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

Surface Water Quality Monitoring to Support the Development of a Watershed Protection Plan for Geronimo Creek

TSSWCB Project Number 08-06
Revision #0

Quality Assurance Project Plan

Texas State Soil and Water Conservation Board

Prepared by

Guadalupe-Blanco River Authority

Effective Period: January 1, 2009 – October 31, 2010

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

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A1 APPROVAL PAGE

Quality Assurance Project Plan for Surface Water Quality Monitoring to Support the Development of a Watershed Protection Plan for Geronimo Creek.

United States Environmental Protection Agency (EPA), Region VI

Name: Donna Miller
Title: EPA Chief; State/Tribal Programs Section

Signature:______________________________________Date:_____________________

Name: Randall Rush
Title: EPA Texas Nonpoint Source Project Manager

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Texas State Soil and Water Conservation Board (TSSWCB)

Name: Loren Henley
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Signature:______________________________________Date:_____________________

Name: Donna Long
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:_____________________

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Name: Chuck Lorea
Title: Laboratory Director

Signature:______________________________________Date:_____________________

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

Signature:______________________________________Date:_____________________

Ana-Lab Corporation

Name: Skeeter Ludwig
Title: Laboratory Director

Signature:______________________________________Date:_____________________

Name: Bill Peery
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.)

A2 TABLE OF CONTENTS

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List of Acronyms and Abbreviations

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
CAR	Corrective Action Report
CBOD	Carbonaceous Biological Oxygen Demand
COC	Chain-of -Custody
COD	Chemical Oxygen Demand
CR	County Road
CRP	Clean Rivers Program
DO	Dissolved Oxygen
DOC	Demonstration of Capability
DQO	Data Quality Objective
FY	Fiscal Year
GBRA	Guadalupe-Blanco River Authority
ITRAX	Imaging Software used by GBRA
LCS	Laboratory Control Standard
LOD	Limit Of Detection
LOQ	Limit Of Quantitation
MPN	Most Probable Number
NCR	Nonconformance Report
NPS	Nonpoint Source
NRCS	Natural Resource Conservation Service
GC WPP	Geronimo Creek Watershed Protection Plan
GCWP	Geronimo Creek Watershed Partnership
QA	Quality Assurance
QM	Quality Manual
QASM	Quality Assurance System Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
QMP	Quality Management Plan
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)
SWCD	Soil and Water Conservation District
TAMU SSL	Texas A&M University Spatial Sciences Laboratory

TAG	Technical Advisory Group
TCE	Texas Cooperative Extension
TCEQ	Texas Commission on Environmental Quality
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
TSSWCB	Texas State Soil and Water Conservation Board
TSWQS	Texas Surface Water Quality Standards
TWQI	Texas Water Quality Inventory
USDA	US Department of Agriculture
USEPA	US Environmental Protection Agency
USGS	US Geological Survey
WCSC	Regional Watershed Coordination Steering Committee
WPP	Watershed Protection Plan
WQMP	Water Quality Management 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: Randall Rush;
Title: Texas NPS Project Manager, Water Quality Division

Texas State Soil and Water Conservation Board (TSSWCB)
P.O. Box 658;
Temple, Texas 76503

Name: Loren Henley
Title: TSSWCB Project Manager

Name: Donna Long
Title: TSSWCB Quality Assurance Officer (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)

Randall Rush, 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)

Loren Henley, 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 work plan 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 nonconformances and corrective actions taken as documented in quarterly progress reports from GBRA Project Manager.

Donna Long, TSSWCB Quality Assurance Officer
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 TSSWCB. Ensures that subcontractors are qualified to perform contracted work. Maintains quality-assured data on GBRA Internet sites. Ensures TSSWCB project manager and/or QA Officer are notified of deficiencies and

nonconformances, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TSSWCB.

Josie Longoria, QAO/Regional Laboratory Director
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. Coordinates and monitors deficiencies, nonconformances and corrective action. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Supervises laboratory, purchasing of equipment, maintain quality assurance manual for laboratory operations, and supervision of lab safety program. Ensures that field staff are properly trained and that training records are maintained.

Lee Gudgell, Water Quality Technician
Responsible for coordinating sampling events, including maintenance of sampling bottles, supplies, and equipment. Maintains records of field data collection and observations.

Clarissa Castellanos, Laboratory Technician III
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.

Brian Lyssy, Laboratory Technician III
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.

Emily Knepp, Laboratory Technician II/Sample Custodian
Performs sample custodial duties, laboratory analysis for inorganic constituents, nutrients, etc.; assists in collection of field data and samples for stream monitoring and chemical sampling of environmental sites.

Emmylou Gutierrez, Laboratory Technician II
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.

Kylie McNabb, Laboratory Technician II
Perform laboratory analysis and/or collect field data and samples as directed by laboratory director.

Ray Harp, Part-Time Laboratory Technician I
Perform laboratory analysis and/or collect field data and samples as directed by laboratory director.

San Antonio River Authority

Chuck Lorea, 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.

