Nonpoint Source Grant Program

Surface Water Quality Monitoring to Support the Coordinating Implementation of the Watershed Protection Plan for Mid and Lower Cibolo Creek

TSSWCB Project 19-52
Revision #0

Quality Assurance Project Plan

Texas State Soil and Water Conservation Board

Prepared by

San Antonio River Authority

Effective Period: upon signature through April 30, 2021

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

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A1 APPROVAL PAGE

Surface Water Quality Monitoring to Support the Mid and Lower Cibolo Creek Watershed Protection Plan

Texas State Soil and Water Conservation Board (TSSWCB)

Name: Jana Lloyd
Title: TSSWCB Project Manager

Signature: _____ Date: _____

Name: Mitch Conine
Title: TSSWCB Quality Assurance Officer

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San Antonio River Authority

Name: Patricia M. Carvajal
Title: SARA Project Manager

Signature: _____ Date: _____

Name: Shannon Tollison
Title: SARA Laboratory Supervisor

Signature: _____ Date: _____

Name: Jeanette Hernandez
Title: SARA Laboratory Quality Assurance Officer

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Name: Ernest Moran
Title: SARA Stormwater Supervisor

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Name: Charles J. Lorea, IV
Title: SARA Watershed Monitoring Supervisor

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Title: SARA Project Manager

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Name: Kylie Gudgell
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Name: Michelle Robertson
Title: Quality Assurance Officer

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DHL Laboratory

Name: John DuPont
Title: Laboratory Manager

Signature: _____ Date: _____

Name: Sherri Herschmann
Title: Quality Assurance Officer

Signature: _____ Date: _____

The SARA 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 QAPP and any amendments or added appendices of this QAPP. The SARA will maintain this documentation as part of the project's QA records, and will be available for review. (See sample letter in Attachment 1 of this document.)

A2 TABLE OF CONTENTS

List of Acronyms

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practice
BOD	Bio-chemical Oxygen Demand
C	Centigrade (Temperature)
CAR	Corrective Action Report
CBOD	Carbonaceous Biological Oxygen Demand
CFR	Code of Federal Regulations
cfs	Cubic Feet Per Second
COC	Chain of Custody
COD	Chemical Oxygen Demand
CR	County Road
CRP	Clean Rivers Program
CWA	Clean Water Act
DO	Dissolved Oxygen
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
GIS	Geographic Information System
GPS	Global Positioning System
H_2SO_4	Sulfuric Acid
ID	Identification
L	Liter
LCS	Laboratory Control Standard
LOD	Limit of Detection
LOQ	Limit of Quantitation
m	Meter
mg/L	Milligrams per Liter
mL	Milliliters
MPN	Most Probable Number
NA	Not Applicable
NELAP	National Environmental Laboratory Accreditation Program
NH_3-N	Ammonia-Nitrogen
NO_3-N	Nitrate-Nitrogen
NWIS	National Water Information System
NCR	Nonconformance Report
NRCS	U.S. Department of Agriculture Natural Resources Conservation Service
OSSF	On-Site Sewage Facility
PCWP	Plum Creek Watershed Partnership
QA	Quality Assurance
QAM	Quality Assurance Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
R	Recovery (%Percent Recovery)
RL	Reporting Limit
RPD	Relative Percent Difference
SA	Sample Amount (reference concentration)

SARA	San Antonio River Authority
SARA-EL	San Antonio River Authority - Environmental Laboratory
SLOC	Station Location
SM	Standard Methods
SOP	Standard Operating Procedure
SR	Sample Result Concentration (%Percent Recovery)
SSR	Spiked Sample Concentration (%Percent Recovery)
su	Standard Units
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System (formerly TRACS)
TCEQ	Texas Commission on Environmental Quality
TKN	Total Kjeldahl Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
TSSWCB	Texas State Soil and Water Conservation Board
TSWQS	Texas Surface Water Quality Standards
TWQI	Texas Water Quality Inventory
USGS	U.S. Geological Survey
WPP	Watershed Protection Plan
WQMP	Water Quality Management Plan
WWTF	Wastewater Treatment Facility

A3 DISTRIBUTION LIST

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

TSSWCB
1497 Country View Lane
Temple, TX 76504

Name: Jana Lloyd
Title: TSSWCB Project Manager

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

SARA
100 E. Guenther
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Name: Patricia M. Carvajal
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San Antonio, TX 78212

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2300 Double Creek Drive
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Sherri Herschmann, Laboratory Quality Assurance Officer
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GBRA Laboratory
933 East Court Street
Seguin, Texas 78155

Kylie Gudgell, Laboratory Manager
(830)463-7160

Michelle Robertson, Quality Assurance Officer
(830)463-7160

The SARA will provide copies of this QAPP and any amendments or appendices of this QAPP to each person on this list and to each sub-tier project participant, e.g., subcontractors, other units of government, laboratories. The SARA will document distribution of the QAPP and any amendments and appendices, maintain this documentation as part of the project's QA records, and will be available for review.

A4 PROJECT/TASK ORGANIZATION

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

TSSWCB

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

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

SARA

Patricia M. Carvajal, Project Manager
Responsible for implementing and monitoring requirements in the contract, and the QAPP. Responsible for writing and maintaining records of the QAPP and its distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. Coordinates project planning activities and work of project partners. Ensures monitoring systems audits are conducted to ensure QAPP is followed by project participants and that project is producing data of known quality. Responsible for ensuring that field data are properly reviewed and verified for integrity and continuity, reasonableness and conformance to project requirements, and then validated against the data quality objectives listed in Table A7.1. Ensures that subcontractors are qualified to perform contracted work. Ensures that quality-assured data is posted on SARA Internet sites. Ensures TSSWCB Project Manager and/or QAO are notified of deficiencies and non-conformances, and that issues are resolved. Responsible for validating that data collected are acceptable for reporting to the TCEQ SWQMIS.

Charles J. Lorea, IV
Responsible for the overall management of the stormwater monitoring which includes: ensuring that staff are adequately trained on the use monitoring equipment and monitoring procedures. Responsible for supervising the maintenance of the sample sites and ensuring that staff are keeping up with the operations and maintenance of the sampling equipment used to collect stormwater samples. Ensures that staff notify QA staff of deficiencies and non-conformances.

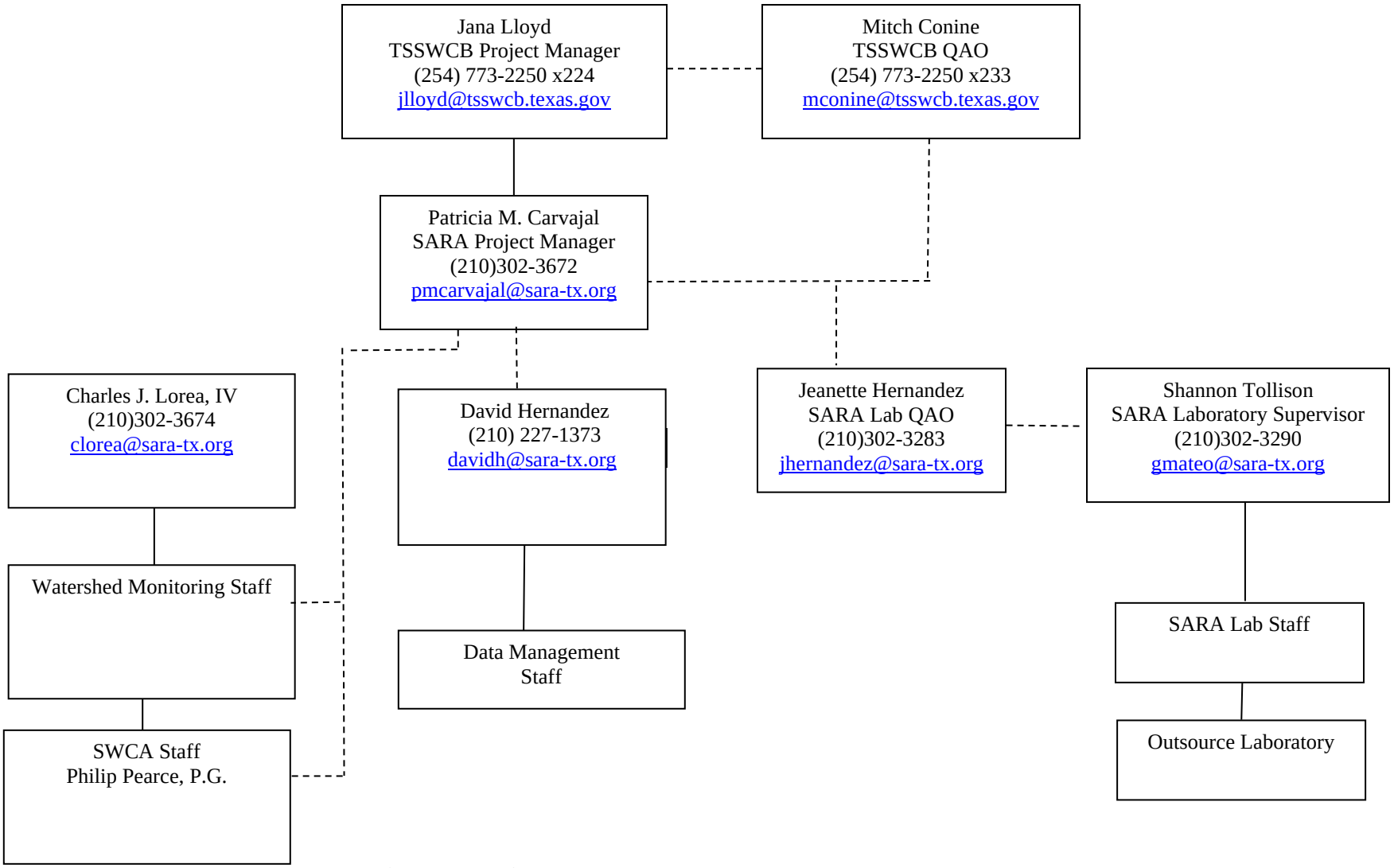
Shannon Tollison, Laboratory Supervisor
The responsibilities of the lab director include supervision of laboratory, purchasing of equipment, maintain quality assurance manual for laboratory operations, and supervision of lab safety program. Additionally, the lab director will review and verify all laboratory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

Jeanette Hernandez, SARA Laboratory Quality Assurance Officer
Responsible for coordinating the implementation of the QA program. Responsible for identifying, receiving, and maintaining QA records. Notifies the SARA Regional Laboratory Director and SARA Project Manager of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective action. Coordinates and maintains records of data verification and validation. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques.

