Surface Water Quality Monitoring Project
For The
Guadalupe River Basin

Quality Assurance Project Plan

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

Clean Rivers Program
Technical Analysis Division
Texas Natural Resource Conservation Commission
P.O. Box 13087, MC - 147
Austin, Texas 78711-3087

Effective Period: September 1, 2001 to August 31, 2002

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

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A1 APPROVAL PAGE

Texas Natural Resource Conservation Commission

Technical Analysis Division

Jim Thomas, Director Date Technical Analysis Division	Charles Dvorsky, Manager Date Water Quality Planning & Assessment Section
Linda Brookins Date Program Manager, Clean Rivers Program	Allison Woodall Date Project Manager, Clean Rivers Program

Compliance Support Division

Carol Batterton, Director Date Compliance Support Division	Stephen Stubbs Date TNRCC Quality Assurance Manager
Bernard Ray Date CRP Quality Assurance Specialist Quality Assurance Section	

Guadalupe-Blanco River Authority

Debbie C. Magin Date GBRA, Project Manager	Hopkins Haden Date GBRA, Quality Assurance Officer

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 revisions of this plan. GBRA will maintain this documentation as part of the project's quality assurance records, and will ensure that the document is available for review.

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LIST OF ACRONYMS

AWRL	**Ambient Water Reporting Limits**
BMP	**Best Management Practices**
COC	**Chain-of Custody**
CRP	**Clean Rivers Program**
DMP	**Data Management Plan**
DQO	**Data Quality Objective**
FY	**Fiscal Year**
GBRA	**Guadalupe-Blanco River Authority**
LCRA	**Lower Colorado River Authority**
MDMA	**Monitoring Data Management & Analysis**
QA	**Quality Assurance**
QAM	**Quality Assurance 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**
RWA	**Receiving Water Assessment**
SOP	**Standard Operating Procedure**
SWQM	**Surface Water Quality Monitoring**
TMDL	**Total Maximum Daily Load**
TNRCC	**Texas Natural Resource Conservation Commission**
TRACS	**Texas Regulatory and Compliance System**
TSWQS	**Texas Surface Water Quality Standards**
VOA	**Volatile Organic Analytes**
WMT	**Watershed Management Team**

A3 DISTRIBUTION LIST

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GBRA will provide copies of this project plan and any amendments or revisions of this plan to each sub-tier project participant, e.g., subcontractors, other units of government, laboratories. GBRA will document distribution of the plan by sub-tier participants and maintain this documentation as part of the project's quality assurance records, and will ensure that the document will be available for review.

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

TNRCC

Linda Brookins
CRP Program Manager

Responsible for TNRCC activities supporting the development and implementation of the Texas Clean Rivers Program. Responsible for verifying that the QMP is followed by CRP staff. Supervises TNRCC CRP staff. 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.

Bernard Ray
CRP Lead Quality Assurance Specialist

Responsible for CRP QA management. Assists CRP Project Managers in QA-related issues. Assists in CRP guidance development. Develops and updates the CRP QMP. Coordinates the review and approval of CRP QA documents. Conducts monitoring systems audits of Planning Agencies. Monitors implementation of corrective actions. Conveys QA problems to appropriate management. Advises CRP Project managers regarding the development of QAPPs. Facilitates and monitors corrective action process.

Allison Woodall
CRP Project Manager

Responsible for the development, implementation, and maintenance of CRP contracts. Tracks deliverables. Participates in guidance development. Reviews and approves QAPPs, QAPP amendments and appendices. Assists CRP Lead QA Specialist in conducting Planning agency audits; verifies that QAPPs are being followed by contractors and that projects are producing data of known quality. Reviews 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. For corrective actions, determines and documents the root cause(s), programmatic impact, required corrective action(s), actions needed to prevent recurrence, method(s) of verification, timetable(s) for completion, and responsible staff for correcting and monitoring the corrective action.

Eric Reese
CRP Data Manager

Responsible for tracking and verifying CRP data. Provides quality assured data sets to TNRCC Information Resources in compatible formats for uploading to the statewide database. Coordinates correction of data errors with CRP Project Managers, GBRA/UGRA Data Managers, and TNRCC Information Resources staff. Provides training and guidance to CRP and GBRA/UGRA on technical data issues. Reviews and approves data-related portions of program QMP and project-specific QAPPs. Performs technical reviews of project-specific Data Management Plans. Develops and maintains Standard Operating Procedures for CRP data management.

Laurie Curra
CRP Project Quality Assurance Specialist

Assists Lead QAS with CRP QA management. Serves as liaison between CRP management and agency QA management. Responsible for CRP guidance development related to program quality assurance. Responsible for the review and approval of amendments and appendices to QAPPs. Serves on planning team for CRP special projects. Monitors implementation of corrective actions.

Guadalupe-Blanco River Authority

Debbie C. Magin
GBRA Project Manager

Responsible for implementing CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Responsible for development and writing of QAPP, with coordination with the Quality Assurance Officer. 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 circumstances which may adversely affect quality of data derived from collection and analysis of samples. Responsible for validating that all data collected meet the data quality objectives of the project and are suitable for reporting to the TNRCC.

Hopkins Haden
GBRA Quality Assurance Officer

Assists with writing and maintaining basin QAPPs, amendments and appendices. Assists with monitoring systems audits for GBRA projects.

