Clean Water Act Section 319(h) Nonpoint Source Pollution Control Program

Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo and Alligator Creeks Watershed Partnership

TSSWCB Project Number 11-06
Revision #2

Quality Assurance Project Plan

Texas State Soil and Water Conservation Board

Prepared by

Guadalupe-Blanco River Authority

Effective Period: Upon EPA approval through September 21, 2015
(with Annual Updates Required)

Questions concerning this quality assurance project plan should be directed to:

Debbie Magin
Director of Water Quality Services
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A1 APPROVAL PAGE

Quality Assurance Project Plan for Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo and Alligator Creeks Watershed Partnership

United States Environmental Protection Agency (EPA), Region VI

Name: Curry Jones
Title: EPA Chief; State/Tribal Programs Section

Signature:______________________________________Date:_____________________

Name: Henry Brewer
Title: EPA Texas Nonpoint Source Project Officer

Signature:______________________________________Date:_____________________

Texas State Soil and Water Conservation Board (TSSWCB)

Name: Jana Lloyd
Title: TSSWCB Project Manager

Signature:______________________________________Date:_____________________

Name: Mitch Conine
Title: TSSWCB Quality Assurance Officer (QAO)

Signature:______________________________________Date:_____________________

Guadalupe-Blanco River Authority (GBRA)

Name: Debbie Magin
Title: Project Manager

Signature:______________________________________Date:_____________________

Name: Josie Longoria
Title: Quality Assurance Officer (QAO)

Signature:______________________________________Date:_____________________

San Antonio River Authority Environmental Laboratory (SARA-EL)

Name: David Hernandez
Title: Laboratory Director

Signature:_____________________________Date:________________

Name: Patricia Carvajal
Title: Quality Assurance Officer (QAO)

Signature:_____________________________Date:________________

The GBRA will secure written documentation from each sub-tier project participant (e.g., subcontractors, other units of government, laboratories) stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or added appendices of this plan. The GBRA will maintain this documentation as part of the project's quality assurance records, and will be available for review. (See sample letter in Attachment 1 of this document.)

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List of Acronyms and Abbreviations

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
CAR	Corrective Action Report
COC	Chain-of -Custody
CR	County Road
CRP	Clean Rivers Program
DO	Dissolved Oxygen
FY	Fiscal Year
GC WPP	Geronimo Creek Watershed Protection Plan
GCWP	Geronimo Creek Watershed Partnership
GBRA	Guadalupe-Blanco River Authority
LCS	Laboratory Control Standard
LOD	Limit of Detection
LOQ	Limit of Quantitation
mL	Milliliters
MPN	Most Probable Number
NPS	Nonpoint Source
QA	Quality Assurance
QASM	Quality Assurance System Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference
SA	Sample Amount (reference concentration)
SARA-EL	San Antonio River Authority - Environmental Laboratory
SM	Standard Methods
SOP	Standard Operating Procedure
SR	Sample Result
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System (formerly TRACS)
TAG	Technical Advisory Group
TCEQ	Texas Commission on Environmental Quality
TSS	Total Suspended Solids
TSSWCB	Texas State Soil and Water Conservation Board
TSWQS	Texas Surface Water Quality Standards
USEPA	US Environmental Protection Agency
USGS	US Geological Survey
WPP	Watershed Protection Plan

A3 DISTRIBUTION LIST

Organizations, and individuals within, which will receive copies of the approved QAPP and any subsequent revisions include:

U.S. Environmental Protection Agency Region 6 (EPA)
1445 Ross Avenue, Suite # 1200;
Dallas, TX 75202-2733

Name: Henry Brewer
Title: Texas NPS Project Officer, Water Quality Division

Texas State Soil and Water Conservation Board (TSSWCB)
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Temple, Texas 76503

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Title: GBRA Project Manager/Data Manager

Name: Josie Longoria
Title: GBRA Regional Laboratory Director /QAO

Name: Lee Gudgell
Title: Water Quality Field Technician

San Antonio River Authority Environmental Laboratory (SARA-EL)
600 E. Euclid
San Antonio, TX 78212

Name: David Hernandez
Title: SARA-EL Laboratory Director

Name: Patricia Carvajal
Title: SARA-EL QAO

The GBRA 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, laboratories. The GBRA 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 be available for review.

A4 PROJECT/TASK ORGANIZATION

The following is a list of individuals and organizations participating in the project with their specific roles and responsibilities:

U.S. Environmental Protection Agency Region 6 (EPA)

Henry Brewer, EPA Project Officer
Responsible for managing the project for EPA. Reviews project progress and reviews and approves QAPP and QAPP amendments.

Texas State Soil and Water Conservation Board (TSSWCB)

Jana Lloyd, TSSWCB Project Manager
Responsible for ensuring that the project delivers data of known quality, quantity, and type on schedule to achieve project objectives. Provides the primary point of contact between the GBRA and the TSSWCB. Tracks and reviews deliverables to ensure that tasks in the workplan are completed as specified in the contract. Responsible for verifying that the QAPP is followed by the GBRA. Notifies the TSSWCB QAO of significant project non-conformances and corrective actions taken as documented in quarterly progress reports from GBRA Project Manager.

Mitch Conine, TSSWCB QAO
Reviews and approves QAPP and any amendments or revisions and ensures distribution of approved/revised QAPPs to TSSWCB participants. Assists the TSSWCB Project Manager on QA-related issues. Coordinates reviews and approvals of QAPPs and amendments or revisions. Conveys QA problems to appropriate TSSWCB management. Monitors implementation of corrective actions. Coordinates and conducts audits.

Guadalupe Blanco River Authority (GBRA)

Debbie Magin, Project Manager/Data Manager
Responsible for implementing and monitoring GC WPP requirements in the contract, and the QAPP. Responsible for writing and maintaining records of the QAPP and its distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Coordinates project planning activities and work of project partners. Ensures monitoring systems audits are conducted to ensure QAPP is followed by project participants and that project is producing data of known quality. Responsible for ensuring that field data are properly reviewed and verified. Responsible for the transfer of project quality-assured water quality data to the TCEQ SWQMIS. Ensures that subcontractors are qualified to perform contracted work. Maintains quality-assured data on GBRA Internet sites. Ensures TSSWCB project manager and/or QAO are notified of deficiencies and non-

conformances, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ SWQMIS.

Josie Longoria, Regional Laboratory Director/QAO

Responsible for coordinating the implementation of the QA program. Responsible for maintaining the QAPP and monitoring its implementation. Responsible for identifying, receiving, and maintaining project quality assurance records. Responsible for coordinating with the TSSWCB QAO to resolve QA-related issues. Notifies the GBRA Project Manager of particular circumstances which may adversely affect the quality of data. Supervises laboratory, purchasing of equipment, maintain quality assurance manual for laboratory operations, and supervision of lab safety program. Maintains quality assurance manual for laboratory operations, maintains operating procedures that are in compliance with the QAPP. Coordinates and monitors deficiencies, non-conformances and corrective action. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Responsible for the overall quality control and quality assurance of analyses performed by the GBRA Regional Laboratory

Lee Gudgell, Water Quality Field Technician

Responsible for coordinating sampling events, including maintenance of sampling bottles, supplies, and equipment. Maintains records of field data collection and observations. Ensures that field staff are properly trained and that training records are maintained. Uploads data to TCEQ SWQMIS after review by GBRA Project Manager.

Laboratory Analyst/Technicians (5.5)

Performs laboratory analysis for inorganic constituents, nutrients, etc.; assists in collection of field data and samples for stream monitoring and chemical sampling of environmental sites, performs sample custodial duties.

