Laboratory Inspection	Dates to be determined by TCEQ	TCEQ Laboratory Inspector	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the TCEQ to address corrective actions

Corrective Action Process for Deficiencies

The LNRA QAO is responsible for implementing and tracking corrective action resulting from audit findings outlined in the audit report. Records of audit findings and corrective actions are maintained by both the CRP and the LNRA QAO. Audit reports and corrective action documentation will be submitted to the TCEQ with the Progress Report.

Deficiencies are any deviation from the QAPP, *SWQM Procedures*, SOPs, or the DMRG. 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 Lead Organization 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 Lead Organization Project Manager, in consultation with the Lead Organization 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.

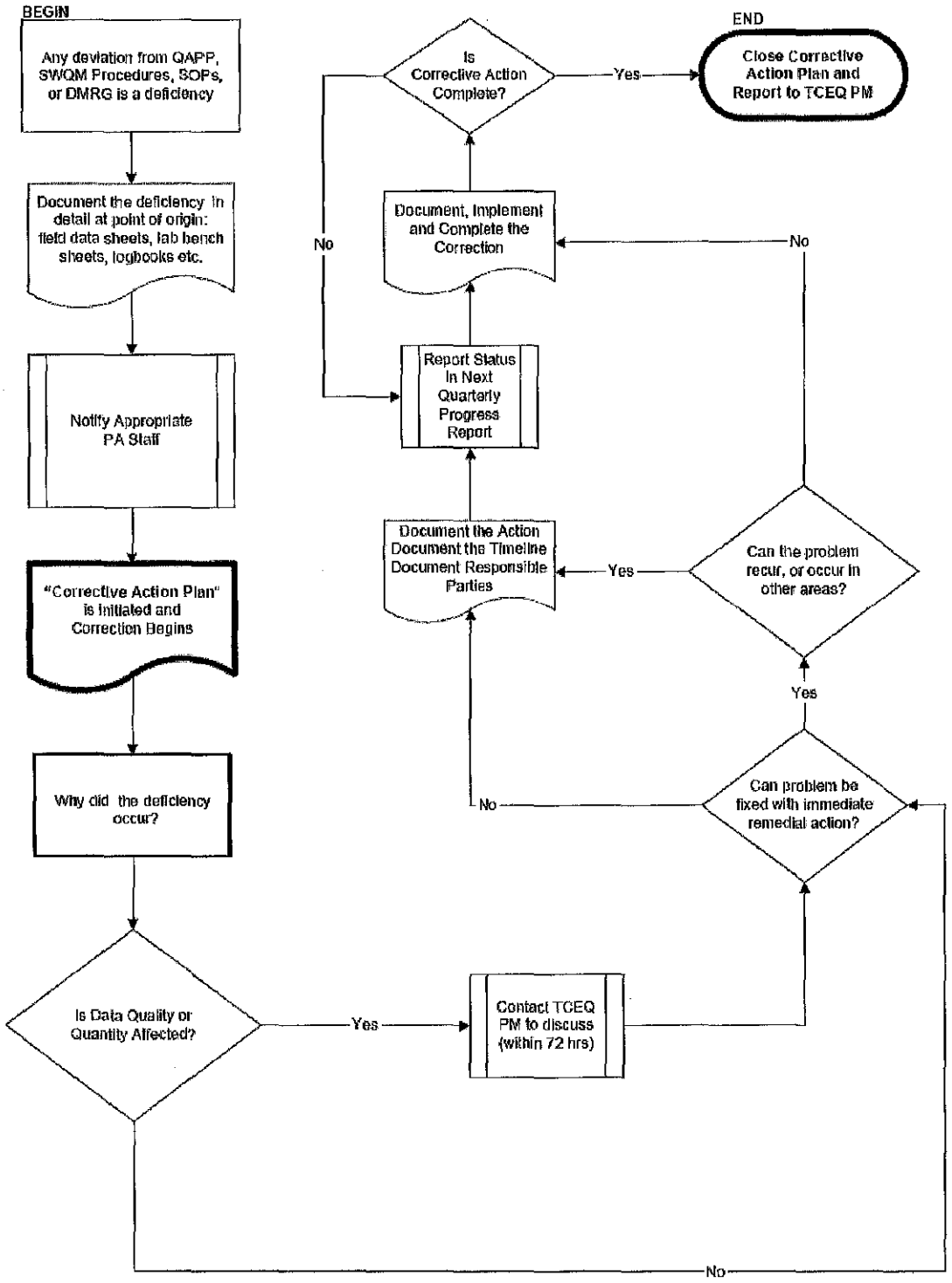
Corrective Action

CAPs should:

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

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

Figure C1.1 Corrective Action Process for Deficiencies



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 Basin Planning Agency QAO is responsible for tracking deficiencies and implementing corrective actions in a pre-CAP log. Records of audit findings and corrective actions are maintained by the Basin Planning Agency QAO. Audit reports and corrective action documentation will be submitted to the TCEQ with the Progress Report.