Debbie C. 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 TNRCC in a compatible format. Maintains quality-assured data on GBRA internet site. Responsible for the basin Data Management Plan.

Michael McCall
GBRA Laboratory Analyst/Field Technician

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

Hopkins H. Haden
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.

Chanda Burgoon
GBRA Laboratory Technician

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 Full/Part-time Laboratory Technician

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.

Part-time Laboratory Assistant

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.

Lower Colorado River Authority

Trace metals and organics analysis. The LCRA lab will be used as backup to the Albion laboratory for metals analyses, allowing flexibility in sampling and scheduling. Before metals samples are taken to the LCRA lab, it will be confirmed that they can meet the AWRLs required by the QAPP.

Albion Laboratories

Trace metals analysis.

UPPER GUADALUPE RIVER AUTHORITY

Scott Loveland
UGRA CRP 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.

Darren Keith Marquart
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.

Scott Loveland
UGRA CRP 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 TNRCC in a compatible format. Maintains quality-assured data on GBRA internet site.

Darren Keith Marquart
UGRA Water Quality Specialist

Assists with data management; performs lab and field analysis of inorganic constituents, nutrients, etc.; analyzes bioassessment samples. Primary work responsibilities are wet chemistry and bacteriological analyses.

Doris Rogers
UGRA Secretary/Receptionist

Responsible for sample management.

Nadine Starks
UGRA Water Quality Analyst

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.

Staff Temporaries
UGRA

Perform laboratory analysis and/or collect field data and samples as directed by senior water quality specialist.

PROJECT ORGANIZATION CHART

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 complies with commission rules for 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 TNRCC 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 that will be used to implement the QA requirements necessary to document the reliability and validity of environmental data. The QAPP is reviewed by the TNRCC 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 state-wide 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 TNRCC. 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 2002 -2003.*

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 2002-2003 includes continuation of the existing monitoring program, including biological monitoring and annual sampling for trace metals concentrations at selected sites. The program will be expanded to include two new sampling sites, which will be visited monthly and one systematic site that will be monitored for the duration of the biennium. After coordination with other monitoring entities in the basin, the new sites were selected to fill in gaps where data collection was deficient.

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 order,
- to provide data necessary for satisfying legal mandates including Clean Water Act Section 305(d) reporting,
- standards setting, and where appropriate, attainment determinations, and
- to provide data to address particular needs as they are defined.

Figure 2 is a map of the Basin sampling locations for FY 2002.

Figure 2 map

A6 PROJECT/TASK DESCRIPTION

As in past years, the 2002-2003 monitoring program addresses routine and systematic monitoirng. The major components are 1) collection of routine field and conventional water quality parameters, along with flow, at sites throughout the basin, 2) semi-annual collection of biological data at selected sites, including benthics, fish and habitat, and 3) sampling for trace metals annually at selected sites.

Additional components of the FY 2002-2003 program, added at the direction of the steering committee, include 1) expanding the routine monitoring sites to include two sites in Kendall County, 2) adding a systematic monitoring site in the contributing watersheds to upper Plum Creek in Hays County, 3) performing special studies identified by the basin-wide steering committee, and 4) to perform a study that will evaluate the techniques proposed by the U.S. Environmental Protection Agency to establish numeric nutrient stream standards criteria. Diurnal monitoring for dissolved oxygen will extend into September and October at four sites that were listed on the 2000 303d list. Other sites may be selected in the year for diurnal monitoring. Quality assurance for the special studies will be addressed in appendices that will be submitted at a later date as the studies are developed.

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 monitoring to be conducted under this QAPP.

Amendments to the QAPP

Revisions to the QAPP may be necessary to reflect changes in project organization, tasks, schedules, objectives, and methods; to improve operational efficiency; and to accommodate unique or unanticipated circumstances. Requests for amendments are directed from the GBRA Project Manager to the CRP Project Manager in writing. They 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 distributed by the GBRA Project Manager and incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list.

Appendices to the QAPP

Appendices as referenced under the Project Description above will be submitted as work that is planned. Projects requiring QAPP appendices will be planned in consultation with the GBRA and the TNRCC Project Manager and TNRCC 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 and UGRA Project Managers, the GBRA and UGRA QAOs, the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist and other TNRCC personnel as appropriate. Copies of approved QAPPs appendices will be distributed by the GBRA to project participants before monitoring activities are commenced.

A7 QUALITY OBJECTIVES AND CRITERIA

The purpose of fixed/routine water quality monitoring is to collect surface water quality data needed for conducting water quality assessments in accordance with TNRCC'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, TNRCC, etc.), will be subsequently reconciled for use and assessed by the TNRCC. No decisions will be made by the project team based on the data collected. Systematic monitoring will be used to investigate water quality conditions that exist at a selected site for duration of the biennium. At the end of the period, the systematic site will be evaluated to determine if there is a water quality concern and if there is the need to include it as a part of the routine monitoring program.

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

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Ambient Water Reporting Limits

Ambient water reporting limits, or AWRLs, are the specifications at which data will be reported to the TNRCC. Ongoing ability to recover an analyte at the AWRL is demonstrated through analysis of a calibration or check standard at the AWRL. The AWRLs for target analytes and performance limits at AWRLs for this project are set forth in Table A7.1. Quality control requirements are defined in Section B5. (also see Accuracy.)