San Antonio River Authority Environmental Laboratory (SARA-EL)

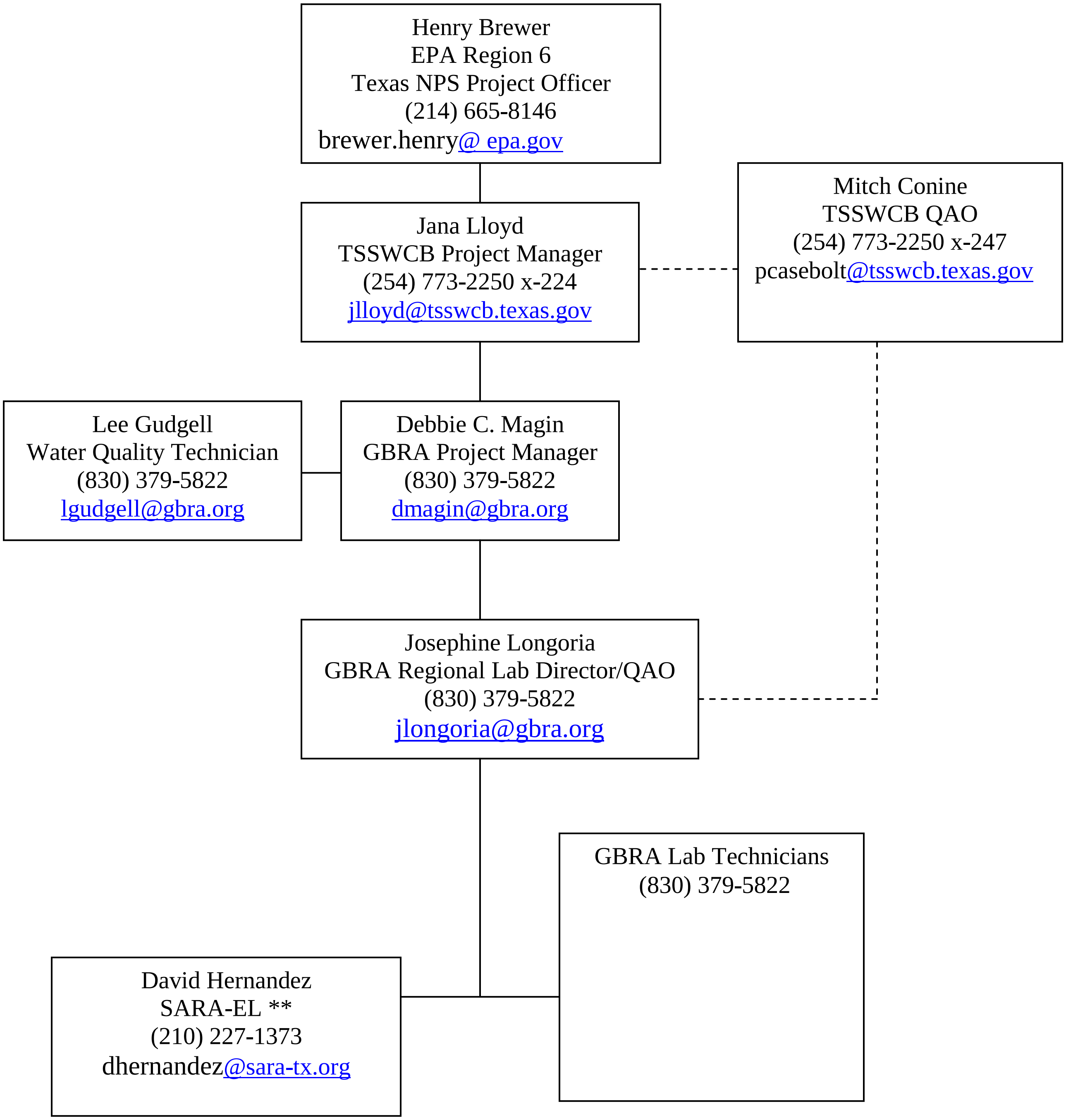
David Hernandez, Lab Manager

Supervises laboratory, lab safety program, and purchasing of equipment. Reviews and verifies all laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validates the data against the measurement performance specifications listed in Table A7.1.

Patricia Carvajal, QAO

Maintains quality assurance manual for laboratory operations, maintains operating procedures that are in compliance with the QAPP. Responsible for the overall quality control and quality assurance of analyses performed by SARA's Environmental Services Department.

Figure A4.1 Project Organizational Chart*-- Lines of Communication



* See Project/Task Organization in this section for a description of each position's responsibilities.

** San Antonio River Authority Environmental Laboratory to be used to meet holding times in the event of equipment failure at the GBRA Regional laboratory.

A5 PROBLEM DEFINITION/BACKGROUND

In 2007, the TSSWCB Regional Watershed Coordination Steering Committee, using established criteria, ranked Geronimo Creek in the top 3 watersheds for development of a Watershed Protection Plan (WPP). The development of a WPP for Geronimo Creek began in June 2008. The project included water quality monitoring, water quality modeling and stakeholder facilitation. The Geronimo and Alligator Creeks WPP has been a stakeholder driven process lead by, GBRA, Texas AgriLife Extension, and TSSWCB. The Geronimo and Alligator Creeks Watershed Partnership (GCWP) Steering Committee includes local officials, land and business owners and citizens and is supported by state and federal agency partners. With technical assistance from project staff, the Steering Committee has identified issues that are of particular importance to the surrounding communities, and has contributed information on land uses and activities that has been helpful in identifying the sources of nutrient and bacterial impairments, and in guiding the development of the WPP.

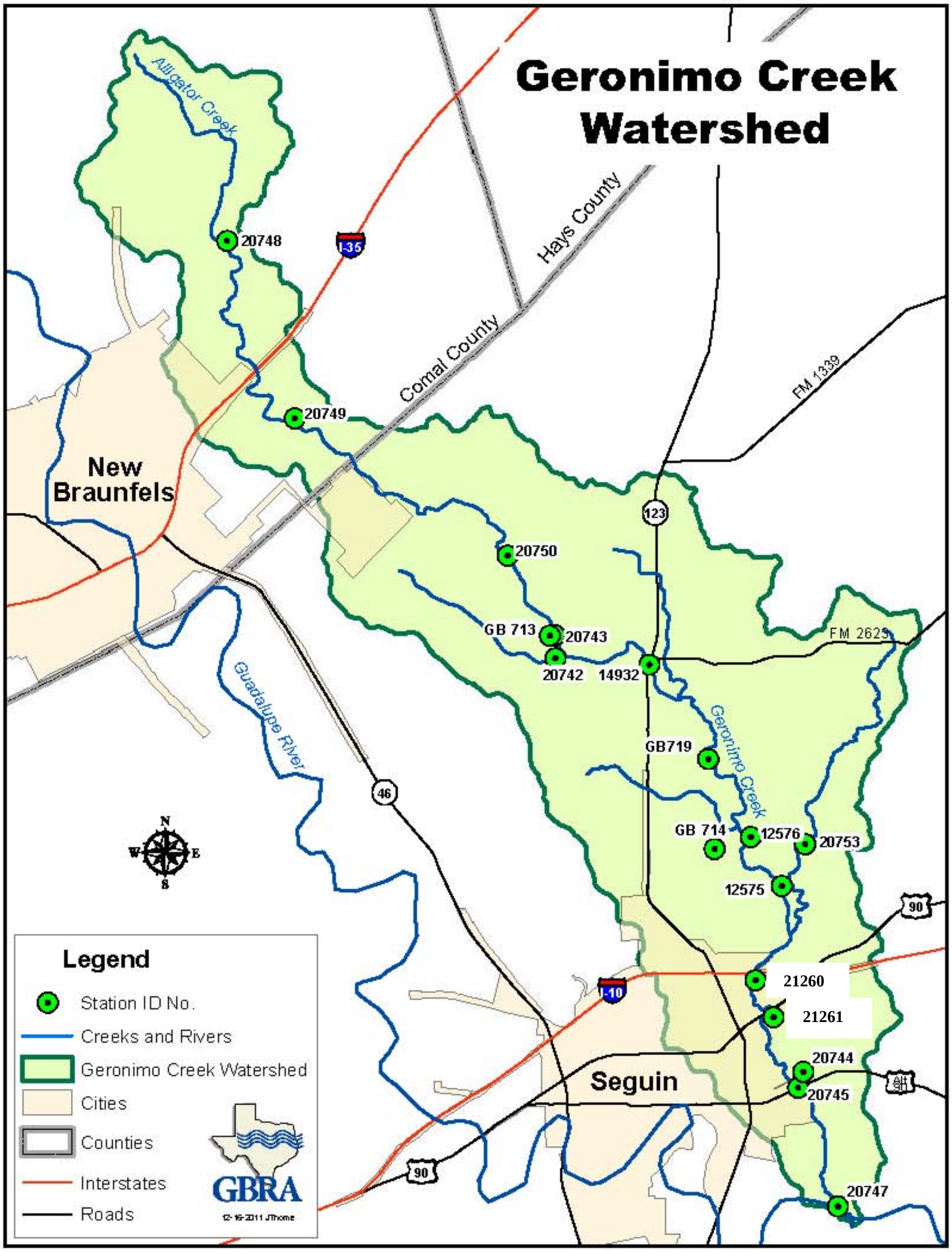
Historical data identified the impairment for bacteria and a concern for nutrients. The water quality monitoring program attempted to fill gaps in the historical data but was severely hampered by the drought of 2008-09. Data collection in the project further verified that periodic elevations of *E. coli* levels continue to exist. Routine ambient water quality data is collected at one site (12576) by GBRA through the Clean Rivers Program (CRP).

The Geronimo Creek WPP was completed in September 2012. The WPP has been reviewed by EPA for 9-Element consistency. It is anticipated that WPP implementation funding through Clean Water Act §319(h) nonpoint source grants will not be requested until the FY2014 funding cycle. Therefore, this would result in a lapse in data collection efforts resulting in at least a 3-year data gap in water quality data.