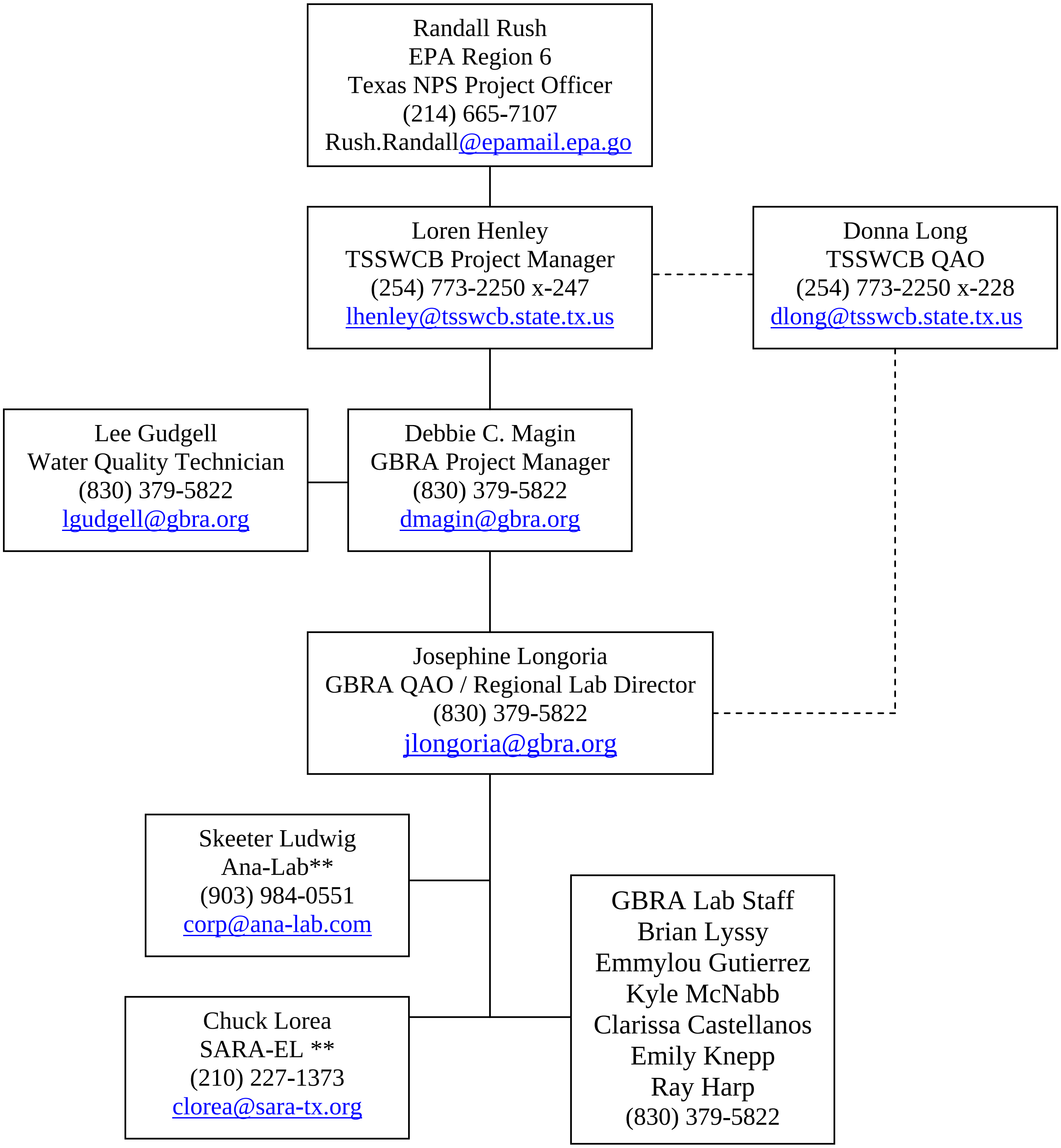
Patricia Carvajal, Quality Assurance Officer
Maintains quality assurance manual for laboratory operations, maintains operating procedures that are in compliance with the QAPP. Responsible for the overall quality control and quality assurance of analyses performed by SARA’s Environmental Services Department.

Ana-Lab Corporation

Skeeter Ludwig, 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 validates the data against the measurement performance specifications listed in Table A7.1.

Bill Peery, Quality Assurance Officer
Maintains quality assurance manual for laboratory operations, maintains operating procedures that are in compliance with the QAPP, amendments and appendices. Responsible for the overall quality control and quality assurance of analyses performed by Ana-Lab.

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 or Ana-Lab Corporation to be used to meet holding times in the event of equipment failure at the GBRA Regional laboratory.

A5 PROBLEM DEFINITION/BACKGROUND

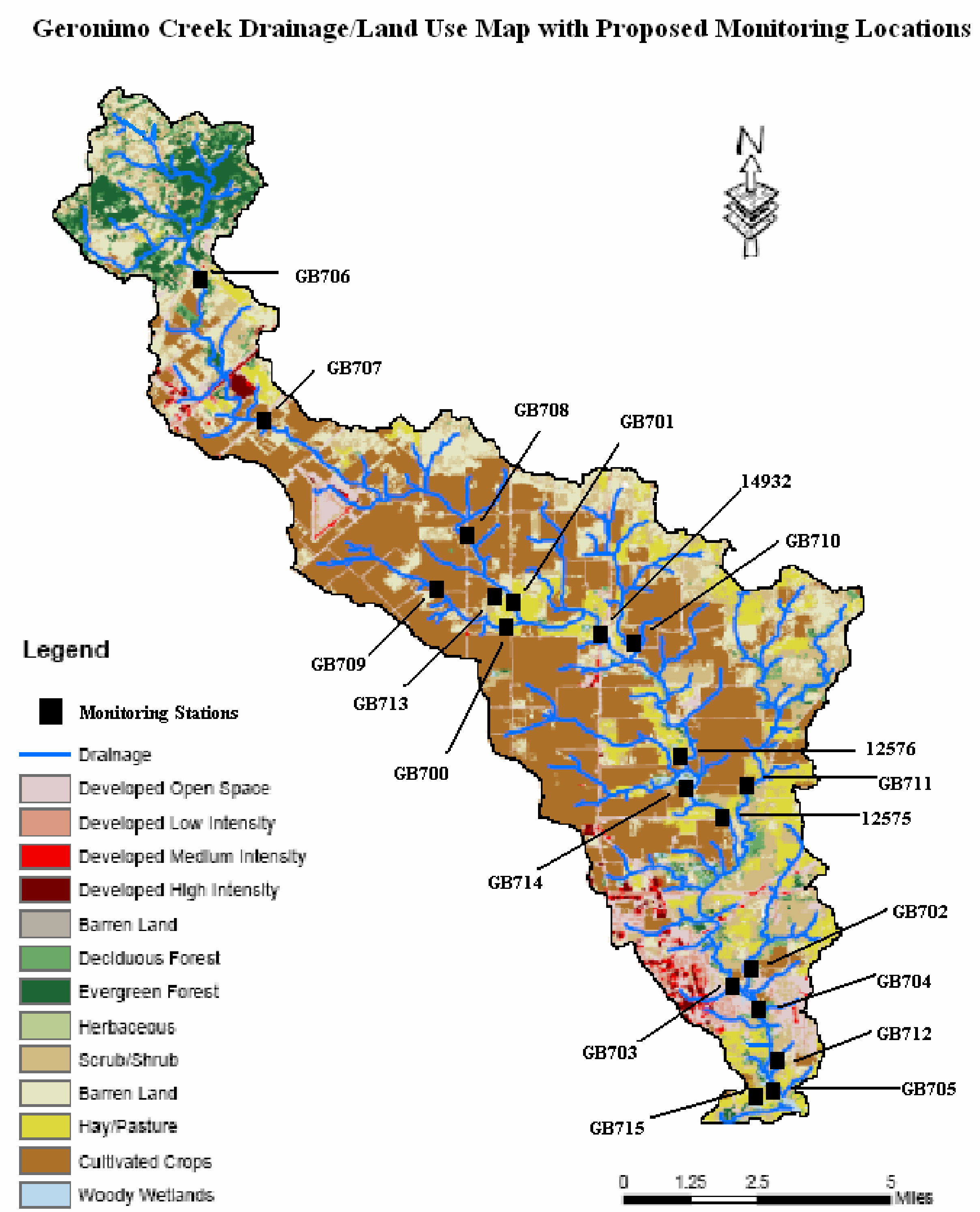
State and federal water resource management and environmental protection agencies have embraced the watershed approach for managing water quality. The watershed approach involves assessing sources and causes of impairments and utilizing this information to develop and implement watershed management plans. This project will address the bacteriological impairment and high and increasing nutrient concentrations in Geronimo Creek. The 2004 Texas Water Quality Inventory listed Geronimo Creek as impaired for *E. coli* bacteria (geometric mean = 162 organisms/100 milliliters). The Guadalupe-Blanco River Authority (GBRA) has been sampling Geronimo Creek since 1996. The mean concentration for nitrate-nitrogen during that period is well over the assessment screening concentration and over the drinking water standard. The only point source to the creek is within three-quarters of a mile of the confluence with the Guadalupe River, downstream of the historical monitoring locations. Hence, excess contributions of the bacteria and nutrient loads are most likely from non-point sources. Additionally, GBRA noted in the 2008 Basin Summary Report that because of elevated selenium concentrations, in relation to other sites within the Guadalupe River basin, heavy metals should be monitored on Geronimo Creek when possible.

