Houston-Galveston Area Council (H-GAC) Multi-Basin Quality Assurance Project Plan

3555 Timmons Lane, Suite 120
Houston, Texas 77027

Clean Rivers Program

Water Quality Planning Division

Texas Commission on Environmental Quality

P.O. Box 13087, MC 234

Austin, Texas 78711-3087

Effective Period: FY 2020 to FY 2021

Questions concerning this QAPP should be directed to:
Jean Wright, Houston-Galveston Area Council (H-GAC)
CRP Quality Assurance Officer
P.O. Box 22777
Houston, Texas 77227-2777
(713) 499-6660
jean.wright@h-gac.com

A1 Approval Page

Texas Commission on Environmental Quality

Water Quality Planning Division

9/16/19

Kyle Girten, Manager — Date
Water Quality Monitoring and Assessment Section

9/16/19

Sarah Eagle, Work Leader — Date
Clean Rivers Program

9/16/2019

Kelly Rodibaugh, — Date
Project Quality Assurance Specialist
Clean Rivers Program

9/16/2019

Kelly Rodibaugh, Project Manager — Date
Clean Rivers Program

9/16/2019

Cathy Anderson, Team Leader — Date
Data Management and Analysis

Monitoring Division

9/16/2019

Sharon Coleman — Date
TCEQ Quality Assurance Manager

9/16/2019

Sharon Coleman — Date
Acting Lead CRP Quality Assurance Specialist

Todd Running
H-GAC Project Manager
9/10/19
Date

Jean Wright
H-GAC Quality Assurance Officer
9/9/19
Date

Harris County Pollution Control Services (HCPCS)

Michael Cantu 7/9/19
Michael Cantu — Date
HCPCS CRP Project Manager

Bryan Kosler 9-6-19
Bryan Kosler — Date
Field Quality Assurance Officer

Michael Cantu 7/9/19
Michael Cantu — Date
HCPCS Laboratory Manager

Ericka Jackson 9/6/19
Ericka Jackson — Date
HCPCS Quality Assurance Officer

City of Houston, Houston Health Department (HHD)

Daisy James 9/9/19
Daisy James Date
CRP Project Manager

Lisa Montemayor 9/9/19
Lisa Montemayor
Date
HHD Field Quality Assurance Officer

Roger Sealy 9/9/19
Roger Sealy Date
HHD BLS Lab Manager

Kimyattia Smith 9.9.19
Kimyattia Smith Date
HHD BLS Lab Quality Assurance Officer

City of Houston, Drinking Water Operations (DWO)

Thakur 9/9/19

Shubha Thakur Date
CRP Project Manager & DWO Laboratory Director

Harold Longbaugh 9/9/19

Harold Longbaugh Date
DWO Laboratory Manager

Thakur 9/9/19

Shubha Thakur Date
'Acting' DWO Laboratory Quality Assurance Officer

Desta Takie 9/9/19

Desta Takie Date
DWO Field Quality Assurance Officer

San Jacinto River Authority (SJRA)

9-10-19

Shane Simpson — Date
SJRA CRP Project Manager and
Field Quality Assurance Officer

Environmental Institute of Houston, University of Houston – Clear Lake (EIH)

9/6/19

Dr. George Guillen — Date
EIH CRP Project Manager

9-6-19

Jenny Oakley — Date
Quality Assurance Officer

Texas Research Institute for Environmental Studies (TRIES)

11 Sept 2019

Dr. Chad Hargrave — Date
TRIES CRP Project Manager

11 Sept 2019

Kaitlen Gary — Date
TRIES CRP Quality Assurance Officer

11 Sep 2019

Dr. Rachelle Smith — Date
TRIES Laboratory Manager & Quality Assurance Officer

Eastex Environmental Laboratory, Inc. (Coldspring, TX)

9-10/19

Natalia Bondar — Date
Eastex Lab Technical Director

9/10/19

Tiffany Guerrero — Date
Eastex Lab Quality Assurance Officer

A2 Table of Contents

List of Acronyms

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
BTLIMS	Bin Technology Laboratory Information Management System
CAP	Corrective Action Plan
CE	Collecting Entity
COC	Chain of Custody
CRP	Clean Rivers Program
DMRG	Surface Water Quality Monitoring Data Management Reference Guide, most recent version
DM&A	Data Management and Analysis
DWO	City of Houston, Drinking Water Operations
Eastex	Eastex Environmental laboratory (Facility in Coldspring, TX only)
EPA	United States Environmental Protection Agency
FY	Fiscal Year
EIH	Environmental Institute of Houston, University of Houston – Clear Lake
GIS	Geographical Information System
GPS	Global Positioning System
H-GAC	Houston-Galveston Area Council
HCPCS	Harris County Pollution Control Services
HHD	City of Houston Health Department
HHD-BLS	Houston Health Department – Bureau of Laboratory Services
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
MT	Monitoring Type
NELAP	National Environmental Lab Accreditation Program
QA	Quality Assurance
QM	Quality Manual
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Specialist
QC	Quality Control
QMP	Quality Management Plan
RT	Routine Monitoring
RMW	Regional Monitoring Workgroup
SE	Submitting Entity
SJRA	San Jacinto River Authority
SLOC	Station Location
SOP	Standard Operating Procedure
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TMDL	Total Maximum Daily Load
TCEQ	Texas Commission on Environmental Quality
TNI	The NELAC Institute
TRIES	Texas Research Institute for Environmental Studies
TSWQS	Texas Surface Water Quality Standards
VOA	Volatile Organic Analytes

A3 Distribution List

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

Kelly Rodibaugh, Project Manager
Clean Rivers Program
MC-234
(512) 239-1739

Sharon Coleman
Acting Lead CRP Quality Assurance Specialist
MC-165
(512) 239-6340

Cathy Anderson
Team Leader, Data Management and Analysis
MC-234
(512) 239-1805

Houston-Galveston Area Council
3555 Timmons Lane, Suite 120
Houston, Texas 77027

Todd Running, Project Manager
(713) 993-4549

Jean Wright, Quality Assurance Officer
(713) 499-6660

The H-GAC will provide copies of this project plan and any amendments or appendices of this plan to each person on this list and to each sub-tier project participant, e.g., subcontractors, subparticipants, or other units of government. The H-GAC will document distribution of the plan and any amendments and appendices, maintain this documentation as part of the project's quality assurance records, and ensure the documentation is available for review. Sub-Tier participants & Laboratories to receive copies of the QAPP include:

- Harris County Pollution Control Services & Laboratory
- City of Houston, Houston Health Department & Laboratory
- City of Houston, Drinking Water Operations & Laboratory
- Environmental Institute of Houston, University of Houston-Clear Lake
- San Jacinto River Authority
- Texas Research Institute for Environmental Studies & Laboratory
- Eastex Environmental Laboratory

A4 Project/Task Organization

Description of Responsibilities

TCEQ

Sarah Eagle
CRP Work Leader
Responsible for Texas Commission on Environmental Quality (TCEQ) activities supporting the development and implementation of the Texas Clean Rivers Program (CRP). Responsible for verifying that the TCEQ Quality Management Plan (QMP) is followed by CRP staff. Supervises TCEQ CRP staff. Reviews and responds to any deficiencies, corrective actions, or findings related to the area of responsibility. Oversees the development of Quality Assurance (QA) guidance for the CRP. Reviews and approves all QA audits, corrective actions, , reports, work plans, contracts, QAPPs, and TCEQ Quality Management Plan. Enforces corrective action, as required, where QA protocols are not met. Ensures CRP personnel are fully trained.

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

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

Cathy Anderson
Team Leader, Data Management and Analysis (DM&A) Team
Participates in the development, approval, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Ensures DM&A staff perform data management-related tasks.

Peter Bohls
CRP Data Manager, DM&A Team
Responsible for coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval. Ensures that data are reported following instructions in the Data Management Reference Guide, most recent version (DMRG). Runs automated data validation checks in the Surface Water Quality Management Information System (SWQMIS) and coordinates data verification and error correction with CRP Project Managers. Generates SWQMIS summary reports to assist CRP Project Managers' data review. Identifies data anomalies and inconsistencies. Provides training and guidance to CRP and Planning Agencies on technical data issues to ensure that data are submitted according to documented procedures. Reviews QAPPs for valid stream monitoring stations. Checks validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s). Develops and maintains data management-related SOPs for CRP data management. Coordinates and processes data correction requests. Participates in the development, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP).

Kelly Rodibaugh
CRP Project Quality Assurance Specialist
Serves as liaison between CRP management and TCEQ QA management. Participates in the development, approval, implementation, and maintenance of written QA standards (e.g., Program Guidance, SOPs, QAPPs, QMP). Serves on planning team for CRP special projects and reviews QAPPs in coordination with other CRP staff. Coordinates documentation and implementation of corrective action for the CRP.

Houston-Galveston Area Council (H-GAC)

Todd Running
H-GAC Project Manager
Responsible for implementing and monitoring CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Ensures monitoring systems audits are conducted to ensure QAPPs are followed by the H-GAC and basin partners and that projects are producing data of known quality. Ensures that basin partners are qualified to perform contracted work. Ensures CRP project managers and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for confirming that data collected are validated and are acceptable for reporting to the TCEQ.

Jean Wright
H-GAC Quality Assurance Officer
Responsible for coordinating the implementation of the HGAC CRP QA program. Responsible for writing and maintaining the Multi-Basin QAPP and monitoring its implementation. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of basin partner commitment to requirements specified in this QAPP as needed. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the H-GAC 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. Conducts monitoring systems audits on basin partners to determine compliance with project and program specifications, issues written reports, and follows through on findings. Ensures that field staff is properly trained and that training records are maintained.

Bill Hoffman
H-GAC Data Manager
Responsible for ensuring that field and laboratory data collected by or submitted to H-GAC CRP are properly reviewed, verified, and validated. Responsible for the transfer of basin quality-assured water quality data to the TCEQ in the format described in the DMRG, most recent version. Maintains quality-assured data on H-GAC internet sites.

Eastex Environmental Laboratory (Eastex) (Coldspring, TX, facility only)

Natalia Bondar
Laboratory Technical Director - Eastex Environmental Lab (Contract Lab)
Responsible for the overall performance, administration, and reporting of analyses performed by Eastex Environmental Laboratory (Coldspring, TX). Responsible for supervision of laboratory personnel involved in generating analytical data for the project. Ensures that laboratory personnel have adequate training and a thorough knowledge of this QAPP and related SOPs. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation is complete and adequately maintained, and results are reported accurately.

Tiffany Guerrero
Eastex Lab QAO
Responsible for the overall quality control and quality assurance of analyses performed by Eastex Environmental Laboratory (Coldspring, TX). Monitors the implementation of the QM/QAPP within the laboratory to ensure complete compliance with QA data quality objectives, as defined by this QAPP. Coordinates and monitors deficiencies and corrective actions. Conducts in-house audits to ensure compliance with written SOPs and to identify potential problems. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory.

Harris County Pollution Control Services (HCPCS)

Michael Cantu
CRP Project Manager / Manager-Laboratory Services
Responsible for overall performance, administration, and reporting of analyses performed by HCPCS Laboratory. Responsible for supervision of laboratory personnel involved in generating analytical data for the project. Ensures that laboratory personnel have adequate training and a thorough knowledge of this QAPP and related SOPs. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation is complete and adequately maintained, and results are reported accurately. Additionally, the lab director will review and verify all laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and will confirm data is validated against the data quality objectives listed in Appendix A of this QAPP.

Ericka Jackson
Lab Quality Assurance Officer (QAO) / CRP QAO / CRP Data Manager
Responsible for monitoring the activities of HCPCS laboratory personnel, ensuring that all data collected meet the data quality objectives of the project. Ensures both field and laboratory data are entered into appropriate spreadsheets and data bases and is reviewed and validated as required. Responsible for submitting all data to H-GAC in the correct format. Responsible for the overall quality control and quality assurance of analyses performed by HCPCS Laboratory. Monitors the implementation of the QM/QAPP within the laboratory to ensure complete compliance with QA data quality objectives, as defined by this QAPP. Conducts in-house audits to ensure compliance with written SOPs and to identify potential problems. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory. Responsible for coordinating the implementation of the QA program. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the H-GAC QAO to resolve QA-related issues. Notifies the H-GAC QAO of particular circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective action. Responsible for ensuring that field and laboratory data collected by or submitted to H-GAC CRP are properly reviewed, verified, and validated. Formats and delivers data in the format described in the DMRG, most recent version, to H-GAC CRP Data Manager.

Bryan Kosler
Field Supervisor & Field QAO
Responsible for monitoring the activities of HCPCS field personnel, ensuring that all data collected meet the data quality objectives of the project. Responsible for supervising the collection, preservation, handling and delivery of samples. Responsible for ensuring that field measurements, sample custody, and documentation follow procedures described in this QAPP. Notifies the HCPCS lab QA staff of particular circumstances which may adversely affect the quality of data. Responsible for coordinating with H-GAC QAO to resolve field related issues. Trains all field monitoring personnel.

City of Houston – Houston Health Department (HHD)

Daisy James
CRP Project Manager
Responsible for conducting routine monitoring in support of the QAPP. Responsible for implementing and monitoring CRP requirements in QAPPs and QAPP amendments and appendices. Coordinates basin planning activities with the H-GAC Project Manager. Ensures H-GAC Quality Assurance Officer is notified of deficiencies and corrective actions, and that issues are resolved

Lisa Montemayor
CRP QAO
Responsible for coordinating the implementation of the QA program and for coordinating with the H-GAC QA staff to resolve QA-related issues. Notifies the CRP Project Manager and H-GAC QA staff of circumstances which may adversely affect the quality of data. Coordinates and monitors deficiencies and corrective actions. Coordinates the research and review of technical QA material and data related to water quality monitoring system design and analytical techniques. Ensures that field staff is properly trained and that training records are maintained.

Lisa Leija
CRP Data Manager
Responsible for ensuring that field data are properly reviewed and verified. Formats and delivers data in in the format described in the most recent version of the DMRG to the H-GAC CRP Data Manager. Responsible for sending hard copies of field data sheets and COC forms to H-GAC CRP Data Manager.

City of Houston – Houston Health Department – Bureau of Laboratory Services (HHD-BLS)

Roger Sealy
HHD-BLS Lab Manager
Responsible for overall performance, administration, and reporting of analyses performed by HHD-BLS. Responsible for supervision of laboratory personnel involved in generating analytical data for the project. Ensures that laboratory personnel have adequate training and a thorough knowledge of this QAPP and related SOPs. Communicates QA issues to HHD CRP QAO, HHD CRP Data Manager, and HGAC staff. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation is complete and adequately maintained, and results are reported accurately. Responsible party for ensuring that laboratory staff are trained and that training records are maintained. Additionally, the lab manager will review and verify all laboratory data for integrity and continuity, reasonableness and conformance to project requirements, and will confirm data is validated against the data quality objectives listed in Appendix A of this QAPP. Provides a final review of lab data against Appendix A of this QAPP, NELAC standards and method requirements prior to submission to HGAC.

Kimyattia Smith
HHS-BLS Lab Quality Assurance Officer
Responsible for the overall quality control and quality assurance of analyses performed by HHD-BLS. Monitors the implementation of the QM/QAPP within the laboratory to ensure complete compliance with QA data quality objectives, as defined by the QAPP. Conducts in-house audits to ensure compliance with written SOPs and to identify potential problems. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory. Coordinates and monitors deficiencies and corrective actions. Validates data against the quality objectives listed in Appendix A of this QAPP.

City of Houston – Drinking Water Operations (DWO)

Shubha Thakur
CRP Project Manager / Laboratory Director
Responsible for implementing and monitoring CRP requirements in contracts, QAPPs and QAPP amendments and appendices. Coordinates basin planning activities and work of basin partners. Ensures monitoring systems audits are conducted to ensure QAPPs are followed by City of Houston Drinking Water Operations Laboratory, participants and that projects are producing data of known quality. Ensures CRP project managers and /or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved.

Harold Longbaugh
Laboratory Manager
Responsible overall performance, administration and reporting of analyses by City of Houston Drinking Water Operations Laboratory. Responsible for supervision of laboratory personnel involved in generating analytical data for the project. Ensures that laboratory personnel have adequate training and a thorough knowledge of this QAPP and related SOPs. Responsible for oversight of all laboratory operations ensuring that all QA/QC requirements are met, documentation is complete and adequately maintained, and results are reported accurately. Responsible for reviewing & validating field data submitted on COCs & laboratory data against raw data entered in BTLIMS.

Shubha Thakur
'Acting' Lab QA Manager / 'Acting' CRP QAO / 'Acting' Lab Data Manager
Responsible for overall quality control and quality assurance of analyses performed by City of Houston Drinking Water Operations Laboratory. Monitors the implementation of the QM/QAPP within the laboratory to ensure complete compliance with QA data quality objectives, as defined by the QAPP. Conducts in-house audits to ensure compliance with written SOPs and to identify potential problems. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory. Responsible for training and keeping record of lab personnel to produce quality analytical data. Communicates any QA issues with laboratory manager and laboratory director. Responsible for coordinating and monitoring deficiencies and corrective actions. Responsible for coordinating with the TCEQ QAS to resolve QA-related issues. Notifies the City of Houston Drinking Water Operations Project Manager and laboratory manager of particular circumstances which may adversely affect the quality of data. Responsible for reviewing at least 10% of laboratory data against raw data entered in BTLIMS. Coordinates and maintain records of data verification and validation. Responsible for sending analytical data with required QA/QC and Data Review Checklist to HGAC CRP Data Manager.

Desta Takie
Field Supervisor / CRP Field QAO / CRP Field Data Manager
Responsible for supervising the collection, preservation, handling and delivery of samples. Responsible for ensuring that field measurements, sample custody, and documentation follow procedures described in the this QAPP. Notifies the DWO Lab QAO of particular circumstances which may adversely affect the quality of data. Responsible for verifying and validating data files against measurement performance specifications and other requirements in the QAPP. Formats and delivers field data in the format described in the most recent revision of the DMRG to H-GAC CRP Data Manager. Submits hard copies of field sheets, chain-of custody reports and Data Review Checklist to HGAC CRP Data Manager. Trains all field monitoring personnel and maintains training records.

San Jacinto River Authority (SJRA)

Shane Simpson
CRP Project Manager / Field Supervisor / Quality Assurance Officer
Responsible for conducting routine monitoring in support of this QAPP. Responsible for implementing and monitoring CRP requirements in QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities with the H-GAC. Ensures H-GAC CRP project manager and/or QAO are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for supervising the collection, preservation, handling and delivery of samples. Responsible for ensuring that field measurements, sample custody, and documentation follow procedures described in this QAPP. Notifies the H-GAC QAO of particular circumstances which may adversely affect the quality of data. Trains all field monitoring personnel and maintains training records. Responsible for coordinating the implementation of the QA program. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the H-GAC QA staff to resolve QA-related issues. Coordinates and monitors deficiencies and corrective actions. Responsible for data entry of all field data.

Randy Acreman
CRP Data Manager
Responsible for verifying and validating data files against measurement performance specifications and other requirements in this QAPP. Formats and delivers data in the format described in the DMRG, most recent version, to H-GAC CRP Data Manager. Submits electronic data and supporting documents (field data sheets, chain-of-custody reports, and Data Review Check-lists) to the H-GAC CRP Data Manager.

Environmental Institute of Houston (EIH) University of Houston Clear Lake

Dr. George Guillen
EIH CRP Project Manager
Responsible for conducting routine monitoring in support of this QAPP. Responsible for implementing and monitoring CRP requirements in, QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities with the H-GAC.

Jenny Oakley
CRP QAO / Data Manager / Field Supervisor
Responsible for verifying and validating data files against measurement performance specifications and other requirements in this QAPP. Formats and delivers data in the format described in the DMRG, most recent version, to H-GAC CRP Data Manager. Trains all field monitoring personnel and maintains training records. Ensures H-GAC CRP project manager and/or QAO are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for coordinating the implementation of the QA program. Responsible for identifying, receiving, and maintaining project QA records. Responsible for coordinating with the H-GAC QA staff to resolve QA-related issues. Coordinates and monitors deficiencies and corrective actions.