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

C2 Reports to Management

Reports to LNRA Project Management

The LNRA QAO informs the LNRA Project Manager of any significant QA/QC issues verbally and/or in written memos. Otherwise, the LNRA Project Manager receives the quarterly Progress Reports from the LNRA QAO and reviews the laboratory reports of water quality analyses.

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, and status of corrective actions; and outlines the status of each task's deliverables.

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

SWQMIS Data Validator Report – Sent to TCEQ CRP Project Manager along with Data Summary and Data Event and Result files.

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

Note: For the purposes of this document, the term verification refers to the data review processes used to determine data completeness, correctness, and compliance with technical specifications contained in applicable documents (e.g., QAPPs, SOPs, QMs, analytical methods). Validation refers to a specific review process that extends the evaluation of a data set beyond method and procedural compliance (i.e., data verification) to determine the quality of a data set specific to its intended use.

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. 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 and meet the conditions of end use as described in Section A7 of this document.

Data review, verification, and validation will be performed using self-assessments and peer and management review as appropriate to the project task. The data review tasks to be performed by field and laboratory staff is listed in the first two columns of Table D2.1, respectively. Potential errors are identified by examination of documentation and by manual (or computer-assisted) examination of corollary or unreasonable data. If a question arises or an error is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues which can be corrected are corrected and documented. If an issue cannot be corrected, the task manager consults with 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 and QAO. Data review, verification, and validation tasks to be performed on the data set include, but are not limited to, the confirmation of laboratory and field data review, evaluation of field QC results, additional evaluation of anomalies and outliers, analysis of sampling and analytical gaps, and confirmation that all parameters and sampling sites are included in the QAPP.

The Data Review Checklist (See Appendix F) covers three main types of review: data format and structure, data quality review, and documentation review.

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 QAO 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 QAO. All failed QC checks, missing samples, missing analytes, missing parameters, and suspect results should be discussed in the Data Summary (Appendix F) which is sent to TCEQ along with the Events and Results files and the Validator Report.

Table D2.1: Data Review Tasks

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

D3 Reconciliation with User Requirements

Data produced in this project, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be analyzed and reconciled with project data quality requirements. Data meeting project requirements will be used by the TCEQ for the Texas Water Quality Integrated Report in accordance with TCEQ's Guidance for Assessing and Reporting Surface Water Quality in Texas, August 2010 or most recent version, and for TMDL development, water quality standards development, and permit decisions, as appropriate. Data which do not meet requirements will not be submitted to SWQMIS nor will be considered appropriate for any of the uses noted above.

Appendix A: Measurement Performance Specifications

(Table A7.1)

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 need to be considered for each type of monitoring activity. The CRP emphasizes that data should be collected to address multiple objectives, if possible, thereby maximizing the expenditure of resources. 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 should be given to the main use of the project data and the data quality needed to support that use, then secondary goals should be considered.

Table A7.1 should be modified to reflect actual parameters, methods, etc. employed by the Basin Planning Agency and its participants. Alternative methods than those listed in the following table may be used. 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 Table A7.1 are stored in SWQMIS. Any parameters listed in Table A7.1 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 2014-2015 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).

**Chlorophyll-a -- Only a Reporting Limit available (No LOQ available). Not a NELAP defined LOQ--no commercially available solution can be used as an LOQ Standard at this level.

