Quality Assurance Project Plan
Houston-Galveston Area Council

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 2014 to FY 2015

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

9/25/13

Laurie Curra, Manager — Date
Water Quality Monitoring & Assessment Section

25 Sept 13

Patricia Wise, Work Leader — Date
Clean Rivers Program

25 Sept 13

Allison Fischer — Date
Project Quality Assurance Specialist
CRP

9/25/13

Allison Fischer — Date
Project Manager, CRP
CRP

9/25/13

Nancy Ragland, Team Leader — Date
Data Management and Analysis

Monitoring Division

Sharon R. Coleman — Date
TCEQ Quality Assurance Manager

Daniel R. Burke — Date
Lead CRP Quality Assurance Specialist
Laboratory and Quality Assurance Section

Houston-Galveston Area Council (H-GAC)

Todd Running — Date 9/18/13
H-GAC Project Manager

Jean Wright — Date 9/13/13
H-GAC Quality Assurance Officer

The H-GAC will secure written documentation from each sub-tier project participant (e.g., subcontractors, other units of government) stating the organization's awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or added appendices of this plan. Alternatively, additional signature blocks for sub-tier participants may be added to section A1. Signatures in section A1 will eliminate the need to adherence letters to be maintained. The H-GAC will maintain this documentation as part of the project's quality assurance records, and will ensure the documentation is available for review.

Harris County Pollution Control Services (HCPCS)

Chris Barry 8/1/13
Chris Barry Date
HCPCS CRP Project Manager

Tim Duffey 8-2-13
Tim Duffey Date
Field Quality Assurance Officer

Chris Barry 8/1/13
Chris Barry Date
HCPCS Laboratory Manager

Debra Burney 8/2/13
Debra Burney Date
Laboratory Quality Assurance Officer

City of Houston, Health and Human Services (HHS)

8/8/13

Arturo Blanco Date
HHS CRP Project Manager

8/8/13

Lisa Groves Date
HHS Field Quality Assurance Officer

8/12/2013

Dr. Odatt Rajan Date
HHS CRP Laboratory Director

8/13/13

Cyndie Boulé Date
HHS Laboratory Quality Assurance Officer

8/13/13 (for Emina Marjanovich)

Emina Marjanovich Date
HHS Lab Inorganic Chemistry Section Technical Supervisor

8/13/13

Linda Holman Date
HHS lab Microbiology Section Technical Supervisor

City of Houston, Department of Water Quality Control (WQC)

8-1-2013

Fabian Heaney — Date
WQC Laboratory Director

8/1/2013

Desta Takie — Date
WQC Field Quality Assurance Officer

8/1/2013

Ying Wei — Date
WQC CRP Project Manager & Laboratory Manager

8/1/13

Shubha Thakur — Date
WQC Laboratory Quality Assurance Officer

San Jacinto River Authority (SJRA)

Randy Acreman 8-1-13

Randy Acreman — Date
SJRA Project Manager

Randy Acreman 8-1-13

Randy Acreman — Date
Field Quality Assurance Officer

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

Dr. George Guillen	8/5/13 Date	Jenny Oakley	8/5/13 Date
EIH CRP Project Manager		EIH Field Quality Assurance Officer	

Eastex Environmental Laboratory

Pam Hickman — Date 8-2-13
Eastex Lab Manager

Daniel Bowen — Date 8/2/13
Eastex Lab Quality Assurance Officer

Todd Running — Date: 9/18/13
H-GAC Project Manager

Jean Wright — Date: 9/13/13
H-GAC Quality Assurance Officer

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Field Quality Assurance Officer

8/1/13
Chris Barry — Date
HCPCS Laboratory Manager

8/8/13
Debra Burney — Date
Laboratory Quality Assurance Officer

City of Houston, Health and Human Services (HHS)

Arturo Blanco 8/8/13
Arturo Blanco Date
HHS CRP Project Manager

Lisa Groves 8/8/13
Lisa Groves Date
HHS Field Quality Assurance Officer

Odatt Rajan 8/12/2013
Dr. Odatt Rajan Date
HHS CRP Laboratory Director

Cyndie Boulé 8/13/13
Cyndie Boulé Date
HHS Laboratory Quality Assurance Officer

Cyndie Boulé 8/13/13 (for Emina Marjanovich)
Emina Marjanovich Date
HHS Lab Inorganic Chemistry Section Technical Supervisor

Linda Holman 8/13/13
Linda Holman Date
HHS lab Microbiology Section Technical Supervisor

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WQC CRP Project Manager & Laboratory Manager

8/1/13
Shubha Thakur — Date
WQC Laboratory Quality Assurance Officer

San Jacinto River Authority (SJRA)

Randy Acreman 8-1-13

Randy Acreman Date
SJRA Project Manager

Randy Acreman 8-1-13

Randy Acreman Date
Field Quality Assurance Officer

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

Dr. George Guillen	8/5/13	Jenny Oakley	8/6/13
Date		Date	
EIH CRP Project Manager		EIH Field Quality Assurance Officer	

Eastex Environmental Laboratory

Pam Hickman
Eastex Lab Manager

Date 8-2-13

Daniel Bowen
Eastex Lab Quality Assurance Officer

Date 8/2/13

A2 Table of Contents

List of Acronyms

AWRL	Ambient Water Reporting Limit
BMP	Best Management Practices
CAP	Corrective Action Plan
COC	Chain of Custody
CRP	Clean Rivers Program
DMRG	Surface Water Quality Monitoring Data Management Reference Guide, January 2012, or most recent version
DM&A	Data Management and Analysis
Eastex	Eastex Environmental Laboratory
EIH	Environmental Institute of Houston – University of Houston, Clear Lake
EPA	United States Environmental Protection Agency
FWS	Flood Warning System
FY	Fiscal Year
GIS	Geographical Information System
GPS	Global Positioning System
H-GAC	Houston-Galveston Area Council
HCFCD	Harris County Flood Control District
HCPCS	Harris County Pollution Control Services
HHS	City of Houston, Health & Human Services
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
MPS	Measurement Performance Specifications
NCDC	National Climatic Center
NELAP	National Environmental Lab Accreditation Program
NOAA	National Oceanic and Atmospheric Administration
NWIS	National Water Information System
PWE	City of Houston, Public Works Engineering
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
RMW	Regional Monitoring Workgroup
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
TSWQS	Texas Surface Water Quality Standards
UHCL	University of Houston – Clear Lake
VOA	Volatile Organic Analytes
WIMS	Water Information Management System
WQC	City of Houston, Water Quality Control Division

A3 Distribution List

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

Allison Fischer, Project Manager
Clean Rivers Program
MC-234
(512) 239-2574

Daniel R. Burke
Lead CRP Quality Assurance Specialist
MC-165
(512) 239-0011

Nancy Ragland
Team Leader, Data Management and Analysis
MC-234
(512) 239-6546

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 Houston-Galveston Area Council (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, other units of government. 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 will 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, Health & Human Services & Laboratory
- City of Houston, Water Quality Control & Laboratory
- Environmental Institute of Houston, University of Houston-Clear Lake
- San Jacinto River Authority
- Eastex Environmental Laboratory

A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

TCEQ

Patricia Wise
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, reviews, 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.

Daniel R. Burke
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.

Allison Fischer
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.

Nancy Ragland
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, including coordination and tracking of CRP data sets from initial submittal through CRP Project Manager review and approval; ensuring that data is reported following

instructions in the Surface Water Quality Monitoring Data Management Reference Guide, January 2012, or most current version (DMRG); running automated data validation checks in Surface Water Quality Monitoring Information System (SWQMIS) and coordinating data verification and error correction with CRP Project Managers; generating SWQMIS summary reports to assist CRP Project Managers' data review; identifying data anomalies and inconsistencies; providing training and guidance to CRP and Planning Agencies on technical data issues to ensure that data are submitted according to documented procedures; reviewing QAPPs for valid stream monitoring stations, validity of parameter codes, submitting entity code(s), collecting entity code(s), and monitoring type code(s); developing and maintaining data management-related standard operating procedures (SOPs) for CRP data management; and coordinating and processing data correction requests.

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 is reported following instructions in the DMRG. Runs automated data validation checks in 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).

Allison Fischer
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 and Field Supervisor
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 basin planning agency participants and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures CRP project managers and/or QA Specialists are notified of deficiencies and corrective actions, and that issues are resolved. Responsible for supervising sample collection, processing, handling, holding and reporting activities to ensure compliance with monitoring requirements. Responsible for validating that data collected are acceptable for reporting to the TCEQ.

Jean Wright
H-GAC Quality Assurance Officer
Responsible for coordinating the implementation of the QA program. Responsible for writing and maintaining the QAPP and monitoring its implementation. Responsible for maintaining records of QAPP distribution, including appendices and amendments. Responsible for maintaining written records of sub-tier commitment to requirements specified in this QAPP. 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 project participants 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 data are properly reviewed and verified. Responsible for the transfer of basin quality-assured water quality data to the TCEQ in a format compatible with SWQMIS. Maintains quality-assured data on the H-GAC internet sites.

Eastex Environmental Laboratory (Eastex)

Pam Hickman
Laboratory Director - Eastex Environmental Laboratory (Contract Lab)
Responsible for producing quality analytical data for samples collected and submitted by H-GAC. Maintains verification of procedures establishing the level of quality. Responsible for sending data and COC forms to H-GAC within time specified in contract.

Daniel Bowen
Eastex Lab QAO
Checks training, competency, and re-training of technicians. Performs verification and validation procedures to confirm quality data is issued to clients. Performs other QA/QC duties and checks associated with lab activities. Resolves out-of-control issues. Conducts internal lab audits.

Harris County Pollution Control Services (HCPCS)

Chris Barry
CRP Project Manager / Manager-Laboratory Services
Responsible for project oversight, and maintaining communication with H-GAC Project Manager, and between field and laboratory personnel. Responsible for producing quality analytical data and maintaining verification of procedures establishing the level of quality.

Debra Burney
Lab Quality Assurance Officer (QAO) / CRP QAO / CRP Data Manager
Responsible for monitoring the activities of HCPCSPC field and 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.

Tim Duffey
Field Supervisor & Field QAO
Responsible for supervising the collection, preservation, handling and delivery of samples. Responsible for ensuring that field measurements, sample custody, and documentation follow prescribed procedures. Trains all field monitoring personnel.

City of Houston Health and Human Services (HHS)

Arturo Blanco
CRP Project Manager
Responsible for meeting the requirements of the contract between H-GAC and the City of Houston Health and Human Services Department, ensuring project oversight consistent with QAPP requirements, and communicating project status to H-GAC Project Manager. Additional responsibilities include ensuring the H-GAC CRP project manager and/or the H-GAC QAO are notified of circumstances that may adversely affect quality of data derived from collection and analysis of samples.

Lisa Groves
CRP QAO and Field Supervisor for Ambient Waters
Responsible for supervising sample collection, processing, handling, holding and reporting activities to ensure compliance with monitoring requirements. Responsible for notifying the Project Manager and Quality Assurance Officer of circumstances that may adversely affect the quality of data. Responsible for working with Project manager to ensure coordination of activities. Reviews and verifies data prior to submission to H-GAC. Trains all HHS monitoring personnel.

Lisa Leija
CRP Data Manager
Responsible for data entry of all field and laboratory data. Responsible for reviewing for transcription inaccuracies. Reviews data for outliers and verifies reasonableness. Formats and delivers data in electronic format to H-GAC Data Manager. Responsible for sending hard copies of field data sheets and COC forms to H-GAC CRP Data Manager.

City Of Houston - Health and Human Services (HHS) Laboratory

Dr. Odatt Rajan
CRP Lab Director
Responsible for meeting the requirements of the contract between H-GAC and the City of Houston Health and Human Services Holcombe Laboratory, ensures implementation is consistent with CRP QAPP requirements, QAPP amendments and appendices, and communicates project status to H-GAC Project Manager. Ensures lab's QMP and required monitoring systems audits are conducted to ensure QAPPs are followed and that projects are producing data of known quality. Ensures H-GAC CRP project manager and/or QA Specialist are notified of circumstances which may adversely affect quality of data derived from analysis of samples. Responsible for validating that all data collected meet the data quality objectives of the project and are suitable for reporting to the TCEQ. Ensures lab personnel are involved in coordinating basin planning activities and work with other basin partners as needed.

Emina Marjanovich
Holcombe Laboratory Inorganic Chemistry Section Technical Supervisor
Responsible for inorganic chemistry laboratory testing of samples from CRP as per CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Ensures NELAP certification in CRP parameters and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures CRP project managers, laboratory director, and/or QA Specialists are notified of circumstances which may adversely affect quality of data derived from collection and analysis of samples. Responsible for validating that all data collected meet the data quality objectives of the project and are suitable for reporting to the TCEQ.

Linda Holman
Holcombe Laboratory Microbiology Section Technical Supervisor
Responsible for microbiology laboratory testing of samples from CRP as per CRP requirements in contracts, QAPPs, and QAPP amendments and appendices. Ensures NELAP certification in CRP parameters and that projects are producing data of known quality. Ensures that subcontractors are qualified to perform contracted work. Ensures CRP project managers, laboratory director, and/or QA Specialists are notified of circumstances which may adversely affect quality of data derived from collection and analysis of samples. Responsible for validating that all data collected meet the data quality objectives of the project and are suitable for reporting to the TCEQ.