SWCA Environmental Consultants

Philip C. Pearce, P.G
Responsible for supervising aspects of the sampling and measurement of surface waters and other parameters in the field for stormwater. Responsible for the acquisition of water samples and field data measurements in a timely manner that meet the quality objectives specified in Section A7, as well as the requirements of Sections B1 through B8. Responsible for field scheduling, staffing, and ensuring that staff is appropriately trained as specified in Section A8.

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



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

A5 PROBLEM DEFINITION/BACKGROUND

The Cibolo Creek is the boundary or flows through Bexar County, Comal County, Guadalupe County and Kendal County. The focus of this effort is the Mid and Lower Cibolo Creek watersheds which have very little stormwater data available. The monitoring efforts for this project will focus on the collection of discrete samples over the hydrograph of various rain events to characterize the water quality of the stormwater within the watershed.

The 2012 303(d) List identified the Lower Cibolo Creek (Segment 1902) as exceeding the contact recreation criterion for *E. coli* bacteria. The ultimate water quality goal for this segment is to reduce bacterial concentrations to within acceptable risk levels for the stream to meet the Primary Contact Recreation Standard 1. (https://www.sara-tx.org/public_resources/library/documents/water_quality_monitoring/2013BSR-web.pdf).

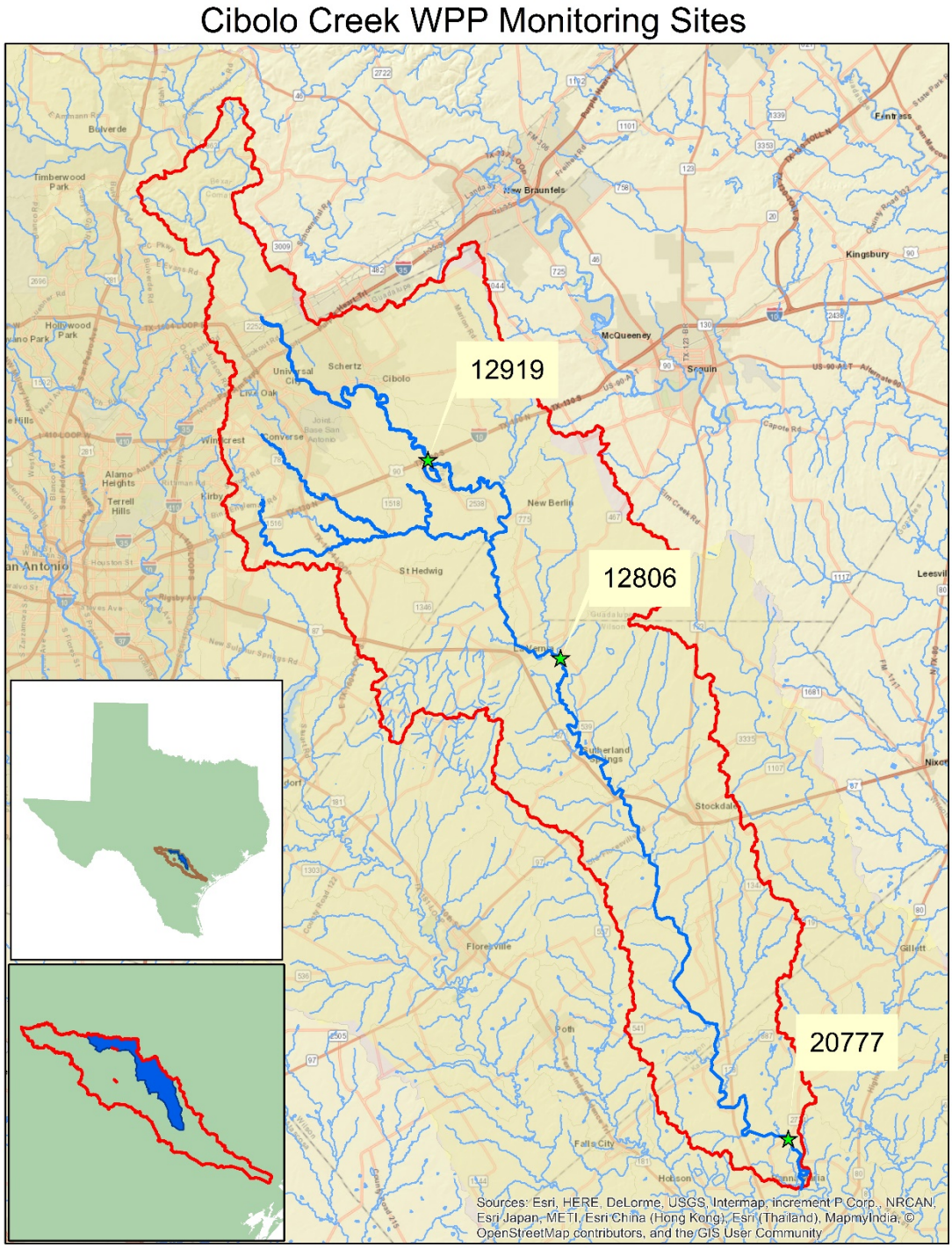
In 2011, a Recreation Use Attainability Analysis (RUAA) was conducted by Texas AgriLife Research and Texas A&M University (http://www.tceq.texas.gov/waterquality/standards/ruaas/lowercibolo1902). At public meetings for this project, the public made it clear that their desire was to have the Lower Cibolo Creek meet Primary Contact Recreation Standards. One of the objectives of this project is to harness this desire to gain support for the necessary activities to reduce bacteria concentrations in the Mid and Lower Cibolo Creek in order to meet the Primary Contact Recreation Standard.

The Mid Cibolo and Lower Cibolo Creek have seen increased development in the residential sector as well as increased activity as a result of hydraulic fracturing activity in the Eagle Ford Shale formation. With this increased development, it is important that a plan to protect the watershed's creeks and streams be developed in order to protect the biological and riparian resources in the Mid and Lower Cibolo Creek watersheds.

Previous monitoring efforts conducted by the San Antonio River Authority include intensive monitoring efforts in the Lower Cibolo Creek Watershed to assist in identifying areas that may be contributing to elevated pollutant loads in the watershed. This project will include gathering and assessing data to develop Load Duration Curves and spatial analysis using Geographic Information Systems (GIS) analysis. Gaining local support of watershed protection plans is crucial to long term success of implementing the watershed protection plan and achieving water quality standards. Stakeholders will be engaged in order to characterize the watershed and estimate pollutant loading reductions for watershed protection plan development.

Another project currently underway is the Cibolo Creek Holistic Watershed Master plan project, which will also utilize the water quality monitoring data that will also support the watershed assessment and development of the Mid/Lower Cibolo Creek Watershed Protection Plan. The Cibolo Creek Holistic Watershed Master Plan will focus on flood issues (hydrologic and hydraulic analysis), stream restoration, water quality modeling, water quality best management practices, (GIS)/mapping/remote sensing, low impact development, MS4 permitting, conservation easements, mitigation banking and nature-based park planning. The activities of this project include identification of major flooding reaches, stream characterization and identification of the restoration potential, point and nonpoint pollutant sources that impact water quality, and development of holistic solutions to address identified risk centers and to meet multiple objects and goals. This project will share data and coordinate through SARA during the development of the WPP for this area, which will complement both planning efforts.

Figure A5.1 Mid/Lower Cibolo Watershed and Stormwater Sampling Locations



A6 PROJECT/TASK DESCRIPTION

To perform water quality monitoring for storm events of varying size and intensity to support the WPP development for the Mid and Lower Cibolo Creek watershed.

Three locations; equipped with automatic samplers; will be monitored for stormwater sampling. These samples will be collected over the hydrograph of the storm event. A minimum of 7 samples will be collected over the hydrograph to characterize the pollutant load for the duration of the storm event. A minimum of 5 storm events will be sampled for this monitoring effort. Each station is equipped with a data sonde to monitor dissolved oxygen, pH, temperature, specific conductance and depth. A USGS flow gauge is co-located with one station (12919). The other two stations have a flow rating curve developed to determine stream flow based upon elevation of the water level.

Each sampler will collect samples once a minimum rise in water level is detected. The staff then collect the samples from the units based upon the amount of time that has elapsed since the unit was triggered. Once adequate time has passed the samples are collected and transported to the laboratory for analysis. The samples are analyzed for the parameters identified in Table A7.1.

The stations will be maintained by SARA Stormwater Staff which includes the retrieval of data sondes that have been deployed. Units are retrieved approximately every 30-45 days and a different unit installed in its place to maintain continuity of data recording. Upon return to SARA the units are post checked to verify that the units have maintained calibration over the course of the deployment period. The criteria used is identified in the TCEQ Surface Water Quality Monitoring Procedures, Volume 1 (RG-415 Revised August 2012, or most current revision) and the appropriate SARA standard operating procedure.

A7 QUALITY OBJECTIVES AND CRITERIA FOR DATA QUALITY

The measurement performance specifications to support the project objectives for a minimum data set are specified in Table A7.1- A7.5 and in the text following. Sampling will consist of stormwater samples over the hydrograph of storm events that meet the minimum qualifying criteria.

Table A7.1 Measurement Performance Specifications for Field Parameters

Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
RAINFALL FOR DURATION OF STORM EVENT (INCHES)[1]	inches	water	TCEQ SOP V1	46530	NA*	NA*	NA*	NA*	NA*	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G and TCEQ SOP V1	00300	NA*	NA	NA	NA	NA	Field
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	NA*	NA	NA	NA	NA	Field
SPECIFIC CONDUCTANCE, FIELD (US/CM @ 25C)	us/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	NA*	NA	NA	NA	NA	Field
PH (STANDARD UNITS)	s.u.	water	EPA 150.1 and TCEQ SOP V1	00400	NA*	NA	NA	NA	NA	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	NA*	NA	NA	NA	NA	Field
PRESENT WEATHER (1=CLEAR,2=PTCLDY,3=CLDY,4=RAIN,5=OTHER)	NU	other	NA	89966	NA	NA	NA	NA	NA	Field
WATER COLOR (1=BROWN, 2=REDDISH, 3=GREEN, 4=BLACK, 5=CLEAR, 6=OTHER)	NU	water	TCEQ SOP V1	89969	NA	NA	NA	NA	NA	Field
WATER ODOR (1=SEWAGE, 2=OILY/CHEMICAL, 3=H2S, 4=MUSKY, 5=FISHY, 6=NONE, 7=OTHER)	NU	water	TCEQ SOP V1	89971	NA	NA	NA	NA	NA	Field
FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	NA*	NA	NA	NA	NA	Field
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	NA*	NA	NA	NA	NA	Field
STREAM FLOW ESTIMATE (CFS)	cfs	Water	TCEQ SOP V1	74069	NA*	NA	NA	NA	NA	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	NA*	NA	NA	NA	NA	Field

Table A7.1 Measurement Performance Specifications for Field Parameters

Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab

* Reporting to be consistent with SWQM guidance and based on measurement capability.
** Optional Data- to be collected when conditions are optimal only. This data will be used to refine the flow model only, not for compositing samples.