The land use in the area is primarily agricultural. The 44,152-acre watershed is made up of 45.5% cropland, including managed pasture, 31.6% rangeland, 9.8% forest and 11.5% developed land. The New Braunfels airport and a commercial fish hatchery, neither of which has a point source discharge are also located in the watershed. The lower portion of the Geronimo Creek watershed is in the extra-territorial jurisdiction (ETJ) of the city of Seguin. The upper portion of the Alligator Creek watershed, a tributary of Geronimo Creek, lies in the ETJ of the city of New Braunfels. Alligator Creek begins on the west side of IH 35 and travels southeast, crossing IH 35 and travelling through a rapidly developing area of the IH35 corridor.

The WPP for Geronimo Creek will be developed using existing water quality data and the data collected under this quality assurance project plan. Accurate source identification is key to prioritizing implementation projects for funding. GBRA will collect SWQM data to characterize the Geronimo Creek watershed through this project, TSSWCB CWA §319(h) project 08-06. A separate quality assurance project plan will direct the activities of the consultant selected to perform water quality modeling, that will utilize the data from this project to characterize the Geronimo Creek watershed. Figure A5.1 is a map of the monitoring locations in the Geronimo Creek watershed.

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 A.5 Monitoring locations in Geronimo Creek Watershed



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, bacteria and effluent parameters, to support development of a WPP for the Geronimo Creek watershed in Guadalupe and Comal Counties. Four types of surface water quality monitoring will be conducted: routine ambient, targeted watershed, groundwater, and wastewater effluent. 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 Geronimo Creek Watershed Partnership, 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 7 sites monthly, collecting field, conventional, flow and bacteria parameter groups. Sampling period extends over 12 months. The routine monitoring will complement the existing routine ambient monitoring regime conducted by GBRA. GBRA will collect metals in water at three of the routine monitoring locations and one groundwater well location once in the twelve months.

GBRA will conduct targeted watershed monitoring at 15 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 4 seasons. Spatial, seasonal and meteorological variation will be captured in these snapshots of watershed water quality. Eight of the 15 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 effluent monitoring at 1 wastewater treatment facility (WWTF), once per season, collecting field, conventional, flow, bacteria and effluent parameter groups. Sampling period extend through 4 seasons. The WWTF sampling will characterize WWTF contribution to flow regime and pollutant loadings.

GBRA will conduct groundwater monitoring at 3 wells once per season collecting field, conventional, flow and bacteria parameter groups. GBRA will monitor one groundwater location for metals in water once in the twelve month sampling period. The wells are located in the vicinity of springs, originating from the same groundwater strata, that contribute to the baseflow of the creek and its tributaries. Sampling period extends through 4 seasons. The groundwater monitoring will characterize groundwater/spring contributions to flow regime and pollutant loadings.

GBRA will manage monitoring data for use in the development of a Geronimo Creek WPP. GBRA will submit monitoring data for use in characterizing the Geronimo Creek watershed with geostatistical analysis and modeling. GBRA will submit monitoring data to TSSWCB for review and submittal to TCEQ, for inclusion in the 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, the results and activities of this project will be summarized in the Geronimo Creek WPP developed through TSSWCB CWA §319(h) project #08-06.

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

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. 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 check the water quality situation, and 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.

