QUALITY ASSURANCE PROJECT PLAN

for the

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY'S
ENVIRONMENTAL MONITORING AND MEASUREMENT ACTIVITIES
RELATING TO
ROUTINE MONITORING, INTENSIVE SURVEYS, USE ATTAINABILITY
SURVEYS, SPECIAL STUDIES AND RECEIVING WATER ASSESSMENTS
UNDER THE SURFACE WATER QUALITY MONITORING PROGRAM
AND WATER QUALITY ASSESSMENT PROGRAM

prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 6 WATER QUALITY PROTECTION DIVISION

December 1, 2003

Section A1. Title and Approval Sheet

Project Title Surface Water Quality Monitoring (SWQM) and Water Quality Assessment (WQA) Program

Project Information QTRAK# 04-068
Grant Title: FY2004 Multi-Media Performance Partnership Grant: Section 106, Surface Water Quality Management Program

Organization
Surface Water Quality Monitoring Program, MC-165
Texas Commission on Environmental Quality (TCEQ)
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Effective Date This Quality Assurance Project Plan (QAPP) is effective for a period of one year from approval date.

Approvals:

<u>TEXAS COMMISSION ON ENVIRONMENTAL QUALITY</u>

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Jim Davenport, Team Leader
Water Quality Standards Team, Water Quality Assessment Section

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Charles Bayer, Site-Specific Coordinator
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Lori Hamilton, Project Quality Assurance Specialist
Water Quality Standards Team, Water Quality Assessment Section

____ Date ________________

Jim Busceme, Laboratory Manager
TCEQ Houston Laboratory, Monitoring Operations Division

____ Date _________________

U.S. ENVIRONMENTAL PROTECTION AGENCY - REGION VI

Sylvia Ritzky, USEPA 106 Project Officer
State and Tribal Programs Section, Assistance Programs Branch

____ Date _________________

Joan Brown, Chief
Assistance Programs Branch

____ Date _________________

The SWQM Program will secure written documentation (via a return receipt memorandum) from each project participant, e.g., subcontractors, other units of government, contract laboratories, stating the organizations awareness of and commitment to requirements contained in this quality assurance project plan and any amendments or revisions of this plan. The SWQM Project QA Specialist will maintain this documentation as part of the projects quality assurance records.

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Section A3. Distribution List

A final copy of this QAPP is to be received and retained by:

Anne Rogers - Surface Water Quality Monitoring Program, TCEQ, MC-165
Patrick Roques - Surface Water Quality Monitoring Program, TCEQ, MC-165
David Brymer - Laboratory and Mobile Monitoring Section, TCEQ, MC-165
Dave Sullivan - Monitoring Data Management and Analysis Section, TCEQ, MC-165
Sharon Coleman - Compliance Support Division, TCEQ, MC-176
Jim Busceme - Monitoring Operations Division, TCEQ, Laboratory, MC-LAB
Each Regional Water Section Manager - Field Operations Division, TCEQ
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Pat Hooper - Field Operations Division, TCEQ, MC-174
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Sylvia Ritzky - State and Tribal Programs Section, Assistance Programs Branch, United States Environmental Protection Agency (USEPA) Region 6
Philip Crocker - Watershed Management Section, Ecosystems Protection Branch, USEPA Region 6
Timothy Dawson - Compliance Assurance and Enforcement Division, USEPA Region 6
Joan Brown - Assistance Programs Branch, USEPA Region 6
Alicia Gill - Environmental Laboratory Services, Lower Colorado River Authority
Mark Fisher - Water Quality Assessment Section, TCEQ, MC-150
Jim Davenport - Water Quality Assessment Section, TCEQ, MC-150
Charles Bayer - Water Quality Assessment Section, TCEQ, MC-150
Lori McElroy - Water Quality Assessment Section, TCEQ, MC-150
Laurie Curra - Clean Rivers Program, TCEQ, MC-147
Susan Gandara - Quality Assurance Officer, United States Geological Survey (USGS),

Section A4. Project/Task Organization

The Surface Water Quality Monitoring (SWQM) Program functions under the auspices of the Laboratory and Mobile Monitoring (L&MM) Section of the Monitoring Operations Division (MOD)of the Office of Compliance and Enforcement (OCE) of the TCEQ. Additionally, the SWQM Program manages the SWQM Statewide Monitoring Network which encompasses the water quality monitoring performed by the agency's 16 regional offices. These regional personnel are managed by the Field Operations Division (FOD) of the OCE. In addition the Central Office staff of the SWQM Program perform monitoring through various special projects.

The Water Quality Assessment (WQA) Section functions under the Water Quality Division of the Office of Permitting, Remediation and Registration.

Figure 1 outlines the project organization for the TCEQ SWQM and WQA Programs and is followed by a brief description of job responsibilities for key participants in the SWQM and WQA Programs.

Figure 1. Organizational Chart

RESPONSIBILITIES OF KEY PROJECT PERSONNEL

Suzanne Vargas, 106 Grant Manager, TCEQ, 512-239-4619
Responsible for administration and coordination of TCEQ 106 grant activities on this project, compiles status reports noting activities performed. These reports are submitted to USEPA twice per year.

David Brymer, SWQM Program Manager, Section Manager, L&MM Section, TCEQ, 512-239-1725
Responsible for oversight of the implementation of the SWQM Quality Management Plan (QMP) and QAPPs, directs the day-to-day management of the section.

The Executive Director, Deputy Directors, Division Directors, and the quality assurance manager have delegated authority to develop and implement program-related quality systems. The program manager is responsible for ensuring that environmental activities are performed in accordance with applicable plans and procedures, work performance is measured against specifications, and appropriate management oversight and inspection is accomplished. Program managers are also responsible for improving systems relating to specific programs as well as ensuring deficient items and services are evaluated and controlled (i.e., inadvertent use or adverse impact on other items and services is prevented), root cause(s) of deficiencies and nonconformances are determined, and corrective actions are planned, implemented, and verified in a timely manner.

Patrick Roques, SWQM Project Manager, SWQM Team Leader, L&MM Section, TCEQ, 512-239-4604
Responsible for managing the TCEQs ongoing surface water quality monitoring activities and achieving project-related tasks and objectives. The SWQM Project Manager will:

- Maintain a thorough knowledge of program work activities, commitments, deliverables, and time frames;
- Develop necessary lines of communication and good working relationships between the lead division staff and personnel of other divisions and organizations participating in a program;
- Select water body project managers for specific water quality studies;
- Monitor the effectiveness of the overall program quality system;
- Provide feedback to supervisory and administrative personnel as necessary regarding the Performance of grant and water body project managers;
- Advise upper management when program timetables, tasks, and coordination procedures are not being met;
- Elevate problems and issues requiring resolution to the lead Division Director, or designee(s), for disposition, when appropriate;
- Execute contracts and intergovernmental agreements; and
- Determine acceptability of measurement data process.

Sharon Coleman, (Acting) SWQM Program Quality Assurance Specialist, Quality Assurance Section, Compliance Support Division, TCEQ, 512-239-1976

Responsible for the following quality assurance and quality control tasks:

- Participates in the development, approval, implementation, and maintenance of written quality assurance standards (e.g., QMPs, Standard Operating Procedures (SOPs), QAPPs);
- Assists the SWQM Project Manager in developing and implementing quality systems;
- Participates in the preparation of quality reports;
- Distributes annual assessment plans;
- Determines the lead assessor for assessments;
- Recommends to division directors and project managers, and through them to deputy directors, that work be stopped in order to safeguard programmatic objectives, worker safety, public health, or environmental protection;
- Concurs with proposed corrective actions and verifications;
- Receives and maintain assessment records;
- Monitors the implementation of corrective actions;
- Identifies positive and adverse trends in program quality systems;
- Reports on the status of corrective actions;
- Provides technical expertise and/or consultation on quality services; and
- Assesses the effectiveness of program quality systems.

Anne Rogers, Project Quality Assurance Specialist, SWQM Program, L&MM Section, TCEQ, 512-239-4597.
Responsible for the following quality assurance and quality control (QC) tasks:

- Participates in the development, approval, implementation, and maintenance of written quality assurance standards (e.g., QMPs, SOPs, QAPPs);
- Assists the SWQM Project Manager in developing and implementing quality systems;
- Participates in the preparation of quality reports;
- Determines conformance with program quality system requirements;
- Assists SWQM Program QA Specialist in determining the lead assessor for assessments;
- Recommends to division directors and project managers, and through them to deputy directors, that work be stopped in order to safeguard programmatic objectives, worker safety, public health, or environmental protection;
- Concurs with proposed corrective actions and verifications;
- Receives and maintains assessment records;
- Monitors the implementation of corrective actions;
- Identifies positive and adverse trends in program quality systems;
- Reports on the status of corrective actions;
- Prepares and distributes annual assessment plans;
- Assists SWQM Project Manager, in determining the lead assessor for assessments;
- Provides technical expertise and/or consultation on quality services;
- Assesses the effectiveness of program quality systems;
- Prepares and forwards an annual quality assurance report to the quality assurance manager; and

- Coordinates quality and technical training.

Brandon Harris, Team Leader, Water Data Management and Analysis (WDM&A) Team, TCEQ, 239-4535

Responsible for ensuring the following data management tasks are carried out by WDM&A staff:

- Coordinates with SWQM program staff on data management needs;
- Ensures that submitted site locations, parameter codes, sample data results, and data corrections are entered into the SWQM portion of the TCEQ Regulatory Activities and Compliance System (TRACS) database;
- Trains SWQM central office and FOD SWQM personnel on procedures for submitting site locations, parameter codes, sample data results, and data corrections;
- Updates annually the SWQM Data Management Reference Guide.

Jim Busceme, Laboratory Director, TCEQ Houston Laboratory, 281- 457-5229

- Responsible for the operation of the TCEQ Houston Laboratory.
- Leads, plans, and coordinates the functional activities of the laboratory and interactions with other MOD Sections, other divisions in TCEQ, and other agencies and laboratories.
- Ensures the most efficient use of laboratory personnel, facilities, and resources.
- Oversees all activities generating analytical data.
- Oversees adherence to the laboratory Quality Assurance Plan, specific SOPs, ensures proper documentation, and enforces corrective actions as required.

TCEQ SWQM program staff (refers to both regional and central office personnel, also referred to in this document as "data collectors" or "collectors")

Responsible for performing sample collection and data processing duties in accordance with SWQM SOPs, Data Quality Objectives (DQOs), Data Management Reference Guide (DMRG), and this QAPP, reporting to SWQM Program Manager, or designee, any deviation from SOPs or DQOs, maintaining proper documentation of sampling events, sample preservation, sample shipment, and field procedures. For Special Studies (SSs), Receiving Water Assessments (RWAs), Use Attainability Analyses (UAAs), and Continuous Monitoring Projects (CMPs), the FOD SWQM personnel or central office SWQM staff will be the water body project manager for that work and will oversee all work of other personnel involved in the project. In addition these staff are responsible for the review of raw data reports for field QC samples along with associated samples to determine measurement validity.

Contract Laboratory Management

Responsible for supervising all aspects and functions of the respective analyses, ensuring adequate documentation occurs, and verifying the quality of analytical data. Ensure use of USEPA approved analytical procedures. Ensure adherence to this QAPP and any relevant QA documents of the contract lab. Coordinates with program manager, or designee, and QA specialist in establishing analytical requirements, reports deviations from DQOs, and assists in implementing corrective action.

Laboratory Staff

Responsible for performing analyses and data processing duties according to guidelines included in the SWQM QAPP and their laboratory's QA manual, policies, and procedures. Responsible for implementing and maintaining internal QC and for notifying the laboratory supervisor of anomalous or erroneous analytical results. Responsible for documenting use of SOPs and calibration of lab equipment.

Mark Fisher, WQA Program Manager, Section Manager, WQA Section, TCEQ, 512-239-4586. Responsible for oversight of WQA projects, directs the day-to-day management of the section. Responsible for ensuring that environmental activities are performed in accordance with applicable plans and procedures, work performance is measured against specifications, and appropriate management oversight and inspection is accomplished. Also responsible for improving systems relating to specific programs as well as ensuring deficient items and services are evaluated and controlled (i.e., inadvertent use or adverse impact on other items and services is prevented), root cause(s) of deficiencies and nonconformances are determined, and corrective actions are planned, implemented, and verified in a timely manner.

Jim Davenport, WQA Project Manager, Team Leader, Water Quality Standards Team, WQA Section, TCEQ, 512-239-4585. Responsible for managing the TCEQs WQA Section activities and achieving project-related tasks and objectives. The WQA Project Manager will:

- Maintain a thorough knowledge of the WQA section work activities, commitments and time frames;
- Assign water body project managers for WQA Section SSs;
- Develop necessary lines of communication and good working relationships between the WQA Section and personnel of other divisions and organizations participating in a program;
- Monitor the effectiveness of the program quality system;
- Provide feedback to supervisory and administrative personnel as necessary regarding the performance of grant and water body project managers;
- Advise supervisory personnel when WQA section timetables, tasks, and coordination procedures are not being met;
- Elevate problems and issues requiring resolution to the appropriate Division Director, or designee(s), for disposition, when appropriate;
- Execute contracts and intergovernmental agreements; and
- Determine acceptability of measurement data collected by the WQA Section.

Charles Bayer, Site-Specific Coordinator, Water Quality Standards Team, WQA Section, TCEQ, 512-239-4583. Responsible for coordinating site-specific standards development. The Site-Specific Coordinator will:

- Request RWAs or UAAs to be conducted;
- Assign RWAs and UAAs to data collectors;
- Maintain all completed RWA and UAA documents that are submitted by collectors.

Lori Hamilton, Project Quality Assurance Specialist, WQA Section, TCEQ, 512-239-0683. Responsible for the following quality assurance and QC tasks for the WQA Section:

- Participates in the development, approval, implementation, and maintenance of written quality assurance and technical documents (e.g., SOPs, QAPPs, SSs);
- Participates in the preparation of quality reports;
- Prepares and distributes annual assessment plans;
- Recommends to project managers that work be stopped in order to safeguard programmatic objectives, worker safety, public health, or environmental protection;
- Coordinates the identification, disposition, and reporting to WQA Project Manager and Program Manager of nonconforming items and activities;
- Concurs with proposed corrective actions and verifications; monitor the implementation of corrective actions; and report on the status of corrective actions;
- Receives and maintains assessment records;
- Provides technical expertise and/or consultation on quality services;
- Coordinate quality and technical training; and
- Coordinate with SWQM Program Specialist.

TCEQ WQA Section Staff

Responsible for performing sample collection and data processing duties in accordance with SWQM SOPs, DQOs and this QAPP, reporting to the WQA project manager, or designee, any deviation from SOPs or DQOs, maintaining proper documentation of sampling events, sample preservation, sample shipment, and field procedures. For RWAs, UAAs, and SSs conducted by WQA Section staff, the staff member assigned the project will be the water body project manager for that work and will oversee all work of other personnel involved in the project.

Section A5. Problem Definition/Background

The TCEQ SWQM Program provides for an integrated evaluation of physical, chemical, and biological characteristics of aquatic systems in relation to human health concerns, ecological condition, and designated uses. SWQM data provide a basis for the establishment of effective TCEQ management policies that promote the protection, restoration, and wise use of Texas surface-water resources.

The SWQM Program was established in 1967 by the Texas Water Quality Board to collect, store and make available water quality data which that agency and now TCEQ requires to carry out its assigned functions. Although the program was developed to serve the needs of state regulators, the data are now widely used by state and federal water quality managers, cities, consultants, students and the general public. The SWQM Program routinely collects surface water quality data from more than 445 sites statewide and includes the collection of physicochemical, biological and hydrological data at varying frequencies. Samples are collected from most of the 367 designated stream, reservoir and estuary segments across Texas as well as the Gulf of Mexico to monitor for the attainment of designated uses and numerical criteria. Smaller non-designated water bodies are also monitored to define water quality and in response to perceived risk for pollution. In addition to fixed-station monitoring, non-routine sampling is conducted with specific objectives in several other programs. These are outlined in Section A6 of this QAPP.

The SWQM Program encompasses the full range of activities required to obtain, manage, store, assess, share, and report water quality information to other TCEQ teams, agency management, other agencies and institutions, local governments, and the public. Primary statutory authority for the SWQM Program is provided under Section 26.127 of the Texas Water Code, which states, "The executive director has the responsibility for establishing a water quality sampling and monitoring program for the state. All other state agencies engaged in water quality or water pollution control activities shall coordinate those activities with the Commission." The SWQM Program is strongly influenced by Sections 104(b), 106, 205(j), 303(d), 305(b), 314, 319, and 604(b) of the Federal Clean Water Act of 1987. The TCEQ SWQM Program is largely funded by a Clean Water Act Section 106 cooperative grant agreement with USEPA Region 6.