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2008 (RG-415). TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

Table A7.2 Measurement Performance Specifications for SARA-REL

Conventional and Bacteriological Parameters in Water

Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540 D	00530	4	1.0	NA	NA	NA	SARA - REL
NITROGEN, AMMONIA, TOTAL (MG/L AS N) (non-distilled)	mg/L	water	SM 4500-NH_3 D[3]	00610	0.1	0.1	70-130	20	80-120	SARA - REL
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	70-130	20	80-120	SARA - REL
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.05	70-130	20	80-120	SARA - REL
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	5	70-130	20	80-120	SARA-REL
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	5	70-130	20	80-120	SARA-REL
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2 Rev. 2 (1993)	00625	0.2	0.2	70-130	20	80-120	SARA - REL
DISSOLVED ORTHOPHOSPHORUS, WET METHOD (MG/L AS P) (filter >14 min)	mg/L	water	EPA 365.3	70507	0.04	0.02	70-130	20	80-120	SARA - REL
CARBBIOCHEM OXY DM NIT INHB, TOT (MG/L, 5 DAY-20)	mg/L	water	SM5210B	00314	2	2	NA	NA	NA	SARA - REL
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 365.3	00665	0.06	0.02	70-130	20	80-120	SARA - REL
CARBON, TOTAL ORGANIC, NPOC (TOC), MG/L	mg/L	water	SM 5310 C	00680	2	1.0	70-130	20	80-120	SARA - REL
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	SM 9223-B	31699	1	1	NA	0.50**	NA	SARA - REL
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	SARA - REL

Table A7.2 Measurement Performance Specifications for SARA-REL

Conventional and Bacteriological Parameters in Water

Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab

** This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2008 (RG-415). TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

Table A7.3 Measurement Performance Specifications for Metals in Water by SARA-REL

Metals in Water[1]

Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
CALCIUM, TOTAL (MG/L AS CA)	mg/L	water	EPA 200.8	00916	0.5	0.10	70-130	20	80-120	SARA - REL
MAGNESIUM, TOTAL (MG/L AS MG)	mg/L	water	EPA 200.8	00927	0.5	0.10	70-130	20	80-120	SARA - REL
SODIUM, TOTAL (MG/L AS NA)	mg/L	water	EPA 200.8	00929	NA	0.10	70-130	20	80-120	SARA - REL
POTASSIUM, TOTAL (MG/L AS K)	mg/L	water	EPA 200.8	00937	NA	0.10	70-130	20	80-120	SARA - REL
BARIUM, TOTAL (UG/L AS BA)	µg/L	water	EPA 200.8	01007	NA	1.0	70-130	20	80-120	SARA - REL
BERYLLIUM, TOTAL (UG/L AS BE)	µg/L	water	EPA 200.8	01012	NA	1.0	70-130	20	80-120	SARA - REL
CHROMIUM, TOTAL (UG/L AS CR)	µg/L	water	EPA 200.8	01034	NA	1.0	70-130	20	80-120	SARA - REL
COBALT, TOTAL (UG/L AS CO)	µg/L	water	EPA 200.8	01037	NA	1.0	70-130	20	80-120	SARA - REL
COPPER, TOTAL (UG/L AS CU)	µg/L	water	EPA 200.8	01042	NA	1.0	70-130	20	80-120	SARA - REL
IRON, TOTAL (UG/L AS FE)	µg/L	water	EPA 200.8	01045	300	1.0	70-130	20	80-120	SARA - REL
MANGANESE, TOTAL (UG/L AS MN)	µg/L	water	EPA 200.8	01055	50	1.0	70-130	20	80-120	SARA - REL
THALLIUM, TOTAL (UG/L AT TL)	µg/L	water	EPA 200.8	01059	NA	1.0	70-130	20	80-120	SARA - REL
MOLYBDENUM, TOTAL (UG/L AS MO)	µg/L	water	EPA 200.8	01062	NA	1.0	70-130	20	80-120	SARA - REL
NICKEL, TOTAL (UG/L AS NI)	µg/L	water	EPA 200.8	01067	NA	1.0	70-130	20	80-120	SARA - REL

Table A7.3 Measurement Performance Specifications for Metals in Water by SARA-REL

Metals in Water[1]										
Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
SILVER, TOTAL (UG/L AS AG)	µg/L	water	EPA 200.8	01077	NA	1.0	70-130	20	80-120	SARA - REL
ZINC, TOTAL (UG/L AS ZN)	µg/L	water	EPA 200.8	01092	NA	5.0	70-130	20	80-120	SARA - REL
ANTIMONY, TOTAL (UG/L AS SB)	µg/L	water	EPA 200.8	01097	NA	5.0	70-130	20	80-120	SARA - REL
SELENIUM, TOTAL (UG/L AS SE)	µg/L	water	EPA 200.8	01147	2	1.0	70-130	20	80-120	SARA - REL
ALUMINUM, TOTAL (UG/L AS AL)	µg/L	water	EPA 200.8	01105	NA	10.0	70-130	20	80-120	SARA - REL
ARSENIC, TOTAL (UG/L AS AS)	µg/L	water	EPA 200.8	01002	NA	1.0	70-130	20	80-120	SARA - REL
CADMIUM, TOTAL (UG/L AS CD)	µg/L	water	EPA 200.8	01027	NA	1.0	70-130	20	80-120	SARA - REL
LEAD, TOTAL (UG/L AS PB)	µg/L	water	EPA 200.8	01051	NA	1.0	70-130	20	80-120	SARA - REL

[1]All metals will be analyzed for in a screening event. Any metals parameters that are found to be below the reporting level will not be analyzed for in subsequent sampling events.

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Community and Habitat Data, 2007 (RG-416)

Table A7.4 Measurement Performance Specifications for GBRA

Conventional and Bacteriological Parameters in Water										
Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540 D	00530	4	1.0	NA	NA	NA	GBRA
NITROGEN, AMMONIA, TOTAL (MG/L AS N) (non-distilled)	mg/L	water	EPA 350.1	00610	0.1	0.1	70-130	20	80-120	GBRA
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	70-130	20	80-120	GBRA
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.05	70-130	20	80-120	GBRA
CHLORIDE (MG/L AS CL)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00940	5	5	70-130	20	80-120	GBRA

Table A7.4 Measurement Performance Specifications for GBRA

Conventional and Bacteriological Parameters in Water

Parameter	Units	Matrix	Method	Parameter Code	AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD of LCS/LCSD)	Bias %Rec. of LCS	Lab
SULFATE (MG/L AS SO4)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00945	5	5	70-130	20	80-120	GBRA
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2 Rev. 2 (1993)	00625	0.2	0.2	70-130	20	80-120	GBRA
DISSOLVED ORTHOPHOSPHORUS, WET METHOD (MG/L AS P) (filter >14 min)	mg/L	water	EPA 300.0	70507	0.04	0.02	70-130	20	80-120	GBRA
CARBBIOCHEM OXY DM NIT INHB, TOT (MG/L, 5 DAY-20)	mg/L	water	SM5210B	00314	2	2	NA	NA	NA	GBRA
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	EPA 365.3	00665	0.06	0.02	70-130	20	80-120	GBRA
CARBON, TOTAL ORGANIC, NPOC (TOC), MG/L	mg/L	water	SM 5310 C	00680	2	1.0	NA	NA	NA	GBRA
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/100 mL	water	IDEXX Colilert-18	31699	1	1	NA	0.50**	NA	GBRA
E.COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	GBRA

** This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1998. (Note: The 21st edition may be cited if it becomes available.)TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2008 (RG-415). TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

TABLE A7.5 Measurement Performance Specifications for DHL ANALYTICAL

Metals in Water

Parameter	Units	Matrix	Method	Parameter Code	TCEQ AWRL	LOQ	LOQ Check Sample %Rec	Precision (RPD)	Bias %Rec. of LCS
HARDNESS, TOTAL CALCULATED (MG/L AS CACO3)*	mg/L	water	SM 2340 B	82394	5	2.0	NA	NA	NA
CALCIUM, TOTAL (MG/L AS CA)	mg/L	water	EPA 200.8	00916	0.5	0.1	70-130	15	85-115
MAGNESIUM, TOTAL (MG/L AS MG)	mg/L	water	EPA 200.8	00927	0.5	0.1	70-130	15	85-115
SODIUM, TOTAL (MG/L AS NA)	mg/L	water	EPA 200.8	00929	NA	0.1	70-130	20	80-120
POTASSIUM, TOTAL (MG/L AS K)	mg/L	water	EPA 200.8	00937	NA	0.1	70-130	15	85-115
ARSENIC, TOTAL (UG/l AS AS)	ug/L	water	EPA 200.8	01002	NA	1.0	70-130	15	85-115

BARIUM, TOTAL (UG/L AS BA)	µg/L	water	EPA 200.8	01007	NA	1.0	70-130	15	85-115
CHROMIUM, TOTAL (UG/L AS CR)	µg/L	water	EPA 200.8	01034	NA	1.0	70-130	15	85-115
COPPER, TOTAL (UG/L AS CU)	µg/L	water	EPA 200.8	01042	NA	1.0	70-130	15	85-115
LEAD, TOTAL (UG/l AS PB)	ug/L	water	EPA 200.8	01051	NA	1.0	70-130	15	85-115
MANGANESE, TOTAL (UG/L AS MN)	µg/L	water	EPA 200.8	01055	50	1.0	70-130	15	85-115
MOLYBDENUM, TOTAL (UG/L AS MO)	µg/L	water	EPA 200.8	01062	NA	1.0	70-130	15	85-115
NICKEL, TOTAL (UG/L AS NI)	µg/L	water	EPA 200.8	01067	NA	1.0	70-130	15	85-115
ZINC, TOTAL (UG/L AS ZN)	µg/L	water	EPA 200.8	01092	NA	5.0	70-130	15	85-115
ALUMINUM, TOTAL (UG/l AS AL)	ug/L	water	EPA 200.8	01105	NA	10.0	70-130	15	85-115
IRON, TOTAL (MG/l AS FE)	mg/L	water	EPA 200.8	74010	NA	0.10	70-130	15	85-115

*Hardness is not used for regulatory purposes but is used to assess metals in water at inland sites (estuarine sites do not require hardness analysis).

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
U.S. Code of Federal Regulations (CFR). Title 40: Protection of Environment, Part 136
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard Methods for the Examination of Water and Wastewater, 23rd Edition, 2017.
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416).