Cyndie Boule
Holcombe Laboratory Quality Assurance Officer
Responsible for ensuring the quality system is implemented and followed. Develops, facilitates, and conducts laboratory quality assurance audits and notifies laboratory management of deficiencies (or opportunities for continuous improvement) and monitors corrective actions. Provides QC samples as per requirements of QAPP. Responsible for keeping the laboratory's *Quality Assurance Manual* current. Responsible for ensuring initial and continuing training as well as the demonstrations of capability meet NELAP acceptance criteria. Additional responsibilities include identifying, receiving, and maintaining project laboratory quality assurance records, notifying the laboratory Director, the

Project Manager, and H-GAC's Project Manager of circumstances that may adversely affect the quality of data, and validating data prior to the submission of laboratory data to H-GAC.

City of Houston – Water Quality Control Division (WQC)

Fabian Heaney
Laboratory Director
Responsible for producing quality analytical data and maintaining verification of procedures for establishing the level of quality. This position supervises, manages, and provides guidance to administrative and operational support staff regarding laboratory operations, practices/policies, quality assurance, safety/security/training, information technology, legislation/regulation, and procurement/billing functions to ensure high-quality internal and external customer service. Oversees planning, development, and supervision of operational and administrative programs, evaluates, and makes improvements to operational procedures, policies, and services provided to internal and external stakeholders/customers.

Ying Wei
Laboratory Manager / CRP Project Manager
Responsible for the day-to-day operations of the lab and supervision of lab personnel to produce quality analytical data. Maintains verification of procedures for establishing the level of quality. Ensures staff are properly trained according to prescribed procedures and laboratory techniques. Develops and revises standard operating procedures, techniques, polices and reports. Responsible for coordinating CRP activities with H-GAC Project Manager and QA Officer.

Shubha Thakur
Lab QAO / CRP QAO
Checks training, competency, and re-training of technicians. Performs verification and validation procedures to confirm quality data is issued to clients. Performs other QA/QC duties and checks associated with lab activities. Resolves out-of-control issues. Conducts internal lab audits. Provides QC samples as per requirements of QAPP. Responsible for keeping the laboratory's *Quality Assurance Manual* current. Responsible for ensuring initial and continuing training as well as the demonstrations of capability meet NELAP acceptance criteria.

Wenli Huang
CRP Data Manager
Responsible for ensuring all data and associated reports meet the requirements of the QAPP by managing, reviewing, verifying, and submitting electronic data to H-GAC's CRP Data Manager. This includes comparing hard copy and electronic data files, and chain-of-custody forms.

Joey Eickhoff
Field Supervisor
Responsible for supervising the collection, field preservation, handling and delivery of samples to the laboratory. Responsible for ensuring that equipment calibration, field measurements, sample custody, and documentation follow prescribed procedures in the QAPP. Trains all WQC monitoring personnel.

Janice Tyler
CRP Field Data Manager
Responsible for ensuring all data and associated reports meet the requirements of the QAPP by managing, reviewing, verifying, and submitting electronic data to H-GAC's CRP data Manager. This includes comparing hard copy and electronic data files.

Desta Takie
CRP Field QAO
Performs all associated QA/QC checks on the data and completes Data Review Check-list for accuracy, reasonableness, and completeness. Submits hard copies of field sheets, chain-of custody reports and Data review Checklist to HGAC.

San Jacinto River Authority (SJRA)

Randy Acreman
CRP Project Manager / Field Supervisor / Quality Assurance Officer
Responsible for project oversight and maintaining communication with H-GAC Project Manager for all samples collected from both Lake Conroe and the Woodlands area. Ensures that all program activities are conducted in accordance with established SWQM procedures, methods and protocols, as well as requirements of the CRP QAPP. Responsible for ensuring that all data and associated reports meet requirements of the QAPP. Reviews data, electronic data files, chain-of-custody forms, and Data Review Check-lists for accuracy, reasonableness, and completeness. Performs QA/QC checks on data. Reviews the Data Review Check-list for accuracy. Ensures all monitoring personnel are properly trained. Responsible for ensuring that proper methods and protocols are followed during sample collection. Responsible for scheduling and ensuring all field samples and parameters are collected. Maintains and administers QA/QC checks on field equipment. Ensures water samples are transported and relinquishes to City of Houston laboratory staff or contract lab with required COC in timely manner.

Shane Simpson
CRP Data Manager
Enters field data into an electronic data file and reviews data for accuracy and reasonableness. Enters laboratory data into an electronic data file and reviews all data for accuracy, reasonableness, completeness, and compliance with the QAPP. Responsible for reviewing and verifying data with field operations and with contract laboratory personnel. Submits electronic data and supporting documents (field data sheets, chain-of-custody reports, and Data Review Check-lists) to the Project Manager/QAO for review. Submits data and supporting documents to H-GAC. Completes and submits Data Review Checklists to H-GAC Data Manager with each set of data submitted to H-GAC.

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

Dr. George Guillen
EIH CRP Project Manager, Field Supervisor & CRP Quality Assurance Officer
Responsible for meeting the requirements of the contract between H-GAC and the Environmental Institute of Houston (EIH) by implementing CRP requirements, the H-GAC QAPP, and QAPP amendments and appendices. Ensures project oversight is consistent with QAPP requirements and communicates project status to H-GAC Project Manager. Notifies H-GAC Project Manager and/or the H-GAC QAO of circumstances that may adversely affect quality of data derived from collection and analysis of samples. Helps coordinates basin planning activities and works with basin partners. Responsible for ensuring that proper methods and protocols are followed during sample collection and that field data are properly reviewed, verified and submitted to H-GAC in a timely manner.

Jenny Oakley
CRP Data Manager & Field QAO
Responsible for entering data in spreadsheets, reviewing and verifying data with field operations and with contract laboratory personnel. Performs required QA/QC checks on data and ensures results are acceptable for submission to H-GAC. Trains all field monitoring personnel and is responsible for ensuring that proper methods and protocols are followed during sample collection.

Project Organization Chart

Figure A4.1. Organization Chart - Lines of Communication for H-GAC Region

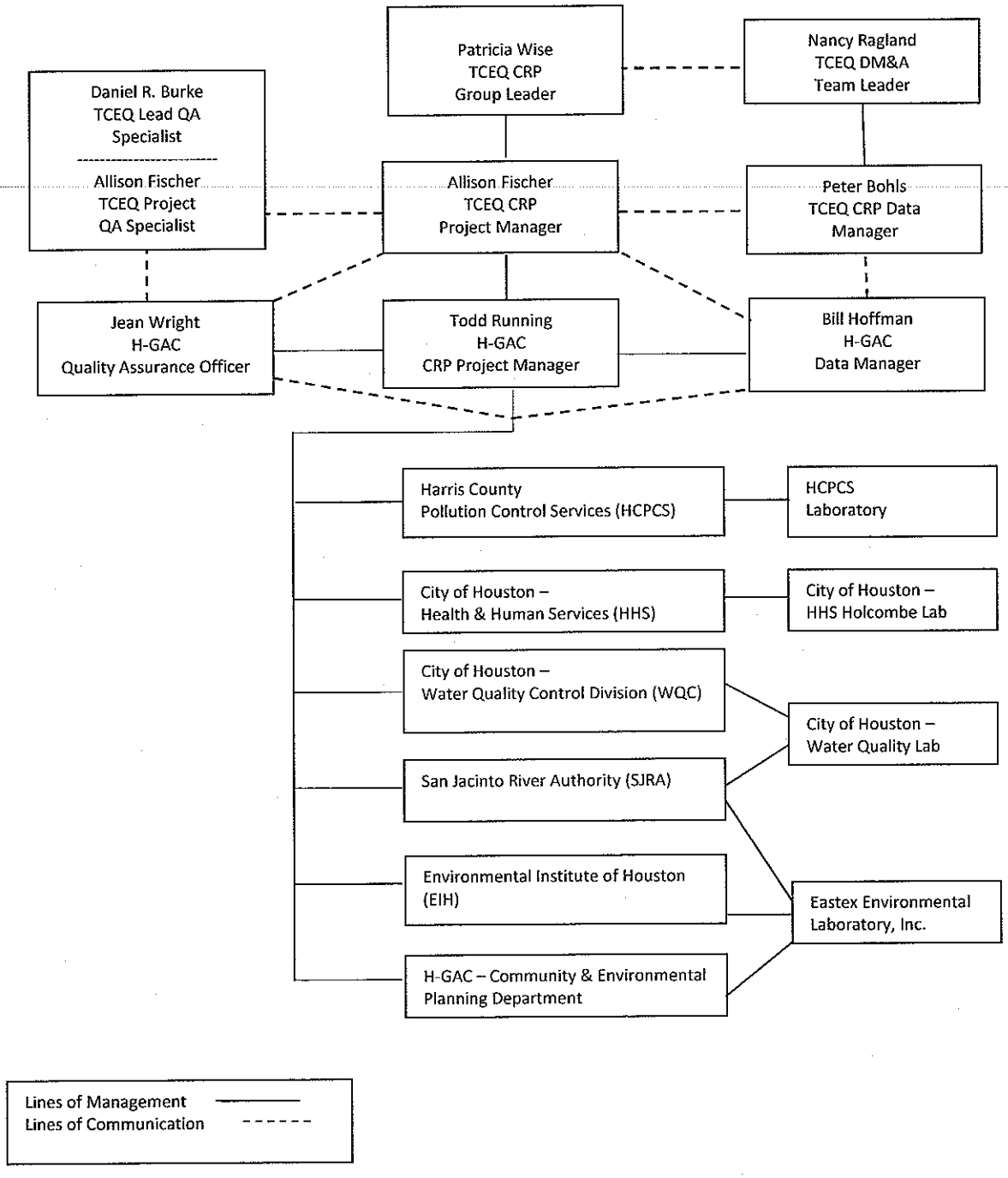


Figure A4.1a. The Houston-Galveston Area Council (H-GAC) CRP Organizational Chart.

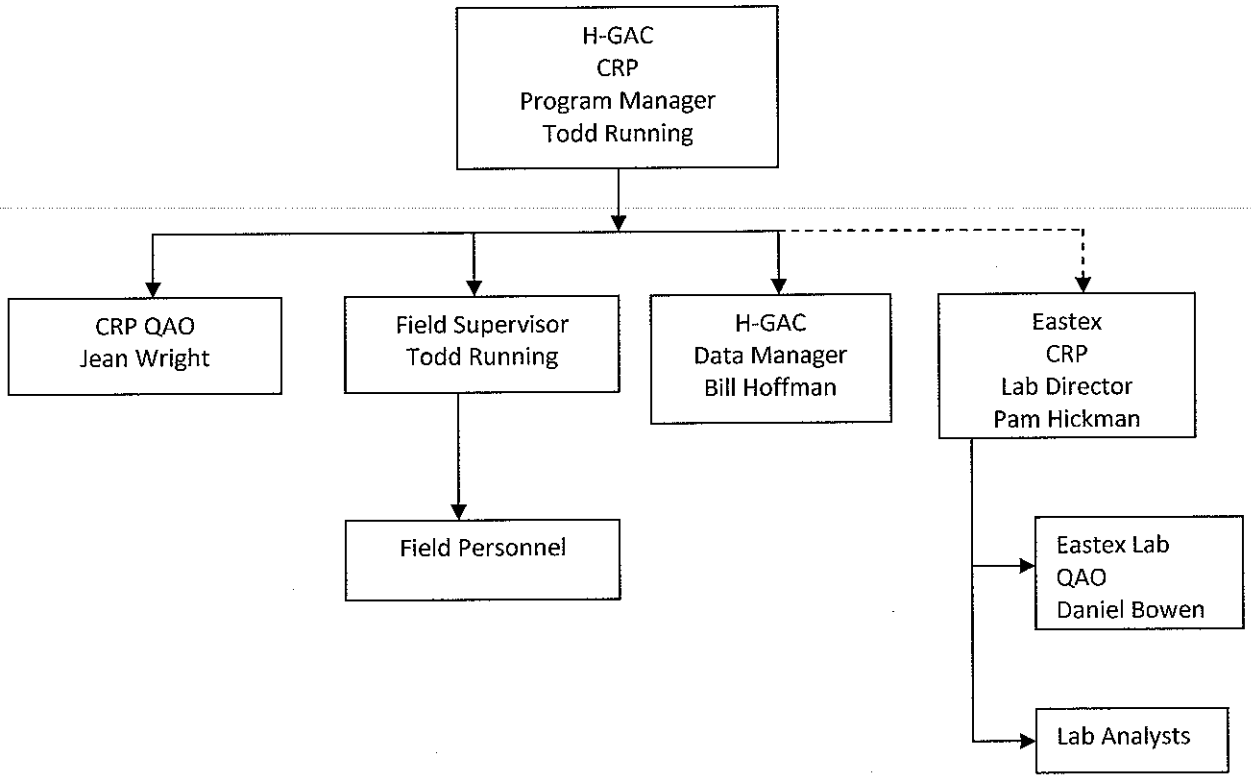


Figure A4.1b. The Harris County Pollution Control Services (HCPCS) CRP Organizational Chart.