GBRA will also conduct effluent monitoring at one wastewater treatment plant to characterize the contribution to flow and pollutant loading. 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, seasonal and meteorological 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	ºC	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
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[7]	NA	20	80-120	GBRA[6]
Turbidity	NTU	water	SM 2130 B.	82079	0.5	0.5	NA	20	NA	GBRA[6]
Sulfate	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	1	70-130	20	80-120	GBRA[6]
Chloride	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	1	70-130	20	80-120	GBRA[6]
Chlorophyll-a, spectrophotometric method	ug/L	water	SM 10200-H[4]	32211	5	1[7]	70-130	20	NA	GBRA
Pheophytin, spectrophotometric method	ug/L	water	SM 10200-H[4]	32218	5	1	70-130	20	NA	GBRA
E. coli, IDEXX™ Colilert	MPN/100 mL	water	Colilert-18	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
Ammonia-N, total	mg/L	water	EPA 350.1 Rev. 2.0 (1993)	00610	0.1	0.1	70-130	20	80-120	GBRA[6]
Hardness, total (as CaC03)	mg/L	water	SM 2340 C.	00900	5	5	NA	20	80-120	GBRA

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.)										
Nitrate-N, total	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	70-130	20	80-120	GBRA[6]
Total phosphorus[5]	mg/L	water	EPA 365.3	00665	0.05	0.05	70-130	20	80-120	GBRA[6]
BOD, 5-day	mg/L	water	SM 5210B	00310	2	1.0	NA	<10 = 33.3 >10 = 15.4	NA	GBRA
CBOD, 5-day	mg/L	water	SM 5210B	00310	2	1.0	NA	<10 = 33.3 >10 = 15.4	NA	GBRA
COD	mg/L	water	SM 5220 D.	00335	10	20.0	70-130	20	80-120	GBRA
Metals in Water										
Aluminum, dis.	ug/L	water	EPA 200.8 EPA 200.7 Rev. 4.4 (1994)	01106	200	4 50	70-130	20	80-120	Ana-Lab
Arsenic, dis.	ug/L	water	EPA 200.8 Rev. 4.4 (1994)	01000	5	2	70-130	20	80-120	Ana-Lab
Cadmium, dis.	ug/L	water	EPA 200.8 Rev. 5.4 (1998)	01025	0.1 for waters <50 mg/L hardness .3 for waters $\geq$50 mg/L hardness	1	70-130	20	80-120	Ana-Lab
Chromium, dis.	ug/L	water	EPA 200.8 Rev. 5.4 (1998)	01030	10	1	70-130	20	80-120	Ana-Lab
Copper, dis.	ug/L	water	EPA 200.8 Rev. 5.4 (1998)	01040	1 for waters <50 mg/L hardness 3 for waters $\geq$50 mg/L hardness	1	70-130	20	80-120	Ana-Lab
Lead, dis.	ug/L	water	EPA 200.8 Rev. 5.4 (1998)	01049	0.1 for waters <85 mg/L hardness 1 for waters >85 mg/L hardness	1	70-130	20	80-120	Ana-Lab
Mercury, total	ug/L	water	SW7470 A EPA 1631	71960	0.006	0.2	70-130	20	80-120	Ana-Lab
Nickel, dis.	ug/L	water	EPA 200.8 Rev. 5.4 (1998)	01065	10	1	70-130	20	80-120	Ana-Lab
Selenium, total	ug/L	water	EPA 200.8 Rev. 5.4 (1998)	01147	2	2	70-130	20	80-120	Ana-Lab
Metals in Water (cont.)										
Silver, dis.	ug/L	water	EPA 200.8 Rev. 5.4 (1998)	01075	0.5	0.5	70-130	20	80-120	Ana-Lab
Zinc, dis.	ug/L	water	EPA 200.8 Rev. 5.4 (1998)	01090	5.0	5.0	70-130	20	80-120	Ana-Lab

1. Reporting to be consistent with TCEQ SWQM guidance and based on measurement capability.
2. Based on range statistic as described in Standard Methods, 20th Edition, Section 9020-B, " Quality Assurance / Quality Control – Intralaboratory Quality Control Guidelines." This criterion applies to bacteriological duplicates with concentrations greater than 10 MPN/100 mL or greater than 10 organisms/100 mL.
3. Secondary method listed. To be used in the event that the primary method cannot be used or needs to be confirmed, i.e. automated method cannot be used due to instrument failure.
4. In addition to SM 10200 H. cited for chlorophyll a, the SOP posted on the TCEQ CRP web site will be followed as well.
5. 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.
6. The SARA Environmental Laboratory and the Ana-Lab Corp. may be used in the event of lab equipment failure so that samples will be processed within prescribed holding times. Both labs adhere to the NELAC standards.
7. Reporting limit. Not a NELAP-defined LOQ (no commercially available spiking solution used as LOQ check standard.)

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 TSSWCB:

- 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. deioinized 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 *Development of a Watershed Protection Plan for Geronimo Creek*, 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 water body 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, seasonally and under varying meteorological conditions. 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 QA Officer (or designee) their ability to properly calibrate field equipment and perform field sampling and analysis procedures. Field personnel training is documented and retained in the personnel file and 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 kept for a minimum of one year and then scanned into the GBRA ITRAX 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 ITRAX, 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/Ana-Lab	One Year/ Indefinitely	Paper/ Electronic
Field SOPs	GBRA	One Year/ Indefinitely	Paper/ Electronic
Laboratory QA Manuals	GBRA/SARA/Ana-Lab	One Year/ Indefinitely	Paper/ Electronic
Laboratory SOPs	GBRA/SARA/Ana-Lab	One Year/ Indefinitely	Paper/ Electronic
Laboratory data reports/results	GBRA/SARA/Ana-Lab	One Year/Indefinitely	Paper/electronic
Laboratory staff training records	GBRA/SARA/Ana-Lab	One Year/ Indefinitely	Paper/ Electronic
Instrument printouts	GBRA/SARA/Ana-Lab	One Year/ Indefinitely	Paper/ Electronic
Laboratory equipment maintenance logs	GBRA/SARA/Ana-Lab	One Year/ Indefinitely	Paper/ Electronic
Laboratory calibration records	GBRA/SARA/Ana-Lab	One Year/ Indefinitely	Paper/ Electronic
Corrective Action Documentation	GBRA/SARA/Ana-Lab	One Year/ Indefinitely	Paper/ Electronic

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

Amendments to the QAPP

Revisions to the QAPP may be necessary to address incorrectly documented information or to reflect changes in project organization, tasks, schedules, objectives, and methods. Requests for amendments will be directed from the 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.

B1 SAMPLING PROCESS DESIGN

The sample design is based on the needs for the development of the watershed protection plan 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 #08-06 (*Development of a Watershed Protection Plan for Geronimo Creek)* 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. Tthe TSSWCB and GBRA coordinate closely with other participants to ensure a comprehensive water monitoring strategy within the watershed.