Ambient Water Reporting Limits (AWRLs)

The AWRL establishes the reporting specification at or below which data for a parameter must be reported to be compared with freshwater screening criteria. The AWRLs specified in Table A7.1-A7.5 are the program-defined reporting specifications for each analyte and yield data acceptable for TCEQ water quality assessment. The LOQ (formerly known as reporting limit) is the minimum level, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The following requirements must be met in order to report results to the TSSWCB:

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

Laboratory Measurement QC Requirements and Acceptability Criteria are provided in Section B5.

Precision

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

Laboratory precision is assessed by comparing replicate analyses of laboratory control samples in the sample matrix (e.g. deionized water, sand, commercially available tissue) or sample/duplicate

pairs in the case of bacterial analysis. Precision results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for precision are defined in Table A7.1-A7.5.

Bias

Bias is a statistical measurement of correctness and includes multiple components of systematic error. A measurement is considered unbiased when the value reported does not differ from the true value. Bias is determined through the analysis of laboratory control samples and LOQ check standards prepared with verified and known amounts of all target analytes in the sample matrix (e.g. deionized water) and by calculating percent recovery. Results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for LCSs are specified in Table A7.1-A7.5.

Representativeness

Site selection, the appropriate sampling regime, the sampling of all pertinent media according to TCEQ SWQM SOPs, and use of only approved analytical methods will assure that the measurement data represents the conditions at the monitoring sites.

Automated storm flow sampling will be conducted at three locations in the watershed. Representativeness will be measured with the completion of sample collection in accordance with the approved QAPP.

Comparability

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

Completeness

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

A8 SPECIAL TRAINING/CERTIFICATION

New field personnel receive training in proper sampling and field analysis. Before actual sampling or field analysis occurs, they demonstrate to the SARA Aquatic Biologist their ability to properly calibrate field equipment and perform field sampling and analysis procedures. Field personnel training is documented and retained in the personnel file and are available during a monitoring systems audit.

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

A9 DOCUMENTS AND RECORDS

The documents and records that describe, specify, report, or certify activities are listed. The list below is limited to documents and records that may be requested for review during a monitoring systems audit. Add other types of project documents and records as appropriate.

Table A9.1 Project Documents and Records

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	TSSWCB/SARA/DHL/ GBRA	5 years	Paper/ Electronic
QAPP distribution documentation	SARA	5 years	Paper/ Electronic
QAPP commitment letters	SARA	5 years	Paper/ Electronic
Field notebooks or data sheets	SARA	5 years	Paper/ Electronic
Field staff training records	SARA	5 years	Paper/ Electronic
Field equipment calibration/maintenance logs	SARA	5 years	Paper/ Electronic
COC records	SARA/DHL/ GBRA	5 years	Paper/ Electronic
Field SOPs	SARA	5 years	Paper/ Electronic
Laboratory QA Manuals	SARA/DHL/ GBRA	5 years	Paper/ Electronic
Laboratory SOPs	SARA/DHL/ GBRA	5 years	Paper/ Electronic
Laboratory data reports/results	SARA/DHL/ GBRA	5 years	Paper/electronic
Laboratory staff training records	SARA/DHL/ GBRA	5 years	Paper/ Electronic
Instrument printouts	SARA/DHL/ GBRA	5 years	Paper/ Electronic
Laboratory equipment maintenance logs	SARA/DHL/ GBRA	5 years	Paper/ Electronic
Laboratory calibration records	SARA/DHL/ GBRA	5 years	Paper/ Electronic
Corrective Action Documentation	SARA/DHL/ GBRA	5 years	Paper/ Electronic

Laboratory Test Reports

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

* title of report and unique identifiers on each page
* name and address of the laboratory
* name and address of the client
* a clear identification of the sample(s) analyzed
* date and time of sample receipt
* date and time of collection
* identification of method used
* identification of samples that did not meet QA requirements and why (i.e., holding times exceeded)
* sample results
* units of measurement
* sample matrix
* dry weight or wet weight (as applicable)

* clearly identified subcontract laboratory results (as applicable)
* a name and title of person accepting responsibility for the report
* project-specific QC results to include field split results (as applicable); equipment, trip, and field blank results (as applicable); and LOQ and LOD confirmation (% recovery)
* narrative information on QC failures or deviations from requirements that may affect the quality of results or is necessary for verification and validation of data
* certification of NELAP compliance on a result by result basis.

Electronic Data

Data collected will be submitted electronically to the TCEQ in the Event/Result file format described in the most current version of the DMRG, which can be found at https://www.tceq.texas.gov/waterquality/data-management/dmrg_index.html. A completed Data Review Checklist and Data Summary (see Appendix D) will be submitted with each data submittal.

All reported data resulting from monitoring events will have a unique TagID (see DMRG). Data collected under this QAPP has been assigned the tag prefix of "TX". TagIDs used in this project will be six-character alphanumerics with the structure of the two-letter Tag prefix followed by a four digit number.

Submitting Entity, Collecting Entity, and a 4- Character Monitoring Type codes will reflect the project organization and monitoring type in accordance with the DMRG. The proper coding of Monitoring Type is essential to accurately capture any bias toward certain environmental condition as well as the purpose of the project. The TSSWCB Project Manager and the TCEQ SWQMIS Data Manager should be consulted to assure proper use of the Monitoring Type code.

Table A9.2 Tag Prefixes and Monitoring Type Codes

Sample Description	Tag Prefix	Submitting Entity	Collecting Entity	Monitoring Type Code
Stormwater	TX	SA	SA	BFLF
Stormwater	TX	SA	SW	BFLF

BF – Biased Flow
LF – Load Contributions

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 SARA Project Manager to the TSSWCB Project Manager electronically. Amendments are effective immediately upon approval by the SARA Project Manager, the SARA Laboratory QAO, the TSSWCB Project Manager, and the TSSWCB QAO. They will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by the SARA Project Manager.

B1 SAMPLING PROCESS DESIGN

The sample design is focusing on stormwater monitoring as that is a significant data need that has not been able to be addressed. In modeling water quality a significant portion of the increased bacteria and nutrient levels have been observed in elevated flows in conjunction with rainfall events. The stormwater monitoring will allow the water quality models to more accurately assess the pollutant loads occurring in stormwater.

SARA will conduct automated storm monitoring at 3 sites within the Cibolo Creek Watershed. It is intended that up to 5 storm events will be monitored to characterize urban/residential NPS loadings. Depending on meteorological conditions, seasonal variation in storm events will be captured. It is anticipated that a minimum of 7 discreet samples will be collected for each rain event dependent upon the duration of the storm event and the amount of time it takes for the flow to return to near baseline conditions.

Guidance for Qualifying Storm Events

Qualifying storm events should produce a minimum of 0.5 inches of rainfall at the sample site; the number of days since the last rainfall event is documented. There is not a minimum number of dry days required in order to collect a storm event. This allows for the collection of events of varying conditions.

Table B1.2 Sampling trigger and sampling interval Summary

Station	Minimum Rainfall (inches)	Sampling Interval[2]	Sampling Trigger[1]
12806	0.5	1 hour	0.5 ft water level rise
12919	0.5	1 hour	0.5 ft water level rise
20777	0.5	1 hour	0.5 ft water level rise

[1]Sampling trigger may be adjusted to adequately capture appropriate rainfall events for the sample location
[2]Sampling interval may be adjusted as necessary to accommodate the characteristics of the watershed

Baseline samples

It is intended that each event be accompanied by an initial baseline sample that is collected within 24 hours of the start of a rain event. If a storm event is delays beyond 24 hours an additional baseline sample can be collected if adequate time and staff are available. If it is not possible to collect an additional baseline sample a Non Conformance Report will be initiated to document that the baseline sample is outside of the 24 hour window for a baseline sample.

Hydrograph samples

It is intended that the sampling interval be adequate to characterize the hydrograph of the storm event such that samples be obtained from just prior to the storm event (baseline), a minimum of two samples be obtained as the flow increases, a sample be collected near the peak of flow, a

minimum of two samples be obtained as the flow decreases and a sample be collected as the flow returns to near baseline conditions.

If the rainfall continues beyond the sampler's capacity to collect additional sample intervals it will be necessary for the container carousel to be changed out in order for sampling to continue and for the entire hydrograph to be sampled. This time frame can vary depending upon the settings for each particular sampler/sample site.

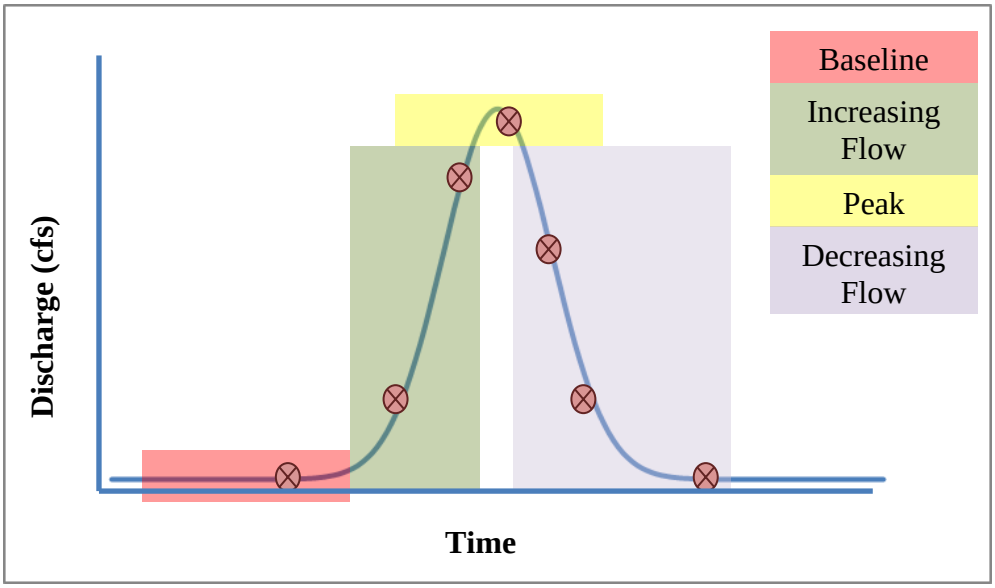


Figure G.1: Hydrograph of Ideal Storm Water Runoff

Priority for Parameters if insufficient sample to run all analyses.

Container Priority	Analysis Priority
Whirl Pak	E. coli
Qt. cubitainer	NH_3N, TPO4, TKN, TOC
Gallon cubitainer	Anions, O-PO_4, TSS, CBOD
1L plastic bottle	Metals

The holding time for the *E. coli* samples collected by the autosampler during a storm event will be extended for up to 24 hours. During a storm event, the safety of the sampling crew will not be compromised in case of lightning or flooding. In the instance that the storm flow sampler is inaccessible due to weather conditions or flooding, the sampler will be retrieved when conditions allow and the event will be documented. *E.coli* samples analyzed by SM 9223-B should always be processed as soon as possible. Samples must be processed as soon as possible and within 24 hours.