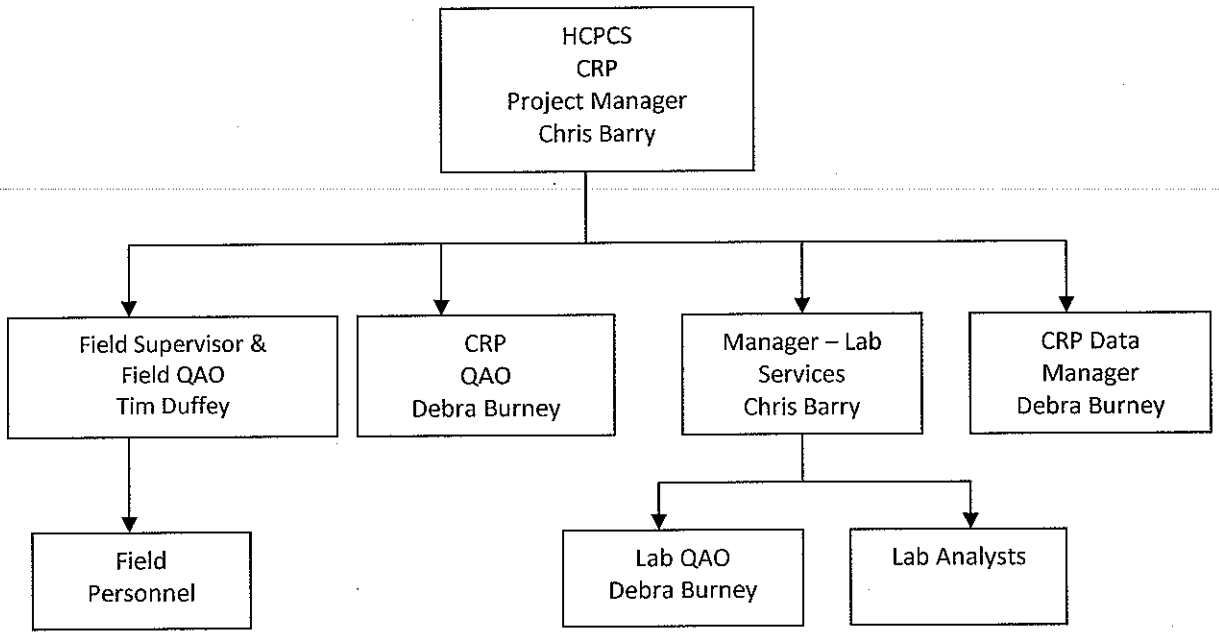


Figure A4.1c. The City of Houston, Health & Human Services (HHS) CRP Organizational Chart.

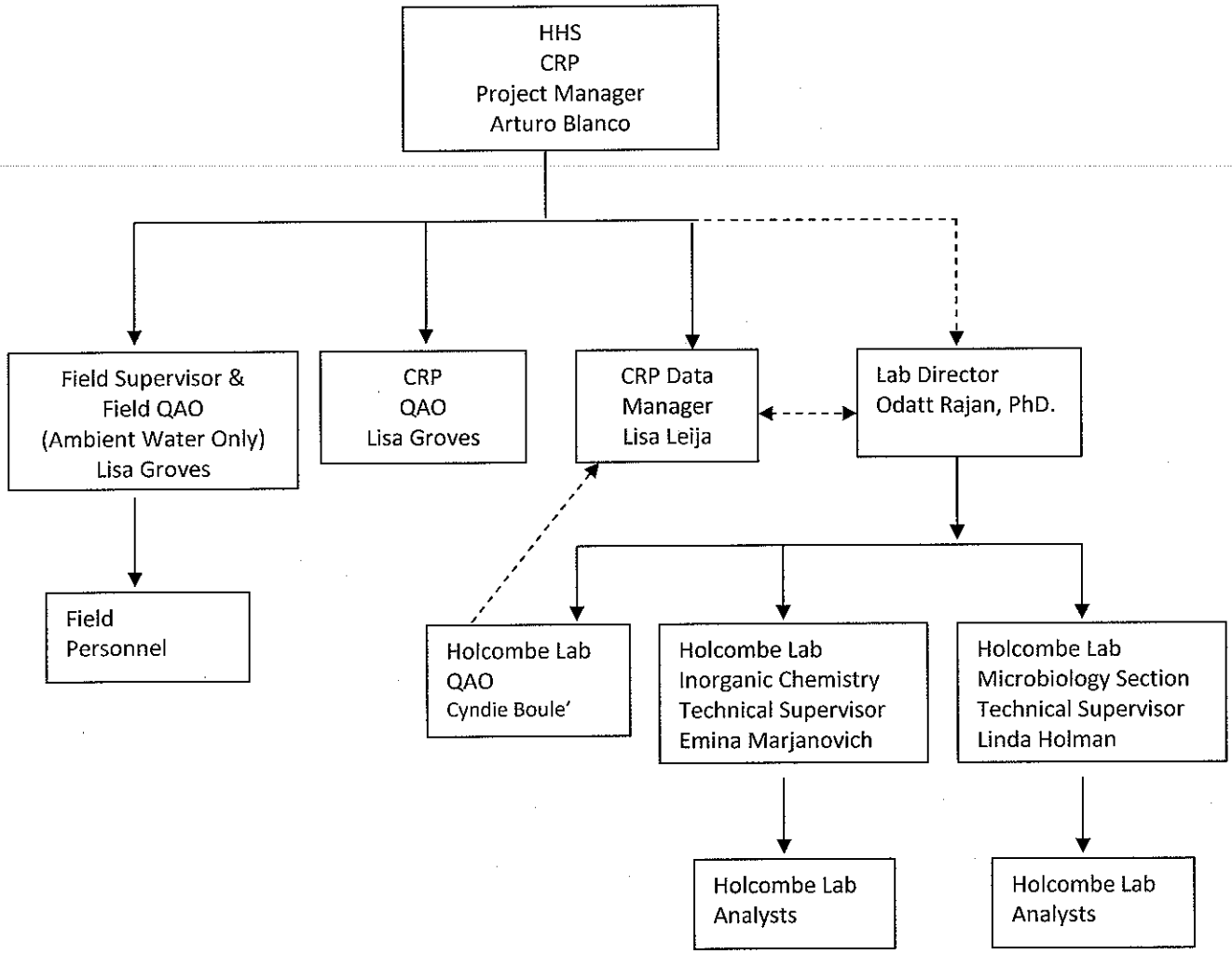


Figure A4.1d. The City of Houston, Water Quality Control (WQC) CRP Organizational Chart.

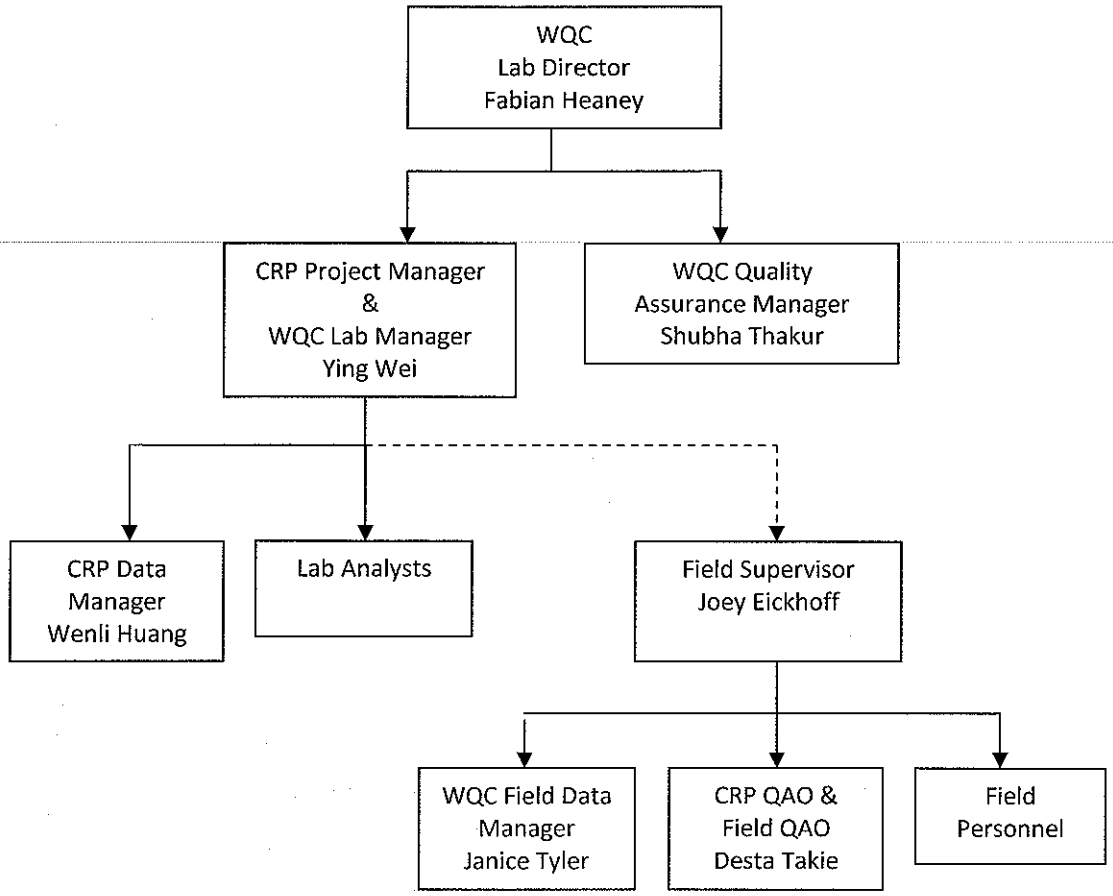


Figure A4.1e. San Jacinto River Authority (SJRA) CRP Organizational Chart.

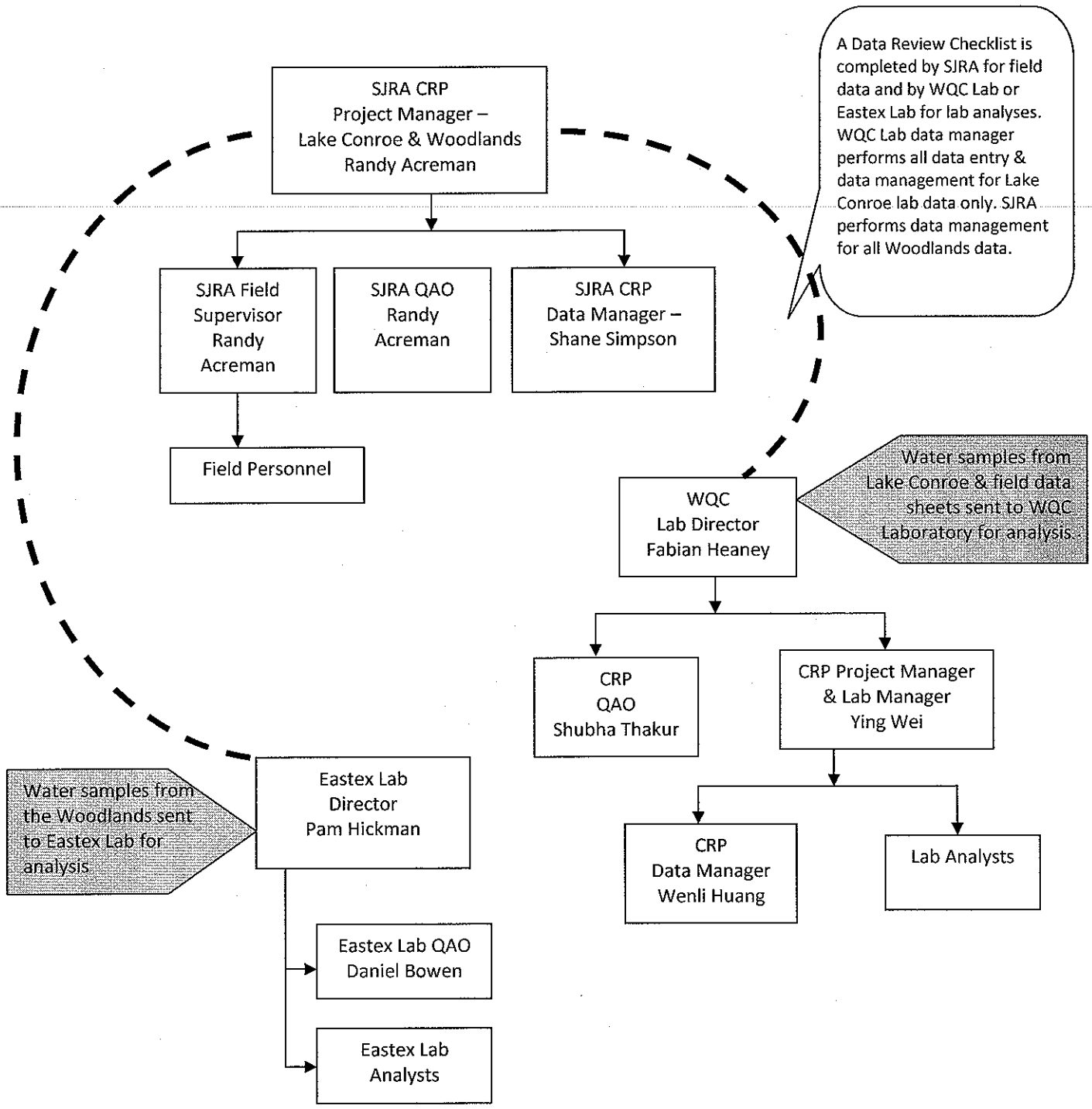
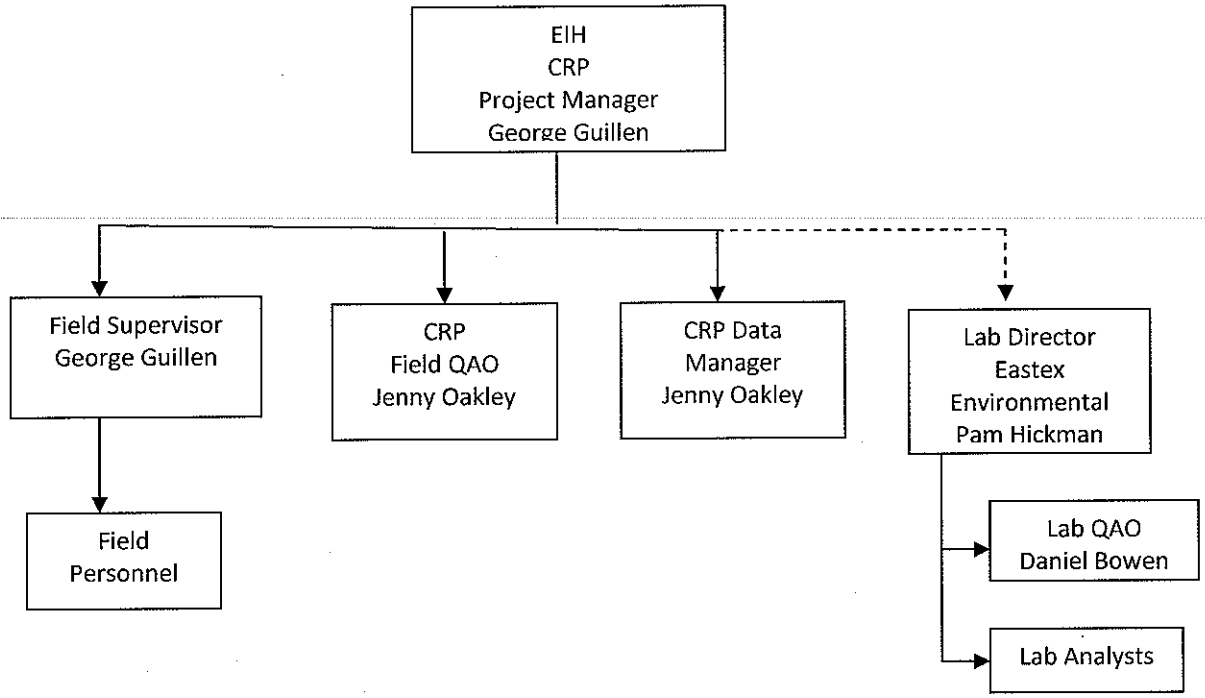