As a result, this 3-year project, TSSWCB Project No. 11-06, *Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo Creek and Alligator Creeks Watershed Partnership,* is warranted to provide for interim water quality data collection efforts. Maintaining an effective monitoring program will provide critical water quality data that will be used to judge the effectiveness of WPP implementation efforts and serve as a tool to quantitatively measure water quality restoration.

The purpose of this QAPP is to clearly delineate GBRA QA policy, management structure, and procedures, which are used to implement the QA requirements necessary to verify and validate the surface water quality data collected. Project results will be used to support the achievement of the Geronimo Creek Steering Committee objectives.

Figure A5.1 Map of Geronimo Creek Monitoring Locations



A6 PROJECT/TASK DESCRIPTION

This project will generate data of known and acceptable quality for the surface water quality monitoring of main stem and tributary stations on Segment 1804A (Geronimo Creek) for field, conventional, flow, and bacteria. The monitoring component of TSSWCB Project No. 11-06, *Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo Creek and Alligator Creeks Watershed Partnership,* will look for trends and fill in data gaps identified in the Project 08-06, *Development of a Watershed Protection Plan for Geronimo Creek*. Three types of surface water quality monitoring will be conducted: routine ambient, targeted watershed, and groundwater. Currently, routine ambient water quality data is collected monthly at 1 main stem station by GBRA (Geronimo Creek at Haberle Road - 12576).

GBRA will conduct all work performed under this project including technical and financial supervision, preparation of status reports, coordination with local stakeholders, surface water quality monitoring sample collection and analysis, and data management. GBRA will participate in the GCWP, Steering Committee, TAG and appropriate Work Groups in order to efficiently and effectively achieve project goals and to summarize activities and achievements made throughout the course of this project.

GBRA will conduct routine ambient monitoring at 8 sites monthly, collecting field, conventional, flow and bacteria parameter groups. Figure A5.1 is a map of the monitoring locations in the Geronimo Creek watershed. The sampling period extends over 29 months. The routine monitoring will complement the existing routine ambient monitoring regime conducted by GBRA.

GBRA will conduct targeted watershed monitoring at 14 sites twice per season, once under dry weather conditions and once under wet weather conditions each season, collecting field, conventional, flow and bacteria parameter groups. Sampling period extends through 12 seasons. Spatial, seasonal and meteorological variation will be captured in these snapshots of watershed water quality. Eight of the 14 sites are routine sites that will be sampled under different conditions in the quarter, so that at least one sampling event is under dry conditions and one is under wet conditions.

GBRA will conduct groundwater monitoring at 2 wells and one spring once per season collecting field, conventional, flow and bacteria parameter groups. The well is located in the vicinity of springs, originating from the same groundwater strata that contribute to the base flow of the creek and its tributaries. The sampling period extends through 12 seasons. The groundwater monitoring will characterize groundwater/spring contributions to flow regime and pollutant loadings.

GBRA will manage monitoring data in support of the Geronimo Creek WPP. GBRA will submit monitoring data to TCEQ SWQMIS.

GBRA will post monitoring data to the GBRA website in a timely manner. GBRA will summarize the results and activities of this project through inclusion in GBRA's Clean Rivers Program Basin Highlights Report and/or Basin Summary Report. Additionally, GBRA will develop a final Assessment Data Report summarizing water quality data collected, and will provide an assessment of water quality with respect to the effectiveness of BMPs implemented and a discussion of interim short-term progress in achieving the Geronimo Creek WPP water quality goals.

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

Table A6.1 QAPP Milestones

TASK	PROJECT MILESTONES	AGENCY	START	END
2.1	Develop DQOs and QAPP for review by USEPA.	GBRA	M1	M3
2.2	Submit revisions to QAPP as necessary.	TSSWCB, GBRA	M4	M41
4.1	GBRA will monitor at 7 routine sites monthly, collecting field, conventional, flow and bacteria parameter groups.	GBRA	M4	M41
4.2	GBRA will monitor 6 routine sites quarterly collecting field, conventional, flow and bacteria parameter groups.	GBRA	M4	M41
4.3	GBRA will conduct biased flow monitoring at 14 sites, once per season under wet conditions, collecting field, conventional, flow and bacteria parameter groups.	GBRA	M4	M41
4.4	GBRA will conduct routine groundwater monitoring at up to 4 sites (2 springs and 2 wells) once per quarter, collecting field conventional, flow and bacteria parameter groups.	GBRA	M4	M41
4.5	GBRA will transfer monitoring data to TCEQ SWQMIS at least quarterly.	GBRA	M4	M41

A7 QUALITY OBJECTIVES AND CRITERIA FOR DATA QUALITY

The purpose of routine water quality monitoring is to collect surface water data needed for water quality assessments, in accordance with TCEQ's Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data and to identify significant long-term water quality trends. These water quality data, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be subsequently reconciled for use by the TSSWCB.

Systematic watershed monitoring, i.e. targeted monitoring, is defined by sampling that is planned for a short duration (1 to 2 years) and is designed to: screen waters that would not normally be included in the routine monitoring program, monitor at sites to characterize the water quality under a range of flow regimes created by wet and dry periods, to assess water quality with respect to effectiveness of best management practices implemented, and to investigate areas of potential concern. Targeted monitoring in the Geronimo Creek watershed, done under wet and dry conditions, will be collected to capture spatial, seasonal and meteorological snapshots of water quality.

Monitoring will be conducted on groundwater to characterize contributions from nearby springs that originate from the same strata to the flow and pollutant loadings. Spatial and seasonal variations will be captured. The data will be used to determine whether any of the groundwater/springs contribute significantly to the flow regime or to the loading of pollutants that have led to the impairment of the stream. These water quality data will be subsequently reconciled for use and assessed by the TSSWCB.

The measurement performance specifications to support the project objectives for a minimum data set are specified in Table A7.1 and in the text following.

Table A7.1 GBRA Measurement Performance Specifications

PARAMETER	UNITS	MATRIX	METHOD	PARA-METER CODE	AWRL	LOQ	LOQ CHECK STD %Rec	PRECISION (RPD of LCS/LCS dup)	BIAS (%Rec. of LCS)	Lab
Field Parameters										
pH	pH/ units	water	SM 4500-H^+ B. and TCEQ SOP, V1	00400	NA[1]	NA	NA	NA	NA	Field
DO	mg/L	water	SM 4500-O G. and TCEQ SOP, V1	00300	NA[1]	NA	NA	NA	NA	Field
Conductivity	umhos/cm	water	SM 2510 and TCEQ SOP, V1	00094	NA[1]	NA	NA	NA	NA	Field
Conductivity	umhos/cm	water	SM 2510	00095	NA[1]	NA	NA	NA	NA	GBRA
Temperature	°C	water	SM 2550 and TCEQ SOP, V1	00010	NA[1]	NA	NA	NA	NA	Field
Flow	cfs	water	TCEQ SOP, V1	00061	NA[1]	NA	NA	NA	NA	Field
Days since precipitation event	days	water	TCEQ SOP V1	72053	NA[1]	NA	NA	NA	NA	Field
Flow measurement method	1-gage 2-electric 3-mechanical 4-weir/flume 5-doppler	water	TCEQ SOP, V1	89835	NA[1]	NA	NA	NA	NA	Field
Flow severity	1-no flow 2-low 3-normal 4-flood 5-high 6-dry	water	TCEQ SOP, V1	01351	NA[1]	NA	NA	NA	NA	Field
Flow Estimate	cfs	water	TCEQ SOP, V1	74069	NA[1]	NA	NA	NA	NA	Field
Conventional and Bacteriological Parameters										
TSS	mg/L	water	SM 2540 D.	00530	4	1[6]	NA	NA	NA	GBRA[5]
Turbidity	NTU	water	SM 2130 B.	82079	0.5	0.5	NA	NA	NA	GBRA[5]
Sulfate	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	1	70-130	20	80-120	GBRA[5]
Chloride	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	1	70-130	20	80-120	GBRA[5]
Chlorophyll-a, spectrophotometric method	ug/L	water	SM 10200-H[3]	32211	3	1[7]	NA	20	80-120	GBRA
Pheophytin, spectrophotometric method	ug/L	water	SM 10200-H[3]	32218	3	1	NA	NA	NA	GBRA
E. coli, IDEXX™ Colilert[7]	MPN/100 mL	water	Colilert-18	31699	1	1	NA	0.5[2]	NA	GBRA
E. coli	org/100mL	water	EPA 1603	31699	1	1	NA	0.5[2]	NA	GBRA
Ammonia-N, total[3]	mg/L	water	SM 4500-NH_3 D.	00610	0.1	0.1	70-130	20	80-120	GBRA
Total Kjeldahl	mg/L	water	EPA 350.1	00625	0.2	0.2	70-130	20	80-120	GBRA[5]

Nitrogen			Rev. 2.0 (1993)							

PARAMETER	UNITS	MATRIX	METHOD	PARA-METER CODE	AWRL	LOQ	LOQ CHECK STD %Rec	PRECISION (RPD of LCS/LCS dup)	BIAS (%Rec. of LCS)	Lab
Conventional and Bacteriological Parameters (cont.)										
Hardness, total (as CaC03)	mg/L	water	SM 2340 C.	00900	5	5	NA	20	80-120	GBRA
Nitrate-N, total	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	70-130	20	80-120	GBRA[5]
Total Phosphorus[4]	mg/L	water	EPA 365.3	00665	0.05	0.05	70-130	20	80-120	GBRA[5]

1 Reporting to be consistent with TCEQ SWQM guidance and based on measurement capability.
2 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.
3 In addition to SM 10200 H. cited for chlorophyll a, the SOP posted on the TCEQ CRP web site will be followed as well.
4 Automated method for total phosphorus on the Konelab Aquakem 200, following the GBRA SOP written based on the EPA method 365.3 and the Konelab operating procedures. The manual method will be used as a secondary method in case of instrument failure.
5 The SARA Environmental Laboratory may be used in the event of lab equipment failure so that samples will be processed within prescribed holding times. The SARA-EL adheres to the NELAC standards.
6 Reporting limit. Not a NELAP-defined LOQ (no commercially available spiking solution used as LOQ check standard.)
7 The Colilert method will be reported until such time as accreditation for Method 1603 is obtained.