Routine monitoring will compliment existing routine ambient monitoring being conducted by GBRA. The seven new 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, nitrate-nitrogen, ammonia-nitrogen, total hardness, total suspended solids, turbidity, total phosphorus) that are currently collected at the existing site being monitored by GBRA. Analytical results will be used in assessments conducted by TCEQ, in stream modeling by the selected consultant and compared to data from existing and historical monitoring locations in the watershed. 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 four quarters, once under dry weather conditions and once during wet weather conditions. The area has been known to experience scattered showers, i.e. afternoon heat-related showers of short duration that may cause some portions of the watershed to be under wet weather conditions while others are not. 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. During wet weather conditions, the safety of the sampling crew will not be compromised in case of lightning or flooding. 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.

One wastewater treatment facility will be sampled once per quarter over the span of the project. Data will be collected to characterize the wastewater facilities’ contributions to the flow regime and pollutant loading. Samples will be collected at the outfall of each facility, before it mixes with the receiving stream. Parameters will include flow, field, and conventional parameters, including biochemical oxygen demand, carbonaceous oxygen demand and chemical oxygen demand. The wastewater facilities measure the effluent flow in million gallons per day. At the time of sampling, the flow will be obtained from the wastewater treatment plant and converted to cubic feet per second.

Three groundwater sites 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. If possible, flow will be measured manually immediately downstream of each associated spring.

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 *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue*, *2003* (RG-415). Additional aspects outlined in Section B below reflect specific requirements for sampling for the TSSWCB Project No.08-06, *Development of a Watershed Protection Plan for Geronimo Creek*, 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^oC	100 mL	48 hours
Hardness	Water	Plastic or glass	Cool, 0-6^oC, H_2SO_4 to pH < 2*	1 L	6 months
TSS	Water	Plastic or glass	Cool, 0-6^oC	1 L	7 days
Nitrate-nitrogen	Water	Plastic or glass	Cool, 0-6^oC	1 L	48 hours
Ammonia-nitrogen	Water	Plastic or glass	Cool, 0-6^oC, H_2SO_4 to pH < 2*	1 L	28 days
Total phosphorus	Water	Plastic or glass	Cool, 0-6^oC, H_2SO_4 to pH < 2*	1 L	28 days
Sulfate	Water	Plastic or glass	Cool, 0-6^oC	1 L	28 days
Chloride	Water	Plastic or glass	Cool, 0-6^oC	1 L	28 days
Chlorophyll a /Pheophytin	Water	Amber plastic or glass	Dark, Cool, 0-6^oC before Fil-tration; Dark, 0^oC after Filtration	1 L	Filter within 24 hours/28 days at 0^oC
E. coli	Water	Sterile, plastic	Cool, 0-6^oC	100 mL	6 hours
BOD	Water	Plastic	Cool, 0-6^oC	1 L	48 hours
C-BOD	Water	Plastic	Cool, 0-6^oC	1 L	48 hours
COD	Water	Plastic	Cool, 0-6^oC, H_2SO_4 to pH < 2*	1 L	28 days
Metals, total	Water	Plastic or glass	Cool, 0-6^oC, HNO_3 to pH < 2*	I L	6 months
Metals, dissolved	Water	Plastic or glass	Cool, 0-6^oC, HNO_3 to pH < 2*	I L	Filtered on site/6 months
Mercury, total	Water	Teflon or glass	Cool, 0-6^oC, HNO_3 to pH < 2*	I L	28 days

*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 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. The sample containers for metals in water are provided by Ana-Lab and are new, certified glass or plastic bottles, or glass or plastic bottles cleaned and documented according to EPA method 1669.

Processes to Prevent Contamination

Procedures outlined in the *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003* (RG-415) outline the necessary steps to prevent contamination of samples, including direct collection into sample containers, when possible; and clean sampling techniques for metals. Field QC samples (identified in Section B5) are collected to verify that contamination has not occurred.

Documentation of Field Sampling Activities

Field sampling activities are documented on field data sheets as presented in Appendix C. 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.

Deficiencies, Nonconformances and Corrective Action Related to Sampling Requirements

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies which affect data quantity and/or quality and render the data unacceptable or indeterminate. Deficiencies related to sampling methods requirements include, but are not limited to, such things as sample container, volume, and preservation variations, improper/inadequate storage temperature, holding-time exceedances, and sample site adjustments.

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 Nonconformance Report (NCR) to document the deficiency.

The GBRA Project Manager, in consultation with the 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 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 Corrective Action Report.

Corrective Action Reports (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.

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 D). The following list of items matches the COC form in Appendix D.

- 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 chain of custody. Ice chests will remain in the possession of the field technician or in the locked vehicle until delivered to the lab. After samples for trace metals are filtered in the field, these sample containers are immediately stored in an ice chest for shipment to Ana-Lab in Kilgore, Texas, by common carrier, accompanied by the chain of custody. If in the event of laboratory equipment failure and in order to meet holding times, chain of custodies and samples will be delivered on ice to the SARA laboratory 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.

Deficiencies, Nonconformances and Corrective Action Related to Chain-of-Custody

Deficiencies are defined as unauthorized deviations from procedures documented in the QAPP or other applicable documents. Nonconformances are deficiencies which affect data quantity and/or quality and render the data unacceptable or indeterminate. Deficiencies related to chain-of-custody include but are not limited to delays in transfer, resulting in holding time violations; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, 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, 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 Corrective Action Report.

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.

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.08-06, *Development of a Watershed Protection Plan for Geronimo Creek*, 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 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 Analytical Methods

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, quality control 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 Corrective Action Report (see Appendix F).

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.

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

The minimum Field QC Requirements are outlined in the *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003* (RG-415). Specific requirements are outlined below. Field QC sample results are submitted with the laboratory data report (see Section A9.).

Field blank – Field blanks are required for total metals-in-water samples when collected without sample equipment (i.e., as grab samples) and a minimum of one field blank for total metals-in-water sample event collected. A field blank consists of deionized water that is taken to the field and poured into the sample container. Field blanks are used to assess the contamination from field sources such as airborne materials, containers, and preservatives. Field blanks are collected when sampling for total mercury and total selenium.