Figure A4.1f. The Environmental Institute of Houston (EIH) at the University of Houston - Clear Lake (UHCL) CRP Organizational Chart.



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. The QAPP was developed and will be implemented in accordance with provisions of the TCEQ Quality Management Plan, January 2013 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 scientifically valid and legally defensible. 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) development, establishing water quality standards, making permit decisions and used by other programs 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 2014 -2015.*

The H-GAC is the Clean Rivers Program lead agency for 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 exists and is leading the monitoring effort for its basin as intended by the Texas Legislature through the Clean Rivers Act. In other 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.

The four basins under H-GAC's oversight comprise a truly diverse region. The basins encompass three major Eco-regions (South Central Plains, Gulf Coast Plains and Western Gulf Coastal Plains) and are home to over 4 million people. Economic activity includes petroleum refining, petrochemical production, manufacturing, transportation, commercial fishing, water-oriented recreation, agriculture (forestry, farming and ranching), aerospace and government. This region has the largest concentration of permitted wastewater discharges (municipal and industrial) in Texas. Most of the outfalls discharge to tributaries that eventually flow into Galveston Bay via the San Jacinto River and Houston Ship Channel. Galveston Bay is an estuary of state and national importance. In fact, three of

the four basins overseen by H-GAC drain into or are part of the Galveston Bay system. The San Jacinto River Basin contains the most highly urbanized and industrialized portion of the Houston metropolitan area.

The 2012 State of Texas Integrated Report (which includes a List of Impaired Water Bodies and is required under Section 303d of the Clean Water Act) identifies 43 of the 51 classified segments located within H-GAC's four Clean Rivers Program basins as having an impairment(s) or water quality concern(s). This includes 1 segment in the Trinity-San Jacinto Coastal Basin, 15 segments in the San Jacinto River Basin (plus 54 sub-segments), 7 segments in the San Jacinto-Brazos Coastal Basin (plus 20 sub-segments), and 4 segments in the Brazos-Colorado Coastal Basin (plus 3 sub-segments), plus 16 bay/estuary segments (14 sub-segments) which are in H-GAC's monitoring area. Among the segments listed in H-GAC's basins, the identified water quality impairments are related to the following factors (with some segments listed for several reasons): elevated bacteria levels which could pose a health risk to people engaged in contact recreation activities, fish/shellfish consumption advisories issued by the Texas Department of Health with most related to dioxin and PCB concerns in the Houston Ship Channel vicinity, low dissolved oxygen, and elevated bacteria levels which trigger shellfish harvesting closures/limitations in shellfish harvesting areas.

In addition to promoting water quality data collection, the Clean Rivers Program aims to develop and maintain "a basin-wide 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 the 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 not only is used by their individual agencies, but will be shared among the other participants through a data clearinghouse maintained by H-GAC. The agencies that make up the regional monitoring workgroup (RMW) include the Texas Commission on Environmental Quality – Region 12, **Harris County Pollution Control Services, City of Houston Health and Human Services, City of Houston Water Quality Control, San Jacinto River Authority, the Environmental Institute of Houston (EIH) – University of Houston Clear Lake (UHCL),** Harris County Flood Control District (HCFCD), the City of Houston Public Works and Engineering (PWE), and the **Houston-Galveston Area Council (H-GAC).** Other agencies and organizations which are invited to participate or are active on the steering committee include the United States Environmental Protection Agency - Houston Lab, the United States Geological Survey, Texas Parks and Wildlife Coastal Fisheries, Texas Parks and Wildlife Inland Fisheries, National Oceanic and Atmospheric Administration/National Marine Fisheries Service, Texas Water Development Board, Texas State Soil and Water Conservation Board, United States Fish and Wildlife, and Texas Department of State Health Services.

Note: Only the agencies listed in **Bold** type above fall under this QAPP.

H-GAC's Regional Monitoring Workgroup agreed on the following six goals for the regional water quality monitoring program:

1. Expand the water quality information base to better assess the condition of water resources in the region, to determine the need for water quality management measures, and to support basic water quality management functions.

2. Generate valid, representative environmental data to accurately assess water quality conditions in the region and to support effective water quality decision-making.

3. Minimize duplication of effort and maximize coordination to make optimal use of the limited resources devoted to water quality monitoring in the region.

4. Enhance water quality monitoring and data management capabilities within the region to obtain more and better water quality information locally and to improve water quality assessment and management efforts at the regional level.

5. Make water quality data collected in the region more usable, shareable and accessible to public agencies, private firms and organizations, and the public.

6. Advocate the importance of stable, long-term monitoring to water quality management efforts in the region.

Underlying these goals and the entire planning process are several significant themes:

- a regional monitoring approach will build on and complement existing monitoring programs while still supporting the specific monitoring mandates of the various agencies;
- implementation of the Clean Rivers Program regional monitoring plan will also accomplish elements of the *Regional Monitoring Program for the Galveston Bay Plan*;
- a regional strategy will enable Clean Rivers Program monitoring funds to be leveraged with existing local resources;
- a regional QAPP will ensure data of defined quality for use by others, which is the motivation for agencies to coordinate their monitoring and then share the resulting data;
- the participating agencies will rely on H-GAC to serve as a regional clearinghouse for the efficient transfer, exchange, centralized access, and archiving of water quality data; and
- through the Clean Rivers Program (CRP), the various agencies can communicate to policymakers, basin interests, and the public the importance of systematic, long-term water quality monitoring and the status of existing monitoring efforts in the region.

The coordinated program (the agencies previously noted in **bold** font) routinely collects surface water quality data from nearly 300 sites throughout the region. Sampling includes collection of physicochemical, bacteriological, biological 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 39 classified stream, reservoir and bay segments to monitor for the attainment of uses and numerical criteria. Unclassified water bodies are also monitored in response to perceived risk for pollution and/or to define water quality. A map showing the locations of all fixed monitoring locations are included in Appendix C.

Beginning in July 2008, all laboratories working with the Clean Rivers Program began reporting data which was produced under NELAP certification. H-GAC continues its leadership role in coordinating efforts to make sure all the laboratories that perform analyses on CRP samples continue to be NELAP certified (National Environmental Laboratory Accreditation Program). H-GAC funds the annual renewal of certifications and provides the proficiency samples to 3 partner laboratories.

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 which H-GAC is pursuing 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 regional Quality Assurance Project Plan (QAPP) is the mechanism for bringing this data into the statewide water quality database (SWQMIS). 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.

The local agencies involved in this regional monitoring effort are: the Harris County Pollution Control Services, the City of Houston Department of Health and Human Services, the City of Houston Water Quality Control Laboratory, the San Jacinto River Authority, the Environmental Institute of Houston at UHCL, and the Houston-Galveston Area Council. The Harris County Flood Control District and the City of Houston Public Works and Engineering conducted routine monitoring in previous years but in this QAPP, their efforts have been redirected to conducting a special study related to bacteria. This special project will be addressed in an appendix under a separate QAPP. These organizations have a combined total of approximately 300 monitoring sites throughout the region. Each of the agencies' monitoring activities will be coordinated through the RMW. 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 forms respectively. A brief description of each partners program follows.

> **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. 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 - Department of Health and Human Services 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 nine times per site per fiscal year.

City of Houston Water Quality Control Division 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 Water Quality Control 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 WQC Lab for analysis. Samples are collected on a monthly basis. Field data is submitted to H-GAC on a monthly basis. Lab data from Lake Conroe is submitted to H-GAC on a quarterly basis directly from WQC Lab.

SJRA also collects routine samples to establish baseline surface water quality information for Lake Woodlands and Panther Branch – a tributary 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. A few but not all of the TSWQS metals-in-water are collected and analyzed twice a year to look for changes over time. Data is submitted to H-GAC on a quarterly basis.

Environmental Institute of Houston was contracted by H-GAC to monitor surface water quality at more than 50 locations in the San Jacinto-Brazos Coastal Basin. There are no local cities or agencies able to voluntarily monitor the waterways in those areas. Data is collected for the Clean Rivers Program on a quarterly basis for a total of 4 events at each site per year.

Houston-Galveston Area Council began collecting quarterly surface water quality monitoring samples at 30 locations beginning in September 2007. Today, the number has increased to 33 monitoring sites. There are no local agencies available or willing to collect samples in the areas being targeted so H-GAC established its own monitoring program. Special studies were conducted in the past which indicate the areas are under pressure from 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. While Ortho-P is no longer a preferred parameter for TCEQ, H-GAC will continue to collect Ortho-P within the San Bernard River and Cedar Bayou watersheds until the monitoring efforts associated with those two watershed protection plan projects is completed. By keeping this one parameter within the CRP monitoring efforts, duplication of effort is minimized and sampling costs are reduced.

Routine monitoring is scheduled at varying frequencies, which are determined by the parameters of concern for individual streams and/or proximity to a monitoring agency's field office and lab. Water bodies are also selected for baseline monitoring if there is a 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 the H-GAC QAPP and the most current versions of TCEQ's *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring (RG-415)* and the TCEQ's *Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data 2007 (RG-416).*

24-Hour Dissolved Oxygen (DO) monitoring by the Houston-Galveston Area Council.
Numerous segment and sub-segments in the 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 segments which have been listed in the 303(d) List as being impaired or having concerns. Additional data is needed to determine whether these segment and/or unclassified segments are actually impaired. H-GAC will conduct six-eight 24-hour DO monitoring events on each of these water bodies throughout a two year period. All data collected and summarized will be submitted to the TCEQ for inclusion in SWQMIS.