***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, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)

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

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2007 (RG-416)

TABLE A7.1 Measurement Performance Specifications for LNRA FY 2014-2015 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	0.50*	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, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)

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

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2007 (RG-416)

TABLE A7.1 Measurement Performance Specifications for LNRA FY 2014-2015 QAPP

Flow Parameters

Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	NA*	NA	NA	NA	NA	Field
FLOW SEVERITY: 1=No Flow,2=Low,3=Normal,4=Flood,5=High, 6=Dry	NU	water	TCEQ SOP V1	01351	NA*	NA	NA	NA	NA	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	NA*	NA	NA	NA	NA	Field

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

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, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)

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

TABLE A7.1 Measurement Performance Specifications for LNRA FY 2014-2015 QAPP

Field Parameters

Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	NA*	NA	NA	NA	NA	Field
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	NA*	NA	NA	NA	NA	Field
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	NA*	NA	NA	NA	NA	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	NA*	NA	NA	NA	NA	Field
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	NA*	NA	NA	NA	NA	Field
SALINITY - PARTS PER THOUSAND	PPT	water	SM 2520 and TCEQ SOP V1	00480	NA*	NA	NA	NA	NA	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	NA*	NA	NA	NA	NA	Field
RESERVOIR STAGE (FEET ABOVE MEAN SEA LEVEL)†	FT ABOVE MSL	water	TWDB	00052	NA*	NA	NA	NA	NA	Field
RESERVOIR PERCENT FULL†	% RESERVOIR CAPACITY	water	TWDB	00053	NA*	NA	NA	NA	NA	Field
RESERVOIR ACCESS NOT POSSIBLE LEVEL TOO LOW ENTER 1 IF REPORTING	NS	other	TCEQ Drought Guidance	00051	NA*	NA	NA	NA	NA	Field
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)***	meters	other	TCEQ SOP V2	89864	NA*	NA	NA	NA	NA	Field
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)***	meters	other	TCEQ SOP V2	89865	NA*	NA	NA	NA	NA	Field
POOL LENGTH, METERS***	meters	other	TCEQ SOP V2	89869	NA*	NA	NA	NA	NA	Field
% POOL COVERAGE IN 500 METER REACH***	%	other	TCEQ SOP V2	89870	NA*	NA	NA	NA	NA	Field
PRIMARY CONTACT, OBSERVED ACTIVITY (# OF PEOPLE OBSERVED)	# of people observed	other	NA	89978	NA	NA	NA	NA	NA	Field
EVIDENCE OF PRIMARY CONTACT RECREATION (1 = OBSERVED, 0 = NOT OBSERVED)	NU	other	NA	89979	NA	NA	NA	NA	NA	Field

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

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

† As published by the Texas Water Development Board on their website http://wiid.twdb.state.tx.us/lms/resinfo/BushButton/lakestatus.asp?selcat=3&slbasin=2

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, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)

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

TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2007 (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 collecting information to characterize water quality in a variety of locations and conditions. These efforts will include a combination of:

- planning and coordinating basin-wide monitoring,
- routine, regularly-scheduled monitoring to collect long-term information and support statewide assessment of water quality,
- systematic, regularly-scheduled short-term monitoring to screen water bodies for issues,
- permit support monitoring to provide information for setting permit effluent limits, and
- special study, intensive monitoring targeted to:
- identify sources and causes of pollution,
- assess priority water quality issues,
- obtain background water quality information,
- provide information for setting site-specific permit effluent limits, and
- evaluate statewide, regional, and site-specific water quality standards.

Task Description:

Monitoring Description – LNRA plans to monitor a minimum of 21 sites:

- 18 sites will be monitored monthly for field data
- 17 sites quarterly for laboratory conventional parameters
- 6 reservoir sites for chlorophyll-a quarterly
- 8 sites for *E. coli* bacteria quarterly

All monitoring procedures and methods will follow the guidelines prescribed in the LNRA QAPP and the *TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods (RG-415.)*

Coordinated Monitoring Meeting - The LNRA will hold an abbreviated annual coordinated monitoring consultation with the CRP Project Manager for Lavaca Basin via telephone or e-mail. LNRA does all the monitoring (except for that contracted to USGS) in Lavaca Basin. Neither TCEQ nor any other agency currently monitors in the Lavaca Basin. A summary of any changes will be provided to the CRP Project Manager within two weeks of the consultation and changes to the monitoring schedule will be entered into the statewide database on the Internet (http://cms.lcra.org), and the CRP Project Manager will be notified that changes have been posted to the CMS.