Precision

The precision of data is a measure of the reproducibility of a measurement when a collection or an analysis is repeated. 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. Performance limits for laboratory duplicates are defined in Table A7.1. Performance limits for field duplicates are defined in Section B5.

Accuracy

Accuracy is a statistical measurement of correctness and includes components of systemic error. A measurement is considered accurate when the value reported does not differ from the true value. Accuracy is verified through the analysis of laboratory spikes and calibration control standards. Performance limits for laboratory spikes and calibration control standards for AWRLs are specified in Table A7.1.

Representativeness

Site selection, the appropriate sampling regime, the sampling of all pertinent media according to TNRCC SOPs, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Fixed/routine data collected under the Clean Rivers Program for water quality assessments are considered to be spatially and temporally representative of fixed/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 fixed/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 TNRCC SOPs. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format as specified in the Data Management Plan (Appendix E).

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

No special training or certifications are required for this project. Training on field techniques, quality assurance, data management, etc., is provided by the TNRCC for the Planning Agencies as part of the Clean Rivers Program.

A9 DOCUMENTS AND RECORDS

The documents that describe, specify, report, or certify activities are listed in Table A9.1.

Table A9.1 Project Documents and Records

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	TNRCC/GBRA/UGRA	Seven years	Paper/Electronic
QAPP distribution documentation	GBRA	Seven years	Paper
Field notebooks or data sheets	UGRA/GBRA	Two years/ indefinitely	Paper/microfilm
Field equipment calibration/maintenance logs	UGRA/GBRA	Two years/ indefinitely	Paper/microfilm
Chain of custody records	UGRA/GBRA	Two years/ indefinitely	Paper/microfilm
Field SOPs	UGRA/GBRA	Two years/ indefinitely	Paper
Laboratory QA Manuals	GBRA/UGRA/LCRA/Albion	Indefinitely	Paper
Laboratory SOPs	GBRA/UGRA/LCRA/Albion	Indefinitely	Paper
Laboratory data reports/results	GBRA/UGRA/LCRA/Albion	One year/indefinitely	Paper/microfilm
Instrument printouts	GBRA/UGRA/LCRA/Albion	One year/indefinitely	Paper/microfilm
Laboratory equipment maintenance logs	GBRA/UGRA/LCRA/Albion	One year/indefinitely	Paper/microfilm
Laboratory calibration records	GBRA/UGRA/LCRA/Albion	One year/indefinitely	Paper/microfilm
Corrective Action Documentation	GBRA/UGRA/LCRA/Albion	One year/indefinitely	Paper/microfilm

B1 SAMPLING PROCESS DESIGN

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

B2 SAMPLING METHODS

Field Sampling Procedures

The field sampling procedures are documented in the TNRCC *Surface Water Quality Monitoring Procedures Manual* (1999, or subsequent editions). Additional aspects outlined in Section B below reflect specific requirements for sampling under the Clean Rivers Program and/or provide additional clarification. Biological monitoring will be done following the protocol outlined in TNRCC *Receiving Water Assessment* manual. No receiving water assessments are scheduled for FY 2002-2003, but if it becomes necessary to conduct a RWA, the TNRCC *Receiving Water Assessment* protocols will be followed.

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°C	100 mL	48 hours
Hardness	Water	Plastic or glass	Cool, 4°C, HNO_3 to pH < 2	1 L	6 months
Solids	Water	Plastic or glass	Cool, 4°C	1 L	7 days
Nitrate/nitrite-nitrogen	Water	Plastic or glass	Cool, 4°C, H_2SO_4 to pH < 2	1 L	28 days
Ammonia-nitrogen	Water	Plastic or glass	Cool, 4°C, H_2SO_4 to pH < 2	1 L	28 days
Total phosphorus	Water	Plastic or glass	Cool, 4°C, H_2SO_4 to pH < 2	1 L	28 days
Sulfate	Water	Plastic or glass	Cool, 4°C	1 L	28 days
Chloride	Water	Plastic or glass	Cool, 4°C	1 L	28 days
Chlorophyll a /Pheophytin	Water	Amber plastic or glass	Cool, 4°C/0 °C after filtration	1 L	Filter within 24 hours/14 days at 0°C
E. coli	Water	Sterile, plastic	Cool, 4°C	100 mL	6 hours
Metals, total	Water	Plastic or glass	Cool, 4°C, HNO_3 to pH < 2	1 L	6 months
Metals, dissolved	Water	Plastic or glass	Cool, 4°C, HNO_3 to pH < 2	1 L	Filtered on site/6 months
Mercury, total	Water	Plastic or glass	Cool, 4°C, HNO_3 to pH < 2	1 L	28 days

Sample Containers

Sample containers (cubitainers) 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 new, certified glass or plastic bottles, or glass or plastic bottles cleaned and documented according to EPA method 1669. Amber glass bottles are used routinely for chlorophyll samples. Sterile bottles are used for bacteriological samples and may have 1% sodium thiosulfate tablets added. Certificates are maintained in a notebook by the GBRA/UGRA or by the Albion and LCRA laboratories.