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

B2 SAMPLING METHODS

Field Sampling Procedures

With the exception of bacterial sampling, all stormwater sample collection will be conducted in accordance with the methods set forth in the NPDES Storm Water Sampling Guidance, 1992.

Once a rain event is forecast the samplers will be prepared to collect samples. This includes verifying that clean bottles are in the units as well as adding ice to the units. Sample temperatures will be verified at time of pick-up to confirm the samples were held within an acceptable temperature range of above freezing to 6°C (>0≤6°C). Bacteria analyses will be incubated within 24 hours of the sample being collected from the automatic sampler. Although it is not recommended that bacteria samples be collected with an automatic sampler the bacteria results will be closely scrutinized to determine if carry over is evident in the analytical results.

Samples will be picked up within 6 hours after the first sample was collected (sooner if the storm flow has fallen below the trigger level without likelihood of resuming). Additional bottles will be loaded into the sampler if the rain event is continuing. The samples will then be transported to the SARA Environmental Center and portioned into the appropriate containers, preserved as necessary, and relinquished to the laboratory for analysis preferably within 2 hours of pick-up.

The four bottles that are collected at each time step are considered one grab sample. These will be combined to adequately reflect the sample composition on all of the containers. This combined sample will then be distributed into the appropriate sample containers for submission to the laboratory for analysis.

Table B2.1 Sample Storage, Preservation and Handling Requirements

Table B2.1 Sample Storage, Preservation, and Handling Requirements			
Parameter	**Matrix**	**Preservation[5]**	**Holding Time**
Gallon Container {3000 mL}[6]			
TSS	Water	Cool to above 0 to ≤ 6°C	7 days
Nitrate-N, total[3]	Water	Cool to above 0 to ≤ 6°C	48 hours
CBOD	Water	Cool to above 0 to ≤ 6°C	48 hours
Sulfate	Water	Cool to above 0 to ≤ 6°C	28 days
Chloride	Water	Cool to above 0 to ≤ 6°C	28 days
Nitrite-N[3]	Water	Cool to above 0 to ≤ 6°C	48 hours
Orthophosphorus (Lab-filtered)	Water	Cool to above 0 to ≤ 6°C	48 hours
Whirl-Pak {200mL}[6]			
E. coli, IDEXX Colilert	Water	Cool to above 0 to ≤ 6°C	8 hrs[1]
Quart Preserved Container {600mL}[6]			

Table B2.1 Sample Storage, Preservation, and Handling Requirements

Parameter	Matrix	Preservation[5]	Holding Time
Ammonia-N, total Non-distilled	Water	H_2SO_4 to pH <2 Cool to above 0 to ≤ 6°C	28 days[2]
Total phosphorous	Water	H_2SO_4 to pH <2 Cool to above 0 to ≤ 6°C	28 days[2]
Total Kjeldahl Nitrogen	Water	H_2SO_4 to pH <2 Cool to above 0 to ≤ 6°C	28 days[2]
TOC	Water	H_2SO_4 to pH <2 Cool to above 0 to ≤ 6°C	28 days[2]
1 Liter Plastic Bottle {500 mL}			
Metals	Water	HNO3 to pH <2[4]	6 moths
Minimum amount of sample required from automatic samplers →4000 mL			

[1] *E.coli* samples analyzed by SM 9223-B should always be processed as soon as possible and within 24 hours of sample collection.
[2]Nutrient samples will be preserved within 15 minutes of the sample being prepared for submission to the laboratory.
[3]Sulfate, Chloride, Nitrate and Nitrite are analyzed together using Ion Chromatography; the volume required is a total of 100 mLs, not 100 mLs per parameter
[4]Preservation will be performed in the laboratory and within 14 days of collection
[5]For stormwater samples, sample temperatures will be verified at time to pick up to make sure they are within acceptable range (above freezing to 6°C) prior to delivery to laboratory.
[6]Baseline sample containers are to be submitted full; samples from the automatic samplers will contain the amounts identified in brackets.

Storm Event Holding Time

Stormwater samples will be collected using automatic ISCO samplers as described above. The samples will be transported in an iced container and delivered to the SARA laboratory for analysis. Hold time for bacteria samples is set at a maximum of 24 hours. All other analyses will adhere to method specific hold times and are described in Table B2.1. Hold time begins according to the time that the aliquot was collected by the automatic sampler. This is recorded on the paperwork as the sample collection time.

Sample Containers

Sample containers used in the automated samplers will be 24 – 1 liter plastic containers. The Sample will then be transferred to the appropriate containers for submission to the laboratory for analysis. Upon arrival at the laboratory the samples will be portioned into the appropriate containers and submitted to the laboratory for analysis.

Processes to Prevent Contamination

Procedures in the TCEQ *SWQM Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue: RG-415 (August 2012 or most recent version)* outline

the necessary steps to prevent contamination of samples, including direct collection into sample containers, when possible.

Documentation of Field Sampling Activities

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

- Station ID
- Sampling date
- Location
- Sampling depth
- Sampling time
- Sample collector's initials
- Values for all field parameters, including flow and flow severity
- Detailed observational data, including:
    - water appearance
    - weather
    - biological activity
    - unusual water related odors
    - pertinent observations related to water quality or stream uses (i.e., exceptionally poor water quality conditions/standards not met; stream uses such as swimming, boating, fishing, irrigation pumps)
    - watershed or instream activities (i.e., bridge construction, livestock watering upstream)
- missing parameters (e.g., when a scheduled parameter or group of parameters is not collected)

Recording Data

For the purposes of this section and subsequent sections, all field and laboratory personnel follow the basic rules for recording information as documented below:

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

Deficiencies, Nonconformances and Corrective Action Related to Sampling Requirements

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

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

The SARA Project Manager, in consultation with the SARA Laboratory 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 SARA Project Manager, in consultation with SARA Laboratory QAO, will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the SARA Laboratory QAO by completion of a CAR (Appendix E).

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

B3 SAMPLE HANDLING AND CUSTODY

Sample Tracking

Proper sample handling and custody procedures ensure the custody and integrity of samples beginning at the time of sampling and continuing through transport, sample receipt, preparation, and analysis.

A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. The COC form is a record that documents the possession of the samples from the time of collection to receipt in the laboratory. The following information concerning the sample is recorded on the COC form (See Appendix B). The following list of items matches the COC form in Appendix B.

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

Sample Labeling

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

- Site identification
- Date and time of sampling
- Preservative added, if applicable
- Designation of “field-filtered” as applicable
- Sample type (e.g., routine, targeted, spring)

Sample Handling

Samples are collected by automated samplers equipped with plastic 1 liter containers. The samples will then be transported to the Environmental Center where each set of 4-1 liter containers will be combined and the appropriate sample containers filled and preserved as appropriate to perform the appropriate analyses. The containers will then be sealed and a chain-of-custody seal, including the date and initials of the field staff, will be applied to the container. The sample container is labeled with a permanent marker and relinquished to the laboratory.

The sample custodian accepts the sample, checking for any abnormalities in the sample (e.g. leakers, missing or torn COC seals, etc.) and notes any abnormalities at log in. The sample

custodian also checks and documents the temperature of the samples using an infrared thermometer, and that all acid preserved samples are below 2 S.U. pH. Paperwork is examined for completeness and the sample custodian accepts the sample and documentation by signing the chain of custody (field data sheet) and also posting the date and time of acceptance.

The sample custodian enters the sample information into the laboratory's information management system and prints out a set of labels. Each sample container brought in, gets a label with a unique identification number. The water quality samples are then either given directly to an analyst, preparing to analyze the sample(s) immediately, or placed in a refrigerator in a secured portion of the laboratory. Access is controlled through the use of programmed access cards.

Laboratory staff run backlog reports to identify samples that need to be analyzed and to identify when sample hold time elapses.

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 COC include but are not limited to delays in transfer, resulting in holding time violations; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc.

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

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

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

B4 ANALYTICAL METHODS

The analytical methods, associated matrices, and performing laboratories are listed in Tables A7.1 –A7.x The authority for analysis methodologies under this project is derived from the TSWQS (Texas Administrative Code §§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 must be in accordance with the most recently published edition of the book entitled Standard Methods for the Examination of Water and Wastewater, the TCEQ Texas Surface Water Quality Monitoring Procedures as amended, 40 CFR Part 136, or other reliable procedures acceptable to the commission, and in accordance with Chapter 25 of this title."

Laboratories collecting data under this QAPP are compliant with The NELAC Institute (TNI) standards (applicable standard as identified by TCEQ), at a minimum. Copies of laboratory QAMs and SOPs are available for review by the TSSWCB.

Standards Traceability

All standards used in the field and laboratory are traceable to certified reference materials. Standards preparation is fully documented and maintained in a standards log book. Each documentation includes information concerning the standard identification, starting materials, including concentration, amount used and lot number; date prepared, expiration date and preparer's initials/signature. The reagent bottle is labeled in a way that will trace the reagent back to preparation. Table A7.1- A7.5 lists the methods to be used for field and laboratory analyses.

Deficiencies, Nonconformances and Corrective Action Related to Analytical Methods

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

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

The SARA Project Manager, in consultation with SARA Laboratory 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 SARA Project Manager, in consultation with the SARA Laboratory QAO, will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the SARA Laboratory QAO by completion of a CAR (see Appendix E).

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

B5 QUALITY CONTROL

Sampling Quality Control Requirements and Acceptability Criteria

The minimum Field QC Requirements are outlined in the TCEQ *SWQM Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue: RG-415 (August 2012 or most recent version)*. Specific requirements are outlined below. Field QC sample results are submitted with the laboratory data report (see Section A9).

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

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

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

Detailed laboratory QC requirements and corrective action procedures are contained within the individual laboratory QAMs. The minimum requirements that all participants abide by are stated below.

Limit of Quantitation (LOQ) – The LOQ is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The laboratory will analyze a calibration standard (if applicable) at the LOQ specified in Table A7.1 – A7.5. An LOQ will be verified annually for each matrix and analyte on each instrument. Additionally, LOQs may be verified using the analyst's best professional judgment whenever a significant change in instrument response is observed or expected (i.e. after preventative maintenance, major repair or unusual responses are observed.) Calibrations including the standard at the LOQ listed in Table A7.1 – A7.5 will meet the calibration requirements of the analytical method or corrective action will be implemented.