The mission of the SWQM Program is to characterize the water quality of the ambient surface waters of the state. Basic components of the SWQM Program include a routine monitoring network, ISs, SSs, UAAs, and RWAs. Water quality data obtained through these components are stored in the SWQM TRACS database. The monitoring results obtained through the SWQM Program may be used by the TCEQ to (1) characterize existing conditions, (2) evaluate stream standards modifications and permit decisions, (3) evaluate spatial and temporal trends, (4) determine water quality standards compliance, (5) identify emerging problems, and (6) evaluate the effectiveness of water quality control programs. The QAPP is peer reviewed within the TCEQ to ensure that data generated for the purposes described above are scientifically valid and legally defensible. This process will ensure that all data submitted to the TRACS database have been collected and analyzed in a way that ensures its reliability and, therefore, can be used in Total Maximum Daily Load (TMDL) development, stream standard modification, permit decisions, and water quality assessments.

The TCEQ's SWQM Program is jointly coordinated by the SWQM Team within the MOD and the Water Program within the FOD. Routine monitoring is conducted by FOD SWQM personnel in the TCEQ's 16 regional offices. The cities in which TCEQ regional offices are located and the areas monitored by each region are shown in Figure 2. The SWQM Team also works jointly with the WQA Section within the Water Quality Division on RWAs, UAAs and SSs in order to characterize surface waters of the state. SS, RWA and UAA monitoring is conducted by TCEQ regional office, SWQM central office and WQA Section personnel. The SWQM Team in central office is also responsible for conducting CMPs with assistance from staff in the regional offices.

Figure 2. Map of TCEQ Regions

Section A6. Project/Task Description

SURFACE WATER QUALITY SAMPLING TASKS

The TCEQ collects surface water quality data in the operation of five monitoring tasks: Routine Monitoring (also called fixed-station monitoring), SS Monitoring, UAA Monitoring, RWA Monitoring, and CMPs. All monitoring tasks employ similar sampling procedures and will be referred to throughout this document collectively as water quality monitoring. The project/task description details for fixed-station monitoring outlined below apply to the other four monitoring types as well.

Under the 106 grant there is no annual work plan which specifically outlines site locations, sampling frequencies, or measurement parameters for fixed-station monitoring, SSs, UAAs, RWAs, other biological monitoring events, or CMPs. The SWQM Program coordinates and develops the SWQM Coordinated Monitoring Schedule for both the SWQM Program and Clean Rivers Program (CRP.) This Coordinated Monitoring Schedule is made available to EPA each year on the Lower Colorado River Authority's (LCRA)Web page, http://cms.lcra.org/ . This schedule contains the specific site locations, sampling frequencies, and measurement parameters for the fiscal year for all monitoring activities listed above except CMPs. The monitoring details of each CMP will be contained in the project's QAP and will be made available to EPA for review upon request.

For all SSs and CMPs, the collector will prepare a QAP as outlined in the SWQM and WQA Special Study QAP (Appendix C.) These QAPs will contain a description of the project, the experimental design including geographic and temporal limits, specific monitoring activities to be performed, the roles and responsibilities of staff involved in the project, and time frame/deliverables of the study. These QAPs will require an abbreviated sign-off by key staff involved in the project as well as the SWQM Program QA Specialist and will remain on file in the central office SWQM Program QA files. Approved QAPs for the WQA Section SSs will be kept on file in the WQA Section. A copy of the QAP for any project that will have data submitted to the TRACS database will be provided to the Water Data Management and Analysis Team.

For all RWAs and UAAs, the collector will prepare a brief description of the monitoring project as outlined in the SWQM and WQA MPDF (Appendix B.) These project description forms will require the same sign-off process as QAPs and will be kept on file in the SWQM Program QA files. Approved project description forms for RWAs and UAAs to be conducted by the WQA Section will be kept on file in the WQA Section. A copy of the MPDF for any project that will have data submitted to the TRACS database will be provided to the Water Data Management and Analysis Team.

EPA may be interested in reviewing the QAP or MPDF on any particular project. To facilitate this, the TCEQ will provide EPA with a quarterly tracking table of all QAPs and MPDFs beginning with the first quarter of each fiscal year. At any time EPA may request a QAP or MPDF be sent to the

EPA Region 6 office for review. The SWQM staff will coordinate with the WQA Section to incorporate the two tracking tables before being sent to EPA.

ROUTINE MONITORING DESCRIPTION

The purpose of fixed-station monitoring is to collect, store, and make available the surface water quality and biological/habitat data which the TCEQ requires to carry out its assigned functions. Collectors are located at most of the 16 TCEQ region offices across the state. Sample and data collection are performed at sites, frequencies, and parameter coverage specified in the annual SWQM Coordinated Monitoring Schedule. The SWQM Coordinated Monitoring Schedule can be found on the LCRA's Web page at http://cms.lcra.org/ and other information on planning monitoring, site locations, sampling frequencies, and measurement parameters can be found on the agency's coordinated monitoring webpage at:
http://www.tnrcc.state.tx.us/water/quality/data/wqm/coop_monitoring_2004.html
The schedule is revised each fiscal year to account for changes in water quality and agency priorities.

Data collection is performed according to procedures outlined in the SWQM Procedures Manual (SWQM PM), TCEQ publication number GI-252 and the TCEQ's Biological Monitoring Fact Sheet on Use Attainability Analysis. Equipment calibration, use and specific calculations for field measurements are discussed throughout this section and a list is included in the SWQM PM. Data collection procedures used by each region are evaluated annually during SWQM Program Technical Systems Audits (TSAs), or reviews, conducted by SWQM Team personnel. In addition, the SWQM Program and the FOD conducts annual workshops designed to teach FOD SWQM personnel new sampling and data reporting procedures.

Data management for routine monitoring data is outlined in Chapter B10 of this document.

SPECIAL STUDY DESCRIPTION

SSs provide the TCEQ with an improved understanding of sources, distribution, and fate of particular constituents in selected reaches of water bodies. In some instances, SSs are conducted over the entire length of one or more segments, a basin, or other geographical area. SSs are conducted by FOD SWQM and TMDL personnel in TCEQs 16 regional offices as well as by staff of the central office SWQM Team and WQA Section.

SS monitoring is used for a variety of purposes, including:

(1) to assess toxicity in surface waters;

(2) to assess impacts of point and nonpoint source discharges;
(3) to develop water quality controls and assess improvement after enforcement action or implementation of controls;

(4) to develop new or revised sampling and assessment procedures;

(5) to describe impacts of habitat modifications on water quality;

(6) to describe water quality in intermittent streams, isolated pools of intermittent streams, and in unclassified, effluent-dominated streams;

(7) to augment significant complaint or fish kill investigations;

(8) to define water quality and biological characteristics of streams, reservoirs, estuaries and wetlands;

(9) to support the TMDL Program by gathering additional data in impaired water bodies or other waters of concern;

(10) to determine quantitative cause/effect relationships of water quality; and

(11) to set priorities and effluent limits for establishing or improving pollution controls.

(12) to characterize existing and attainable conditions of surface waters to establish/evaluate water quality standards modifications, permit decisions, and water quality standards compliance.

Though SS monitoring changes substantially from year to year, during the last several years much of the emphasis of SSs have been placed on toxic substances; biological, and point and nonpoint source assessments; and supporting TMDL projects. Projects formerly called Intensive Surveys are now classified as SSs and approved QAPs are required of those types of projects. All acceptable data collected during SSs are stored in the SWQM database in TRACS.

QAPs are written for each SS and will follow the format in the TCEQ SWQM and WQA Special Study QAP (Appendix C.) These QAPs will be written as an addendum to the SWQM QAPP and will have an abbreviated sign-off process by the water body project manager, their section manager, the SWQM or the WQA Section project manager, and the SWQM Program QA specialist. All original QAP addendums will remain on file in the SWQM Program QA files in central office. All original QAP addendums for the WQA Section will remain on file in the WQA Section QA files in the central office. A copy of the QAP for any project that will have data submitted to the TRACS database will be provided to the Water Data Management and Analysis Team.

Data management for SS monitoring data is outlined in Chapter B10 of this document.

USE ATTAINABILITY ANALYSIS DESCRIPTION

A UAA is a multi-step assessment of the physical, chemical, biological and economic factors affecting attainment of a use. A UAA may include a water body survey and assessment, a wasteload evaluation or an economic analysis. UAAs are used by TCEQ to evaluate and define existing and potential uses of water bodies. They are used to determine if existing criteria and uses described in the Texas Surface Water Quality Standards (TSWQS) are appropriate, if the uses and criteria are being maintained, or to determine causes of use or criteria not being attained.

Selection of water bodies for UAAs include those where violations of existing water quality standards are recurrent, advanced treatment funding decisions are pending, new or amendments of major wastewater permits are scheduled, or toxic substances have been identified or are suspected of impairing a use. UAA reports generated by TCEQ vary according to the specific problem(s) defined for the selected water bodies and the specific analysis parameters selected to address the defined problems.

Use Attainability Surveys, the field portion of a UAA, are conducted by personnel from the WQA Section, personnel from the MOD in the central office in Austin, or personnel from the FOD in the regional offices. Detailed procedures for conducting a UAA may be found in the following documents:

(1) Procedures to Implement the Texas Surface Water Quality Standards, TCEQ, RG-194, January, 2003: Site-specific Standards for Aquatic Life Use, pages 133-136;

(2) SWQM PM;

(3) RWA Procedures Manual, TCEQ publication number GI-253; and

(4) SWQM Biological Monitoring Fact Sheet, on Use Attainability Analysis

RWA DESCRIPTION

An RWA is a special-purpose UAA. It is a single study conducted on a specific reach of a stream to assess its physical, chemical, and biological characteristics. These studies are done on unclassified streams primarily to obtain data so that appropriate aquatic life uses can be assigned. RWAs are requested by the Site-Specific Coordinator of the Water Quality Standards Team when the applicable aquatic-life category for an unclassified stream has not been determined and cannot be adequately established from existing information. The FOD SWQM personnel, the central office SWQM staff, or the WQA Section staff conduct the study and characterize the receiving stream upstream of existing or downstream of proposed outfalls. CRP partners in Texas are also charged with conducting RWAs for the TCEQ. The RWA activities of CRP partners are managed by the TCEQ's CRP and are done in accordance with all protocols outlined in the Receiving Water Assessment Procedures Manual, TCEQ publication number GI-253 and in the SWQM Biological Monitoring Fact Sheet on Use Attainability Analysis. All acceptable data collected during RWAs are stored in the automated SWQM database in TRACS.

An RWA contains:

(1) data on physical and habitat characteristics of the stream which can include (a) stream morphology, such as numbers of bends and substrate types, (b) information on the riparian zone, such as types of vegetation, bank slope, and percentage of erosion on banks, (c) flow characteristics, such as velocity and evidence of flow fluctuations, (d) in-stream cover, such as logs and under cut banks. These physical characteristics are used to develop a habitat quality index for the stream.

(2) water quality measurements such as dissolved oxygen (DO), pH, and temperature which are measured in the field (Field data). Water samples may also be collected and sent to a laboratory to determine the concentrations of common constituents such as nutrients and dissolved salts.

(3) biological characterization which is usually determined by sampling both the fish and macroinvertebrate populations. A Regional Index of Biotic Integrity (IBI) for fish, as developed by the Texas Parks and Wildlife Department (TPWD), was used to assess fish data sets for the 2004 305(b) and will be used in all future aquatic life assessments. The reference report for the Regional IBI can be found on the TPWD website at http://www.tpwd.state.tx.us/texaswater/river_studies/pdf_files/ibi_for_texas_streams.pdf The numbers and types of macroinvertebrates collected are either compared to an unimpacted site in the area or applied to a state-wide index developed to characterize these organisms.

CONTINUOUS WATER QUALITY MONITORING DESCRIPTION

Continuous monitoring characterizes water quality in greater detail than is possible with grab samples or short term deployments of multiprobe instruments. Parameters that can currently be monitored with confidence include water temperature, pH, conductivity, and dissolved oxygen. Parameters that are currently under development for inclusion in quality-assured continuous monitoring data sets are turbidity, nitrate, ammonia, ortho-phosphate, and total phosphorus. Typically continuous monitoring is accomplished by deploying a station consisting of: monitoring equipment for the parameter(s) of interest, a data logger to store and relay collected data to the TCEQ, telemetry such as cellular, radio, satellite or landline telephone infrastructure capable of transmitting collected data to the TCEQ, and a power source to run all monitoring and communication instrumentation. A structure must be erected at the station to house communication, monitoring, and power equipment. The station may be deployed at any water body where a need for detailed water quality information is identified, access to the site is granted by a public or private landowner, and logistical requirements for the establishment of power, communications, and monitoring at the site can be satisfied. Continuous water quality monitoring stations are operated by FOD SWQM staff in some of TCEQ’s 16 regional offices or local cooperators working with FOD or Central SWQM staff. Support for communication and deployment is provided by staff in Monitoring Operations (MOPs) Ambient Monitoring Section.

Continuous monitoring is used for a variety of purposes, including:

(1) to identify short term or seasonal water quality trends;
(2) to assess impacts of point and nonpoint source discharges;

(3) to develop water quality controls and assess improvement after watershed management or TMDL implementation plans have been enacted;

(4) to develop new continuous monitoring methodology and build on the success of the continuous ambient monitoring air network infrastructure;

(5) to provide data to the public for water bodies of interest.

Raw data for all parameters collected using continuous monitoring is stored in TCEQ's IPS/MeteoStar database. The capability of loading CMP data into TRACS from IPS/MeteoStar is currently under development. Regulatory use of continuous monitoring data is limited to dissolved oxygen, temperature, pH, and conductivity. Post calibration data in compliance with criteria published in the most recent edition of the Surface Water Quality Monitoring Manual must accompany all data.

QAPs are written for each CMP and will follow the format in the TCEQ SWQM and WQA Special Study QAP (Appendix C.) These QAPs will be written as an addendum to the SWQM QAPP and will have an abbreviated sign-off process by the water body project manager, their section manager, the SWQM or the WQA Section project manager, the WDM&A data validator, and the SWQM Program QA specialist. All original QAP addendums will remain on file in the SWQM Program QA files in central office. A copy of the QAP for any project that will have data submitted to the TRACS database will be provided to the Water Data Management and Analysis Team. All original QAP addendums for the WQA Section will remain on file in the WQA Section QA files in the central office. The most recent SOPs describing site selection, deployment, operation, and data validation continuous monitoring protocols will be cited in each QAP.

<u>ASSESSMENT TOOLS</u>
The assessment tools used for data collection in this program are outlined in detail in Section C1 of this document.

A description of the actual uses of SWQM data is found in Section A7 of this document.

A schedule of tasks for fiscal year 2004 is found in Table 1.

TABLE 1. WORK SCHEDULE - FY 2004

TASKS	S '03	O '03	N '03	D '03	J '04	F '04	M '04	A '04	M '04	J '04	J '04	A '04
Surface Water Quality Monitoring	*	*	*	*	*	*	*	*	*	*	*	*
Program Coordination	*	*	*	*	*	*	*	*	*	*	*	*
Semi-Annual Progress Report	*						*					
SWQM Annual Workshop	*											
Submit QAPP (QA/R-5) to USEPA				*								
TSAs to regional offices			*				*	*	*	*	*	

PROJECT AND QUALITY REPORTS

A detailed discussion of SWQM records (both data and quality control) is found in Section A10 of this document.

A detailed discussion of SWQM reports and reporting requirements is found in Section C2 of this document.

Section A7. Quality Objectives and Criteria for Measurement Data

The SWQM Program deals with characterizing the ambient conditions of the surface waters of Texas. For this reason, no enforcement, regulatory, or policy decisions will be made as a part of this project. The results of this project will be used, however, to support rule-making, enforcement, regulatory, or policy decisions. SWQM data which are collected following the requirements of this QAPP will be put into the TCEQ's SWQM database in TRACS and may be used by the TCEQ and the public to support and enhance:

- establishment of baseline water quality conditions;
- analysis of trends in water quality and comparison to water quality standards;
- maintenance of surveillance on sensitive aquatic ecosystems and water bodies of high public use and interest;
- determination of the effectiveness of the implementation of water quality controls;
- alerting the TCEQ's FOD SWQM personnel to potential water quality violations and, in the case of documented violations, showing whether or not permit violations have contributed to water quality degradation;
- water quality assessments in the biennial Texas Basin Water Quality Inventory Report (the 305(b) report) to the USEPA;
- making impairment determinations under Section 303(d) of the Clean Water Act or for the integrated 303(d)/305(b) report; and
- establishment of priorities for water quality management actions.