Processes to Prevent Contamination

Procedures outlined in the TNRCC *Surface Water Quality Procedures Manual* 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 in field data logs as presented in Appendix C. The following will be recorded for all visits:

1. Station ID
2. Location
3. Sampling time
4. Sampling date
5. Sampling depth
6. Sample collector's name/signature
7. Values for all measured field parameters
8. Detailed observational data, including:
   - water appearance
   - weather
   - days since last significant rainfall
   - flow severity
9. Other observational data, including:
   - biological activity
   - 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.)
   - unusual odors
   - specific sample information (number of sediment 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 with no modifications, write-overs or cross-outs;
2. Correction of errors with a single line followed by an initial and date;
3. Close-outs on incomplete pages with an initialed and dated diagonal line.

Failures in Sampling Methods Requirements and/or Deviations from Sample Design and Corrective Action

Examples of failures in sampling methods and/or deviations from sample design requirements include but are not limited to sample container problems, sample site considerations, etc. Failures or deviations from the QAPP are documented on the field data sheet or analyst log and reported to the GBRA/UGRA Project Managers. The GBRA/UGRA Project Managers will determine if the deviation from the QAPP compromises the validity of the resulting data. The GBRA/UGRA Project Managers, in consultation with the GBRA/UGRA QAOs will decide to accept or reject data associated with the sampling event, based on best professional judgment. The resolution of the situation will be reported to the TNRCC in the quarterly report. Corrective action documentation is maintained by GBRA/UGRA.

B3 SAMPLING HANDLING AND CUSTODY PROCEDURES

Chain-of -Custody The COC system described in this QAPP replaces the "tag" system as described in the SWQM Manual.

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 contractors. The following information concerning the sample is recorded on the COC form (See 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

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" as applicable
5. Sample type (e.g., conventional water parameters, organics, etc. as defined in the monitoring schedule in Appendix B*)*

Sample Handling

After collection of samples are complete, sample containers are immediately stored in a ice chest for transport to the laboratory, accompanied by the chain of custody. Ice chests will remain in the possession of the field technician or in the locked vehicle until delivered to the lab. After receipt at the 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. Trace metal samples are filtered in the field. Samples for dissolved metals are shipped by common carrier, along with the

chain of custody, to the Lower Colorado River Authority Laboratory in Austin, Texas or the Albion Laboratory in College Station, Texas, depending on the specific metal analyses needed.

Failures in Chain-of-Custody and Corrective Action

All failures associated with chain-of-custody procedures are immediately reported to the GBRA/UGRA Project Managers. These include delays in transfer, resulting in holding time violations; violations of sample preservation requirements; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc. The GBRA/UGRA Project Managers, in consultation with the GBRA/UGRA QAOs, will determine if the procedural violation may have compromised the validity of the resulting data. The GBRA/UGRA Project Managers in consultation with the GBRA/UGRA QAOs will decide how the issue will be resolved based on best professional judgment and inform the staff. Possible courses of action include: document and proceed; redo the entire sampling event; or selectively analyze the samples. The resolution of the situation will be reported to the TNRCC in the quarterly progress report. Corrective action documentation is maintained by GBRA/UGRA.

B4 ANALYTICAL METHODS

The analytical methods, associated matrices, and performing laboratories are listed in Table A7.1 of Section A7. The authority for analysis methodologies 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 *TNRCC Surface Water Quality Monitoring Procedures Manual*, 40 CFR 136, or other reliable procedures acceptable to the Agency." Laboratories collecting data under this QAPP are compliant with ISO/IEC Guide 25.

Copies of laboratory SOPs are retained by GBRA and UGRA and are available for review by the TNRCC. Laboratory SOPs are consistent with EPA requirements as specified in the method.

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 TNRCC-approved analytical methodologies as specified in this QAPP will be submitted to the TNRCC. Requests for method modifications will be documented on form TNRCC-10364, the TNRCC Application for Analytical Method Modification, and submitted for approval to the TNRCC Quality Assurance Section. Approval by the TNRCC will be granted or denied based on review of the application, specifically the section documenting an initial demonstration of method equivalency conducted by the laboratory. Work will only begin after the modified procedures have been approved.

Failures or Deviations in Analytical Method Requirements and Corrective Actions

Failures in field and laboratory measurement systems involve, but are not limited to, instrument malfunctions, failures in calibration, blank contamination, QC sample problems (i.e., poor spike recoveries), etc. In many cases, the field technician or lab analyst will be able to correct the problem (i.e., via re-calibration or re-analysis). If the problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, then it is conveyed to the respective supervisor, who will make the determination. If the analytical system failure compromises the sample results, the data will not be reported to the TNRCC as part of this study. The nature and disposition of the problem is documented on the data report that is sent to the GBRA/UGRA Project Managers. The GBRA/UGRA Project Managers will include this information on the quarterly report that is sent to the TNRCC. Corrective action documentation is maintained by the GBRA/UGRA.

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

The minimum field QC Requirements are outlined in the *TNRCC Surface Water Quality Monitoring Procedures Manual.* Specific requirements are outlined below. Field QC sample results are submitted with the data report (see Section C2.).

Field equipment blank - 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. The analysis of equipment blanks should yield values lower than the AWRL, 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. Equipment blanks will be collected at the time that samples are filtered in the field for trace metals concentrations and delivered along with the samples to the Lower Colorado River Authority Laboratory and Albion Laboratory.

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. 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 AWRL. 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.