References for Table A7.1:

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
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures Manual, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, June 2003 or subsequent editions (RG-415)

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 Table A7.1 are the program-defined reporting specifications for each analyte and yield data acceptable for TCEQ water quality assessment. The limit of quantitation (LOQ; formerly known as reporting limit) 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 TCEQ SWQMIS:

- 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 standard for each batch of 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 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 Table A7.1.

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 laboratory control samples and LOQ check standards prepared with verified and known amounts of all target analytes in the sample matrix (e.g. deionized water) 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 laboratory control standards are specified in Table A7.1.

Representativeness

Site selection, the appropriate sampling regime, the sampling of all pertinent media according to TCEQ SWQM SOPs, and use of only approved analytical methods will assure that the measurement data represents the conditions at the monitoring sites. Routine data collected for the monitoring component of the TSSWCB Project No. 11-06, *Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo Creek and Alligator Creeks Watershed Partnership*, and submitted to TCEQ for water quality assessments, 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 four seasons (to include inter-seasonal variation). Although data may be collected during varying regimes of weather and flow, the data sets collected during routine monitoring will not be biased toward unusual conditions of flow, runoff, or season. The routine sites will double as targeted sites. Whether the routine samples will satisfy the wet (biased high flow) or dry (biased low flow) weather conditions will depend on the flow conditions when samples are collected during the routine sampling that quarter. The goal for meeting total representation of the waterbody will be tempered by the availability of stream and meteorological conditions during the project and the potential funding for complete representativeness.

Data collection for targeted sampling will be biased toward both ambient conditions and those conditions that are influenced by storm events. Depending on meteorological conditions, monitoring for stormwater flows will occur a minimum of once per season during a measurable rainfall event. Goundwater will be collected spatially and seasonally. Sampling of the wastewater treatment facility will be conducted once per quarter and at the same time of day and week, without regard to specific meteorological conditions or facility flow regimes. Representativeness will be measured with the completion of sample collection in accordance with the approved QAPP.

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 SWQM 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 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 in proper sampling and field analysis. Before actual sampling or field analysis occurs, they demonstrate to the QAO (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 are available during a monitoring systems audit.

Contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in section 5.4.4 of the NELAC® standards (concerning Review of Requests, Tenders and Contracts).

A9 DOCUMENTS AND RECORDS

The documents and records that describe, specify, report, or certify activities are listed. These reports may or may not be kept in paper form since the reports can be regenerated from the lab database at any time. If kept, the paper form is retained for a minimum of one year and then scanned into the GBRA TABFusion Records Management System (RMS) for permanent record.

The GBRA laboratory database is housed on the laboratory computer and is backed up on the network server nightly. A back up copy of the network server files, including TABFusion RMS, is made every Monday and that copy is stored off-site at a protected location. The GBRA network administrator is responsible for the servers and back up generation.

Table A9.1 Project Documents and Records

Document/Record	Location	Retention* (yrs)	Format
QAPPs, amendments and appendices	TSSWCB/GBRA	One Year/ Indefinitely	Paper/ Electronic
QAPP distribution documentation	GBRA	One Year/ Indefinitely	Paper/ Electronic
QAPP commitment letters	GBRA	One Year/ Indefinitely	Paper/ Electronic
Field notebooks or data sheets	GBRA	One Year/ Indefinitely	Paper/ Electronic
Field staff training records	GBRA	One Year/ Indefinitely	Paper/ Electronic
Field equipment calibration/maintenance logs	GBRA	One Year/ Indefinitely	Paper/ Electronic
Chain of custody records	GBRA/SARA	One Year/ Indefinitely	Paper/ Electronic
Field SOPs	GBRA	One Year/ Indefinitely	Paper/ Electronic
Laboratory QA Manuals	GBRA/SARA	One Year/ Indefinitely	Paper/ Electronic
Laboratory SOPs	GBRA/SARA	One Year/ Indefinitely	Paper/ Electronic
Laboratory data reports/results	GBRA/SARA	One Year/ Indefinitely	Paper/electronic
Laboratory staff training records	GBRA/SARA	One Year/ Indefinitely	Paper/ Electronic
Instrument printouts	GBRA/SARA	One Year/ Indefinitely	Paper/ Electronic
Laboratory equipment maintenance logs	GBRA/SARA	One Year/ Indefinitely	Paper/ Electronic
Laboratory calibration records	GBRA/SARA	One Year/ Indefinitely	Paper/ Electronic
Corrective Action Documentation	GBRA/SARA	One Year/ Indefinitely	Paper/ Electronic

*Retention period in paper format/electronic format.

The TSSWCB may elect to take possession of records at the conclusion of the specified retention period.

Laboratory Test Reports

Test reports from the laboratory will document the test results clearly and accurately. The requirements for reporting data and the procedures are provided.

* title of report and unique identifiers on each page
* name and address of the laboratory
* name and address of the client
* a clear identification of the sample(s) analyzed
* date and time of sample receipt
* date and time of collection
* sample depth
* identification of method used
* identification of samples that did not meet QA requirements and why (i.e.- holding times exceeded)
* sample results
* units of measurement
* sample matrix
* dry weight or wet weight (as applicable)
* clearly identified subcontract laboratory results (as applicable)
* a name and title of person accepting responsibility for the report
* project-specific quality control results to include field split results (as applicable); equipment, trip, and field blank results (as applicable); and LOQ and LOD confirmation (% recovery)
* narrative information on QC failures or deviations from requirements that may affect the quality of results or is necessary for verification and validation of data
* certification of NELAC® compliance on a result by result basis.

Electronic Data

Data will be submitted electronically to the TCEQ SWQMIS and/or consultant for review in the Event/Result file format. A completed Data Summary (see example in Appendix D) will be submitted with each data submittal.

Revisions and Amendments to the QAPP

Until the work described is completed, this QAPP shall be revised as necessary and reissued annually on the anniversary date, or revised and reissued within 120 days of significant changes, whichever is sooner. The last approved versions of QAPPs shall remain in effect until revised versions have been fully approved; the revision must be submitted to the TSSWCB for approval before the last approved version has expired. If the entire QAPP is current, valid, and accurately reflects the project goals and the organization's policy, the annual re-issuance may be done by a certification that the plan is current. This will be accomplished by submitting a cover letter stating the status of the QAPP and a copy of new, signed approval pages for the QAPP.

Amendments to the QAPP may be necessary to address incorrectly documented information or to reflect changes in project organization, tasks, schedules, objectives, and methods; address deficiencies and nonconformance; improve operational efficiency; and/or accommodate unique or unanticipated circumstances. Requests for amendments will be directed from the GBRA Project Manager to the TSSWCB Project Manager electronically. Amendments are effective immediately upon approval by the GBRA Project Manager, the GBRA QAO, the TSSWCB Project Manager, and the TSSWCB QAO. They will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by the GBRA Project Manager. Amendments shall be reviewed, approved, and incorporated into a revised QAPP during the annual revision process.

B1 SAMPLING PROCESS DESIGN

The sample design has been developed in support of the WPP for Geronimo Creek. Under their direction, the TSSWCB and GBRA have been tasked with providing data to characterize water quality conditions in support of the 305(b) assessment, and to identify significant long-term water quality trends. Based on GBRA knowledge of the watershed and TSSWCB Project No. 11-06, *Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo Creek and Alligator Creeks Watershed Partnership* needs, achievable water quality objectives and priorities and the identification of water quality issues were used to develop the work plan which are in accord with available resources. The TSSWCB and GBRA coordinate closely with other participants to ensure a comprehensive water monitoring strategy within the watershed.