Texas Research Institute for Environmental Studies (TRIES)

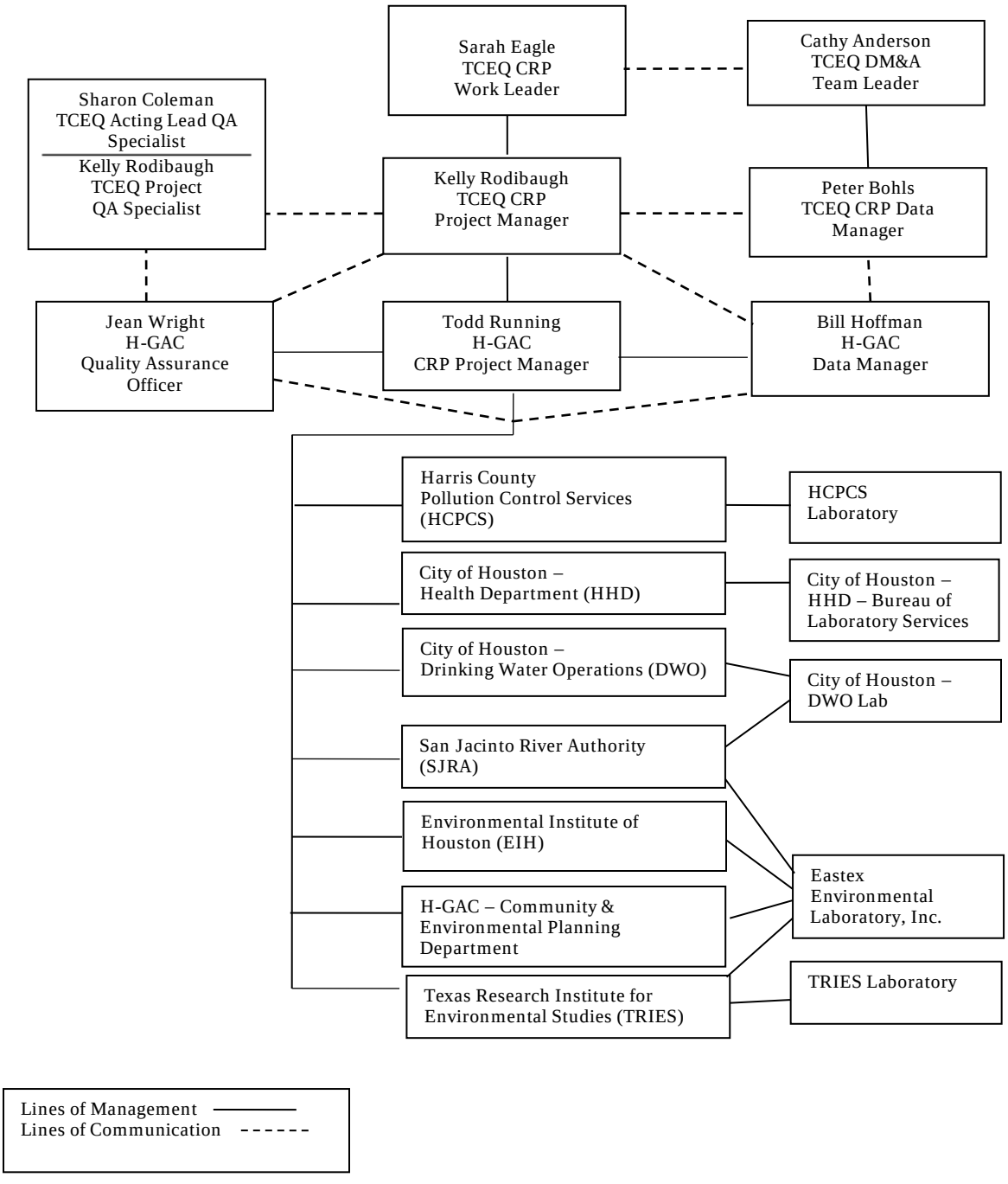
Dr. Chad Hargrave
CRP Project Manager
Responsible for conducting routine monitoring in support of this QAPP. Responsible for implementing and monitoring CRP requirements in QAPPs, and QAPP amendments and appendices. Coordinates basin planning activities with the H-GAC. Ensures H-GAC CRP project manager and/or QAO are notified of deficiencies and corrective actions, and that issues are resolved.

Kaitlen Gary
CRP Field QAO / CRP Field Supervisor / CRP Data Manager
Responsible for supervising the collection, preservation, handling and delivery of samples. Responsible for ensuring that field measurements, sample custody, and documentation follow procedures described in this QAPP. Notifies the H-GAC QAO of particular circumstances which may adversely affect the quality of data. Responsible for verifying and validating field and laboratory data against measurement performance specifications and other requirements in this QAPP. Formats and delivers data in the format described in the DMRG, most recent version, to H-GAC CRP Data Manager. Trains all field monitoring personnel and maintains training records.

Dr. Rachelle Smith
CRP Lab Manager / Lab QAO
Responsible for the overall quality control and quality assurance of analyses performed by TRIES Lab. Monitors the implementation of the QM/QAPP within the laboratory to ensure complete compliance with QA data quality objectives, as defined by this QAPP. Coordinates and monitors deficiencies and corrective actions. Conducts in-house audits to ensure compliance with written SOPs and to identify potential problems. Responsible for supervising and verifying all aspects of the QA/QC in the laboratory.

Project Organization Chart

Figure A4.1. Organization Chart - Lines of Communication



Lines of Management
Lines of Communication

Figure A4.1a. The Houston-Galveston Area Council (H-GAC) CRP Organizational Chart.

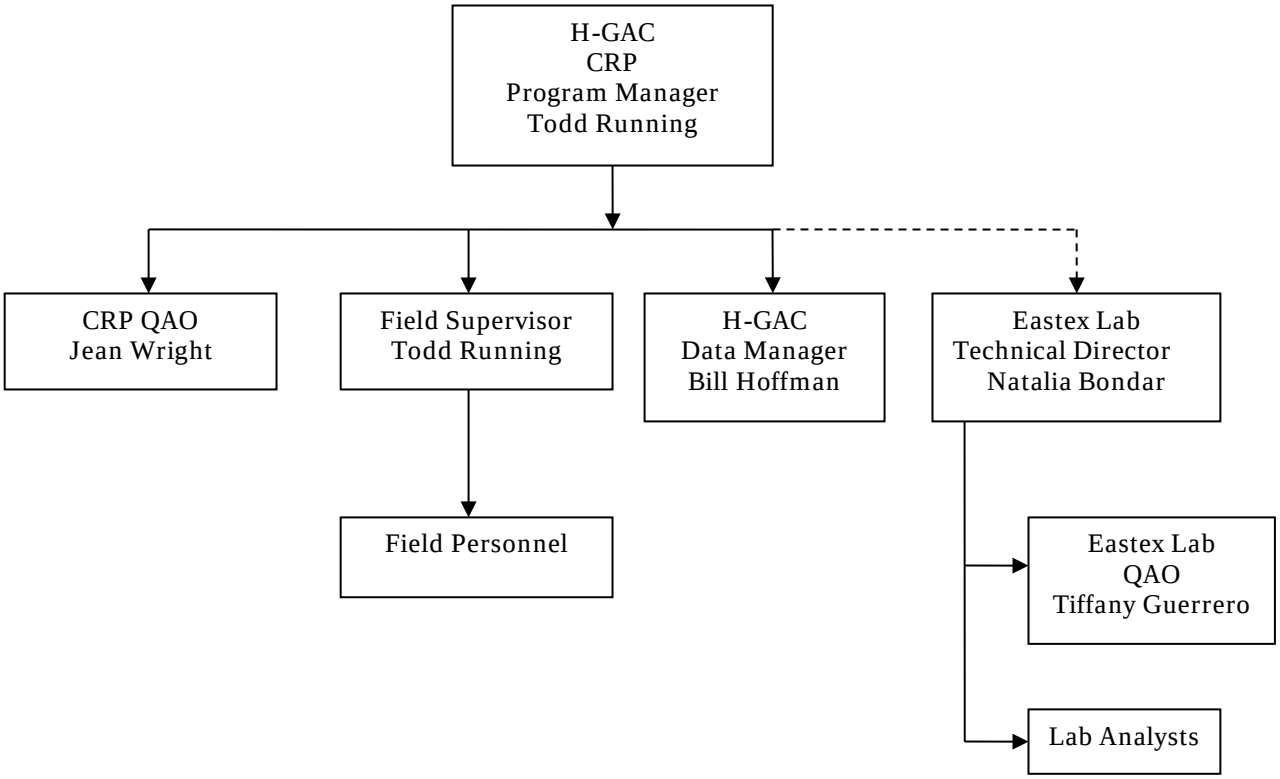


Figure A4.1b. The Harris County Pollution Control Services (HCPCS) CRP Organizational Chart.

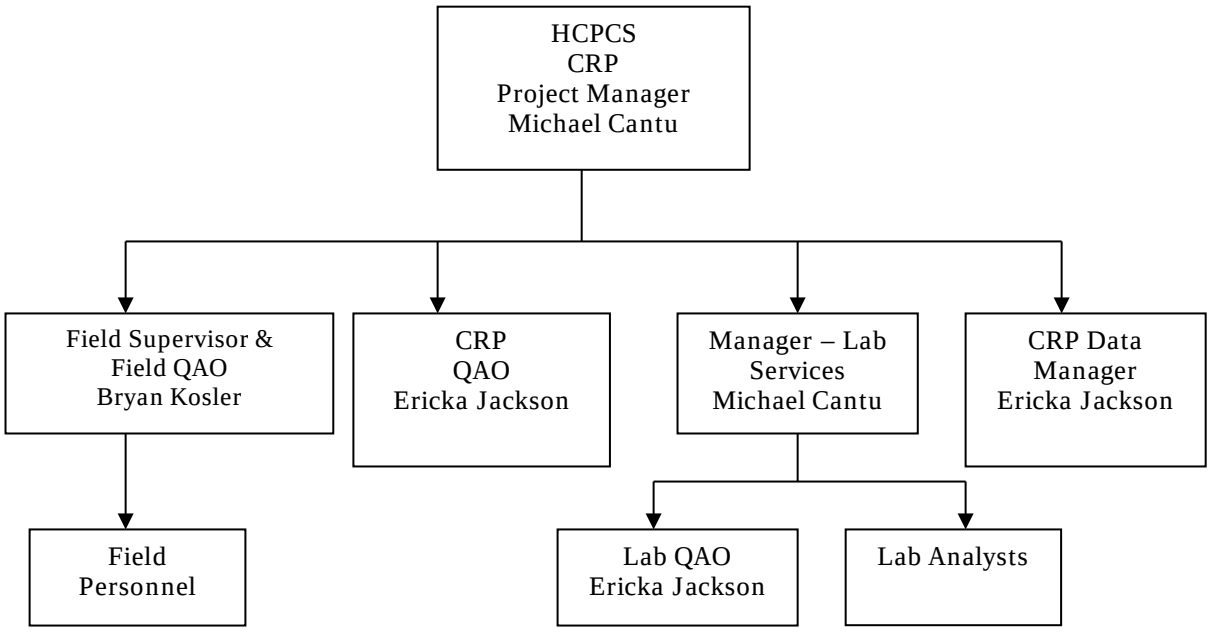


Figure A4.1c. The City of Houston, Health Department (HHD) CRP Organizational Chart.

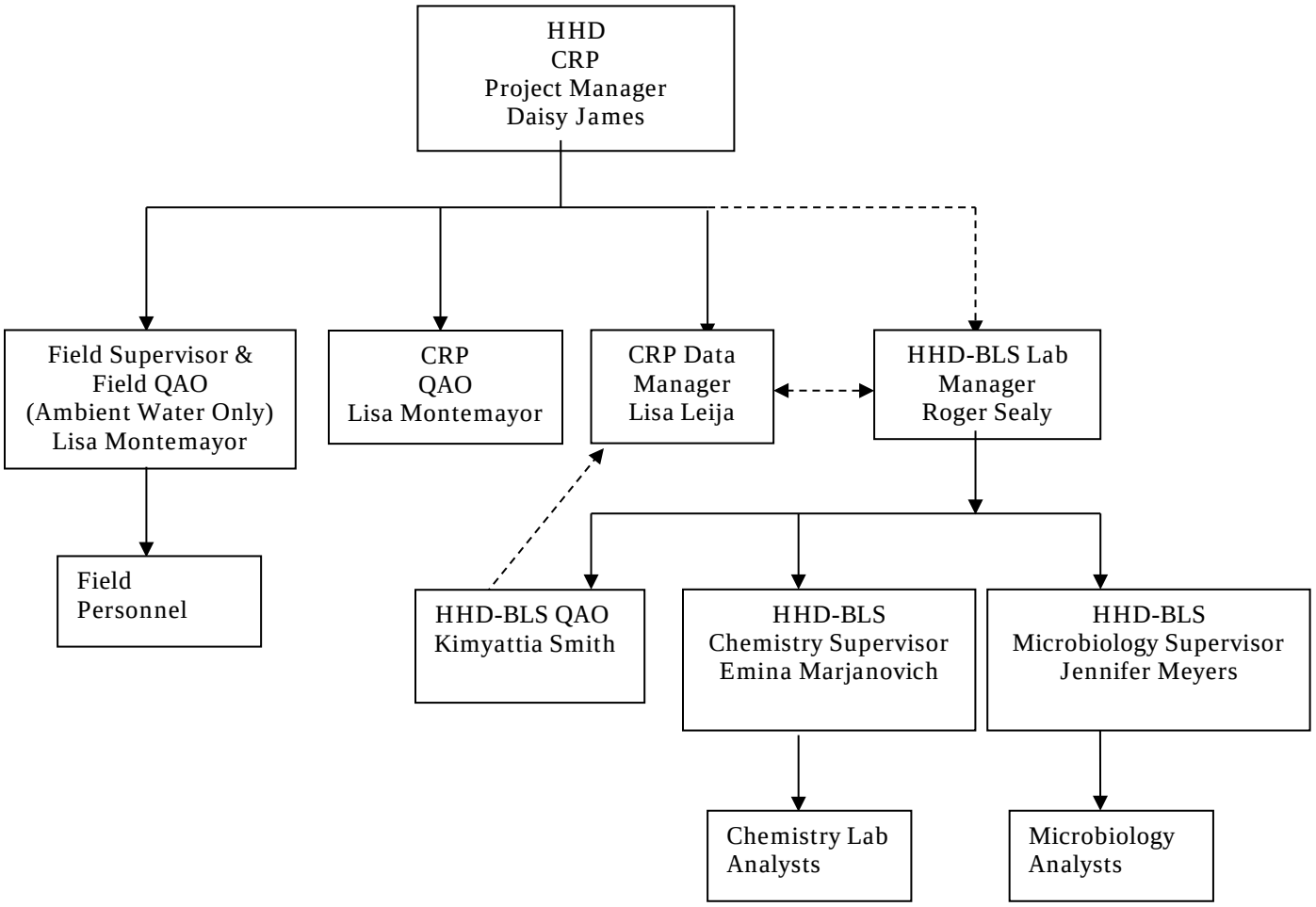


Figure A4.1d. The City of Houston, Drinking Water Operations (DWO) CRP Organizational Chart.

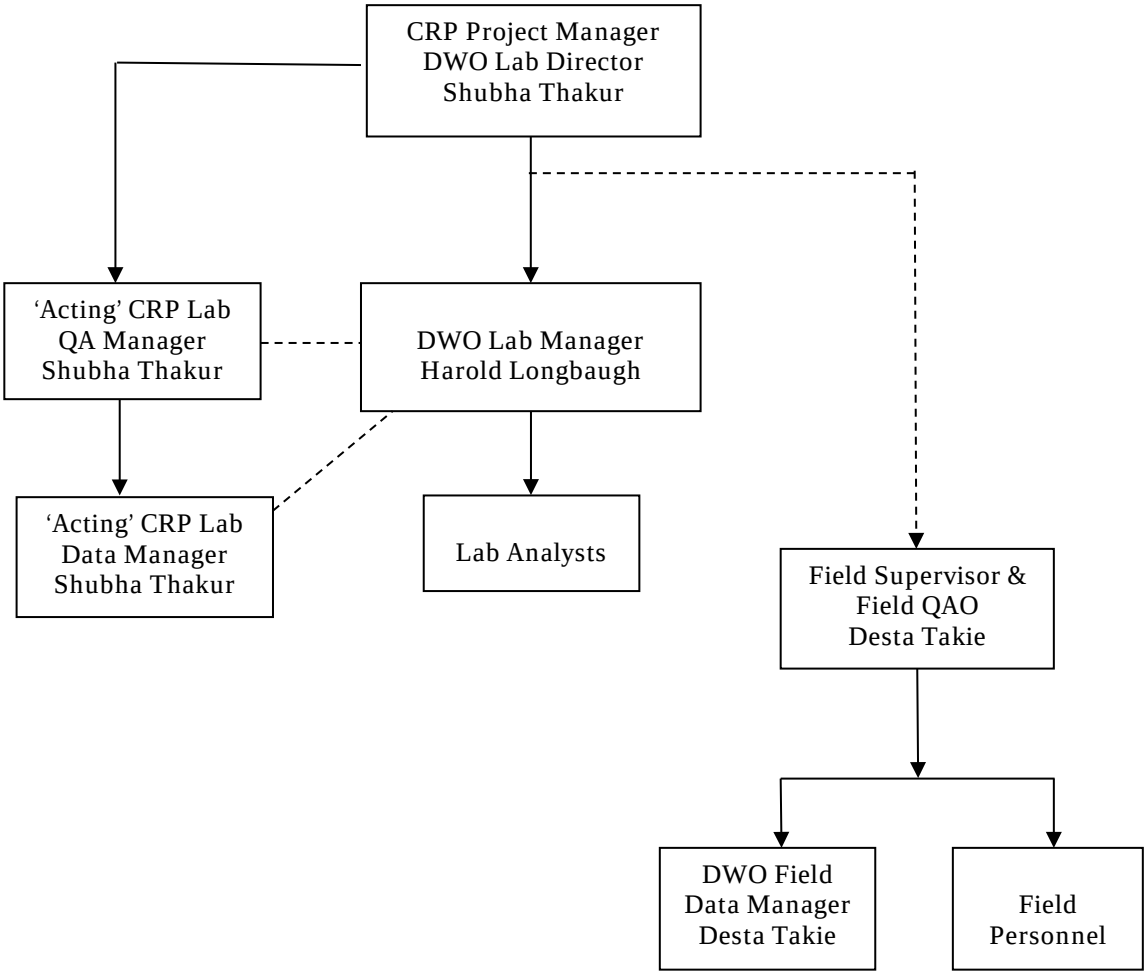


Figure A4.1e. San Jacinto River Authority (SJRA) CRP Organizational Chart.

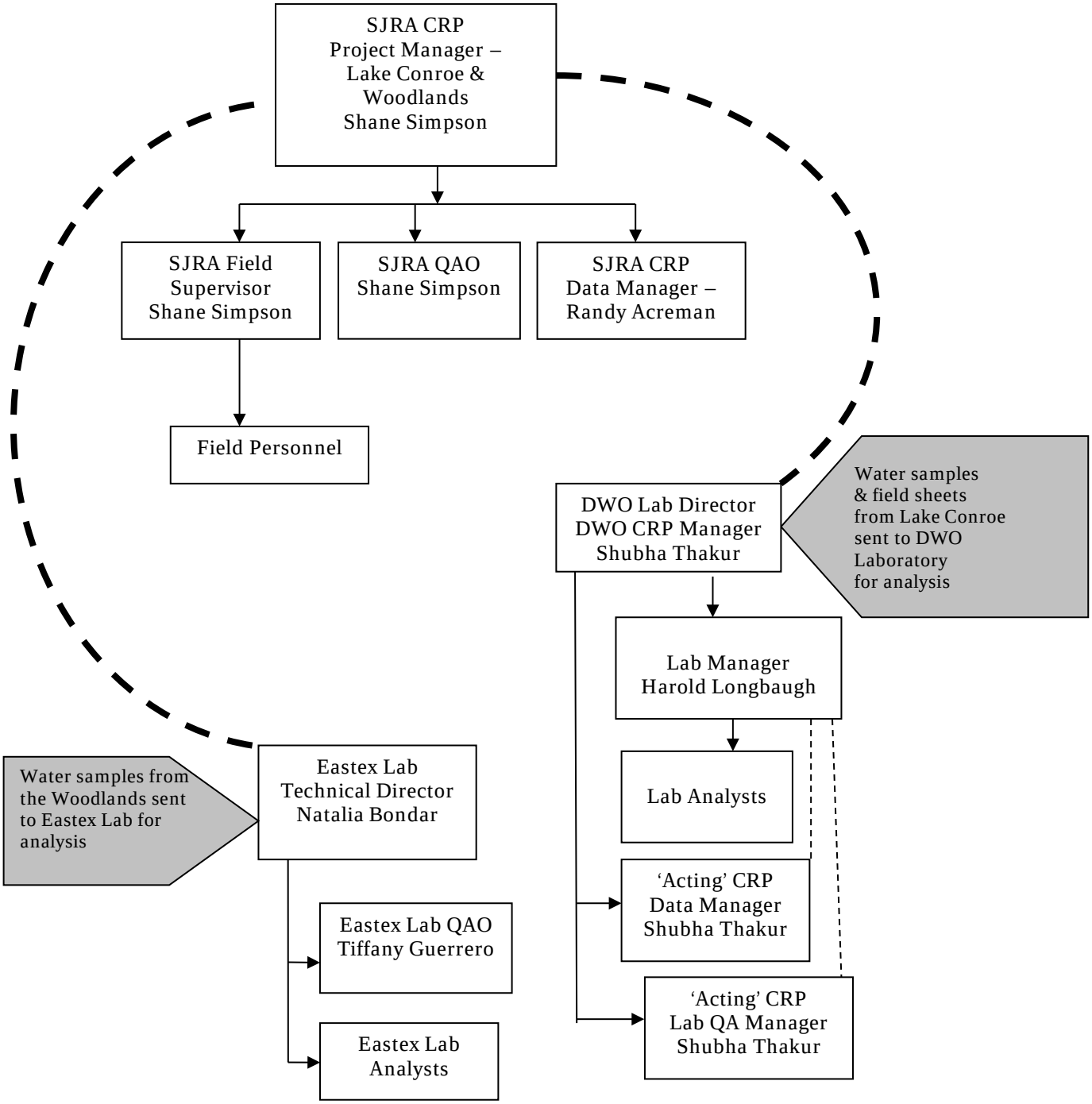


Figure A4.1f. The Environmental Institute of Houston (EIH) at the University of Houston - Clear Lake (UHCL) CRP Organizational Chart.