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

Field equipment blank – Field equipment blanks are required for metals-in-water samples when collected using sampling equipment. A minimum of one field equipment blank for metals-in-water samples is collected during the metals sampling event. Afield equipment blank is a sample of reagent water poured into or over a sampling device or pumped through a sampling device. It is collected in the same type of container as the environmental sample, preserved in the same manner and analyzed for the same parameter. Field equipment blanks are collected when sampling for dissolved metals.

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

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 *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003* (RG-415). 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.

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 Deficiencies, Nonconformances, and Correction Action related to Quality Control.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

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 the project samples are analyzed. Calibrations including the standard at the LOQ will meet the calibration requirements of the analytical method or corrective action will be implemented.

LOQ Check Standard – An LOQ check standard 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 standard is spiked into the sample matrix at a level less than or near the LOQ for each analyte for each batch of samples that are run.

The LOQ check standard is carried through the complete preparation and analytical process. LOQ check standards are run at a rate of one per analytical batch. A batch is defined as 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.

The percent recovery of the LOQ check standard 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 standard:

%R = SR/SA * 100

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

Laboratory Control Standard (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. 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. The LCS is used to document the bias of the analytical process. LCSs are run at a rate of one per batch. A batch is defined as a set of environmental samples that are prepared and/or analyzed together within the same process using the same lot of reagents.

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

Performance limits and control charts are used to determine the acceptability of LCS analyses. Project control limits are specified in Table A7.1.

Laboratory Duplicates - A laboratory duplicate is prepared in the laboratory by splitting aliquots of an LCS. Both samples are carried through the entire preparation and analytical process. LCS duplicates are used to assess precision and are performed at a rate of one per batch. A batch is defined as a set of environmental samples that are prepared and/or analyzed together within the same process using the same lot of reagents.

For most parameters, precision is calculated by the relative percent difference (RPD) of LCS duplicate results as defined by 100 times the difference (range) of each duplicate set, divided by the average value (mean) of the set. For duplicate results, X1 and X2, the RPD is calculated from the following equation:

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

A bacteriological duplicate is considered to be a special type of laboratory duplicate and applies when bacteriological samples are run in the field as well as in the lab. Bacteriological duplicate analyses are performed on samples from the sample bottle on a 10% basis. Results of bacteriological duplicates are evaluated by calculating the logarithm of each result and determining the range of each pair.

Performance limits and control charts are used to determine the acceptability of duplicate analyses. Project control limits are specified in Table A7.1. The specifications for bacteriological duplicates in Table A7.1 apply to samples with concentrations > 10 org. / 100mL.

Laboratory equipment blank – Laboratory equipment blanks are prepared at the laboratory where collection materials for metals sampling equipment are cleaned between uses. These blanks document that the materials provided by the laboratory are free of contamination. The QC check is performed before the metals sampling equipment is sent to the field. The analysis of laboratory equipment blanks should yield values less than the LOQ. Otherwise, the equipment should not be used.

Matrix spike (MS) –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 are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Percent recovery of the known concentration of added analyte is used to assess accuracy of the analytical process. The spiking occurs prior to sample preparation and analysis. Spiked samples are routinely prepared and analyzed at a rate of 10% of samples processed, or one per batch whichever is greater. A batch is defined as 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. The information from these controls is sample/matrix specific and is not used to determine the validity of the entire batch. The MS is spiked at a level less than or equal to the midpoint of the calibration or analysis range for each analyte. Percent recovery (%R) is defined as 100 times the observed concentration, minus the sample concentration, divided by the true concentration of the spike.

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 laboratory shall document the calculation for %R. The percent recovery of the matrix spike is calculated using the following equation in which %R is percent recovery, SSR is the observed spiked sample concentration, SR is the sample result, and SA is the reference concentration of the spike added:

%R = (SSR – SR)/SA * 100

Measurement performance specifications for matrix spikes are not specified in this document.

The results are compared to the acceptance criteria as published in the mandated test method. Where there are no established criteria, the laboratory shall determine the internal criteria and document the method used to establish the limits. For matrix spike results outside established criteria, corrective action shall be documented or the data reported with appropriate data qualifying codes.

Method blank –A method blank is a sample of matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as the samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. The method blank is carried through the complete sample preparation and analytical procedure. 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 then 5% of the lowest value of the batch, or corrective action will be implemented.

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 quality control include but are not limited to field and laboratory quality control 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 Corrective Action Report (see Appendix F).

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 *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003* (RG-415). 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 *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003* (RG-415). 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 TSSWCB.

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

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

No special requirements for acceptance are specified for field sampling supplies and consumables. All field supplies and consumables are accepted upon inspection for breaches in shipping integrity.

All new batches of field and laboratory supplies and consumables received by the GBRA laboratory are inspected upon receipt for damage, missing parts, expiration date, and storage and handling requirements. Chemicals, reagents, and standards are logged into an inventory database that documents grade, lot number, manufacturer, dates received, opened, and emptied. All reagents shall meet ACS grade or equivalent where required. Acceptance criteria are detailed in organization's standard operating procedures.

B9 NON-DIRECT MEASUREMENTS

This QAPP does not include the use of routine data obtained from non-direct measurement sources.

B10 DATA MANAGEMENT

Data Management Process

Field technicians and laboratory personnel follow protocols that ensure that data collected for the TSSWCB project #08-06 (*Development of a Watershed Protection Plan for Geronimo Creek)* maintains its integrity and usefulness in the WPP development. Field data collected at the time of the sampling event is logged by the field technician, along with notes on sampling conditions on field data sheets. The field sheet is the responsibility of the field technician and is transported with the sample to the laboratory. The lab technician /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 chain of custody. The lab technician /sample custodian must review the chain of custody to verify that it is filled out correctly and complete. Lab technicians take receipt of the sample and review the chain of custody, begin sample prep or analysis and transfer samples into the refrigerator for storage. Examples of the field data sheet and chain of custody used can be found in Appendices C and D.

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, serves as the Quality Assurance Officer. The Regional Laboratory Director/QAO or the QAO designee reviews the report that is generated when all analyses are complete. Again, the report is reviewed to see that all necessary information is included and that the data quality objectives have been met. When the report 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 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, the laboratory and water quality databases are corrected.