Routine monitoring will complement existing routine ambient monitoring being conducted by GBRA. The seven routine monitoring sites have been selected to increase the spatial distribution of data. Monthly routine monitoring includes the conventional, bacterial and field parameter groups (*E. coli*, pH, dissolved oxygen, temperature, specific conductance, chloride, sulfate, chlorophyll a, pheophytin, Total Kjeldahl Nitrogen (TKN), nitrate-nitrogen, ammonia-nitrogen, total hardness, total suspended solids, turbidity, total phosphorus) that are currently collected at the existing site being monitored by GBRA under the Clean Rivers Program. Analytical results will be compared to data from existing and historical monitoring locations in the watershed, used in assessments conducted by TCEQ, and used to assess water quality with respect to effectiveness of best management practices implemented. Flow will be measured manually (mechanically, electronically or by Doppler.)

Sites for targeted monitoring were selected to represent spatial, seasonal and meteorological conditions throughout the Geronimo Creek and contributing subwatersheds. Sampling will be conducted two times per quarter for twelve quarters, once under dry weather conditions and once during wet weather conditions. Targeted monitoring sites will be visited when the overall watershed is under the specific weather conditions, dry or wet. There may be times, during dry weather conditions, when there is no water in the stream in the subwatersheds. Those visits will be documented but no stream data will be collected. Streams are considered under wet weather conditions after a rainfall event has contributed runoff to the base flow of the stream. In case of lightning or flooding during wet weather conditions, the safety of the sampling crew will not be compromised. In the instance that a sampling site is inaccessible due to weather conditions or flooding, “no sample due to inaccessibility” will be documented in the field notebook. As soon as possible after the conditions are safe, the stream will be sampled under wet conditions in order to characterize the distribution of loadings across the true range of flows.

Three groundwater sites (two wells and one spring) associated with and in close proximity to the headwaters of flowing springs have been identified using local and historical knowledge. Groundwater will be monitored for conventional and field parameters for twelve quarters. If possible, flow will be measured manually immediately downstream of the associated spring. Monitoring will be conducted on groundwater to determine whether any of the groundwater/springs contribute significantly to the flow regime or to the loading of pollutants that have led to the impairment of the stream.

See Appendix A 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 according to procedures documented in the *TCEQ Surface Water Quality Monitoring Procedures*. Additional aspects outlined in Section B below reflect specific requirements for sampling for the TSSWCB Project No.11-06, *Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo Creek and Alligator Creeks Watershed Partnership*, and/or provide additional clarification.

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Matrix	Container	Preservation*	Sample Volume	Holding Time
Turbidity	Water	Plastic or glass	Cool, 0-6^{o}C	100 mL	48 hours
Hardness	Water	Plastic or glass	Cool, 0-6^{o}C, H_2SO_4 to pH < 2*	1 L	6 months
TSS	Water	Plastic or glass	Cool, 0-6^{o}C	1 L	7 days
Nitrate-nitrogen	Water	Plastic or glass	Cool, 0-6^{o}C	1 L	48 hours
Ammonia-nitrogen	Water	Plastic or glass	Cool, 0-6^{o}C, H_2SO_4 to pH < 2*	1 L	28 days
Total Kjeldahl Nitrogen	Water	Plastic or glass	Cool, 0-6^{o}C, H_2SO_4 to pH < 2*	1 L	28 days
Total Phosphorus	Water	Plastic or glass	Cool, 0-6^{o}C, H_2SO_4 to pH < 2*	1 L	28 days
Sulfate	Water	Plastic or glass	Cool, 0-6^{o}C	1 L	28 days
Chloride	Water	Plastic or glass	Cool, 0-6^{o}C	1 L	28 days
Chlorophyll a /Pheophytin	Water	Amber plastic or glass	Dark, Cool, 0-6^{o}C before Filtration; Dark, 0^{o}C after Filtration	1 L	Filter within 24 hours/28 days at 0^{o}C
E. coli	Water	Sterile, plastic	Cool, <10^{o}C	100 mL	6 hours

*Preservation occurs within 15 minutes of sample collection.

Sample Containers

Sample containers are plastic one liter bottles that are cleaned and reused for conventional parameters. The bottles are cleaned with the following procedure: 1) wash containers with tap water and alconox (laboratory detergent), 2) triple rinse with hot tap water, and 3) triple rinse with deionized water. Amber plastic bottles are used routinely for chlorophyll a samples. Disposable, pre-cleaned, sterile bottles are purchased for bacteriological samples. Certificates of analysis and/or sterility sample containers for bacteriological sampling are maintained in a notebook by each laboratory.

Processes to Prevent Contamination

Procedures outlined in the *TCEQ Surface Water Quality Monitoring Procedures* outline the necessary steps to prevent contamination of samples, including direct collection into sample containers, when possible. Field QC samples (identified in Section B5) are collected to verify that contamination has not occurred.

Documentation of Field Sampling Activities

Field sampling activities are documented on field data sheets as presented in Appendix B. The following will be recorded for all visits:

- station ID
- sampling date
- location
- sampling depth
- sampling time
- sample collector's name/signature
- values for all field parameters, including flow and flow severity
- detailed observational data, including:
    - water appearance
    - weather
    - biological activity
    - unusual odors
    - pertinent observations related to water quality or stream uses (i.e. exceptionally poor water quality conditions/standards not met; stream uses such as swimming, boating, fishing, irrigation pumps)
    - watershed or instream activities

  (i.e. bridge construction, livestock watering upstream)
- missing parameters
  (i.e. when a scheduled parameter or group of parameters is not collected)

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:

- Legible writing in indelible ink with no modifications, write-overs or cross-outs;
- Correction of errors with a single line followed by an initial and date;
- Close-out on incomplete pages with an initialed and dated diagonal line.

Sampling Method Requirements or Sample Processing 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 and appropriate sampling procedures may invalidate resulting data and may require corrective action. Corrective action may include for samples to be discarded and re-collected. It is the responsibility of the GBRA Project Manager, in consultation with the GBRA 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 TSSWCB Project Manager both verbally and in writing in the project progress reports and by completion of a corrective action report (CAR).

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 C).

- Date and time of collection
- Site identification
- Sample matrix
- Number of containers and respective volumes
- Preservative used or if the sample was filtered
- Analyses required
- Name of collector
- Custody transfer signatures and dates and time of transfer
- Bill of lading (if applicable)
- Subcontract laboratory, if used

Sample Labeling

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

- Site identification
- Date and time of sampling
- Preservative added, if applicable
- Designation of “field-filtered” (for metals) as applicable
- Sample type (i.e., analysis(es)) to be performed

Sample Handling

After collection of samples are complete, sample containers are immediately stored in an ice chest for transport to the GBRA laboratory, accompanied by the COC. Ice chests will remain in the possession of the field technician or in the locked vehicle until delivered to the lab. If in the event of laboratory equipment failure and in order to meet holding times, COCs and samples will be delivered on ice to the SARA-EL in San Antonio, Texas by GBRA personnel. After receipt at the GBRA lab, the samples are stored in the refrigeration unit or given to the analyst for immediate analysis. Only authorized laboratory personnel will handle samples received by the laboratory.

Sample Tracking Procedure Deficiencies and Corrective Action

All deficiencies associated with COC procedures as described in this QAPP are immediately reported to the GBRA 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 GBRA Project Manager in consultation with the GBRA 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 TSSWCB Project Manager in the project progress report. CARs will be prepared by the GBRA QAO and submitted to TSSWCB 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 Table A7.1 of Section A7. The authority for analysis methodologies for the TSSWCB Project No.11-06, *Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo Creek and Alligator Creeks Watershed Partnership,* is derived from the TSWQS (§§307.1 - 307.10) in that data generally are generated for comparison to those standards and/or criteria. The standards state that "Procedures for laboratory analysis will be in accordance with the most recently published edition of Standard Methods for the Examination of Water and Wastewater, the latest version of the TCEQ Surface Water Quality Monitoring Procedures, 40 CFR Part 136, or other reliable procedures acceptable to the Agency."

Laboratories collecting data under this QAPP are compliant with the NELAC® standards, at a minimum. Copies of laboratory QASMs and SOPs are available for review by the TSSWCB.

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. Table A7.1. Measurement Performance Specifications, lists the methods to be used for field and laboratory analyses.

Deficiencies, Nonconformances and Corrective Action Related to Quality Control

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies which affect quantity and/or quality and render the data unacceptable or indeterminate. Deficiencies related to field and laboratory measurement systems include, but are not limited to, instrument malfunctions, blank contamination, QC sample failures, etc.

Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the GBRA Project Manager. The GBRA Project Manager will notify the GBRA QAO of the potential nonconformance. The GBRA QAO will initiate a NCR to document the deficiency.

The GBRA Project Manager, in consultation with GBRA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore is not a valid nonconformance, the NCR will be completed accordingly and the

NCR closed. If it is determined a nonconformance does exist, the GBRA Project Manager, in consultation with the GBRA QAO, will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the GBRA QAO by completion of a CAR (see Appendix E).

