SURFACE WATER QUALITY MONITORING PROJECT
FOR THE
GUADALUPE RIVER BASIN

Quality Assurance Project Plan
(With amendment 1, 2, 3 and 4)

Guadalupe-Blanco River Authority
933 E. Court St.
Seguin, TX 78155

Clean Rivers Program
Monitoring Operations Division
Texas Commission on Environmental Quality
P.O. Box 13087, MC 165
Austin, Texas 78711-3087

Effective Period: FY 2006 to FY 2007

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

Debbie Magin
Director of Water Quality Services
933 E. Court St.
Seguin, Texas 78155
(830) 379-5822
dmagin@gbra.org

A1 APPROVAL PAGE

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Monitoring Operations Division

Steve Spaw, Director Date Monitoring Operations Division	Patrick Roques, Manager Date Water Quality Monitoring & Assessment Section
Laurie Curra Date Program Manager, Clean Rivers Program	Allison Woodall Date Project Manager, Clean Rivers Program

Compliance Support Division

Jose A. Franco, Director Date Compliance Support Division	Stephen Stubbs Date TCEQ Quality Assurance Manager
Daniel R. Burke Date CRP Lead Quality Assurance Specialist Quality Assurance Section	

GUADALUPE-BLANCO RIVER AUTHORITY

Debbie Magin Date GBRA Project Manager	Josephine Longoria Date GBRA Quality Assurance Officer

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 ensure that the documentation will be available for review. (See sample letter in Attachment 1 of this document.)

A2 TABLE OF CONTENTS

Tables:

Figures:

LIST OF ACRONYMS

AWRL	**Ambient Water Reporting Limit**
BMP	**Best Management Practices**
CAR	**Corrective Action Report**
COC	**Chain-of Custody**
CRP	**Clean Rivers Program**
DOC	**Demonstration of Capability**
DQO	**Data Quality Objective**
FY	**Fiscal Year**
GBRA	**Guadalupe-Blanco River Authority**
LCRA	**Lower Colorado River Authority**
LIMS	**Laboratory Information Management System**
MDMA	**Monitoring Data Management & Analysis**
QA	**Quality Assurance**
QM	**Quality Manual**
QAO	**Quality Assurance Officer**
QAPP	**Quality Assurance Project Plan**
QAS	**Quality Assurance Specialist**
QC	**Quality Control**
QMP	**Quality Management Plan**
RBP	**Rapid Bioassessment Protocol**
RL	**Reporting Limit**
RWA	**Receiving Water Assessment**
SARA	**San Antonio River Authority**
SOP	**Standard Operating Procedure**
SWQM	**Surface Water Quality Monitoring**
TMDL	**Total Maximum Daily Load**
TCEQ	**Texas Commission on Environmental Quality**
TRACS	**TCEQ Regulatory Activities and Compliance System**
TSWQS	**Texas Surface Water Quality Standards**
UGRA	**Upper Guadalupe River Authority**
VOA	**Volatile Organic Analytes**
WMT	**Watershed Management Team**
WVWA	**Wimberley Valley Watershed Association**

A3 DISTRIBUTION LIST

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

Allison Woodall, Project Manager
Clean Rivers Program
MC-165
(512) 239-4628

Daniel R. Burke
CRP Lead Quality Assurance Specialist
MC-176
(512) 239-6340

Dr. David W. Sullivan
Manager, Monitoring Data Management and Analysis Section
MC-165
(512) 239-1623

GBRA
933 E. Court St.
Seguin, Texas 78155

Debbie Magin, Project Manager
(830) 379-5822

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

UGRA
125 Lehman, Suite 100
Kerrville, TX 78028

Tara Bushnoe
(830) 896-5456 x.227

VILLAGE OF WIMBERLEY
1405 Mt. Sharp Rd.
Wimberley, TX 78676

David Baker
(512) 847-9391

SARA ENVIRONMENTAL LAB
100 E. Guenther St.
San Antonio, TX 78283

Chuck Loera
(210) 227-1373

ALBION ENVIRONMENTAL
College Station, TX 77845

Dr. Paul Boothe
(979) 268-2677

LCRA ENVIRONMENTAL LAB SERVICES
Austin, TX 78744

Marites Kallick
(512) 356-6022

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 ensure that the documentation will be available for review.

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

TCEQ

Laurie Curra
CRP Program Manager

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

Daniel R. Burke
CRP Lead Quality Assurance Specialist

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

Allison Woodall
CRP Project Manager

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

Eric Reese
CRP Data Manager

Responsible for coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval. Performs automated data validation routines and coordinates error correction. Provides quality assured data sets to TCEQ Information Resources in compatible formats for uploading to the statewide database. Generates reports to assist CRP Project Managers' data review. Provides training and guidance to CRP and Planning Agencies on technical data issues. Reviews and approves data-related portions of program QMP and project-specific QAPPs. Develops and maintains Standard Operating Procedures for CRP data management.

Laurie Curra
CRP Project Quality Assurance Specialist

Serves as liaison between CRP management and TCEQ QA management. Participates in the development, approval, implementation, and maintenance of written quality assurance standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Serves on planning team for CRP special projects. Coordinates documentation and implementation of corrective action for the CRP.

GBRA

Debbie Magin
GBRA Project Manager

Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Ensures monitoring systems audits are conducted to ensure QAPPs are followed by GBRA participants and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures CRP project managers and/or QA Specialists are notified of deficiencies and nonconformances, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ. Responsible for writing and maintaining the QAPP and monitoring its implementation. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP.

Josephine Longoria
GBRA Quality Assurance Officer

Responsible for coordinating the implementation of the QA program. Responsible for identifying, receiving, and maintaining project quality assurance records. Responsible for coordinating with the TCEQ QAS 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 and maintains records of data verification and validation. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Conducts monitoring systems audits on project participants to determine compliance with project and program specifications, issues written reports, and follows through on findings. Ensures that field staff are properly trained and that training records are maintained.

Debbie Magin
GBRA Data Manager

Responsible for ensuring that field data are properly reviewed and verified. Responsible for the transfer of basin quality-assured water quality data to the TCEQ in a format compatible with the SWQM portion of the TRACS database. Maintains quality-assured data on GBRA internet sites.

Lee Gudgell

GBRA Laboratory Technician III/Field Technician

Responsible for coordinating sampling events, including maintenance of sampling bottles, supplies, and equipment. Maintains records of field data collection and observations. Conducts monitoring systems audits on project participants to determine compliance with project and program specifications, issues written reports, and follows through on findings.

Josephine Longoria
GBRA Regional Laboratory Director

The responsibilities of the lab director include supervision of laboratory, purchasing of equipment, maintain quality assurance manual for laboratory operations, and supervision of lab safety program. Additionally, the lab director will review and verify all field and laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validated against the data quality objectives listed in Tables A7.1.

Juan Carmona
GBRA Laboratory Analyst 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.

Brian Lyssy
GBRA 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.

Carissa Castellanos
GBRA 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.

Rachele Cuellar
GBRA Laboratory Technician II

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.

Vacant
GBRA Part-Time Laboratory Technician

Perform laboratory analysis and/or collect field data and samples as directed by laboratory director.

ALBION LABORATORIES

Dr. Paul N. Boothe

Albion Laboratory Director

The responsibilities of the lab director include supervision of laboratory, purchasing of equipment, maintain quality assurance manual for laboratory operations, and supervision of lab safety program. The Albion lab director will review and verify all field and laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validated against the measurement performance specifications listed in Tables A7.1.

Dr. Paul N. Boothe
Albion Quality Assurance Officer

Maintains operating procedures that are in compliance with the QAPP, amendments and appendices. Assists with monitoring systems audits for CRP projects. Additionally, the Albion QAO will review and verify all laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validated against the measurement performance specifications listed in Tables A7.1.

LCRA ENVIRONMENTAL LABORATORY SERVICES

Marites Kallick
LCRA Project Manager

Reviews and verifies all laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validataed against the measurement performance specifications listed in Table A7.1.

Alicia C. Gill
LCRA Lab Manager

The responsibilities of the lab director include supervision of laboratory, purchasing of equipment, maintain quality assurance manual for laboratory operations, and supervision of lab safety program. The LCRA lab director will review and verify all field and laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validated against the measurement performance specifications listed in Table A7.1.

Hollis Pantalion
LCRA Quality Assurance Officer

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 LCRA's Environmental Laboratory Services. Assists with monitoring systems audits for CRP projects.

SARA

Chuck Loera
SARA Lab Manager

The responsibilities of the lab director include supervision of laboratory, purchasing of equipment, and supervision of lab safety program. The SARA lab director will review and verify all field and laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and then validated against the measurement performance specifications listed in Table A7.1.

David Black
SARA 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 SARA's Environmental Services Department. Assists with monitoring systems audits for CRP projects.

UGRA

Tara Bushnoe
UGRA Project Manager

Responsible for directing CRP activities in the upper Guadalupe River Basin, in Kerr County. Assures strict compliance with the CRP requirements for project administration and quality assurance. Responsible for coordinating and conducting sampling events, including maintenance of sampling bottles, supplies, and equipment. Maintains records of field data collection and observations. Assists GBRA staff in collecting and analyzing bioassessment samples.

Tara Bushnoe
UGRA Quality Assurance Officer

Maintains operating procedures that are in compliance with the QAPP, amendments and appendices. Assists with monitoring systems audits for CRP projects. Ensures that field staff are properly trained and that training records are maintained. Additionally, the UGRA QAO will review and verify all field and laboratory data for integrity and continuity, reasonableness and conformance to project requirements, validating the field and lab data in accordance with the data quality objectives listed in Table A7.2.

Tara Bushnoe
UGRA Data Manager

Responsible for ensuring that field and lab data are properly reviewed and verified. Responsible for the transfer of basin quality-assured water quality data to the TCEQ in a format compatible with SWQMIS (formerly the SWQM portion of the TRACS database). Maintains link from the water monitoring section of the UGRA web page to the Kerr County monitoring sites section of the GBRA web page.

Esther Salyers
UGRA Laboratory Director

The responsibilities of the lab director include supervision of the laboratory and lab staff, maintaining quality assurance manual for laboratory operations, and supervision of lab safety program. Performs laboratory analyses for inorganic constituents, nutrients, etc. Additionally, the lab director will review and verify all laboratory data for integrity and continuity, reasonableness and conformance to project requirements, validating the lab data in accordance with the data quality objectives listed in Table A7.2. Will assist when necessary in the collection of field data and samples for stream monitoring and chemical sampling of environmental sites.

Ann Stock
UGRA Laboratory Analyst/Field Technician

Performs laboratory analyses for inorganic constituents, nutrients, etc.; assists in the collection of field data and samples for stream monitoring and chemical sampling of environmental sites.

Tina Meyer

UGRA Field Technician

Will assist when necessary in the collection of field data and samples for stream monitoring and chemical sampling of environmental sites.

VILLAGE OF WIMBERLEY

David Baker
Village of Wimberley Project Manager

Responsible for directing CRP activities for the Wimberley Valley Watershed Association and the Village of Wimberley for the Blanco River-Cypress Creek Water Quality Monitoring Study. Assures strict compliance with the CRP requirements for project administration and quality assurance. Maintains operating procedures that are in compliance with the QAPP. Assists with monitoring systems audits for CRP projects. Responsible for ensuring that field data are properly reviewed and verified. Responsible for the transfer of project quality-assured water quality data to GBRA Project Manager.

Jason Pinchback
Village of Wimberley Field Technician

Responsible for coordinating sampling events, including maintenance of sampling bottles, supplies, and equipment. Maintains records of field data collection and observations. Responsible for the transfer of project quality-assured water quality data to GBRA Project Manager.