The GBRA Project Manager, in consultation with GBRA QAO (and other affected individuals/organizations), will determine if the error constitutes a nonconformance. 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 Corrective Action Report (see Appendix F).

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 data summary report that accompanies the data submittal. 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.

The GBRA Project Manager is responsible for transmitting the data to the TSSWCB Project Manager, who then transmits the data to TCEQ. GBRA will transmit the data to the consultant chosen to perform the geostatistical analysis and modeling. If errors are found after the TSSWCB, TCEQ or consultant reviews, those errors are corrected by the GBRA Project Manager, logged in a data correction log and all participants are notified.

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

Field data collected → Field data sheets → Lab database → Report generation → Quality control review by GBRA QAO → 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 → TSSWCB Project Manager and Consultant

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

Laboratory data → Laboratory analysis logs → Lab database → Report generation → Quality control review by GBRA QAO → 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 → TSSWCB Project Manager and Consultant

Data Errors and Loss

The GBRA Regional Laboratory Director supervises the GBRA Regional laboratory and serves as the Quality Assurance Officer. The Regional Laboratory Director/QAO or the QAO designee reviews the report that is generated when all analyses are complete. The report is reviewed to see that all necessary information is included and that the data quality objectives have been met. When the report 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 data for reasonableness and if errors or anomalies are found the report is returned to the laboratory director 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, the laboratory and water quality databases are corrected. The GBRA Project Manager is responsible for transmitting the data to the TSSWCB Project Manager who then transmits the data to TCEQ. The GBRA Project Manager is responsible for transmitting the data to the consultant chosen to perform geostatistical analysis and modeling. If errors are found after the TSSWCB, TCEQ or consultant reviews, those errors are corrected by the GBRA Project Manager, logged in a data correction log and all participants are notified.

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 into the GBRA ITRAX for permanent record.

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

The data reports that are generated are reviewed by the GBRA 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. 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 scanned into the GBRA ITRAX 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 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.

After data is sent to the TSSWCB for review and submittal to TCEQ and the consultant chosen to perform the geostatistical analysis and modeling, 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 scanned into the GBRA ITRAX for permanent record.

The GBRA ITRAX is part of the network that is backed up each evening. 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 Sequel 2000. The systems are operating in Windows 2003 and any additional software needed for word processing, spreadsheet or presentations uses Microsoft Office 2003.

Information Resource Management Requirements

Data will be managed in accordance with the TCEQ Surface *Water Quality Monitoring Data Management Reference Guide, GIS Policy* (TCEQ OPP 8.11), *GPS Policy* (TCEQ OPP 8.12) and applicable GBRA information resource management policies. The personnel collecting data for the TSSWCB project #08-06 (*Development of a Watershed Protection Plan for Geronimo Creek)* do not create TCEQ certified locational data using Global Positioning System (GPS) equipment. GPS equipment may be used as a component of the information required by the Station Location (SLOC) request process, but TCEQ staff are responsible for creating the certified locational data that will ultimately be entered into the TCEQ's SWQMIS. Any information developed for the TSSWCB project #08-06 (*Development of a Watershed Protection Plan for Geronimo Creek)* using a Geographic Information System (GIS) will be used solely to meet deliverable requirements and will not be submitted to the TCEQ as a certified data set.

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 #08-06 (*Development of a Watershed Protection Plan for Geronimo Creek)*	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 TSSWCB 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 Section A7. Only those data which are supported by appropriate quality control data and meet the measurement performance specifications defined for this project will be considered acceptable, and will be reported to TSSWCB.

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

Another element of the data validation process is consideration of any findings identified during the monitoring systems audit conducted by the TSSWCB Quality Assurance Officer. 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 TSSWCB.

If any requirements or specifications of the TSSWCB project #08-06 (*Development of a Watershed Protection Plan for Geronimo Creek)* 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 Data Manager with the data. This information is communicated to the TSSWCB by the GBRA in the Data Summary. The data is not transmitted to TSSWCB, TCEQ or consultant chosen to perform geostatistical analysis and modeling for their use in assessment or modeling.

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 Field Technicians
Post-calibrations checked to ensure compliance with error limits	GBRA Field Technicians
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/Ana-Lab Laboratory Directors(QAOs)
Laboratory data calculated, reduced, and transcribed correctly	GBRA/SARA/Ana-Lab Laboratory Directors(QAOs) and GBRA Project Manager
LOQs consistent with requirements for Ambient Water Reporting Limits	GBRA/SARA/Ana-Lab Laboratory Directors(QAOs) and GBRA Project Manager
Analytical data documentation evaluated for consistency, reasonableness and/or improper practices	GBRA/SARA/Ana-Lab Laboratory Directors(QAOs) and GBRA Project Manager
Analytical QC information evaluated to determine impact on individual analyses	GBRA/SARA/Ana-Lab Laboratory Directors(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 Field Technicians
Sampling and analytical data gaps checked and documented	GBRA 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 in the assessment process for the Texas Water Quality Inventory and 303(d) List.

Appendix A Sampling Process Design and Monitoring Schedule

Sample Design Rationale

The sample design is based on the intent of the TSSWCB project #08-06 (*Development of a Watershed Protection Plan 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. 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. Utilizing historical knowledge of the watershed, GBRA developed a sampling plan to ensure a comprehensive water monitoring strategy within the watershed.

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 and for modeling by TAMU SSL. 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, Volume 1* (RG-415). Overall consideration is given to accessibility and safety. All monitoring activities have been developed with the TSSWCB project #08-06 (*Development of a Watershed Protection Plan for Geronimo Creek)* 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.

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

Monitoring Sites

The Monitoring Table for the TSSWCB project #08-06 (*Development of a Watershed Protection Plan for Geronimo Creek)* are presented on the following page.