Field duplicate - A field duplicate is defined as a second sample (or measurement) from the same location, collected in immediate succession, using identical techniques. Except for bacteriological sample collection, this applies to all cases of routine surface water collection procedures, including in-stream grab samples, bucket grab samples (e.g., from bridges), pumps, and other water sampling devices. Duplicate samples are sealed, handled, stored, shipped, and analyzed in the sample manner as the primary sample. Precision of duplicate results for most parameters is calculated by the relative percent difference (RPD) 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 using the following equation:

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

Performance limits and control charts are used to determine the acceptability of field duplicate analyses.

The frequency requirement for field duplicates is specified in the SWQM Manual. Field duplicates will be collected on a 10% basis.

Field blank - A field blank consists of deionized water that is taken to the field and poured into the sample container. Field blanks are not routinely required but are used to assess the contamination from field sources such as airborne materials, containers, and preservatives. The analysis of field blanks should yield values lower than the AWRL. When target analyte concentrations are high, blank values should be lower than 5% of the lowest value of the batch. Field blanks will accompany samples collected for trace metals analysis.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Detailed laboratory QC requirements and corrective action procedures are contained within the individual laboratory quality assurance manuals (QAMs). The minimum requirements that all participants abide by are stated below. Lab QC sample results are submitted with the data report (see Section C2).

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 AWRL, otherwise the equipment should not be used.

Laboratory duplicate - A laboratory duplicate is prepared by splitting aliquots of a single sample (or a matrix spike or a laboratory control standard) in the laboratory. Both samples are carried through the entire preparation and analytical process. Laboratory duplicates are used to assess precision and are performed on 10% of samples analyzed, including bacteriological analyses performed in the field. Acceptability criteria are outlined in Table A7.1 of Section A7.

For most parameters, precision is calculated by the relative percent difference (RPD) of 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:

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

Performance limits and control charts are used to determine the acceptability of duplicate analyses.

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 same 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. Precision limits for bacteriological analyses are defined in "A7 – Quality Objectives and Criteria."

Laboratory Control Standard (LCS) - A laboratory control sample consists of analyte-free water spiked with the analyte of interest prepared from standardized reference material. The laboratory control standard is generally spiked into laboratory pure water at a level less than or equal to the mid-point of the calibration curve for each analyte. The LCS is carried through the complete preparation and analytical process. The LCS is used to document the accuracy of the method due to the analytical process. LCSs are generally run at a rate of one per batch. Acceptability criteria are laboratory-specific and are usually based on results of past laboratory data. LCSs are routinely incorporated into the analysis program. The analysis of LCSs is a measure of accuracy and is calculated by Percent Recovery (%R), which is defined as 100 times the observed concentration, divided by the true concentration of the spike.

The following formula is used to calculate percent recovery, where %R is percent recovery; SR is the sample result; SA is the spike added:

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

AWRL Calibration Standard or Check Standard

To demonstrate ongoing ability to recover at the AWRL, the laboratory will analyze a calibration standard (if applicable) at or below the AWRL 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 AWRL will meet the calibration requirements of the analytical method. Second, the instrument response (e.g., absorbance, peak area, etc.) for the standard at the AWRL 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 AWRL 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 AWRL 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:

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

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. The MS is spiked at a level less than or equal to the midpoint of the calibration or analysis range for each analyte. The MS is used to document the accuracy of a method due to sample matrix and not to control the analytical process. Acceptability criteria are outlined in Table A7.1 and are calculated by percent recovery. 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:

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

Method blank - 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 AWRL. For very high level analyses, blank value should be less then 5% of the lowest value of the batch, or corrective action will be implemented.

Additional method-specific QC requirements - Additional QC samples are run (e.g., 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.

Failures in Field and Laboratory Quality Control and Corrective Action

Sampling QC excursions are evaluated by the GBRA/UGRA Project Managers, in consultation with the GBRA/UGRA QAOs. In that differences in field duplicate sample results are used to assess the entire sampling process, including environmental variability, the automatic rejection of results based on control chart limits is not practical. Therefore, some professional judgment will be relied upon in evaluating results. Rejecting sample results based on wide variability is a possibility. Blank data are scrutinized very closely. Blank values exceeding the acceptability criteria may automatically invalidate the sample, especially in cases where high blank values may be indicative of contamination that may be causal in putting a value above the standard. Incidences of field duplicate excursions and blank contamination are noted in the CRP quarterly report.

Laboratory measurement quality control failures are evaluated by the laboratory staff. The disposition of such failures and conveyance to the TNRCC are discussed in Section B4 under "Failures or Deviations in Analytical Methods and Corrective Actions." Corrective action documentation is maintained by GBRA/UGRA.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

All sampling equipment testing and maintenance requirements are detailed in the *TNRCC Surface Water Quality Monitoring Procedures Manual*. 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 QAM(s). Testing and maintenance records are maintained and are available for inspection by the TNRCC. 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 TNRCC.

B7 INSTRUMENT CALIBRATION AND FREQUENCY

Field equipment calibration requirements are contained in the *TNRCC Surface Water Quality Monitoring Procedures Manual*. 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 TNRCC.

Detailed laboratory calibrations are contained within the QAM(s). The laboratory QAM 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 TNRCC. Equipment requiring periodic

calibrations include, but are not limited to, thermometers, pH meters, balances, incubators, turbidity meters, and analytical instruments. Calibration records are available to the TNRCC for review.

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 data obtained from non-direct measurement sources.

B10 DATA MANAGEMENT

Data Management Protocols are addressed in the Data Management Plan which is in Appendix E of this document.