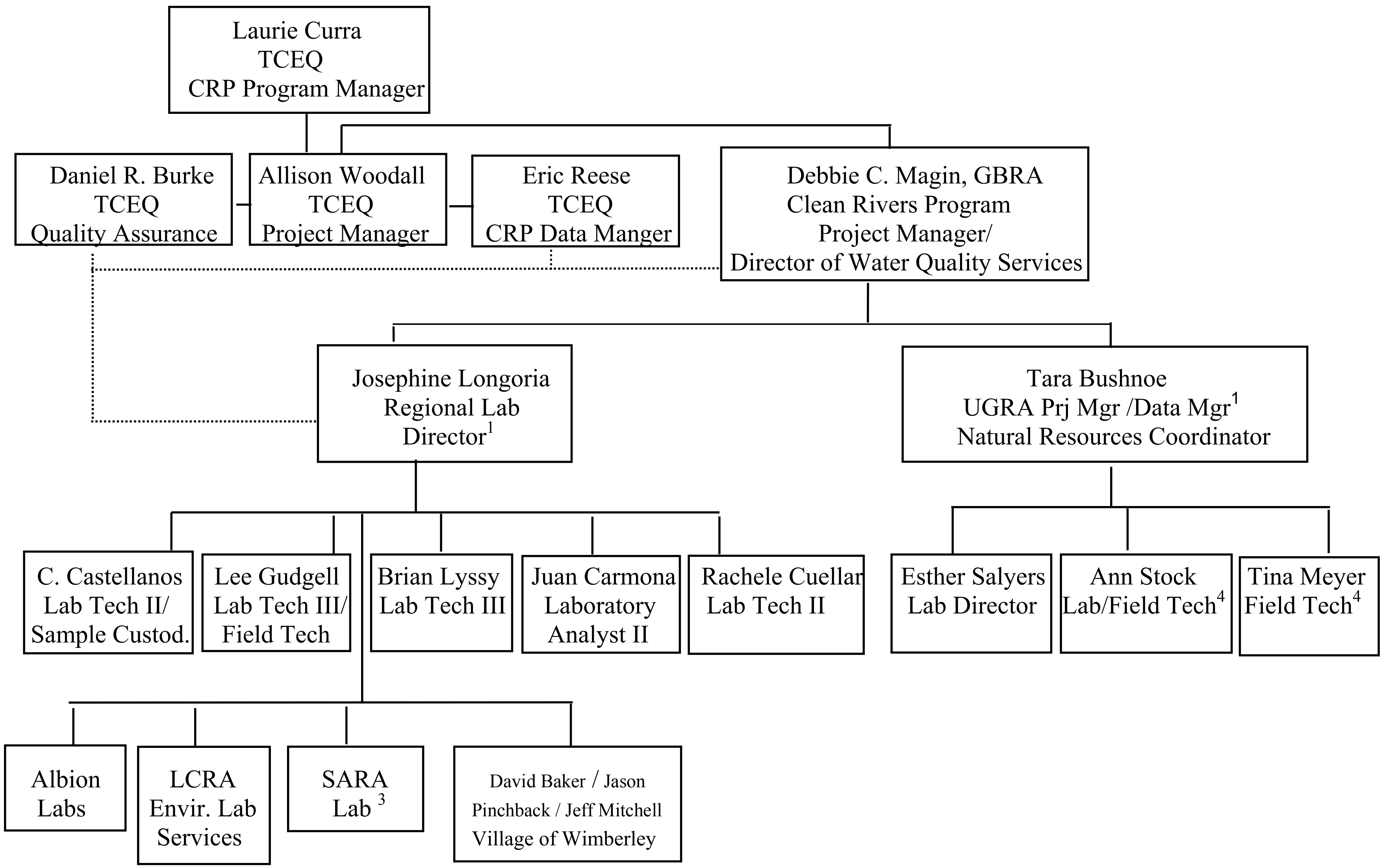
David Baker
Village of Wimberley Field Technician

Responsible for coordinating sampling events, including maintenance of sampling bottles, supplies, and equipment. Maintains records of field data collection and observations. Responsible for the transfer of project quality-assured water quality data to GBRA Project Manager.

Jeff Mitchell
Village of Wimberley Field Technician

Responsible for coordinating sampling events, including maintenance of sampling bottles, supplies, and equipment. Maintains records of field data collection and observations. Responsible for the transfer of project quality-assured water quality data to GBRA Project Manager.

Figure A4.1 CRP Organizational Chart[2]-- Lines of Communication



1 Serve as Quality Assurance Officer for each River Authority
2 See Project/Task Organization in this section for a description of each position’s responsibilities.
3 SARA laboratory will be used in the event of an equipment failure and the need to meet holding times
4 Positions listed but for final two quarters of 2007 samples will be collected by GBRA.

A5 PROBLEM DEFINITION/BACKGROUND

In 1991, the Texas Legislature passed the Texas Clean River Act (Senate Bill 818) in response to growing concerns that water resource issues were not being pursued in an integrated, systematic manner. The act requires that ongoing water quality assessments be conducted for each river basin in Texas, an approach that integrates water quality issues within the watershed. The CRP legislation mandates that “each river authority (or local governing entity) shall submit quality-assured data collected in the river basin to the commission.” “Quality-assured data” in the context of the legislation means “data that comply with commission rules for surface water quality monitoring programs, including rules governing the methods under which water samples are collected and analyzed and data from those samples are assessed and maintained.” This QAPP addresses the program developed between the GBRA and the TCEQ to carry out the activities mandated by the legislation. The QAPP was developed and will be implemented in accordance with provisions of the *Quality Management Plan for the Clean Rivers Program* (most recent version).

The purpose of this QAPP is to clearly delineate GBRA QA policy, management structure, and procedures which will be used to implement the QA requirements necessary to verify and validate the surface water quality data collected. The QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are scientifically valid and legally defensible. This process will ensure that data collected under this QAPP and submitted to the statewide database have been collected and managed in a way that guarantees its reliability and therefore can be used in water quality assessments and other programs deemed appropriate by the TCEQ. Project results will be used to support the achievement of Clean Rivers Program objectives as contained in the Clean Rivers *Program Guidance and Reference Guide* FY 2006 -2007.

The GBRA in conjunction with UGRA have been monitoring water quality since the mid-1980s and have been actively involved in water quality planning since the early 1970s. Through the Clean Rivers Program’s Surface Water Quality Monitoring Project, the river authorities have enhanced and modified their existing programs. The expansion of the existing monitoring efforts has allowed the river authorities’ staffs to gather data to characterize water quality conditions in areas not previously monitored. The program for FY 2006-2007 includes continuation of the existing monitoring program, including biological monitoring, and annual sampling for trace metals concentrations and organics in sediment at selected sites. Additionally, organics analyses will be performed one time in FY2007 on one site in Kerrville. Two systematic sites will be added in 2006-2007 and will be monitored for the duration of the biennium. Beginning in April 2007, GBRA will sample the final two quarterly sampling events for the UGRA, but will not continue the weekly bacteriological sampling under the CRP QAPP.

The monitoring goals for the CRP program in the Guadalupe River Basin are to verify that the overall health of the stream is and remains in good condition.

The Village of Wimberley is a monitoring entity in the Guadalupe River Basin that contributes data collected under the GBRA QAPP. The Village will collect data at sites on the Blanco River and Cypress Creek monthly. These sites are coordinated with the GBRA and TCEQ monitoring schedule annually. Figure A5.1 is a map of the sampling locations for FY 2006.

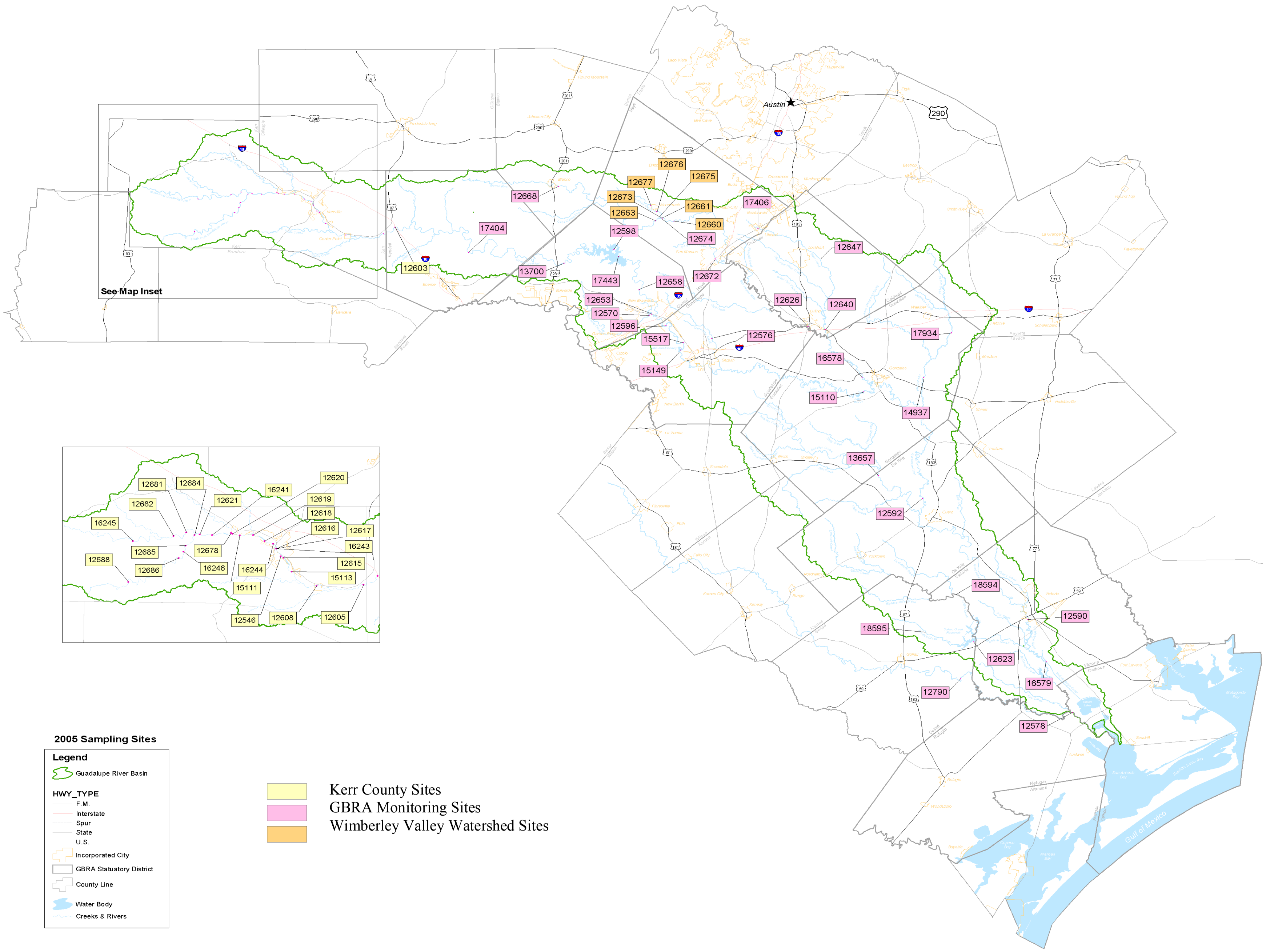


Figure A5.1 Map of Basin with Sampling Locations
(see Appendix B for 2007 schedule and map)

A6 PROJECT/TASK DESCRIPTION

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

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

Amendments to the QAPP

Revisions to the QAPP may be necessary to address incorrectly documented information or to reflect changes in project organization, tasks, schedules, objectives, and methods. Requests for amendments will be directed from the GBRA Project Manager to the CRP Project Manager electronically. Amendments are effective immediately upon approval by the GBRA Project Manager, the GBRA QAO, the CRP Project Manager, the CRP Lead QA Specialist, and the CRP Project QA Specialist. They will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by the GBRA Project Manager.

Special Project Appendices

Projects requiring QAPP appendices will be planned in consultation with the GBRA and the TCEQ Project Managers and TCEQ technical staff. Appendices will be written in an abbreviated format and will reference the Basin QAPP where appropriate. Appendices will be approved by the GBRA Project Manager, the GBRA QAO, the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist and other TCEQ personnel as appropriate. Copies of approved QAPPs appendices will be distributed by the GBRA to project participants before data collection activities commence.

A7 QUALITY OBJECTIVES AND CRITERIA

The purpose of routine water quality monitoring is to collect surface water quality data needed for conducting 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 and assessed by the TCEQ.

Systematic watershed 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. Due to the limitations regarding these data (e.g., not temporally representative, limited number of samples, biological sampling does not meet the specimen vouchering requirements), the data will be used to determine whether any locations have values exceeding the TCEQ's water quality criteria and/or screening levels (or in some cases values elevated above normal). The GBRA will use this information to determine future monitoring priorities. Typically, metals in water and organics in sediment samples are collected using the systematic approach, which allows new sites to be chosen every 1 to 2 years and enhances spatial coverage. The sites listed in Appendix B do not indicate a Program Code (Monitoring Type) of IS for the metals in water or organics in sediment analyses since this would require unnecessary duplication of site information.

GBRA will conduct biological monitoring using a systematic approach. The biological monitoring will adhere to the specifications described in the TCEQ *Surface Water Quality Monitoring Procedures,* *Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2005* (RG-416). One difference in methods is with respect to vouchering requirements: GBRA will maintain voucher specimens for each species found in the basin, and will retain questionable or unusual vouchers found during a sampling event. Due to this difference in methods, biological data will be reported using the Program Code BN. The BN Program Code refers to biological sampling that follows SWQM Procedures but does not meet the specimen vouchering requirements. The objectives of the Routine Biological Monitoring are to:

- inventory fish and benthic macroinvertebrate communities,
- collect data to be used for community structure trend analysis,
- where possible, correlate measures of chemical water quality to biological information,
- verify the Aquatic Life Use designations assigned to these water bodies, and
- collect data useful to the TCEQ for assessing Aquatic Life Use assessment.

GBRA will conduct diel water quality monitoring using a systematic approach. The diel monitoring will adhere to the specifications described in the TCEQ ***Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003*** (RG-415). The diel data will be reported using the Program Code DI to distinguish it as a unique type of monitoring that requires a specific type of assessment in accordance with TCEQ's ***Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*.**

The organics in sediment sampling scheduled in Appendix B follows the systematic approach. The purpose for this sampling is to determine whether and at what concentrations pollutants associated with urban activities are found in stream sediment. The site chosen for this sampling is downstream of urban areas. The organic compounds to be analyzed are identified in Table A7.1. All other applicable sections contain the required information for organics in sediment analyses to be conducted.

The SARA laboratory has been included in the QAPP and on Table A7.1 so that in the event of an equipment failure, samples can be processed within the prescribed holding time. The SARA laboratory analyzes samples for the San Antonio River Authority's Clean Rivers Program and operates under their accepted QAPP, which assures that the appropriate quality control system is in place for the analyses of the GBRA samples.

The measurement performance specifications to support the project objectives for a minimum data set are specified in Tables A7.1 through A7.3, and in the text following.