The numeric stream standards for the variables discussed in Section A6 of this document are specific for each stream segment throughout the State. These stream standards are referenced in the TCEQ's 30 Texas Administrative Code (TAC), 307 entitled Texas Surface Water Quality Standards.

Table 2 contains the various products produced by the SWQM Program.

TABLE 2. SWQM PRODUCTS

Product Name	Number of Copies	Recipient(s)	Performance Criteria
SWQM Monitoring Strategy - Update	1	EPA - Region VI	EPA Region VI Guidance for State Monitoring Programs
Annual SWQM QAPP	1	EPA - Region VI	QAR-5 Document
305(b) Assessment Database for Texas - Update	1	EPA - Headquarters	EPA 305(b) Assessment Database System Format Specifications
Annual Coordinated Routine Monitoring Schedule	1	EPA - Region VI	None
Semi-annual Progress Reports	2	EPA - Region VI	EPA Dialogue Table

THE SWQM MONITORING STRATEGY

The TCEQ is preparing a Surface Water Quality Monitoring Strategy (SWQM Strategy), describing how the agency plans and implements monitoring. The strategy will discuss monitoring design and will specify methods for choosing monitoring sites, parameters and frequency for routine monitoring and SSs. This design will be used in the preparation of the annual Cooperative Surface Water Quality Monitoring Schedule. Details of such aspects of the monitoring program as probabilistic sampling design, biologic criteria development and biological monitoring, and trend analysis will be included in the SWQM Strategy.

TREND ANALYSIS

The TCEQ has identified trend analysis as a tool to determine if a water body is not expected to meet applicable water quality standards, or is threatened as defined in 40 CFR section 130.2(j) and EPA guidance. In general, trend analysis provides information which contributes to a quantitative, objective assessment of whether or not the values for a random variable such as the chlorides concentration, or biological integrity (the dependent variable) are increasing or decreasing over time, as a function of an independent variable such as time. Trend analysis also provides an estimate of the rate of change. In most cases the explanatory (independent) variable will be time. The TCEQ may also look at trend analyses to evaluate improvement in impaired water bodies as well as where there are no trends. However, trend analyses will most likely be prioritized to evaluate water bodies which appear to be threatened. For purposes of generating a statistical trend, 20 to 60 samples collected over a period of five to 20 years are required. Trend analysis is not routinely done as part of the assessment program and there is no current strategy for identifying water bodies which may need a trend analysis. The TCEQ has some long-term stations as part of the routine monitoring network. One of the purposes of these monitoring stations is to assess long-term water quality trends. When it is decided that a trend analysis is warranted on a particular water body, a separate QAP describing the trend analysis will be developed for that study. Trend analyses will be described in more detail in the soon-to-be-developed SWQM Strategy.

The first step in a trend analysis will be to plot the data with the dependent variable plotted on the y-axis and the independent variable plotted on the x-axis. Visual inspection of the data so plotted will allow an evaluation of whether the relationship looks linear or non-linear, and whether the variability of the dependent variable is relatively uniform across the range of observed values for the independent variable, i.e. the data are homoscedastic, or the variability of the dependent variable changes across the range of observed values for the independent variable, i.e. the data are heteroscedastic. If it is determined that the relationship appears non-linear, and/or the data are heteroscedastic, a data transformation may be applied to either or both of the dependent and independent variables.

If either the raw data or the transformed data exhibit apparent linearity and relative homoscedasticity then simple linear regression will be used to determine if there is a significant decreasing or increasing trend in the value of the dependent variable over time. Acceptance or rejection of the regression model as accurately representing a meaningful trend in the value of the dependent variable will be based on the following procedure:

1. A test of the null hypothesis (H_0) that the slope of the regression line which describes the relationship between the dependent variable (e.g. chloride) and the independent variable (e.g. time) is zero. This is expressed statistically as:

H_0:$\beta_1 = 0$
versus the alternative hypothesis (H_1)
H_1:$\beta_1 \neq 0$.

Where β_1 = the slope of the regression line computed from the sample data
And $\propto = 0.50$
Where $\propto$ (alpha) is the significance level of the regression; probability of rejecting H_0 when it is true.

2. If H_0 is rejected, i.e. $p<0.50$ then the amount of variance explained by the regression as expressed by the coefficient of determination (r^2) will be evaluated.

3. Residuals plots will be used to assess adherence of the data to the assumptions of parametric linear regression.

4. If the preceding analysis indicates a meaningful regression, the model can be used to predict the mean value for the dependent variable four years hence. If the criterion or standard for the dependent variable is an upper limit then the water body will be considered threatened if the predicted value is greater than the criterion or standard. If the criterion or standard represents a lower limit then the water body will be considered threatened if the predicted value is below the segment criterion for the parameter in question.

If, transformation of the data does not result in linearity and homoscedasticity then the non-parametric Kendall-Thiel robust line method will be used to determine if data indicate an increasing or decreasing trend in the value of the dependent variable. In a procedure analogous to that outlined for the parametric linear regression the results of the Kendall-Thiel analysis will be examined according to the following guidelines:

1. A test of the null hypothesis

$H_0: \tau = 0$
versus the alternative hypothesis
$H_1: \tau \neq 0$

Where τ = Kendall's Tau correlation coefficient which expresses the degree of correlation between two variables (e.g. flow and chloride)
And $\propto = 0.50$

2. Based on the linear equation derived in the analysis, an estimate of the median value for the dependent variable 4 years hence can be derived. If the 80% confidence interval about this median includes the criterion for the parameter in question it will be concluded that the water body is not threatened.

ACHIEVING DQO'S FOR THE SWQM MONITORING PROGRAM

The DQOs for this program can be met by adhering to the procedures defined in this QAPP. The precision, bias, representativeness, comparability, and completeness required to meet these objectives are summarized below in text and in Table 3. When a particular project has DQOs which differ from those listed below, involve other parameters, alternative laboratory methods, etc., a Special Study QAP for that project will be prepared, and will be signed by the appropriate representatives from all involved entities as well as the TCEQs Quality Assurance Project Officer for the SWQM Program. The QAP will be kept on file in the SWQM QA files and will be available during QA audits. So, essentially, the DQOs for RWAs and UAAs will be the same as for the routine monitoring program, and if they differ, will be identified in the MPDF for that UAA or

RWA. All DQOs for SSs requiring a QAP will be outlined in that QAP.

The DQOs outlined in this QAPP are consistent with the requirements for providing data to be used in the preparation of the 305(b) report and the 303(d) list. The methods of assessment and screening levels used in the data analysis are as outlined in the Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data, TNRCC, August 17, 2001.

Analytical methods used in the SWQM Program are based on the TSWQS and reporting limit requirements. Any changes in methods, procedures, equipment, etc. will be documented by amendment through a QAP or MPDF.

Any project undertaken by the TCEQ will employ only methods and techniques which have been determined to produce measurement data of a known and verifiable quality and which are of quality sufficient to meet the overall objectives of the water quality monitoring investigation. The DQOs for routine monitoring variables/analytical methods for the SWQM Program are listed in Table 3. The DQOs for organic substances/analytical methods for the SWQM Program are listed in Table 4.

Ambient Water Reporting Limits (AWRLS)

The AWRL establishes the reporting specification at **or below** which data for a parameter must be reported to be compared with freshwater screening criteria. The AWRLs specified in Tables 3 and 4 are the program-defined reporting specifications for each analyte and yield data acceptable for routine water quality monitoring. *Note: While the AWRL is the highest acceptable reporting limit that can be reported for a given parameter, all possible uses of the data should be considered and reporting limits should be specified accordingly.* The reporting limit is the lowest concentration at which the laboratory will report quantitative data within a specified recovery range. The laboratory will meet two requirements in order to report meaningful results to the SWQM Program:

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

Acceptance criteria are defined in Section B5.

Precision

Precision is a statistical measure of the reproducibility of a measurement when a collection or an analysis is repeated and includes components of random error. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions. Laboratory precision is assessed by duplicate analyses of laboratory control standards. Precision results are plotted on quality control charts and used during evaluation of analytical performance. Project control limits for laboratory control standard/laboratory control standard duplicate (LCS/LCS dup.) pairs are defined in Tables 3 and 4.

Precision LCS/LCS dup. pairs must be run at a frequency of one per batch. Field splits are used to assess the variability of sample handling, preservation, storage, and analysis. Control limits for field splits are defined in Section B5.

Bias

Bias is a statistical measurement of correctness and includes components of systematic error. A measurement is considered unbiased when the value reported does not differ from the true value. Laboratory bias is assessed through the analysis of laboratory control standards (LCS) prepared with known and verified concentrations of analyte. Bias of LCS measurements are run at a frequency of one per batch. Results are plotted on quality control charts and used during evaluation of analytical performance. Project control limits for laboratory control standards are specified in Tables 3 and 4.

Representativeness

The representativeness of the data is dependent on the sampling locations and the sampling procedures adequately representing the true condition of the sample site. Requirements for selecting sample sites are discussed in detail in Chapter 2 of the SWQM PM. Sample siting, sampling of relevant media (water, sediment and biota) and use of only approved analytical methods will assure that the measurement data represents the conditions at the site. It is well known that water flowing past a given location on land is constantly changing in response to inflow, tidal cycle, weather, etc. Sampling schedules will be designed with respect to frequency, locations and methodology in order to maximize representativeness. At a minimum, samples are collected over at least two seasons (to include inter-seasonal variation) and over two years (to include inter-year variation) to include some data collected during an index period (March 15- October 15). Although data may be collected during varying regimes of weather and flow, the data sets will not be biased toward unusual conditions of flow, runoff, or season. The goal for meeting total representation of the water body will be tempered by the potential funding for complete representativeness.

<u>Probabilistic Sampling</u>
The TCEQ is participating in the National Wadeable Stream Study, a probabilistic biological assessment of the nation's wadeable streams. This study has a separate QAPP and TCEQ is participating under that QAPP. TCEQ considers this participation a pilot study to acertain the level of resources required to conduct future probabilistic studies. When TCEQ develops its own probabilistic study, it will be incorporated into the QAPP or a separate QAPP will be developed. Probabilistic study designs will also be discussed in the soon-to-be-developed SWQM Strategy.

Comparability

The comparability of data produced by and for the TCEQ is predetermined by the commitment of its staff and contracted laboratories 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 significant figures, and by reporting data in standard format as specified in the various TCEQ data reporting forms.

Completeness

The completeness of data is basically a relationship of how much of the data are available for use compared to the total potential data before any conclusion is reached. Ideally, 100% of the data should be available. However, the possibility of data becoming unavailable due to laboratory error, insufficient sample volume, or samples broken in shipping must be expected. Also, unexpected situations may arise where field conditions do not allow for 100% data completeness. Therefore, 90% data completeness is required by the TCEQ for data usage.

TABLE 3. ROUTINE MONITORING VARIABLES/ANALYTICAL METHODS

Analysis	Matrix	Units	Parameter Code	Analytical Method	Precision of LCS/LCS dup. (%RPD)	Bias of LCS (% Recovery)	AWRL	Accuracy of RL (% Recovery)
pH	water	pH/ units	00400	EPA 150.1 and TCEQ SOP	NA	NA	NA	NA
Dissolved Oxygen	water	mg/L	00300	EPA 360.1 and TCEQ SOP	NA	NA	NA	NA
Conductivity	water	uS/cm	00094	EPA 120.1 and TCEQ SOP	NA	NA	NA	NA
Salinity	water	ppt, marine only	00480	SM 2520 and TCEQ SOP	NA	NA	NA	NA
Chlorine residual	water	mg/L	50060	SM 4500-Cl G and TCEQ SOP	NA	NA	0.1	NA
Temperature	water	° C	00010	EPA 170.1 and TCEQ SOP	NA	NA	NA	NA
Secchi Depth	water	meters	00078	TCEQ SOP	NA	NA	NA	NA
Days since last significant rainfall	NA	days	72053	TCEQ SOP	NA	NA	NA	NA
Maximum pool width	water	meters	89864	TCEQ RWA SOP	NA	NA	NA	NA
Maximum pool depth	water	meters	89865	TCEQ RWA SOP	NA	NA	NA	NA
Pool length	water	meters	89869	TCEQ RWA SOP	NA	NA	NA	NA
% pool coverage	water	%	89870	TCEQ RWA SOP	NA	NA	NA	NA
Total water depth	water	meters	82903	TCEQ RWA SOP	NA	NA	NA	NA

Analysis	Matrix	Units	Parameter Code	Analytical Method	Precision of LCS/LCS dup. (%RPD)	Bias of LCS (% Recovery)	AWRL	Accuracy of RL (% Recovery)
Flow	water	cfs	00061	TCEQ SOP	NA	NA	NA	NA
Flow measurement method	water	1-gage 2-electric 3-mechanical 4-weir/flume 5-doppler	89835	TCEQ SOP	NA	NA	NA	NA
Flow severity	water	1-no flow, 2-low, 3-normal, 4-flood, 5-high, 6-dry	01351	TCEQ SOP	NA	NA	NA	NA
ALKALINITY, Total	water	mg/L	00410	EPA 310.1	20	80-120	10.0	75-125
ALUMINUM	water - D	µg/L	01106	EPA 200.7	20	80-120	200	75-125
	water - T	µg/L	01105	EPA 200.7	20	70-130	200	75-125
	sediment - T	mg/kg	01108	SW 846 6020A	30	70-130	0.5	75-125
AMMONIA-NITROGEN	water	mg/L	00610	EPA 350.1	20	70-130	0.02[1]	75-125
ANTIMONY	water - D	µg/L	01095		20	80-120	0.08	75-125
	water - T	µg/L	01097		20	80-120	0.08	75-125
ARSENIC	water - D	µg/L	01000	EPA 200.8	20	80-120	5.0	75-125
	water - T	µg/L	01002	EPA 200.8	20	80-120	5.0	75-125
	sediment - T	mg/kg	01003	SW846 6020A	30	70-130	7.0	75-125
	tissue - T	mg/kg	01004	SW846 6020A	30	70-130	3.0	75-125
BARIUM	water - D	µg/L	01005	EPA 208.1	20	80-120	1000	75-125

Analysis	Matrix	Units	Parameter Code	Analytical Method	Precision of LCS/LCS dup. (%RPD)	Bias of LCS (% Recovery)	AWRL	Accuracy of RL (% Recovery)
	water - T	µg/L	01007	EPA 208.1	20	80-120	1000	75-125
	sediment - T	mg/kg	01008	SW846 6010	30	70-130	200	75-125
BERYLLIUM	water - D	µg/L	01010	EPA 200.8	20	80-120	0.0026	75-125
	water - T	µg/L	01012	EPA 200.8	20	80-120	0.0026	75-125
BIOCHEMICAL OXYGEN DEMAND, 5-day	water	mg/L	00310	SM 5210-B	20	70-130	2.0[2]	NA
CADMIUM	water - D	µg/L	01025	EPA 200.8	20	80-120	0.1 where H<50 mg/L 0.3 where H≥50 mg/L	75-125
	water - T	µg/L	01027	EPA 200.8	20	80-120	0.1 where H<50 mg/L 0.3 where H≥50 mg/L	75-125
	sediment - T	mg/kg	01028	SW846 6020A	30	70-130	0.6	75-125
	tissue - T	mg/kg	71940	SW846 6020A	30	70-130	0.5	75-125
CALCIUM	water - D	mg/L	00915	EPA 200.7	20	80-120	0.5	75-125
	water - T	mg/L	00916	EPA 215.2	20	80-120	0.5	75-125
CARBONACEOUS-BIOCHEMICAL OXYGEN DEMAND	water	mg/L	00307	SM 5210-B	20	70-130	2.0[2]	NA
CHEMICAL OXYGEN DEMAND	water	mg/L	00335	EPA 410.2	20	80-120	10.0	75-125
CHLORIDE	water	mg/L	00940	EPA 300.0	20	80-120	10.0	75-125
CHLOROPHYLL a	water	µg/L	32211	SM 10200-H*****	20	NA ****	10	75-125
CHROMIUM	water - D	µg/L	01030	EPA 200.8	20	80-120	10.0	75-125
	water - T	µg/L	01034	EPA 200.8	20	80-120	10.0	75-125
	sediment - T	mg/kg	01029	SW846 6010	30	70-130	21	75-125