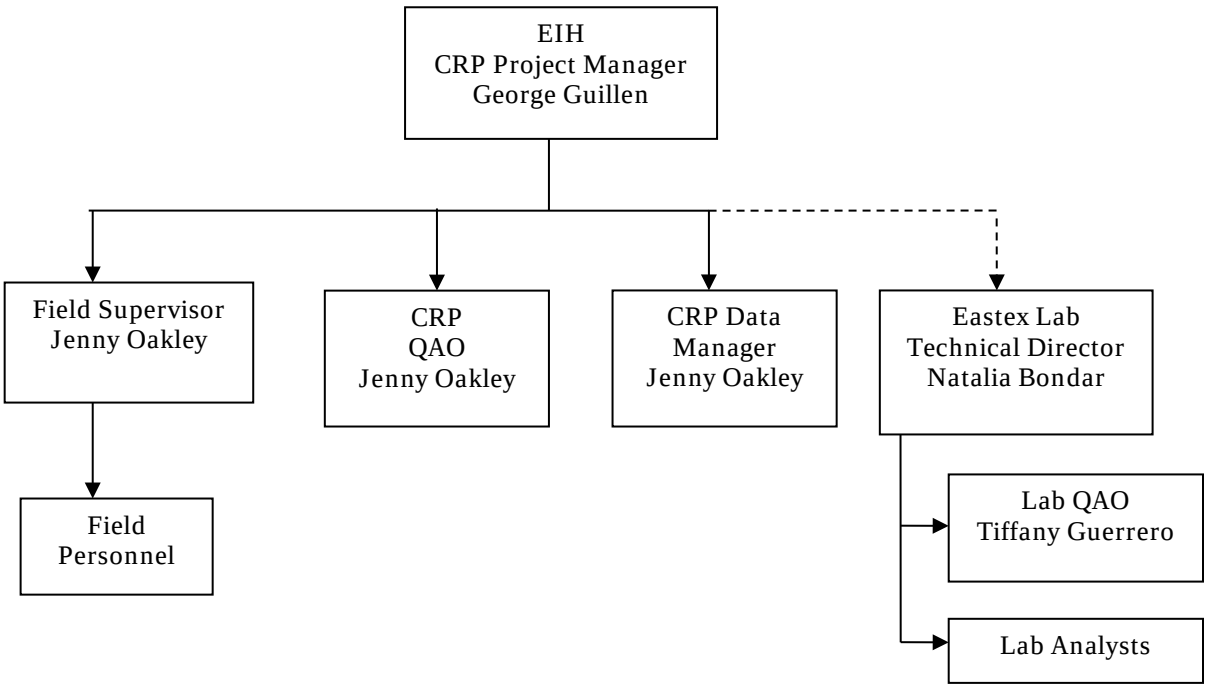
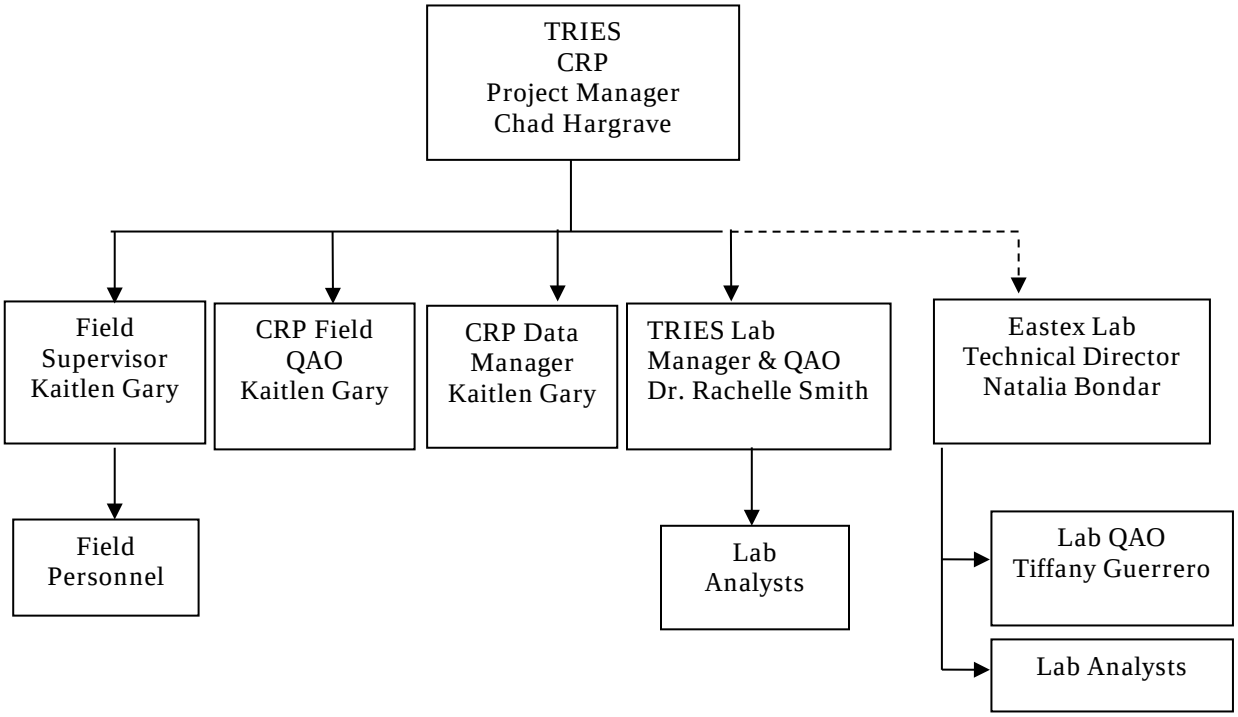


Figure A4.1g. Texas Research Institute for Environmental Studies (TRIES) CRP Organizational Chart.



A5 Problem Definition / Background

In 1991, the Texas Legislature passed the Texas Clean River Act (Senate Bill 818) in response to growing concerns that water resource issues were not being pursued in an integrated, systematic manner. The act requires that ongoing water quality assessments be conducted for each river basin in Texas, an approach that integrates water quality issues within the watershed. The CRP legislation mandates that each river authority (or local governing entity) shall submit quality-assured data collected in the river basin to the commission. Quality-assured data in the context of the legislation means data that comply with TCEQ rules for surface water quality monitoring (SWQM) programs, including rules governing the methods under which water samples are collected and analyzed and data from those samples are assessed and maintained. This QAPP addresses the program developed between the Houston-Galveston Area Council (H-GAC) and the TCEQ to carry out the activities mandated by the legislation. This QAPP was developed and will be implemented in accordance with provisions of the TCEQ Quality Management Plan, January 2019 or most recent version (QMP).

The purpose of this QAPP is to clearly delineate H-GAC QA policy, management structure, and procedures which will be used to implement the QA requirements necessary to verify and validate the surface water quality data collected. The QAPP is reviewed by the TCEQ to help ensure that data generated for the purposes described above are of known and documented quality, deemed acceptable for their intended use. This process will ensure that data collected under this QAPP and submitted to SWQMIS have been collected and managed in a way that guarantees its reliability and therefore can be used in water quality assessments, total maximum daily load (TMDL) and water quality standards development, permit decisions, and other program activities deemed appropriate by the TCEQ. Project results will be used to support the achievement of CRP objectives, as contained in the *Clean Rivers Program Guidance and Reference Guide FY 2020 -2021*.

H-GAC is the lead agency for the Clean Rivers Program in the San Jacinto River Basin and three associated coastal basins - the Trinity-San Jacinto, the San Jacinto-Brazos and the Brazos-Colorado. In many of the state's major river basins, a legislatively created river authority leads the monitoring effort for its basin as intended by the Texas Legislature through the Clean Rivers Act. In areas not covered by a particular river authority, either a neighboring authority or some other logical regional entity is to be designated to coordinate monitoring. H-GAC is a Council of Governments (COG), the regional authority for the Gulf Coast State Planning Region, and has been actively involved in regional water quality planning and public outreach activities since the 1970's. In addition, many of the key agencies and individuals involved in water quality matters in the region already participate in environmental committees and programs initiated by H-GAC.

In addition to promoting water quality data collection, the Clean Rivers Program aims to develop and maintain a multi-basin water quality monitoring program that minimizes duplicative monitoring, facilitates the assessment process, and targets monitoring to support the permitting and standards process.

H-GAC's regional surface water quality monitoring program is a voluntary association of local monitoring agencies, coordinated through H-GAC, under the auspices of the Texas Clean Rivers Program. Federal, state, and local agencies that conduct routine surface water quality monitoring programs within the San Jacinto River, Trinity-San Jacinto Coastal, San Jacinto-Brazos Coastal and Brazos-Colorado Coastal Basins collect surface water quality monitoring information that is used not only by the individual agencies but will be shared among the other participants through a data clearinghouse maintained by H-GAC. The agencies that submit data through the H-GAC Clean Rivers Program are Harris County Pollution Control Services (HCPCS), City of Houston Health Department (HHD), City of Houston Drinking Water Operations (DWO), San Jacinto River Authority (SJRA), the Environmental Institute of Houston– University of Houston Clear Lake (EIH), the Texas Research Institute on Environmental Studies (TRIES), and the Houston-Galveston Area Council (H-GAC).

The coordinated program routinely collects surface water quality data from more than 300 sites throughout the region. Sampling includes collection of physicochemical, bacteriological, and hydrological data at varying frequencies. The program was established to collect, store and make available water quality data, which the participating agencies require to carry out their assigned functions. The Houston-Galveston Area Council collects this data and uses it for evaluations of water quality under the Clean Rivers Program. The data is also widely used by state water quality managers, cities, counties, consultants, students and the general public. Routine samples are collected from classified stream, reservoir and bay segments to monitor for the attainment of uses and numerical criteria. Numerous unclassified water bodies are also monitored for attainment of designated and presumed uses, in

response to perceived risk for pollution and/or to define water quality. A map showing the locations of all fixed monitoring locations is included in Appendix C.

Since July of 2008, all laboratories working with the Clean Rivers Program have been reporting data which was produced in accordance with NELAP (National Environmental Laboratory Accreditation Program) requirements. H-GAC continues its leadership role in coordinating efforts to ensure laboratories that perform analyses on CRP samples maintain NELAP accreditation for CRP analytes.

A6 Project/Task Description

In the absence of a single, regional entity that comprehensively monitors water quality across the San Jacinto River Basin and the various coastal basins in the Houston metropolitan area, the regional monitoring approach H-GAC pursues through the Clean Rivers Program involves coordinating efforts among those local agencies which monitor water quality in some portion of the area for their own specialized purposes and with their own organizational approaches. H-GAC's Multi-Basin Quality Assurance Project Plan (QAPP) is the mechanism for bringing this data into the statewide water quality database, the Surface Water Quality Monitoring Information System, or SWQMIS, maintained by TCEQ. The participation of local monitoring agencies in this regional coordination effort has been largely voluntary as these agencies have not received significant Clean Rivers Program (CRP) funding for their activities.

See Appendix B for the project-related work plan tasks and schedule of deliverables for a description of work defined in this QAPP. Appendix B also contains a copy of the annual coordinated monitoring schedule (CMS) which describes the sampling design and monitoring activities pertaining to this QAPP. Appendix C contains a map of the sampling station locations. Appendices D and E contain copies of the local programs' field monitoring sheets and Chain-of-Custody (COC) forms respectively. A brief description of each partner's program follows.

Houston-Galveston Area Council monitoring locations are sampled on a quarterly basis. These areas are under pressure from increasing urbanization. Routine monitoring in these areas will support future assessments and allow H-GAC or TCEQ to evaluate if or how the streams' water quality changes over time.

Harris County Pollution Control Services' surface water quality monitoring is conducted at specific sites on the Houston Ship Channel, San Jacinto River, side bays of Galveston Bay, and in and around Clear Lake and its tributaries on the north shore. Data is collected on a monthly or bi-monthly basis for informational and regulatory purposes involving municipal and industrial wastewater treatment facilities.

City of Houston – Health Department monitors area surface waters to document water quality status and trends with specific concerns for human health risks associated with the use of the waters for contact/non-contact recreation and potable water supply. Data is collected six times per site per fiscal year.

City of Houston Drinking Water Operations monitors ambient water quality at many locations on Lake Houston and the tributaries flowing into the lake. Lake Houston is one of the primary sources of public water supply for the City of Houston. The monitoring that is conducted allows the Water Quality Control Division to assess the quality of water that will eventually be pumped into water production facilities, treated and distributed to the public as drinking water. Data is collected on a monthly or bi-monthly basis and provided to the Clean Rivers Program as detailed in this QAPP. Because Lake Conroe is also a public drinking water source, the City of Houston contracts with SJRA to collect water samples from that lake. Lake Conroe samples are also analyzed at the Drinking Water Operations Laboratory.

San Jacinto River Authority monitors surface waters in Lake Conroe, Lake Woodlands, Upper and Lower Panther Branch and Bear Branch. Data is provided to the Clean Rivers Program as detailed in this QAPP. SJRA collects routine surface water quality samples from Lake Conroe and transports samples to the City of Houston – DWO Lab for analysis. Water samples are collected on a monthly basis. Field data is submitted to H-GAC on a quarterly basis. Lab data from Lake Conroe is submitted to H-GAC on a quarterly basis directly from DWO Lab. SJRA also collects routine samples to establish baseline surface water quality

information for Lake Woodlands, Panther Branch and Bear Branch – tributaries of Spring Creek. That data is also shared with the Clean Rivers Program as detailed in this QAPP. Field parameters are monitored monthly while conventional, flow, and bacteriological parameters are analyzed quarterly. Total Copper and Selenium in water samples are collected and analyzed twice a year to look for changes in the concentrations of these metals in the water body over time. Data is submitted to H-GAC on a quarterly basis.

Environmental Institute of Houston is contracted by H-GAC to monitor surface water quality locations in the San Jacinto-Brazos Coastal Basin, the Brazos-Colorado Coastal Basin, Trinity-San Jacinto Coastal Basin, and the Bays and Estuaries (Basin 24). Data is collected for the Clean Rivers Program on a quarterly basis for a total of four events at each site per year.

The **Texas Research Institute for Environmental Studies** is contracted by H-GAC to monitor ambient surface water quality on the Upper East Fork San Jacinto River and Winters Bayou watersheds. Data collected at these sites will supplement data currently collected in this watershed at four active CRP monitoring stations, all of which were previously established by H-GAC and the City of Houston Drinking Water Operations.

Routine monitoring is scheduled at varying frequencies, which are determined by the parameters of concern for individual streams. Water bodies are also selected for baseline monitoring if there is high public interest; if it has a high potential for impairment; or there is a need for continuous up-to-date water quality information. Frequencies vary from quarterly for some partners and parameters to monthly in more highly impacted areas (see coordinated monitoring schedule in Appendix B).

Data collected through routine monitoring is designed to characterize water quality trends and monitor progress in protecting and restoring water quality. This monitoring will provide an overall view of water quality throughout the river and coastal basins. Baseline monitoring will include the collection of basic field parameters at all sites and the collection of bacteria, flow, and conventional chemical parameters at sites where indicated. All monitoring procedures and methods will follow the guidelines prescribed in H-GAC QAPP and the most current versions of TCEQ's *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).*

24-Hour Dissolved Oxygen (DO) monitoring by the Houston-Galveston Area Council and the Environmental Institute of Houston.

Numerous segments and unclassified waterbodies in H-GAC region have dissolved oxygen (DO) impairments or concerns for depressed DO. Using the most recent Texas Integrated Report, H-GAC identified segments and/or unclassified waterbodies which have been listed in the 303(d) List as being impaired or having DO concerns. Additional data is needed to confirm DO impairments on these segments and/or unclassified waterbodies. All data collected and summarized will be submitted to the TCEQ. H-GAC and/or EIH will conduct 24-hour DO monitoring at up to four monitoring sites quarterly during the two-year contract period. Monitoring events will be planned and conducted according to the most current version of TCEQ's *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).*

The sites are located on segments/unclassified segments:

- Site 21965 – (1010C) – Spring Branch at Shakey Hollow west of Woodbranch Village in Montgomery County
- Site 11490 – (1110_01) – Oyster Creek at Hwy 35 west of Angleton in Brazoria County
- Site 11493 – (1110_03) – Oyster Creek at FM 1462 west of Rosharon in Brazoria County

Permit Support monitoring by the Houston-Galveston Area Council (H-GAC) and the Environmental Institute of Houston (EIH).

During FY2020, H-GAC and EIH will collect field parameters and discharge measurements at three stations in segment 1004 - the West Fork San Jacinto River, and three stations in segment 1110 – Oyster Creek Above Tidal. At least ten monitoring events will be conducted at each station with a goal of collecting 12 events at each location.

- Site 11181 – (1004D – Crystal Creek at FM 1314 southeast of Conroe
- Site 11243 – (1004) – West Fork San Jacinto River immediately upstream of SH 242
- Site 16626 – (1004E) – Stewarts Creek 175 meters downstream of SH Loop 336 southeast of Conroe
- Site 11491 – (1110_02) – Oyster Creek at Sims Road (CR 30) at Holiday Lakes in Brazoria County

- Site 11493 – (1110_03) – Oyster Creek at FM 1462 west of Rosharon in Brazoria County

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

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

Amendments to the QAPP

Revisions to the QAPP may be necessary to address incorrectly documented information or to reflect changes in project organization, tasks, schedules, objectives, and methods. Requests for amendments will be directed from the H-GAC Project Manager to the CRP Project Manager electronically. The H-GAC will submit a completed QAPP Amendment document, including a justification of the amendment, a table of changes, and all pages, sections, and attachments affected by the amendment. Amendments are effective immediately upon approval by the H-GAC Project Manager, the H-GAC QAO, the CRP Project Manager, the CRP Lead QA Specialist, the TCEQ QA Manager or designee, the CRP Project QA Specialist, and additional parties affected by the amendment. Amendments are not retroactive. No work shall be implemented without an approved QAPP or amendment prior to the start of work. Any activities under this contract that commence prior to the approval of the governing QA document constitute a deficiency and are subject to corrective action as described in section C1 of this QAPP. Any deviation or deficiency from this QAPP which occurs after the execution of this QAPP will be addressed through a Corrective Action Plan (CAP). An Amendment may be a component of a CAP to prevent future recurrence of a deviation.

Amendments will be incorporated into the QAPP by way of attachment and distributed to personnel on the distribution list by the H-GAC Project Manager. If adherence letters are required, the H-GAC will secure an adherence letter from each sub-tier project participant (e.g., subcontractors, sub-participant, or other units of government) affected by the amendment stating the organization's awareness of and commitment to requirements contained in each amendment to the QAPP. The H-GAC will maintain this documentation as part of the project's QA records, and ensure that the documentation is available for review.

Special Project Appendices

Projects requiring QAPP appendices will be planned in consultation with the H-GAC and the TCEQ Project Manager and TCEQ technical staff. Appendices will be written in an abbreviated format and will reference the Multi-Basin QAPP where appropriate. Appendices will be approved by the H-GAC Project Manager, the H-GAC QAO, the Laboratory (as applicable), and the CRP Project Manager, the CRP Project QA Specialist, the CRP Lead QA Specialist and additional parties affected by the Appendix, as appropriate. Copies of approved QAPP appendices will be distributed by the H-GAC to project participants before data collection activities commence. H-GAC will secure written documentation from each sub-tier project participant (e.g., subcontractors, subparticipants, other units of government) stating the organization's awareness of and commitment to requirements contained in each special project appendix to the QAPP. The H-GAC will maintain this documentation as part of the project's QA records, and ensure that the documentation is available for review.

A7 Quality Objectives and Criteria

The purpose of routine water quality monitoring is to collect surface water quality data that can be used to characterize water quality conditions, identify significant long-term water quality trends, support water quality standards development, support the permitting process, and conduct water quality assessments in accordance with TCEQ's Guidance for Assessing and Reporting Surface Water Quality in Texas, June 2015 or most recent version (https://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/14txir/2014_guidance.pdf). These water quality data, and data collected by other organizations (e.g., United States Geological Survey (USGS), TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

The measurement performance specifications to support the project purpose for a minimum data set are specified in Appendix A.

Ambient Water Reporting Limits (AWRLs)

For surface water to be evaluated for compliance with Texas Surface Water Quality Standards ("TSWQS") and screening levels, data must be reported at or below specified reporting limits. To ensure data are collected at or below these reporting limits, required ambient water reporting limits ("AWRL") have been established. A full listing of AWRLs can be found at https://www.tceq.texas.gov/assets/public/waterquality/crp/QA/awrlmaster.pdf .