Table A7.1 GBRA Measurement Performance Specifications

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	RECOVERY AT RLs	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	^{o}C	water	SM 2550 and TCEQ SOP V1	00010	NA[1]	NA	NA	NA	NA	Field
Flow	cfs	water	TCEQ SOP V1	00061	NA[1]	NA	NA	NA	NA	Field
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	NA	20	NA	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	00945	10	1	75-125	20	80-120	GBRA[6]
Sulfate[3]	mg/L	water	SM 4500-SO_4 E.	00945	10	1	75-125	20	80-120	GBRA
Chloride	mg/L	water	EPA 300.0	00940	10	1	75-125	20	80-120	GBRA
Chloride[3]	mg/L	water	SM 4500-Cl C.	00940	10	1	75-125	20	80-120	GBRA[6]
Chlorophyll-a, spectrophotometric method	ug/L	water	SM 10200-H[4]	32211	5	1	75-125	20	NA	GBRA
Pheophytin, spectrophotometric method	ug/L	water	SM 10200-H[4]	32218	3	1	75-125	20	NA	GBRA
E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B	31699	1	1	NA	0.5[2]	NA	GBRA[6]
Ammonia-N, total[3]	mg/L	water	SM 4500-NH_3 D.	00610	0.02	0.02	75-125	20	80-120	GBRA
Ammonia-N, total	mg/L	water	EPA 350.1	00610	0.02	0.02	75-125	20	80-120	GBRA[6]
Hardness, total (as CaC03) [3]	mg/L	water	SM 2340 C.	00900	5	5	NA	20	80-120	GBRA
Hardness, total (as CaC03)	mg/L	water	EPA 130.1	00900	5	5	NA	20	80-120	GBRA
Nitrate-N, total	mg/L	water	EPA 300.0	00620	0.02	0.02	75-125	20	80-120	GBRA[6]
Nitrate/nitrite-N, total[3]	mg/L	water	SM 4500-NO_3 E. + NO_2 B.	00630	0.04	0.02	75-125	20	80-120	GBRA
Total phosphorus[5]	mg/L	water	EPA 365.2	00665	0.06	0.05	75-125	20	80-120	GBRA[6]

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	RECOVERY AT RLs	PRECISION (RPD of LCS/LCS dup)	BIAS (%Rec. of LCS)	Lab
Metals in Water										
Aluminum, dis.	ug/L	water	EPA 200.7	01106	200	2	75-125	20	75-125	Albion
Arsenic, dis.	ug/L	water	EPA 200.8 (modified)	01000	5	1	75-125	20	75-125	Albion
Cadmium, dis.	ug/L	water	EPA 1638 and 200.8	01025	0.1 for waters <50 mg/L hardness .3 for waters ≥50 mg/L hardness	0.1	75-125	20	75-125	Albion
Chromium, dis.	ug/L	water	EPA 200.8	01030	10	1	75-125	20	75-125	Albion
Copper, dis.	ug/L	water	EPA 1638 and 200.8	01040	1 for waters <50 mg/L hardness 3 for waters ≥50 mg/L hardness	0.3	75-125	20	75-125	Albion
Lead, dis.	ug/L	water	EPA 1638 and 200.8	01049	0.1 for waters <85 mg/L hardness 1 for waters >85 mg/L hardness	0.1	75-125	20	75-125	Albion
Mercury, total	ug/L	water	EPA 1631	71960	0.006	0.0005	75-125	20	75-125	Albion
Nickel, dis.	ug/L	water	EPA 1638 and 200.8	01065	10	1.0	75-125	20	75-125	Albion
Selenium, total	ug/L	water	EPA 1632 (modified)	01147	2	0.1	75-125	20	75-125	Albion
Silver, dis.	ug/L	water	EPA 1638 and 200.8	01075	0.5	0.1	75-125	20	75-125	Albion
Zinc, dis.	ug/L	water	EPA 1638 and 200.8	01090	5	5	75-125	20	75-125	Albion

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	RECOVERY AT RLs	PRECISION (RPD of LCS/LCS dup)	BIAS (%Rec. of LCS)	Lab
Organics in Sediment										
TPH	ug/kg	sediment	SW846 8260B			5	75-125	30	60-140	LCRA
Benzene	ug/kg	sediment	SW846 8260B	34237	250	5	75-125	30	60-140	LCRA
Toluene	ug/kg	sediment	SW846 8260B	34483	300	5	75-125	30	60-140	LCRA
Ethylbenzene	ug/kg	sediment	SW846 8260B	34374	250	5	75-125	30	60-140	LCRA
Xylene	ug/kg	sediment	SW846 8260B	45510	650	5	75-125	30	60-140	LCRA

PARAMETER	UNIT	MATRIX	METHOD	STORET	LABORATORY PERFORMING ANALYSIS
Benthics- Freshwater – Qualitative					
Biological Data Reporting Units	1= number of individuals from sub-sample; 2 = number of individuals/ft^2; 3 = number of individuals/m^2; 4 = total number in kicknet	water	TCEQ SOP V2	89899	GBRA
Kicknet Effort, area kicked	m^2	water	TCEQ SOP V2	89903	GBRA
Kicknet Effort, minutes kicked	minutes	water	TCEQ SOP V2	89904	GBRA
Snags and Shoreline Sampling Effort, minutes picked	minutes	water	TCEQ SOP V2	89905	GBRA
Number of individuals in benthic RBA sub-sample (± 100)	#	water	TCEQ SOP V2	89906	GBRA
Benthic Sampler	1=Surber, 2=Ekman, 3=kicknet, 4=Petersen, 5=Hester-Dendy	water	TCEQ SOP V2	89950	GBRA
Undercut bank at sample point	%	water	TCEQ SOP V2	89921	GBRA
Overhanging brush at sample point	%	water	TCEQ SOP V2	89922	GBRA
Gravel substrate at sample point	%	water	TCEQ SOP V2	89923	GBRA
Sand substrate at sample point	%	water	TCEQ SOP V2	89924	GBRA
Soft bottom at sample point	%	water	TCEQ SOP V2	89925	GBRA
Macrophyte bed at sample point	%	water	TCEQ SOP V2	89926	GBRA
Snags and brush at sample point	%	water	TCEQ SOP V2	89927	GBRA
Ecoregion (Texas Ecoregion Code)	#	NA	TCEQ SOP V2	89961	GBRA
Total Taxa (Taxa Richness)	#	water	TCEQ SOP V2	90055	GBRA
EPT Taxa	#	water	TCEQ SOP V2	90008	GBRA
Biotic Index (HBI)	NA	water	TCEQ SOP V2	90007	GBRA
Chironomidae	#	water	TCEQ SOP V2	92491	GBRA
Dominant Taxon	%	water	TCEQ SOP V2	90042	GBRA
Dominant FFG	%	water	TCEQ SOP V2	90010	GBRA
Predators	%	water	TCEQ SOP V2	90036	GBRA
Ratio of Intolerant:Tolerant taxa	NA	water	TCEQ SOP V2	90050	GBRA
Total Trichoptera as Hydropsychidae	%	water	TCEQ SOP V2	90069	GBRA
Non-insect taxa	#	water	TCEQ SOP V2	90052	GBRA
Collector-gatherers	%	water	TCEQ SOP V2	90025	GBRA
Total number as Elmidae	%	water	TCEQ SOP V2	90054	GBRA

PARAMETER	UNIT	MATRIX	METHOD	STORET	LABORATORY PERFORMING ANALYSIS
Nekton Freshwater					
Nekton, none captured	NA	water	TCEQ SOP V2	98005	GBRA
Electrofishing effort, duration of shocking	Seconds	water	TCEQ SOP V2	89944	GBRA
Seining effort	# of Hauls	water	TCEQ SOP V2	89947	GBRA
Combined length of seine hauls	meters	water	TCEQ SOP V2	89948	GBRA
Seining effort, duration	minutes	water	TCEQ SOP V2	89949	GBRA
Minimum Seine Mesh Size, net average bar	inches	water	TCEQ SOP V2	89930	GBRA
Maximum Seine Mesh Size, net average bar	inches	water	TCEQ SOP V2	89931	GBRA
Net length	m	water	TCEQ SOP V2	89941	GBRA
Electrofishing method	1 = boat, 2 = backpack, 3=tote barge	water	TCEQ SOP V2	89943	GBRA
Area seined	m^2	water	TCEQ SOP V2	89976	GBRA
Stream Order	#	NA	TCEQ SOP V2	84161	GBRA
Ecoregion (Texas Ecoregion Code)	#	NA	TCEQ SOP V2	89961	GBRA
Total fish species (richness)	#	water	TCEQ SOP V2	98003	GBRA
Total darter species	#	water	TCEQ SOP V2	98004	GBRA
Total sunfish species (except bass)	#	water	TCEQ SOP V2	98008	GBRA
Total sucker species	#	water	TCEQ SOP V2	98009	GBRA
Total intolerant species	#	water	TCEQ SOP V2	98010	GBRA
Tolerant individuals	%	water	TCEQ SOP V2	98016	GBRA
Omnivore individuals	%	water	TCEQ SOP V2	98017	GBRA
Insectivore individuals	%	water	TCEQ SOP V2	98021	GBRA
Piscivore individuals	%	water	TCEQ SOP V2	98022	GBRA
Total individuals	#	water	TCEQ SOP V2	98023	GBRA
Hybrid individuals	%	water	TCEQ SOP V2	98024	GBRA
Individuals w/ disease/anomalies	%	water	TCEQ SOP V2	98030	GBRA

PARAMETER	UNITS	METHOD	STORET	LABORATORY PERFORMING ANALYSIS
Physical Habitat				
Streambed slope over evaluated reach (from USGS map)	NA	TCEQ SOP V2	72052	GBRA
Approximate drainage area above the most downstream transect from USGS map	km^2	TCEQ SOP V2	89859	GBRA
Length of stream	km	TCEQ SOP V2	89860	GBRA
Lateral transects made	#	TCEQ SOP V2	89832	GBRA
Average stream width	m	TCEQ SOP V2	89861	GBRA
Average stream depth	m	TCEQ SOP V2	89862	GBRA
Instantaneous stream flow	cfs	TCEQ SOP V2	00061	GBRA
Flow measurement method	1=gage, 2= electric, 3= mechanical, =weir/flume	TCEQ SOP V2	89835	GBRA
Channel Flow Status	1=no flow, 2=low, 3=moderate, 4=high	TCEQ SOP V2	89848	GBRA
Maximum pool width at time of study	m	TCEQ SOP V2	89864	GBRA
Maximum pool depth in study area	m	TCEQ SOP V2	89865	GBRA
Total stream bends	#	TCEQ SOP V2	89839	GBRA
Moderately defined stream bends	#	TCEQ SOP V2	89841	GBRA
Well-defined stream bends	#	TCEQ SOP V2	89840	GBRA
Poorly defined stream bends	#	TCEQ SOP V2	89842	GBRA
Riffles	#	TCEQ SOP V2	89843	GBRA
Dominant substrate	1 = clay, 2 = silt, 3 = sand, 4 = gravel, 5 = cobble, 6 = boulder, 7 = bedrock, 8 = other	TCEQ SOP V2	89844	GBRA
Avg. % of substrate gravel >2mm	%	TCEQ SOP V2	89845	GBRA
Avg. % instream cover	%	TCEQ SOP V2	84159	GBRA
Stream Cover Types	#	TCEQ SOP V2		GBRA
Avg. % stream bank erosion potential	%	TCEQ SOP V2	89846	GBRA
Avg. stream bank angle	degrees	TCEQ SOP V2	89847	GBRA
Avg. width natural riparian vegetation	m	TCEQ SOP V2	89866	GBRA
Avg. % trees as riparian vegetation	%	TCEQ SOP V2	89849	GBRA
Avg. % shrubs as riparian vegetation	%	TCEQ SOP V2	89850	GBRA
Avg. % grasses and forbes as riparian vegetation	%	TCEQ SOP V2	89851	GBRA
Avg. % cultivated fields as riparian vegetation	%	TCEQ SOP V2	89852	GBRA
Avg. % other as riparian vegetation	%	TCEQ SOP V2	89853	GBRA
Avg.% tree canopy coverage	%	TCEQ SOP V2	89854	GBRA
Overall Aesthetics	1= wilderness, 2= natural, 3= common, 4= offensive	TCEQ SOP V2	89867	GBRA
Stream order	#	TCEQ SOP V2	84161	GBRA
Texas Ecoregion Code	#	TCEQ SOP V2	89961	GBRA
Land development impact	1= unimpacted, 2= low, 3= moderate, 4=high	TCEQ SOP V2	89962	GBRA

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	PRECISION (RPD of LCS/LCS dup)	BIAS (%Rec. of LCS)	Lab
Diurnal monitoring summary statistics									
24-hour average dissolved oxygen	mg/L	water	TCEQ SOP V1 /Calculation	89857	NA	NA	NA	NA	GBRA
Maximum daily dissolved oxygen	mg/L	water	TCEQ SOP V1 /Calculation	89856	NA	NA	NA	NA	GBRA
Minimum daily dissolved oxygen	mg/L	water	TCEQ SOP V1 /Calculation	89855	NA	NA	NA	NA	GBRA
Number of measurements	none	none	TCEQ SOP V1	89858	NA	NA	NA	NA	GBRA
24-hour average water temperature	ºC	water	TCEQ SOP V1 /Calculation	00209	NA	NA	NA	NA	GBRA
Maximum daily water temperature	ºC	water	TCEQ SOP V1 /Calculation	00210	NA	NA	NA	NA	GBRA
Minimum daily water temperature	ºC	water	TCEQ SOP V1 /Calculation	00211	NA	NA	NA	NA	GBRA
24-hour average conductivity	umhos/cm	water	TCEQ SOP V1 /Calculation	00212	NA	NA	NA	NA	GBRA
Maximum daily conductivity	umhos/cm	water	TCEQ SOP V1 /Calculation	00213	NA	NA	NA	NA	GBRA
Minimum daily conductivity	umhos/cm	water	TCEQ SOP V1 /Calculation	00214	NA	NA	NA	NA	GBRA
Maximum daily pH	s.u.	water	TCEQ SOP V1 /Calculation	00215	NA	NA	NA	NA	GBRA
Minimum daily pH	s.u.	water	TCEQ SOP V1 /Calculation	00216	NA	NA	NA	NA	GBRA

1 Reporting to be consistent with 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."

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 365.2 and the Konelab operating parameters. The manual method will be used as a secondary method in case of instrument failure.