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”, etc...) may have unacceptable measurement uncertainty associated with them. This will immediately disqualify analyses from submittal to TCEQ SWQMIS. Therefore, data with these types of problems should not be reported to the TCEQ SWQMIS. 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 to TCEQ for loading and storage in SWQMIS.

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

The minimum Field QC Requirements are outlined in the *TCEQ Surface Water Quality Monitoring 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 *TCEQ Surface Water Quality Monitoring 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, or one per batch, whichever is more frequent. To the extent possible, field splits prepared and analyzed over the course of the project should be performed on samples from different sites.

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

RPD = |(X1-X2)/{(X1+X2)/2} X 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 an analyte (i.e., > RL) were measured and analytical variability can be eliminated as a factor, then variability in field split results will primarily be used as a trigger for discussion with field staff to ensure samples are being handled in the field correctly. Some individual sample results may be invalidated based on the examination of all extenuating information. The information derived from field splits is generally considered to be event specific and would not normally be used to determine the validity of an entire batch; however, some batches of samples may be invalidated depending on the situation. Professional judgment during data validation will be relied upon to interpret the results and take appropriate action. The qualification (i.e. invalidation) of data will be documented on the Data Summary Report. Deficiencies will be addressed as specified in this section under Quality Control or Acceptability Requirements Deficiencies and Corrective Actions.

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 (i.e. sample duplicates, surrogates, internal standards, continuing calibration samples, interference check samples, positive control, negative control, and media blank) as specified in the methods. 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 QASMs. The minimum requirements that all participants abide by are stated below.

Limit of Quantitation (LOQ) – The laboratory will analyze a calibration standard (if applicable) at the LOQ 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 Table A7.1 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 listed in Table A7.1, for each analyte for each analytical batch of samples that are 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 Table A7.1, 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, SR is the sample result, and SA is the reference concentration for the check sample:

$$\%R = SR/SA * 100$$

Measurement performance specifications are used to determine the acceptability of LOQ check sample analyses as specified in Table A7.1.

Laboratory Control Sample (LCS) - A LCS consists of a sample matrix (e.g. deionized water) free from the analytes of interest spiked with verified known amounts of analyte. 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 equal to the mid-point of the calibration curve 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.

The LCS is carried through the complete preparation and analytical process. LCSs are run at a rate of one per 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; SR is the measured result; and SA is the true result:

$$\%R = SR/SA * 100$$

Measurement performance specifications are used to determine the acceptability of LCS analyses as specified in 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 control sample duplicate (LCSD) is prepared in the laboratory by splitting aliquots of an LCS. Both samples are carried through the entire preparation and analytical process. LCSDs are used to assess precision and are performed at a rate of one per 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, X1 and X2, the RPD is calculated from the following equation:

$$RPD = |(X1 - X2)/\{(X1+X2)/2\} * 100|$$

For bacteriological parameters, precision is evaluated using the results from laboratory duplicates. Bacteriological duplicate are collected on a 10% frequency (or once per sampling run, whichever is more frequent). These duplicates will be collected in sufficient volume (200 mL or more) for analysis of the sample and its laboratory duplicate from the same container.

The base-10 logarithms of the result from the original sample and the result from its duplicate will be calculated. The absolute value of the difference between the two logarithms will be calculated, and that difference will be compared to the precision criterion in Table A7.1.

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

The precision criterion in Table A7.1 for bacteriological duplicates applies to only samples with concentrations > 10 MPN/100 mL. Field splits will not be collected for bacteriological analyses.

<u>Matrix spike (MS)</u> –Matrix spikes are prepared by adding a known mass 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 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, SSR is the concentration measured in the matrix spike, SR is the concentration in the unspiked sample and SA is the concentration of analyte that was added:

%R = (SSR – SR)/SA * 100

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

Deficiencies, Nonconformances and Corrective Action Related to Quality Control

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP. Nonconformances are deficiencies which affect data quantity and/or quality and render the data unacceptable or indeterminate. Deficiencies related to QC include but are not limited to field and laboratory QC sample failures.

Deficiencies are documented in logbooks, field data sheets, etc., by field or laboratory staff and reported to the cognizant field or laboratory supervisor who will notify the GBRA Project Manager. The GBRA Project Manager will notify the GBRA QAO of the potential nonconformance. The GBRA QAO will initiate a NCR to document the deficiency.

The GBRA Project Manager, in consultation with GBRA QAO (and other affected individuals/organizations), will determine if the deficiency constitutes a nonconformance. If it is determined the activity or item in question does not affect data quality and therefore is not a valid nonconformance, the NCR will be completed accordingly and the NCR closed. If it is determined a nonconformance does exist, the GBRA Project Manager in consultation with the GBRA QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the GBRA QAO by completion of a CAR (see Appendix E).

CARs document: root cause(s); impact(s); specific corrective action(s) to address the deficiency; action(s) to prevent recurrence; individual(s) responsible for each action; the timetable for completion of each action; and, the means by which completion of each corrective action will be documented. CARs will be included with quarterly progress reports. In addition, significant conditions (i.e., situations which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data) will be reported to the TSSWCB immediately both verbally and in writing.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

All sampling equipment testing and maintenance requirements are detailed in the *TCEQ Surface Water Quality Monitoring 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 QASM(s).

B7 INSTRUMENT CALIBRATION AND FREQUENCY

Field equipment calibration requirements are contained in the *TCEQ Surface Water Quality Monitoring Procedures*. Post-calibration error limits and the disposition resulting from error are adhered to. Data not meeting post-error limit requirements invalidate associated data collected subsequent to the pre-calibration and are not submitted to the TCEQ SWQMIS.

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

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

All sampling equipment testing and maintenance requirements are detailed in the *TCEQ Surface Water Quality Monitoring 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 QASM(s).

B9 NON-DIRECT MEASUREMENTS

The following non-direct measurement source(s) will be used for this project:

USGS gage station data will be used throughout the 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 SWQMIS under Parameter Code 00061 (Flow, Instantaneous) or Parameter Code 74069 (Flow Estimate), depending on the proximity of monitoring station to the USGS gage station.

B10 DATA MANAGEMENT

Data Management Process

Data Dictionary - Terminology and field descriptions are included in the *SWQM Data Management Reference Guide*, January 2010 or most recent version. The following table contains the codes used by GBRA when submitting data under this QAPP.

Table B10.1 Entity Codes

Name of Monitoring Entity	Tag Prefix	Submitting Entity	Collecting Entity
Guadalupe-Blanco River Authority	*TX*	*TX*	*GB*

GBRA Data Management Process

Field technicians and laboratory personnel follow protocols that ensure that data collected for the TSSWCB Project No. 11-06, *Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo Creek and Alligator Creeks Watershed Partnership*, maintains its integrity and usefulness. Field data collected at the time of the sampling event is logged by the field technician, along with notes on sampling conditions in field logs or on field data sheets. The field log/sheet is the responsibility of the field technician and is transported with the sample to the laboratory. The Water Quality Field Technician or Sample Custodian logs the sample in the Lab Samples Database. Each sample is assigned a separate and distinct sample number. The sample is accompanied by a COC. The Water Quality Field Technician or Sample Custodian must review the COC to verify that it is filled out correctly and complete. Lab technicians take receipt of the sample and review the COC, begin sample prep or analysis and transfer samples into the refrigerator for storage. Examples of the field data sheets and COC used can be found in Appendices B and C. Samples that are outsourced to other laboratories are accompanied by a copy of the COC.

Data generated by lab technicians are logged permanently on analysis bench sheets. The data are reviewed by the analyst prior to entering the data into the Lab Samples Database. In the review, the analyst verifies that the data includes date and time of analysis, that calculations are correct, that data includes documentation of dilutions and correction factors, that data meets data quality objectives and that the data includes documentation of instrument calibrations, standard curves and control standards. A second review by another lab analyst/technician validates that the data meets the data quality objectives and that the data includes documentation of instrument calibrations, standard curves and control standards. After this review the lab analyst/technician inputs the data and quality control information into the Lab Samples Database for report generation and data storage.

The GBRA Regional Laboratory Director supervises the GBRA Regional laboratory and reviews the report that is generated when all analyses are complete. The analysis log is reviewed to see that all necessary information is included and that the data quality objectives have been met. When the report generated by the GBRA laboratory is complete, the lab director signs the report. If the GBRA lab director or QAO designee feel there has been an error or finds that information is missing, the report is returned to the analyst for review and tracking to correct the error and generate a corrected copy. The GBRA Project Manager reviews the respective data for reasonableness and if errors or anomalies are found the report is returned to the laboratory staff for review and tracking to correct the error. After review for reasonableness the data is cross-checked to the analysis logs by the GBRA Project Manager. If at any time errors are identified, a corrected supplemental report will be created. The GBRA Project Manager is responsible for transmitting the data to TCEQ SWQMIS. If errors are found after the TCEQ review, those errors are corrected by the GBRA Project Manager and logged in a data correction log.