<u>Legend for Table B1.1:</u>

GB = Guadalupe Blanco River Authority
RT = Program code for routine samples
BF = Program code for targeted monitoring samples
Bacteria = E. coli
Conventional = total suspended solids, turbidity, sulfate, chloride, nitrate nitrogen, ammonia nitrogen, chlorophyll a, pheophytin, total hardness, total phosphorus, BOD (effluent only), CBOD(effluent only) and COD (effluent only)
Flow = flow collected by gage, electric, mechanical or Doppler; includes severity
Field = pH, temperature, conductivity, dissolved oxygen

Table B1.1 Monitoring Sites and Schedule

Segment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	Metals in Water	Bacteria	Con-ventional	Flow	Field	Comments
1804A	GB700	Geronimo Creek at Huber Road, Upstream of the Alligator Creek Confluence		GB	RT		12	12	12	12	
1804A	GB700	Geronimo Creek at Huber Road, Upstream of the Alligator Creek Confluence		GB	BF		4	4	4	4	1
1804A	GB701	Alligator Creek at Huber Road (Headwater)		GB	RT	1	12	12	12	12	
1804A	GB701	Alligator Creek at Huber Road (Headwater)		GB	BF		4	4	4	4	1
1804A	14932	Geronimo Creek at SH 123		GB	RT		12	12	12	12	
1804A	14932	Geronimo Creek at SH 123		GB	BF		4	4	4	4	1
1804A	12576	Geronimo Creek at Haberle Road		GB	RT	1	12	12	12	12	3
1804A	12576	Geronimo Creek at Haberle Road		GB	BF		4	4	4	4	1
1804A	GB702	Bear Creek at East Walnut Street		GB	RT		12	12	12	12	
1804A	GB702	Bear Creek at East Walnut Street		GB	BF		4	4	4	4	1
1804A	GB703	Geronimo Creek at HWY 90A		GB	RT		12	12	12	12	
1804A	GB703	Geronimo Creek at HWY 90A		GB	BF		4	4	4	4	1
1804A	GB704	Geronimo Creek at Mount Vernon, Downstream of the Bear Creek Confluence		GB	RT		12	12	12	12	
1804A	GB704	Geronimo Creek at Mount Vernon, Downstream of the Bear Creek Confluence		GB	BF		4	4	4	4	1
1804A	GB705	Geronimo Creek at Hollub Lane, Downstream of the City of Seguin WWTF		GB	RT	1	12	12	12	12	
1804A	GB705	Geronimo Creek at Hollub Lane, Downstream of the City of Seguin WWTF		GB	BF		4	4	4	4	1
1804A	GB706	Alligator Creek at FM 1102		GB	BF		4	4	4	4	

Table B1.1 Monitoring Sites and Schedule

Segment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	Metals in Water	Bacteria	Con-ventional	Flow	Field	Comments
1804A	GB707	Alligator Creek at FM 1101		GB	BF		4	4	4	4	
1804A	GB708	Alligator Creek at Barbarossa Road (CR 107A)		GB	BF		4	4	4	4	
1804A	GB709	Geronimo Creek at Pieper Road (CR 130)		GB	BF		4	4	4	4	
1804A	GB710	Unnamed Tributary at Heinemeyer Road (CR 121)		GB	BF		4	4	4	4	
1804A	GB711	Unnamed Tributary at Laubach Road (CR 108)		GB	BF		4	4	4	4	
1804A	12575	Geronimo Creek at FM 20		GB	BF		4	4	4	4	
1804A	GB712	10277-003 City of Seguin Geronimo Creek WWTF		GB	-		4	4	4	4	2
1804A	GB713	Water Well near Alligator Creek Headwater Springs at Huber Road		GB	BF		4	4	4	4	
1804A	GB714	Water Well near Geronimo Creek at Laubach Road		GB	BF	1	4	4	4	4	
1804A	GB715	Water Well near Geronimo Creek at Hollub Lane		GB	BF		4	4	4	4	

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. The data collected from WWTF sampling will not be used for enforcement or compliance monitoring by TCEQ. As such, results will not be reported to TCEQ for inclusion in any data tracking system. Monitor type code is not applicable.

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

Appendix B. Field Data Sheet

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)	72053		DAYS SINCE LAST SIGNIFICANT PRECIPITATION
00400		pH (s.u)	01351		FLOW SEVERITY 1-no flow 2-low
00300		D.O. (mg/L)			3-normal 5-high 4-flood 6-dry
00094		SPECIFIC COND (µmhos/cm)	00061		INSTANTANEOUS STREAM FLOW (ft³/sec)
00480		SALINITY (ppt, marine only)	89835		FLOW MEASUREMENT METHOD
50060		CHLORINE RESIDUAL (mg/L)			1- Flow Gage Station 2- Electric 3- Mechanical 4- Weir/Flume
00078		SECCHI DISK (meters)	74069		FLOW ESTIMATE (ft³/sec)
82078		TURBIDITY-FIELD (NTU)	82903		TOTAL WATER DEPTH (meters)
31616		FECAL COLIFORM (#/100 ml)	00055		WATER VELOCITY (maximum)(ft/sec)
31699		E. coli (#/100 ml) (Colilert Method)	89864		MAXIMUM POOL WIDTH (meters) *
31701		Enterococci (#/100 ml) (Enterolert Method)	89869		POOL LENGTH (meters) *
			89865		MAXIMUM POOL DEPTH (meters) *
			89870		% POOL COVERAGE IN 500 M REACH *

*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 Form

GBRA
GUADALUPE-BLANCO RIVER AUTHORITY

Chain of Custody

Guadalupe-Blanco River Authority -
933 E. Court Street • Seguin, Texas
(830) 379-5822 • Fax: (830) 401-099

Account #: ____________________

Customer Information

Name: ____________________ Phone # ____________________

Adress: ____________________ Cell #: ____________________ Email:

____________________ Fax #: ____________________

Sample Collected By: ____________________ ____________________

Signature Printed Name

Temp C°	Date Collected	Time Collected	Matrix	Sx Vol.	Sample Name/ Description	TCEQ I.D. #	Grab/ Comp.	Analysis Requested	GBR Sample

Delivered By: ____________________ Date/Time: __________ Received By: ____________________

Delivered By: ____________________ Date/Time: __________ Received By: ____________________

** Special Notes: ____________________

Condition of Container(s), (intact) ____________________ Preservation: ____________________ (acidified,

Ice: ____________ (y/n) Number of Containers: __________ Date/Time of Preservation: ____________

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, TCEQ or TAMU SSL; and**
- **Other discrepancies.**

-
-
-
-
-
-
-

Data Manager: ______________________________

Date: ___________________________

Appendix E Corrective Action Form

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.