6 The SARA laboratory may be used in the event of an equipment failure so that samples will be processed within the prescribed holding time. The SARA lab analyzes samples for the San Antonio River Basin Clean Rivers Program, under its accepted QAPP, and will follow the same quality system accepted by TCEQ CRP**.**

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, 1999
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
TCEQ SOP V2 - TCEQ Surface Water Quality Monitoring Procedures Manual, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2005 (RG-416)
American Society for Testing and Materials (ASTM) Annual Book of Standards, Vol. 11.02

Table A7.2 UGRA Measurement Performance Specifications

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	RECOVERY AT RLs	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	GBRA
DO	mg/L	water	SM 4500-O G. and TCEQ SOP V1	00300	NA[1]	NA	NA	NA	NA	GBRA
Conductivity	umhos/cm	water	SM 2510 and TCEQ SOP V1	00094	NA[1]	NA	NA	NA	NA	GBRA
Temperature	°C	water	SM 2550 and TCEQ SOP V1	00010	NA[1]	NA	NA	NA	NA	GBRA
Flow	cfs	water	TCEQ SOP V1	00061	NA[1]	NA	NA	NA	NA	GBRA
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	GBRA
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	GBRA
Flow estimate	cfs	water	TCEQ SOP V1	74069	NA[1]	NA	NA	NA	NA	GBRA
Conventional and Bacteriological Parameters										
TSS	mg/L	water	SM 2540 D.	00530	4	1	NA	20	NA	GBRA
Turbidity	NTU	water	SM 2130 B	82079	0.5	0.5	NA	20	NA	GBRA
Sulfate[3]	mg/L	water	SM 4500-SO_4 E.	00945	10	1	75-125	20	80-120	GBRA
Sulfate	mg/L	water	EPA 300.0	00945	10	1	75-125	20	80-120	GBRA
Chloride[3]	mg/L	water	SM 4500-Cl B.	00940	10	2	75-125	20	80-120	GBRA
Chloride	mg/L	water	EPA 300.0	00940	10	1	75-125	20	80-120	GBRA
Chlorophyll-a, spectrophotometric method	ug/L	water	SM 10200-H[4]	32211	5	1	75-125	20	NA	GBRA
Pheophytin, spectrophotometric method	ug/L	water	SM 10200-H[4]	32218	3	1	75-125	20	NA	GBRA
E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B	31699	1	1	NA	0.5[2]	NA	GBRA
Nitrate/nitrite-N, total[3]	mg/L	water	SM 4500-NO_3 E. + NO_2 B.	00630	0.04	0.02	75-125	20	80-120	GBRA
Nitrate, total	mg/L	water	EPA 300.0	00620	0.02	0.02	75-125	20	80-120	GBRA
Total phosphorus	mg/L	water	EPA 365.2	00665	0.06	0.05	75-125	20	80-120	GBRA
VSS	mg/L	water	SM 2540 E.	00535	4	1	NA	20	NA	GBRA

1 Reporting to be consistent with 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."
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.

References for Table A7.2:

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, 1999
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
American Society for Testing and Materials (ASTM) Annual Book of Standards, Vol. 11.02

Table A7.3 Village of Wimberley Measurement Performance Specifications

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	RECOVERY AT RLs	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
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	NA	20	NA	GBRA
E. coli, IDEXX Colilert	MPN/100 mL	water	SM 9223-B	31699	1	1	NA	0.5[2]	NA	GBRA
Ammonia-N, total[3]	mg/L	water	SM 4500-NH_3 D.	00610	0.02	0.02	75-125	20	80-120	GBRA
Ammonia-N, total	mg/L	water	EPA 350.1	00610	0.02	0.02	75-125	20	80-120	GBRA
Nitrate-N, total	mg/L	water	EPA 300.0	00620	0.02	0.02	75-125	20	80-120	GBRA
Nitrate/nitrite-N, total[3]	mg/L	water	SM 4500-NO_3 E. + NO_2 B.	00630	0.04	0.02	75-125	20	80-120	GBRA
Total phosphorus[4]	mg/L	water	EPA 365.2	00665	0.06	0.05	75-125	20	80-120	GBRA
Fecal Coliform, membrane filtration	cfu/100mL	water	SM 9222 D.	31616	1		NA	0.5[2]	NA	GBRA

PARAMETER	UNITS	MATRIX	METHOD	STORET	AWRL	Lab Reporting Limit (RL)	PRECISION (RPD of LCS/LCS dup)	BIAS (%Rec. of LCS)	Lab
Diurnal monitoring summary statistics									
24-hour average dissolved oxygen	mg/L	water	TCEQ SOP V1 /Calculation	89857	NA	NA	NA	NA	GBRA
Maximum daily dissolved oxygen	mg/L	water	TCEQ SOP V1 /Calculation	89856	NA	NA	NA	NA	GBRA
Minimum daily dissolved oxygen	mg/L	water	TCEQ SOP V1 /Calculation	89855	NA	NA	NA	NA	GBRA
Number of measurements	none	none	TCEQ SOP V1	89858	NA	NA	NA	NA	GBRA
24-hour average water temperature	^{o}C	water	TCEQ SOP V1 /Calculation	00209	NA	NA	NA	NA	GBRA
Maximum daily water temperature	^{o}C	water	TCEQ SOP V1 /Calculation	00210	NA	NA	NA	NA	GBRA
Minimum daily water temperature	^{o}C	water	TCEQ SOP V1 /Calculation	00211	NA	NA	NA	NA	GBRA
24-hour average conductivity	umhos/cm	water	TCEQ SOP V1 /Calculation	00212	NA	NA	NA	NA	GBRA
Maximum daily conductivity	umhos/cm	water	TCEQ SOP V1 /Calculation	00213	NA	NA	NA	NA	GBRA
Minimum daily conductivity	umhos/cm	water	TCEQ SOP V1 /Calculation	00214	NA	NA	NA	NA	GBRA
Maximum daily pH	s.u.	water	TCEQ SOP V1 /Calculation	00215	NA	NA	NA	NA	GBRA
Minimum daily pH	s.u.	water	TCEQ SOP V1 /Calculation	00216	NA	NA	NA	NA	GBRA

1 Reporting to be consistent with 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."
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 Automated method for total phosphorus on the Konelab Aquakem 200, following the GBRA SOP written based on the EPA method 365.2 and the Konelab operating parameters. The manual method will be used as a secondary method in the case of instrument failure.

References for Table A7.3:

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, 1999
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
American Society for Testing and Materials (ASTM) Annual Book of Standards, Vol. 11.02

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 Tables A7.1 - 3 are the program-defined reporting specifications for each analyte and yield data acceptable for routine monitoring. The reporting limit is the lowest concentration at which the laboratory will report quantitative data within a specified recovery range. The laboratory will meet two requirements in order to report meaningful results to the Clean Rivers Program:

* The laboratory's reporting limit for each analyte will be at **or below** the AWRL.
* The laboratory will demonstrate and document on an ongoing basis the laboratory's ability to quantitate at its reporting limits.

Acceptance criteria and an explanation of how the AWRL requirement applies to water, sediment, and tissue sample matrices are provided in Section B5.

Precision

Precision is a statistical measure of the variability of a measurement when a collection or an analysis is repeated and includes components of random error. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions.

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 standards 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 plotted on quality control charts which are based on historical data and used during evaluation of analytical performance. Program-defined measurement performance specifications for laboratory control standard/laboratory control standard duplicate pairs are defined in Tables A7.1 - 3.

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 standards prepared with verified and known amounts of all target analytes in the sample matrix (e.g. deionized water, sand, commercially available tissue) and by calculating percent recovery. Results are plotted on quality control charts which are calculated based on historical data and used during evaluation of analytical performance. Program-defined measurement performance specifications for laboratory control standards are specified in Tables A7.1 - 3.

Representativeness

Site selection, the appropriate sampling regime, the sampling of all pertinent media according to TCEQ SOPs, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Routine data collected under the Clean Rivers Program for water quality assessments are considered to be spatially and temporally representative of routine water quality conditions. At a minimum, samples are collected over at least two seasons (to include inter-seasonal variation) and over two years (to include inter-year variation) to include some data collected during an index period (March 15- October 15). Although data may be collected during varying regimes of weather and flow, the data sets will not be biased toward unusual conditions of flow, runoff, or season. The goal for meeting total representation of the water body will be tempered by the potential funding for complete representativeness.

Comparability

Confidence in the comparability of routine data sets for this project and for water quality assessments is based on the commitment of project staff to use only approved sampling and analysis methods and QA/QC protocols in accordance with quality system requirements and as described in this QAPP and in TCEQ SOPs. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format as specified in 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 will demonstrate to the GBRA QA Officer (or designee) their ability to properly calibrate field equipment and perform field sampling and analysis procedures. Field personnel training is documented and retained in the personnel file and will be available during a monitoring systems audit. If new field personnel are employed by UGRA and the Village of Wimberley, GBRA must observe one monitoring event prior to the submittal of data collected by the new employee to confirm the compliance with CRP requirements.

Laboratory analysts have a general knowledge of laboratory operations, test methods, and quality assurance. They also have a combination of education, experience, skill, and training to perform their specific function. Laboratory management maintains records of qualifications and training on each employee.

A9 DOCUMENTS AND RECORDS

The documents and records that describe, specify, report, or certify activities are listed.

Table A9.1 Project Documents and Records

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	TCEQ/GBRA/UGRA	Seven years	Paper/Electronic
QAPP distribution documentation	GBRA	Seven years	Paper
QAPP commitment letters	GBRA	Seven years	Paper
Field notebooks or data sheets	UGRA/GBRA	Seven years/ indefinitely	Paper/electronic
Field equipment calibration/maintenance logs	UGRA/GBRA	Seven years/ indefinitely	Paper/electronic
Chain of custody records	UGRA/GBRA	Seven years/ indefinitely	Paper/electronic
Field SOPs	UGRA/GBRA	Seven years/ indefinitely	Paper/electronic
Laboratory QA Manuals	GBRA/UGRA/Albion/LCRA /SARA	Indefinitely/7 years/indefinitely/5 years/5 years	Paper/electronic
Laboratory SOPs	GBRA/UGRA/Albion/LCRA /SARA	Indefinitely/7 years/indefinitely/5 years/5 years	Paper/electronic
Laboratory staff training records	GBRA/UGRA/Albion/LCRA /SARA	Indefinitely/7 years/indefinitely/5 years/5 years	Paper/electronic
Laboratory data reports/results	GBRA/UGRA/Albion/LCRA /SARA	Indefinitely/7 years/indefinitely/5 years/5 years	Paper/electronic
Instrument printouts	GBRA/UGRA/Albion/LCRA /SARA	Indefinitely/7 years/indefinitely/5 years/5 years	Paper/electronic
Laboratory equipment maintenance logs	GBRA/UGRA/Albion/LCRA /SARA	Indefinitely/7 years/indefinitely/5 years/5 years	Paper/electronic
Laboratory calibration records	GBRA/UGRA/Albion/LCRA /SARA	Indefinitely/7 years/indefinitely/5 years/5 years	Paper/electronic
Corrective Action Documentation	GBRA/UGRA/Albion/LCRA /SARA	Indefinitely/7 years/indefinitely/5 years/5 years	Paper/electronic

Laboratory Test Reports

Test reports from the laboratory will document the test results clearly and accurately. The test report will include the information necessary for the interpretation and validation of data and will include the following:

* 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
* identification of method used
* identification of samples that did not meet QA requirements and why (e.g., holding times exceeded)
* sample results
* 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 RL 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.

Electronic Data

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the CRP Guidance. A completed Data Summary (see example in Appendix E) will be submitted with each data submittal.

B1 SAMPLING PROCESS DESIGN

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

B2 SAMPLING METHODS

Field Sampling Procedures

Field sampling will be conducted according to procedures documented in the *TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2003.(RG-415) and Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data* (*RG-416)*. Additional aspects outlined in Section B below reflect specific requirements for sampling under the Clean Rivers Program and/or provide additional clarification.