LOQ Check Standard – An LOQ check sample consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The LOQ check sample is spiked into the sample matrix at a level equal to the LOQ specified in Table A7.1 – A7.5. The LOQ check sample will be verified annually for each

matrix and analyte on each instrument. Additionally, LOQ check samples may be verified using the analyst's best professional judgment whenever a significant change in instrument response is observed or expected (i.e. after preventative maintenance, major repair or unusual responses are observed.) If it is determined that samples have exceeded the high range of the calibration curve, samples are diluted or run on another curve.

The LOQ check sample is carried through the complete preparation and analytical process. 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, not to exceed the analysis of 20 environmental samples.

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

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

Measurement performance specifications are used to determine the acceptability of LOQ Check Sample analyses as specified in Table A7.1 – A7.5.

Laboratory Control Standard (LCS) - A LCS consists of a sample matrix (e.g., deionized water) free from the analytes of interest spiked with verified known amounts of analyte. The LCS is spiked into the sample matrix at a level less than or equal to the mid-point of the calibration curve for each analyte. In cases of test methods with very long lists of analytes, LCSs are prepared with all the target analytes and not just a representative number.

The LCS is carried through the complete preparation and analytical process. The LCS is used to document the bias of the analytical process. LCSs are run at a rate of one per preparation batch. A preparation 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, not to exceed the analysis of 20 environmental samples.

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

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

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

Performance limits and control charts are used to determine the acceptability of LCS analyses. Project control limits are specified in Table A7.1 – A7.5.

Laboratory Duplicates - A laboratory duplicate is prepared in the laboratory by splitting aliquots of a sample. 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 analytical batch. A

batch is defined as a set of environmental samples that are prepared and/or analyzed together with the same process using the same lot of reagents, not to exceed the analysis of 20 environmental samples.

For most parameters, precision is calculated by the 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 lab. Bacteriological duplicate analyses are performed on samples from the same sample bottle on a 10% basis. Results of bacteriological duplicates are evaluated by calculating the logarithm of each result and determining the range of each pair.

Performance limits and control charts are used to determine the acceptability of duplicate analyses. Project control limits are specified in Table A7.1- A7.5. The specifications for bacteriological duplicates in Table A7.2 and A7.3 apply to samples with concentrations > 10 org/100mL.

Matrix spike (MS) –Matrix spikes are prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Percent recovery of the known concentration of added analyte is used to assess accuracy of the analytical process. The spiking occurs prior to sample preparation and analysis. Spiked samples are routinely prepared and analyzed at a rate of 10% of samples processed, or one per analytical batch whichever is greater. A batch is defined as samples that are analyzed together with the same method and personnel, using the same lots of reagents, not to exceed the analysis of 20 environmental samples. The information from these controls is sample/matrix specific and is not used to determine the validity of the entire batch. The MS is spiked at a level less than or equal to the midpoint of the calibration or analysis range for each analyte. Percent recovery (%R) is defined as 100 times the observed concentration, minus the sample concentration, divided by the true concentration of the spike.

The results from matrix spikes are primarily designed to assess the validity of analytical results in a given matrix and are expressed as percent recovery (%R). The laboratory shall document the calculation for %R. The percent recovery of the matrix spike is calculated using the following equation in which %R is percent recovery, SSR is the observed spiked sample concentration, SR is the sample result, and SA is the reference concentration of the spike added:

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

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

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

Method blank –A method blank is a sample of matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as the samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. The method blank is carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values less than the LOQ.

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

Deficiencies, Nonconformances and Corrective Action Related to Quality Control

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

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

The SARA Project Manager, in consultation with SARA Laboratory 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 SARA Project Manager in consultation with the SARA

Laboratory QAO will determine the disposition of the nonconforming activity or item and necessary corrective action(s); results will be documented by the SARA Laboratory QAO by completion of a CAR (see Appendix E).

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

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

All in-stream sampling equipment testing and maintenance requirements are detailed in the *Sample Equipment Manual.* Equipment records are kept on all field equipment and a supply of critical spare parts is maintained by the San Antonio River Authority Stormwater & Investigations Supervisor.

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. Instruments requiring daily or in-use testing may 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.

B7 INSTRUMENT CALIBRATION AND FREQUENCY

In-stream field Equipment calibration requirements are contained in the *SWQM Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue (RG-415) (*August 2012, or most recent version*)*

Post calibration error limits and the disposition resulting from error are adhered to. Data not meeting post-error limit requirements invalidates associated data collected subsequent to the pre-calibration and are not reported.

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

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

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

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

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

Samples are collected by field staff and transferred to the laboratory for analyses as described in Sections B1 and B2. Sampling information (e.g. site location, date, time, sampling depth, etc.) is used to generate a unique sampling event in an interim database built on an auto-generated alphanumeric key field. Measurement results from both the field data sheets and laboratory data sheets are manually entered (by field and laboratory staff, respectively) into the interim database for their corresponding event. Customized data entry forms facilitate accurate data entry. Following data verification and validation, the data are exported from the interim database into the Event/Result format required for submission to TCEQ's SWQMIS (as described in the SWQM DMRG, most recent revision). Once TCEQ approval of the data is obtained, the data are loaded into SWQMIS by TCEQ data managers. E

The Figure in Appendix E is a flow chart identifying the flow of the data at SARA from collection to sending the information to the TCEQ. Although the flow chart may not identify it, at any point in the review of data, the reviewer can send the data back to the prior level for additional work, or documentation. Field measurements and data collections are performed according to SWQM Procedures Manual (RG-415).

Analytical data from back-up laboratories is entered in to the SARA LIMS and the laboratory that performed the analysis is identified on the analytical reports. Analytical results are reviewed prior to validation. Analytical reports from back-up laboratories are scanned and filed according to the schedule in Table A9.2.

See Appendix F for the Data Management Process Flow Chart

Forms and Checklists

See Appendix B for the Field Data Sheets.
See Appendix D for the Data Review Checklist and Summary.
See Appendix B for the laboratory Chain-of-Custody form

Data Dictionary

Terminology and field descriptions are included in the SWQM DMRG (most recent version). For the purposes of verifying which entity codes are included in this QAPP, a table outlining the entities that will be used when submitting data under this QAPP is included below.

Table B10.1 Submitting Entity & Monitoring Entity Codes

Name of Monitoring Entity	Tag Prefix	Submitting Entity	Collecting Entity
San Antonio River Authority	TX	SA	SA
SWCA Environmental Consultants	TX	SA	SW

Refer to Appendix B Table B1.1 for monitoring codes

Record-keeping and Data Storage

San Antonio River Authority record keeping and document control procedures are contained in the water quality sampling and laboratory standard operating procedures (SOPs) and this QAPP. Original field and laboratory data sheets are stored in the San Antonio River Authority offices in file cabinets or the lab library in accordance with the record-retention schedule in Section A9.

Archives/Data Retention

Complete original data sets are archived on paper and retained on-site by the San Antonio River Authority for a retention period specified in section A9.

Data Handling, Hardware, and Software Requirements

SARA laboratory data will be input into SARA's LIMS. This system is the PerkinElmer *LabWorks* ™ Enterprise System. The SARA LIMS relies heavily on Microsoft SQL databases and Excel spreadsheets. The actual data is housed in a SQL server with an Access front end.

Information Resource Management Requirements

The Data Manager is familiar with the TCEQ's data management reference guide, and follows the processes described in the document. The work of the Data Manager is reviewed by the SARA QAO. The TCEQ uses the TCEQ Data Review Checklist. If deficiencies or non-conformances are identified in the audit, the condition is addressed and a corrective action memo outlining the steps taken is sent to the SARA Project Manager for their approval.

Data will be managed in accordance with the *TCEQ Surface Water Quality Monitoring Data Management Reference Guide, most current revision* and applicable San Antonio River Authority information resource management policies.

Migration/Transfer/Conversion

Data collected under this QAPP is entered in the SARA Laboratory Information Management System (LIMS) and will be identified with a unique tag id.

SQL Server Integration Services scripts are run to capture required data from LIMS upon validation into historical tables. Any validated data scheduled to be sent to the TCEQ under an approved QAPP will be displayed on the SARA website with the status of "provisional". The definition of provisional data is as follows: **Provisional Data -** Surface water quality data that is collected at stations that are part of an approved Quality Assurance Project Plan, where the data has not been accepted by the Texas Commission on Environmental Quality (TCEQ) Surface Water Quality Monitoring Information System (SWQMIS).

Views have been created and will be run using Microsoft SQL to acquire appropriate data sets for each deliverable. Automated data checks will be performed on the views using a SQL Server Integration Services script created by the Information Technology (IT) Department.

Data is exported, in the required pipe delimited format as detailed in the SWQM Data Management Reference Guide, most recent revision, using a Microsoft SQL Server Integration Services (SSIS) Package also created by the SARA IT Department. Upon acceptance of a data deliverable, by the TCEQ SWQMIS database system, the Data Management staff or the IT Department will remove the "provisional" status from the accepted data.

Historical tables can be viewed and queried on by the Data Management staff for internal and external use. Upon request, the related sections of the data dictionary will be sent with the data.

Backups and Recovery

- Incremental backups are done daily.
- Full backups are done weekly.

The San Antonio River Authority has now converted to a hard disk based data duplication backup system. SARA is approximately 98% virtual servers running on VMWare EXSi and Dell Compellent hardware. These virtual servers are backed up on a rotating basis with Symantec Backup Exec writing to ~~a~~ DataDomain storage systems. This storage system then replicates the stored data to another one at the Guenther location where the offsite data is stored. There is a Symantec Backup Exec Central Administration Server (Symantec CAS) at the Guenther location and a Symantec Backup Exec Server at the Euclid Datacenter location. The daily, weekly and monthly backup jobs are replicated from the Symantec Backup Exec Media server to the DR Site through the use of Open Storage Technology (OST) and DataDomain DDBoost to minimize network bandwidth. The primary storage system at the Euclid Datacenter location and the Martinez II Administration Office (DR Site) is Dell Compellent and these replicate continuously throughout the day through iSCSI storage replication. We are also in the process of implementing VMWare Site Recovery Manager (SRM) which will allow automated failover of selected servers between the Euclid Datacenter location and the Martinez II DR Sites and also manages the failback process without losing data and controlling the replication of live storage to replication storage and back. With all of this in place, we could lose the complete datacenter at Euclid and be down only long enough for the server to boot up in the DR Site. We would also maintain access to all historical data written by Symantec Backup Exec from the Guenther location.

In the event that data recovery is needed an IT request is initiated describing the situation and the files that need to be recovered. The IT staff will then contact the individual requesting the recovery and restore the needed files from the back-up. In the event of a catastrophic systems failure a backup server will be used to process data until the primary server is repaired.