The sites are located on segments/unclassified segments:

- 0902 – Cedar Bayou Above Tidal at Hwy 90 northeast of Crosby, TX (site 11120)
- 0902 – Cedar Bayou Above Tidal at FM 1960, east of Lake Houston (site 11123)
- 1008A – Mill Creek at Hardin Store Road north of Tomball (Spring Creek tributary) (site 20461)
- 1101A – Magnolia Creek approximately 600 meters upstream of FM518, League City, 30 meters upstream of WWTP permit WQ0010568-003 (site 16611)
- 1101E – Unnamed tributary (Newport Ditch) of Clear Creek tidal at FM518 west of I-45 between Williamsport St. and Ellis Landing (site 18818)
- 1302B – West Bernard Creek at County Road 225 east of Hungerford (site 20721)

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 Basin Planning Agency will submit a completed QAPP Amendment document, including a justification of the amendment, a table of changes, and all pages, sections or 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 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 has occurs after the execution of this QAPP should 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. The H-GAC will secure written documentation from each sub-tier project participant (e.g., subcontractors, other units of government) 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 Basin QAPP where appropriate. In some circumstances, special project appendices will be written in a 'stand-alone' format. The format will be discussed and determined during the project planning phase. 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 other TCEQ personnel, as appropriate. Copies of approved QAPPs appendices will be distributed by the H-GAC to project participants before data collection activities commence. The H-GAC will secure written documentation from each sub-tier project participant (e.g., subcontractors, other units of government) stating the organization's awareness of and commitment to requirements contained in each special project appendix to the QAPP unless the same project participants sign the QAPP appendix or amendment. 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 2012 Guidance for Assessing and Reporting Surface Water Quality in Texas, or the most recent version, which is located at http://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/12twqi/2012_guidance.pdf.

These water quality data, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

Systematic watershed monitoring is defined by sampling that is planned for a short duration (1 to 2 years) and is designed to: screen waters that would not normally be included in the routine monitoring program, monitor at sites to check the water quality situation, and investigate areas of potential concern. Due to the limitations regarding these data (e.g., not temporally representative, limited number of samples, biological sampling does not meet the specimen vouchering requirements), the data will be used to determine whether any locations have values exceeding the TCEQ's water quality criteria and/or screening levels (or in some cases values elevated above normal). The H-GAC will use this information to determine future monitoring priorities. These water quality data and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be subsequently reconciled for use and assessed by the TCEQ.

The measurement performance specifications to support the project purpose for a minimum data set are specified in Appendix A: Table A7.1 and in the text following. The tables have been modified to reflect actual parameters, methods, etc. employed by H-GAC and its local partners. In a few cases alternative methods other than those listed in the shell table have been used. Procedures for laboratory analysis are in accordance with the most recently published edition of Standard Methods for the Examination of Water and Wastewater, 40 CFR 136.

Twenty-four hour monitoring of basic field parameters is being collected by H-GAC and has been included in their Measurement Performance Specification (MPS) table A7.1a. H-GAC will deploy sondes to collect data at 6 locations. Sondes will be deployed in accordance with the requirements outlined in *TCEQ's Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods* (RG-415). When data collection is completed in August 2015, there will be data from at least 6 monitoring events (3 each year) but no more than 8 events (4 each year) under this QAPP. There will be no more than 2 critical periods, no more than 4 sets of data from the index periods, and 2 sets of data from the non-index periods. All the data sets for each of the 6 locations will be made available to TCEQ for submission to SWQMIS and potential use in future assessments.

San Jacinto River Authority conducts routine metals data collection to screen for and verify changes over time at the monitoring locations in the Woodlands. No metals testing is conducted on Lake Conroe.

TCEQ is gathering data from across the state to develop nutrient water quality standards for freshwater streams. H-GAC and its local partners will collect data that could be used in the development of those nutrient criteria. Total Kjeldahl nitrogen (TKN) is a part of the suite of parameters being collected and will be collected on a quarterly basis from most of the 300+ monitoring sites. Chlorophyll *a* will be collected on a quarterly basis at selected sites. Analysis for both parameters will be funded by CRP.

Ambient Water Reporting Limits (AWRLs)

The AWRL establishes the reporting specification at or below which data for a parameter must be reported to be compared with freshwater screening criteria. The AWRLs specified in Appendix A Table A7.1 are the program-defined reporting specifications for each analyte and yield data

acceptable for the TCEQ's water quality assessment. A full listing of AWRLs can be found at http://www.tceq.state.tx.us/compliance/monitoring/crp/qa/index.html. The limit of quantitation (LOQ) is the minimum level, concentration, or quantity of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The following requirements must be met in order to report results to the CRP:

- The laboratory's LOQ for each analyte must be at or below the AWRL as a matter of routine practice
- The laboratory must demonstrate its ability to quantitate at its LOQ for each analyte by running an LOQ check sample for each analytical batch of CRP samples analyzed. Note: This requirement is more stringent than the National Environmental Lab Accreditation Program (NELAP) which requires that the LOQ be verified annually for each quality system matrix, method and analyte.

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

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

Field splits are used to assess the variability of sample handling, preservation, and storage, as well as the analytical process, and are prepared by splitting samples in the field. Control limits for field splits are defined in Section B5.

Laboratory precision is assessed by comparing replicate analyses of laboratory control samples (LCS) in the sample matrix (e.g. deionized water, sand, commercially available tissue) or sample/duplicate pairs in the case of bacterial analysis. Precision results are compared against measurement performance specifications and used during evaluation of analytical performance. Program-defined measurement performance specifications for precision are defined in Appendix A.

Bias
Bias is a statistical measurement of correctness and includes multiple components of systematic error. A measurement is considered unbiased when the value reported does not differ from the true value. Bias is determined through the analysis of 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, the sampling of all pertinent media according to TCEQ SOPs, and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. Routine data collected under CRP for water quality assessment are considered to be spatially and temporally representative of routine water quality conditions.

Water Quality data are collected on a routine frequency and are separated by approximately even time intervals. At a minimum, samples are collected over 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 total representation of the water body will be tempered by the potential funding for complete representativeness.

Comparability

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

Completeness

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

A8 Special Training/Certification

New field personnel receive training in proper sampling and field analysis. Before actual sampling or field analysis occurs, they will demonstrate to the QA Officer (or designee) their ability to properly calibrate field equipment and perform field sampling and analysis procedures. Field personnel training is documented and retained in the personnel file and will be available during a monitoring systems audit.

The requirements for Global Positioning System (GPS) certification are located in Section B10, Data Management.

Contractors and subcontractors must ensure that laboratories analyzing samples under this QAPP meet the requirements contained in The NELAC Institute section TNI) Volume 1 Module 2, Section 4.5.5 (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	Tim Duffey
City of Houston – Health & Human Services	Lisa Groves
City of Houston – Water Quality Control	Joey Eickhoff
San Jacinto River Authority	Randy Acreman
Environmental Institute of Houston	Jenny Oakley

A9 Documents and Records

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

Table A9.1a – 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	H-GAC / 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
Laboratory calibration records	Eastex Lab	7	Paper
Laboratory instrument printouts	Eastex Lab	7	Paper
Laboratory data reports/results	H-GAC / Eastex Lab	7	Paper
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	H-GAC / HCPCS	7	Paper
Field SOPs	HCPCS	7	Paper
Laboratory Quality Manuals	H-GAC / HCPCS	7	Current version – electronic & paper; prior versions paper only
Laboratory SOPs	HCPCS	7	Current version – electronic & paper; prior versions paper only
QAPP distribution documentation	H-GAC / HCPCS	7	Paper
Field staff training records	H-GAC / HCPCS	7	Paper
Field equipment calibration/maintenance logs	HCPCS	7	Paper
Field notebooks or data sheets	HCPCS	7	Paper
Chain of custody records	HCPCS	7	Paper
Laboratory calibration records	HCPCS Laboratory	7	Paper
Laboratory instrument printouts	HCPCS Laboratory	7	Paper
Laboratory data reports/results	H-GAC / HCPCS Laboratory	7	Paper
Laboratory equipment maintenance logs	HCPCS Laboratory	7	Paper
Corrective Action Documentation	H-GAC / HCPCS	7	Paper

Table A9.1c – Project Documents and Records – Houston – HHS

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

Table A9.1d – Project Documents and Records – Houston – WQC

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	H-GAC / WQC / WQC Lab	≥7	Paper
Field SOPs	WQC	10	Paper
Laboratory Quality Manuals	H-GAC / WQC Lab	10	Current version – electronic & paper; prior versions paper only
Laboratory SOPs	WQC Lab	10	Current version – electronic & paper; prior versions paper only
QAPP distribution documentation	WQC / H-GAC / WQC Lab	≥7	Paper
Field staff training records	WQC / H-GAC	≥7	Paper
Field equipment calibration/maintenance logs	WQC	10	Paper
Field notebooks or data sheets	WQC / H-GAC	≥7	Paper
Chain of custody records	WQC / H-GAC	≥7	Paper
Laboratory calibration records	WQC Lab	≥7	Paper
Laboratory instrument printouts	WQC Lab	≥7	Paper
Laboratory data reports/results	WQC Lab / H-GAC	≥7	Paper
Laboratory equipment maintenance logs	WQC Lab	10	Paper
Corrective Action Documentation	H-GAC / WQC Lab	≥7	Paper

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

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

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

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

Table A9.1g – Project Documents and Records – EIH

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

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 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 H-GAC's and EIH's monitoring programs as well as the samples collected by SJRA from The Woodlands area. The final lab data for the H-GAC and EIH programs is submitted by Eastex directly to H-GAC's Data Manager. It is reformatted as needed and reviewed prior to submission to TCEQ. Eastex submits SJRA data collected from the Woodlands area directly to SJRA. Then, SJRA inputs the information to EXCEL spreadsheets, reformats the data, and reviews it. Finally, SJRA submits that data to H-GAC's Data Manager. All partner TKN and chlorophyll a data is analyzed by Eastex and submitted directly to H-GAC. Eastex lab reports include the following information.

1) The title "Test Report" or other identifying statement (the lab offers several report formats);
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;
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;
7) Date of receipt of sample, date and time of sample collection, sample matrix, and time of sample preparation and/or analysis if the required holding time for either activity is less than or equal to 48 hours (including holding time for SM9223-B);
8) Identification of the test method used plus its LOQ and LOD;
9) Reference to sampling procedure (grab or composite);
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) Measurements, examinations and derived results, supported by tables, graphs, sketches and photographs as appropriate, and any failures identified; identification of whether data are calculated on a dry weight or wet weight basis; identification of the reporting units such as µg/l or mg/kg;
12) Clear identification of all test data provided by outside sources, such as subcontracted laboratories, clients, etc.;
13) Clear identification of numerical results with values below the Reporting Limit, and
14) Identification of accreditation status per analysis.

If H-GAC receives any Eastex summary reports without all the above information, it is still available upon request.

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

- Sample results
- Units of measurement
- Sample matrix
- Dry weight or wet weight (as applicable)
- Station information
- Date and time of collection
- Holding time for SM9223-B
- 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 NELAP standards 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.

Local partners (HCPCS, HHS, WQC, and SJRA) who share their data do not submit any lab data report to H-GAC but those reports are available upon request. 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.

The contract lab, Eastex Environmental, mails lab reports to H-GAC's data manager for all TKN data, chlorophyll *a* data, and extra enterococci bacteria data collected by HCPCS, HHS, WQC, and SJRA, as well as water quality data from EIH and H-GAC sampling programs. The H-GAC data manager reviews the reports and inputs the data into the appropriate database. See Section B10 for an explanation of the data review process.

Electronic Data

H-GAC's local partners or sub-tier participants will 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 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. The entire 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
HHS	MS Access database
WQC	MS Excel
SJRA	MS Excel /Hard Copy
EIH	MS Excel
HCPCS	MS Access database
Eastex Environmental Lab	Hard Copy and EXCEL spreadsheet

Data will be submitted electronically to the TCEQ in the Event/Result file format described in the most current version of the DMRG, which can be found at (http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wdma/dmrg_index.html). A completed Data Summary (see Appendix G) will be submitted with each data submittal. The Data Summary identifies all the actions that were taken in regards to this data. Explanations can range from why data is missing or was removed to confirming outliers or why data which varies from the Measurement Performance Specifications are acceptable.

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, 2012. (RG-415) and Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data 2007 (RG-416), collectively referred to as "SWQM Procedures". Updates to SWQM Procedures are posted to the Surface Water Quality Monitoring Procedures website (http://www.tceq.texas.gov/waterquality/monitoring/swqm_procedures.html), and shall be incorporated into the 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. Other SOPs may apply and should be listed. Do not attach field SOPs to this document or rewrite them for inclusion in this section unless there are significant items to be brought to the TCEQ's attention.

Sample volume, container types, minimum sample volume, preservation requirements, and holding time requirements are presented in the following tables for each local partner.

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

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to 4°C	1 L	7 days
Turbidity	water	Plastic	Cool to 4°C	50 mL[4]	48 hours
Sulfate	water	Plastic	Cool to 4°C	100 mL[4]	28 days
Chloride	water	Plastic	Cool to 4°C	100 mL[4]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	100 mL	8 hours[1]
Enterococci IDEXX Enterolert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	100 mL	8 hours
TKN	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	500 mL[3]	28 days
Ammonia-N	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	125 mL[3]	28 days
Nitrite + nitrate-N	water	Plastic	Cool to 4°C, H_2SO_4 to pH <2	125 mL[3]	28 days
Phosphorus-P, total	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	125 mL[3]	28 days
Hardness, Total	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	125 mL[3]	28 days
Orthophosphate Phosphorus	water	Plastic	Cool to 4°C	250 mL	48 hours
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 23 days

[1] *E.coli* samples analyzed by SM 9223-B should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 48 hours.
[3] Five tests are analyzed from one 1L plastic bottle.
[4] One 500 mL plastic container is used to collect these three samples.