Sample Volume, Container Types, Minimum Sample Volume, Preservation Requirements, and Holding Time Requirements

Table B2.1 Sample Storage, Preservation and Handling Requirements

Parameter	Matrix	Container	Preservation*	Sample Volume	Holding Time
Turbidity	Water	Plastic or glass	Cool, 4^oC	100 mL	48 hours
Hardness	Water	Plastic or glass	Cool, 4^oC, H_2SO_4 to pH < 2*	1 L	6 months
Solids (TSS,VSS,TDS)	Water	Plastic or glass	Cool, 4^oC	1 L	7 days
Nitrate/nitrite-nitrogen	Water	Plastic or glass	Cool, 4^oC, H_2SO_4 to pH < 2	1 L	28 days
Nitrate-nitrogen	Water	Plastic or glass	Cool, 4^oC	1 L	48 hours
Ammonia-nitrogen	Water	Plastic or glass	Cool, 4^oC, H_2SO_4 to pH < 2*	1 L	28 days
Orthophosphate	Water	Plastic or glass	Cool, 4^oC	1 L	48 hours
Total phosphorus	Water	Plastic or glass	Cool, 4^oC, H_2SO_4 to pH < 2*	1 L	28 days
Sulfate	Water	Plastic or glass	Cool, 4^oC	1 L	28 days
Chloride	Water	Plastic or glass	Cool, 4^oC	1 L	28 days
Chlorophyll a /Pheophytin	Water	Amber plastic or glass	Dark, Cool, 4^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, 4^oC	100 mL	6 hours
Metals, total	Water	Plastic or glass	Cool, 4^oC, HNO_3 to pH < 2*	1 L	6 months
Metals, dissolved	Water	Plastic or glass	Cool, 4^oC, HNO_3 to pH < 2*	1 L	Filtered on site/6 months
Mercury, total	Water	Teflon or glass	Cool, 4^oC, HNO_3 to pH < 2*	1 L	28 days
BTEX	Sediment	Glass	Cool, 4^oC	40 mL	7 days
TPH	Sediment	Glass	Cool, 4^oC	40 mL	7 days
Biological	Water	Plastic or glass	Ethanol CDA 19 (field); 10% Formalin (voucher)	1 L/5 mL specimen jars	1 day (field); indefinitely (voucher)

*Preservation occurs within 15 minutes of 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. The sample containers for metals are provided by Albion Laboratories and are new, certified glass or plastic bottles, or glass or plastic bottles cleaned and documented according to EPA method 1669. The sample containers for organic analyses are provided pre-cleaned from LCRA and are 40 mL VOA vials for BTEX and TPH. Amber plastic bottles are used routinely for chlorophyll samples. Disposable, pre-cleaned, sterile bottles are purchased for bacteriological samples. Certificates are maintained in a notebook by each laboratory.

Processes to Prevent Contamination

Procedures outlined in the *TCEQ Surface Water Quality Monitoring Procedures* outline the necessary steps to prevent contamination of samples. These include: direct collection into sample containers, when possible; clean sampling techniques for metals; and certified containers for organics. 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:

1. Station ID
2. Sampling Date
3. Location
4. Sampling depth
5. Sampling time
6. Sample collector's name/signature
7. Values for all field parameters
8. Detailed observational data, including:
    * water appearance
    * weather
    * biological activity
    * unusual odors
    * pertinent observations related to water quality or stream uses (e.g., exceptionally poor water quality conditions/standards not met; stream uses such as swimming, boating, fishing, irrigation pumps, etc.)
    * watershed or instream activities (events impacting water quality, e.g., bridge construction, livestock watering upstream, etc.)
    * specific sample information (number of sediments grabs, type/number of fish in a tissue sample, etc.)
    * 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:

1. Legible writing in indelible ink with no modifications, write-overs or cross-outs;
2. Correction of errors with a single line followed by an initial and date;
3. 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 the GBRA, UGRA and/or Village of Wimberley 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 or the UGRA and/or Village of Wimberley 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 or the UGRA and/or Village of Wimberley QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the contractor 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 TCEQ immediately both verbally and in writing.

B3 SAMPLE HANDLING AND CUSTODY

Chain-of-Custody

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 COC form is used to document sample handling during transfer from the field to the laboratory and among subcontract laboratories. 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.

1. Date and time of collection
2. Site identification
3. Sample matrix
4. Number of containers
5. Preservative used or if the sample was filtered
6. Analyses required
7. Name of collector
8. Custody transfer signatures and dates and time of transfer
9. Bill of lading (*if applicable*)

Sample Labeling

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

1. Site identification
2. Date and time of sampling
3. Preservative added, if applicable
4. Designation of "field-filtered" *(for metals)* as applicable
5. 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 laboratories (GBRA, UGRA), 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 respective lab. After samples for trace metal are filtered in the field, these sample containers are immediately stored in an ice chest for transport to the Albion Laboratory in College Station, Texas by common carrier, accompanied by the chain of custody. Samples for organics analyses are immediately stored in an ice chest and delivered by GBRA field staff, along with the chain of custody, to the LCRA laboratory in Austin, Texas. If in the event of laboratory equipment failure and in order to meet holding times, samples will be delivered on ice to the SARA laboratory by GBRA personnel. Samples collected by UGRA for total phosphorus and chlorophyll a and pheophytin will be stored in an ice chest and delivered by UGRA staff to the GBRA laboratory. After receipt at the GBRA or UGRA 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 the GBRA, UGRA and/or Village of Wimberley 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 or the UGRA and/or Village of Wimberley 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 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 or the UGRA and/or Village of Wimberley 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 TCEQ immediately both verbally and in writing.

B4 ANALYTICAL METHODS

The analytical methods, associated matrices, and performing laboratories are listed in Tables A7.1 - 3 of Section A7. The authority for analysis methodologies under the Clean Rivers Program 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 ISO/IEC Standard 17025, at a minimum. Copies of Laboratory QMs and SOPs are available for review by the TCEQ.

Standards Traceability

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

Analytical Method Modification

Only data generated using approved analytical methodologies as specified in this QAPP will be submitted to the TCEQ. Requests for method modifications will be documented on form TCEQ-10364, the TCEQ Application for Analytical Method Modification, and submitted for approval to the TCEQ Quality Assurance Section. Work will begin only after the modified procedures have been approved.

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 GBRA, UGRA and/or Village of Wimberley 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, UGRA and/or Village of Wimberley QAOs of the potential nonconformance. The GBRA, UGRA and/or Village of Wimberley QAOs will initiate a Nonconformance Report (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 or UGRA QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the GBRA or UGRA 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 TCEQ immediately both verbally and in writing.

The TCEQ has determined that analyses associated with the remark codes "holding time exceedance," "sample received unpreserved," "estimated value," etc. may have unacceptable measurement uncertainty associated with them. This will immediately disqualify analyses from submittal to TRACS. Therefore, data with these types of problems should not be reported to the TCEQ.

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

The minimum Field QC Requirements are outlined in the *TCEQ Surface Water Quality Monitoring Procedures.* Specific requirements are outlined below. Field QC sample results are submitted with the laboratory data report (see Section A9.).

<u>Field blank</u> - Field blanks are required for total metals-in-water samples when collected without sample equipment (i.e., as grab samples) and one field blank is collected on each day that total metals-in-water samples are 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 as per the coordinated monitoring schedule.

The analysis of field blanks should yield values lower than the reporting limit. 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 and one field equipment blank is collected on each day that metals- in-water samples are collected. A field 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 as per Appendix B.

The analysis of field equipment blanks should yield values lower than the reporting limit, 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 *SWQM Procedures*. Split samples are preserved, handled, shipped, and analyzed identically and are used to assess variability in all of these processes. Field splits apply to conventional samples only and are collected on a 10% basis 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:

$$RPD = (X1-X2)/((X1+X2)/2))$$

A 30% RPD criteria will be used to screen field split results as a possible indicator of excessive variability in the collection and analytical system. If it is determined that meaningful quantities of constituent (i.e., > RL) were measured and analytical variability can be eliminated as a factor, than variability in field split results will primarily be used as a trigger for discussion with field staff to ensure samples are being handled in the field correctly. Some sample results or batches of samples may be invalidated based on the examination of all extenuating information. Professional judgement 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. Deficiencies will be addressed as specified in this section under Deficiencies, Nonconformances, and Correction Action related to Quality Control.

Trip blank - Trip blanks are required for volatile organic analyses (VOA) only. VOA trip blanks are samples prepared in the laboratory with laboratory pure water and preserved as required. A trip blank is submitted with each ice chest of VOA samples submitted to the laboratory. They are transported to the sampling site, handled like an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field. Their purpose is to check contamination of the sample through leaching of the septum. The analysis of trip blank should yield values less than the reporting limit. When target analyte concentrations are very high, blank values should be less then 5% of the lowest value of the batch, or corrective action will be implemented.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Detailed laboratory QC requirements and corrective action procedures are contained within the individual laboratory quality manuals (QSMs). The minimum requirements that all participants abide by are stated below. Lab QC sample results are submitted with the laboratory data report (see Section A9.).

AWRL/Reporting Limit Verification - Water Samples

The laboratory's reporting limit for each analyte will be at or below the AWRL. To demonstrate the ongoing ability to recover at the reporting limit, the laboratory will analyze a calibration standard (if applicable) at or below the reporting limit on each day Clean Rivers Program samples are analyzed. Two acceptance criteria will be met or corrective action will be implemented. First, calibrations including the standard at the reporting limit will meet the calibration requirements of the analytical method. Second, the instrument response (e.g., absorbance, peak area, etc.) for the standard at the reporting limit will be treated as a response for a sample by use of the calibration equation (e.g., regression curve, etc.) in calculating an apparent concentration of the standard. The calculated and reference concentrations for the standard will then be used to calculate percent recovery (%R) at the reporting limit using the equation:

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

where CR is the calculated result and SA is reference concentration for the standard. Recoveries must be within 75-125% of the reference concentration.

When daily calibration is not required (e.g., EPA Method 624), or a method does not use a calibration curve to calculate results, the laboratory will analyze a check standard at the reporting limit on each day Clean Rivers Program samples are analyzed. The check standard does not have to be taken through sample preparation, but must be recovered within 75-125% of the reference concentration for the standard. The percent recovery of the 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:

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

If the calibration (when applicable) or the recovery of the calibration or control standard is not acceptable, corrective actions (e.g., re-calibration) will be taken to meet the specifications before proceeding with analyses of CRP samples.

The laboratory will report results of quantitation checks with the data.

Laboratory Control Standard (LCS) - A LCS consists of a sample matrix (i.e., e.g. deioinized water, sand, commercially available tissue) 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 Tables A7.1 - 3.

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, X_1 and X_2, the RPD is calculated from the following equation:

$$RPD = (X_1 - X_2)/\{(X_1+X_2)/2\} * 100$$

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 Tables A7.1 - 3. The specifications for bacteriological duplicates in Tables A7.1 - 3 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 reporting limit. Otherwise, the equipment should not be used.

Matrix spike (MS) - A matrix spike is an aliquot of sample spiked with a known concentration of the analyte of interest. 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 a set of environmental samples that are prepared and/or analyzed together within the same process using the same lot of reagents. 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 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:

$$\%R = (SSR - SR)/SA * 100$$

MS recoveries are plotted on control charts and used to control analytical performance. Measurement performance specifications for matrix spikes are not specified in this document.

<u>Method blank</u> - A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in the sample processing and analyzed with each batch. 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 reporting limit. 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.

<u>Additional method-specific QC requirements</u> - Additional QC samples are run (e.g., sample duplicates, surrogates, internal standards, continuing calibration samples, interference check samples) as specified in the methods. The requirements for these samples, their acceptance criteria, and corrective actions are method-specific.

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 the GBRA, UGRA and/or Village of Wimberley 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, UGRA and/or Village of Wimberley 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 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, UGRA and/or Village of Wimberley 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 TCEQ immediately both verbally and in writing.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

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

All laboratory tools, gauges, instrument, and equipment testing and maintenance requirements are contained within laboratory QSM(s). Testing and maintenance records are maintained and are available for inspection by the TCEQ. Instruments requiring daily or in-use testing include, but are not limited to, water baths, ovens, autoclaves, incubators, refrigerators, and laboratory-pure water. Critical spare parts for essential equipment are maintained to prevent downtime. Maintenance records are available for inspection by the TCEQ.

B7 INSTRUMENT CALIBRATION AND FREQUENCY

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

Detailed laboratory calibrations are contained within the QSM(s). The laboratory QSM identifies all tools, gauges, instruments, and other sampling, measuring, and test equipment used for data collection activities affecting quality that must be controlled and, at specified periods, calibrated to maintain bias within specified limits. Calibration records are maintained, are traceable to the instrument, and are available for inspection by the TCEQ. Equipment requiring periodic calibrations include, but are not limited to, thermometers, pH meters, balances, incubators, turbidity meters, and analytical instruments.

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.

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 the CRP database maintains its integrity and usefulness. Field data collected at the time of the sampling event is logged by the field technician, along with notes on sampling conditions in field logs or on field data sheets. The field log/sheet is the responsibility of the field technician and is transported with the sample to the laboratory. The 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 sheets and chains of custody used can be found in Appendices C and D.

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

The GBRA Regional Laboratory Director supervises the GBRA Regional laboratory and reviews the report that is generated when all analyses are complete. The UGRA Laboratory Director supervises the UGRA lab and reviews the report when all data is 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 lab director(QAO) feels 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 is responsible for transmitting the data to TCEQ. If errors are found after the TCEQ review, those errors are corrected by the GBRA Project Manager and logged in a data correction log.

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

Field data collected → Field data sheets → Lab database → 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 → TCEQ CRP Project Manager

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 → TCEQ CRP Project Manager

Data Errors and Loss

The GBRA Regional Laboratory Director supervises the GBRA Regional laboratory and reviews the report that is generated when all analyses are complete. The UGRA Laboratory Director supervises the UGRA lab and reviews the report when all data is 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 lab director(QAO) feels 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 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 Project Manager. If at any time errors are identified, the laboratory and water quality databases are corrected. The Project Manager is responsible for transmitting the data to TCEQ. If errors are found after the TCEQ review, those errors are corrected by the Project Manager and logged in a data correction log.

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 microfilmed for permanent record.

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

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

The 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 network administrator is responsible for the servers and back up generation.