C1 ASSESSMENTS AND RESPONSE ACTIONS

The following table presents the types of assessments and response action 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 TNRCC in Quarterly Report
Monitoring Systems Audit	Dates to be determined by TNRCC CRP	TNRCC	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the TNRCC to address corrective actions
Monitoring Systems Audit of UGRA	Once/contract	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. GBRA will report problems to TNRCC in Progress Report.
Laboratory Inspection	Dates to be determined by TNRCC	TNRCC Laboratory Inspector	Requirements appearing in lab SOPs and QAPs, 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 TNRCC to address corrective actions
Performance Evaluation Samples	Annually	Laboratories and commercial suppliers	Evaluation of laboratory competency in performing analyses	Report problems to the TNRCC in Progress Report

Corrective Action

The GBRA/UGRA Project Managers are responsible for implementing and tracking corrective action procedures as a result of audit findings. Record of audit findings and corrective actions are maintained by both the CRP and GBRA/UGRA

Project Managers. The laboratory has 30 days to respond in writing to the GBRA Project Manager of the actions taken by the laboratory to correct deficits found in the lab audit. All communications are a part of the permanent record and are maintained by the GBRA/UGRA Project Managers. Data supplied by the laboratory will be scrutinized by the GBRA/UGRA Project Managers and QAOs to determine if it should be transmitted to TNRCC. Failure by the laboratory to respond to audit findings with corrective actions or explanations may result in discontinuation of lab services. Corrective action documentation will be submitted to the TNRCC with the Progress Report.

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

C2 REPORTS TO MANAGEMENT

Reports to Planning Agency Project Management

Laboratory data reports contain QC information so that this information can be reviewed by the GBRA/UGRA Project Managers. After review, the GBRA /UGRA Project Managers mark the lab report as "QA Reviewed" and begins process of data transmittal to TNRCC. Project status, assessments and significant QA issues will be dealt with by the GBRA/UGRA Project Managers who will determine whether it will be included in reports to the TNRCC Project Management.

Reports to TNRCC Project Management

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

Progress Report - Summarizes the GBRA/UGRA 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 TNRCC in the quarterly progress report.

Reports by TNRCC Project Management

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

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

All data obtained from field and laboratory measurements will be reviewed and verified for integrity and continuity, reasonableness, and conformance to project requirements, and then validated against the data quality objectives which are listed in Table A7.1. Only those data which are supported by appropriate quality control data and meet the data quality objectives defined for this project will be considered acceptable, and will be reported for entry into TNRCC's state-wide database.

The procedures for verification and validation of data are described in Section D2, below. The GBRA/UGRA Data Managers are responsible for ensuring that field data are properly reviewed, verified, and submitted in the required format to the project database. Likewise, the Laboratory Manager of Albion and LCRA Laboratories are responsible for ensuring that laboratory data are reviewed, verified, and submitted in the required format to the project database. Finally, the GBRA/UGRA Project Managers are responsible for validating that all data collected meet the data quality objectives of the project and are suitable for reporting to TNRCC.

D2 VERIFICATION AND VALIDATION METHODS

All data will be verified to ensure they are representative of the samples analyzed and locations where measurements were made, and that the data and associated quality control data conform to project specifications. The staff and management of the respective field, laboratory, and data management tasks are responsible for verifying the data each task generates or

handles. The field and laboratory tasks ensure the verification of raw data, electronically generated data, and data on chain-of-custody forms and hard copy output from instruments. The data management task deals primarily with electronic data.

Verification of data will be performed using self-assessments and peer review, as appropriate to the project task, followed by technical review by the manager of the task. The data to be verified (listed by task in Table D.1) are evaluated against project specifications and are checked for errors, especially errors in transcription, calculations, and data input. Potential outliers are identified by examination for unreasonable data, or identified using computer-based statistical software. If a question arises or an error or potential outlier is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues that can be corrected are corrected and documented electronically or by initialing and dating the associated paperwork. If an issue cannot be corrected, the task manager consults with a higher-level project management to establish the appropriate course of action, or the data associated with the issue are rejected. The performance of the data management task is documented by completion of the data review checklist.

The GBRA/UGRA Project Managers are responsible for validating that the verified data meet the measurement performance criteria and are reportable to TNRCC. One element of the validation process involves evaluating the data again for anomalies. Any suspected errors or anomalous data must be addressed by the manager of the task associated with the data, before data validation can be completed. Prior to transmittal of data to TNRCC, the current month's data is compared to the median, mean, maximum and minimum values in the historical database for each site for each parameter. If anomalies are identified, the GBRA/UGRA project manager will make the determination if the data is valid and if it should be transmitted to TNRCC. A second element of the validation process is consideration of any findings identified during the annual monitoring systems audit conducted by the TNRCC Quality Assurance Specialist assigned to the project. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. Finally, the GBRA/UGRA Project Managers validate that the data meet the data quality objectives of the project and are suitable for reporting to TNRCC.