The limit of quantitation (LOQ) is the minimum reporting limit, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence by the laboratory analyzing the sample. Analytical results shall be reported down to the laboratory's LOQ (i.e., the laboratory's LOQ for a given parameter is its reporting limit) as specified in Appendix A.

The following requirements must be met in order to report results to the CRP:

- The laboratory's LOQ for each analyte must be set at or below the AWRL.
- Once the LOQ is established in the QAPP, that is the reporting limit for that parameter until such time as the laboratory amends the QAPP and lists an updated LOQ.
- The laboratory must demonstrate its ability to quantitate at its LOQ for each analyte by running an LOQ check sample for each analytical batch of CRP samples analyzed.
- When reporting data, no results may be reported below the LOQ stated in this QAPP.
- Measurement performance specifications for LOQ check samples are found in Appendix A.

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

Precision

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

Laboratory precision is assessed by comparing replicate analyses of Laboratory Control Samples (LCS) in the sample matrix (e.g. deionized water, sand, commercially available tissue), Matrix Spike/Matrix Spike Duplicate (MS/MSD), or sample/duplicate (DUP) pairs, as applicable. 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 Appendix A.

Bias

Bias is the systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value). Bias is a statistical measurement of correctness and includes multiple components of systematic error. Bias is determined through the analysis of LCS and LOQ check samples prepared with verified and known amounts of all target analytes in the sample matrix (e.g. deionized water, sand, commercially available tissue) and by calculating percent recovery. Results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for bias are specified in Appendix A.

Representativeness

Site selection, the appropriate sampling regime, comparable monitoring and collection methods, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Routine data collected under CRP are considered to be spatially and temporally representative of ambient water quality conditions. Water quality data are collected on a routine frequency and are separated by approximately even time intervals. At a minimum, samples are collected over at least two seasons (to include inter-seasonal variation) and over two years (to include inter-year variation) and include some data collected during an index

period (March 15- October 15). Although data may be collected during varying regimes of weather and flow, the data sets will not be biased toward unusual conditions of flow, runoff, or season. The goal for meeting maximum representation of the water body will be tempered by funding availability.

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 as described in this QAPP and in TCEQ guidance. Comparability is also guaranteed by reporting data in standard units, by using accepted rules for rounding figures, and by reporting data in a standard format as specified in the Data Management Plan in Section B10.

Completeness

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

A8 Special Training/Certification

Before new field personnel independently conduct field work, the local partner designated trainer (See table A8.1 below) trains him/her in proper instrument calibration, field sampling techniques, and field analysis procedures. The QA officer (or designee) will document the successful field demonstration. The QA Officer (or designee) will retain documentation of training and the successful field demonstration in the employee's personnel file (or other designated location) and ensure that the documentation will be available during monitoring systems audits.

Local partners, contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in The NELAC Institute Standard (2009) Volume 1, Module 2, Section 4.5.5 (concerning Subcontracting of Environmental Tests).

Table A8.1 The Designated Trainer for each Local Partner.

Local Partner Agency	Designated Trainer
Houston-Galveston Area Council	Jean Wright
Harris County Pollution Control Services	Bryan Kosler
City of Houston – Houston Health Department	Lisa Montemayor
City of Houston – Drinking Water Operations	Desta Takie
San Jacinto River Authority	Jean Wright
Environmental Institute of Houston	Jenny Oakley
Texas Research Institute for Environmental Studies	Kaitlen Gary

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.

Table A9.1a Project Documents and Records – H-GAC

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	H-GAC	≥7	Paper & electronic
Field SOPs	H-GAC	≥7	Paper & electronic
Laboratory Quality Manuals	Eastex Lab	≥7	Paper & electronic
Laboratory SOPs	Eastex Lab	≥7	Paper & electronic
QAPP distribution documentation	H-GAC / Eastex Lab	≥7	Paper
Field staff training records	H-GAC	≥7	Paper
Field equipment calibration/maintenance logs	H-GAC	≥7	Paper
Field instrument printouts	H-GAC	≥7	Paper & electronic
Field notebooks or data sheets	H-GAC	≥7	Paper
Chain of custody records	H-GAC / Eastex Lab	≥7	Paper & electronic
Laboratory calibration records	Eastex Lab	≥7	Paper
Laboratory instrument printouts	Eastex Lab	≥7	Paper
Laboratory data reports/results	Eastex Lab	≥7	Electronic
Laboratory equipment maintenance logs	Eastex Lab	≥7	Paper
Corrective Action Documentation	H-GAC / Eastex Lab	≥7	Paper & electronic

Table A9.1b Project Documents and Records - HCPCS

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	HCPCS / H-GAC	7	Paper
Field SOPs	HCPCS	7	Paper
Laboratory Quality Manuals	HCPCS Laboratory	7	Paper &/or electronic
Laboratory SOPs	HCPCS Laboratory	7	Paper &/or electronic
QAPP distribution documentation	HCPCS / H-GAC	7	Paper
Field staff training records	HCPCS	7	Paper
Field equipment calibration/maintenance logs	HCPCS	7	Paper
Field instrument printouts	HCPCS	7	Paper &/or electronic
Field notebooks or data sheets	HCPCS	7	Paper
Chain of custody records	HCPCS Laboratory	7	Paper
Laboratory calibration records	HCPCS Laboratory	7	Paper
Laboratory instrument printouts	HCPCS Laboratory	7	Paper
Laboratory data reports/results	HCPCS Laboratory	7	Paper &/or electronic
Laboratory equipment maintenance logs	HCPCS Laboratory	7	Paper
Corrective Action Documentation	HCPCS / HCPCS Laboratory / H-GAC	7	Paper

Table A9.1c Project Documents and Records – Houston - HHD

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	HHD / H-GAC	≥7	Paper &/or electronic
Field SOPs	HHD	≥7	Paper &/or electronic

Laboratory Quality Manuals	HHD-BLS	≥7	Paper &/or electronic
Laboratory SOPs	HHD-BLS	≥7	Paper &/or electronic
QAPP distribution documentation	HHD / HHD-BLS / H-GAC	≥7	Paper
Field staff training records	HHD	≥7	Paper &/or electronic
Field equipment calibration/ maintenance logs	HHD	≥7	Paper
Field instrument printouts	HHD	≥7	Paper &/or electronic
Field notebooks or data sheets	HHD / H-GAC	≥7	Paper
Chain of custody records	HHD / HHD-BLS / H-GAC	≥7	Paper
Laboratory calibration records	HHD-BLS	≥7	Paper &/or electronic
Laboratory instrument printouts	HHD-BLS	≥7	Paper &/or electronic
Laboratory data reports/results	HHD-BLS	≥7	Paper &/or electronic
Laboratory equipment maintenance logs	HHD-BLS	≥7	Paper
Corrective Action Documentation	HHD / HHD-BLS / H-GAC	≥7	Paper &/or electronic

Table A9.1d Project Documents and Records – Houston - DWO

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	DWO / DWO Lab / H-GAC	≥7	Paper
Field SOPs	DWO	≥7	Paper
Laboratory Quality Manuals	DWO Lab	≥7	Paper &/or electronic
Laboratory SOPs	DWO Lab	≥7	Paper &/or electronic
QAPP distribution documentation	DWO / DWO Lab / H-GAC	≥7	Paper
Field staff training records	DWO	≥7	Paper
Field equipment calibration/ maintenance logs	DWO	≥7	Paper
Field instrument printouts			
Field notebooks or data sheets	DWO / H-GAC	≥7	Paper &/or electronic
Chain of custody records	DWO / H-GAC	≥7	Paper
Laboratory calibration records	DWO Lab	≥7	Paper &/or electronic
Laboratory instrument printouts	DWO Lab	≥7	Paper &/or electronic
Laboratory data reports/results	DWO Lab	≥7	Paper &/or electronic
Laboratory equipment maintenance logs	DWO Lab	≥7	Paper
Corrective Action Documentation	DWO / DWO Lab / H-GAC	≥7	Paper &/or electronic

Table A9.1e Project Documents and Records – SJRA – Lake Conroe samples only

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	SJRA / DWO Lab / H-GAC	≥7	Paper
Field SOPs	SJRA	≥7	Paper
Laboratory Quality Manuals	DWO Lab	≥7	Paper &/or electronic
Laboratory SOPs	DWO Lab	≥7	Paper &/or electronic

QAPP distribution documentation	SJRA / DWO Lab / H-GAC	≥7	Paper
Field staff training records	SJRA	≥7	Paper
Field equipment calibration/ maintenance logs	SJRA	≥7	Paper
Field instrument printouts	SJRA	≥7	Paper
Field notebooks or data sheets	SJRA	≥7	Paper &/or electronic
Data sonde files	SJRA	≥7	Electronic
Chain of custody records	SJRA / DWO Lab / H-GAC	≥7	Paper
Laboratory calibration records	DWO Lab	≥7	Paper &/or electronic
Laboratory instrument printouts	DWO Lab	≥7	Paper &/or electronic
Laboratory data reports/results	DWO Lab	≥7	Paper &/or electronic
Laboratory equipment maintenance logs	DWO Lab	≥7	Paper
Corrective Action Documentation	SJRA / DWO Lab / H-GAC	≥7	Paper &/or electronic

Table A9.1f Project Documents and Records – SJRA – The Woodlands samples only

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	SJRA / H-GAC	≥7	Paper
Field SOPs	SJRA	≥7	Paper
Laboratory Quality Manuals	Eastex Lab	≥7	Paper &/or electronic
Laboratory SOPs	Eastex Lab	≥7	Paper &/or electronic
QAPP distribution documentation	SJRA / Eastex Lab / H-GAC	≥7	Paper
Field staff training records	SJRA	≥7	Paper
Field equipment calibration/ maintenance logs	SJRA	≥7	Paper
Field instrument printouts	SJRA	≥7	Paper &/or electronic
Field notebooks or data sheets	SJRA	≥7	Paper &/or electronic
Chain of custody records	SJRA / Eastex Lab / H-GAC	≥7	Paper
Laboratory calibration records	Eastex Lab	≥7	Paper
Laboratory instrument printouts	Eastex Lab	≥7	Paper
Laboratory data reports/results	Eastex Lab	≥7	Paper
Laboratory equipment maintenance logs	Eastex Lab	≥7	Paper
Corrective Action Documentation	SJRA / Eastex Lab / H-GAC	≥7	Paper &/or electronic

Table A9.1g Project Documents and Records – EIH

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	EIH / Eastex Lab / H-GAC	7	Paper
Field SOPs	EIH	7	Paper
Laboratory Quality Manuals	Eastex Lab	7	Paper &/or electronic
Laboratory SOPs	Eastex Lab	7	Paper &/or electronic
QAPP distribution documentation	EIH / Eastex Lab / H-GAC	7	Paper
Field staff training records	EIH	7	Paper

Field equipment calibration/ maintenance logs	EIH	7	Paper &/or electronic
Field instrument printouts	EIH	7	Paper
Field notebooks or data sheets	EIH	7	Paper &/or electronic
Chain of custody records	EIH / Eastex Lab / H-GAC	7	Paper &/or electronic
Laboratory calibration records	Eastex Lab	7	Paper
Laboratory instrument printouts	Eastex Lab	7	Paper
Laboratory data reports/results	Eastex Lab	7	Electronic
Laboratory equipment maintenance logs	Eastex Lab	7	Paper
Corrective Action Documentation	EIH / Eastex Lab / H-GAC	7	Paper

Table A9.1h Project Documents and Records - TRIES

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	TRIES / Eastex Lab / H-GAC	7	Paper &/or electronic
Field SOPs	TRIES	7	Paper &/or electronic
Laboratory Quality Manuals	TRIES Lab / Eastex Lab	7	Paper &/or electronic
Laboratory SOPs	TRIES Lab / Eastex Lab	7	Paper &/or electronic
QAPP distribution documentation	TRIES / TRIES Lab / Eastex Lab / H-GAC	7	Paper
Field staff training records	TRIES	7	Paper
Field equipment calibration/maintenance logs	TRIES	7	Paper
Field instrument printouts	TRIES	7	Paper &/or electronic
Field notebooks or data sheets	TRIES	7	Paper &/or electronic
Chain of custody records	TRIES / TRIES Lab / Eastex Lab / H-GAC	7	Paper &/or electronic
Laboratory calibration records	TRIES Lab / Eastex Lab	7	Paper
Laboratory instrument printouts	TRIES Lab / Eastex Lab	7	Paper
Laboratory data reports/results	TRIES Lab	7	Paper &/or electronic
Laboratory equipment maintenance logs	TRIES Lab / Eastex Lab	7	Paper
Corrective Action Documentation	TRIES / TRIES Lab / Eastex Lab / H-GAC	7	Paper &/or electronic

Laboratory Test Reports

Test/data reports from the laboratory must document the test results clearly and accurately. Routine data reports should be consistent with the TNI Standard (2009), Volume 1, Module 2, Section 5.10 and include the information necessary for the interpretation and validation of data. The requirements for reporting data and the procedures are provided.

Eastex is the contract lab for the analysis of all parameters in samples collected by H-GAC, EIH, and SJRA in the Lake Woodlands watershed. Eastex also analyzes TKN and chlorophyll *a* in samples collected by HCPCS, DWO, HHD, and SJRA. Eastex Lab submits 'data packets' to the H-GAC Data Manager on a monthly basis. Data are reformatted by H-GAC as needed and combined with additional field and lab data during SAS processing and reviewed with the final datasets. For FY 2020-2021, Eastex will submit data in electronic format only. Formal lab reports (hard copy) will be available upon request. Eastex Lab reports include the following information.

1) The title "Test Report" or other identifying statement – Formal Report only
2) Name and address of laboratory, and phone number with name of contact person
3) A unique identification number and the total number of pages, with all pages sequentially numbered – Formal Report only
4) Name and address of client
5) Description and unambiguous identification of the sample(s) including the client identification code (i.e. station information)
6) Identification of results for any sample that did not meet sample acceptance requirements (Data Review Checklist)
7) Date of receipt of sample, date and time of sample collection, sample matrix, and time of sample preparation and/or analysis
8) Identification of the test method used plus its LOQ and LOD
9) Reference to sampling procedure (grab or composite) – Formal Report only
10) Any deviations from, additions to or exclusions from SOPs, and any conditions that may have affected the quality of results, and including the use and definitions of data qualifiers
11) Identification of whether data are calculated on a dry weight or wet weight basis – Formal report only
12) Identification of the reporting units such as µg/l or mg/kg
13) Clear identification of all test data provided by outside sources, such as subcontracted laboratories, clients, etc.
14) Clear identification of numerical results with values below the Reporting Limit, and
15) Identification of accreditation status per analysis – Formal Report only

The information in test reports from other partners (HHCPCS, HHD, DWO, and TRIES) will be consistent with the information that is needed to prepare data submittals to TCEQ. At the very minimum, test reports from all labs (regardless of whether they are hard copy or electronic) will include the following or be available upon request:

- Sample results
- Units of measurement
- Sample matrix
- Dry weight or wet weight (as applicable)
- Station information
- Date and time of collection
- Holding time for *E. coli*
- LOQ (formerly referred to as the reporting limit), and qualification of results outside the working range (if applicable)
- LOD (formerly referred to as the method detection limit) is provided to H-GAC upon request
- Certification of NELAP compliance

Otherwise, reports should be consistent with the TNI Standard and should include any additional information critical to the review, verification, validation, and interpretation of data. This should be based on the process that has been worked out with H-GAC and is documented in Section D1 and D2 of this document.

Other local partners – HCPCS, HHD, DWO, SJRA, and TRIES – share their data but review their own lab reports in-house. Local partner lab data reports are provided to H-GAC upon request only. Each partner's data manager works with their respective labs to receive their lab reports and input results to a database or spreadsheet which is then sent to H-GAC in an electronic format.

Electronic Data

H-GAC's local partners or sub-tier participants submit data to H-GAC electronically. Each partner's data set is submitted with a completed Data Review Checklist (Appendix F). See Section B10 for a description of the Data Management Process.

Data is submitted in several formats, as shown Table A9.2. Upon arrival at H-GAC, datasets are copied to partner-specific "raw data" folders on a secured network drive that is regularly backed-up by H-GAC's IT staff.

The data manager reformats the data to create an input dataset for SAS processing and saves it in a separate folder as a "working" file. Unaltered copies of submitted data are retained in the raw data folder. Partner-specific SAS code has been written to create Access tables for review; identify outliers and possible errors, and automate the correction, deletion, or acceptance of suspect data values; and to create properly formatted text files to be submitted to TCEQ. Many tasks previously performed manually are now performed as part of SAS processing and additional improvements to the data management process are made on an ongoing basis. While many data validation and verification tasks are now part of routine processing, data sets are still reviewed manually by H-GAC's QAO to identify issues not found during routine processing. The data processing, verification, and review process is described in H-GAC's Data Management Procedures (Appendix H).

The following table outlines how data is received from each local partner or sub-tier participant. All local partner data is submitted with a Data Review Checklist. The Checklist includes specific information regarding each data set. As H-GAC performs data processing and management tasks, the Data Manager compiles a Data Summary report (see example in Appendix G) that is submitted with the Event/Results text files. The Data Summary Report/Sheet will include information from the local partner Data Review Checklists as well as information about any changes to or deletions of data by H-GAC before it was submitted to TCEQ.

Table A9.2 The Software used by Local Partners to Submit Data to H-GAC.

Sub-Tier Participants	Software
HCPCS	MS Access
HHD	MS Access
DWO	MS Excel
SJRA	MS Excel
EIH	MS Excel
TRIES	MS Excel
Eastex Environmental Lab	MS Excel

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

B1 Sampling Process Design

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

B2 Sampling Methods

Field Sampling Procedures

Field sampling will be conducted in accordance with the latest versions of the TCEQ Surface Water Quality Monitoring Procedures Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue, 2012 (RG-415) and Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416), collectively referred to as "SWQM Procedures." Updates to SWQM Procedures are posted to the Surface Water Quality Monitoring Procedures website (https://www.tceq.texas.gov/waterquality/monitoring/swqm_guides.html), and shall be incorporated into H-GAC's procedures, QAPP, SOPs, etc., within 60 days of any final published update. Additional aspects outlined in Section B below reflect specific requirements for sampling under CRP and/or provide additional clarification.

Table B2.1a Sample Storage, Preservation and Handling Requirements for H-GAC Samples Analyzed by Eastex Environmental Laboratory

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	1 L	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	100 mL[2]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL[2]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL[4]	8 hours[1]
TKN	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL[3]	28 days
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	125 mL[3]	28 days
Nitrite + nitrate-N	water	Plastic	Cool to <6°C but not frozen, H_2SO_4 to pH <2	125 mL[3 and 5]	28 days
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	100 mL[2 and 5]	48 hours
Nitrite-N	water	Plastic	Cool to <6°C but not frozen	100 mL[2 and 5]	48 hours
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	125 mL[3]	28 days

1. *E.coli* samples should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.
2. One 500 mL plastic container is used to collect these four parameters.
3. Four or five tests are analyzed from one 1L plastic bottle.
4. Maximum volume analyzed for E. coli is 50 ml allowing duplicate analyses from 1 container.
5. Eastex will run IC speciation (100 mL samples) but will analyze Nitrite+Nitrate (125 mL sample) by cadmium reduction method if IC equipment is down

Table B2.1b Sample Storage, Preservation and Handling Requirements for HCPCS

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	½ Gal	7 days
Enterococci IDEXX Enterolert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL	8 hours
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	50 mL[2]	28 days
TKN	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL	28 days[1]
Nitrite + nitrate-N	water	Plastic	Cool to <6°C but not frozen, H_2SO_4 to pH <2	50 mL[2]	28 days
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	50 mL[2]	28 days
Chlorophyll-*a*[1]	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 24 days[1]

1. Eastex Environmental will pick up and analyze samples(s).
2. Three nutrient tests are collected from one 500 mL plastic container.

Table B2.1c Sample Storage, Preservation and Handling Requirements for HHD

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	700 mL[3]	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	100 mL[3]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL[3]	28 days
E. coli IDEXX Colilert-18	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL/250 mL	8 hours[1]
Enterococci IDEXX Enterolert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL	8 hours
TKN	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	250 mL	28 days[2]
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	100 mL[4]	28 days
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	100 mL[3]	48 hours
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	100 mL[4]	28 days

1. E. coli samples analyzed by SM 9223-B should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.
2. Eastex Environmental Lab will pick up and analyze sample(s).
3. Multiple tests are collected from one 1-liter plastic cubitainer that has not been acidified.
4. Multiple tests are conducted out of one 1 liter plastic cubitainer which has been preserved with acid.

Table B2.1d Sample Storage, Preservation and Handling Requirements for DWO

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	1000 mL	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL[4]	8 hours[1]
TKN	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL	28 days[2]
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL	28 days
Nitrate-Nitrite	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	48 hours
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	48 hours
Phosphorus-P, total	water	Brown, glass bottle	Cool to <6°C but not frozen H_2SO_4 to pH <2	125 mL	28 days
Chlorophyll-*a*	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 24 days[2]
Alkalinity, Total	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	14 days

1. E. coli samples analyzed by SM 9223-B should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.
2. Eastex Environmental Lab will pick up and analyze sample(s).
3. All tests are collected in one 500 mL plastic bottle.
4. Maximum volume analyzed for E. coli is 50 ml allowing duplicate analyses from 1 container.