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

The microfilm generated is stored in the GBRA vault. The GBRA records manager is the custodian of these files.

Data Handling, Hardware, and Software Requirements

The laboratory database is housed on a GBRA server and backed up each evening. The laboratory database uses SQL 2000 database software. The systems are operating in Windows 2003 and any additional software needed for word processing, spreadsheet or presentations uses Microsoft Office 2000.

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 and UGRA information resource management policies. The Clean Rivers Program grantees 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 Surface Water Quality Monitoring database. Any information developed by Clean Rivers Program grantees 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. Because the Clean Rivers Program grantees do not create certified locational data, TCEQ's OPP 8.11 and 8.12 do not apply.

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 TCEQ in Quarterly Report
Monitoring Systems Audit	Dates to be determined by TCEQ CRP	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the TCEQ to address corrective actions
Monitoring Systems Audit of Sub-participants	Dates to be determined by the GBRA	GBRA	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the GBRA. PA will report problems to TCEQ in Progress Report.
Laboratory Inspection	Dates to be determined by TCEQ	TCEQ Laboratory Inspector	Requirements appearing in lab SOPs and QAPP, ISO/IEC Guide 25, applicable EPA methods and Standard Methods, 40 CFR 136, and other documents applicable to CRP programs including portions of the Texas Administrative Code and the Code of Federal Regulations.	30 days to respond in writing to the TCEQ 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 CRP and the GBRA Project Manager. Audit reports and corrective action documentation will be submitted to the TCEQ with the Progress Report.

If audit findings and corrective actions cannot be resolved, then the authority and responsibility for terminating work are specified in the CRP QMP and in 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 Managers After review, the GBRA Project Manager marks the lab report as "QA Reviewed" and begins process of data transmittal to TCEQ. 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 TCEQ Project Management.

Reports to TCEQ Project Management

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

Progress Report - Summarizes the Basin 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 TCEQ in the quarterly progress report.

Reports by TCEQ Project Management

Contractor Evaluation - The GBRA participates in a Contractor Evaluation by the TCEQ annually for compliance with administrative and programmatic standards. Results of the evaluation are submitted to the TCEQ Financial Administration Division, Procurement and Contracts Section.

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

All field and laboratory 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 for entry into the SWQM portion of TRACS.

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 *(or computer-assisted)* examination of corollary or unreasonable data. If a question arises or an error is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues which can be corrected are corrected and documented. If an issue cannot be corrected, the task manager consults with 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 lab 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 TCEQ CRP Lead Quality Assurance Specialist. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. After the data are reviewed and documented, the GBRA Project Manager validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

If any requirements or specifications of the CRP are not met, based on any part of the data review, the responsible party should document the nonconforming activities and submit the information to the GBRA Data Manager with the data. This information is communicated to the TCEQ by the GBRA in the Data Summary.

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/UGRA Field Technicians/Wimberley Field Technicians
Post-calibrations checked to ensure compliance with error limits	GBRA Field Technicians/UGRA Field Technicians/Wimberley Field Technicians
Field data calculated, reduced, and transcribed correctly	GBRA Project Manager/UGRA Project Manager/Wimberley Project Manager
Laboratory Data Review	
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 Laboratory Director(QAO)/ Albion QAO/LCRA-SARA Project Managers
Laboratory data calculated, reduced, and transcribed correctly	GBRA Laboratory Director(QAO) and Project Manager/ Albion QAO/ LCRA-SARA Project Managers
Reporting limits consistent with requirements for Ambient Water Reporting Limits	GBRA Project Manager/ Albion QAO/LCRA-SARA Project Managers
Analytical data documentation evaluated for consistency, reasonableness and/or improper practices	GBRA Laboratory Director(QAO) and Project Manager / Albion QAO/LCRA-SARA Project Managers
Analytical QC information evaluated to determine impact on individual analyses	GBRA Laboratory Director(QAO)/ Albion QAO/LCRA-SARA Project Managers
All laboratory samples analyzed for all parameters	GBRA Project Manager
Data Set Review	
The test report has all required information as described in Section A9 of the QAPP	GBRA Project Manager/UGRA Project Manager
Confirmation that field and lab data have been reviewed	GBRA Laboratory Director(QAO) and Project Manager/UGRA QAO and Project Manager
Data set (to include field and laboratory data) evaluated for reasonableness and if corollary data agree	GBRA Project Manager/UGRA Project Manager
Outliers confirmed and documented	GBRA Project Manager/UGRA Project Manager
Field QC acceptable (e.g., field splits and trip, field and equipment blanks)	GBRA Field Technicians/UGRA Field Technicians/Wimberley Field Technicians
Sampling and analytical data gaps checked and documented	GBRA Field Technicians and Project Manager /UGRA Field Technicians and Project Manager/ Wimberley Field Technicians
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 (e.g., USGS, TCEQ, etc.), will be analyzed and reconciled with project data quality requirements. Data meeting project requirements will be used by the TCEQ for the *Texas Water Quality Inventory and 303(d) List* in accordance with TCEQ's *Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*, and for TMDL development, stream standards modifications, and permit decisions as appropriate. Data which do not meet requirements will not be submitted to the SWQM portion of TRACS nor will be considered appropriate for any of the uses noted above.

APPENDIX A   TASK 3 WORK PLAN

TASK 3: WATER QUALITY MONITORING

Objectives: Data collection efforts will focus on providing information to support:

- planning and coordination of basin-wide monitoring
- temporal and spatial analysis of water quality
- knowledge of water quality and flow for unclassified streams
- evaluation and development of state-wide, regional, and site-specific water quality standards
- permit criteria related to the flow status of receiving streams
- priority monitoring
- use attainability assessments
- special studies

Task Description: **Monitoring Description**
The GBRA and UGRA will conduct water quality monitoring and provide details in the Progress Report format as prescribed in the FY 2004-05 CRP Guidance, Exhibit 1C.

GBRA will conduct routine monitoring at 19 sites on a monthly basis, collecting field, conventional, flow and bacteria parameter groups. In addition GBRA will monitor seven sites quarterly and three sites bimonthly for the same parameter group. There will be 10 sites monitored in Kerr County under a subcontract on a quarterly basis for the same parameter groups. Biological and habitat assessments will be collected semi-annually at 7 sites, 2 in Kerr County and 5 in the GBRA district. Nine sites, two in Kerr County and 7 in the GBRA district will be sampled for metals. Nineteen stations in Kerr County will be monitored bi-weekly for E. coli as non-point source monitoring from May through August. The Wimberley Valley Watershed Associations (WVWA), another sub-tier participant, will monitor seven sites eight times per year for conventional, flow, bacteria and field parameter groups in Hays County and will conduct a diurnal monitoring event once per month at one site. GBRA will monitor organics in water, as listed as Priority Surface Water Quality Monitoring Core Parameters, at one site in Kerr County in 2006 and propose to monitor a different urban site in 2007, not yet selected.

GBRA will post key elements of monitoring, including data, special study reports or summaries (e.g., executive summary, maps, data analysis) to the web site in a timely manner. Site selection and frequencies of monitoring are determined by the number of minimum measurements necessary for site assessments as described in the FY 2004-05 CRP Guidance, Task 3. At those sites where biological samples will be collected twice per year, the assessments will be performed during the index period of March 15 and October 15, with one event falling between July 1 and September 30. At those sites where biological samples will be collected once per year, the assessment will be performed during the index period. All monitoring procedures and methods will follow the guidelines prescribed in the GBRA QAPP, the TCEQ *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue (RG-415)* and the TCEQ *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data (RG-416).*

Coordinated Monitoring Meeting - The GBRA will hold an annual coordinated monitoring meeting. Qualified monitoring organizations will be invited to attend the working meeting in which monitoring needs and purposes will be discussed segment by segment and station by station. Information from participants and stakeholders will be used to select stations and parameters that will enhance overall water quality monitoring coverage, eliminate duplication of effort, and address basin priorities. The changes to the monitoring schedule will be entered into the statewide database on the Internet and communicated to meeting attendees. Changes to monitoring that occur during the course of the year will be entered into the statewide database on the Internet and communicated to meeting attendees.

Progress Report

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

Biological Data Reporting

Biological/habitat data reported to the TCEQ under an approved QAPP, will be summarized at the end of each fiscal year and submitted electronically or in hard copy using the Biological Data Reporting Packet outlined in Exhibit 3D in the CRP Guidance. Two copies of the reporting packet with color photos will be submitted.

Equipment: No need for additional equipment is anticipated to support this task.

Deliverables & Dues Dates: **September 1, 2005 through August 31, 2006**

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - December 15, 2005; March 15 and June 15, 2006
B. Coordinated Monitoring Meeting - between March 15 and April 30, 2006
C. Email notification to the CRP Project Manager that statewide coordinated monitoring schedule updates have been completed - May 31, 2006
D. Biological Data Reporting Packet on disk - due dates coordinated with CRP Project Manager

September 1, 2006 through August 31, 2007

A. Conduct water quality monitoring, summarize activities, and submit with Progress Report - September 15 and December 15, 2006; March 15 and June 15 and August 31, 2007
B. Coordinated Monitoring Meeting - between March 15 and April 30, 2007
C. Email notification to the CRP Project Manager that statewide coordinated monitoring schedule updates have been completed - May 31, 2007
D. Biological Data Reporting Packet on disk - due dates coordinated with CRP Project Manager

Appendix B   Sampling Process Design and Monitoring Schedule (plan)

Sample Design Rationale

The sample design is based on the legislative intent of the Clean Rivers Program. Under the legislation, the GBRA has been tasked with providing data to identify significant long-term water quality trends, to characterize water quality conditions in support of the 305(b) assessment. Based on Steering Committee input, achievable water quality objectives and priorities and the identification of water quality issues are used to develop work plans, which are in accord with available resources. As part of the Steering Committee process, GBRA coordinates closely with the TCEQ and other participants to ensure a comprehensive water monitoring strategy within the Watershed. Data collected in the years that GBRA has participated in the Clean Rivers Program has resulted in an extensive database of data that is accessible on the website to the public and municipalities throughout the basin. Serving as historical reference, the database continues to be requested on a regular basis by students, engineering firms, municipalities, and citizens, and because of the importance of this data, GBRA will continue the monitoring frequency of the past biennium.

Site Selection Criteria

This data collection effort involves monitoring routine water quality, using procedures that are consistent with the TCEQ SWQM program, for the purpose of data entry into the statewide database maintained by the TCEQ. To this end, some general guidelines are followed when selecting sampling sites, as basically outlined below, and discussed thoroughly in the TCEQ Surface Water Quality Monitoring Procedures, Volume 1 (RG-415). Overall consideration is given to accessibility and safety. All monitoring activities have been developed in coordination with the CRP Steering Committee and with the TCEQ.

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. At a minimum for reservoirs, locate sites near the dam (reservoirs) and in the major arms. Larger reservoirs might also include stations in the middle and upper (riverine) areas. Select sites that best represent the water body by avoiding coves and back water areas. A single monitoring site is considered representative of 25 percent of the total reservoir acres, but not more than 5,120 acres.

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

4. Because historical water quality data can be very useful in assessing use attainment or impairment, it may be best to use sites that are on current or past monitoring schedules.

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

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

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

Monitoring Sites

Monitoring Tables for fiscal year 2006 are presented on the following page.

Monitoring Sites for FY 2006

The sample design for surface water quality monitoring is shown in Table B1.1 below.

Legend for Table B1.1:

GB = Guadalupe Blanco River Authority
UG = Upper Guadalupe River Authority
WV = Wimberley Valley Watershed Association, Village of Wimberley
DO 24hr = diurnal monitoring for dissolved oxygen, conductivity, temperature and pH; measurements taken every hour for 24 hours; includes minimum, maximum and average.
Aq Hab = aquatic habitat assessment
Benthics = benthic macroinvertabrate biological data collection
Nekton = nekton biological data collection
Metals Water = collection of samples for dissolved arsenic, silver, aluminum, cadmium, chromium, copper, nickel, lead and zinc, and for total mercury and selenium
Organics Water = BTEX, and TPHs
Conventional (GB) = total suspended solids, turbidity, sulfate, chloride, nitrate nitrogen, ammonia nitrogen, chlorophyll a, pheophytin, total hardness, total phosphorus
Conventional (UG) = total suspended solids, turbidity, sulfate, chloride, nitrate nitrogen, ammonia nitrogen, chlorophyll a, pheophytin, total hardness, total phosphorus, volatile suspended solids
Conventional (WV) = total suspended solids, ammonia nitrogen, total phosphorus, nitrate nitrogen
Bacteria = E. coli
Flow = flow collected by gage, electric, mechanical or Doppler; includes severity
Field (GB and UG) = pH, temperature, conductivity, dissolved oxygen
Field (WV) = pH, temperature, conductivity, dissolved oxygen, days since last significant rainfall, secchi disk