Archives/Data Retention – Complete original paperwork is archived and retained on-site by the San Antonio River Authority either in hard copy form or in electronic form as stated in Table A9.1

The original paperwork is available through Papervision®, which is an electronic system which allows staff to access electronic scans of the documents. Each individual has a unique ID and password in order to access the system. These records cannot be manipulated. Only authorized QA staff can document comments in the Papervision system.

Data Verification/Validation

The control mechanisms for detecting and correcting errors and for preventing loss of data during data reduction, data reporting, and data entry are contained in Sections D1, D2, and D3.

Record Keeping and Data Storage

San Antonio River Authority record keeping and document control procedures are contained in the water quality sampling and laboratory standard operating procedures (SOPs) and this QAPP. Original field and laboratory data sheets are stored in the San Antonio River Authority offices in file cabinets or the lab library in accordance with the record-retention schedule in Section A9.

Data Handling, Hardware, and Software Requirements

The laboratory database is housed on a SARA server and backed up each evening. The laboratory database uses Sequel 2000. The systems are operating in Windows 2010 and any additional software needed for word processing, spreadsheet or presentations uses Microsoft Office 2010.

Information Resource Management Requirements

Data will be managed in accordance with the TCEQ *SWQM Data Management Reference Guide*, *most recent revision*) and applicable SARA information resource management policies.

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	SARA	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TSSWCB in Quarterly Progress Report
Monitoring Systems Audit of SARA	Dates to be determined by TSSWCB	TSSWCB	Field sampling, handling and measurement; facility review; and data management as they relate to this project	30 days to respond in writing to the TSSWCB to address corrective actions
Laboratory Inspection	Dates to be determined by TSSWCB	TSSWCB	Analytical and QC procedures employed at the SARA laboratory and the contracted laboratories	30 days to respond in writing to the TSSWCB to address corrective actions

Corrective Action

The SARA Project Manager is responsible for implementing and tracking corrective action resulting from audit findings outlined in the audit report. Records of audit findings and corrective actions are maintained by both the TSSWCB and the SARA Project Managers. Audit reports and corrective action documentation will be submitted to the TSSWCB with the Quarterly Progress Report.

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

Status of CAPs will be documented in the Environmental Sciences Departments Non Conformance Reporting System. 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 immediately.

The San Antonio River Authority Quality Manager/Deputy Quality Manager is responsible for implementing and tracking corrective actions. Corrective action plans will be documented in the ESD Non Conformance Reporting System. Records of audit findings and corrective actions are maintained by both the TCEQ and the San Antonio River Authority QAO.

If audit findings and corrective actions cannot be resolved, then the authority and responsibility for terminating work lies with the Quality Manager/Deputy Quality Manager.

C2 REPORTS TO MANAGEMENT

Reports to SARA Project Management

Progress of the project is monitored through the items in Table C2.1

Table C2.1 Reports

Type of Report	Frequency (daily, weekly, monthly, quarterly, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipients
Non-Conformance report	As Needed	As Needed	Field Staff Laboratory staff	QA Staff and Laboratory Mgmt.
Project Progress Monthly Update	Monthly	Not Applicable	SARA Project Manager	SARA Project Management Software

Reports to TSSWCB

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

Quarterly Progress Report - Summarizes the SARA'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 SARA, a report of findings, recommendations and response is sent to the TSSWCB in the quarterly progress report.

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

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

All field and laboratory data will be reviewed and verified for integrity and continuity, reasonableness, and conformance to project requirements, and then validated against the project objectives and measurement performance specifications which are listed in Section A7. Only those data which are supported by appropriate QC data and meet the measurement performance specifications defined for this project will be considered acceptable, and will be reported to TCEQ SWQMIS.

The procedures for verification and validation of data are described in Section D2, below. The *San Antonio River Authority* Watershed Monitoring Supervisor and Stormwater & Investigations Supervisor are responsible for ensuring that field data are properly reviewed and verified for integrity. The Laboratory Supervisor is responsible for ensuring that laboratory data are scientifically valid, defensible, of acceptable precision and bias, and reviewed for integrity. The *San Antonio River Authority* Data Manager will be responsible for ensuring that all data are properly reviewed and verified, and submitted in the required format. The San Antonio River Authority QAO is responsible for validating a minimum of 10% of the data produced in each task. Finally, the *San Antonio River Authority* Project Manager, with the concurrence of the *San Antonio River Authority* QAO, is responsible for validating that all data to be reported meet the objectives of the project.

D2 VERIFICATION AND VALIDATION METHODS

All field and laboratory data will be reviewed, verified and validated to ensure they conform to project specifications and meet the conditions of end use as described in Section A7 of this document.

Data review, verification, and validation will be performed using self-assessments and peer and management review as appropriate to the project task. The data review tasks to be performed by field and laboratory staff is listed in the first two sections of Table D.2, respectively. Potential errors are identified by examination of documentation and by manual examination of corollary or unreasonable data. If a question arises or an error is identified, the manager of the task responsible for generating the data is contacted to resolve the issue. Issues which can be corrected are corrected and documented. If an issue cannot be corrected, the task manager consults with higher level project management to establish the appropriate course of action, or the data associated with the issue are rejected. Field and laboratory reviews, verifications, and validations are documented.

After the field and laboratory data are reviewed, another level of review is performed once the data are combined into a data set. This review step, as specified in Table D2.1, is performed by the SARA Project Manager. Data review, verification, and validation tasks to be performed on the data set include, but are not limited to, evaluation of anomalies and outliers, analysis of sampling and analytical gaps, and confirmation that all parameters and sampling sites are included in the QAPP.

Another element of the data validation process is consideration of any findings identified during the monitoring systems audit conducted by the TSSWCB QAO. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. After the data are reviewed and documented, the SARA Project Manager validates that the data meet the DQOs of the project and are suitable for reporting to TCEQ SWQMIS.

If any requirements or specifications of this project are not met, based on any part of the data review, the responsible party should document the nonconforming activities (with a CAR) and submit the information to the SARA Project Manager with the data. This information is communicated to the TSSWCB by the SARA in the Data Summary. The data is not transmitted to TCEQ SWQMIS.

Table D2.1 Data Review Tasks

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

SARA– SARA Watershed Monitoring/Stormwater Staff
SARA LAB– SARA Laboratory Staff
SARA QA – SARA Quality Assurance Staff
SARA DM – Data Management Staff
SWCA – SWCA Environmental Consultants
GBRA – GBRA Laboratory
DHL - DHL Analytical Services

D3 RECONCILIATION WITH USER REQUIREMENTS

Data produced in this project will be analyzed and reconciled with project data quality requirements. Data meeting project requirements will be used in the implementation and adaptive management of the Mid/Lower Cibolo Creek WPP and will be submitted to TCEQ SWQMIS.

Appendix A Sampling Process Design and Monitoring Schedule

Sample Design Rationale

Stormwater data has been identified as a data need for the Mid/Lower Cibolo Creek watershed. To remedy that data gap the San Antonio River Authority has implemented an Automated Stormwater Monitoring Program.

Site Selection Criteria

This data collection effort involves monitoring routine water quality, using procedures that are consistent with the TCEQ SWQM program, for the purpose of data entry into the SWQMIS database maintained by the TCEQ. To this end, some general guidelines are followed when selecting sampling sites, as basically outlined below, and discussed thoroughly in the TCEQ *SWQM Procedures, Volume 1* (*RG-415*). Overall consideration is given to accessibility and safety.

1. Sites should be accessible. When possible, stream sites should have a USGS stream flow gauge. If not, a discharge rating curve will be developed to determine the flow.

Monitoring Sites

Table B1.1 Stormwater Sampling Station

Station Description	TCEQ Station ID	Sample Matrix	Discharge Measurement	Monitoring Type Code	Program Code	Number of Events Anticipated over contract period
Cibolo Creek at CR337	12806	Non-Potable Water	Discharge Rating Curve[1]	BFLF	MLCIBOLO_WPP	5
Cibolo Creek at IH 10/US 90	12919	Non-Potable Water	USGS Gage 08185065	BFLF	MLCIBOLO_WPP	5
Cibolo Creek at FM 2724	20777	Non-Potable Water	Discharge Rating Curve[1]	BFLF	MLCIBOLO_WPP	5

[1]Discharge values will be based upon flow rating curves; these values are reported as estimated flow

Appendix B Field Data Sheet / Chain of Custody Form

(or most recent revision)

SAN ANTONIO RIVER AUTHORITY
Storm Water Field Data Sheet

Check for Review by Field Staff (Initial/Date) ☐ _____

Sample No.(s):_____ **Tag Id:**_____ **Matrix:** ☐ NPW ☐ QC ☐Sediment

Station Id: _____-_____ **Station Location:**_____

Program Code: ☐ CRP ☐SARA_SM ☐TXDOT_Storm ☐PC ☐SAR_Loop ☐NPS_Project ☐Storm
☐Special Request (Specify Requestor in Comments) ☐ (Please Specify) _____

Sample Type: ☐BF ☐AS ☐BE ☐Pollution Complaint ☐SR ☐SS (Specify in Comments) ☐ _____

Submitting Entity: _____ **Collecting Entity:** _____

Collection Method: ☐ Grab **Instrument #:**_____

Collection Date:_____ **Collection Time:**_____ **End Depth:**_____

Collector(s) Signature(s): _____

# of Containers/Container Type	Type of Field Preservation	Requested Analysis	pH <2 (Y or N)[2]
_____GC - Gallon Cubitainer	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____QC - Quart Cubitainer	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____CB - Clear Glass Bottle	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____LW - Large Whirlpak	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____PB - Plastic Bottle	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____Other (Specify)_____	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		
_____Other (Specify)_____	☐ Ice ☐ H_2SO_4 ☐ HNO_3 ☐ Filtered		

[1]Observed/corrected temperature (ID: C01-096) [2]pH Paper: R006-63-6 ☐ Field Parameters ☐ Flow Sample Temperature (°C)[1]: _____/_____

FIELD PARAMETERS **Meter:** ☐600 XLM ☐6920V2-2M

Parameter	Code	Value
Dissolved Oxygen	00300	mg/L
Temperature	00010	°C
pH	00400	S.U.
*Conductivity (temperature compensated value to 25 °C)	00094	µS/cm
Days Since Last Precipitation Event	72053	days
Rainfall (inches, gauge data)	46529	inches

FIELD OBSERVATIONS

Parameter	Code	Depth Sensor reset to 0.00 (prior to collecting first sample of the day): ☐		
Flow Severity	01351	☐ 1 – No Flow ☐ 2 – Low	☐ 3 – Normal ☐ 4 – Flood	☐ 5 – High ☐ 6 - Dry
Water Color	89969	☐ 1 – Brown ☐ 2 – Reddish	☐ 3 – Green ☐ 4 – Black	☐ 5 – Clear ☐ 6 – Other (Specify in Comments)
Water Odor	89971	☐ 1 – Sewage ☐ 2 – Oily / Chemical	☐ 3 – H_2S ☐ 4 – Musky	☐ 5 – Fishy ☐ 7 – Other (Specify in Comments) ☐ 6 – None
Present Weather	89966	☐ 1 – Clear ☐ 2 – Partly Cloudy	☐ 3 – Cloudy ☐ 4 – Rain	
Field Comments:				

CHAIN OF CUSTODY

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Relinquished By:_____ Date:_____ Time:_____

Received By:_____ Date:_____ Time:_____

Sample Comments:

Stream Discharge Measurement

Measurement Method [89835]: ☐ 1 – Gage ☐ 2 – Elec ☐ 3 - Mech ☐ 4 – Weir/Flume ☐ 5 - Doppler	Total Discharge (∑Q) cfs [00061]:
Estimated Flow [74069]:	

LABELS

$Field, $Flow	Additional Label if applicable

Appendix C Data Summary Report

Data Summary

Data Information

Data Source: _____

Date Submitted: _____

Tag_id Range: _____

Date Range: _____

Comments

Please explain in the space below any data discrepancies including:

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

_____

- _____
- _____
- _____
- _____
- _____
- _____
- _____

Data Manager: _____

Date: _____

Appendix D Data Review Checklist

Data Review Checklist

This checklist is to be used by the Planning Agency and other entities handling the monitoring data in order to review data before submitting to the TCEQ. This table may not contain all of the data review tasks being conducted.