Analysis	Matrix	Units	Parameter Code	Analytical Method	Precision of LCS/LCS dup. (%RPD)	Bias of LCS (% Recovery)	AWRL	Accuracy of RL (% Recovery)
	tissue - T	mg/kg	71939	SW846 6010	30	70-130	100	75-125
CHROMIUM VI	water - D	µg/L	01220	EPA 218.5	20	80-120	6	75-125
COBALT	water - D	µg/L	00080	EPA 200.8	20	80-120	0.75	75-125
	water - T	µg/L	01037	EPA 200.8	20	80-120	0.75	75-125
COPPER	water - D	µg/L	01040	EPA 200.8	20	80-120	1.0 where H<50 mg/L 3.0 where H≥50 mg/L	75-125
	water - T	µg/L	01042	EPA 200.8	20	80-120	1.0 where H<50 mg/L 3.0 where H≥50 mg/L	75-125
	sediment - T	mg/kg	01043	SW846 6010	30	75-125	14	75-125
	tissue - T	mg/kg	71937	SW846 6010	30	75-125	40	75-125
DISSOLVED ORGANIC CARBON	water	mg/L		SM 5310-D	20	80-120	0.5	75-125
E. COLI	water	MPN/100 mL	31699	SM 9223-B	0.5 **	NA	NA	NA
ENTEROCOCCUS	water	org/100 mL	31701	ASTM D-6503	0.5 **	NA	NA	NA
FECAL COLIFORM	water	cfu/100 mL	31616	SM 9222-D	0.5 **	NA	1	NA
FLUORIDE	water	mg/L	00951	EPA 300.0	20	80-120	0.5	75-125
GRAIN SIZE ANALYSIS	sediment	% of dry wt.	80256 89991 82008 82009	HLAB 160	%gravel - 20 %sand - 20 %silt - 20 %clay - 20	NA	NA	NA
HARDNESS, (as $CaCO_3$)	water - T	mg/L	82394	SM 2340-B	20	80-120	5.0	75-125
	water - D	mg/L	46570	SM 2340-B	20	80-120	5.0	75-125
IRON	water - D	µg/L	01046	EPA 236.1	20	80-120	300	75-125

Analysis	Matrix	Units	Parameter Code	Analytical Method	Precision of LCS/LCS dup. (%RPD)	Bias of LCS (% Recovery)	AWRL	Accuracy of RL (% Recovery)
	water - T	µg/L	01045	EPA 236.1	20	80-120	300	75-125
KJELDAHL NITROGEN	water - T	mg/L	00625	EPA 351.3	20	80-120	0.2	75-125
	sediment - T	mg/kg	00627	mod. EPA 351.31	30	70-130	0.8	75-125
LEAD	water - D	µg/L	01049	EPA 200.8	20	80-120	0.1 where H<85 mg/L *** 1.0 where H≥85 mg/L	75-125
	water - T	µg/L	01051	EPA 200.8	20	80-120	0.1 where H<85 mg/L 1.0 where H≥85 mg/L	75-125
	sediment - T	mg/kg	01052	SW846 6020A	30	70-130	20	75-125
	tissue - T	mg/kg	71936	SW846 6020A	30	70-130	1	75-125
MAGNESIUM	water - D	mg/L	00925	EPA 242.1	20	80-120	0.5	75-125
	water - T	mg/L	00927	EPA 242.1	20	80-120	0.5	75-125
MANGANESE	water - D	µg/L	01056	EPA 243.1	20	80-120	50	75-125
	water - T	µg/L	01055	EPA 243.1	20	80-120	50	75-125
MERCURY	water - D	µg/L	71890	EPA 1631	20	80-120	0.006	75-125
	water - T	µg/L	71900	EPA 1631	20	80-120	0.006	75-125
	sediment - T	mg/kg	71921	SW846 7471	30	70-130	0.1	75-125
	tissue - T	mg/kg	71930	SW846 7471	30	70-130	0.7	75-125
MOLYBDENUM	water - D	µg/L	01060	EPA 200.8	20	80-120	35	75-125
	water - T	µg/L	01062	EPA 200.8	20	80-120	35	75-125
NICKEL	water - D	µg/L	01065	EPA 200.8	20	80-120	10.0	75-125
	water - T	µg/L	01067	EPA 200.8	20	80-120	10.0	75-125
	sediment - T	mg/kg	01068	SW846 6020A	30	70-130	15	75-125

Analysis	Matrix	Units	Parameter Code	Analytical Method	Precision of LCS/LCS dup. (%RPD)	Bias of LCS (% Recovery)	AWRL	Accuracy of RL (% Recovery)
NITRATE- NITROGEN	water	mg/L	00620	EPA 300.0	20	80-120	0.02[1]	75-125
NITRATE-NITRITE	water	mg/L	00630	EPA 353.3	20	80-120	0.04	75-125
NITRITE-NITROGEN	water	mg/L	00615	EPA 300.0	20	80-120	0.02[1]	75-125
OIL AND GREASE (Hexane extraction)	water	mg/L	00552	EPA 1664	20	80-120	5.0	75-125
	sediment	mg/kg	00553	mod. EPA 1664	30	80-120	80	75-125
ORTHO-PHOSPHATE - P	water	mg/L	00671 (fld filt)	EPA 300.0	20	75-125	0.04[3]	75-125
	water	mg/L	70507	EPA 300.0	20	75-125	0.04[1]	75-125
PHEOPHYTIN a	water	µg/L	32218	SM 10200-H*****	NA	NA ****	5	NA
POTASSIUM	water - D	µg/L	00935	EPA 200.7	20	80-120	200	75-125
	water - T	µg/L	00937	EPA 200.7	20	80-120	200	75-125
SELENIUM	water - T	µg/L	01147	EPA 200.8	20	80-120	2.0	75-125
	water - D	µg/L	01145	EPA 200.8	20	80-120	2.0	75-125
	sediment - T	mg/kg	01148	SW846 6020A	30	70-130	1.0	75-125
	tissue - T	mg/kg	01149	SW846 6020A	30	70-130	2.0	75-125
SILVER	water - T	µg/L	01077	EPA 200.8	20	80-120	0.5	75-125
	water - D	µg/L	01075	EPA 200.8	20	80-120	0.5	75-125
	sediment - T	mg/kg	01078	SW846 6020A	30	70-130	0.5	75-125
SODIUM	water - D	µg/L	00930	EPA 200.7	20	80-120	500	75-125
	water - T	µg/L	00929	EPA 200.7	20	80-120	500	75-125
STRONTIUM	water - D	µg/L	01080	EPA 200.8	20	80-120	0.75	75-125
SULFATE	water	mg/L	00945	EPA 300.0	20	80-120	10.0	75-125

Analysis	Matrix	Units	Parameter Code	Analytical Method	Precision of LCS/LCS dup. (%RPD)	Bias of LCS (% Recovery)	AWRL	Accuracy of RL (% Recovery)
TITANIUM	water - D	µg/L	01150	EPA 200.8	20	80-120	1.0	75-125
	water - T	µg/L	01152	EPA 200.8	20	80-120	1.0	75-125
THALLIUM	water - D	µg/L	01057	EPA 200.8	20	80-120	0.002	75-125
	water - T	µg/L	01059	EPA 200.8	20	80-120	0.002	75-125
TIN	water - D	µg/L	01100	EPA 200.7	20	80-120	0.036	75-125
	water - T	µg/L	01102	EPA 200.7	20	80-120	0.036	75-125
TOTAL COLIFORM	water	cfu/100mL	31501	SM 9222-B	0.5 *	NA	1	NA
TOTAL DISSOLVED SOLIDS	water	mg/L	70300	EPA 160.1	20	80-120	10.0[2]	NA
NONPURGEABLE ORGANIC CARBON (TOTAL ORGANIC CARBON)	water	mg/L	00680	EPA 415.1	20	80-120	2.0	75-125
	sediment	mg/kg	81951	SM5310-B	30	70-130	1500	75-125
TOTAL PHOSPHORUS	water	mg/L	00665	EPA 365.3	20	80-120	0.06	75-125
	sediment	mg/kg as P	00668	mod. EPA 365.3	30	70-130	0.8	75-125
TOTAL SUSPENDED SOLIDS	water	mg/L	00530	EPA 160.2	20	80-120	4.0[2]	NA
TOTAL SOLIDS	sediment	%	81373	HLAB 200	NA	NA	NA	NA
TURBIDITY	water	NTU	82079	SM 2130 B	20	80-120	0.5	NA
VANADIUM	water - D	µg/L	01085		20	80-120	.01	75-125
VOLATILE SUSPENDED SOLIDS	water	mg/L	00535	EPA 160.4	20	NA	4.0[2]	NA
ZINC	water - T	µg/L	01092	EPA 200.8	20	80-120	5.0	75-125
	water - D	µg/L	01090	EPA 200.8	20	80-120	5.0	75-125

Analysis	Matrix	Units	Parameter Code	Analytical Method	Precision of LCS/LCS dup. (%RPD)	Bias of LCS (% Recovery)	AWRL	Accuracy of RL (% Recovery)
	sediment - T	mg/kg	01093	SW846 6010	30	70-130	64	75-125

REFERENCES AND NOTES FOR TABLE 3

EPA = USEPA. Methods for Chemical Analysis of Water and Waste, revised March 1983, Manual #EPA-600/4-79-020. Washington, DC.; USEPA. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993, Manual #EPA/600/R-93/100; USEPA. Methods for the Determination of Metals in Environmental Samples, Supplement 1, May 1994 EPA/600/R-94/111. Only the methods of analysis are listed.

HLAB = TCEQ Houston Laboratory Standard Operating Procedure. The principle reference for HLAB 160 is EPA 600/2-78-054. The main reference for HLAB 200 is Standard Methods 18th edition, Method 2540G.
SM = American Public Health Association, et al. Standard Methods for the Examination of Water and Wastewater. Washington, DC
SW = USEPA. Test methods for Evaluating Solid Waste. SW–846 3rd edition. Update III (1997).
ASTM = American Society for Testing and Materials. Annual Book of Standards, Vol 11.02.

* Measurement performance criteria will vary according to range of results.
** Based on range statistics as described in Standard Methods, 20th Edition, Section 9020-B, "Quality Assurance/Quality Control - Intralaboratory Quality Control Guidelines."
*** The "H" in the AWRL column refers to the hardness of the ambient water being analyzed.
**** In lieu of LCS/LCS dup., sample duplicates with analyte concentrations greater than the AWRL will be analyzed.
***** Analysis of chlorophyll-a and pheophytin-a samples by the TCEQ Houston Laboratory will be performed by a method modification contained in TCEQ SOP - HLAB 159

AWRL superscript codes:
1 - The TCEQ laboratory reporting limit for ammonia, nitrate-nitrogen, and nitrite-nitrogen will be 0.05 mg/L using the AWRL methodology, i.e. +/- 25% accuracy of the low point on the calibration curve.
2 - The AWRL is automatically determined by application of the rules for calculation and reporting of the BOD, CBOD, TDS, TSS, and VSS test results.
3- The TCEQ laboratory reporting limit for ortho-phosphorous will be 0.06 mg/L using the AWRL methodology, i.e. +/- 25% accuracy of the low point on the calibration curve.

Components in sediments and soils are reported on a dry-weight basis unless otherwise specified in the report. Percent Solids information available upon request.

Metals in Tissues are reported on a wet-weight basis unless otherwise requested or specified in the report. Percent Solids test performed upon request.

Methods listed in Table 3 are the preferred method of analysis. Other methods may be employed and the data will be accepted as long as the methods used: (1) meet the sensitivity requirements of the AWRLs in Table 3, and (2) are contained in 40CFR36, the most current version of Standard Methods, or are another reliable procedure approved by the TCEQ. If the TCEQ Houston Laboratory or other contract laboratory wishes to use a method other than the one identified in Table 3, the laboratory must receive written permission from the SWQM Program prior to using that method.

TABLE 4. ORGANIC SUBSTANCES/ANALYTICAL METHODS

SEMIVOLATILE ORGANICS

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% Rec)
34694	Phenol	108-95-2	Water	µg/L	SW846 8270C	30	70-130	55	6	75-125
34695			Sediment	µg/kg	SW846 8270C	30	70-130	1000	500	75-125
34468			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34586	2-Chlorophenol	95-57-8	Water	µg/L	SW846 8270C	30	70-130	40	5	75-125
34589			Sediment	µg/kg	SW846 8270C	30	70-130	1000	500	75-125
34590			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34591	2-Nitrophenol	88-75-5	Water	µg/L	SW846 8270C	30	70-130	960	5	75-125
34594			Sediment	µg/kg	SW846 8270C	30	70-130	1150	500	75-125
34595			Tissue	mg/kg	SW846 8270C	30	70-130	0.7	0.5	75-125
34601	2,4-Dichlorophenol	120-83-2	Water	µg/L	SW846 8270C	30	70-130	40	5	75-125
34604			Sediment	µg/kg	SW846 8270C	30	70-130	1200	500	75-125
34605			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34452	3-Methyl-4-Chlorophenol (parachlorometa cresol)	59-50-7	Water	µg/L	SW846 8270C	30	70-130	0.15	5	75-125
34455			Sediment	µg/kg	SW846 8270C	30	70-130	1400	500	75-125
34456			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
77687	2,4,5-Trichlorophenol	95-95-4	Water	µg/L	SW846 8270C	30	70-130	32	5	75-125
78401			Sediment	µg/kg	SW846 8270C	30	70-130	1150	500	75-125
88809			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34621	2,4,6-Trichlorophenol	88-06-2	Water	µg/L	SW846 8270C	30	70-130	7	5	75-125
34624			Sediment	µg/kg	SW846 8270C	30	70-130	1000	500	75-125

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% Rec)
34625			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34606	2,4-Dimethylphenol	105-67-9	Water	µg/L	SW846 8270C	30	70-130	105	5	75-125
34609			Sediment	µg/kg	SW846 8270C	30	70-130	1100	500	75-125
34610			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34616	2,4-Dinitrophenol	51-28-5	Water	µg/L	SW846 8270C	30	70-130	30	50	75-125
34619			Sediment	µg/kg	SW846 8270C	30	70-130	2100	500	75-125
34620			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	2	75-125
34646	4-Nitrophenol	100-02-7	Water	µg/L	SW846 8270C	30	70-130	530	5	75-125
34649			Sediment	µg/kg	SW846 8270C	30	70-130	2100	500	75-125
34650			Tissue	mg/kg	SW846 8270C	30	70-130	1.7	0.5	75-125
34657	4,6-Dinitro-o-cresol (DNOC)	534-52-1	Water	µg/L	SW846 8270C	30	70-130	11	50	75-125
34660			Sediment	µg/kg	SW846 8270C	30	70-130	1800	500	75-125
34661			Tissue	mg/kg	SW846 8270C	30	70-130	0.7	0.5	75-125
39032	Pentachlorophenol (PCP)	87-86-5	Water	µg/L	SW846 8270C	30	70-130	0.5	0.5	75-125
39061			Sediment	µg/kg	SW846 8270C	30	70-130	1600	500	75-125
39060			Tissue	mg/kg	SW846 8270C	30	70-130	1.7	0.5	75-125
34438	N-Nitrosodimethylamine	62-75-9	Water	µg/L	SW846 8270C	30	70-130	0.0035	5	75-125
34441			Sediment	µg/kg	SW846 8270C	30	70-130	850	500	75-125
34442			Tissue	mg/kg	SW846 8270C	30	70-130	1.7	0.5	75-125
34273	bis-(2-Chloroethyl) ether	111-44-4	Water	µg/L	SW846 8270C	30	70-130	0.15	5	75-125
34276			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34277			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34566	1,3-Dichlorobenzene	541-73-1	Water	µg/L	SW846 8270C	30	70-130	42	5	75-125
34569			Sediment	µg/kg	SW846 8270C	30	70-130	660	500	75-125
34570			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% Rec)
34571	1,4-Dichlorobenzene (p-dichlorobenzene)	106-46-7	Water	µg/L	SW846 8270C	30	70-130	38	5	75-125
34574			Sediment	µg/kg	SW846 8270C	30	70-130	700	500	75-125
34575			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34536	1,2-Dichlorobenzene	95-50-1	Water	µg/L	SW846 8270C	30	70-130	55	5	75-125
34539			Sediment	µg/kg	SW846 8270C	30	70-130	670	500	75-125
34540			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-12
34283	bis-(2-Chloroisopropyl) ether	39638-32-9	Water	µg/L	SW846 8270C	30	70-130	700	5	75-125
34286			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34287			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34396	Hexachloroethane	67-72-1	Water	µg/L	SW846 8270C	30	70-130	42.0	5	75-125
34399			Sediment	µg/kg	SW846 8270C	30	70-130	760	500	75-125
34400			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34428	N-Nitroso-di-n-Propylamine	621-64-7	Water	µg/L	SW846 8270C	30	70-130	0.025	5	75-125
34431			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34432			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34447	Nitrobenzene	98-95-3	Water	µg/L	SW846 8270C	30	70-130	19	5	75-125
34450			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34451			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34408	Isophorone	78-59-1	Water	µg/L	SW846 8270C	30	70-130	170	5	75-125
34411			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34412			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34278	bis-(2-Chloroethoxy) methane	111-91-1	Water	µg/L	SW846 8270C	30	70-130	5	5	75-125
34281			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34282			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% Rec)
34551	1,2,4-Trichlorobenzene	120-82-1	Water	µg/L	SW846 8270C	30	70-130	25	5	75-125
34554			Sediment	µg/kg	SW846 8270C	30	70-130	600	500	75-125
34555			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34696	Naphthalene	91-20-3	Water	µg/L	SW846 8270C	30	70-130	250	5	75-125
34445			Sediment	µg/kg	SW846 8270C	30	70-130	670	500	75-125
34446			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34391	Hexachlorobutadiene	87-68-3	Water	µg/L	SW846 8270C	30	70-130	1.5	5	75-125
39705			Sediment	µg/kg	SW846 8270C	30	70-130	760	500	75-125
34395			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34386	Hexachlorocyclopentadiene	77-47-4	Water	µg/L	SW846 8270C	30	70-130	25	10	75-125
34389			Sediment	µg/kg	SW846 8270C	30	70-130	1300	500	75-125
34390			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34581	2-Chloronaphthalene	91-58-7	Water	µg/L	SW846 8270C	30	70-130	27	10	75-125
34584			Sediment	µg/kg	SW846 8270C	30	70-130	950	1000	75-125
34585			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	1	75-125
34200	Acenaphthylene	208-96-8	Water	µg/L	SW846 8270C	30	70-130	5	5	75-125
34203			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34204			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34341	Dimethyl Phthalate	131-11-3	Water	µg/L	SW846 8270C	30	70-130	165	5	75-125
34344			Sediment	µg/kg	SW846 8270C	30	70-130	770	500	75-125
34345			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34626	2,6-Dinitrotoluene	606-20-2	Water	µg/L	SW846 8270C	30	70-130	5	5	75-125
34629			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34630			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34205	Acenaphthene	83-32-9	Water	µg/L	SW846 8270C	30	70-130	11	5	75-125