The following flow diagram outlines the path that data that is generated in the field takes:

Field data collected → Field data sheets → Lab database → Quality control review by GBRA QAO → Report generation → Data checked for reasonableness by GBRA Project Manager → Data transferred to GBRA water quality database → Data verification to analysis logs by GBRA Project Manager → ASCII file format created → TCEQ SWQMIS

The following flow diagram outlines the path that data that is generated by the lab takes:

Laboratory data → Laboratory analysis logs → Lab database → Quality control review by GBRA QAO→ Report generation → Data checked for reasonableness by GBRA Project Manager → Data transferred to GBRA water quality database → Data verification to analysis logs by GBRA Project Manager → ASCII file format created → TCEQ SWQMIS

The following flow diagram outlines the path that data that are generated by outsource labs takes:

Sample delivered to outsource lab → Laboratory data → Laboratory analysis logs → Lab database → Report generation→ Quality control review by laboratory QAO → Data transferred to GBRA→ Data checked for reasonableness by GBRA Project Manager → Data transferred to GBRA water quality database → Data verification to outsource lab reports by GBRA Project Manager → ASCII file format created → TCEQ SWQMIS

Data Errors and Loss

To minimize the potential for data loss, the databases, both lab and server files are backed up nightly and copies of the files are stored off-site weekly. If the laboratory database or network server fails, the back-up files can be accessed to restore operation or replace corrupted files.

Record Keeping and Data Storage

After data is collected and recorded on field data sheets, the data sheets are filed for review and use later. These files are kept in paper form for a minimum of one year and then scanned for permanent record.

The data produced during each analysis is recorded on analysis bench sheets. The information contained in the bench sheets include all quality control data associated with each day's or batch's analysis. The data on the logs are transferred to the laboratory database for report generation. The bench sheets are kept in paper form for a minimum of one year and then scanned for permanent record.

The data reports that are generated are reviewed by the laboratory director and signed. They are then given to the GBRA Project Manager for verification. If an anomaly or error is found, the report is marked and returned to the laboratory for review, verification and correction, if necessary. If a correction is made, a supplemental laboratory report is created. These reports may or may not be kept in paper form since the reports can be regenerated from the lab database at any time. If kept, the paper form is kept for a minimum of one year and then sent for scanning into the TABFusion Records Management System.

The laboratory database is housed on the laboratory computer and is backed up on the network server nightly. The GBRA back-up copy of the network server files is made every Friday and that copy is stored off-site at a protected location. The network administrator is responsible for the servers and back up generation.

After data is sent to the TCEQ SWQMIS, the file that has been created is kept on the network server permanently. The network server is backed up nightly. Paper copies of the data and field duplicate sample reports are kept for a minimum of one year and then microfilmed for permanent record.

The database containing the scanned images of all lab records is contained on a network server and backed up nightly. A back-up copy of the network server files is made every Friday and that copy for GBRA is stored off-site at a protected location. The GBRA records manager is the custodian of these files.

Data Handling, Hardware, and Software Requirements

The laboratory database is housed on a GBRA server and backed up each evening. The laboratory database uses SQL 2005 database software. The systems are operating in Windows XP and any additional software needed for word processing, spreadsheet or presentations uses Microsoft Office 2010.

Information Resource Management Requirements

Data will be managed in accordance with the TCEQ *Surface Water Quality Monitoring Data Management Reference Guide*, and applicable GBRA information resource management policies.

Global Positioning System (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 the TCEQ's SWQMIS database. Positional data obtained by the GBRA using a Global Positioning System will follow the TCEQ's OPP 8.11 and 8.12 policy regarding the collection and management of positional data. All positional data to be 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.

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 station location.

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	GBRA	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TSSWCB in Quarterly Report
Monitoring Systems Audit of GBRA	Dates to be determined by TSSWCB	TSSWCB	Field sampling, handling and measurement; facility review; and data management as they relate to the TSSWCB project #11-06 (*Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo and Alligator Creeks Watershed Partnership)*	30 days to respond in writing to the TSSWCB to address corrective actions
Laboratory Inspection	Dates to be determined by TSSWCB	TSSWCB	Analytical and quality control procedures employed at the GBRA laboratory and the contracted laboratories	30 days to respond in writing to the TSSWCB to address corrective actions

Corrective Action

The GBRA Project Manager 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 TSSWCB and the GBRA Project Managers. Audit reports and corrective action documentation will be submitted to the TSSWCB with the Quarterly Report.

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

C2 REPORTS TO MANAGEMENT

Reports to GBRA Project Management

Laboratory data reports contain QC information so that this information can be reviewed by the GBRA Project Manager. After review, if the GBRA Project Manager finds no anomalies or questionable data, the process of data transmittal to TCEQ SWQMIS begins. Project status, assessments and significant QA issues will be dealt with by the GBRA Project Manager who will determine whether it will be included in reports to the TSSWCB Project Management.

Reports to TSSWCB Project Management

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

Quarterly Report - Summarizes the GBRA's activities for each task; reports monitoring status, problems, delays, and corrective actions; and outlines the status of each task's deliverables.

Monitoring Systems Audit Report and Response - Following any audit performed by the GBRA, a report of findings, recommendations and response is sent to the TSSWCB in the quarterly progress report.

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

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 (i.e. QAPPs, SOPs, QASMs, 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 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 Table A7.1. 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 TCEQ 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 are listed in the first two sections of Table D.2, respectively. Potential errors are identified by examination of documentation and by manual 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 higher level project management to establish the appropriate course of action, or the data associated with the issue are rejected. 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 D.2 is performed by the GBRA Project Manager. 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.

Another element of the data validation process is consideration of any findings identified during the monitoring systems audit conducted by the TSSWCB QAO. 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 GBRA Project Manager validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ SWQMIS.

If any requirements or specifications of the TSSWCB project #11-06, *Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo Creek and Alligator Creeks Watershed Partnership*, are not met, based on any part of the data review, the responsible party should document the nonconforming activities (with a CAR) and submit the information to the GBRA Project Manager with the data. This information is communicated to the TSSWCB by the GBRA. The data is not transmitted to TCEQ SWQMIS.

Table D2.1: Data Review Tasks

Field Data Review	Responsibility
Field data reviewed for conformance with data collection, sample handling and chain of custody, analytical and QC requirements	GBRA Water Quality Field Technicians
Post-calibrations checked to ensure compliance with error limits	GBRA Water Quality Field Technicians and GBRA Project Manager
Field data calculated, reduced, and transcribed correctly	GBRA Project Manager
Laboratory Data Review	**Responsibility**
Laboratory data reviewed for conformance with data collection, sample handling and chain of custody, analytical and QC requirements to include documentation, holding times, sample receipt, sample preparation, sample analysis, project and program QC results, and reporting	GBRA/SARA(QAOs)
Laboratory data calculated, reduced, and transcribed correctly	GBRA/SARA and GBRA Project Manager
LOQs consistent with requirements for Ambient Water Reporting Limits	GBRA/SARA (QAOs) and GBRA Project Manager
Analytical data documentation evaluated for consistency, reasonableness and/or improper practices	GBRA/SARA (QAOs) and GBRA Project Manager
Analytical QC information evaluated to determine impact on individual analyses	GBRA/SARA (QAOs) and GBRA Project Manager
All laboratory samples analyzed for all parameters	GBRA Project Manager
Data Set Review	**Responsibility**
The test report has all required information as described in Section A9 of the QAPP	GBRA Project Manager
Confirmation that field and lab data have been reviewed	GBRA Laboratory Director(QAO) and GBRA Project Manager
Data set (to include field and laboratory data) evaluated for reasonableness and if corollary data agree	GBRA Project Manager
Outliers confirmed and documented	GBRA Project Manager
Field QC acceptable (e.g., field splits and trip, field and equipment blanks)	GBRA Water Quality Field Technicians and GBRA Project Manager
Sampling and analytical data gaps checked and documented	GBRA Water Quality Field Technicians and GBRA Project Manager
Verification and validation confirmed. Data meets conditions of end use and are reportable	GBRA Project Manager

D3 RECONCILIATION WITH USER REQUIREMENTS

Data produced in this project, and data collected by other organizations (i.e. USGS, TCEQ, etc.), will be analyzed and reconciled with project data quality requirements. Data meeting project requirements will be used in the development and implementation of the Geronimo Creek WPP and will be submitted to TCEQ SWQMIS for for use in the development of the biennial Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d).

Appendix A Sampling Process Design and Monitoring Schedule

Sample Design Rationale

The sample design is based on the intent of the TSSWCB project #11-06, *Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo Creek and Alligator Creeks Watershed Partnership*. Under their direction, the TSSWCB and GBRA have been tasked with providing data to characterize water quality conditions in support of the 305(b) assessment, and to identify significant long-term water quality trends. Achievable water quality objectives and priorities, the identification of water quality issues, and the monitoring program conducted under TSSWCB Project No. 08-06, were used to develop the work plan, which are in accord with available resources. Utilizing historical knowledge of the watershed, GBRA developed a sampling plan to ensure a comprehensive water monitoring strategy within the watershed.