Data Format and Structure	Y, N, or N/A
Are there any duplicate Tag Id numbers in the Events file?	
Do the Tag prefixes correctly represent the entity providing the data?	
Have any Tag Id numbers been used in previous data submissions?	
Are Tag IDs associated with a valid SLOC?	
Are sampling Dates in the correct format, MM/DD/YYYY with leading zeros?	
Are sampling Times based on the 24 hr clock (e.g. 09:04) with leading zeros?	
Is the Comments field filled in where appropriate (e.g. unusual occurrence, sampling problems, unrepresentative of ambient water quality)?	
Are Submitting Entity, Collecting Entity, and Monitoring Type codes used correctly?	
Do sampling dates in the Results file match those in the Events file for each Tag Id?	
Are values represented by a valid parameter code with the correct units?	
Are there any duplicate parameter codes for the same Tag Id?	
Are there any invalid symbols in the Greater Than/Less Than (GT/LT) field?	
Are there any Tag Ids in the Results file that are not in the Events file or vice versa?	
Data Quality Review	Y, N, or N/A
Are “less-than” values reported at the LOQ? If no, explain in Data Summary.	
Have the outliers been verified and a "1" placed in the Verify_flg field?	
Have checks on correctness of analysis or data reasonableness been performed? e.g., Is ortho-phosphorus less than total phosphorus? Are dissolved metal concentrations less than or equal to total metals? Is the minimum 24 hour DO less than the maximum 24 hour DO? Do the values appear to be consistent with what is expected for site?	
Have at least 10% of the data in the data set been reviewed against the field and laboratory data sheets?	
Are all parameter codes in the data set listed in the QAPP?	
Are all stations in the data set listed in the QAPP?	
Documentation Review	Y, N, or N/A
Are blank results acceptable as specified in the QAPP?	
Were control charts used to determine the acceptability of lab duplicates (if applicable)?	
Was documentation of any unusual occurrences that may affect water quality included in the Event file’s Comments field?	
Were there any failures in sampling methods and/or deviations from sample design requirements that resulted in unreportable data? If yes, explain in Data Summary.	
Were there any failures in field and/or laboratory measurement systems that were not resolvable and resulted in unreportable data? If yes, explain in Data Summary.	
Was the laboratory’s NELAP Accreditation current for analysis conducted?	

Appendix E Corrective Action Report

Example

Non-Conformance Report Detail

Report ID:	724		
ESD Section:	Lab	**Parameter(s):**	Coliform, Total
Reporter:	Maru Garayar	**Sample(s) Affected:**	AA46856, AA46857, AA46858
Date of Occurance:	June 10, 2009	**Project(s) Affected:**	NA
Date Submitted:	June 11, 2009	**Severity Level:**	Results not being reported
Description:	Upon taking out Colilert-18 set on 6/10/09(batches 17483 and 17482) from client Le Snyder it was found the three of the samples had exceeded the hold time.		
Action Taken:	Submitted NCR and awaiting response.		

Non-Conformance Report

Assigned to: Maru Garayar

Quality Manager/Deputy Quality Manager Comments

Date	Submitter	Comments
No comments have been submitted.		

Corrective Action Report

Date	Submitter	Comments	Accepted
July 6, 2009	Maru Garayar	**Root Cause Investigation** Upon removing samples from incubator on 6/10/09 it was found that analyst did not analyze coliert-18 bottles within the specified hold time.	**Accepted By:** Gregory Mateo
July 6, 2009	Maru Garayar	**Corrective Action to Address a Finding** Client was notified and data for three samples was not used. Client resubmitted samples. Situation was also discussed at lab staff meeting.	**Accepted By:** Gregory Mateo
July 6, 2009	Maru Garayar	**Corrective Action to Prevent a Re-occurance** It was recommended to check to-do lists regularly. Also for anyone logging in to notify analyst if sample has a shorter hold time then usual.	**Accepted By:** Gregory Mateo

The corrective actions have been accepted by Patricia Carvajal on August 4, 2009.

30 Day Follow-up Report

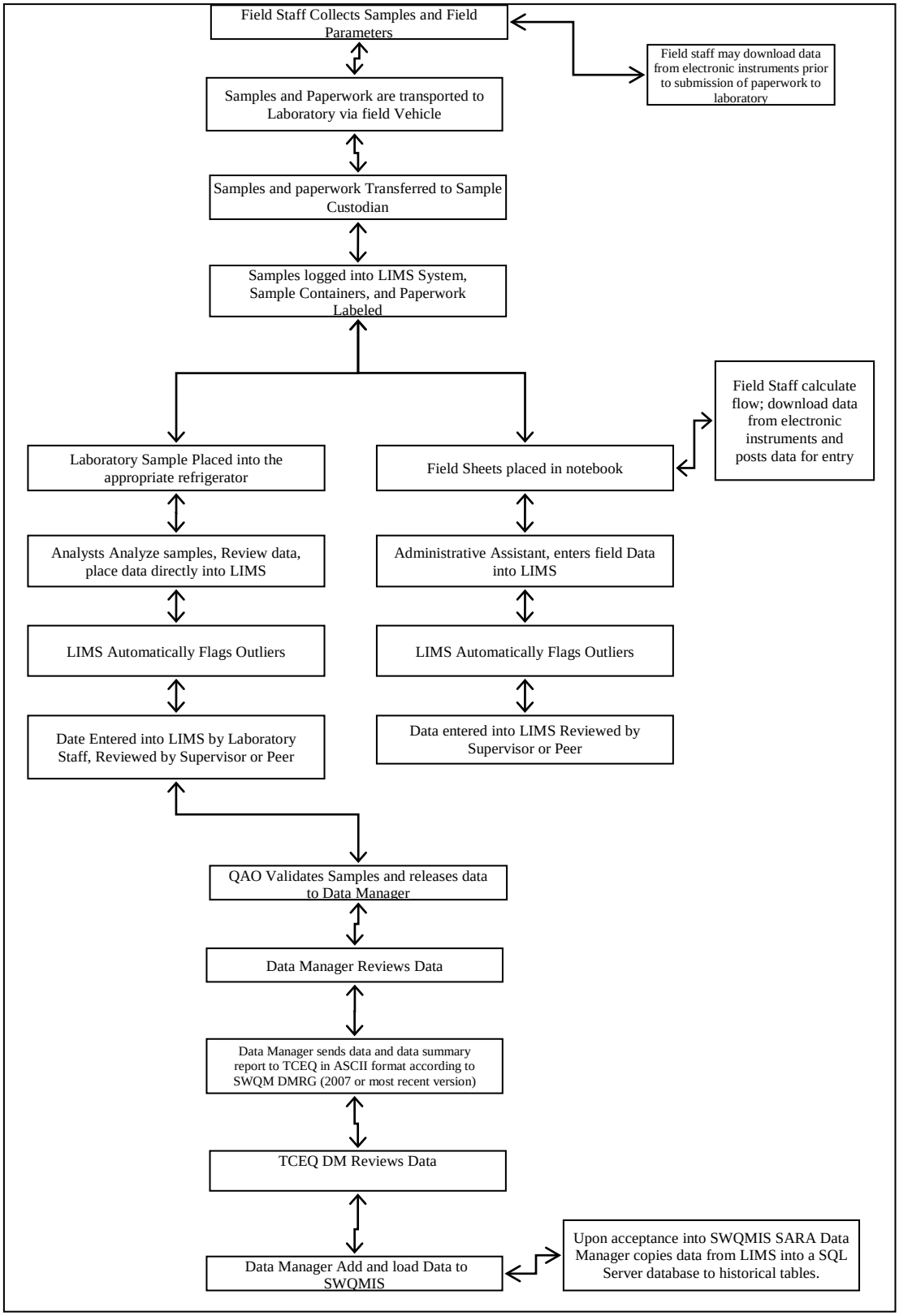
Date	Submitter	Comments
September 9, 2009	Patricia Carvajal	I asked the analyst how she determined if a sample has exceeded the hold time. The primary method is for the sample receiver to document the date on the board in the event the sample was collected the previous day.

Reviews and Sign-offs

QM Accepted on September 18, 2009 by Patricia Carvajal
Supervisor Accepted on September 18, 2009 by Gregory Mateo

This report was closed by Patricia Carvajal on September 18, 2009.

Appendix F Data Management Flow Chart



Appendix G. Automated Sampler Testing and Maintenance Requirements

Testing Requirements – Units will be tested at least once prior to a sampling event to determine if the settings have been properly entered and that the auto sampler collects the required samples according to the desired schedule.

Maintenance Requirements – Regular maintenance for the auto sampler units will be performed prior to deploying the unit for a stormwater event. Refer to auto-sampler manual for specific information regarding maintenance and replacement of parts.

1. Check for proper time settings
2. Inspect the pump tube for wear. Replace it if necessary
3. Clean the pump tubing housing
4. Change the suction line if necessary.
5. Clean the bottles, suction line, strainer, and pump tube.
6. Check the humidity indicator.
7. When the battery warning appears on the display, replace the controller's internal battery

ATTACHMENT 1

Example Letter to Document Adherence to the QAPP

TO: (name)
(organization)

FROM: (name)
(organization)

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

(address)

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

_____ _____

Signature Date

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