Table B2.1e Sample Storage, Preservation and Handling Requirements for SJRA Samples Collected from Lake Conroe and Analyzed by DWO Laboratory

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	1000 mL	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL[4]	8 hours[2]
TKN[2]	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL	28 days[2]
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL	28 days
Nitrite-N	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	48 hours
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	28 days

Phosphorus-P, total	water	Brown, glass bottle	Cool to <6°C but not frozen H_2SO_4 to pH <2	125 mL	28 days
Chlorophyll-*a*[2]	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 24 days[2]
Alkalinity, Total	water	Plastic	Cool to <6°C but not frozen	50 mL[3]	14 days

1. E. coli samples analyzed by SM 9223-B should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.
2. Eastex Environmental Lab will pick up and analyze sample(s).
3. One 500 mL plastic bottle is collected, specified volumes withdrawn for analysis.
4. Maximum volume analyzed for E. coli is 50 ml allowing duplicate analyses from 1 container.

Table B2.1f Sample Storage, Preservation and Handling Requirements for SJRA Samples Collected from The Woodlands and Analyzed at Eastex Environmental Laboratory

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	1 L	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	100 ml[3]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL[3]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL[5]	8 hours[1]
Ammonia-N	water	Plastic	Cool to <6°C but not frozen Add H_2SO_4 to pH <2	125 mL[2]	28 days
TKN	water	Plastic	Cool to <6°C but not frozen Add H_2SO_4 to pH <2	500 mL	28 days
Nitrite-N	water	Plastic	Cool to <6°C but not frozen	100 mL[3 and 6]	48 hours
Nitrate-N	water	Plastic	Cool to <6°C but not frozen,	100 mL[3 and 6]	48 hours
Nitrite+Nitrate -N	water	Plastic	Cool to <6°C but not frozen Add H_2SO_4 to pH <2	125 mL[2 and 6]	28 days
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen Add H_2SO_4 to pH <2	125 mL[2]	28 days
Chlorophyll-*a*	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 24 days[2]
Hardness, Total	water	Plastic	Cool to <6°C but not frozen Add H_2SO_4 to pH <2	100 mL[4]	28 days
Copper, Total	water	Plastic	Cool to <6°C but not frozen Add HNO_3 to pH <2	100 mL[4]	6 months
Selenium, Total	water	Plastic	Cool to <6°C but not frozen Add HNO_3 to pH <2	100 mL[4]	s6 months

1. E. coli samples should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.
2. Nutrient tests are collected from one 1 L plastic bottle.
3. One 1 L plastic container is used to collect these three parameters.
4. All three "Total Metals" related parameters are collected in one 1-L plastic container and split at the lab for the various parameters.
5. Maximum volume analyzed for E. coli is 50 ml allowing duplicate analyses from 1 container.
6. Eastex will run IC speciation (100 mL samples) first but will analyze Nitrite+Nitrate (125 mL sample) by cadmium reduction method if IC equipment is down.

Table B2.1g Sample Storage, Preservation and Handling Requirements for EIH. Samples Analyzed by Eastex Environmental Laboratory

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	1 L	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	100 ml[3]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL[3]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL[4]	8 hours[1]
Enterococci IDEXX Enterolert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120 mL[4]	8 hours
TKN	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	500 mL[2]	28 days
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	125 mL[2]	28 days
Nitrite-N	water	Plastic	Cool to <6°C but not frozen	100 mL[2 and 5]	48 hours
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	100 mL[2 and 5]	48 hours
Nitrite + nitrate-N	water	Plastic	Cool to <6°C but not frozen, H_2SO_4 to pH <2	125 mL[3 and 5]	28 days
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	125 mL[2]	28 days
Chlorophyll-*a*	water	Brown plastic	Dark & iced before filtration; Dark & frozen after filtration	4 L	Filtered w/in 48 hours; after filtered, then frozen up to 24 days

1. *E. coli* samples should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.
2. Five tests are analyzed from one 1L plastic bottle.
3. One 500 mL plastic container is used to collect these three samples.
4. Maximum volume analyzed for bacteria analysis is 50 ml allowing duplicate analyses from 1 container.
5. Eastex will run IC speciation (100 mL samples) first but will analyze Nitrite+Nitrate (125 mL sample) by cadmium reduction method if IC equipment is down.

Table B2.1h Sample Storage, Preservation, and Handling Requirements for TRIES. Requirements for TRIES Samples Analyzed by the TRIES Laboratory and Eastex Environmental Laboratory

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to <6°C but not frozen	1 L	7 days
Sulfate	water	Plastic	Cool to <6°C but not frozen	100 mL[2]	28 days
Chloride	water	Plastic	Cool to <6°C but not frozen	100 mL[2]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	120[4] mL	8 hours[1]
Ammonia-N	water	Plastic	Cool to <6°C but not frozen H_2SO_4 to pH <2	125 mL[3]	28 days
Nitrate-N	water	Plastic	Cool to <6°C but not frozen	125 mL[3 and 6]	48 hours

Nitrite-N	water	Plastic	Cool to <6°C but not frozen	125 mL[3 and 6]	48 hours
Nitrite + nitrate-N	water	Plastic	Cool to <6°C but not frozen, H_2SO_4 to pH <2	125 mL[3 and 6]	28 days[5]
Phosphorus-P, total	water	Plastic	Cool to <6°C but not frozen HNO_3 to pH <2	125 mL[3]	28 days

1. E.coli samples analyzed by SM 9223-B should always be processed as soon as possible and incubated no later than 8 hours from time of collection. When transport conditions necessitate sample incubation after 8 hours from time of collection, the holding time may be extended and samples must be processed as soon as possible and within 30 hours.
2. One 500 mL plastic container is used to collect these two samples.
3. Four or five tests are analyzed from one 1L plastic bottle.
4. Maximum volume analyzed for E. coli is 50 ml allowing duplicate analyses from 1 container.
5. Eastex Environmental Lab will pick up and analyze sample(s) if necessary.
6. TRIES & Eastex can both run IC speciation but Eastex will analyze Nitrite+Nitrate by cadmium reduction method if TRIES IC equipment is down

Sample Containers

Certificates from sample container manufacturers are maintained in a notebook by each of the monitoring partners as appropriate. Information about the various sample containers for each local partner is described below.

Houston-Galveston Area Council (H-GAC)

All sample containers are provided to H-GAC by their contract lab, Eastex. The lab performs and tracks required QC procedures for all bottles purchased.

- Plastic, disposable sample containers are used for conventional parameters.
- Sterile, sealed, 120 mL plastic, disposable bottles with a sodium thiosulfate tablet added, are used for bacteriological samples.
- When preservation is required for particular parameters, the acid is added to the container in the field by field personnel immediately after samples are collected.

Harris County Pollution Control Services (HCPCS)

All sample containers are purchased by the HCPCS Lab except as noted below. The labs perform and track all required QC procedures for the bottles they purchased and provide to the field crew.

- Pre-cleaned, plastic, disposable sample containers are used for conventional parameters.
- Sterile, sealed, 120 mL plastic, disposable bottles with a sodium thiosulfate tablet added, are used for bacteriological samples.
- Brown, polyethylene, 4-liter cubitainers are used routinely for chlorophyll-*a* samples and are provided by H-GAC's contract lab, Eastex.
- Pre-cleaned, plastic, disposable sample containers for the TKN samples are also provided by H-GAC's contract lab, Eastex.
- When preservation is required for particular parameters, the bottles are pre-acidified at the lab. Containers are never dipped underwater but are filled using a white or opaque, plastic pitcher and water sample are collected from the required depth as specified in the SWQM Procedures Volume 1 manual.

City of Houston - Health Department (HHD)

All sample containers are purchased by the Bureau of Pollution Control and Prevention except as noted below. All containers are received at the field office located on Park Place. Before containers are used by field crews, a specified number of containers are pulled out for delivery to the HHD-BLS Lab where all QC checks and documentation are performed. The HHD-BLS Lab QAO reviews and tracks the results of all QC testing.

- Pre-cleaned, plastic, disposable sample containers are used for conventional parameters.
- Sterile, sealed, 120 or 250 mL plastic, disposable bottles with sodium thiosulfate tablet added, are used for the microbiological samples.
- Pre-cleaned, plastic, disposable sample containers for the TKN samples are provided by H-GAC's contract lab, Eastex Environmental Lab.
- When preservation is required, the preservative is added to the container in the field by field personnel immediately after the samples are collected.

City of Houston - Drinking Water Operations (DWO) **and** San Jacinto River Authority – Lake Conroe samples
All disposal sample containers are purchased by the DWO Lab except as noted below. Each lab cited below performs and tracks all required QC procedures for all bottles they purchase. SJRA-Lake Conroe samples are analyzed by the City of Houston Drinking Water Operations Lab (DWO).

- Pre-cleaned, plastic, disposable sample containers are used for conventional parameters.
- Sterile, sealed, 120 mL plastic, disposable bottles with sodium thiosulfate added, are used for bacteriological samples.
- Amber glass bottles are used to collect total phosphorus samples. These containers are thoroughly cleaned for re-use. See washing procedure following this list.
- Brown, polyethylene, 4-liter cubitainers are used routinely for chlorophyll-*a* samples and are provided by H-GAC's contract lab, Eastex.
- Pre-cleaned, plastic, disposable sample containers for the TKN samples are provided by H-GAC's contract lab, Eastex Environmental Lab.
- When preservation is required for particular parameters, the bottles are pre-acidified at the office. Bottles are never filled by dipping. Rather, bottles are filled by pouring from a sample collection container that has been pre-rinsed 3 times at each monitoring location.

DWO container washing procedures (excluding bacteria bottles): The bottles are sent through a mechanical wash cycle followed by an acid rinse. The procedure is as follows: The bottles are placed in a dish washing machine where it goes through a pre-wash cycle with distilled water, a wash cycle with phosphate-free soap, a deionized water (DI) rinse cycle, then an acid rinse cycle. Next, the bottles are rinsed with DI water several times making sure there is at least a three (3) volume exchange of water. Lastly, the bottles are air dried. Afterwards, the bottles are sealed prior to storage for their next use.

San Jacinto River Authority – The Woodlands samples
Eastex Environmental Lab is the contract lab for samples collected from The Woodlands. The lab performs and tracks required QC procedures for all bottles purchased.

- Plastic, disposable sample containers are used for conventional parameters.
- Sterile, sealed, 120 mL plastic, disposable bottles with a sodium thiosulfate tablet added, are used for bacteriological samples.
- Brown, polyethylene, 4-liter cubitainers are used for chlorophyll-*a* samples.
- When preservation is required for particular parameters, the containers are pre-acidified by the lab before being given to field personnel.
- New, certified pre-cleaned, plastic bottles are used for all "metals-in-water" samples. The vendor provides certificates for the bottles which are maintained on file by the laboratory and the lab tests at least one bottle from each box purchased as part of QC.
- Pre-cleaned, plastic, disposable sample containers for the TKN samples are provided by H-GAC's contract lab, Eastex Environmental Lab.

Environmental Institute of Houston (EIH)
All sample containers are provided to H-GAC by their contract lab, Eastex. The lab performs and tracks required QC procedures for all bottles purchased.

- Pre-cleaned, plastic, disposable sample containers are used for conventional parameters.
- Sterile, sealed, 120 mL plastic, disposable bottles with a sodium thiosulfate tablet added, are used for bacteriological samples.
- Brown, polyethylene, 4-liter cubitainers are used for chlorophyll-*a* samples and are provided by H-GAC's contract lab, Eastex.
- When preservation is required for particular parameters, the acid is added to the container in the field by field personnel immediately after samples are collected.

The TRIES Analytical Lab provides all sample containers for sample collection. The lab performs and tracks required QC procedures for all bottles purchased.

- Pre-cleaned, plastic, reusable sample containers are used for conventional parameters.
- Sterile, sealed, 120 mL plastic, disposable bottles with a sodium thiosulfate tablet added, are used for bacteriological samples.
- When preservation is required for particular parameters, the acid is added to the container in the field by field personnel immediately after samples are collected.

TRIES container washing procedures (excluding bacteria bottles): The bottles are sent through a mechanical wash cycle. The procedure is as follows: The bottles are placed in a dish washing machine where it goes through a pre-wash cycle with distilled water, a wash cycle with phosphate-free soap, and then a deionized water (DI) rinse cycle. Next, the bottles are allowed to air dry. Afterwards, the bottles are sealed prior to storage for their next use.

Processes to Prevent Contamination

SWQM Procedures outline the necessary steps to prevent contamination of samples, including: direct collection into sample containers, when possible; and clean sampling techniques for metals. Several local partners collect samples from a bridge and must use the bucket method. All those partners practice the triple rinse procedure to eliminate or at least minimize the chance of carry-over from one site to the next. Field QC samples for metals testing (identified in Section B5) are collected to verify that contamination has not occurred.

Documentation of Field Sampling Activities

Field sampling activities are documented on field data sheets as presented in Appendix D. Flow worksheets, aquatic life use monitoring checklists, habitat assessment forms, field biological assessment forms, and records of bacteriological analyses (if applicable) are part of the field data record. The following will be recorded for all visits:

- Station ID
- Sampling Date
- Location
- Sampling Depth
- Sampling Time
- Sample Collector's name
- Values for all field parameters collected

Notes containing detailed observational data not captured by field parameters, including;

- Water appearance
- Weather
- Biological activity
- Unusual odors
- Pertinent observations related to water quality or stream uses
- Watershed or instream activities
- Specific sample information
- Missing parameters

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:

- Write legibly, in indelible ink
- Make changes by crossing out original entries with a single line strike-out, entering the changes, and initialing and dating the corrections.
- Close-out incomplete pages with an initialed and dated diagonal line.

Sampling Method Requirements or Sampling Process Design Deficiencies, and Corrective Action

Examples of sampling method requirements or sample design deficiencies include but are not limited to such things as inadequate sample volume due to spillage or container leaks, failure to preserve samples appropriately, contamination of a sample bottle during collection, storage temperature and holding time exceedance, sampling at the wrong site, etc. Any deviations from the QAPP, SWQM Procedures, or appropriate sampling procedures may invalidate data, and require documented corrective action. Corrective action may include for samples to be discarded and re-collected. It is the responsibility of the H-GAC Project Manager, in consultation with the H-GAC QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the CRP Project Manager both verbally and in writing in the project progress reports and by completion of a CAP.

The definition of and process for handling deficiencies and corrective action are defined in Section C1.

B3 Sample Handling and Custody

Sample Tracking

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

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

- Date and time of collection
- Site identification
- Number of containers
- Preservative used
- Analyses required
- Name of collector
- Custody transfer signatures and dates and time of transfer

Sample Labeling

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

- Site identification
- Date and time of collection
- Preservative added (if applicable)
- Indication of field-filtration (as applicable)
- Sample type (i.e., analyses) to be performed

Sample Handling

Upon collection, all local partners immediately immerse their samples in coolers containing ice. If a temperature blank is carried (it is not required), it shall be placed on top of the samples instead of buried in the ice. Samples are transported to each local partner's lab by the person who collected the samples or, in the case of EIH, H-GAC, and SJRA samples from The Woodlands area, the samples are transferred to a lab courier who signs the chain of custody form and transports the samples to the lab. After the samples arrive, the lab personnel taking custody of samples will verify the samples are "in the process" of cooling to <6 °C before signing the COC. Internal sample handling, custody, and storage procedures for each of the laboratories

supporting H-GAC's monitoring entities are described in the Quality Manuals (QM) and available to H–GAC upon request. For TKN and chlorophyll *a* samples, all samples are transferred to a lab courier who signs the chain of custody form and transports the samples to the contract lab for processing and analysis. References for each local partner's field and lab sample handling procedure are listed in the following table.

Table B3.1. Sample Handling References for Local Monitoring Partners.

Monitoring Entity	Reference to Sample Handling
Houston-Galveston Area Council	H-GAC's Standard Operating Procedures (SOP) Manual for Conducting Surface Water Quality Monitoring references the most current *TCEQ Surface Water Quality Monitoring Procedures Volume 1 & 2* plus specific SOP's pertaining to H-GAC monitoring activities only. Eastex Environmental Laboratory QM, most current version, covers samples relinquished to the lab.
Harris County Pollution Control Services	Harris County Pollution Control Services Department Standard Operating Procedure – *Procedures for Sample Custody, Login and Tracking Using Sample Master LIMS*. Most current version.
City of Houston, Health Department	HHD-BLS Environmental Laboratory Services QM, Section 22 – Sample Management, most current version.
City of Houston, Drinking Water Operations Laboratory *And* San Jacinto River Authority – Lake Conroe samples	DWO - Environmental Sampling SOP, most recent revision.
San Jacinto River Authority – The Woodlands area samples	SJRA's Sample Custody Standard Operating Procedure, October 2007. Eastex Environmental Laboratory QM, most current version, covers samples relinquished to the lab.
Environmental Institute of Houston	EIH's Standard Operating Procedures (SOP) Manual for Conducting Surface Water Quality Monitoring references the most current *TCEQ Surface Water Quality Monitoring Procedures Volume 1 & 2* plus additional/specific SOP's pertaining to EIH's monitoring activities only. Eastex Environmental Laboratory QM, most current version, covers samples relinquished to the lab.
Texas Research Institute for Environmental Studies	TRIES's Standard Operating Procedures (SOP) Manual for Conducting Surface Water Quality Monitoring references the most current *TCEQ Surface Water Quality Monitoring Procedures Volume 1* plus specific SOP's pertaining to TRIES monitoring activities only. TRIES Laboratory QM, or most current version, covers the handling of all samples analyzed. Eastex Environmental Laboratory QM, most current version, covers samples relinquished to the lab.

Sample Tracking Procedure Deficiencies and Corrective Action

All deficiencies associated with COC procedures, as described in this QAPP, are immediately reported to the H-GAC Project Manager or QAO. These include such items as delays in transfer resulting in holding time violations; violations of sample preservation requirements; incomplete documentation, including signatures; possible tampering of samples; broken or spilled samples, etc. The H-GAC Project Manager in consultation with the H-GAC QAO will determine if the procedural violation may have compromised the validity of the resulting data. Any failures that have reasonable potential to compromise data validity will invalidate data and the sampling event should be repeated. The resolution of the situation will be reported to the TCEQ CRP Project Manager in the project progress report. CAPs will be prepared by the H-GAC QAO and submitted to TCEQ CRP Project Manager along with project progress report.

The definition of and process for handling deficiencies and corrective action are defined in Section C1.

B4 Analytical Methods

The analytical methods, associated matrices, and performing laboratories are listed in Appendix A. The authority for analysis methodologies under CRP is derived from the 30 Texas Administrative Code (TAC) Chapter 307, in that data generally are generated for comparison to those standards and/or criteria. The Texas Surface Water Quality Standards state "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 Surface Water Quality Monitoring Procedures as amended, 40 CFR 136, or other reliable procedures acceptable to the TCEQ, and in accordance with Chapter 25 of this title."

Laboratories collecting data under this QAPP must be NELAP-accredited in accordance with 30 TAC Chapter 25. Copies of laboratory QMs and SOPs shall be made available for review by the TCEQ.

Standards Traceability

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

Analytical Method Deficiencies and Corrective Actions

Deficiencies in field and laboratory measurement systems involve, but are not limited to such things as instrument malfunctions, failures in calibration, blank contamination, quality control samples outside QAPP-defined limits, etc. In many cases, the field technician or lab analyst will be able to correct the problem. If the problem is resolvable by the field technician or lab analyst, then they will document the problem on the field data sheet or laboratory record and complete the analysis. If the problem is not resolvable, then it is conveyed to the applicable Laboratory Supervisor, who will make the determination and notify the H-GAC QAO if the problem compromises sample results. If the analytical system failure may compromise the sample results, the resulting data will not be reported to the TCEQ. The nature and disposition of the problem is reported on the data report which is sent to the H-GAC Data Manager. The H-GAC QAO will include this information in the CAP and submit with the Progress Report which is sent to the TCEQ CRP Project Manager.

The definition of and process for handling deficiencies and corrective action are defined in Section C1.

The TCEQ has determined that analyses associated with qualifier codes (e.g., "holding time exceedance," "sample received unpreserved," "estimated value") may have unacceptable measurement uncertainty associated with them. This will immediately disqualify analyses from submittal to SWQMIS. Therefore, data with these types of problems should not be reported to the H-GAC or TCEQ. Additionally, any data collected or analyzed by means other than those stated in the QAPP, or data suspect for any reason should not be submitted for loading and storage in SWQMIS. However, when data is lost, its absence will be described in the data summary report

submitted with the corresponding data set, and a corrective action plan (as described in section C1) may be necessary.

B5 Quality Control

Sampling Quality Control Requirements and Acceptability Criteria

The minimum field QC requirements, and program-specific laboratory QC requirements, are outlined in SWQM Procedures. Specific requirements are outlined below. Field QC sample results are submitted with the laboratory data report (see Section A9.).