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

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to 4°C	½ Gal	7 days
Enterococci IDEXX Enterolert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	100 mL	8 hours
Ammonia-N	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	50 mL[3]	28 days
TKN	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	500 mL	28 days[2]
Nitrite + nitrate-N	water	Plastic	Cool to 4°C, H_2SO_4 to pH <2	50 mL[3]	28 days
Phosphorus-P, total	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	50 mL[3]	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 23 days[2]

[2] Contract lab will pick up and analyze samples(s).
[3] Three nutrient tests are collected from one 250 mL plastic container.

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

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to 4°C	700 mL[3]	7 days
Sulfate	water	Plastic	Cool to 4°C	100 mL[3]	28 days
Chloride	water	Plastic	Cool to 4°C	100 mL[3]	28 days
E. coli IDEXX Colilert-18	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	100 mL	8 hours[1]
Enterococci IDEXX Enterolert	water	Sterile Plastic w/ sodium thoisulfate	Cool to <6°C but not frozen	100 mL	8 hours
TKN	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	250 mL	28 days[2]
Ammonia-N	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	100 mL[4]	28 days
Nitrate-N	water	Plastic	Cool to 4°C	100 mL[3]	48 hours
Phosphorus-P, total	water	Plastic	Cool to 4°C 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 within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 48 hours.
[2] Contract lab will pick up and analyze sample(s).
[3] Multiple tests are collected from one 1-liter plastic cubitainer with no preservative added.
[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 WQC

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to 4°C	100 mL[3]	7 days
Sulfate	water	Plastic	Cool to 4°C	50 mL[3]	28 days
Chloride	water	Plastic	Cool to 4°C	50 mL[3]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	100 mL	8 hours[1]
Enterococci IDEXX Enterolert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	100 mL	8 hours
TKN	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	500 mL	28 days[2]
Ammonia-N	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	500 mL	28 days
Nitrate-N	water	Plastic	Cool to 4°C,	50 mL[3]	48 hours
Nitrite-N	water	Plastic	Cool to 4°C,	50 mL[3]	48 hours
Phosphorus-P, total	water	Brown, glass bottle	Cool to 4°C 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 23 days[2]
Alkalinity, Total	water	Plastic	Cool to 4°C	50 mL[3]	28 days

[1] *E.coli* samples analyzed by SM 9223-B should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 48 hours.
[2] Contract lab will pick up and analyze sample(s).
[3] All tests are collected in one 500 mL plastic bottle.

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

Parameter	Matrix	Container	Preservation	Sample Volume	Holding Time
TSS	water	Plastic	Cool to 4°C	100 mL[3]	7 days
Sulfate	water	Plastic	Cool to 4°C	50 mL[3]	28 days
Chloride	water	Plastic	Cool to 4°C	50 mL[3]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	100 mL	8 hours[2]
TKN	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	500 mL	28 days[2]
Ammonia-N	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	500 mL	28 days
Nitrate-N	water	Plastic	Cool to 4°C,	50 mL[3]	28 days
Nitrite-N	water	Plastic	Cool to 4°C,	50 mL[3]	48 hours
Phosphorus-P, total	water	Brown, glass bottle	Cool to 4°C 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 23 days[2]
Alkalinity, Total	water	Plastic	Cool to 4°C	50 mL[3]	28 days

[1] *E.coli* samples analyzed by SM 9223-B should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 48 hours.
[2] Contract lab will pick up and analyze sample(s).
[3] All tests are collected in one 500 mL plastic bottle.

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 4°C	1 L	7 days
Sulfate	water	Plastic	Cool to 4°C	100 ml[4]	28 days
Chloride	water	Plastic	Cool to 4°C	100 mL[4]	28 days
E. coli IDEXX Colilert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	100 mL	8 hours[1]
Enterococci IDEXX Enterolert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	100 mL	8 hours
Ammonia-N	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	125 mL[3]	28 days
TKN	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	500 mL	28 days[2]
Nitrite+Nitrate-N	water	Plastic	Cool to 4°C, H_2SO_4 to pH <2	125 mL[3]	28 days
Nitrate-N	water	Plastic	Cool to 4°C, H_2SO_4 to pH <2	125 mL[3]	28 days
Phosphorus-P, total	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	125 mL[3]	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 23 days[2]
Hardness, Total	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	100 mL	28 days
Copper, Total	water	Plastic	Cool to 4°C HNO_3 to pH <2	100 mL[5]	6 months
Selenium, Total	water	Plastic	Cool to 4°C HNO_3 to pH <2	100 mL[5]	6 months

[1] *E.coli* samples analyzed by SM 9223-B should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 48 hours.
[2] Contract lab will pick up and analyze sample(s).
[3] Nutrient tests are collected from one 1 L plastic bottle.
[4] One 1 L plastic container is used to collect these two samples.
[5] All 3 "Total Metals" are collected in one 1-L plastic container and split at the lab for the various parameters.

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 4°C	1 L	7 days
Turbidity	water	Plastic	Cool to 4°C	50 mL[4]	48 hours
Sulfate	water	Plastic	Cool to 4°C	100 ml[4]	28 days
Chloride	water	Plastic	Cool to 4°C	100 mL[4]	28 days
E. coli IDEXX Colilert*	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	100 mL	8 hours[1]
Enterococci IDEXX Enterolert	water	Sterile Plastic w/ sodium thiosulfate	Cool to <6°C but not frozen	100 mL	8 hours
TKN	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	500 mL[3]	28 days
Ammonia-N	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	125 mL[3]	28 days
Nitrite + nitrate-N	water	Plastic	Cool to 4°C, H_2SO_4 to pH <2	125 mL[3]	28 days
Phosphorus-P, total	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	125 mL[3]	28 days
Hardness, Total	water	Plastic	Cool to 4°C H_2SO_4 to pH <2	125 mL[3]	28 days
Ortho phosphate Phosphorus	water	Plastic	Cool to 4°C	250 mL	48 hours
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 23 days

[1] *E.coli* samples analyzed by SM 9223-B should always be processed as soon as possible and within 8 hours. When transport conditions necessitate delays in delivery longer than 6 hours, the holding time may be extended and samples must be processed as soon as possible and within 48 hours.
[3] Five tests are analyzed from one 1L plastic bottle.
[4] One 500 mL plastic container is used to collect these three samples.

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.

- 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.
- The tubing used by H-GAC to field filter ortho phosphate phosphorus samples is re-used. H-GAC's contract lab (Eastex) cleans the tubing between each use by washing each piece with a 10 % nitric acid solution and a 10% Hydrochloric acid solution. Each tube is triple rinsed with D.I. water between and after the 2 acid washes, then hung and allowed to air dry. The lab

individually packages each tube in a zip-lock style, plastic baggie and performs QC testing to assure that no contamination results from the washing procedure.
- 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 peristaltic pump and collected from the required depth as specified in the SWQM Procedures Volume 1 manual using an in-take tube 1 foot (0.3 meter) long.

City of Houston - Department of Health and Human Services (HHS)

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 Holcomb Lab where all QC checks and documentation are performed. The HHS 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 Water Quality Control (WQC)

All disposal sample containers are purchased by the WQC Lab except as noted below. Each lab cited below performs and tracks all required QC procedures for all bottles they purchase.

- 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.

Container washing procedures: 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 – Lake Conroe samples

SJRA-Lake Conroe samples are analyzed by the City of Houston Water Quality Control Lab (WQC).

- Pre-cleaned, plastic, disposable sample containers are used for conventional parameters except total phosphorus samples.
- 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.

WQC container washing procedures: 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 for storage.

San Jacinto River Authority – The Woodlands samples

Eastex Environmental Lab is the contract lab for samples collected from The Woodlands.

- 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.
- 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.
- 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.
- The tubing used by H-GAC to field filter ortho phosphate phosphorus samples is re-used. H-GAC's contract lab (Eastex) cleans the tubing between each use by washing each piece with a 10 % nitric acid solution and a 10% Hydrochloric acid solution. Each tube is triple rinsed with D.I. water between and after the 2 acid washes, then hung and allowed to air dry. The lab individually packages each tube in a zip-lock style, plastic baggie and performs QC testing to assure that no contamination results from the washing procedure.
- 0.45 micron capsule filters for ortho phosphate field filtration are provided by H-GAC and come individually sealed and certified for metals sampling.
- 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.

Processes to Prevent Contamination

Procedures outlined in SWQM Procedures outline the necessary steps to prevent contamination of samples. These include: direct collection into sample containers, whenever possible; and clean sampling techniques for metals. Several local partners collect samples from a bridge and must use the bucket method. All 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 (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 (or actual name of the documents used to record field data) as presented in Appendix C. Flow worksheets (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 and signature
Values for all field parameters

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

Water appearance
Weather
Biological activity *(continued on next page)*

Recreational 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
- Changes are made 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 form (See Appendix D). The following list of items

matches the COC form in Appendix D. All COC forms to be used in the project should be included in Appendix D for the TCEQ's review.

Date and time of collection
Site identification
Sample matrix
Number of containers
Preservative used
Was the sample filtered
Analyses required
Name of collector
Custody transfer signatures and dates and time of transfer
Bill of lading, if applicable

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 for metals, as applicable
Sample type (i.e., analysises) 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) kept on file with H–GAC. 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 & lab sample handling procedure is 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 Volumes 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, Tracking, Data Entry and Reporting*. Most current version
City of Houston, Department of Health and Human Services	Holcombe Lab's Environmental Laboratory Services QM, Section 22 – Sample Management, most current version
City of Houston, Water Quality Control Laboratory *And* San Jacinto River Authority – Lake Conroe samples	Water Quality - 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.

Sample Tracking Procedure Deficiencies and Corrective Action

All deficiencies associated with COC procedures, as described in this QAPP, are immediately reported to the Lead Organization Project Manager. 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 Lead Organization 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 Tex. Admin. Code Chap. 307, in that data generally are generated for comparison to those standards and/or criteria. The 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 Volumes 1 and 2 as amended, 40 CFR 136, or other reliable procedures acceptable to the TCEQ, and in accordance with chapter 25 of this title."

Laboratories that produce analytical data under this QAPP must be NELAP accredited. Copies of laboratory QMs and SOPs are available for review by the TCEQ.

Standards Traceability

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

Analytical Method 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 partner's Laboratory Supervisor, who will make the determination and notify the H-GAC QAO. 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 Lead Organization Project Manager 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 the 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 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.

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 QC sample requirements in this section are specific to routine water quality monitoring for TSWQS use attainment determinations.

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 frequency requirement for field blanks for total metals-in-water samples is specified in the SWQM Procedures. SJRA is the only partner to collect metals-in-water and only from The Woodlands locations. SJRA collects samples once every 6 months. A field blank will be collected on each day metals sampling is performed.

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

Field 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.

Field Split

A field split is a single sample subdivided by field staff immediately following collection, and submitted to the laboratory as two separately identified samples, according to procedures specified in the SWQM Procedures. Split samples are preserved, handled, shipped, and analyzed identically, and are used to assess variability in all of these processes. Field splits apply to conventional samples only. To the extent possible, field splits prepared and analyzed over the course of the project should be performed on samples from different sites. The frequency requirement for field splits is specified in the SWQM Procedures. Field splits are collected on a 10% basis or more frequently if deemed necessary.

The precision of field split results is calculated by relative percent difference (RPD) using the following equation:

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

A 30% RPD criteria will be used to screen field split results as a possible indicator of excessive variability in the sample handling and analytical system. If it is determined that elevated quantities of analyte (i.e., > 5 times the LOQ) were measured and analytical variability can be eliminated as a factor, than variability in field split results will primarily be used as a trigger for discussion with field staff to ensure samples are being handled in the field correctly. Some individual sample results may be invalidated based on the examination of all extenuating information. The information derived from field splits is generally considered to be event specific and would not normally be used to determine the validity of an entire batch; however, some batches of samples may be invalidated depending on the situation. Professional judgment during data validation will be relied upon to interpret the results and take appropriate action. The qualification, or invalidation, of data will be documented on the Data Summary. Deficiencies will be addressed as specified in this section under Quality Control or Acceptability Requirements Deficiencies and Corrective Actions.

In the event of a field split QC failure the single sample associated with the split may need to be qualified as not meeting project QC requirements, and these qualified data will not be reported to the TCEQ.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

Batch

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

Method Specific QC requirements

QC samples, other than those specified later this section, are run (e.g., sample duplicates, surrogates, internal standards, continuing calibration samples, interference check samples, positive control, negative control, and media blank) 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, compare counts with an 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. Record the results.

Limit of Quantitation (LOQ)
The laboratory will analyze a calibration standard (if applicable) at the LOQ published in Appendix A, Table A7, 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, Tables A7.1a thru h 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 near the LOQ published in Appendix A, Tables A7a thru h, 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 samples run on batches with calibration curves that do not include the LOQ published in Appendix A, Tables A7a thru h, 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. LOQ Check Samples are run 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, Tables A7.1a thru h.

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. LCSs are run 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 Table A7.1.

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 prepared in the laboratory by splitting aliquots of an LCS. 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 LCS 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: (If other formulas apply, adjust appropriately.)

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

For bacteriological parameters, precision is evaluated using the results from laboratory duplicates. Bacteriological lab duplicates are analyzed on a 10% frequency (or once per sampling run, whichever is more frequent). These duplicates will be collected in containers of sufficient volume for analysis of the sample and its laboratory duplicate using the same dilution volume (See Section B6).