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% Rec)
34208			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34209			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34611	2,4-Dinitrotoluene	121-14-2	Water	µg/L	SW846 8270C	30	70-130	0.55	5	75-125
34614			Sediment	µg/kg	SW846 8270C	30	70-130	800	500	75-125
34615			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34381	Fluorene	86-73-7	Water	µg/L	SW846 8270C	30	70-130	5.5	5	75-125
34384			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34385			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34641	4-Chlorophenyl Phenyl Ether	7005-72-3	Water	µg/L	SW846 8270C	30	70-130	5	5	75-125
34644			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34645			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34336	Diethyl Phthalate	84-66-2	Water	µg/L	SW846 8270C	30	70-130	1000	5	75-125
34339			Sediment	µg/kg	SW846 8270C	3030	70-130	750	500	75-125
34340			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34433	N-Nitrosodiphenylamine	86-30-6	Water	µg/L	SW846 8270C	30	70-130	290	5	75-125
34436			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34437			Tissue	mg/kg	SW846 8270C	30	70-130	0.7	0.5	75-125
34636	4-Bromophenyl Phenyl Ether	101-55-3	Water	µg/L	SW846 8270C	30	70-130	0.75	5	75-125
34639			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34640			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34461	Phenanthrene	85-01-8	Water	µg/L	SW846 8270C	30	70-130	15	5	75-125
34464			Sediment	µg/kg	SW846 8270C	30	70-130	510	500	75-125
34465			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34220	Anthracene	120-12-7	Water	µg/L	SW846 8270C	30	70-130	0.15	5	75-125
34223			Sediment	µg/kg	SW846 8270C	30	70-130	770	500	75-125

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% Rec)
34224			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
39110	Di-n-Butyl Phthalate	84-74-2	Water	µg/L	SW846 8270C	30	70-130	3.5	5	75-125
39112			Sediment	µg/kg	SW846 8270C	30	70-130	900	500	75-125
34683			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34376	Fluoranthene	206-44-0	Water	µg/L	SW846 8270C	30	70-130	3	5	75-125
34379			Sediment	µg/kg	SW846 8270C	30	70-130	760	500	75-125
34380			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34469	Pyrene	129-00-0	Water	µg/L	SW846 8270C	30	70-130	3.5	8	75-125
34472			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34473			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
39120	Benzidine	92-87-5	Water	µg/L	SW846 8270C	30	70-130	0.0005	5	75-125
39121			Sediment	µg/kg	SW846 8270C	30	70-130	1050	2000	75-125
34241			Tissue	mg/kg	SW846 8270C	30	70-130	0.7	2	75-125
34292	N-Butylbenzyl Phthalate	85-68-7	Water	µg/L	SW846 8270C	30	70-130	46	5	75-125
34295			Sediment	µg/kg	SW846 8270C	30	70-130	770	500	75-125
34296			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34320	Chrysene	218-01-9	Water	µg/L	SW846 8270C	30	70-130	0.20	5	75-125
34323			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34324			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34526	Benzo(a)anthracene	56-55-3	Water	µg/L	SW846 8270C	30	70-130	0.05	5	75-125
34529			Sediment	µg/kg	SW846 8270C	30	70-130	390	500	75-125
34530			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34631	3,3'-Dichlorobenzidine	91-94-1	Water	µg/L	SW846 8270C	30	70-130	0.1	5	75-125
34634			Sediment	µg/kg	SW846 8270C	30	70-130	1100	500	75-125
34635			Tissue	mg/kg	SW846 8270C	30	70-130	1.7	0.5	75-125

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% Rec)
39100	bis-(2-Ethylhexyl) phthalate	117-81-7	Water	µg/L	SW846 8270C	30	70-130	3	5	75-125
39102			Sediment	µg/kg	SW846 8270C	30	70-130	900	500	75-125
39099			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34596	Di-n-octyl Phthalate	117-84-0	Water	µg/L	SW846 8270C	30	70-130	11	5	75-125
34599			Sediment	µg/kg	SW846 8270C	30	70-130	770	500	75-125
34600			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34230	Benzo (b) fluoranthene	205-99-2	Water	µg/L	SW846 8270C	30	70-130	0.19	5	75-125
34233			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34234			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34242	Benzo (k) fluoranthene	207-08-9	Water	µg/L	SW846 8270C	30	70-130	0.19	5	75-125
34245			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34246			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34247	Benzo (a) pyrene	50-32-8	Water	µg/L	SW846 8270C	30	70-130	0.05	5	75-125
34250			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34251			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34403	Indeno (1,2,3-cd) pyrene	193-39-5	Water	µg/L	SW846 8270C	30	70-130	0.19	10	75-125
34406			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34407			Tissue	mg/kg	SW846 8270C	30	70-130	0.7	0.5	75-125
34556	Dibenz (a,h) anthracene	53-70-3	Water	µg/L	SW846 8270C	30	70-130	0.19	10	75-125
34559	(1,2,5,6-Dibenzanthracene)		Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
79040			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.5	75-125
34521	Benzo (ghi) perylene	191-24-2	Water	µg/L	SW846 8270C	30	70-130	15	15	75-125
34524			Sediment	µg/kg	SW846 8270C	30	70-130	750	500	75-125
34525			Tissue	mg/kg	SW846 8270C	30	70-130	0.7	0.5	75-125
79778	Cresols, total	1319-77-3	Water	µg/L	SW846 8270C	30	70-130	1700	10	75-125

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% Rec)
88811			Sediment	µg/kg	SW846 8270C	30	70-130	1600	1000	75-125
88812			Tissue	mg/kg	SW846 8270C	30	70-130	880	1	75-125
73611	N-nitrosodiethylamine	55-18-5	Water	µg/L	SW846 8270C	30	70-130	0.02	10	75-125
88817			Sediment	µg/kg	SW846 8270C	30	70-130	600	500	75-125
88818			Tissue	mg/kg	SW846 8270C	30	70-130	0.01	2	75-125
73609	N-nitrosodi-n-butylamine	924-16-3	Water	µg/L	SW846 8270C	30	70-130	0.9	5	75-125
73159			Sediment	µg/kg	SW846 8270C	30	70-130	700	500	75-125
88821			Tissue	mg/kg	SW846 8270C	30	70-130	0.4	0.5	75-125
77734	1,2,4,5-Tetrachlorobenzene	95-94-3	Water	µg/L	SW846 8270C	30	70-130	0.10	5	75-125
88826			Sediment	µg/kg	SW846 8270C	30	70-130	670	500	75-125
88827			Tissue	mg/kg	SW846 8270C	30	70-130	5	0.5	75-125
77793	Pentachlorobenzene	608-93-5	Water	µg/L	SW846 8270C	30	70-130	3	5	75-125
39118			Sediment	µg/kg	SW846 8270C	30	70-130	1	500	75-125
85679			Tissue	mg/kg	SW846 8270C	30	70-130	14	0.5	75-125
77045	Pyridine	110-86-1	Water	µg/L	SW846 8270C	30	70-130	44	5	75-125
88823			Sediment	µg/kg	SW846 8270C	30	70-130	700	500	75-125
88824			Tissue	mg/kg	SW846 8270C	30	70-130	17	0.5	75-125

PESTICIDES

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% R)
39370	4,4' - DDT	50-29-3	Water	µg/L	SW846 8081A	30	70-130	0.0005	.05	75-125
39373			Sediment	µg/kg	SW846 8081A	30	70-130	11	5	75-125
39376			Tissue	mg/kg	SW846 8081A	30	70-130	0.002	0.005	75-125

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% R)
39360	4,4' - DDD	72-54-8	Water	µg/L	SW846 8081A	30	70-130	0.005	0.05	75-125
39363			Sediment	µg/kg	SW846 8081A	30	70-130	11	5	75-125
81897			Tissue	mg/kg	SW846 8081A	30	70-130	0.005	0.005	75-125
39365	4,4' - DDE	72-55-9	Water	µg/L	SW846 8081A	30	70-130	0.004	0.05	75-125
39368			Sediment	µg/kg	SW846 8081A	30	70-130	13	5	75-125
81896			Tissue	mg/kg	SW846 8081A	30	70-130	0.002	0.005	75-125
39330	Aldrin	309-00-2	Water	µg/L	SW846 8081A	30	70-130	0.002	0.05	75-125
39333			Sediment	µg/kg	SW846 8081A	30	70-130	6	5	75-125
34680			Tissue	mg/kg	SW846 8081A	30	70-130	0.004	0.005	75-125
39380	Dieldrin	60-57-1	Water	µg/L	SW846 8081A	30	70-130	0.001	0.05	75-125
39383			Sediment	µg/kg	SW846 8081A	30	70-130	6	5	75-125
39406			Tissue	mg/kg	SW846 8081A	30	70-130	0.001	0.005	75-125
39390	Endrin	72-20-8	Water	µg/L	SW846 8081A	30	70-130	0.001	0.05	75-125
39393			Sediment	µg/kg	SW846 8081A	30	70-130	10	5	75-125
34685			Tissue	mg/kg	SW846 8081A	30	70-130	0.01	0.005	75-125
39350	Chlordane, total	57-74-9	Water	µg/L	SW846 8081A	30	70-130	0.002	1	75-125
39351			Sediment	µg/kg	SW846 8081A	30	70-130	9	50	75-125
34682			Tissue	mg/kg	SW846 8081A	30	70-130	0.3	0.05	75-125
39410	Heptachlor	76-44-8	Water	µg/L	SW846 8081A	30	70-130	0.002	0.05	75-125
39413			Sediment	µg/kg	SW846 8081A	30	70-130	6	5	75-125
34687			Tissue	mg/kg	SW846 8081A	30	70-130	0.002	0.005	75-125
39420	Heptachlor Epoxide	1024-57-3	Water	µg/L	SW846 8081A	30	70-130	0.08	0.05	75-125
39423			Sediment	µg/kg	SW846 8081A	30	70-130	3	5	75-125
34686			Tissue	mg/kg	SW846 8081A	30	70-130	0.002	0.005	75-125
39480	Methoxychlor	72-43-5	Water	µg/L	SW846 8081A	30	70-130	0.02	0.05	75-125

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% R)
39481			Sediment	µg/kg	SW846 8081A	30	70-130	12	5	75-125
81644			Tissue	mg/kg	SW846 8081A	30	70-130	0.02	0.005	75-125
39782	Lindane (gamma BHC) (gamma-hexachlorocyclohexane)	58-89-9	Water	µg/L	SW846 8081A	30	70-130	0.04	0.05	75-125
39783			Sediment	µg/kg	SW846 8081A	30	70-130	1	5	75-125
39785			Tissue	mg/kg	SW846 8081A	30	70-130	0.002	0.005	75-125
39400	Toxaphene	8001-35-2	Water	µg/L	SW846 8081A	30	70-130	0.0001	1	75-125
39403			Sediment	µg/kg	SW846 8081A	30	70-130	100	50	75-125
34691			Tissue	mg/kg	SW846 8081A	30	70-130	0.1	0.05	75-125
39700	Hexachlorobenzene	118-74-1	Water	µg/L	SW846 8270C	30	70-130	0.01	5	75-125
39701			Sediment	µg/kg	SW846 8270C	30	70-130	470	0.005	75-125
34688			Tissue	mg/kg	SW846 8270C	30	70-130	0.5	0.05	75-125
39337	Alpha BHC (alpha-hexachlorocyclohexane)	319-84-6	Water	µg/L	SW846 8081A	30	70-130	0.08	0.05	75-125
39076			Sediment	µg/kg	SW846 8081A	30	70-130	6	5	75-125
39074			Tissue	mg/kg	SW846 8081A	30	70-130	0.1	0.005	75-125
39338	Beta BHC (beta-hexachlorocyclohexane)	319-85-7	Water	µg/L	SW846 8081A	30	70-130	0.28	0.05	75-125
34257			Sediment	µg/kg	SW846 8081A	30	70-130	6	5	75-125
34258			Tissue	mg/kg	SW846 8081A	30	70-130	0.004	0.005	75-125
34259	Delta BHC	319-86-8	Water	µg/L	SW846 8081A	30	70-130	0.05	0.05	75-125
34262			Sediment	µg/kg	SW846 8081A	30	70-130	6	5	75-125
34263			Tissue	mg/kg	SW846 8081A	30	70-130	0.004	0.005	75-125
39780	Dicofol (Kelthane)	115-32-2	Water	µg/L	SW846 8081A	30	70-130	0.11	1	75-125
79799			Sediment	µg/kg	SW846 8081A	30	70-130	20	NA	75-125
85684			Tissue	mg/kg	SW846 8081A	30	70-130	0.004	NA	75-125

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% R)
39755	Mirex	2385-85-5	Water	µg/L	SW846 8081A	30	70-130	0.0005	0.05	75-125
79800			Sediment	µg/kg	SW846 8081A	30	70-130	3	NA	75-125
81645			Tissue	mg/kg	SW846 8081A	30	70-130	0.04	NA	75-125
39530	Malathion	121-75-5	Water	µg/L	SW846 8141A	30	70-130	0.005	0.5	75-125
39531			Sediment	µg/kg	SW846 8141A	30	70-130	40	50	75-125
39534			Tissue	mg/kg	SW846 8141A	30	70-130	0.05	0.05	75-125
39540	Parathion (Ethyl)	56-38-2	Water	µg/L	SW846 8141A	30	70-130	0.007	0.5	75-125
39541			Sediment	µg/kg	SW846 8141A	30	70-130	40	50	75-125
81810			Tissue	mg/kg	SW846 8141A	30	70-130	0.5	0.05	75-125
39570	Diazinon	333-41-5	Water	µg/L	SW846 8141A	30	70-130	0.5	0.5	75-125
39571			Sediment	µg/kg	SW846 8141A	30	70-130	50	50	75-125
81806			Tissue	mg/kg	SW846 8141A	30	70-130	0.1	0.05	75-125
39730	2,4-D	94-75-7	Water	µg/L	SW846 8151A	30	70-130	35	0.5	75-125
39731			Sediment	µg/kg	SW846 8151A	30	70-130	40	5	75-125
88830			Tissue	mg/kg	SW846 8151A	30	70-130	NA	NA	75-125
39740	2,4,5-T	93-76-5	Water	µg/L	SW846 8151A	30	70-130	0.5	0.5	75-125
39741			Sediment	µg/kg	SW846 8151A	30	70-130	9	5	75-125
88833			Tissue	mg/kg	SW846 8151A	30	70-130	NA	NA	75-125
39760	2,4,5-TP (Silvex)	93-72-1	Water	µg/L	SW846 8151A	30	70-130	24	0.5	75-125
39761			Sediment	µg/kg	SW846 8151A	30	70-130	7	5	75-125
39764			Tissue	mg/kg	SW846 8151A	30	70-130	NA	NA	75-125
81403	Chlorpyrifos (Dursban)	2921-88-2	Water	µg/L	SW846 8141A	30	70-130	0.02	0.5	75-125
81404			Sediment	µg/kg	SW846 8141A	30	70-130	40	50	75-125
81807			Tissue	mg/kg	SW846 8141A	30	70-130	0.2	0.05	75-125
34361	Endosulfan I (Alpha)	959-98-8	Water	µg/L	SW846 8081A	30	70-130	0.03	0.05	75-125