Field blank

Field blanks are required for total metals-in-water samples when collected without sample equipment (i.e., as grab samples). For other types of samples, they are optional. A field blank is prepared in the field by filling a clean container with pure deionized water and appropriate preservative, if any, for the specific sampling activity being undertaken. Field blanks are used to assess contamination from field sources, such as airborne materials, containers, or preservatives. The minimum frequency requirement for field blanks for total metals-in-water samples is specified in the SWQM Procedures. For SJRA, metals are collected twice a year.

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

Field blanks are associated with batches of field samples. In the event of a field blank failure for one or more target analytes, all applicable data associated with the field batch may need to be qualified as not meeting project QC requirements, and these qualified data will not be reported to the TCEQ. These data include all samples collected on that day during that sample run and should not be confused with the laboratory analytical batch.

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

Comparison Counting

For routine bacteriological samples, repeat counts on one or more positive samples are required, at least monthly. If possible, the analyst will compare counts with another analyst who also performs the analysis. Replicate counts by the same analyst should agree within 5 percent, and those between analysts should agree within 10 percent. The analyst(s) will record the results.

Limit of Quantitation (LOQ)

The laboratory will analyze a calibration standard (if applicable) at the LOQ published in Appendix A of this QAPP on each day calibrations are performed. In addition, an LOQ check sample will be analyzed with each analytical batch. Calibrations including the standard at the LOQ listed in Appendix A will meet the calibration requirements of the analytical method, or corrective action will be implemented.

LOQ Check Sample

An LOQ check sample consists of a sample matrix (e.g., deionized water, sand, commercially available tissue) free from the analytes of interest spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. It is used to establish intra-laboratory bias to assess the performance of the measurement system at the lower limits of analysis. The LOQ check sample is spiked into the sample matrix at a level less than or equal to the LOQ published in Appendix A of this QAPP, for each analyte for each analytical batch of CRP samples run. If it is determined that samples have exceeded the high range of the calibration curve, samples should be diluted or run on another curve. For diluted or high concentration samples run on batches with calibration curves that do not include the LOQ published in Appendix A of this QAPP, a check sample will be run at the low end of the calibration curve.

The LOQ check sample is carried through the complete preparation and analytical process and is performed check s at a rate of one per analytical batch.

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

$$\%R = {}^{S_R}/_{S_A} \times 100$$

Measurement performance specifications are used to determine the acceptability of LOQ Check Sample analyses as specified in Appendix A of this QAPP.

Laboratory Control Sample (LCS)

An LCS 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. The LCS is spiked into the sample matrix at a level less than or near the midpoint of the calibration 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, except in cases of organic analytes with multipeak responses.

The LCS is carried through the complete preparation and analytical process and is performed at a rate of one per preparation batch.

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

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

$$\%R = {}^{S_R}/_{S_A} \times 100$$

Measurement performance specifications are used to determine the acceptability of LCS analyses as specified in Appendix A.

Laboratory Duplicates

A laboratory duplicate is an aliquot taken from the same container as an original sample under laboratory conditions and processed and analyzed independently. A laboratory duplicate is achieved by preparing 2 separate aliquots of a sample, LCS, or matrix spike. Both samples are carried through the entire preparation and analytical process. Laboratory duplicates are used to assess precision and are performed at a rate of one per preparation batch.

For most parameters except bacteria, precision is evaluated using the relative percent difference (RPD) between 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:

$$RPD = \frac{|X_1 - X_2|}{\left(\frac{X_1 + X_2}{2}\right)} \times 100$$

For bacteriological parameters, precision is evaluated using the results from laboratory duplicates. Bacteriological duplicates are analyzed at a 10% frequency (or once per preparation batch, whichever is more frequent). Sufficient volume should be collected to analyze laboratory duplicates from the same sample container.

The base-10 logarithms of the results from the original sample and its duplicate are calculated. The absolute value of the difference between the two base-10 logarithms is calculated and compared to the precision criterion in Appendix A.

If the precision criterion is exceeded, the data are not acceptable for use under this project and are not reported to H-GAC or TCEQ. Results from all samples associated with that failed duplicate (usually a maximum of 10 samples) are considered to have excessive analytical variability and are qualified as not meeting project QC requirements.

The precision criterion in Appendix A for bacteriological duplicates applies only to samples with concentrations > 10 MPN.

Matrix spike (MS) – Matrix spikes are prepared by adding a known quantity of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

Matrix spikes indicate the effect of the sample on the precision and accuracy of the results generated using the selected method. Matrix-specific QC samples indicate the effect of the sample matrix on the precision and accuracy of the results generated using the selected method. The information from these controls is sample/matrix specific and would not normally be used to determine the validity of the entire batch. The frequency of matrix spikes is specified by the analytical method, or a minimum of one per preparation batch, whichever is greater. To the extent possible, matrix spikes prepared and analyzed over the course of the project should be performed on samples from different sites.

The components to be spiked shall be as specified by the mandated analytical method. The results from matrix spikes are primarily designed to assess the validity of analytical results in a given matrix, and are expressed as percent recovery (%R).

The percent recovery of the matrix spike is calculated using the following equation, where %R is percent recovery, S_{SR} is the concentration measured in the matrix spike, S_R is the concentration in the parent sample, and S_A is the concentration of analyte that was added:

$$\%R = \frac{S_{SR} - S_R}{S_A} \times 100$$

Matrix spike recoveries are compared to the acceptance criteria published in the mandated test method. If the matrix spike results are outside established criteria, the data for the analyte that failed in the parent sample is not acceptable for use under this project and will not be reported to TCEQ. The result from the parent sample associated with that failed matrix spike will be considered to have excessive analytical variability and will be qualified by the laboratory as not meeting project QC requirements. Depending on the similarities in composition of the samples in the batch, H-GAC may consider excluding all of the results in the batch related to the analyte that failed recovery.

Measurement performance specifications for matrix spikes for each partner lab are discussed below.

- Harris County Pollution Control Services (HCPCS) The measurement performance specification for matrix spikes is recovery between 75 and 125 percent. If a spike recovery is outside this range, the result is qualified in the QC narrative contained in the data submittal checklist. In addition, the laboratory applies control chart techniques to monitor performance, and establishes updated internal control limits for matrix spike recovery on an annual basis.

- The City of Houston, HHD BLS Lab has a matrix spike recovery requirement of 80-120 percent unless specifically stated for the parameter. A spike that falls outside laboratory limits is reanalyzed. If the spike fails a second time, another sample within the same set is prepared as a spike and analyzed. When several different matrix spikes fall outside stated limits, matrix interference is likely. If the required matrix spike recovery is not met, the data affected are qualified and flagged as exceeding control limits.

- The City of Houston, DWO Lab The recovery of matrix spikes for the samples analyzed in DWO laboratory is between 80 to 120 percent. If a spike recovery is outside this range, the result is qualified in the QC narrative contained in the data submittal checklist. In addition, the laboratory applies control chart techniques to monitor performance.

- Eastex uses matrix spike recovery limits of 80-120 for parameters where a spike solution is available. These recoveries are monitored with QC charts to help determine interferences or detect trends. Matrix spikes that fail to meet these guidelines are reanalyzed, if possible. An alternate sample may be used to help determine whether the problem was specific to that sample. If matrix spikes are not achievable within 80-120 % recovery then this recovery is flagged as exceeding the control limit on the QC report.

- TRIES Lab uses matrix spike recovery limits of 75-125 percent which are published in the mandated test method where a spike solution is required. Matrix spikes that fail to meet these guidelines are reanalyzed, if possible, or an alternate sample may be used to help determine whether the problem was specific to that sample. If matrix spikes are not achievable within method acceptance criteria, the data are reported with appropriate data qualifying codes on the analytical report. Control Charts are monitored for laboratory performance.

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 used to document contamination from the analytical process. The analysis of method blanks should yield values less than the LOQ. For very high-level analyses, the blank value should be less than 5% of the lowest value of the batch, or corrective action will be implemented. Samples associated with a contaminated blank shall be evaluated as to the best corrective action for the samples (e.g. reprocessing, data qualifying codes). In all cases the corrective action must be documented.

The method blank shall be analyzed at a minimum of one per preparation batch. In those instances for which no separate preparation method is used (e.g., VOA) 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.

Quality Control or Acceptability Requirements Deficiencies and Corrective Actions

Sampling QC excursions are evaluated by the H-GAC Project Manager, in consultation with the H-GAC QAO and/or H-GAC Data Manager. In that differences in sample results are used to assess the entire sampling process, including environmental variability, the arbitrary rejection of results based on pre-determined limits is not practical. Therefore, the professional judgment of the H-GAC Project Manager, QAO and Data Manager will be relied upon in evaluating results. Field blanks for trace elements are scrutinized very closely. Field blank values exceeding the acceptability criteria will automatically invalidate the sample. Notations of blank contamination are noted in the data summaries that accompany data deliverables. Equipment blanks for metals analysis are also scrutinized very closely.

Laboratory measurement quality control failures are evaluated by the laboratory staff. The disposition of such failures and the nature and disposition of the failure is reported to the local partner's Laboratory QAO. The Laboratory QAO will discuss the failure with the H-GAC QAO and/or Data Manager. If applicable, the H-GAC QAO will include this information in a CAP and submit with the Progress Report which is sent to the TCEQ CRP Project Manager.

The definition of and process for handling deficiencies and corrective action are defined in Section C1.

Additionally, in accordance with CRP requirements and the TNI Standard (Volume 1, Module 2, Section 4.5, Subcontracting of Environmental Tests) when a laboratory that is a signatory of this QAPP finds it necessary and/or advantageous to subcontract analyses, the laboratory that is the signatory on this QAPP must ensure that the subcontracting laboratory is NELAP-accredited (when required) and understands and follows the QA/QC requirements included in this QAPP. This includes that the sub-contracting laboratory utilize the same reporting limits as the signatory laboratory and performs all required quality control analysis outlined in this QAPP. The signatory laboratory is also responsible for quality assurance of the data prior to delivering it to the H-GAC, including review of all applicable QC samples related to CRP data. As stated in section 4.5.5 of the TNI Standard, the laboratory performing the subcontracted work shall be indicated in the final report and the signatory laboratory shall make a copy of the subcontractor's report available to the client (H-GAC) when requested.

B6 Instrument/Equipment Testing, Inspection, and Maintenance

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

All laboratory tools, gauges, instrument, and equipment testing and maintenance requirements are contained within laboratory QM(s).

B7 Instrument Calibration and Frequency

Field equipment calibration requirements are contained in the SWQM Procedures. Post-calibration check error limits and the disposition resulting from errors are adhered to. Data collected from field instruments that do not meet the post-calibration check error limits specified in the SWQM Procedures will not be submitted for inclusion into SWQMIS.

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

B8 Inspection/Acceptance of Supplies and Consumables

No special requirements for acceptance are specified for field sampling supplies and consumables. Reference to the laboratory QM may be appropriate for laboratory-related supplies and consumables.

B9 Acquired Data

Non-directly measured data, secondary data, or acquired data involves the use of data collected under another project and collected with a different intended use than this project. The acquired data still meets the quality requirements of this project and is defined below. The following data source(s) will be used for this project:

USGS gage station data will be used throughout this project to aid in determining gage height and flow. Rigorous QA checks are completed on gage data by the USGS and the data are approved by the USGS and permanently stored at the USGS. This data will be submitted to the TCEQ under parameter code 00061 Flow, Instantaneous or parameter code 74069 Flow Estimate depending on the proximity of the monitoring station to the USGS gage station.

Reservoir stage data are collected every day from the USGS, International Boundary and Water Commission (IBWC), and the United States Army Corps of Engineers (USACE) websites. These data are preliminary and subject to revision. The Texas Water Development Board (TWDB) derives reservoir storage (in acre-feet) from these stage data (elevation in feet above mean sea level), by using the latest rating curve datasets available. These data are published at the TWDB website at http://waterdatafortexas.org/reservoirs/statewide. Information about measurement methodology can be found on the TWDB website. These data will be submitted to the TCEQ under parameter code 00052 Reservoir Stage and parameter code 00053 Reservoir Percent Full.

Rainfall data will be acquired from multiple sources to report parameter code 72053 (Days Since Precipitation Event) with each set of water quality data submitted to TCEQ. Each partner will use the internet source that best addresses the rainfall events occurring closest to but upstream of or within the drainage area affecting their various monitoring stations. Historical rainfall data is accessible on these web sites to determine the correct value for parameter 72053, "Days since precipitation event". These sites include:

- National Oceanic and Atmospheric Administration's (NOAA's) National Climatic Data Center (NCDC) (http://www.ncdc.noaa.gov/). The NCDC is responsible for preserving, monitoring, assessing, and providing public access to the nation's climate and historical weather data and information
- Weather Underground (http://www.wunderground.com/) which collects and maintains precipitation data from numerous sources in the selected area
- The Harris County Flood Control District (HCFCD) operates a Flood Warning System (FWS) (http://www.harriscountyfws.org/) which measures rainfall amounts and monitors water levels in bayous and major streams on a real-time basis to inform the public of dangerous weather conditions. The system relies on 133 gage stations strategically placed on bayous and their tributaries throughout the greater Harris County area.
- The USGS National Water Information System (NWIS) web interface can also be used to determine when a significant change in flow occurred at the various flow gages operated around the greater Houston region. The web site http://waterdata.usgs.gov/tx/nwis/current/?type=flow can display discharge data in graph or tabular format to determine days when runoff affected the stream.

B10 Data Management

Data Management Process

Data is received by H-GAC from all partners, including H-GAC's own data monitoring program. Each partner has a paragraph below which gives a brief description of their data submission process.

When data is submitted to H-GAC, the data is saved in "Raw Data" folders. When H-GAC begins to process the data, it is saved into a "Working Data" folder. By changing the folder in which the data is saved, H-GAC always has the original data submittal in electronic format. Data is processed by H-GAC Data Manager and H-GAC's QAO before being submitted to TCEQ in the format specified in the SWQM Data Management Reference Guide, most recent version, for review by the TCEQ CRP Program Manager. H-GAC's full data procedure is described in Appendix H – Data Management Process.

- H-GAC's field sheets are kept in a three-ring binder at H-GAC office. The calibration sheets, field sheets, and COCs are reviewed by the QAO or a designee. If there are nonconformances such as failed calibration, the QAO writes instructions in a different colored ink on the related field sheet regarding data entry. Then the instructions are initialed and dated.

  Electronic data from datasondes and flow-measurement devices are downloaded into a raw data folder. These electronic files are saved as EXCEL files for later processing or proprietary formats developed by manufacturers of the flow measurement devices. Field data are entered in an ACCESS database by

H-GAC staff and saved in a secured network drive ("Working Data") that is backed by H-GAC Data Services on a regular basis. Final field data is reviewed for accuracy and completeness by either H-GAC Data Manager or QAO or designee (but not generally the person who performed the original data entry). After review, data is exported from the database in EXCEL format into the "Working" data folder. Laboratory analysis is performed by Eastex Laboratory and submitted directly to H-GAC in EXCEL format. The data is saved in a "Raw Data" folder and copied into a master "Input" file for later processing. The field data EXCEL file in the "Working" data folder becomes the input file for SAS processing. Datasonde data are also copied to the "Input" file for later processing.

SAS code has been written to process both the field and laboratory datasets. Following initial SAS processing and investigation of flagged records, a draft Data Summary is compiled by H-GAC DM. Details of any data changes are documented in the Data Summary. All SAS output is saved on secured network drives that are backed up regularly by Data Services staff. The DM provides the QAO with the draft Data Summary for review. H-GAC QAO review of the datasets and the Data Summary is documented and provided to H-GAC DM for further investigation, verification, or change. This record of the QAO review is retained with the data package. See H-GAC's Data Management Flow Chart to see the various tables and Flagged Records reports that are created during the Data review process.

- Harris County Pollution Control Services (HCPCS) submits EXCEL spreadsheets to H-GAC containing laboratory and field data. The data are exported from the department database and spreadsheets are reviewed by Lab Manager, the QAO and the Supervisor - Wet Chemistry for accuracy, consistency, and reasonableness (as indicated by inter-parameter correlations, historical parameter results, and screening values established by the TCEQ). Documented non-conformances from QAPP, SOP, and HCPCS Quality Manual requirements that may impact the data and problems encountered in collection or analysis of the samples are evaluated and addressed in the data submittal checklist. A Data Review Checklist is generated for each data packet. The checklist is prepared by the QAO and reviewed and approved by the Supervisor – Wet Chemistry, a representative of the field collection team, and the Sample Administrator.

- The City of Houston HHD field personnel and data manager enter laboratory and field data into an ACCESS database. Print-outs of any data from field equipment memory are printed out to be saved with field forms. The data manager reviews all data entries for accuracy then checks for outliers. A Data Review Checklist is generated for each data packet. Data is then submitted to the HHD-BLS Lab QAO for additional review before being submitted to HGAC. The data management process is explained in the lab's QM - Section 23.8 Data Review.

- City of Houston DWO & Lake Houston field personnel turn in the chain of custody and field form to the sample receiver in the lab. The lab submits EXCEL spreadsheets to H-GAC containing laboratory and field data. These tables are exported from the BTLIMS. Samples are analyzed by chemist according to the required method and results are entered by Chemist performing the analysis, then reviewed by another chemist for accuracy, validity & QA/QC requirement and, finally, validated in BTLIMS by Lab Manager. The Sample Administrator enters the field data provided by sample collector on COCs & the accuracy of this entry in BTLIMS is checked by the laboratory manager. Documented non-conformances from QAPP, SOP, and HCPCS Quality Manual requirements that may impact the data and problems encountered in collection or analysis of the samples are evaluated and addressed in the data submittal checklist. A Data Review Checklist is generated for each data packet. The checklist for data accuracy, completeness, reasonableness and outliers is reviewed by the QAO. The Field supervisor completes a Data Review Checklist for that data set before it is submitted to H-GAC independent of the lab data.

- SJRA collects samples from Lake Conroe and the Lake Woodlands watershed. Lake Conroe samples are submitted to the City of Houston DWO Lab for analysis (see previous paragraph), while Woodlands samples are sent to Eastex Laboratory. Electronic data files from the field datasondes are sent directly to H-GAC's Data Manager for import during data processing. Additional field data are input to an ACCESS database by SJRA's Data Manager, where it is reviewed, formatted, and exported in EXCEL format for submission to H-GAC. H-GAC's Data Manager merges the field data with the profile data and rechecks for outliers and formatting. H-GAC's QAO checks the data for accuracy and reasonableness. SJRA keeps the original field sheets. Copies of field sheets, COCs, calibration logs, and a Data Review

Checklist are sent to H-GAC with every data submittal for Lake Conroe and The Woodlands samples. Eastex Lab sends electronic lab data results to SJRA and H-GAC at the same time for the H-GAC data manager to merge with field data.

- The EIH field QAO or assigned field staff enter field data collected by their program into an EXCEL spreadsheet. All supporting QA data is input to spreadsheets as well. The EIH field QAO and the EIH CRP Project Manager review more than 10% of the data for accuracy, completeness, and reasonableness. A Data Review checklist is generated while data is being reviewed. Then, it is submitted to H-GAC along with electronic data. H-GAC downloads scanned field sheets and COCs from the EIH FTP site for review during data processing. H-GAC's Data Manager receives electronic data files from Eastex Lab and merges lab data with field data during data processing, prior to review and submission to TCEQ.

- TRIES field QAO and TRIES Lab QAO submits all field and lab data to the TRIES Data Manager. The data manager completes all data entry into an Excel spreadsheet. Any supporting QA data is input to a separate spreadsheet. The TRIES field QAO, TRIES Lab QAO and the TRIES CRP Project Manager review more than 10% of data for accuracy, completeness, and reasonableness. A Data Review Checklist is completed by the data manager and submitted to the TRIES CRP Project Manager for final approval. The data manager then submits the Excel spreadsheet for both the field and lab data along with scanned hard copies of the field sheets and COCs to H-GAC. If necessary, analytes analyzed by Eastex Laboratory are submitted directly to H-GAC for processing.

Data Dictionary

Terminology and field descriptions are included in the DMRG, most recent version. A table outlining the entities that will be used when submitting data under this QAPP is included below for the purpose of verifying which entity codes are included in this QAPP.

Table B10.1 –Sampling Entity Data Submission Codes

Name of Monitoring Entity	Tag Prefix	Submitting Entity	Collecting Entity
Houston-Galveston Area Council	I	HG	HG
Harris County Pollution Control Services	I	HG	HC
City of Houston – Health Department	I	HG	HH
City of Houston – Drinking Water Operations	I	HG	HW
San Jacinto River Authority	I	HG	SJ
Environmental Institute of Houston – University of Houston Clear Lake	I	HG	UI
Texas Research Institute for Environmental Studies - SHSU	I	HG	TF

Data Errors and Loss

H-GAC stores original electronic data as "Raw Data" files. These files are saved in the original format and other than changing the name of a file, remains unchanged. Files that are changed prior to processing are saved in the "Working Data" folders. The "SAS Data Processing" network folder holds all input and output from SAS processing. The "Input" folder contains the file imported into SAS. An ACCESS database is produced during SAS processing for each dataset and exported to the "ACCESS" folder. The database contains multiple tables used to aid review of the data, identify possible problems, and document verification of outliers and changes to data that are flagged during processing. Text files in the format required by SWQMIS are exported during SAS processing to the "Output" folder. All changes, validation, and verification actions on the data are documented in a Data Review Summary Report which accompanies each data set submittal (Appendix G).