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

Deliverables & Dues Dates:

September 1, 2013 through August 31, 2014

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - December 15, 2013; March 15 and June 15, 2014
B. Coordinated Monitoring Consultation Meeting – between March 15 and April 30, 2014
C. Coordinated Monitoring Consultation Meeting Summary of Changes - within 2 weeks of the meeting
D. Email notification that Coordinated Monitoring Schedule updates are complete - May 31, 2014

September 1, 2014 through August 31, 2015

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - September 15 and December 15, 2014; March 15 and June 15 and August 31, 2015
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Appendix B Sampling Process Design and Monitoring Schedule (plan)

Sample Design Rationale FY 2014

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 is making no changes to the FY 2014 - 2015 Monitoring Schedule from recent years. LNRA intends to cover the Lavaca Basin as thoroughly as possible (within resource limits) during monitoring for FY 2014 - 2015. LNRA will continue its intense routine monitoring activities in and near Lake Texana and in the inflows to the Lake: Navidad River, Sandy Creek, and East and West Mustang Creeks. LNRA will also monitor and sample in the Lavaca River in Segment 1602 (above tidal influence) at 3 sites and at Rocky Creek (receiving water for Shiner WWTP effluent). LNRA will monitor below the Palmetto Bend Dam in Segment 1603, and along the tidally influenced Segment 1601 of the Lavaca River below its confluence with the Navidad River and southward on to near the mouth of Lavaca Bay

Site Selection Criteria

This data collection effort involves monitoring routine water quality, using procedures that are consistent with the TCEQ SWQM program, for the purpose of data entry into the SWQMIS database maintained by the TCEQ. To this end, some general guidelines are followed when selecting sampling sites, as basically outlined below, and discussed thoroughly in SWQM Procedures. 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.

- Locate stream sites so that samples can be safely collected from the centroid of flow. Centroid is defined as the midpoint of that portion of stream width which contains 50 percent of the total flow. If few sites are available for a stream segment, choose one that would best represent the water body, and not an unusual condition or contaminant source. Avoid backwater areas or eddies when selecting a stream site.

- 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.

- Routine monitoring sites are selected to maximize stream coverage or basin coverage. Very long segments may require more stations. As a rule of thumb, stream segments between 25 and 50 miles long require two stations, and longer than 50 miles require three or more depending on the existence of areas with significantly different sources of contamination or potential water quality concerns. Major hydrological features, such as the confluence of a major tributary or an instream dam, may also limit the spatial extent of an assessment based on one station.

- 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.

- All classified segments (including reservoirs) should have at least one routine monitoring site that adequately characterizes the water body, and should be coordinated with the TCEQ or other qualified monitoring entities reporting routine data to TCEQ.

- Routine monitoring sites may be selected to bracket sources of pollution, influence of tributaries, changes in land uses, and hydrological modifications.

- Sites should be accessible. When possible, stream sites should have a USGS or IBWC stream flow gauge. If not, it should be possible to conduct flow measurement during routine visits.

Monitoring Sites

Monitoring Tables for fiscal year 2014 are presented on the following page. A map of FY2014 water quality monitoring sites follows the table.

Critical vs. non-critical measurements

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

Table B1.1 Sample Design and Schedule, FY 2014

Site Description	Station ID	Waterbody ID	Basin	Region	SE	CE	MT	Field	Conv	Bacteria	Flow	24 hr DO	AqHab	Benthics	Nekton	Metal Water	Organic Water	Metal Sed	Organic Sed	Fish Tissue	Amb Tox Water	Amb Tox Sed	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												
ROCKY CREEK IMMEDIATELY UPSTREAM OF LAVACA CR 387 APPROXIMATELY 5.3 MI SOUTH OF HALLETTSVILLE ON US77 AND .92 MI WEST ON CR387	18190	1602B	16	14	LN	LN	RT	4	4	4													Rocky Creek site, electric fence renders stream inaccessible for flow measurement
NAVIDAD RIVER TIDAL MID CHANNEL 30 M UPSTREAM OF LAVACA RIVER CONFLUENCE APPROX 170 M UPSTREAM OF	15374	1603	16	14	LN	LN	RT	12	4														