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% R)
34364			Sediment	µg/kg	SW846 8081A	30	70-130	1	5	75-125
34365			Tissue	mg/kg	SW846 8081A	30	70-130	0.004	0.005	75-125
34356	Endosulfan II (Beta)	33213-65-9	Water	µg/L	SW846 8081A	30	70-130	0.03	0.05	75-125
34359			Sediment	µg/kg	SW846 8081A	30	70-130	1	5	75-125
34360			Tissue	mg/kg	SW846 8081A	30	70-130	0.04	0.005	75-125
34351	Endosulfan sulfate	1031-07-8	Water	µg/L	SW846 8081A	30	70-130	0.03	0.05	75-125
34354			Sediment	µg/kg	SW846 8081A	30	70-130	8	5	75-125
34355			Tissue	mg/kg	SW846 8081A	30	70-130	0.01	0.005	75-125
39560	Demeton	8065-48-3	Water	µg/L	SW846 8141A	30	70-130	0.05	0.5	75-125
82400			Sediment	µg/kg	SW846 8141A	30	70-130	100	50	75-125
82401			Tissue	mg/kg	SW846 8141A	30	70-130	0.05	0.05	75-125
39580	Guthion	86-50-0	Water	µg/L	SW846 8141A	30	70-130	0.005	0.5	75-125
39581			Sediment	µg/kg	SW846 8141A	30	70-130	60	50	75-125
81802			Tissue	mg/kg	SW846 8141A	30	70-130	0.05	0.05	75-125
39496	PCB-1242 (Aroclor-1242)	53469-21-9	Water	µg/L	SW846 8082	30	70-130	0.5	0.5	75-125
39499			Sediment	µg/kg	SW846 8082	30	70-130	30	50	75-125
34689			Tissue	mg/kg	SW846 8082	30	70-130	0.02	0.05	75-125
39504	PCB-1254 (Aroclor-1254)	11097-69-1	Water	µg/L	SW846 8082	30	70-130	0.5	0.5	75-125
39507			Sediment	µg/kg	SW846 8082	30	70-130	30	50	75-125
34690			Tissue	mg/kg	SW846 8082	30	70-130	0.02	0.05	75-125
39488	PCB-1221 (Aroclor-1221)	11104-28-2	Water	µg/L	SW846 8082	30	70-130	0.5	0.5	75-125
39491			Sediment	µg/kg	SW846 8082	30	70-130	30	50	75-125
34664			Tissue	mg/kg	SW846 8082	30	70-130	0.02	0.05	75-125

Parameter Code	**Chemical Compound**	**CAS Number**	**Matrix**	**Units**	**Analytical Method**	**Precision LCS/LCS dup. (% RPD[2])**	**Bias of LCS[4] (% Rec)**	**AWRL**	**LCRA Reporting Limit**	**Accuracy of RL[3] (% R)**
39492	PCB-1232 (Aroclor-1232)	11141-16-5	Water	µg/L	SW846 8082	30	70-130	0.5	0.5	75-125
39495			Sediment	µg/kg	SW846 8082	30	70-130	30	50	75-125
34667			Tissue	mg/kg	SW846 8082	30	70-130	0.02	0.05	75-125
39500	PCB-1248 (Aroclor-1248)	12672-29-6	Water	µg/L	SW846 8082	30	70-130	0.5	0.5	75-125
39503			Sediment	µg/kg	SW846 8082	30	70-130	30	50	75-125
34669			Tissue	mg/kg	SW846 8082	30	70-130	0.02	0.05	75-125
39508	PCB-1260 (Aroclor-1260)	11096-82-5	Water	µg/L	SW846 8082	30	70-130	0.5	0.5	75-125
39511			Sediment	µg/kg	SW846 8082	30	70-130	30	50	75-125
34670			Tissue	mg/kg	SW846 8082	30	70-130	0.02	0.05	75-125
34671	PCB-1016 (Aroclor-1016)	12674-11-2	Water	µg/L	SW846 8082	30	70-130	0.5	0.5	75-125
39514			Sediment	µg/kg	SW846 8082	30	70-130	30	50	75-125
34674			Tissue	mg/kg	SW846 8082	30	70-130	0.02	0.05	75-125
39516	PCBs, Total	1336-36-3	Water	µg/L	SW846 8082	30	70-130	0.001	0.5	75-125
39519			Sediment	µg/kg	SW846 8082	30	70-130	70	50	75-125
39515			Tissue	mg/kg	SW846 8082	30	70-130	0.1	0.05	75-125
88813	Hexachlorophene	70-30-4	Water	µg/L	SW846 8270C	30	70-130	0.03	1	75-125
73120			Sediment	µg/kg	SW846 8270C	30	70-130	490	NA	75-125
88815			Tissue	mg/kg	SW846 8270C	30	70-130	5	NA	75-125

VOLATILE ORGANICS

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% Rec)
30201	Chloromethane	74-87-3	Water	µg/L	SW846 8260B	30	70-130	27,500	5	75-125
88835			Sediment	µg/kg	SW846 8260B	30	70-130	480	5	75-125
30202	Bromomethane	74-83-9	Water	µg/L	SW846 8260B	30	70-130	110	5	75-125
88802			Sediment	µg/kg	SW846 8260B	30	70-130	480	5	75-125
82080	TTHM (Sum of total trihalomethanes)		Water	µg/L	Calculation	30	70-130	50	1	75-125
39175	Vinyl Chloride	75-01-4	Water	µg/L	SW846 8260B	30	70-130	1.0	5	75-125
34495			Sediment	µg/kg	SW846 8260B	30	70-130	550	5	75-125
34311	Chloroethane	75-00-3	Water	µg/L	SW846 8260B	30	70-130	5	5	75-125
34314			Sediment	µg/kg	SW846 8260B	30	70-130	550	5	75-125
34215	Acrylonitrile	107-13-1	Water	µg/L	SW846 8260B	30	70-130	0.64	50	75-125
34218			Sediment	µg/kg	SW846 8260B	30	70-130	1100	50	75-125
34561	1,3 - Dichloropropene	542-75-6	Water	µg/L	SW846 8260B	30	70-130	11.0	5	75-125
03844			Sediment	µg/kg	SW846 8260B	30	70-130	5	5	75-125
32106	Chloroform (Trichloromethane)	67-66-3	Water	µg/L	SW846 8260B	30	70-130	50	5	75-125
34318			Sediment	µg/kg	SW846 8260B	30	70-130	300	5	75-125
34423	Methylene Chloride	75-09-2	Water	µg/L	SW846 8260B	30	70-130	2.5	5	75-125
34426			Sediment	µg/kg	SW846 8260B	30	70-130	350	5	75-125
34501	1,1-Dichloroethylene	75-35-4	Water	µg/L	SW846 8260B	30	70-130	0.8	5	75-125
34504			Sediment	µg/kg	SW846 8260B	30	70-130	230	5	75-125
34496	1,1-Dichloroethane	75-34-3	Water	µg/L	SW846 8260B	30	70-130	2565	5	75-125
34499			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
34546	Trans-1,2-Dichloroethene	156-60-5	Water	µg/L	SW846 8260B	30	70-130	50	5	75-125
34549			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% Rec)
34531	1,2-Dichloroethane	107-06-2	Water	µg/L	SW846 8260B	30	70-130	2.5	5	75-125
34534			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
32102	Carbon Tetrachloride	56-23-5	Water	µg/L	SW846 8260B	30	70-130	1.9	5	75-125
34299			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
32101	Bromodichloromethane	75-27-4	Water	µg/L	SW846 8260B	30	70-130	2160	5	75-125
34330			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
34030	Benzene	71-43-2	Water	µg/L	SW846 8260B	30	70-130	2.5	5	75-125
34237			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
32105	Chlorodibromomethane	124-48-1	Water	µg/L	SW846 8260B	30	70-130	4.6	5	75-125
34309			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
34506	1,1,1-Trichloroethane	71-55-6	Water	µg/L	SW846 8260B	30	70-130	100	5	75-125
34509			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
34541	1,2-Dichloropropane	78-87-5	Water	µg/L	SW846 8260B	30	70-130	2.5	5	75-125
34544			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
34699	trans-1,3-Dichloropropene	10061-02-6	Water	µg/L	SW846 8260B	30	70-130	333	5	75-125
34697			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
34704	cis-1,3-Dichloropropene	10061-01-5	Water	µg/L	SW846 8260B	30	70-130	5	5	75-125
34702			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
34511	1,1,2-Trichloroethane	79-00-5	Water	µg/L	SW846 8260B	30	70-130	2.5	5	75-125
34514			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
34576	2-Chloroethylvinyl Ether	110-75-8	Water	µg/L	SW846 8260B	30	70-130	50	50	75-125
34579			Sediment	µg/kg	SW846 8260B	30	70-130	1900	NA	75-125
39180	Trichloroethylene	79-01-6	Water	µg/L	SW846 8260B	30	70-130	2.5	5	75-125
34487			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
32104	Bromoform	75-25-2	Water	µg/L	SW846 8260B	30	70-130	75	5	75-125

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% Rec)
	(Tribromomethane)									
34290			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
34010	Toluene	108-88-3	Water	µg/L	SW846 8260B	30	70-130	500	5	75-125
34483			Sediment	µg/kg	SW846 8260B	30	70-130	300	5	75-125
34371	Ethylbenzene	100-41-4	Water	µg/L	SW846 8260B	30	70-130	1090	5	75-125
34374			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
34516	1,1,2,2-Tetrachloroethane	79-34-5	Water	µg/L	SW846 8260B	30	70-130	0.85	5	75-125
34519			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
34475	Tetrachloroethylene	127-18-4	Water	µg/L	SW846 8260B	30	70-130	2.5	5	75-125
34478			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
34301	Chlorobenzene	108-90-7	Water	µg/L	SW846 8260B	30	70-130	390	5	75-125
34304			Sediment	µg/kg	SW846 8260B	30	70-130	250	5	75-125
81551	Total Xylenes	1330-20-7	Water	µg/L	SW846 8260B	30	70-130	10	10	75-125
45510			Sediment	µg/kg	SW846 8260B	30	70-130	650	10	75-125
34268	bis (chloromethyl) ether	542-88-1	Water	µg/L	SW846 8260B	30	70-130	0.002	NA	75-125
34271			Sediment	µg/kg	SW846 8260B	30	70-130	NA	NA	75-125
77651	1,2-Dibromoethane	106-93-4	Water	µg/L	SW846 8260B	30	70-130	0.007	5	75-125
88805			Sediment	µg/kg	SW846 8260B	30	70-130	220	5	75-125
46491	Methyl tert-butyl ether (MTBE)	1634-04-4	Water	µg/L	SW846 8260B	30	70-130	1	0.5	75-125
81595	Methyl Ethyl Ketone	78-93-3	Water	µg/L	SW846 8260B	30	70-130	26000	20	75-125
75078			Sediment	µg/kg	SW846 8260B	30	70-130	424	20	75-125

OTHER ORGANICS

Parameter Code	Chemical Compound	CAS Number	Matrix	Units	Analytical Method	Precision LCS/LCS dup. (% RPD[2])	Bias of LCS[4] (% Rec)	AWRL	LCRA Reporting Limit	Accuracy of RL[3] (% Rec)
61209	Perchlorate	14797-73-0	Water	µg/L	EPA 314.0	30	70-130	2[1]	NA	75-125
39750	Carbaryl (Sevin)	63-25-2	Water	µg/L	EPA 632	30	70-130	1.0	5 (625)	75-125
81818			Sediment	µg/kg		30	70-130	NA	NA	75-125
39650	Diuron (Karmex)	330-54-1	Water	µg/L	EPA 632	30	70-130	35	NA	75-125
73030			Sediment	µg/kg		30	70-130	NA	NA	75-125
30340	Tributlytin (TBT)	688-73-3	Water	µg/L	TCEQ 1001	30	70-130	0.01	NA	75-125
			Sediment	µg/kg		30	70-130	NA	NA	75-125
			Tissue	mg/kg		30	70-130	NA	NA	75-125
03556	Dioxins/Furans (TCDD Equivalents), Total	multiple	Water	µg/L	EPA 1613	30	70-130	7.0 E-06	NA	75-125
			Sediment	µg/kg		30	70-130	NA	NA	75-125
			Tissue	mg/kg		30	70-130	NA	NA	75-125
00722	Cyanide (free)	57-12-5	Water	mg/L	SM 4500 H	30	70-130	0.1	NA	75-125
77825	Alachlor	15972-60-8	Water	µg/L	EPA 525.2	30	70-130	1.0	0.1	75-125
82612	Metolachlor	51218-45-2	Water	µg/L	EPA 525.2	30	70-130	2.0	0.1	75-125
39055	Simazine	122-34-9	Water	µg/L	EPA 525.2	30	70-130	2.0	0.1	75-125
39630	Atrazine	1912-24-9	Water	µg/L	EPA 525.2	30	70-130	1.5	0.1	75-125
81757	Cyanazine	21725-46-2	Water	µg/L	EPA 525.2	30	70-130	2.0	0.1	75-125

Codes:
1 - The TCEQ laboratory reporting limit for Perchlorate will be 5 g/L using the AWRL methodology, i.e. +/- 25% accuracy of the low point on the calibration curve.
2 - RPD = Relative Percent Difference
3 - RL = Reporting Level
4 - LCS = Laboratory Control Standards

Methods listed in Table 4 are the preferred method of analysis. Other methods may be employed and the data will be accepted as long as the methods used: (1) meet the sensitivity requirements of the AWRLs in Table4, and (2) are contained in 40CFR36, the most current version of Standard Methods, or are another reliable procedure approved by the TCEQ. If the TCEQ Houston Laboratory or other contract laboratory wishes to use a method other than the one identified in Table 4, the laboratory must receive written permission from the SWQM Program prior to using that method.

Section A8. Special Training Requirements/Certification

No special training or certifications are required for the projects covered in this document. Training on field methods for sampling, use and care of monitoring equipment, safety, quality assurance, etc., is provided by the SWQM Program and FOD SWQM personnel for all regional office personnel, Central Office SWQM staff, WQA Section staff, and CRP participants. Training occurs on an individual basis by senior regional staff for new regional staff, by Central Office SWQM staff for any monitoring entity on a request basis, at set statewide training events, at the annual SWQM Workshop and at the annual FOD SWQM Training. Global Positioning System (GPS) training is required of all TCEQ staff collecting ambient water quality data as stated in Section 8.1.2 of the TCEQ's Operating Procedures Policy (OPP).

Section A9. Documentation and Records

All field data gathered by TCEQ are recorded in field notebooks. These data records are maintained for five years in the region or central office. Field data are required to be reported electronically to the WDM&A Data Manager via FDE at least once per quarter. All hard copies of data are kept on file at the regional office and may be reviewed during TSAs. QC evaluation procedures are further described in Section B5 of this QAPP and in the TCEQ SWQM Program QA Evaluation Guide (Appendix A.)

SS, RWAs and UAAs are unpublished documents that are permanently kept on file in the WQA Section in the Central Office. The Site-Specific Coordinator will receive completed RWA and UAA documents from the water body project manager. When RWAs are done for Texas Pollution Discharge Elimination System (TPDES) permit reviews, the original copy is filed in the applicable TPDES permit file. Copies of RWAs, that are used to support a UAA that establishes uses or criteria lower than presumed uses or criteria, will be sent to the EPA Region VI. Copies of RWAs that support TPDES permit reviews and originals of RWAs that support presumed uses and criteria are also kept on file in the WQA Section in the Central Office.

Documentation for analytical data is kept on file at the laboratories. These are always available and are reviewed during audits by the TCEQ Laboratory QA Specialist. These records include the analyst's comments on the condition of the sample and progress of the analysis, raw data, instrument printouts, and results of calibration and QC checks. The results of routine laboratory analysis are reported back to the collector within one month and organics are reported within six months. These results include a comment field for reporting the description of difficulties and problems encountered during analysis including preservation problems, interferences, and analytical difficulties. Similarly, the collector provides comments that describe the sampling event in ways that will help the end data user, including time of day, field conditions, water appearance, recent runoff, unusual physical and biological conditions.

The final disposition of documents is consistent with agency record-keeping procedures as outlined in the TCEQs Quality Management Plan. See Section B10 for a detailed schedule for disposition of records. Paper copies of all analytical data, field data forms and field notebooks, raw and condensed data for analysis performed on-site in the regional office, and field instrument calibration notebooks are part of the permanent archives in the regional office.