Table D2.1 Data Verification Tasks

Data to be Verified	Field Task	Laboratory Task	Database (or Data Manager) Task
Sample documentation complete	Y	Y	
Standards and reagents traceable	Y	Y	
Holding times not exceeded	Y	Y	
Collection, preparation, and analysis consistent with SOPs and QAPP	Y	Y	
Analytical sensitivity (AWRLs) consistent with QAPP	Y	Y	
QC analyzed at required frequency	Y	Y	
QC results meet performance and program specifications	Y	Y	Y
Results, calculations, transcriptions checked	Y	Y	
Laboratory bench-level review performed		Y	
All laboratory samples analyzed for all parameters		Y	
Corollary data agree	Y	Y	Y
Nonconforming activities documented	Y	Y	Y
TAG IDs correct			Y
TNRCC ID number assigned			Y
Dates formatted correctly			Y
Depth reported correctly			Y
Source codes 1, 2, and program code used correctly			Y
STORET codes valid and in QAPP			Y
Time based on 24-hour clock	Y	Y	Y
Outliers confirmed and documented			Y
Verified data log submitted			Y
10% of data manually reviewed			Y
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)	Y	Y	Y

D3 RECONCILIATION WITH USER REQUIREMENTS

Data produced in this project will not be used by the project team. These data, and data collected by other organizations (e.g., USGS, TNRCC, etc.), will be subsequently analyzed and used by TNRCC for TMDL development, stream standards modifications, permit decisions, and water quality assessments in accordance with TNRCC's *Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*.

Appendix A Work Plan Task 3

Work plan task 3 page 1

Work plan task 3 page 2

Work plan task 3 page 3

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 Planning Agencies have 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 TNRCC and other participants to ensure a comprehensive water monitoring strategy within the Watershed. Data collected in the years that GBRA and UGRA have 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 and UGRA will continue the monitoring frequency of the past biennium.

Site Selection Criteria

This data collection effort involves monitoring fixed/routine water quality, using procedures that are consistent with the TNRCC SWQM program, for the purpose of data entry into the statewide database maintained by the TNRCC. To this end, some general guidelines are followed when selecting sampling sites, as identified below. Overall consideration is given to accessibility and safety. All monitoring activities have been developed with coordination with the CRP Steering Committee and with the TNRCC.

1. Fixed/routine monitoring sites are representative of in-stream data and are free from back-water effects.

2. Fixed/routine monitoring sites are selected to maximize stream coverage or basin coverage. For very long stretches of river length, a station is considered representative of a water body for not more than 25 miles in freshwater and tidal streams. A single monitoring site is considered representative of 25 percent of the total reservoir acres and estuary or ocean square miles, but not more than 5,120 acres or 8 square miles.

3. Fixed/routine monitoring sites are located preferentially where there are “localized” water quality effects based on past water quality data.

4. Fixed/routine monitoring sites are located where historical data exists. No degradation of water quality may b indicated. However, the continuation of water quality monitoring at this site has been deemed important.

5. At least one site for each classified segment will be selected for fixed/routine monitoring unless the segment is already covered by TNRCC or other qualified monitoring entities reporting fixed/routine data to TNRCC.

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

7. Fixed/routine monitoring sites are chosen based on accessibility. When possible, sites are selected where it is possible to collect flow measurements during routine visits or where a stream flow gage is located.

Monitoring Sites

Monitoring Tables for fiscal year 2002 are presented on the following pages.

Monitoring Sites for FY 2002

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

Table B1.1 Sample Design and Schedule, FY 2002

Page 1 mon sched

Page 2 mon sched

Page 3 mon sched

Page 1 mon sched

Critical vs. non-critical measurements

All data taken for CRP and entered into the State of Texas SWQM Database are considered critical.

APPENDIX C – UGRA FIELD DATA SHEETS

Page 1 of ugra sheets

APPENDIX D – GBRA AND UGRA CHAIN OF CUSTODY FORMS

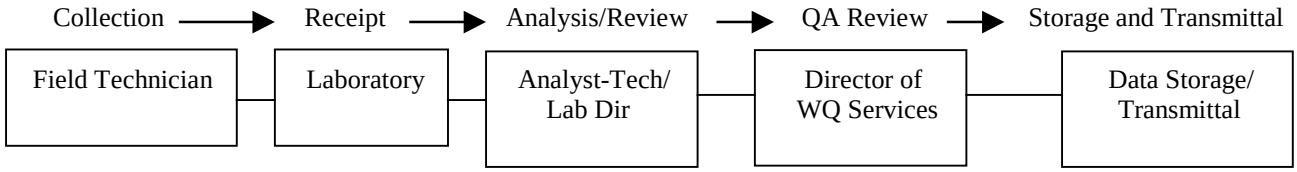
APPENDIX E - CRP DATA MANAGEMENT PLAN

Personnel - 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 field technician logs the sample in the Microsoft Access Lab Samples Database. Each sample is assigned a separate and distinct sample number. The sample is also accompanied by a chain of custody. The field technician 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.

Data generated by lab technicians are logged permanently in bound lab notebooks. The data is 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 documentaion 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 Director of Water Quality Services 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. A hard copy is kept on file. If the lab director 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 Director of Water Quality Services also serves as the Quality Assurance Officer, and is responsible for transmitting the data to TNRCC.

The following organizational chart outlines the path that data that is generated by lab and field personnel takes:



Systems Design - Hardware and Software Requirements – The data generated is input and stored on a personnel computer in the laboratory. Only three computers can access the database, the laboratory computer, the lab office computer and the computer in the office of the Director of Water Quality Services. The computer is networked to the GBRA server for back up to tape each night. The data is not accessible by remote computer, the internet or modem. The data is input into the Lab Samples Database which is a Microsoft Access database especially configured to generate reports, invoices and house data and quality assurance information. It allows correction of data if errors are discovered at a later date. Each month, data generated for Clean Rivers Program is copied from the Lab Samples Database to the Water Quality Database. The WQ Database is also scheduled for daily backup. The Friday back up tapes are kept off site for protection from catastrophic loss of computer files.