Copies of e-mails and communications with partners are printed and filed with the data set to facilitate traceability of reported results to raw data.

Each partner has a paragraph below briefly discussing their data control mechanisms.

- H-GAC water samples are sent to Eastex Lab for analysis. (See Eastex lab details below.) Field data sheets are collected by the assigned staff for input to an ACCESS Database and are reviewed for outliers. H-GAC's QAO reviews the data for transcription accuracy and reasonableness after SAS processing. A Data Summary Sheet is prepared by the Data Manager after SAS processing for review by H-GAC's QAP and for submission to TCEQ with the text files.

- Harris County Pollution Control Services (HCPCS) Details of the mechanisms for review and correction of errors and preventing loss of data are described in the HCPCS Laboratory Services Quality Manual, (most current version). All field data sheets are given to the HCPCS Data Manager who applies the same review, correction of errors, and prevention of loss of data as the lab data. A Data Review Checklist is completed for each set of data submitted to H-GAC.

- City of Houston HHD Details of the HHD-BLS Lab protocols for data reductions and review are described in their Environmental Laboratory Services Quality Manual, Section 23, (most current version). All field data is gathered by the HHD Data Manager who inputs the data to their database, checks all data for outliers and reasonableness. Then, the data is reviewed by a second individual for transcription accuracy. A Data Review Checklist is completed for each set of data submitted to H-GAC.

- City of Houston DWO Details of their Laboratory protocols for data reductions and review are described in their Quality Management Plan, Section 7, (most recent revision). All field data sheets are turned over at the Lake Houston office for data input to EXCEL spreadsheets. The DWO Data Manager reviews the data for outliers and accuracy. Then, the Field QAO or designee reviews the data for transcription accuracy and reasonableness. A Data Review Checklist is completed for each set of data submitted to H-GAC.

- San Jacinto River Authority Lake Conroe water samples are sent to DWO lab where all analyses are completed and results managed (See City of Houston DWO above). A copy of the field data sheet is sent to the lab as well as H-GAC's Data Manager. SJRA inputs field data to an EXCEL spreadsheet and submits spreadsheet to H-GAC Data Manager. Profile data from the Hydrolab Surveyor is downloaded and saved in a raw data file and a working data file. The working data files are reviewed and reformatted as needed, then sent to H-GAC. A Data Review Checklist is completed by SJRA for field data and by DWO Lab or Eastex Lab for lab analyses. DWO Lab data manager performs all data entry & data management for Lake Conroe lab data only.

  Woodlands samples are sent to Eastex Lab for analysis. (See Eastex Lab details below.) Field data sheets are collected and information input to EXCEL spreadsheets by the SJRA Data Manager who also checks the data for outliers and reasonableness. The field QAO or a second employee reviews the data for transcription accuracy. A Data Review Checklist is completed for each set of data submitted to H-GAC. SJRA performs data management for only The Woodlands data.

  H-GAC's Data Manager inputs the data to an ACCESS database, merges the related data sets, and reviews the data for outliers. H-GAC QAO reviews the data for accuracy and reasonableness. A Data Summary Sheet is submitted to TCEQ with each data set from Lake Conroe.

- Eastex Lab Details of their protocols for data reduction and review are described in the Eastex Laboratory Quality Assurance Manual, (most recent version), Sections 8.1. A Data Review Checklist is completed for each set of data submitted to H-GAC. Eastex sends data results from CRP monitoring to H-GAC.

- Environmental Institute of Houston (EIH) water samples are sent to Eastex Lab for analysis. (See Eastex Lab details above.) Field data sheets are collected and information input to EXCEL spreadsheets by the EIH Data Manager or designee who also checks the data for outlier s and reasonableness. The

EIH Field QAO also reviews the data for transcription accuracy and reasonableness. A Data Review Checklist is completed for each set of data submitted to H-GAC.

- TRIES Details of the protocols for data reductions and review are described in their TRIES Analytical Lab Quality Manual, Section 27 (most current version). The TRIES Data Manager collects all field data sheets and immediately inputs data into an EXCEL spreadsheet while also checking for data outliers and reasonableness. The TRIES CRP Project Manager also reviews the data for transcription accuracy and reasonableness. A Data Review Checklist is completed for each set of data submitted to H-GAC.

Record Keeping and Data Storage

As each data set is processed by H-GAC, all hard copies of data and/or field forms are organized into packets. All correspondence or reports related to the data set are to be printed and placed in the packet of information. Including but not limited to the QAO review comments, the draft and final Data Summary Reports/Sheets. Any other documentation related to that specific data set is also to be attached. Each packet of information is placed in a file storage box for long term storage.

Each local agency submits electronic data along with hard copies of field sheets and COC forms. In addition, the local agency is required to submit a "Data Review Checklist" (Appendix F) to H-GAC. Electronic data is stored in folders on H-GAC network as "originals" and as copies for data management, verification, and validation. Daily and weekly backups are completed on H-GAC's server. Hard copies are filed in filing cabinets or file boxes for use as needed. Data more than 2 years old may be stored off-site storage according to H-GAC procedures. All data is maintained for at least seven (7) years by H-GAC and all local partners.

Each partner has a paragraph below briefly discussing their Record Keeping and Data Storage practices.

- Harris County Pollution Control Services (HCPCS) Details of the HCPCS records management and data storage procedures may be found in section 6 of the HCPCS Laboratory Services Quality Manual, (most current version). The laboratory data manager manages all the data – hard copy and electronic – for both field and lab.

- City of Houston HHD-BLS Details of their protocols for records management and data storage procedures are described in their Environmental Laboratory Services Quality Manual, Section 6 and Section 15, (most current version). HHD field data is housed and electronically stored at HHD offices located Park Place, Houston. Electronic data is stored in an Access Database which is maintained by the HHD field office.

- City of Houston DWO Laboratory Details of their protocols for records management and data storage procedures are described in their Quality Management Plan, Section 13, (most recent revision). Original DWO field data is stored at their field office located at Lake Houston. Copies of all field sheets are given to the lab to be kept with lab analysis paperwork. Electronic data is stored in an EXCEL spreadsheet by the field supervisor.

- San Jacinto River Authority (SJRA) will store all hard copies of field and lab data from both Lake Conroe and The Woodlands sample sites in the Program Manager's Lake Conroe office. Electronic data (raw and working files) will be stored on a shared computer server at the same location in EXCEL or ACCESS format.

- Eastex Environmental Lab Details of the Eastex *Electronic Record Storage* system is described in the Laboratory's Quality Assurance Manual, (most current version), Sections 8.4.

- Environmental Institute of Houston (EIH) stores hard copy and electronic data at their offices on the UHCL campus. Electronic data is stored in EXCEL spreadsheets and various workbooks. The data manager maintains the files.

- TRIES Details of the protocols for records management and data storage procedures are described in their TRIES Analytical Lab Quality Manual, Sections 16.1 & 16.2 (most current version). All field data will be stored electronically in an EXCEL spreadsheet and in hard copy format at TRIES. The TRIES Data Manager and the TRIES Lab QAO will maintain the data.

Data Handling, Hardware, and Software Requirements

H-GAC maintains several networked computers to store and manage CRP data. All computers are equipped with at least Office 2007 which includes MS EXCEL 2007 and MS ACCESS 2007. The data manager's computer also includes Oracle 9 to assist with screening, management and reformatting the data to TCEQ's specifications. Additionally, the SAS software is available on the DM's and another computer if an alternate SAS Operator is needed.

Information Resource Management Requirements

Data will be managed in accordance with the TCEQ DMRG, most recent revision, and applicable H-GAC information resource management policies. See Appendix I for H-GAC's C&E Department Geospatial Data Management Plan.

GPS equipment may be used as a component of the information required by the Station Location (SLOC) request process for creating the certified positional data that will ultimately be entered into SWQMIS database. Positional data obtained by CRP grantees using a GPS will follow the TCEQ's OPP 8.11 and 8.12 policy regarding the collection and management of positional data. Positional data may be acquired with a GPS and verified with photo interpolation using a certified source, such as Google Earth or Google Maps. The verified coordinates and map interface can then be used to develop a new SLOC.

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	H-GAC	Monitoring of the project status and records to ensure requirements are being fulfilled	Report to TCEQ in Quarterly Report
Monitoring Systems Audit of H-GAC	Dates to be determined by TCEQ CRP	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to provide corrective actions response to the TCEQ
Monitoring Systems Audit of Program Subparticipants	Dates to be determined by H-GAC (at least once per biennium)	H-GAC	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to H-GAC. QAO will report problems to TCEQ in Progress Report.
Laboratory Assessment	Dates to be determined by TCEQ	TCEQ Laboratory Assessor	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to provide corrective actions response to the TCEQ

Corrective Action Process for Deficiencies

Deficiencies are any deviation from the QAPP, SWQM Procedures, or other applicable guidance. Deficiencies may invalidate resulting data and require corrective action. Repeated deficiencies should initiate a CAP. Corrective action for deficiencies may include for samples to be discarded and re-collected. Deficiencies are documented in logbooks, field data sheets, etc. by field or laboratory staff, are communicated to the H-GAC QAO and/or Data Manager (or other appropriate staff) and should be subject to periodic review so their responses can be uniform, and their frequency tracked. It is the responsibility of the H-GAC Project Manager, in consultation with the H-GAC QAO, to ensure that the actions and resolutions to the problems are documented and that records are maintained in accordance with this QAPP. In addition, these actions and resolutions will be conveyed to the CRP Project Manager both verbally and in writing in quarterly progress reports and by completion of a CAP.

Corrective Action

CAPs should:

- Identify the problem, nonconformity, or undesirable situation
- Identify immediate remedial actions if possible
- Identify the underlying cause(s) of the problem
- Identify whether the problem is likely to recur, or occur in other areas
- Assist in determining the need for corrective action
- Employ problem-solving techniques to verify causes, determine solution, and develop an action plan
- Identify personnel responsible for action
- Establish timelines and provide a schedule
- Document the corrective action

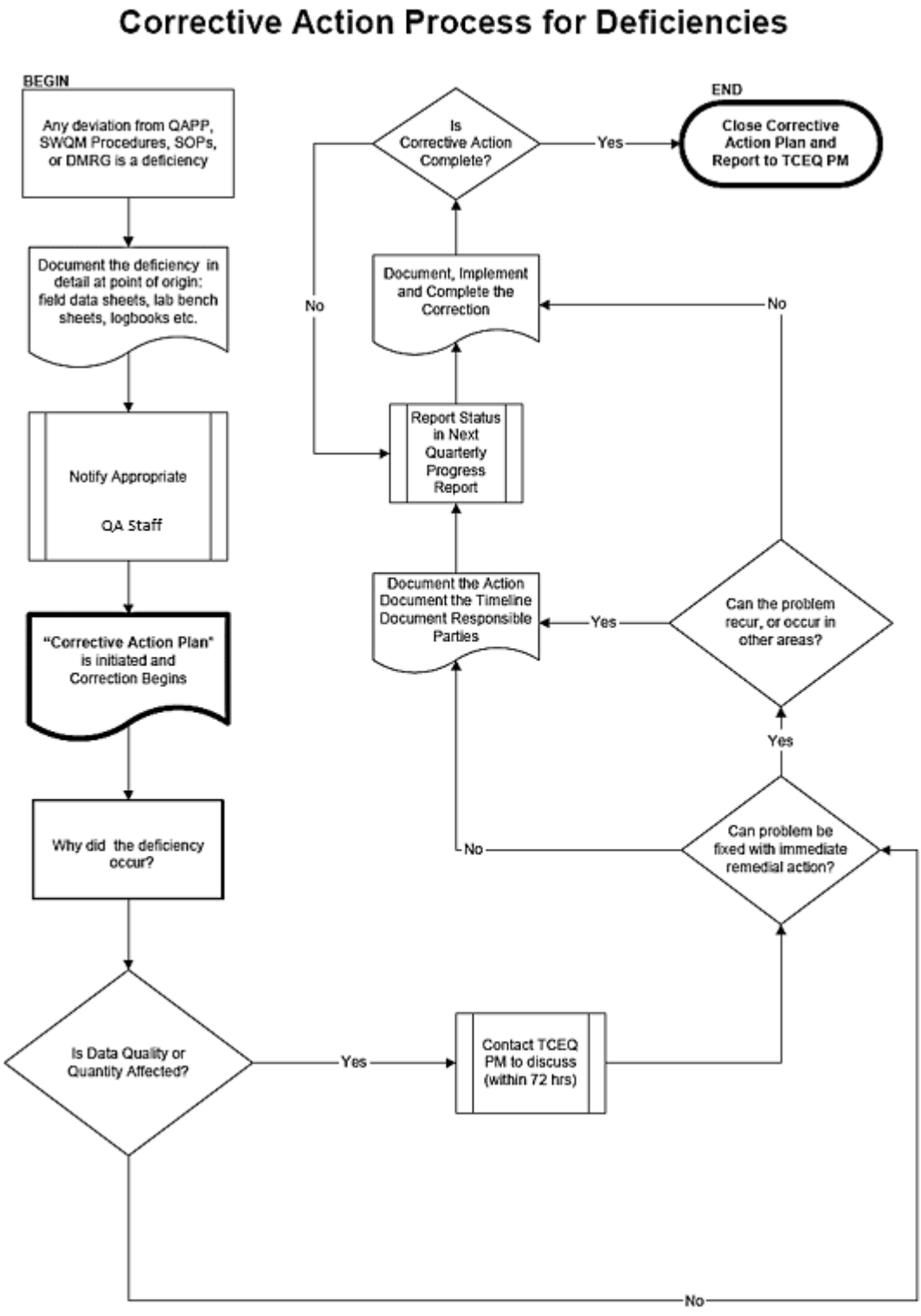
A flow chart has been developed to facilitate the process (see figure C1.1: Corrective Action Process for Deficiencies).

The status of CAPs will be included with quarterly progress reports. In addition, significant conditions which, if uncorrected, could have a serious effect on safety or on the validity or integrity of data will be reported to the TCEQ immediately.

The H-GAC Project Manager or designee is responsible for ensuring that corrective actions have been implemented and tracks deficiencies and corrective actions. Records of audit findings and corrective actions are maintained by the H-GAC QAO. Audit reports and associated corrective action documentation will be submitted to the TCEQ with the quarterly progress reports.

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

Figure C1.1 Corrective Action Process for Deficiencies



C2 Reports to Management

Table C2.1 QA Management Reports

Type of Report	Frequency (daily, weekly, monthly, quarterly, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipients
Quarterly project reports & invoices from local partners	quarterly	Within 10 days of end of quarter	Local partner project manager	Project manager on H-GAC's CRP team
Nonconformance & Corrective Action Reports	As needed	With quarterly reports to TCEQ or sooner depending on severity	Subparticipant Field & Laboratory Staff; H-GAC Staff & QAO	H-GAC QAO; TCEQ Project Mgr
TCEQ CRP Progress Reports	Quarterly	December 15, 2019; March 15, 2020; June 15, 2020; September 15, 2020; December 15, 2020; March 15, 2021; June 15, 2021; August 31, 2021	H-GAC Project Manager or designee	TCEQ CRP Project Management
Monitoring System Audit Report & Response	Once per biennium	Copies of MSA's to be included with quarterly report to TCEQ	H-GAC QAO	TCEQ Project Mgr
Data Review checklists	With data delivery	As needed	Local Partner & sub-contractors	H-GAC Data Mgr
Data Summary Report/Sheet	With data delivery	As needed	H-GAC Data Manager	TCEQ Project Mgr

Reports to H-GAC Project Management

H-GAC CRP QAO is required to report the status of implementation of the procedures discussed in this project plan and, thereby, the status of data quality. This information is gathered during quarterly meetings of the Regional Monitoring Group. Local program representatives are required to give oral presentations which include information about their monitoring activities. The local programs, HHD, EIH, & TRIES, who receive CRP funds to support data collection activities are also required to submit written documentation along with every invoice summarizing their monitoring activities. H-GAC schedules bi-weekly meetings to update the CRP manager and team members regarding status of deliverables and tasks.

During review and evaluation of submitted data, H-GAC's Data Manager and/or H-GAC's QAO will investigate suspected problems with the data. The QAO for each participating local agency is informed either informally (phone call), by fax or by e-mail memoranda of any quality assurance problems encountered. With the local agency's help the issue will be investigated further and a resolution adopted. The resolution for each issue will be documented on the Data Summary Sheet that accompanies each dataset submitted to TCEQ. When H-GAC's Data Manager submits data to TCEQ, a summary of this information will be transmitted by H-GAC's Data Manager or QAO to H-GAC's Project Manager.

Information regarding the monitoring activities of funded subparticipants will then be reported to the TCEQ Project Manager and TCEQ Quality Assurance Specialist by means of quarterly progress reports required under the Clean Rivers Program. The results of field and laboratory annual monitoring system audits will be detailed in reports to the local program managers and/or the person who directly supervises field activities. This information will also be reported to the TCEQ by means of status reports to be included in the quarterly progress reports. Responses from local agencies regarding the audit reports and findings will also be included in the quarterly progress reports to TCEQ.

Reports to TCEQ Project Management

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

Progress Report

Summarizes H-GAC's activities for each task; reports monitoring status, problems, delays, deficiencies, status of open CAPs, and documentation for completed CAPs; and outlines the status of each task's deliverables.

Monitoring Systems Audit Report and Response

Following any audit performed by H-GAC, a report of findings, recommendations and response is sent to the TCEQ in the quarterly progress report.

Data Summary

Contains basic identifying information about the data set and comments regarding inconsistencies and errors identified during data verification and validation steps or problems with data collection efforts (e.g. deficiencies).

Reports by TCEQ Project Management

Contractor Evaluation

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

D1 Data Review, Verification, and Validation

All field and laboratory 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 of this QAPP. Only those data which are supported by appropriate quality control data and meet the measurement performance specifications defined for this project will be considered acceptable and will be reported to the TCEQ for entry into SWQMIS.

The procedures for verification and validation of data are described in Section D2 below. Local agency data managers and H-GAC CRP Data Manager are responsible for ensuring that field data are properly reviewed, verified, and submitted in the required format to the TCEQ Project Manager. Likewise, the Laboratory Managers of HCPCS, HHD, DWO, SJRA, EIH, and Eastex laboratories are responsible for ensuring that laboratory data are reviewed, verified, and submitted in the required format to H-GAC CRP Data Manager. Finally, H-GAC CRP QAO and/or Data Manager are responsible for confirming the validation of all collected data and ensuring that all reported data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

D2 Verification and Validation Methods

All field and laboratory data will be reviewed, verified and validated to ensure they conform to project specifications.

Data review, verification, and validation will be performed using self-assessments as well as peer and management review as appropriate to the project task. The data review tasks to be performed by field and laboratory staff are listed in the first two columns of Table D2.1, respectively. Potential errors are identified by examination of documentation and by manual examination of corollary or unreasonable data; this analysis may be computer-assisted. 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 the higher-level project management to establish the appropriate course of action, or the data associated with the issue are rejected and not reported to the TCEQ for storage in SWQMIS. 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 H-GAC Data Manager and QAO. Data review, verification, and validation tasks to be performed on the data set include, but are not limited to, the confirmation of laboratory and field data review, evaluation of field QC results, additional evaluation of anomalies and outliers, analysis of sampling and analytical gaps, and confirmation that all parameters and sampling sites are included in the QAPP.

The Data Review Checklist (see Appendix F) covers three main types of review: data format and structure, data quality review, and documentation review. The Data Review Checklist is transferred with the water quality data submitted to the TCEQ to ensure that the review process is being performed.

Another element of the data validation process is consideration of any findings identified during the monitoring systems audit conducted by the TCEQ CRP Lead Quality Assurance Specialist. Any issues requiring corrective action must be addressed, and the potential impact of these issues on previously collected data will be assessed. After the data are reviewed and documented, the H-GAC Project Manager or designee validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

If any requirements or specifications of the CRP are not met, based on any part of the data review, the responsible party should document the nonconforming activities and submit the information to the H-GAC Data Manager with the data in the Data Summary (See Appendix F). All failed QC checks, missing samples, missing analytes, missing parameters, and suspect results should be discussed in the Data Summary.