Table B1.1 Sample Design and Schedule, FY 2006

Segment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	DO 24hr	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metal Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Bacteria	Flow	Fish Tissue	Field	Comments
1802	12578	GUADALUPE RIVER AT LOWER GUADALUPE DIVERSION DAM AND SALT WATER BARRIER	GB	GB	RT					1				12			12	12		12	
1803	16579	GUADALUPE RIVER AT DUPONT, 3.0KM DOWNSTREAM OF CONFL WITH BLUE BAYOU AND 17KM SOUTH OF INTERESECTION OF US59 AND US87 IN VICTORIA	GB	GB	RT					1				4			4	4		4	
1803	12590	GUADALUPE RIVER AT FM 447, WEST OF NURSERY AND UPSTREAM OF SOUTH TEXAS ELECTRIC	GB	GB	RT									4			4	4		4	
1803	12592	GUADALUPE RIVER AT OLD SAN ANTONIO ROAD WEST OF CUERO	GB	GB	RT					1				12			12	12		12	
1803	14937	PEACH CREEK AT GONZALES CR 353, 14.0KM EAST OF GONZALES	GB	GB	RT		1	1	1	1				12			12	12		12	
1803	17934	PEACH CREEK, SE BANK IMMEDIATELY DOWNSTREAM OF FM1680, 1.05MI E OF THE INTERSECTION WITH GONZALES CR420, WEST OF MOULTON	GB	GB	SS									6			6	6		6	
1803	13657	SANDIES CREEK 100 FT. DOWNSTREAM OF COUNTY HIGHWAY, 1.9 MI. UPSTREAM FROM BIRDS CREEK, 2.0 MI. NE OF WESTHOFF	GB	GB	RT									12			12	12		12	
1804	12576	GERONIMO CREEK AT HABERLE ROAD 3 MILES SOUTH OF GERONIMO	GB	GB	RT									12			12	12		12	ecoregion reference site
1804	15110	GUADALUPE RIVER IMMEDIATELY DOWNSTREAM OF H-5 DAM AT WOOD LAKE, SW OF GONZALES, TX	GB	GB	RT									12			12	12		12	
1804	12596	LAKE DUNLAP-GUADALUPE RIVER NORTH BANK AT AC'S PLACE AT MIDPOINT OF LONE STAR DRIVE	GB	GB	RT									12			12	12		12	
1804	15149	LAKE MCQUEENEY, 0.5 MI. UPSTREAM OF MCQUEENEY DAM ON SOUTHEAST BANK	GB	GB	DI	6															
1804	15149	LAKE MCQUEENEY, 0.5 MI. UPSTREAM OF MCQUEENEY DAM ON SOUTHEAST BANK	GB	GB	RT									12			12	12		12	
1805	17443	CANYON LAKE AT JACOB'S CREEK PARK BOAT RAMP	GB	GB	RT									4			4			4	
1805	12598	CANYON LAKE SOUTH OF JACOBS CREEK PARK 500 YARDS EAST OF PENINSULA	GB	GB	RT									12			12			12	

Table B1.1 Sample Design and Schedule, FY 2006

Segment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	DO 24hr	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metal Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Bacteria	Flow	Fish Tissue	Field	Comments
1806	12546	CAMP MEETING CREEK, 0.1 KM ABOVE CONFLUENCE WITH GUADALUPE IN KERRVILLE	GB	UG	RT									4			4	4		4	
1806	12619	GUADALUPE RIVER AT BEAR CREEK ROAD, 1 MI. WEST OF KERRVILLE	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	12605	GUADALUPE RIVER AT COUNTY RD ADJACENT TO HERMANN SONS' HOME, WEST OF COMFORT	GB	UG	RT									4			4	4		4	
1806	17404	GUADALUPE RIVER AT FM 474 AT AMMANS CROSSING NE OF BOERNE	GB	GB	RT									4			4	4		4	
1806	16244	GUADALUPE RIVER AT FOOTBRIDGE IN LOUISE HAYS PARK APPROX. 100M UPSTREAM OF SH16	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	12616	GUADALUPE RIVER AT G STREET (FORMERLY OLD MEDINA RD) IN KERRVILLE, SEGMENT KM 177.9	GB	UG	RT					1	2			4			4	4		4	
1806	12603	GUADALUPE RIVER AT IH 10 IN COMFORT	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	12620	GUADALUPE RIVER AT INGRAM DAM IN INGRAM	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	16241	GUADALUPE RIVER AT KELLY CREEK ROAD APPROX. 0.2KM SOUTH OF SH39 AND APPROX. 5.6KM WEST OF INGRAM	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	12615	GUADALUPE RIVER AT KERRVILLE STATE PARK, SEGMENT KM 174.4	GB	UG	RT									4			4			4	
1806	12615	GUADALUPE RIVER AT KERRVILLE STATE PARK, SEGMENT KM 174.4	GB	UG	SS									18			18				Turbidity is only conventional parameter monitored.
1806	16243	GUADALUPE RIVER AT LOUISE HAYS PARK DAM APPROX. 50M DOWNSTREAM OF SH16	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	15111	GUADALUPE RIVER AT RIVERVIEW RD IN INGRAM, TX	GB	UG	RT		1	1	1					4			4	4		4	
1806	13700	GUADALUPE RIVER AT RR 311, 1.9 MI. SE OF SPRING BRANCH, 7.5 MI. DOWNSTREAM FROM CURRY CREEK	GB	GB	RT									12			12	12		12	
1806	12617	GUADALUPE RIVER AT SH 16 IN KERRVILLE	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.

Table B1.1 Sample Design and Schedule, FY 2006

Seg ment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	DO 24hr	Aq Hab	Ben thics	Nek ton	Metals Water	Organ ics Water	Metal Sed	Organ ics Sed	Conv ent ional	Amb Tox Water	Amb Tox Sed	Bac teria	Flow	Fish Tissue	Field	Comments
1806	12621	GUADALUPE RIVER AT SH 39 NEAR HUNT, 0.1 KM BELOW THE NORTH/SOUTH FORK CONFL.	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	15113	GUADALUPE RIVER AT SPLIT ROCK RD OFF SH 27, 2.6 KM DOWNSTREAM OF FLATROCK DAM	GB	UG	RT		1	1	1	1				4			4	4		4	
1806	12618	GUADALUPE RIVER AT UGRA LAKE DAM	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	12608	GUADALUPE RIVER CENTER POINT LAKE	GB	UG	RT									4			4			4	
1806	12608	GUADALUPE RIVER CENTER POINT LAKE	GB	UG	SS									18			18				Turbidity is only conventional parameter monitored.
1807	18594	COLETO CREEK AT ARNOLD ROAD/CAMP COLETO ROAD NEAR SCHROEDER TEXAS	GB	GB	SS									6			6	6		6	special monitoring to be conducted through 2007
1807	12623	COLETO CREEK AT US 59 ON VICTORIA-GOLIAD COUNTY LINE	GB	GB	RT									12			12			12	
1807	18595	PERDIDO CREEK AT FM 622 NEAR FANNIN TEXAS	GB	GB	SS									6			6	6		6	special monitoring site through 2007
1808	12626	LOWER SAN MARCOS RIVER AT SH 80 SOUTH OF LULING	GB	GB	RT					1	1			12			12	12		12	
1808	16578	SAN MARCOS RIVER AT US90A, 3.3KM WEST OF INTERSECTION OF US90A AND US183 IN GONZALES, 7KM UPSTREAM OF CONFL. WITH GUADALUPE RIVER	GB	GB	RT									4			4	4		4	
1810	12647	PLUM CREEK AT CR 202, SE OF LOCKHART	GB	GB	RT		1	1	1									1		1	coordinate w. region 11
1810	12640	PLUM CREEK AT OLD WOODEN BRIDGE ON CALDWELL CR 135, SE OF LULING	GB	GB	RT						1			12			12	12		12	
1810	17406	PLUM CREEK AT PLUM CREEK ROAD NORTH OF UHLAND	GB	GB	RT		1	1	1					12			12	12		12	
1811	12653	COMAL RIVER BELOW CLEMONS DAM IN NEW BRAUNFELS	GB	GB	RT									12			12	12		12	
1811	12570	DRY COMAL CREEK AT MISSOURI-KANSAS-TEXAS RAILROAD CROSSING IN NEW BRAUNFELS	GB	GB	RT		1	1	1	1				12			12	12		12	
1812	12658	GUADALUPE RIVER AT RIVER RD 2ND CROSSING, UPSTREAM OF NEW BRAUNFELS	GB	GB	RT									12			12	12		12	
1813	12661	BLANCO RIVER AT BRIDGE ON SH 12 AT WIMBERLEY	GB	WV	RT									8			8	8		8	7 samples collected Mar-Oct.; one sample collected Nov.-Feb.

Table B1.1 Sample Design and Schedule, FY 2006

Segment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	DO 24hr	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metal Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Bacteria	Flow	Fish Tissue	Field	Comments
1813	12668	BLANCO RIVER AT FM 165 1/2 MILE EAST OF BLANCO	GB	GB	RT									12			12	12		12	
1813	12660	BLANCO RIVER AT LOW WATER CROSSING AT CR 174	GB	WV	RT									8			8	8		8	7 samples collected Mar-Oct.; one sample collected Nov.-Feb.
1813	12663	BLANCO RIVER AT LOW WATER CROSSING AT PIONEER TOWN	GB	WV	RT									8			8	8		8	7 samples collected Mar-Oct.; one sample collected Nov.-Feb.
1814	12672	UPPER SAN MARCOS RIVER IMMEDIATELY UPSTREAM OF IH 35 BRIDGE AT SAN MARCOS	GB	GB	RT									4			4	4		4	samples collected downstream of bridge temporarily due to construction
1815	12673	CYPRESS CREEK AT CONFLUENCE WITH THE BLANCO RIVER	GB	WV	RT									8			8	8		8	7 samples collected from Mar.-Oct.; one in Nov.-Feb.
1815	12675	CYPRESS CREEK AT DOWNSTREAM END IN BLUE HOLE CAMPGROUND	GB	WV	RT									8			8	8		8	7 samples collected Mar-Oct.; one sample collected Nov.-Feb.
1815	12674	CYPRESS CREEK AT FM 12 AT WIMBERLEY	GB	GB	RT		1	1	1					4			4	4		4	
1815	12677	CYPRESS CREEK AT JACOBS WELL	GB	WV	DI	12															
1815	12677	CYPRESS CREEK AT JACOBS WELL	GB	WV	RT									8			8	8		8	7 samples collected Mar.-Oct.; one in Nov.-Feb.
1815	12676	CYPRESS CREEK AT RR 12, 1 MILE NORTH OF WIMBERLEY	GB	WV	RT									8			8	8		8	7 samples collected in Mar.-Oct.; one sample in Nov.-Feb.
1816	12678	JOHNSON CREEK AT SH 39 IN INGRAM	GB	UG	RT									4			4	4		4	
1816	12678	JOHNSON CREEK AT SH 39 IN INGRAM	GB	UG	SS									18			18				Turbidity is only conventional parameter monitored.
1817	12682	NORTH FORK GUADALUPE AT RIVER GAGING STATION NEAR CAMP WALDEMAR	GB	UG	RT									4			4	4		4	
1817	12682	NORTH FORK GUADALUPE AT RIVER GAGING STATION NEAR CAMP WALDEMAR	GB	UG	SS									18			18				Turbidity is only conventional parameter monitored.
1817	12681	NORTH FORK GUADALUPE RIVER AT FM 1340	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.

Table B1.1 Sample Design and Schedule, FY 2006

Segment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	DO 24hr	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metal Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Bacteria	Flow	Fish Tissue	Field	Comments
1817	16245	NORTH FORK GUADALUPE RIVER AT ROCK BOTTOM RD. APPROX. 0.3KM SW OF RR1340 AND ARRPOX. 14.3KM WEST OF HUNT	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1818	16246	SOUTH FORK GUADALUP RIVER AT SEAGO RD. APPROX. 0.2KM EAST OF SH39 AND APPROX. 4.8KM WEST OF HUNT	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1818	12685	SOUTH FORK GUADALUPE ADJACENT TO CAMP ARROWHEAD	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1818	12686	SOUTH FORK GUADALUPE ADJACENT TO CAMP MYSTIC	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1818	12684	SOUTH FORK GUADALUPE ADJACENT TO HUNT LIONS PARK	GB	UG	RT									4			4	4		4	
1818	12688	SOUTH FORK GUADALUPE ADJACENT TO LYNXHAVEN LODGE AT SH 39	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1901	12790	SAN ANTONIO RIVER FM 2506 EAST OF FANNIN	GB	GB	RT									12			12	12		12	

Table B1.1 Sample Design and Schedule, FY 2007

Segment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	DO 24hr	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metal Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Bacteria	Flow	Fish Tissue	Field	Comments
1802	12578	GUADALUPE RIVER AT LOWER GUADALUPE DIVERSION DAM AND SALT WATER BARRIER	GB	GB	RT					1				12			12	12		12	
1803	16579	GUADALUPE RIVER AT DUPONT, 3.0KM DOWNSTREAM OF CONFL WITH BLUE BAYOU AND 17KM SOUTH OF INTERESECTION OF US59 AND US87 IN VICTORIA	GB	GB	RT					1				4			4	4		4	
1803	12590	GUADALUPE RIVER AT FM 447, WEST OF NURSERY AND UPSTREAM OF SOUTH TEXAS ELECTRIC	GB	GB	RT									4			4	4		4	
1803	12592	GUADALUPE RIVER AT OLD SAN ANTONIO ROAD WEST OF CUERO	GB	GB	RT					1				12			12	12		12	
1803	14937	PEACH CREEK AT GONZALES CR 353, 14.0KM EAST OF GONZALES	GB	GB	RT		1	1	1	1				12			12	12		12	
1803	13657	SANDIES CREEK 100 FT. DOWNSTREAM OF COUNTY HIGHWAY, 1.9 MI. UPSTREAM FROM BIRDS CREEK, 2.0 MI. NE OF WESTHOFF	GB	GB	RT									12			12	12		12	
1804	12576	GERONIMO CREEK AT HABERLE ROAD 3 MILES SOUTH OF GERONIMO	GB	GB	RT									12			12	12		12	ecoregion reference site
1804	15110	GUADALUPE RIVER IMMEDIATELY DOWNSTREAM OF H-5 DAM AT WOOD LAKE, SW OF GONZALES, TX	GB	GB	RT									12			12	12		12	
1804	12596	LAKE DUNLAP-GUADALUPE RIVER NORTH BANK AT AC'S PLACE AT MIDPOINT OF LONE STAR DRIVE	GB	GB	RT									12			12	12		12	
1804	15149	LAKE MCQUEENEY, 0.5 MI. UPSTREAM OF MCQUEENEY DAM ON SOUTHEAST BANK	GB	GB	RT									12			12	12		12	
1805	17443	CANYON LAKE AT JACOB'S CREEK PARK BOAT RAMP	GB	GB	RT									4			4			4	
1805	12598	CANYON LAKE SOUTH OF JACOBS CREEK PARK 500 YARDS EAST OF PENINSULA	GB	GB	RT									12			12			12	
1806	12546	CAMP MEETING CREEK, 0.1 KM ABOVE CONFLUENCE WITH GUADALUPE IN KERRVILLE	GB	UG	RT									4			4	4		4	
1806	12619	GUADALUPE RIVER AT BEAR CREEK ROAD, 1 MI. WEST OF KERRVILLE	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	12605	GUADALUPE RIVER AT COUNTY RD ADJACENT TO HERMANN SONS' HOME, WEST OF COMFORT	GB	UG	RT									4			4	4		4	