The base-10 logarithms of the result from the original sample and the result from its duplicate will be calculated. The absolute value of the difference between the two logarithms will be calculated, and that difference will be compared to the precision criterion in Appendix A, Tables A7.1a thru h.

If the difference in logarithms is greater than the precision criterion, the data are not acceptable for use under this project and will not be reported to TCEQ. Results from all samples associated with that failed duplicate (usually a maximum of 10 samples) will be considered to have excessive analytical variability and will be qualified as not meeting project QC requirements.

The precision criterion in Appendix A, Tables A7.1a thru h for bacteriological duplicates applies only to samples with concentrations > 10 MPN/100mL. Field splits will not be collected for bacteriological analyses.

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. 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, the partner's lab or H-GAC QAO and Data Manager 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, HHS Holcombe 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, WQC Lab The recovery of matrix spikes for the samples analyzed in WQC laboratory is between 80 to120 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.

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 blanks are performed at a rate of once per preparation batch. 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 Lead Organization Project Manager, in consultation with the Lead Organization QAO. 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 and QAO will be relied upon in evaluating results. Rejecting sample results based on wide variability is a possibility. Field blanks for trace elements and trace organics are scrutinized very closely. Field blank values exceeding the acceptability criteria may automatically invalidate the sample, especially in cases where high blank values may be indicative of contamination which may be causal in putting a value above the standard. Notations of field split excursions and blank contamination are noted in the quarterly report and the final QC Report. 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 problem is reported to the H-GAC Laboratory QAO. The Laboratory QAO will discuss with the H-GAC Project Manager. If applicable, the H-GAC Project Manager 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.

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 error limits and the disposition resulting from error are adhered to. Data collected from field instruments that do not meet the post-calibration 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 is 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.

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 "number of days since" requirement for reporting the 72053 parameter code. 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.

Reservoir stage data are collected every day from the Unites States Geological Survey (USGS), International Boundary and Water Commission (IBWC), and the Unites 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. The web application uses real time gaged observations 7 AM reading each day (or closest reading available) from 119 major reservoirs to approximate daily storage for each reservoir, as well as daily total storage for water planning regions, river basins and the state of Texas. These instantaneous data are updated to mean daily data for all previous days. These data will be submitted to the TCEQ under parameter code 00052 Reservoir Stage and parameter code 00053 Reservoir Percent Full.
Insert additional sources of non-direct measurements as needed.

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's Data Manager (a SAS Operator) and H-GAC's QAO before being submitted to TCEQ in the format specified in the SWQM Data Management Reference Guide, January 2012 or most recent version, for approval to load into SWQMIS. 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 the Data Manager's desk. The calibration sheets, field sheets, and COCs are reviewed by the QAO before any data entry is made. 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 and printed out to be attached to field sheets. These electronic files are imported into an Access database. Field data is entered in this Access database by the H-GAC Data Manager and saved in a secured network drive ("Working Data"). It is reviewed for accuracy and completeness by either the H-GAC Data Manager or QAO (but not the person who performed the original data entry). When associated lab data is received from the lab, the electronic files are also saved in the "RAW Data" folder. The Access database in the "working" file becomes the input file for SAS 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 the 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 IT staff. The DM provides the QAO with the draft Data Summary for review. The H-GAC QAO review of the datasets and the Data Summary is documented and provided to the H-GAC DM for further investigation, verification, or change. This record of the QAO review is retained with the data review 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 two Access tables to H-GAC containing laboratory and field data. These tables are exported from the department database and are reviewed by Lab Manager, the QAO and the Sample Administrator 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 HHS field personnel and data manager enter laboratory and field data into an Access database. Print-outs of any data from field equipment memory is 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 Laboratory 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 WQC & Lake Houston field personnel turn in the chain of custody and field form to the sample receiver in the lab. The data manager enters only the final laboratory data into an Access database. The data manager reviews all data entries for accuracy then checks for outliers. A Data Review Checklist is generated for this data set. The data packet is then submitted to the Laboratory QAO for additional review. All comments are documented on the Data Review Checklist before being submitted to HGAC. The field data is entered into the database by the data entry clerk at the Lake Houston office. She reviews the data for accuracy and completeness. The Field Supervisor reviews at least 10% of the data for accuracy, completeness, reasonableness and outliers. 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 submits those water samples to the City of Houston WQC Lab for analysis. Field personnel turn in the chain of custody and field form to the sample receiver in the lab. The lab data manager enters laboratory data into an Access database. The lab data manager reviews all data entries for accuracy then checks for outliers. A Data Review Checklist is generated for this data set. The data packet is then submitted to the Laboratory QAO for additional review and documentation on Data Review Checklist before being submitted directly to H-GAC. Electronic 'profile' data files from the Hydrolab Surveyor are sent directly to H-GAC's Data Manager who inputs the data to an Access database. Additional Lake Conroe field data are input to an MS EXCEL spreadsheet by SJRA's Data Manager, where it is reviewed, formatted, and submitted 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. Lake Conroe keeps the original field sheets and prints out copies of the Surveyor profile data to keep in their files. Copies of field sheets, COCs, calibration logs, and a Data Review Checklist are sent to H-GAC along with every data submittal for Lake Conroe samples.

- SJRA also collects samples from The Woodlands area. A courier from Eastex Lab inspects, receives, and transports the samples to Eastex Lab for analysis. The SJRA Data Manager enters the field data in MS EXCEL spreadsheet and reviews it for accuracy. SJRA receives lab results from Eastex and enters data into the spreadsheet with the corresponding field data. The SJRA Quality Assurance Officer (QAO) formats the data, verifies at least 10% of the data

for transcription accuracy, reviews the data for outliers, and reviews the chain of custody forms. The QAO compiles the Data Review Checklist forms and submits the final data to H-GAC.

- EIH performs data entry for only the field data collected by their program. The EIH field QAO or the individual who collected the data inputs the data to 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 and hard copies of the field sheets and COCs. H-GAC's Data Manager receives electronic data files from Eastex Lab and merges lab data with field data prior to review and submission to TCEQ.

Data Dictionary

Terminology and field descriptions are included in the SWQM Data Management Reference Guide, January 2012, or 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 & Human Services	I	HG	HH
City of Houston – Water Quality Control Division	I	HG	HW
San Jacinto River Authority	I	HG	SJ
Environmental Institute of Houston – University of Houston Clear Lake	I	HG	UI

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. Any changes to a data file are saved in the "Working Data" folders. In these folders, data is merged, formatted, and converted to the correct reporting units before SAS processing begins. After SAS is applied, the files are stored in ACCESS tables. An ACCESS database is made for each data set. In this database there are several folders where all reports and modifications are documented. There is an INPUT folder, an OUTPUT

folder, Draft Matrix tables which should show all the data as reformatted and ready to be converted into the EVENT/RESULTS format for TCEQ. 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 attached to the data set for traceability.

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

- Harris County Pollution Control Services (HCPCS) Details of the mechanisms for review and correction of errors and preventing loss of data are described in sections 6.6 and 15.1 through 15.5 of the HCPCS Laboratory Services Quality Manual, (most current version). All field data sheets are given to the 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 HHS Details of the Holcombe Laboratory 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 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 WQC 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 to the data entry clerk located at the Lake Houston office for data input to EXCEL spreadsheets. This person is also the Field Data Manager. The Data Manager reviews the data for outliers and accuracy. Then, the Field QAO reviews the data for transcription accuracy and reasonableness. A Data Review Checklist is completed for each set of data submitted to H-GAC.

- Eastex Lab Details of their protocols for data reduction and review are described in the 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. H-GAC is sent their data results plus data results for EIH. H-GAC's Data Manager enters all the EIH data in an Access database.

- San Jacinto River Authority Lake Conroe water samples are sent to WQC lab where all analyses is performed and lab data is managed (See City of Houston WQC 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 a MS EXCEL spreadsheet and submits to H-GAC Data Manager. Profile data from the Hydrolab Surveyor is downloaded and sent to H-GAC directly. H-GAC's Data Manager inputs the data to an Access database, merges the related data sets, and reviews the data for outliers. The

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.

Woodlands 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 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 off data submitted 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 who also checks the data for outliers 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.

- H-GAC water samples are sent to Eastex Lab for analysis. (See Eastex lab details above.) Field data sheets are collected by the Data Manager for input to an Access Database, review for outliers, and reasonableness. H-GAC's QAO reviews the data for transcription accuracy and reasonableness. A Data Summary Sheet is submitted to TCEQ with each data set.

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 correspondences 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 the 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 is sent for 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 HHS Holcombe Laboratory 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). HHS field data is housed and electronically stored at HHS offices located Park Place, Houston. Electronic data is stored in an Access Database which is maintained by the HHS data manager.

- City of Houston WQC 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 WQC 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 maintained by the data entry clerk for the office.

- San Jacinto River Authority will store all hard copies of field and lab data in the Program Manager's Lake Conroe office. Electronic data will be stored in a shared computer server at the same location. Electronic data from the Woodlands samples will be kept in EXCEL workbooks and spreadsheets at the Lake Conroe office. Hard copies will be moved from The Woodlands offices to Lake Conroe and kept in the Program Manager's office.

- 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.

- 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.

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 Windows XP and 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 DMRG, and applicable H-GAC information resource management policies. H-GAC includes an Information Resource Management Department responsible for maintaining all computer hardware and software, including but not limited to servers, network accounts, data back-ups, security, firewalls, etc. Daily management is conducted along with regular maintenance and upgrades to the system.

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. All positional data entered into SWQMIS will be collected by a GPS certified individual with an agency approved GPS device to ensure that the agency receives reliable and accurate positional data. Certification can be obtained in any of three ways: completing a TCEQ training class, completing a suitable training class offered by an outside vendor, or by providing documentation of sufficient GPS expertise and experience. Contractors must agree to adhere to relevant TCEQ policies when entering GPS-collected data.

In lieu of entering certified GPS coordinates, 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. For more information see the "Project Oversight" section of The Clean Rivers Program Guidance and Reference Guide FY 2014-2015.

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 Basin Planning Agency	Dates to be determined by TCEQ CRP	TCEQ	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the TCEQ to address corrective actions
Monitoring Systems Audit of Program Subparticipants	Dates to be determined by the H-GAC (at least once per contract period)	H-GAC	Field sampling, handling and measurement; facility review; and data management as they relate to CRP	30 days to respond in writing to the H-GAC. PA will report problems to TCEQ in Progress Report.

Assessment Activity	Approximate Schedule	Responsible Party	Scope	Response Requirements
Laboratory Inspection	Dates to be determined by TCEQ	TCEQ Laboratory Inspector	Analytical and quality control procedures employed at the laboratory and the contract laboratory	30 days to respond in writing to the TCEQ to address corrective actions

Corrective Action Process for Deficiencies

Deficiencies are any deviation from the QAPP, *SWQM Procedures*, SOPs, or the DMRG. 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 H-GAC Project 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 the project progress reports and by completion of a CAP.

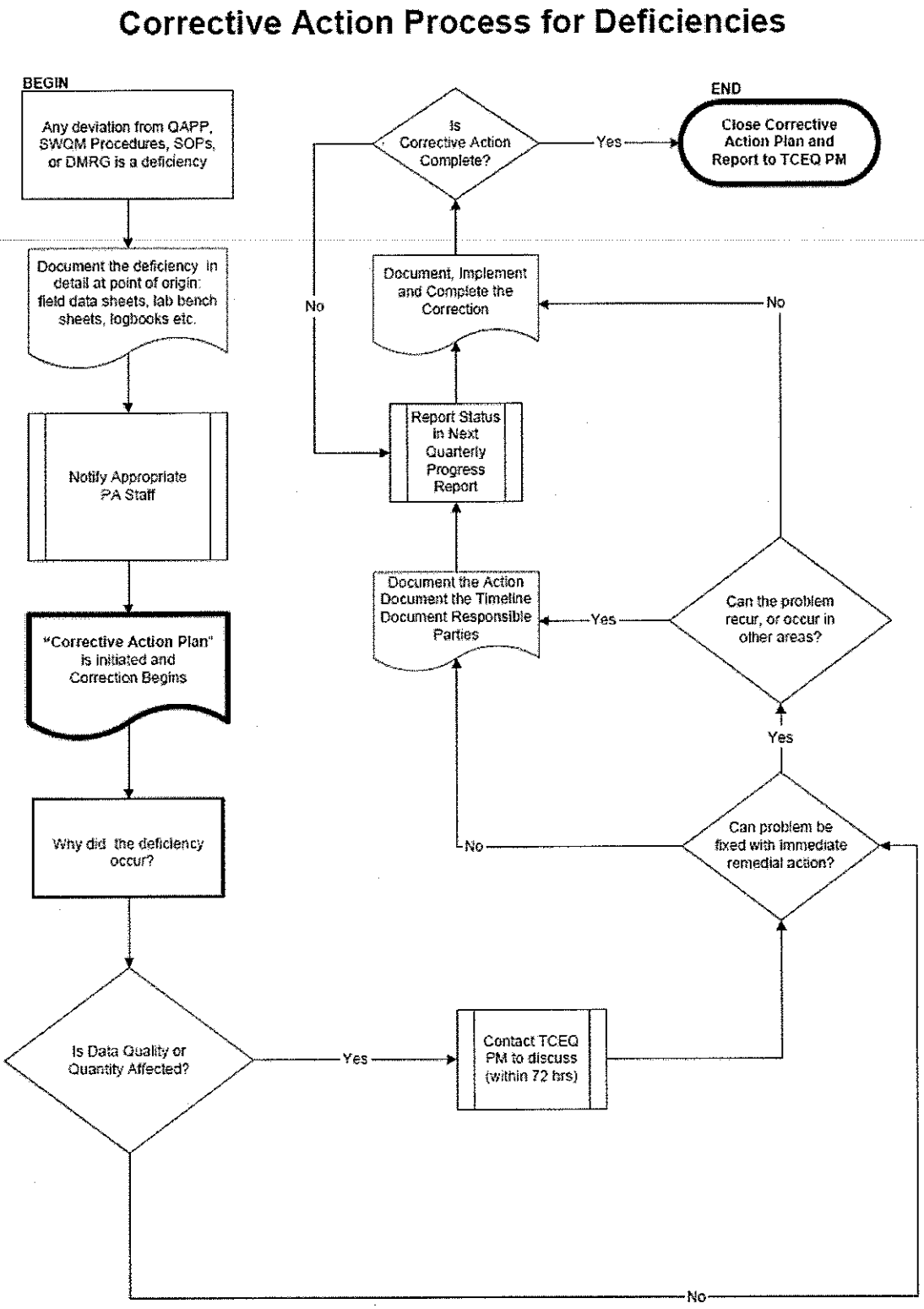
Corrective Action

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
- Evaluate the need for corrective action
- Use 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

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

Figure C1.1 Corrective Action Process for Deficiencies



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 is responsible for implementing and tracking deficiencies and corrective actions in a pre-CAP log. Records of audit findings and corrective actions are maintained by the H-GAC Project Manager. Audit reports and corrective action documentation will be submitted to the TCEQ with the Progress Report.