Data Dictionary - Terminology and field descriptions are included in the SWQM Data Management Reference Guide, 1999, provided in the Appendix 2 of the FY2000-2001 CRP Program Guidance. For the purposes of verifying which source codes are included in this QAPP, a table outlining the codes that will be used when submitting data under this QAPP is included below.

Name of Monitoring Entity	**Source Code 1**	**Source Code 2**
Guadalupe-Blanco River Authority	GB	GB
Upper Guadalupe River Authority	GB	UG

Data Management Plan Implementation –

Quality Assurance/Control - See Section D of this QAPP.

Migration/Transfer/Conversion - As data is generated in the field as well as from laboratory procedures, it is input into the Lab Samples Database. Monthly, the data generated for the Clean Rivers Program and for special projects that generate data that will be transmitted to TNRCC, is copied to the Water Quality Database. At which time that data is to be transmitted to TNRCC the Director of Water Quality Services converts the data to ASCII format and transmits the data by e-mail to TNRCC. In order to transmit data to TNRCC, a routine for data conversion and transmittal is performed. The steps are as follows:

1. Data in the Water Quality Database is reconfigured into files that are designated as event or results files, that are of proper size and field types, and are associated with tag numbers that are assigned in sequence. Greater than and less than values are reconfigured so that the symbols are in their own field.

2. After conversion to the correct database files, the data is validated, based on TNRCC maximum and minimum values for each test parameter and based on GBRA minimum analytical limits. Data that is found to be outside the quality control limits for the entities is verified. If found to be a valid entry, but outside the control limits, it is determined if the data is to be retained in the database. If the data is retained it is accompanied by a remark in the remarks field (for the remark codes, see Appendix 3 of the SWQM Data Management Reference Guide). The explanation regarding the nonconformance is added to the observation field, and includes the storet code, value and why the value is valid. If the data nonconformance cannot be resolved the data is removed before transmittal to TNRCC.

3. Twenty percent of the data in the event files and in the results files is verified manually for errors that may have occurred in conversion.

4. Documentation of the QA review of converted files is verified for audit by the completion of the "Data Management Checklist." A copy of the completed checklist is sent to TNRCC after the electronic transmittal of data.

5. Data ready for transmittal is saved in a historical file and then sent electronically as an ASCII file to TNRCC.

Backup/Disaster Recovery - The Lab Samples Database and the Water Quality Database described in the previous sections house the data collected in the field as well as the data generated by laboratory procedures. Both databases are on the hard drive of the lab personal computer. The hard drive is networked to the GBRA server. Nightly, the hard drive is backed up to the server. On Friday of each week the GBRA server is backed up to a tape and is stored off site, to protect in case of catastrophic disaster. If necessary the server or the tape back up can be called upon to recall data in the event that there would be a hard drive failure on the laboratory personal computer. The Director of Water Quality Services coordinates with the GBRA Systems Administrator on the scheduling of back ups. The Systems Administrator coordinates the back up of hard drives and the server and transports the tapes to the off site location. The standard operating procedure for recovering data on the server or tape backups can be accomplished by the Systems Administrator or her supervisor. Recovery of data can be accomplished with in 24 hours of catastrophic systems failure.

Archives/Data Retention - Complete original data sets are archived on tape and CD-Rom and retained on-site by GBRA for a retention period specified in the original QAPP approved by the TNRCC Project Manager. The GBRA Systems Administrator is responsible for the tape backups and producing the CD rom copies which are made as necessary.

Information Dissemination - The data generated by the Clean Rivers Program is available to the public by linking them to the TNRCC web site via the GBRA web page. Also the lab personnel can generate site specific data tables available as requested.

ATTACHMENT 1 Letters

TO: Roland Garcia
Lower Colorado River Authority

FROM: Debbie Magin
Guadalupe-Blanco River Authority

Please sign and return this form by 10/10/01 to:

933 E. Court St., Seguin, TX 78155

I acknowledge receipt of the referenced document(s). I understand the document(s) describe quality assurance, quality control, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

Signature Date

TO: Dr. Paul Booth
Albion Laboratory

FROM: Debbie Magin
Guadalupe-Blanco River Authority

Please sign and return this form by 10/10/01 to:

933 E. Court St., Seguin, TX 78155

I acknowledge receipt of the referenced document(s). I understand the document(s) describe quality assurance, quality control, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

_____

Signature Date

TO: Scott Loveland
Upper Guadalupe River Authority

FROM: Debbie Magin
Guadalupe-Blanco River Authority

Please sign and return this form by 10/10/01 to:

933 E. Court St., Seguin, TX 78155

I acknowledge receipt of the referenced document(s). I understand the document(s) describe quality assurance, quality control, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

_____

Signature Date

TO: Dr. Paul Jensen
PBS&J

FROM: Debbie Magin
Guadalupe-Blanco River Authority

Please sign and return this form by 10/10/01 to:

933 E. Court St., Seguin, TX 78155

I acknowledge receipt of the referenced document(s). I understand the document(s) describe quality assurance, quality control, and other technical activities that must be implemented to ensure the results of work performed will satisfy stated performance criteria.

_____

Signature Date