A case narrative, or summary of analytical work performed by a laboratory, is not required for this program. There are no other special retention or turnover requirements for documents in the SWQM Program.

Section B1. Sampling Process Design (Experimental Design)

Sampling and analytical procedures for the SWQM Program are detailed in the SWQM PM and in Sections B2, B3 and B4 of this QAPP.

Most of the current year routine monitoring sites are located within classified segments, but about 15% are located on important unclassified waters. The routine monitoring stations are sampled at varying frequencies, with most sampled quarterly. Parametric coverages typically include field measurements, routine water chemistry and fecal coliform analysis. Additional coverages may include toxic substances in water, sediment, or fish tissue, toxicity testing of water and sediment, and fish and/or macrobenthos community structure and habitat assessment. The SWQM Program develops a Coordinated Monitoring Schedule each year for routine sampling performed by the SWQM and CRP Programs. This schedule is available on the LCRA's Web page at http://cms.lcra.org/ and contains the specifics of all monitoring types and parameters discussed below.

Field Measurements, Routine Water Chemistry, Sediment Samples, Biological and Bacteriological Analyses

Sampling which is common to all sites includes field measurements (dissolved oxygen, specific conductance, pH, and temperature), routine water chemistry, and bacterial densities. The objectives of monitoring these parameters are to detect and describe spatial and temporal changes, determine impacts of point and nonpoint sources, and assess compliance with water quality standards. DO, water temperature, and pH are field measurements for which water quality criteria are established for each classified water body. Specific conductance is used as an indirect measure of another established water quality criteria, total dissolved solids. Secchi disk measurements are used to determine the transparency of the water column at each site. Conductivity and salinity are monitored to estimate the total concentration of dissolved ionic matter, evaluate mixing of fresh and salt water in estuaries, determine density stratification, and document impact and dispersion of pollutants. The field-measured parameters are key indicators of the status of many chemical and biological processes. Monitoring of field measurements also provides complementary information necessary in evaluating chemical and biological data. In order to relate chemical concentrations and flow, instantaneous flow measurements are made at most stream sites concurrently with the collection of water samples. In some cases, stream flow is obtained at the time of sampling from a USGS gage if one is located nearby. Water samples are collected, preserved, and sent to the TCEQ or a contract laboratory, where analyses are performed.

24-hour dissolved oxygen measurements are made at sites that have been identified as concerns, based on grab samples. This type of sample is included with the field data in Section A7, Table 3.

The TCEQ currently monitors E. coli, Enterococcus, and fecal coliform bacteria as indicators of human pathogen densities in order to assess the recreational potential of water bodies.

Other variables may be added to the SWQM Program as information needs arise. Training and monitoring protocols along with appropriate approved amendments to the QAPP will be completed as these other tests are added.

Organic substances (pesticides, semi-volatiles, and volatiles) and metals are monitored in water, sediment, and fish tissue at selected routine monitoring sites. The SWQM Program focuses toxic substances monitoring on those sites deemed to have a likelihood of being impacted and selects sample stations on criteria which include: sites near dischargers that have shown receiving water or effluent toxicity, sites that have shown recurrent ambient water and/or sediment toxicity, sites near large industrial or domestic discharges, areas that receive high nonpoint source loads, areas with exceptional recreational uses, sites near hazardous waste facilities, sites downstream of major metropolitan areas, areas adjacent to Superfund sites, and sites which exhibit biological impairment. Toxic substances in water, sediment, and fish tissue are monitored at these sites to determine their prevalence and magnitude, to detect and describe spatial and temporal changes, and to evaluate compliance with applicable water quality standards. The TCEQ's SWQM Program monitors surface waters for compliance with all numeric criteria with a few exceptions. Some compounds, such as Dioxins, are not routinely monitored due to the prohibitive expense of analysis. Other compounds, such as TBT, Perchlorate, or Atrazine, are unlikely to occur outside of specific geographic areas of the state. Monitoring for parameters such as these would be handled through the preparation of a Special Study QAP for those specific regions. The list of core parameters for all sample types, including organics, are listed in Chapter 6- Commonly Used Parameter Codes in the Surface Water Quality Monitoring Data Management Reference Guide.

The results of monitoring sediment chemistry may be used to evaluate the condition of the benthic habitat, determine point and nonpoint source impacts, and to monitor rates of recovery following establishment of pollution controls or improved wastewater treatment. In addition to monitoring toxic chemical contaminants in sediments, conventional parameters in sediment are also measured: percent solids, for determination of water content; sediment grain size, for availability of contaminants and habitat availability; and total organic carbon, for bioavailability of organic contaminants that adsorb to particulates.

The results of monitoring fish tissue chemistry may be used to evaluate the risk to human health, ecosystem health as well as risk to predators, long term trends of bioaccumulative contaminants, and to establish background conditions of contaminants in aquatic organisms. Whole fish samples are analyzed for all purposes listed above. Risks to consumers are assessed using edible tissue samples. Chapter 7 of The SWQM PM details the specifics of collecting fish tissue samples.

Ambient toxicity tests are a direct measurement of toxic conditions in the environment. Sensitive test organisms are exposed to water or sediment collected from a water body and the lethal (causing death) or sublethal (interfering with growth or reproduction) effects are determined by examining the organisms after several days. Ambient toxicity tests can indicate a toxic condition that is not evident from the chemical tests available for environmental samples. Only a limited number of toxic compounds can be measured at the low levels that are often toxic, and several compounds may interact or provide an additive toxic effect. These conditions are revealed by ambient toxicity tests.

Biological communities (fish and benthic macroinvertebrate) are useful in assessing water quality for a variety of reasons, including their sensitivities to low-level disturbances and their functioning as continuous monitors. Monitoring of resident biota, thus, increases the possibility of detecting episodic spills and dumping of pollutants, wastewater treatment plant malfunctions, toxic nonpoint source pollution, or other impacts that periodic chemical sampling is unlikely to detect. Perturbations of the physical habitat such as sedimentation from storm water runoff, dredging, channelization, and erosion may also be detected through biological monitoring in combination with habitat assessment.

In addition to biological work done as part of UAA, ALA, and RWA projects, the TCEQ strategy is to do biological monitoring in water bodies that have DO concerns, nonsupport of toxic criteria identified through routine monitoring, and limited biological data sets indicating nonsupport of the use. The objectives of monitoring fish and benthic macroinvertebrate communities are to detect and describe spatial and temporal changes in the structure and function of these communities. These results can be used to assess impacts of point and nonpoint sources, assess community condition or "health," determine appropriate aquatic life uses, monitor rates of recovery following implementation of improved wastewater treatment, and provide early warning of potential impacts. Details of the TCEQ's strategy for biological monitoring will be found in the soon-to-be-developed TCEQ's SWQM Strategy which will be available on the agency's Web site.

Station and parameter code inventories may be found on the SWQM website at www.tnrcc.state.tx.us/water/quality/data/wmt/partner_resources.html. Criteria for selecting monitoring sites are contained in the SWQM PM. Work plans for UAAs, RWAs, and SSs are approved and documented individually using the formats contained in Appendices B and C.

Section B2. Sampling Methods Requirements

Sample collection procedures, including any implementation requirements, decontamination procedures and materials needed, specific performance requirements for the method, any needed support facilities, preparation and decontamination of sampling equipment, including disposal of decontamination by-products are described in the SWQM PM.

The selection and preparation of sample containers, sample volumes, preservation methods, and maximum holding times to sample extraction and/or analysis, are described in the SWQM PM.

Corrective Actions:

The collector has primary responsibility for responding to failures in the sampling or measurement systems. Deviations from the SWQM PM and the QAPP are documented in the comment section of field notes and communicated in writing to the FOD QA Specialist. Data problem resolution is discussed in detail in Section B10 of this document. If monitoring equipment fails, the collector will report the problem in the comment section of their field notes and will not record data values for the variables in question. Actions will be taken to replace or repair broken equipment prior to the next field use. No data will be entered into the SWQM portion of TRACS which were known to be collected with any faulty equipment.

Corrective actions identified by program coordinators through annual TSAs are the responsibility of regional or central office water program managers. Managers provide a written response describing corrective actions and a timeline for implementation of these corrective actions for each finding that can adversely affect data quality. The SWQM Program tracks these corrective actions and notifies management of deficiencies in meeting them.

Section B3. Sample Handling and Custody Requirements

Proper sample handling procedures for water, sediment and biological samples are discussed in Chapter 9 of the SWQM PM.

Those TCEQ projects whose objectives are to accumulate data to establish waste load allocation or to monitor the ambient conditions of segments of various water bodies use specially designed Request for Analysis (RFA) forms which identifies the sample with a unique RFA tag number, is completed by the data collector and submitted to the laboratory with the sample. This RFA form has spaces dedicated to recording the field pH and conductivity as well as the Tag number of any field QC blanks and field splits which are associated with the sample (as required in the SWQM Procedures Manual). The data collector has the primary responsibility to assure that all pertinent information is recorded correctly and completely. The data collector also checks all RFA forms prior to shipping the sample to the laboratory to validate that all the pertinent field data have been included with correct units. These sheets do not record change of possession but do require that the sample container have the same information printed onto the sample container as written on the RFA form. Figure 3 shows the TCEQ SWQM Programs Water Quality RFA Form. The RFA form is to be used by the TCEQ SWQM or WQA Programs only.

If both water and sediment samples are collected, separate RFA Forms for the water samples and sediment samples must be submitted. Routine water chemistry and metals in water analyses are requested on the same tag. As each RFA Form has a unique tag number, a tag number is used only once. Information required on the RFA form is as follows; Station ID, Station Description, Segment, Collector, Date, Time, and Depth.

The main documentation of sample custody for all samples up to the arrival of the samples at the laboratory is the RFA forms which are matched up with the sample containers. The laboratory checks to see that the information printed on the sample container labels matches the RFA forms. The sample container labels include the date the sample was collected, station ID number, station location description, method of preservation (if applicable), and may include the RFA form number.

The exception to this is for toxicity samples. Toxicity samples will be analyzed by the USEPA Laboratory in Houston. Toxicity water and sediment sample containers are labeled with station ID, location and date. As per USEPA instructions, an RFA Form should not accompany the sample, but instead, the name, address and phone number of the collector is included with the samples.

Ice chests are sealed with tape before shipping. Samples are placed in the ice chest with enough ice to completely fill the ice chest. RFA forms are placed in a plastic bag and taped to the inside of the ice chest lid (preferred), or they may be placed in an envelope and taped to the top of the ice chest. It is assumed that samples in tape-sealed ice chests are secure whether being transported by staff vehicle, by common carrier, or by commercial package delivery. The receiving laboratory has a sample custodian who examines the samples for correct documentation, proper preservation, temperature, and holding times.

Contract laboratories will follow sample custody procedures outlined in their QA plans. Contract laboratory QA plans are on file with the respective laboratory. These QA Plans are reviewed by the TCEQ Quality Assurance Section during laboratory audits.

Figure 3. SWQM Program Water Quality Request for Analysis Form (Front)

Figure 3 (cont). SWQM Program Water Quality Request for Analysis Form (Back)

Section B4. Analytical Methods Requirements

The laboratory supervisor of each contracted lab has primary responsibility for responding to a failure of analytical systems. Solutions which are consistent with the measurement objectives will be reached in consultation with the project manager.

Tables 3 and 4 in Section A7 shows the corresponding preferred analytical method number for each variable used by either the TCEQ Laboratory in Houston or by contract laboratories. Other methods may be employed and the data will be accepted as long as the methods used: (1) meet the sensitivity requirements of the AWRLs in Tables 3 and 4, and (2) are contained in 40CFR36, the most current version of Standard Methods, or are another reliable procedure approved by the TCEQ. If the TCEQ Houston Laboratory or other contract laboratory wishes to use a method other than the one identified in Tables 3 and 4, the laboratory must receive written permission from the SWQM Program prior to using that method. Data analyzed using methods that are not cited in (1) or (2) above will be qualified following the procedures for acquired data under Section B9 of this document.

The samples collected under this QAPP are not hazardous or radioactive. Therefore, decontamination procedures are not necessary.

Failures in laboratory measurement systems involve, but are not limited to, such things as instrument malfunctions, failures in calibration, failure of LCS recovery and/or LCS/LCSD precision, and blank contamination. These problems are generally apparent at the beginning of the run and before the analysis of samples occurs. When this occurs, the analysis is stopped while the analyst attempts to resolve the problem. If the problem is resolved, the analyst documents the problem in his/her laboratory record, re-calibrates, re-verifies the calibration using an LCS or similar sample, and completes the analysis. If the run goes to completion and no other problems are revealed by the QC generated, the data is reported without limitation or comment. If the problem cannot be resolved immediately, the supervisor is notified. The analyst and supervisor make appropriate corrective actions, document the problem and its resolution, then re-calibrate the instrument as above, and continue the analysis of samples. In most cases, the success of the QC for the samples is unknown until the final readings and calculations have been completed. The analyst compares the sample QC with laboratory QC limits or Acceptance Limits given in the EPA Methods, as the first step of the analyst data review. Analytical Control is judged by the performance of the LCSs or CCVs and blanks run with every batch of samples. (The CCV = Continuing Calibration Verification standard is generally NOT digested, while the LCS is; however, this depends on the specific provisions in the EPA Method and the SOP.) If the LCS or CCV recovery does not pass, all of the sample data after the last successful LCS or CCV is not reported. If possible the samples are rerun in a separate run with a separate calibration and separate QC. If the sample hold time is exceeded at any point, the sample is not run again. No results are reported. Other variances can occur in the course of the analysis which MAY impact the data. Deviations from the exact specifications of the SOP or EPA Method are documented in the analyst records and the data reported without comment when the other QC in the run are within specification.

Data from the TCEQ Houston Laboratory meeting any of the following criteria will be excluded from all SWQM data deliverables:

1. If the %Recovery of LCS/LCSD is not within SWQM Acceptance Limits, results will not be reported. Samples will be rerun if within holding time (except chlorophyll).

2. If the %RPD of LCS/LCSD is not within SWQM Acceptance Limits, results will not be reported. Samples will be rerun if within holding time (except chlorophyll).

3. If the AWRL standard is not within SWQM Acceptance Limits, then the entire analytical run will be voided and no results will be reported. Analysis will be rerun if samples are still within holding time (except chlorophyll).

4. If the CCVs are outside of Acceptance Limits, the results will not be reported.

5. If any of the LCS/LCSD, %RPD or AWRL or CCV criteria are not met, then a note stating "Result Not Reported - QC Criteria Failed" will be added to the final report.

The following notes are the only notes that will be used for SWQM samples:

[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

The only note in the list above that will be reported along with results is the first [illegible]

[illegible]

Standards Traceability: All standards used in the field and laboratory are traceable to certified reference materials. Standards preparations 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 preparers initials/signature. The reagent bottle is labeled in a way that will trace the reagent back to preparation.

Analytical Method Modification: Only data generated using analytical methodologies approved by TCEQ as specified in this QAPP will be submitted to the TCEQ. Request for method modifications will be documented on form TCEQ-130364, the TCEQ application for Analytical Method Modification, and submitted for approval to the TCEQ Quality Assurance Section. Approval by the TCEQ will be granted or denied based on review of the application specifically the section documenting an initial demonstration of method equivalency conducted by the laboratory. Work will only begin after the modified procedures have been approved.

Section B5. Quality Control Requirements

The use of USEPA approved methods alone does not assure quality data. Therefore, it is necessary to establish procedures to verify the degree of quality actually attained on real environmental samples. These procedures are internal QC checks. These checks will be performed at various stages of data collection. Standard, documented procedures will be used for all field measurements and activities. Reasons for the use of nonstandard procedures will be clearly documented in the field notes and in the report. Table 5-2 in the SWQM PM summarizes the required QC samples for water.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

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

AWRL/Reporting Limit Verification

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

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

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

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

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

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

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

Laboratory Control Standard (LCS)/Laboratory Control Standard Duplicate (LCSD)- LCS/LCSD pairs are analyte-free water samples spiked with the analyte of interest prepared from standardized reference material. The LCS/LCSD pairs are generally spiked into laboratory pure water at a level less than or equal to the mid-point of the calibration curve for each analyte. They are carried through the complete preparation and analytical process. The LCS/LCSD pairs are used to document the bias of the method due to the analytical process. Bias can be assessed by measuring the percent recovery of LCSs and LCSDs, and precision can be assessed by comparing the results of LCS/LCSD pairs. LCS/LCSD pairs are run at a rate of one each per batch. Acceptability criteria for bias are laboratory specific and usually based on results of past laboratory data (i.e., control charts). Precision and bias criteria for LCS/LCSD pairs are specified in Tables 3 and 4. Laboratory-specific control limits and charts are calculated and maintained by laboratory staff on a periodic basis.