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

C2 Reports to Management

The table below lists all the reports that are generated by the H-GAC Clean Rivers Program. The reports are described in greater detail in the sections following the table.

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 subcontractors	quarterly	Within 10 days of end of quarter	Subparticipant's project manager	Contract/project manager on CRP team
H-GAC CRP Staff meeting	Weekly	Verbal updates only	CRP team members	CRP Program Mgr & staff
Nonconformance & Corrective Action Reports	As needed	With quarterly reports to TCEQ or sooner depending on severity	H-GAC QAO	TCEQ Project Mgr
TCEQ Quarterly Progress Report	Quarterly	15th day of the month following the end of the quarter	H-GAC Project Mgr	TCEQ Project Mgr
Monitoring System Audit Report & Response	Once per contract period	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

The 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 that receive CRP funds to support data collection activities are also required to submit written quarterly reports summarizing their monitoring activities. H-GAC schedules bi-weekly meetings to update the CRP manager and team members regarding status of deliverables and tasks.

After evaluation of the information collected and review of data submitted, the H-GAC QAO and/or the H-GAC Data Manager will either investigate suspected problems with the data or complete information for the Data Summary Sheet that accompanies the data submittal to TCEQ. It is essential that 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 and the solutions adopted. This information will be transmitted by the H-GAC's QAO to the H-GAC Program Manager and the H-GAC Data Manager when data is submitted. This information 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.

Upon completion of each site assessment and site characterization, H-GAC will produce a written report outlining their findings and field verifications. Each report will consist of 3-5 pages along with field survey forms, photographs, and maps. Copies of all reports will be sent to TCEQ along with regular quarterly progress reports unless requested otherwise.

Reports to TCEQ Project Management

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

Progress Report
Summarizes the 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 the 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
The 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. 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 the H-GAC CRP Data Manager are responsible for ensuring that field data are properly reviewed, verified, and submitted in the required format to the project database. Likewise, the Laboratory Managers of HCPCS, HHS, WQC, SJRA, EIH, and Eastex laboratories are responsible for ensuring that laboratory data are reviewed, verified, and submitted in the required format to the H-GAC CRP project database. Finally, the H-GAC CRP QAO is 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 and meet the conditions of end use as described in Section A7 of this document.

Data review, verification, and validation will be performed using self-assessments and peer and management review as appropriate to the project task. The data review tasks to be performed by field and laboratory staff is listed in the first two columns of Table D2.1, respectively. Potential errors are identified by examination of documentation and by manual, examination of corollary or unreasonable data, or 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 information 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's Project Manager validates that the data meet the data quality objectives of the project and are suitable for reporting to TCEQ.

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

Table D2.1: Data Review Tasks

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

H-GAC Data to be Verified	Field Task	Laboratory Task (Eastex Lab)	Lead Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	H-GAC QAO	Sample Custodian.	
Field instrument pre- and post-calibration results within limits	H-GAC 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 QAO	Lab QAO	
Chain of custody complete/acceptable	H-GAC QAO	Sample Cust.	H-GAC Data Mgr
NELAP Accreditation is current		Lab QAO	
Sample preservation and handling acceptable	H-GAC QAO	Sample Custodian.	
Holding times not exceeded		Lab QAO	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	H-GAC QAO	Lab QAO	
Field documentation (e.g., biological, stream habitat) complete	H-GAC QAO		
Instrument calibration data complete	H-GAC QAO	Lab QAO	
Bacteriological records complete		Lab QAO	
QC samples analyzed at required frequency	H-GAC QAO	Lab QAO	H-GAC Data Mgr
QC results meet performance and program specifications		Lab QAO	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		Lab QAO	

H-GAC Data to be Verified	Field Task	Laboratory Task (Eastex Lab)	Lead Organization Data Manager Task
Results, calculations, transcriptions checked	H-GAC 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 & H-GAC QAO
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 Data Mgr & H-GAC QAO	Technical Director	H-GAC Data Mgr
Absence of electronic errors confirmed	H-GAC Data Mgr & H-GAC 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 Data Mgr & H-GAC QAO		H-GAC Data Mgr & H-GAC QAO
Field QC results attached to data review checklist	H-GAC Data Mgr & H-GAC QAO		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 & H-GAC QAO	Technical Director	H-GAC Data Mgr & H-GAC QAO

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

HCPCS Data to be Verified	Field Task	Laboratory &Task	Lead Organization Data Manager Task
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		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

HCPCS Data to be Verified	Field Task	Laboratory &Task	Lead Organization Data Manager Task
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	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		Supervisor –Wet Lab & QAO	
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		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 – Health & Human Services (HHS)

HHS Data to be Verified	Field Task	Laboratory Task (Holcombe Lab)	Lead Organization Data Manager Task
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 Director	
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 Director	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		Lab Supervisors & Lab QAO	
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	Field QAO & Data manager		H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	Data Manager		H-GAC Data Mgr
Depth reported correctly	Field QAO		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	Field QAO	Lab QAO & Lab Director	H-GAC Data Mgr & H-GAC QAO

HHS Data to be Verified	Field Task	Laboratory Task (Holcombe Lab)	Lead Organization Data Manager Task
checked (e.g., all sites for which data are reported are on the coordinated monitoring schedule)			
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 – Water Quality Control (WQC)

WQC Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
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		Lab Supervisor	
Chain of custody complete/acceptable		Sample Custodian	H-GAC Data Mgr
NELAP Accreditation is current		QA Mgr.	
Sample preservation and handling acceptable		QA Mgr.	
Holding times not exceeded		QA Mgr.	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP		QA Mgr.	
Field documentation (e.g., biological, stream habitat) complete		Sample Custodian	
Instrument calibration data complete	Data Manager	Chemists	
Bacteriological records complete		Microbiologist I	
QC samples analyzed at required frequency		QA Mgr.	H-GAC Data Mgr
QC results meet performance and program specifications		QA Mgr.	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		QA Mgr.	
Results, calculations, transcriptions checked		Lab Mgr.	
Laboratory bench-level review performed		Lab Mgr.	
All laboratory samples analyzed for all parameters		Lab Supervisor	
Corollary data agree		QA Mgr.	
Nonconforming activities documented	Field QAO	Lab Mgr.	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	Data Manager	Lab Mgr.	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	Data Manager	Data Manager	H-GAC Data Mgr
Depth reported correctly	Data Manager	Data Manager	H-GAC Data Mgr
TAG IDs correct		Data Manager	H-GAC Data Mgr
TCEQ Station ID number assigned		Data Manager	H-GAC Data Mgr

WQC Data to be Verified	Field Task	Laboratory Task	Lead Organization Data Manager Task
Valid parameter codes		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	Data Manager	Data Manager	H-GAC Data Mgr
Absence of transcription error confirmed	Data Manager	QA Mgr.	H-GAC Data Mgr
Absence of electronic errors confirmed	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 WQC Lab

Data to be Verified	Field Task (SJRA-Lake Conroe data)	Laboratory Task (WQC Lab)	Lead Organization Data Manager Task
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		QA Mgr.	
Sample preservation and handling acceptable		QA Mgr.	
Holding times not exceeded		QA Mgr.	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP		QA Mgr.	
Field documentation (e.g., biological, stream habitat) complete	Field QAO	Sample Custodian	
Instrument calibration data complete	Data Manager	Chemists	
Bacteriological records complete		Microbiologist I	
QC samples analyzed at required frequency		QA Mgr.	H-GAC Data Mgr
QC results meet performance and program specifications		QA Mgr.	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		QA Mgr.	
Results, calculations, transcriptions checked		Lab Mgr.	
Laboratory bench-level review performed		Lab Mgr.	
All laboratory samples analyzed for all parameters		Lab Supervisor	

Data to be Verified	Field Task (SJRA-Lake Conroe data)	Laboratory Task (WQC Lab)	Lead Organization Data Manager Task
Corollary data agree		QA Mgr.	
Nonconforming activities documented	Field QA Officer	Lab Mgr.	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	Data Manager	Lab Mgr.	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	Data Manager	Data Manager	H-GAC Data Mgr
Depth reported correctly	Data Manager	Data Manager	H-GAC Data Mgr
TAG IDs correct		Data Manager	H-GAC Data Mgr
TCEQ Station ID number assigned		Data Manager	H-GAC Data Mgr
Valid parameter codes		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	Data Manager	Data Manager	H-GAC Data Mgr
Absence of transcription error confirmed	Data Manager	QA Mgr.	H-GAC Data Mgr
Absence of electronic errors confirmed	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		QA Mgr.	H-GAC Data Mgr
Verified data log submitted		Lab Mgr.	H-GAC Data Mgr
10% of data manually reviewed		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 Organization Data Manager Task
Sample documentation complete; samples labeled, sites identified	Field Supervisor	Sample Custodian	
Field instrument pre- and post-calibration results within limits	QAO		H-GAC Data Mgr &/or H-GAC QAO
Field QC samples collected for all analytes as prescribed in the TCEQ *SWQM Procedures Manual*	QAO		
Standards and reagents traceable		Lab QAO	
Chain of custody complete/acceptable	QAO	Sample Custodian	H-GAC Data Mgr
NELAP Accreditation is current		Lab QAO	
Sample preservation and handling acceptable		Sample Custodian	
Holding times not exceeded		Lab QAO	H-GAC Data Mgr
Collection, preparation, and analysis consistent with SOPs and QAPP	Field Supervisor	Lab QAO	
Field documentation (e.g., biological, stream habitat) complete	QAO		
Instrument calibration data complete	QAO	Lab QAO	
Bacteriological records complete		Lab QAO	
QC samples analyzed at required frequency	QAO	Lab QAO	H-GAC Data Mgr

Data to be Verified	Field Task (SJRA – Woodlands data)	Laboratory Task (Eastex Lab)	Lead Organization Data Manager Task
QC results meet performance and program specifications	QAO	Lab QAO	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP		Lab QAO	
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	Field Supervisor & QAO	Lab QAO	H-GAC QAO
Outliers confirmed and documented; reasonableness check performed	QAO	Lab QAO	H-GAC Data Mgr & H-GAC QAO
Dates formatted correctly	QAO		H-GAC Data Mgr
Depth reported correctly	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	QAO		H-GAC Data Mgr
Absence of transcription error confirmed	QAO	Tech. Dir.	H-GAC Data Mgr
Absence of electronic errors confirmed	QAO	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)			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	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	Laboratory Task (Eastex Lab)	Lead Organization Data Manager Task
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		Sample Custodian	

EIH Data to be Verified	Field Task	Laboratory Task (Eastex Lab)	Lead Organization Data Manager Task
acceptable			
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	
Analytical sensitivity (Minimum Analytical Levels/Ambient Water Reporting Limits) consistent with QAPP	Field QAO & CRP Project Mgr	Lab QAO	
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		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			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			H-GAC Data Mgr
Absence of transcription error confirmed		Tech. Dir.	H-GAC Data Mgr
Absence of electronic errors confirmed		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)			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

D3 Reconciliation with User Requirements

Data produced in this project, and data collected by other organizations (e.g., USGS, TCEQ, etc.), will be analyzed and reconciled with project data quality requirements. Data meeting project requirements will be used by the TCEQ for the Texas Water Quality Integrated Report in accordance with TCEQ's Guidance for Assessing and Reporting Surface Water Quality in Texas, August 2010 or most recent version, and for TMDL development, water quality standards development, and permit decisions, as appropriate. Data which do not meet requirements will not be submitted to SWQMIS nor will be considered appropriate for any of the uses noted above.