Table D2.1a: Data Review Tasks for the Houston-Galveston Area Council (H-GAC)

H-GAC Data to be Verified	Field Tasks	Laboratory Tasks (Eastex Lab)	Lead Org. QAO or Data Manager Tasks
Sample documentation complete; samples labeled, sites identified	H-GAC Field Staff &/or QAO	Sample Custodian.	
Field instrument pre- and post-calibration results within limits	H-GAC Field Staff &/or QAO		
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*	H-GAC QAO		
Standards and reagents traceable	H-GAC Field Staff	Lab QAO	
Chain of custody complete/acceptable	H-GAC Field Staff &/or QAO	Sample Cust.	H-GAC Data Mgr &/or QAO
NELAP Accreditation is current		Lab QAO	H-GAC Data Mgr
Sample preservation and handling acceptable	H-GAC Field Staff	Sample Custodian.	H-GAC Data Mgr
Holding times not exceeded		Lab QAO	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	H-GAC Field Staff &/or QAO	Lab QAO	H-GAC QAO
Field documentation (e.g., biological, stream habitat) complete	H-GAC Field Staff &/or QAO		
Instrument calibration data complete	H-GAC Field Staff &/or QAO	Lab QAO	
Bacteriological records complete		Lab QAO	H-GAC Data Mgr
QC samples analyzed at required frequency		Lab QAO	H-GAC Data Mgr
QC results meet performance and program specifications		Lab QAO	H-GAC Data Mgr
Analytical sensitivity (Limits of Quantitation/Ambient Water Reporting Limits) consistent with QAPP		Lab QAO	H-GAC Data Mgr
Results, calculations, transcriptions checked	H-GAC Field Staff &/or QAO	Technical Director	
Laboratory bench-level review performed		Head Technician	
All laboratory samples analyzed for all parameters		Lab QAO	
Corollary data agree		Lab QAO	H-GAC Data Mgr
Nonconforming activities documented	H-GAC QAO	Lab QAO	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	H-GAC QAO	Lab QAO	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	H-GAC Data Mgr		H-GAC Data Mgr
Depth reported correctly	H-GAC Data Mgr		H-GAC Data Mgr
TAG IDs correct	H-GAC Data Mgr		H-GAC Data Mgr
TCEQ Station ID number assigned	H-GAC Data Mgr		H-GAC Data Mgr
Valid parameter codes	H-GAC Data Mgr		H-GAC Data Mgr
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly	H-GAC Data Mgr		H-GAC Data Mgr
Time based on 24-hour clock	H-GAC Data Mgr		H-GAC Data Mgr
Absence of transcription error confirmed	H-GAC Field Staff, Data Mgr &/or QAO	Technical Director	H-GAC Data Mgr
Absence of electronic errors confirmed	H-GAC Field Staff, Data Mgr &/or QAO	Technical Director	H-GAC Data Mgr
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)	H-GAC Field Staff, Data Mgr &/or QAO		H-GAC Data Mgr
Field QC results attached to data review checklist	H-GAC Data Mgr		H-GAC Data Mgr
Verified data log submitted	H-GAC Data Mgr		H-GAC Data Mgr
10% of data manually reviewed	H-GAC Data Mgr or H-GAC QAO	Technical Director	H-GAC QAO

Table D2.1b: Data Review Tasks for Harris County Pollution Control Services (HCPCS)

HCPCS Data to be Verified	Field Tasks	Laboratory Tasks	Lead Org. QAO or Data Manager Tasks
Sample documentation complete; samples labeled, sites identified	Sr. Investigator	Sample Administrator	
Field instrument pre- and post-calibration results within limits	Sr. Investigator		H-GAC Data Mgr &/or H-GAC QAO
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*	Sr. Investigator	Manager-Laboratory Services &QAO	
Standards and reagents traceable	Sr. Investigator	Supervisor –Wet Lab; & QAO	
Chain of custody complete/acceptable	Sr. Investigator	Manager- Lab Services, Sample Administrator; & QAO	H-GAC Data Mgr
NELAP Accreditation is current		Manager- Laboratory Services & QAO	
Sample preservation and handling acceptable	Sr. Investigator	Supervisor –Wet Lab & QAO	
Holding times not exceeded		Supervisor –Wet Lab & QAO	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	Sr. Investigator	Supervisor –Wet Lab & QAO	
Field documentation (e.g., biological, stream habitat) complete	Sr. Investigator	Sample Administrator & QAO	
Instrument calibration data complete	Sr. Investigator	QAO	
Bacteriological records complete		Supervisor –Wet Lab & QAO	
QC samples analyzed at required frequency		Supervisor –Wet Lab & QAO	H-GAC Data Mgr
QC results meet performance and program specifications		Supervisor –Wet Lab & QAO	H-GAC Data Mgr
Analytical sensitivity (Limits of Quantitation/Ambient Water Reporting Limits) consistent with QAPP		Supervisor –Wet Lab & QAO	H-GAC Data Mgr
Results, calculations, transcriptions checked		Supervisor –Wet Lab & QAO	
Laboratory bench-level review performed		Supervisor –Wet Lab & QAO	
All laboratory samples analyzed for all parameters		Supervisor –Wet Lab & QAO	
Corollary data agree		Manager- Lab Services & QAO	
Nonconforming activities documented	Sr. Investigator	Supervisor –Wet Lab & QAO	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed		Manager- Lab Services & QAO	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly		QAO & Sample Administrator	H-GAC Data Mgr
Depth reported correctly	Sr. Investigator	QAO	H-GAC Data Mgr
TAG IDs correct			H-GAC Data Mgr
TCEQ Station ID number assigned			H-GAC Data Mgr
Valid parameter codes			H-GAC Data Mgr
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			H-GAC Data Mgr
Time based on 24-hour clock	Sr. Investigator	QAO & Sample Administrator	H-GAC Data Mgr
Absence of transcription error confirmed		Sample Administrator & QAO	H-GAC Data Mgr
Absence of electronic errors confirmed		Sample Administrator & QAO	H-GAC Data Mgr
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)		Sample Administrator & QAO	H-GAC Data Mgr & H-GAC QAO
Field QC results attached to data review checklist		QAO	H-GAC Data Mgr
Verified data log submitted			H-GAC Data Mgr
10% of data manually reviewed		Supervisor –Wet Lab & QAO	H-GAC Data Mgr & H-GAC QAO

Table D2.1c: Data Review Tasks for City of Houston – Houston Health Department (HHD)

HHD Data to be Verified	Field Tasks	Laboratory Tasks (HHD-BLS Lab)	Lead Org. QAO or Data Manager Tasks
Sample documentation complete; samples labeled, sites identified	Field QAO	Appropriate Analytical Staff	
Field instrument pre- and post-calibration results within limits	Field QAO		H-GAC Data Mgr &/or H-GAC QAO
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*	Field Personnel on each run		
Standards and reagents traceable	Field QAO	Lab Supervisors, Lab QAO, Analysts	
Chain of custody complete/acceptable	Data Manager	Receiving analyst – rotation schedule	H-GAC Data Mgr
NELAP Accreditation is current		Laboratory Manager	
Sample preservation and handling acceptable		Lab Supervisors & Lab QAO	
Holding times not exceeded		Lab Supervisors, Lab QAO, Analysts	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	Field QAO	Lab Supervisors, Lab QAO & Analysts	
Field documentation (e.g., biological, stream habitat) complete	Data Manager		
Instrument calibration data complete	Data Manager	Lab Supervisors, Lab QAO, & Analysts	
Bacteriological records complete		Lab Supervisors or Analysts	
QC samples analyzed at required frequency		Lab QAO	H-GAC Data Mgr
QC results meet performance and program specifications		Lab Manager	H-GAC Data Mgr
Analytical sensitivity (Limits of Quantitation/Ambient Water Reporting Limits) consistent with QAPP		Lab Supervisors & Lab QAO	H-GAC Data Mgr
Results, calculations, transcriptions checked		Analysts &Lab Supervisors	
Laboratory bench-level review performed		Lab Supervisors & Lab QAO	
All laboratory samples analyzed for all parameters		Lab QAO	
Corollary data agree		Lab Supervisors & Lab QAO	
Nonconforming activities documented	Field QAO	Lab Supervisors & Lab QAO	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	Data Manager		H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	Data Manager		H-GAC Data Mgr
Depth reported correctly	Data Manager		H-GAC Data Mgr
TAG IDs correct			H-GAC Data Mgr
TCEQ Station ID number assigned			H-GAC Data Mgr
Valid parameter codes		Lab Supervisors	H-GAC Data Mgr
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			H-GAC Data Mgr
Time based on 24-hour clock	Data Manager		H-GAC Data Mgr
Absence of transcription error confirmed	Data Manager	Lab Supervisors	H-GAC Data Mgr
Absence of electronic errors confirmed	Data Manager	Lab Supervisors	H-GAC Data Mgr
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)	Field QAO	Lab QAO & Lab Manager	H-GAC Data Mgr & H-GAC QAO
Field QC results attached to data review checklist		Lab QAO	H-GAC Data Mgr
Verified data log submitted			H-GAC Data Mgr
10% of data manually reviewed	Data Manager		H-GAC Data Mgr & H-GAC QAO

Table D2.1d: Data Review Tasks for City of Houston – Drinking Water Operations (DWO)

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

Table D2.1e: Data Review Tasks for San Jacinto River Authority-samples from Lake Conroe and analyzed by DWO Lab

Data to be Verified	Field Task (SJRA-Lake Conroe data)	Laboratory Task (DWO Lab)	Lead Org. QAO or Data Manager Tasks
Sample documentation complete; samples labeled, sites identified	SJRA QAO	Sample Custodian	
Field instrument pre- and post-calibration results within limits	SJRA QAO		H-GAC Data Mgr &/or H-GAC QAO
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*	SJRA QAO	Sample Custodian	
Standards and reagents traceable	SJRA QAO	Lab Supervisor	
Chain of custody complete/acceptable	SJRA QAO	Sample Custodian	H-GAC Data Mgr
NELAP Accreditation is current		QA Mgr.	
Sample preservation and handling acceptable		Sample Custodian.	
Holding times not exceeded	SJRA Data Manager	Laboratory Mgr.	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	SJRA QAO	QA Mgr.	
Field documentation (e.g., biological, stream habitat) complete	SJRA QAO	Sample Custodian	
Instrument calibration data complete	SJRA Data Manager	Chemists	
Bacteriological records complete		Microbiologist I	
QC samples analyzed at required frequency		Laboratory Mgr.	H-GAC Data Mgr
QC results meet performance and program specifications		Laboratory Mgr.	H-GAC Data Mgr
Analytical sensitivity (Limits of Quantitation/Ambient Water Reporting Limits) consistent with QAPP		Laboratory Mgr.	H-GAC Data Mgr
Results, calculations, transcriptions checked		Laboratory Mgr.	
Laboratory bench-level review performed		Laboratory Mgr.	
All laboratory samples analyzed for all parameters		Lab Supervisor	
Corollary data agree		QA Mgr.	
Nonconforming activities documented	SJRA QAO	QA Mgr.	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	SJRA Data Manager	QA Mgr.	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	SJRA Data Manager	Data Manager	H-GAC Data Mgr
Depth reported correctly	SJRA Data Manager	Data Manager	H-GAC Data Mgr
TAG IDs correct		Data Manager	H-GAC Data Mgr
TCEQ Station ID number assigned	SJRA Data Manager	Data Manager	H-GAC Data Mgr
Valid parameter codes	SJRA Data Manager	Data Manager	H-GAC Data Mgr
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			H-GAC Data Mgr
Time based on 24-hour clock	SJRA Data Manager	Data Manager	H-GAC Data Mgr
Absence of transcription error confirmed	SJRA Data Manager	QA Mgr.	H-GAC Data Mgr
Absence of electronic errors confirmed	SJRA Data Manager	QA Mgr.	H-GAC Data Mgr
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)	SJRA Data Manager	QA Mgr.	H-GAC Data Mgr & H-GAC QAO
Field QC results attached to data review checklist	SJRA QAO	QA Mgr.	H-GAC Data Mgr
Verified data log submitted		Lab Mgr.	H-GAC Data Mgr
10% of data manually reviewed	SJRA QAO	Lab Mgr. or QA Mgr.	H-GAC Data Mgr & H-GAC QAO

Table D2.1f: Data Review Tasks for San Jacinto River Authority-samples from The Woodlands area and analyzed by Eastex Lab

Data to be Verified	Field Task (SJRA – Woodlands data)	Laboratory Task (Eastex Lab)	Lead Org. QAO or Data Manager Tasks
Sample documentation complete; samples labeled, sites identified	SJRA QAO	Sample Custodian	
Field instrument pre- and post-calibration results within limits	SJRA QAO		H-GAC Data Mgr &/or H-GAC QAO
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*	SJRA QAO		
Standards and reagents traceable	SJRA QAO	Lab QAO	
Chain of custody complete/acceptable	SJRA QAO	Sample Custodian	H-GAC Data Mgr
NELAP Accreditation is current		Lab QAO	
Sample preservation and handling acceptable		Sample Custodian	
Holding times not exceeded	SJRA Data Manager	Lab QAO	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	SJRA QAO	Lab QAO	
Field documentation (e.g., biological, stream habitat) complete	SJRA QAO		
Instrument calibration data complete	SJRA Data Manager	Lab QAO	
Bacteriological records complete		Lab QAO	
QC samples analyzed at required frequency		Lab QAO	H-GAC Data Mgr
QC results meet performance and program specifications		Lab QAO	H-GAC Data Mgr
Analytical sensitivity (Limits of Quantitation/Ambient Water Reporting Limits) consistent with QAPP		Lab QAO	H-GAC Data Mgr
Results, calculations, transcriptions checked		Tech. Dir.	
Laboratory bench-level review performed		Head Technician	
All laboratory samples analyzed for all parameters		Lab QAO	
Corollary data agree		Lab QAO	
Nonconforming activities documented	SJRA QAO	Lab QAO	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	SJRA Data Manager	Lab QAO	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	SJRA Data Manager		H-GAC Data Mgr
Depth reported correctly	SJRA Data Manager		H-GAC Data Mgr
TAG IDs correct			H-GAC Data Mgr
TCEQ Station ID number assigned	SJRA Data Manager		H-GAC Data Mgr
Valid parameter codes	SJRA Data Manager		H-GAC Data Mgr
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			H-GAC Data Mgr
Time based on 24-hour clock	SJRA Data Manager		H-GAC Data Mgr
Absence of transcription error confirmed	SJRA Data Manager	Tech. Dir.	H-GAC Data Mgr
Absence of electronic errors confirmed	SJRA Data Manager	Tech. Dir.	H-GAC Data Mgr
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)	SJRA Data Manager		H-GAC Data Mgr & H-GAC QAO
Field QC results attached to data review checklist	SJRA QAO		H-GAC Data Mgr
Verified data log submitted			H-GAC Data Mgr
10% of data manually reviewed	SJRA QAO	Tech. Dir.	H-GAC Data Mgr & H-GAC QAO

Table D2.1g: Data Review Tasks for Environmental Institute of Houston (EIH) with samples analyzed by Eastex Lab

EIH Data to be Verified	Field Task	Eastex Lab Task	Lead Org. QAO or Data Manager Tasks
Sample documentation complete; samples labeled, sites identified	Field QAO	Sample Custodian	
Field instrument pre- and post-calibration results within limits	Field QAO		H-GAC Data Mgr &/or H-GAC QAO
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*	Field QAO		
Standards and reagents traceable	Field QAO	Lab QAO	
Chain of custody complete/acceptable	Field QAO	Sample Custodian	H-GAC Data Mgr
NELAP Accreditation is current		Lab QAO	
Sample preservation and handling acceptable		Sample Custodian	
Holding times not exceeded	Field QAO & CRP Project Mgr	Lab QAO	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	Field QAO	Lab QAO	
Field documentation (e.g., biological, stream habitat) complete	Field QAO & CRP Project Mgr		
Instrument calibration data complete	Field QAO or sample collector	Lab QAO	
Bacteriological records complete	Field QAO or sample collector	Lab QAO	
QC samples analyzed at required frequency	Field QAO or sample collector	Lab QAO	H-GAC Data Mgr
QC results meet performance and program specifications	Field QAO & CRP Project Mgr	Lab QAO	H-GAC Data Mgr
Analytical sensitivity (Limits of Quantitation/Ambient Water Reporting Limits) consistent with QAPP	Field QAO & CRP Project Mgr	Lab QAO	H-GAC Data Mgr
Results, calculations, transcriptions checked	Field QAO & CRP Project Mgr	Tech. Dir.	
Laboratory bench-level review performed		Head Technician	
All laboratory samples analyzed for all parameters		Lab QAO	
Corollary data agree		Lab QAO	
Nonconforming activities documented	Field QAO	Lab QAO	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	Field QAO & CRP Project Mgr	Lab QAO	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	Field QAO & CRP Project Mgr		H-GAC Data Mgr
Depth reported correctly	Field QAO & CRP Project Mgr		H-GAC Data Mgr
TAG IDs correct			H-GAC Data Mgr
TCEQ Station ID number assigned	Field QAO & CRP Project Mgr		H-GAC Data Mgr
Valid parameter codes			H-GAC Data Mgr
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly			H-GAC Data Mgr
Time based on 24-hour clock	Field QAO & CRP Project Mgr		H-GAC Data Mgr
Absence of transcription error confirmed	Field QAO & CRP Project Mgr	Tech. Dir.	H-GAC Data Mgr
Absence of electronic errors confirmed	Field QAO & CRP Project Mgr	Tech. Dir.	H-GAC Data Mgr
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)	Field QAO & CRP Project Mgr		H-GAC Data Mgr & H-GAC QAO
Field QC results attached to data review checklist	Field QAO & CRP Project Mgr		H-GAC Data Mgr
Verified data log submitted	Field QAO & CRP Project Mgr		H-GAC Data Mgr
10% of data manually reviewed	Field QAO & CRP Project Mgr	Tech. Dir.	H-GAC Data Mgr & H-GAC QAO

Table D2.1h: Data Review Tasks for the Texas Research Institute for Environmental Studies (TRIES)

TRIES Data to be Verified	Field Tasks	Laboratory Tasks - TRIES	Laboratory Tasks - Eastex Lab	Lead Org. QAO or Data Manager Tasks
Sample documentation complete; samples labeled, sites identified	TRIES QAO	Sample Custodian (analysts)	Sample Custodian.	
Field instrument pre- and post-calibration results within limits	TRIES QAO			
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*	TRIES QAO			
Standards and reagents traceable	TRIES QAO	Lab QAO	Lab QAO	
Chain of custody complete/acceptable	TRIES QAO	Sample Custodian (analysts)	Sample Custodian	H-GAC Data Mgr
NELAP Accreditation is current		LAB QAO	Lab QAO	
Sample preservation and handling acceptable	TRIES QAO	Sample Custodian (analysts)	Sample Custodian.	
Holding times not exceeded		Sample Custodian (analysts)	Lab QAO	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	TRIES QAO	Lab QAO	Lab QAO	
Field documentation (e.g., biological, stream habitat) complete	TRIES QAO			
Instrument calibration data complete	TRIES QAO	Lab QAO	Lab QAO	
Bacteriological records complete		Lab QAO	Lab QAO	
QC samples analyzed at required frequency	TRIES QAO	Lab QAO	Lab QAO	H-GAC Data Mgr
QC results meet performance and program specifications		Lab QAO	Lab QAO	H-GAC Data Mgr
Analytical sensitivity (Limits of Quantitation/Ambient Water Reporting Limits) consistent with QAPP		Lab QAO	Lab QAO	H-GAC Data Mgr
Results, calculations, transcriptions checked	TRIES QAO	Analysts/Peer Review	Technical Director	
Laboratory bench-level review performed		Lab QAO	Head Technician	
All laboratory samples analyzed for all parameters		Lab QAO	Lab QAO	
Corollary data agree		Lab QAO	Lab QAO	H-GAC Data Mgr
Nonconforming activities documented	TRIES QAO	Lab QAO	Lab QAO	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	TRIES QAO	Lab QAO	Lab QAO	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	TRIES Data Mgr	Lab QAO		H-GAC Data Mgr
Depth reported correctly	TRIES Data Mgr			H-GAC Data Mgr
TAG IDs correct	TRIES Data Mgr			H-GAC Data Mgr
TCEQ Station ID number assigned	TRIES Data Mgr			H-GAC Data Mgr
Valid parameter codes	TRIES Data Mgr			H-GAC Data Mgr & H-GAC QAO
Codes for submitting entity(ies), collecting entity(ies), and monitoring type(s) used correctly	TRIES Data Mgr			H-GAC Data Mgr
Time based on 24-hour clock	H-GAC Data Mgr	Lab QAO		H-GAC Data Mgr
Absence of transcription error confirmed	TRIES Data Mgr & TRIES QAO	Lab QAO	Technical Director	H-GAC Data Mgr
Absence of electronic errors confirmed	TRIES Data Mgr & TRIES QAO		Technical Director	H-GAC Data Mgr
Sampling and analytical data gaps checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)	TRIES Data Mgr & TRIES QAO			H-GAC Data Mgr & H-GAC QAO
Field QC results attached to data review checklist	TRIES Data Mgr & TRIES QAO			H-GAC Data Mgr
Verified data log submitted	TRIES Data Mgr			H-GAC Data Mgr
10% of data manually reviewed	TRIES Data Mgr & TRIES QAO	Lab QAO	Technical Director	H-GAC Data Mgr & H-GAC QAO

D3 Reconciliation with User Requirements

Data produced in this project, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be analyzed and reconciled with project data quality requirements. Data which do not meet requirements will not be submitted to SWQMIS nor will be considered appropriate for any of the uses noted in Section A5.