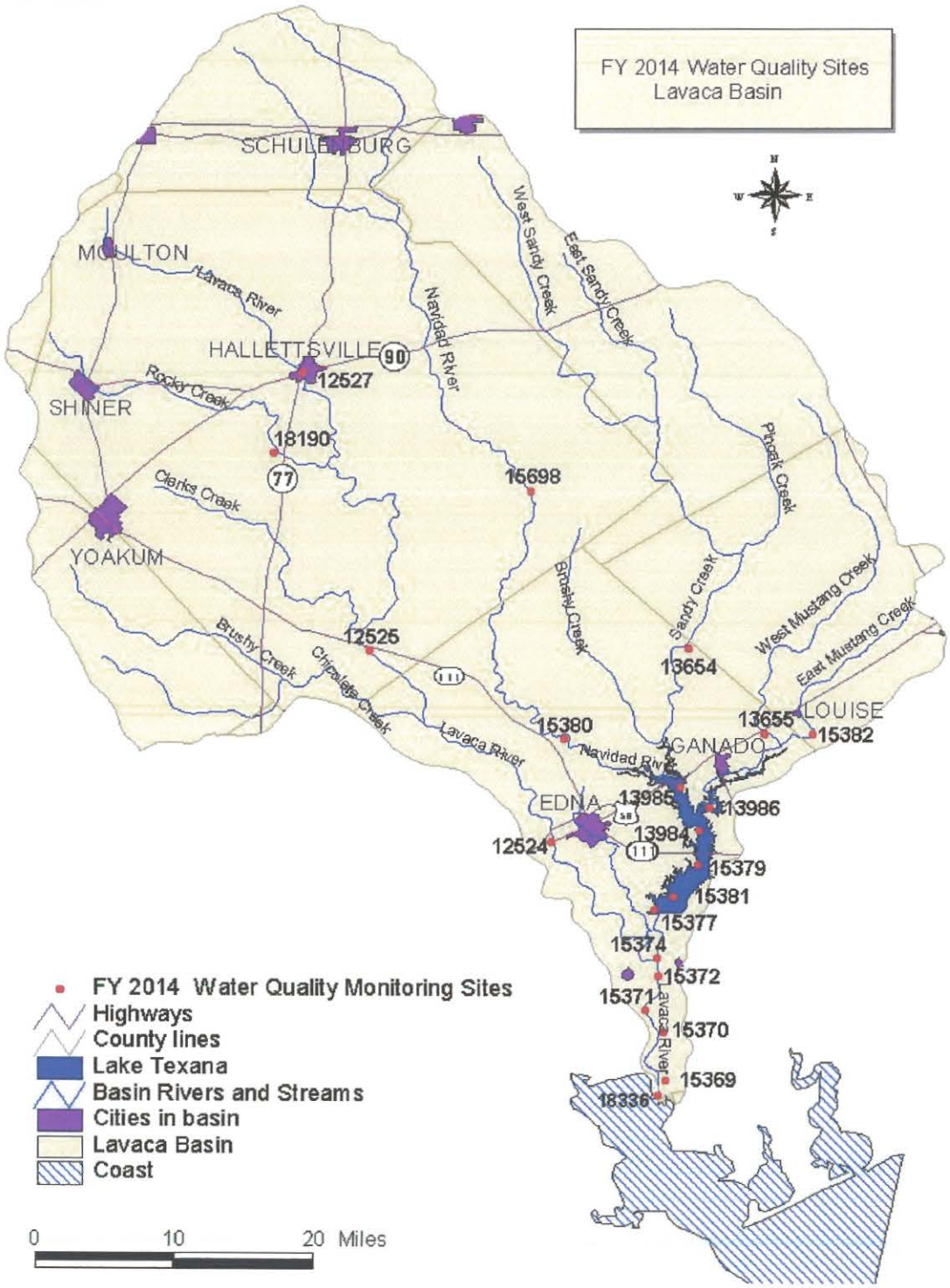
FM 616 BETWEEN VANDERBILT AND LOLITA											
LAKE TEXANA 2 KM UPSTREAM OF SH 111 EAST OF EDNA USGS SITE CC	13984	1604	16	14	LN	LN	RT	12	4	4	
LAKE TEXANA MUSTANG CREEK ARM 1.5 KM UPSTREAM OF CONFL. WITH MAIN LAKE AT MUSTANG CREEK RECREATION AREA SOUTH OF GANADO USGS SITE EC	13986	1604	16	14	LN	LN	RT	12	4	4	
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	
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		
LAKE TEXANA RIVER CHANNEL 3.693 KM DOWNSTREAM OF SH 111 NEAR BRACKENRIDGE PLANTATION RECREATION AREA EAST OF EDNA	15379	1604	16	14	LN	LN	RT	12	4	4	
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	13654	1604C	16	14	LN	LN	RT	12	4		12

CREEK											
NAVIDAD RIVER AT FM 530 17 MI SE OF HALLETTSVILLE	15698	1605	16	14	LN	LN	RT	4	4		4
NAVIDAD RIVER AT JACKSON CR 401 5 MI NORTH OF EDNA	15380	1605	16	14	LN	LN	RT	12	4		12

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 LNRA at (361) 782-5229 and ask for Sylvia Balentine.