Table B1.1 Sample Design and Schedule, FY 2007

Seg ment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	DO 24hr	Aq Hab	Ben thics	Nek ton	Metals Water	Organ ics Water	Metal Sed	Organ ics Sed	Conv ent ional	Amb Tox Water	Amb Tox Sed	Bac teria	Flow	Fish Tissue	Field	Comments
1806	17404	GUADALUPE RIVER AT FM 474 AT AMMANS CROSSING NE OF BOERNE	GB	GB	RT									4			4	4		4	
1806	16244	GUADALUPE RIVER AT FOOTBRIDGE IN LOUISE HAYS PARK APPROX. 100M UPSTREAM OF SH16	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	12616	GUADALUPE RIVER AT G STREET (FORMERLY OLD MEDINA RD) IN KERRVILLE, SEGMENT KM 177.9	GB	UG	RT					1	2			4			4	4		4	
1806	12603	GUADALUPE RIVER AT IH 10 IN COMFORT	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	12620	GUADALUPE RIVER AT INGRAM DAM IN INGRAM	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	16241	GUADALUPE RIVER AT KELLY CREEK ROAD APPROX. 0.2KM SOUTH OF SH39 AND APPROX. 5.6KM WEST OF INGRAM	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	12615	GUADALUPE RIVER AT KERRVILLE STATE PARK, SEGMENT KM 174.4	GB	UG	RT									4			4			4	
1806	12615	GUADALUPE RIVER AT KERRVILLE STATE PARK, SEGMENT KM 174.4	GB	UG	SS									18			18				Turbidity is only conventional parameter monitored.
1806	16243	GUADALUPE RIVER AT LOUISE HAYS PARK DAM APPROX. 50M DOWNSTREAM OF SH16	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	15111	GUADALUPE RIVER AT RIVERVIEW RD IN INGRAM, TX	GB	UG	RT		1	1	1					4			4	4		4	
1806	13700	GUADALUPE RIVER AT RR 311, 1.9 MI. SE OF SPRING BRANCH, 7.5 MI. DOWNSTREAM FROM CURRY CREEK	GB	GB	RT									12			12	12		12	
1806	12617	GUADALUPE RIVER AT SH 16 IN KERRVILLE	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	12621	GUADALUPE RIVER AT SH 39 NEAR HUNT, 0.1 KM BELOW THE NORTH/SOUTH FORK CONFL.	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1806	15113	GUADALUPE RIVER AT SPLIT ROCK RD OFF SH 27, 2.6 KM DOWNSTREAM OF FLATROCK DAM	GB	UG	RT		1	1	1	1				4			4	4		4	
1806	12618	GUADALUPE RIVER AT UGRA LAKE DAM	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.

Table B1.1 Sample Design and Schedule, FY 2007

Seg ment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	DO 24hr	Aq Hab	Ben thics	Nek ton	Metals Water	Organ ics Water	Metal Sed	Organ ics Sed	Conv ent ional	Amb Tox Water	Amb Tox Sed	Bac teria	Flow	Fish Tissue	Field	Comments
1806	12608	GUADALUPE RIVER CENTER POINT LAKE	GB	UG	RT									4			4			4	
1806	12608	GUADALUPE RIVER CENTER POINT LAKE	GB	UG	SS									18			18				Turbidity is only conventional parameter monitored.
1807	18594	COLETO CREEK AT ARNOLD ROAD/CAMP COLETO ROAD NEAR SCHROEDER TEXAS	GB	GB	SS									6			6	6		6	special monitoring to be conducted through 2007
1807	12623	COLETO CREEK AT US 59 ON VICTORIA-GOLIAD COUNTY LINE	GB	GB	RT									12			12			12	
1807	18595	PERDIDO CREEK AT FM 622 NEAR FANNIN TEXAS	GB	GB	SS									6			6	6		6	special monitoring site through 2007
1808	12626	LOWER SAN MARCOS RIVER AT SH 80 SOUTH OF LULING	GB	GB	RT					1	1			12			12	12		12	
1808	16578	SAN MARCOS RIVER AT US90A, 3.3KM WEST OF INTERSECTION OF US90A AND US183 IN GONZALES, 7KM UPSTREAM OF CONFL. WITH GUADALUPE RIVER	GB	GB	RT									4			4	4		4	
1810	12647	PLUM CREEK AT CR 202, SE OF LOCKHART	GB	GB	RT		1	1	1									1		1	coordinate w. region 11
1810	12640	PLUM CREEK AT OLD WOODEN BRIDGE ON CALDWELL CR 135, SE OF LULING	GB	GB	RT						1			12			12	12		12	
1810	17406	PLUM CREEK AT PLUM CREEK ROAD NORTH OF UHLAND	GB	GB	RT		1	1	1					12			12	12		12	
1811	12653	COMAL RIVER BELOW CLEMONS DAM IN NEW BRAUNFELS	GB	GB	RT									12			12	12		12	
1811	12570	DRY COMAL CREEK AT MISSOURI-KANSAS-TEXAS RAILROAD CROSSING IN NEW BRAUNFELS	GB	GB	RT		1	1	1	1				12			12	12		12	
1812	12658	GUADALUPE RIVER AT RIVER RD 2ND CROSSING, UPSTREAM OF NEW BRAUNFELS	GB	GB	RT									12			12	12		12	
1813	12661	BLANCO RIVER AT BRIDGE ON SH 12 AT WIMBERLEY	GB	WV	RT									8			8	8		8	7 samples collected Mar-Oct.; one sample collected Nov.-Feb.
1813	12668	BLANCO RIVER AT FM 165 1/2 MILE EAST OF BLANCO	GB	GB	RT									12			12	12		12	
1813	12660	BLANCO RIVER AT LOW WATER CROSSING AT CR 174	GB	WV	RT									8			8	8		8	7 samples collected Mar-Oct.; one sample collected Nov.-Feb.
1813	12663	BLANCO RIVER AT LOW WATER CROSSING AT PIONEER TOWN	GB	WV	RT									8			8	8		8	7 samples collected Mar-Oct.; one sample collected Nov.-Feb.

Table B1.1 Sample Design and Schedule, FY 2007

Segment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	DO 24hr	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metal Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Bacteria	Flow	Fish Tissue	Field	Comments
1814	12672	UPPER SAN MARCOS RIVER IMMEDIATELY UPSTREAM OF IH 35 BRIDGE AT SAN MARCOS	GB	GB	RT									4			4	4		4	samples collected downstream of bridge temporarily due to construction
1815	12673	CYPRESS CREEK AT CONFLUENCE WITH THE BLANCO RIVER	GB	WV	RT									8			8	8		8	7 samples collected from Mar.-Oct.; one in Nov.-Feb.
1815	12675	CYPRESS CREEK AT DOWNSTREAM END IN BLUE HOLE CAMPGROUND	GB	WV	RT									8			8	8		8	7 samples collected Mar-Oct.; one sample collected Nov.-Feb.
1815	12674	CYPRESS CREEK AT FM 12 AT WIMBERLEY	GB	GB	RT		1	1	1					4			4	4		4	
1815	12675	CYPRESS CREEK AT DOWNSTREAM END IN BLUE HOLE CAMPGROUND	GB	WV	DI	12															
1815	12677	CYPRESS CREEK AT JACOBS WELL	GB	WV	RT									8			8	8		8	7 samples collected Mar.-Oct.; one in Nov.-Feb.
1815	12676	CYPRESS CREEK AT RR 12, 1 MILE NORTH OF WIMBERLEY	GB	WV	RT									8			8	8		8	7 samples collected in Mar.-Oct.; one sample in Nov.-Feb.
1816	12678	JOHNSON CREEK AT SH 39 IN INGRAM	GB	UG	RT									4			4	4		4	
1816	12678	JOHNSON CREEK AT SH 39 IN INGRAM	GB	UG	SS									18			18				Turbidity is only conventional parameter monitored.
1817	12682	NORTH FORK GUADALUPE AT RIVER GAGING STATION NEAR CAMP WALDEMAR	GB	UG	RT									4			4	4		4	
1817	12682	NORTH FORK GUADALUPE AT RIVER GAGING STATION NEAR CAMP WALDEMAR	GB	UG	SS									18			18				Turbidity is only conventional parameter monitored.
1817	12681	NORTH FORK GUADALUPE RIVER AT FM 1340	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1817	16245	NORTH FORK GUADALUPE RIVER AT ROCK BOTTOM RD. APPROX. 0.3KM SW OF RR1340 AND ARRPOX. 14.3KM WEST OF HUNT	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1818	16246	SOUTH FORK GUADALUP RIVER AT SEAGO RD. APPROX. 0.2KM EAST OF SH39 AND APPROX. 4.8KM WEST OF HUNT	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1818	12685	SOUTH FORK GUADALUPE ADJACENT TO CAMP ARROWHEAD	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.

Table B1.1 Sample Design and Schedule, FY 2007

Segment	TCEQ Station ID	Site Description	QAPP	Monitor	Monitor Type	DO 24hr	Aq Hab	Benthics	Nekton	Metals Water	Organics Water	Metal Sed	Organics Sed	Conventional	Amb Tox Water	Amb Tox Sed	Bacteria	Flow	Fish Tissue	Field	Comments
1818	12686	SOUTH FORK GUADALUPE ADJACENT TO CAMP MYSTIC	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1818	12684	SOUTH FORK GUADALUPE ADJACENT TO HUNT LIONS PARK	GB	UG	RT									4			4	4		4	
1818	12688	SOUTH FORK GUADALUPE ADJACENT TO LYNXHAVEN LODGE AT SH 39	GB	UG	SS									20			20				Turbidity is only conventional parameter monitored.
1901	12790	SAN ANTONIO RIVER FM 2506 EAST OF FANNIN	GB	GB	RT									12			12	12		12	

APPENDIX C 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 (ft^3/sec)
00480		SALINITY (ppt, marine only)	89835		FLOW MEASUREMENT METHOD 1- Flow Gage Station 2- Electric 3- Mechanical 4- Weir/Flume
50060		CHLORINE RESIDUAL (mg/L)			
00078		SECCHI DISK (meters)	74069		FLOW ESTIMATE (ft^3/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:

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APPENDIX D CHAINS OF CUSTODY

UPPER GUADALUPE RIVER AUTHORITY
ENVIRONMENTAL LABORATORY
125 Lehmann Drive Kerrville, TX. 78028
(830) 896-5445 fax (830) 257-2621

Request for Analysis or Service
(Chain of Custody)

BILL TO: ______________________ **SHIP TO:** ______________________

Description of Sampling (address, area, etc...): ______________________

Collected By: ______________ **Delivered By:** ______________
Date of Collection: ______________ **Results Attached:** **Yes** ______ **No** ______
Preservation: ______________ **Need data Report:** **Yes** ______ **No** ______

#	Time	Description of Sample Site	Analysis or Service	Result(s)

Notes and Comments:

Relinquished By:		Date & Time:	
Received By		Date & Time:	
Relinquished By:		Date & Time:	
Received By		Date & Time:	
Relinquished By:		Date & Time:	
Received By		Date & Time:	
Relinquished By:		Date & Time:	
Received By		Date & Time:	

GBRA
GUADALUPE-BLANCO RIVER AUTHORITY

Chain of Cust

Guadalupe Blanco River Authority- Regional Laboratory
933 E. Court Street, Seguin, Texas 78155
(830) 379-5822 fax: (830) 401-0991

Customer Info.____

Collected By:____ ____________________________

Printed Name **Signature**

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

Delivered By:______________________________ **Date/Time:**____________ **Received By:**______________________________**D**

Delivered By:______________________________ **Date/Time:**____________ **Received By:**______________________________**D**

**Special Notes:____

Condition of Container(s): (intact)___________________________
Ice:________________(y or n)

Preservation:______________________________(aci
Date/Time of Preservation:____________________

H:/labforms/GBRA COC form *prep:10/8/03 by jl Rev:5*

APPENDIX E DATA SUMMARY

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 TCEQ; and**
- **Other discrepancies.**

Planning Agency Data Manager: ____

Date: ____________________________