Systematic targeted monitoring, collected to capture spatial, seasonal and meteorlogical snapshots of water quality, is designed to screen waters that would not normally be included in routine monitoring, to assess water quality with respect to effectiveness of best management practices implemented and to investigate areas of potential concern. Monitoring will be conducted on groundwater to characterize contributions from nearby springs to determine whether any of the groundwater and springs contribute significantly to the flow regime or to the pollutant loading that has led to the impairment of the stream.

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 statewide 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 the *TCEQ Surface Water Quality Monitoring Procedures*. Overall consideration is given to accessibility and safety. All monitoring activities have been developed with the TSSWCB project #11-06, *Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo Creek and Alligator Creeks Watershed Partnership*, in mind.

1. Locate stream sites so that samples can be safely collected from the centroid of flow. Centroid is defined as the midpoint of that portion of stream width which contains 50 percent of the total flow. If 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.

2. Because historical water quality data can be very useful in assessing use attainment or impairment, those historical sites were selected that are on current or past monitoring schedules.

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

Sites should be accessible. Flow measurement will be made during routine and targeted monitoring visits.

Monitoring Sites

The Monitoring Table for the TSSWCB project #11-06, *Water Quality Monitoring in the Geronimo Creek Watershed and Facilitation of the Geronimo Creek and Alligator Creeks Watershed Partnership*, are presented on the following page.

Legend for Table B1.1:

GB = Guadalupe Blanco River Authority
RT = Program code for routine samples
BF = Program code for targeted monitoring samples
BS = Program code for monitoring samples collected quarterly at the well or spring sites
Bacteria = E. coli
Conventional = total suspended solids, turbidity, sulfate, chloride, nitrate nitrogen, ammonia nitrogen, chlorophyll a, pheophytin, total hardness, total phosphorus, TKN
Flow = flow collected by gage, electric, mechanical or Doppler; includes severity
Field = pH, temperature, conductivity, dissolved oxygen

Segment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	Bacteria	Con-ventional	Flow	Field	Comments
1804A	20742	Geronimo Creek at Huber Road, Upstream of the Alligator Creek Confluence		GB	RT	29	29	29	29	
1804A	20742	Geronimo Creek at Huber Road, Upstream of the Alligator Creek Confluence		GB	BF	12	12	12	12	1
1804A	20743	Alligator Creek at Huber Road (Headwater)		GB	RT	29	29	29	29	
1804A	20743	Alligator Creek at Huber Road (Headwater)		GB	BF	12	12	12	12	1
1804A	14932	Geronimo Creek at SH 123		GB	RT	29	29	29	29	
1804A	14932	Geronimo Creek at SH 123		GB	BF	12	12	12	12	1
1804A	12576	Geronimo Creek at Haberle Road		GB	RT	29	29	29	29	2
1804A	12576	Geronimo Creek at Haberle Road		GB	BF	12	12	12	12	1
1804A	20744	Bear Creek at East Walnut Street		GB	BF	24	24	24	24	1
1804A	20745	Geronimo Creek at HWY 90A		GB	RT	29	29	29	29	
1804A	20745	Geronimo Creek at HWY 90A		GB	BF	12	12	12	12	1
1804A	21260	Geronimo Creek at IH 10 near Seguin		GB	RT	29	29	29	29	
1804A	21260	Geronimo Creek at IH 10 near Seguin		GB	BF	12	12	12	12	1
1804A	21261	Geronimo Creek at Hwy 90 (Seguin Outdoor Learning Center)		GB	RT	29	29	29	29	
1804A	21261	Geronimo Creek at Hwy 90 (Seguin Outdoor Learning Center)		GB	BF	12	12	12	12	1
1804A	20747	Geronimo Creek at Hollub Lane, Downstream of the City of Seguin WWTF		GB	RT	29	29	29	29	
1804A	20747	Geronimo Creek at Hollub Lane, Downstream of the City of Seguin WWTF		GB	BF	12	12	12	12	1
1804A	20748	Alligator Creek at FM 1102		GB	BF	24	24	24	24	
1804A	20749	Alligator Creek at FM 1101		GB	BF	24	24	24	24	

Segment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	Bacteria	Con-ventional	Flow	Field	Comments
1804A	20750	Alligator Creek at Barbarossa Road (CR 107A)		GB	BF	24	24	24	24	
1804A	20753	Unnamed Tributary at Laubach Road (CR 108)		GB	BF	12	12	12	12	
1804A	12575	Geronimo Creek at FM 20		GB	BF	24	24	24	24	
1804A	GB713	Water Well at Alligator Creek headwaters		GB	BS	12	12	12	12	
1804A	GB714	Water Well near Geronimo Creek at Laubach Road		GB	BS	12	12	12	12	
1804A	21262	Spring at Timmermann Property		GB	BS	12	12	12	12	

1. The eight “routine” sites double as “targeted” sites. “Targeted” sampling will collect biased flow (BF) samples twice per quarter – once under wet weather conditions and once under dry weather conditions. Whether these samples will satisfy the wet (biased high flow) or dry (biased low flow) weather conditions depends on the flow condition when samples are collected during the “routine’ sampling that quarter.

2. These samples are collected/analyzed by GBRA utilizing the state-funded Texas Clean Rivers Program funding and serve as a portion of the non-federal match for this project.

Appendix B. Field Data Sheet

Field Sheet – Specific to GBRA Monitoring Program

Texas Commission on Environmental Quality Surface Water Quality Monitoring Program

Field Data Reporting Form

RTAG# | REGION | EMAIL-ID: | COLLECTOR

STATION ID | SEGMENT | SEQUENCE | DATA SOURCE

Station Description

GRAB SAMPLE

M M D D Y Y Y Y — DATE | H H M M — TIME | DEPTH | M = meters F = feet

COMPOSITE SAMPLE

COMPOSITE CATEGORY : T = TIME S = SPACE (i.e. Depth) B = BOTH F = FLOW WEIGHT

M M D D Y Y Y Y — START DATE | H H M M — START TIME | START DEPTH (SURFACE) | M = Meters F = Feet

M M D D Y Y Y Y — END DATE | H H M M — END TIME | END DEPTH (DEEPEST) | M = Meters F = Feet

COMPOSITE TYPE : ## = Number of Grabs in Composite CN = Continuous

00010		WATER TEMP (C° only)
00400		pH (s.u)
00300		D.O. (mg/L)
00094		SPECIFIC COND (υmhos/cm)
50060		CHLORINE RESIDUAL (mg/L)

72053		DAYS SINCE LAST SIGNIFICANT PRECIPITATION			
01351		FLOW SEVERITY		1-no flow	2-low
		3-normal	5-high	4-flood	6-dry
00061		INSTANTANEOUS STREAM FLOW (ft^3/sec)			
89835		FLOW MEASUREMENT METHOD 1- Flow Gage Station 2- Electric 3- Mechanical 4- Weir/Flume			
74069		FLOW ESTIMATE (ft^3/sec)			
82903		TOTAL WATER DEPTH (meters)			

*Parameters related to data collection in perennial pools; i.e., Flow Severity of 1 and Flow of zero reported.

Measurement Comments and Field Observations:

Appendix C. Chain of Custody For

GBRA REGIONAL LABORATORY

GBRA Doc. # 3019-C

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

Account #: ____________________

Chain of Custody

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

ACCREDITED IN ACCORDANCE WITH nelac

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 D Data Summary Report

Data Summary

Data Information

Data Source: ______________________________

Date Submitted: ______________________________

Tag_id Range: ______________________________

Date Range: ______________________________

Comments

Please explain in the space below any data discrepancies including:

- **Inconsistencies with AWRL specifications;**
- **Failures in sampling methods and/or laboratory procedures that resulted in data that could not be reported to the TSSWCB or TCEQ; and**
- **Other discrepancies.**

-
-
-
-
-
-
-

Data Manager: ______________________________

Date: ______________________________

Appendix E Corrective Action Report

Document # 3016 A

Corrective Action(s) for: ______________________________

Date:___________

Analyst:_____________

Sample #'s affected____

STATE THE PROBLEM:

CAUSE OF THE PROBLEM(s) (if known):

ACTIONS TAKEN TO RESOLVE PROBLEM (s):

FOLLOW UP:

REVIEWED BY QA OFFICER:(date/sign)

ATTACHMENT 1
Example Letter to Document Adherence to the QAPP

TO: (name)
(organization)

FROM: (name)
(organization)

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

(address)

I acknowledge receipt of the referenced document(s). 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.

Signature Date

Copies of the signed forms should be sent by the GBRA to the TSSWCB Project Manager within 60 days of EPA approval of the QAPP.