Appendix D: Field Data Sheets

Lavaca Navidad River Authority
Surface Water Quality Field Data Sheet

Station ID: _____ **Sampling Time:** _____ **Sampling Date:** _____
TCEQ # _____ **Collector:** _____ **Weather** _____
89978 (# of people recreating) _____ **89979 (evidence)** _____ **(0 or 1)**
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** _____
89978 (# of people recreating) _____ **89979 (evidence)** _____ **(0 or 1)**
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** _____
89978 (# of people recreating) _____ **89979 (evidence)** _____ **(0 or 1)**
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) At Point (ft/s)(m/s)	Velocity (V) Average (ft/s)(m/s)	Flow (Q) (m^3/s) (ft^3/s) Q = (W)(D)(V)
m^3/s x 35.3 = ft^3/s			Total Flow (Discharge)(3Q) (ft^3/s)		

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

**** Measure at 60% of depth from surface where <2.5 ft. deep. Measure at 20% and 80% o**

Appendix E: Chain of Custody Forms

GBRA REGIONAL LABORATORY

GBRA Doc. # 3019-C

Rev. 11 Eff. 02/20/09 by: JL

Chain of Custody

Guadalupe Blanco River Authority- Regional Laboratory
933 E. Court Street, Seguin, Texas 78155
(830) 379-5822 fax: (830) 379-7478

Account #: _____

Customer Info. Name: _____ Phone #: _____

Address: _____ Cell #: _____ Email: _____

_____ Fax #: _____

Sample Collected By: _____ _____

Signature Printed Name

Thermometer # _____

Temp C	Date Collected	Time Collected	Matrix WW=Wastewater DW=Drinking Water SW=Surface Water S=soil/sludge	Sx Vol. P=Plastic G=Glass	Sample Name/Description	TCEQ I.D. #	Grab / Comp.	Analysis Requested	GBRA Sample I.D.	Bottle I.D.#	pH	Preservation

Delivered By: _____ Date/Time: _____ Received By: _____ Date/Time: _____

Delivered By: _____ Date/Time: _____ Received By: _____ Date/Time: _____

**Special Notes/Ship to: _____

_____

Ice: _____ (y or n) Number of containers _____ Condition of Container(s): (intact) _____

Appendix F: Data Review Checklist and Summary

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	□, □, 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 TCEQ SLOC numbers assigned?	
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	□, □, 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? 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	□, □, or N/A
Are blank results acceptable as specified in the QAPP?	
Were control charts used to determine the acceptability of lab duplicates?	
Was documentation of any unusual occurrences that may affect water quality included in the Event files'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?	

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: _____

Comments
Please explain in the table below any data discrepancies discovered during data review including:
Inconsistencies with LOQs
Failures in sampling methods 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)

Parameter	Tag Ids Affected	Type of Problem	Reason for Problem	Percent Loss*	Corrective Action (Y/N/SOP)

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

ATTACHMENT 1 Example Letter to Document Adherence to the QAPP

TO: (name)

(organization)

FROM: (name)
(organization)

RE: LNRA Fiscal Year 2014-15 CRP QAPP

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

(address)

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

_____

Name Date

Copies of the signed forms should be sent by the LNRA to the TCEQ CRP Project Manager within 45 days of TCEQ approval of the QAPP.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 23, 2013

Sylvia Balentine
Lavaca - Navidad River Authority
P.O. Box 429
Edna, TX 77957

Re: LNRA FY 2014-2015 Clean Rivers Program QAPP

Dear Ms. Balentine:

Enclosed is an approved copy of the referenced document for your files and distribution.

Please ensure that copies of this document are distributed to each project participant as required by Section A3 of the QAPP. The documentation of QAPP distribution and subcontractor commitment to QAPP requirements must be available for review during monitoring system audits.

If you have any questions, please contact your TCEQ Clean Rivers Program project manager, or you may contact me at (512) 239-0011, or by email at daniel.burke@tceq.texas.gov.

Sincerely,

Daniel R. Burke
Lead CRP Quality Assurance Specialist

enclosure

cc: Patricia Wise, TCEQ CRP Project Manager, MC 234