Bias of LCSs and LCSDs is expressed by percent recovery (%R) where SR is the observed spiked sample concentration, and SA is the spike added:

$$\mathbf{\%R = \backslash SR/SA] * 100}$$

The mean bias of LCS/LCSD pairs is expressed by $\%R_{mean}$, where $\%R_{LCS}$ is the percent recovery of the LCS and $\%R_{LCSD}$ is the percent recovery of the LCSD:

$$\mathbf{\%R_{mean}=(\%R_{LCS} + \%R_{LCSD})/2}$$

Precision between LCS/LCSD pairs is expressed by relative percent difference (RPD). For LCS/LCSD results, X_1 and X_2, the RPD is calculated from the following equation:

$$\mathbf{RPD\text{-}\{(X_1\text{-}X_2)/<(X_1+X_2)/2>\}*100}$$

Laboratory Duplicates - A laboratory duplicate is prepared in the laboratory by splitting aliquots of an LCS. Both samples are carried through the entire preparation and analytical process. LCS duplicates are used to assess precision and are performed at a rate of one per batch.

For most parameters, precision is calculated by the relative percent difference (RPD) of LCS duplicate results as defined by 100 times the difference (range) of each duplicate set, divided by the average value (mean) of the set. For duplicate results, X_1 and X_2, the RPD is calculated from the following equation:

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

A bacteriological duplicate is considered to be a special type of laboratory duplicate and applies when bacteriological samples are run in the field as well as in the lab. Bacteriological duplicate analyses are performed on samples from the sample bottle on a 10% basis. Results of bacteriological duplicates are evaluated by calculating the logarithm of each result and determining the range of each pair.

Performance limits and control charts are used to determine the acceptability of duplicate analyses. Project control limits are specified in Tables 3 and 4. The specifications for bacteriological duplicates in Table 3 apply to samples with concentrations > 10 org./100mL.

Laboratory equipment blank - Laboratory equipment blanks are prepared at the laboratory where collection materials for metals sampling equipment are cleaned between uses. These blanks document that the materials provided by the laboratory are free of contamination. The QC check is performed before the metals sampling equipment is sent to the field. The analysis of laboratory equipment blanks should yield values less than the reporting limit. Otherwise, the equipment should not be used.

Matrix spike (MS) - A matrix spike is an aliquot of sample spiked with a known concentration of the analyte of interest. Percent recovery of the known concentration of added analyte is used to assess accuracy of the analytical process. The spiking occurs prior to sample preparation and analysis. Spiked samples are routinely prepared and analyzed at a rate of 10% of samples processed, or one per batch whichever is greater. The MS is spiked at a level less than or equal to the midpoint of the calibration or analysis range for each analyte. Percent recovery (%R) is defined as 100 times the observed concentration, minus the sample concentration, divided by the true concentration of the spike.

The percent recovery of the matrix spike is calculated using the following equation in which %R is percent recovery, SSR is the observed spiked sample concentration, SR is the sample result, and SA is the reference concentration of the spike added:

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

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

Method blank - A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in the sample processing and analyzed with each batch. The method blank is carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination from the analytical process. The analysis of method blanks should yield values less than the reporting limit. For very high-level analyses, the blank value should be less then 5% of the lowest value of the batch, or corrective action will be implemented.

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

Field Quality Control

Additionally, QC samples will be collected in the field. The requirements for these samples are outlined in the SWQM Procedures Manual. The collector reviews field splits using the General Guidance for Review of FOD SWQM Sample Data found in the FOD SWQM Data Process (Appendix D). Field QC data will be tracked and reviewed by the collector as part of the data review process outlined in Section B10 of this QAPP. QC data requirements are to be followed and tracked by each collector by logging the field QC samples and tracking which other field samples are associated with each QC sample. If collector review of blank or field split samples reveals data to be invalid, the collector will take corrective action as described in Section B10 of this QAPP.

Completeness - Completeness is calculated as a percent value. In this equation, ST is the total number of samples collected and SV is the number of samples with a valid analytical report.

$$\%\ \text{Completeness} = \frac{SV}{ST} \times 100$$

Section B6. Instrument/Equipment Testing, Inspection, and Maintenance Requirements

To minimize downtime of measurement systems, all field sampling and laboratory equipment must be maintained in working condition. Also, backup equipment or common spare parts will be available so that if any piece of equipment fails during use, repairs or replacement can be made as quickly as possible and the measurement tasks resumed.

Before any water quality investigation begins, availability of proper equipment should be verified. This includes sampling equipment, safety equipment, and field measurement equipment (with calibration standards). It should be verified that all collectors involved in field activities have been trained to properly use the equipment. Training for data collectors is discussed in Section A8.

Field Equipment - All field equipment which have manufacturers recommended schedules of maintenance will receive preventive maintenance according to that schedule. Other equipment used only occasionally will be inspected for availability of spare parts, cleanliness, battery strength, etc. at least monthly and especially prior to being taken into the field. Common spare parts which should be available include but are not limited to: batteries and multiprobe parts. After use in the field, all equipment will be rechecked for needed maintenance.

Laboratory Equipment - Electronic laboratory equipment usually has recommended maintenance prescribed by the manufacturer. These instructions will be followed as a minimum requirement. Due to the cost of some laboratory equipment, back up capability may not be possible. But all commonly replaced parts will have spares available for rapid maintenance of failed equipment. Such parts include but are not limited to: batteries; tubes; light bulbs; tubing of all kinds; replacement specific ion electrodes; electrical conduits; glassware; pumps; etc.

A separate log book will be maintained for each type of equipment whether field or laboratory. All preventive or corrective maintenance will be recorded. The total history of maintenance performed will be available for inspection during a systems audit.

The following is a list of critical equipment and spare parts which must be maintained by all FOD SWQM personnel and central office SWQM personnel in order to ensure quality data collection in the field at all times:

<u>List of Critical Equipment\Spare Parts</u>

A complete list of all critical equipment and spare parts is listed in Chapter 10 of the SWQM PM.

Additionally, all necessary forms, calibration log books, procedures manuals, equipment instructional manuals, and identification manuals for biological specimens will be kept on hand by all FOD SWQM personnel. The SWQM Team in the central office will maintain a supply of forms, calibration log books, and procedures manuals. It is the responsibility of the collector to notify the central office of their need for appropriate documents in a timely manner to ensure receipt prior to the event for which documents are needed.

Section B7. Instrument Calibration and Frequency

An instrument or device used in obtaining an environmental measurement must be calibrated by the measurement of a standard or standards. Every instrument or device has a specialized procedure for calibration and a special type of standard used to verify calibration. Laboratory and field equipment vary from location to location so that procedures for calibration may vary depending on the manufacturer. Therefore, a single format for calibration procedures and frequency is not possible for this project plan. However, at a minimum all calibration procedures will meet the requirements specified in the USEPA approved methods of analysis. The means and frequency of calibration recommended by the manufacturer of the equipment or devices as well as any instruction given in an analytical method will be followed. When such information is not specified by the method, instrument calibration will be performed at least once daily and continuing calibration will be performed on a 10 percent basis thereafter except for analysis by gas chromatograph/mass spectrometer. It is also required that records of calibration be kept by the person performing the calibration and be accessible for verification during either a laboratory audit or TSA.

Field equipment needs periodic calibration. Calibration is required to be done within 24 hours before use and within 24 hours after measurement activities in the field are performed. Equipment to be calibrated includes, but is not limited to: titration equipment for chlorine analysis; thermometer; DO meter; pH meter; conductivity meter; multiparameter field meter (DO, pH, temperature, and specific conductance). Calibration log books are issued to each collector and the central office. One calibration logbook is to be used per multiprobe instrument. These logbooks are to be kept in a safe place in the regional or central office laboratory and only taken to the field when instruments are to be used over a period of days requiring post-calibration or calibration in the field. All requirements for multiprobe instrumentation and calibration instructions are found in Chapter 2 of the SWQM PM.

If, after post-calibration checks, the data collector determines that the acceptable amount of drift has been exceeded for a multiprobe instrument, the data collector will not submit (through the FDE system in TRACS) data from the probe out of compliance for that sampling event and corresponding result data will not be submitted to the SWQM Program for inclusion in TRACS. The investigator will resolve the problem with the instrument, either by conducting routine maintenance or by sending the instrument to the manufacturer for repair. The investigator will be encouraged to re-measure that field parameter as soon as possible.

SOPs for laboratory equipment and devices needing calibration are referenced in the contract labs QA plans on file with each contracting laboratory. SOPs for the TCEQ laboratory are listed in the Quality Assurance Plan for the Houston Laboratory. The actual text of the SOPs are stored in electronic files and paper copy in the Houston Laboratory. Copies of these TCEQ laboratory procedures may be obtained by contacting the TCEQ Laboratory Director. Electronic meters, analytical balances, thermometers, or temperature gauges will have verifiable calibration records. Laboratory reagents are either vendor-certified or standardized to verify that the percentage or normality is that which is prescribed for the analytical method. Reagent standardization is a form of calibration which is included in both field and laboratory quality control procedures.

The multiprobe sensor calibration and maintenance log used in calibrating and maintaining these instruments may be found in the SWQM PM.

Section B8. Inspection/Acceptance Requirements For Supplies And Consumables

The procurement of supplies, equipment, and services is controlled to ensure that specifications are met for the high quality and reliability required for each field and laboratory function. All equipment and material specifications used by central office or FOD SWQM personnel in surface water quality monitoring are outlined in the SWQM PM. Equipment and materials are purchased by each regional office and by the central office SWQM Team independently. It is the responsibility of each staff person doing the ordering to inspect the equipment and materials for quality.

Upon receipt of materials or equipment, a designated employee receives and signs for the materials. The items are reviewed to ensure the shipment is complete and they are then delivered to the proper storage location. All chemicals are dated upon receipt. All supplies are stored appropriately and given appropriate disposal upon expiration date.

Section B9. Data Acquisition Requirements (Non-direct Measurements)

Water quality data from sources other than the monitoring program are used in the project for characterizing and interpreting water quality conditions in Texas. Monitoring programs generating data which is to be acquired by the TCEQ must be supported by a TCEQ or USEPA approved QAPP or, in the case of data generated by USGS, by an equivalent quality management system which has been approved of by the SWQM Program. These data are usually obtained in electronic format and are inspected in their raw form by automated data editing procedures and water quality experts before data reduction, interpretation, and application is undertaken. Acquired data meeting quality requirements for inclusion in TRACS must be coded to accurately represent the collecting and submitting agencies. Further guidelines are available in the SWQM DMRG (2003 or latest version), Chapters 5 and 6.

[illegible] The procedures are listed in WDM&A's Data Summary and Preparation for Loading to SWQM-TRACS Database Revision 2 Effective 4/17/2003.

Water quality and/or flow data are obtained from the following sources:

- USGS - water quality and flow data from the Water Quality Database in the Austin office. TCEQ has determined the USGS water quality data is equivalent for the purpose of assessment by the SWQM Program.

- River authorities and municipalities under the direction of the TCEQ CRP - water quality and flow data, submitted directly to the SWQM database in TRACS through the CRP project manager.

- Entities under the direction of the TCEQ TMDL Program - water quality and flow data, submitted directly to the SWQM database in TRACS through the TMDL project manager.

- Texas Watch - water quality data collected by volunteers.

- Texas Department of Health - water quality data, mainly fecal coliform data and fish tissue data.

- National Coastal Assessment Program - water quality and sediment data

These data are furnished to the TCEQ as requested.

The intended uses of all acquired water quality data are the same as listed in Section A7.

With the exception of volunteer monitoring data, no limitations have been placed on the use of SWQM data. Volunteer monitoring data collection must follow the procedures outlined in the Texas Watch Volunteer Environmental Monitoring Manual or the SWQM PM in order for it to be used by the TCEQ. Many volunteer monitoring programs use pH Color Comparators or electronic pH pens for measuring ambient pH levels in surface water. The SWQM Program has determined that pH data collected using a pH Color Comparator or a calibrated pH pen are not capable of meeting the SWQM Program DQOs and therefore will not be used for regulatory or assessment purposes.

Section B10. Data Management

TCEQ SWQM data is stored on an Ingres database as one component of the agency's integrated database system (TRACS). This database was established in 1967 with the purpose of collecting and analyzing the data necessary to describe the water quality of Texas streams, reservoirs and estuaries. Today, the TRACS database contains more than 30 years of physicochemical and biological data from more than 7,604 stations collected by the TCEQ, contributing river authorities, cities, and other state and federal agencies.

Background

TCEQ personnel enter field data, as recorded in their field notebooks, on a TRACS Field Data Entry System (FDE) interactive screen. These personnel are usually FOD SWQM staff, but may also include staff from other TCEQ divisions. These TCEQ staff will be referenced throughout this discussion as "data collector" or "collector". "Data" as defined in this section includes data from routine monitoring activities as well as field and routine chemistry data from SSs, RWAs, and UAAs. If data management process for a SS, RWA, or UAA differ from what is outlined in the FOD SWQM Data Process (Appendix D), those processes will be outlined in a QAP for that project. Biological data, for the most part, is not currently housed in TRACS. Visual inspection of the biological data sets is the main form of QA. Processes to quality assure biological data through maximum/minimum values set up in TRACS (as are in place for field and routine chemistry data) are currently under development.

Field data, or measurements which are in their final reportable form when collected, such as Dissolved Oxygen (DO), pH, temperature and conductivity, are sent electronically to the central office via the TRACS FDE System for update to the database. Results of SWQM samples analyzed by the TCEQ Houston Laboratory are entered into the Laboratory Information Management System (LIMS) and are also sent electronically to the TRACS FDE System for update to the database. The data collector receives a hard copy of the sample measurements on a TCEQ Laboratory Analysis Report (Lab Report). [illegible] FOD SWQM Data Process [Appendix D] [illegible]

Field Data Recording and Verification

SWQM field data which are to be added to the TRACS database undergo the following QA checks and follow procedures outlined in the FOD SWQM Data Process (Appendix D):

1. The data collector enters field data directly into the TRACS FDE System. As the data collector enters, s/he confirms that the station ID number, date, time, and depth are valid and confirm that the station ID number and the station description both represent the same sampling location.

2. As field data is keyed into the TRACS FDE System, a series of onscreen prompts indicate any possible data errors: [illegible]

3. [illegible]

Laboratory Analyzed Data Recording and Verification

The laboratory services that generate water quality monitoring data are secured via contract or are conducted at the TCEQ's laboratory in Houston. Contract laboratories are provided a list of required analytes to be run for analysis as well as the correct parameter codes, units of measure and detection limits for all analytical results reported to the SWQM Program. The contract labs may use either the TCEQ's Lab Report, which is provided to them, or they may use their own version of that form provided that the analytes are reported in the specified order and with the correct reporting limits and parameter codes. An effort is being made to coordinate that all contract laboratories will report their data electronically, using the format and instructions specified in the DMRG.

The data from both the Houston laboratory and contract labs are validated according to the procedures outlined in each laboratory's SOP and/or QA plan. The laboratory manager, or surrogate, validate the analytical data by comparing the various QC measurements and by recalculating a random selection of the results produced by each analyst submitting data.

The SWQM Program uses the LIMS to transfer analytical data electronically from the Houston laboratory into the FDE System. All analytical data units and parameter codes are in their final format in LIMS before being approved by the Laboratory Director, or designee. This process greatly reduces the amount of data handling and therefore the possibility of errors in data transferrals.

The laboratory verifies data by checking that the received samples met preservation and hold-time requirements; checking all of the calculations for accuracy; checking all of the raw data against a tray protocol to insure all tests have been completed; checking that all of the required tests, including QC, have been completed; checking that the analyst has checked the QC; checking that the QC is "in control," and, if not, some investigation has been made as to why; checking data entered manually against instrument printout; checking that all of the steps of the SOP have been completed correctly; and checking sample demographics, i.e., that the final report matches laboratory records.

The data are manually screened by a WDM&A Data Manager for errors in electronic transmission and metadata completeness. As laboratory data are updated into TRACS, an automated parameter value review is performed on the dataset for any measurements that fall outside of minimum and maximum value ranges set by the SWQM Team. Any measurements that are found to be outside these ranges are automatically recorded in a text file generated during the update. A WDM&A Data Manager forwards these outliers to the data collector for review. The data collector communicates via email to the WDM&A Data Manager that the measurement is valid, or that she or he will complete a Data Change Request to have the measurement marked as invalid. A list of commonly used parameter codes are included in the SWQM DMRG (2003 or latest version).

QA sample data (duplicates, blanks, and splits) are removed from the FDE System by the WDM&A Data Manager and are not loaded into TRACS. These QA data are reviewed by the data collector on receipt of the hard copy Report of Analysis for acceptable ranges of data variance. If sample measurements are deemed invalid by the data collector during their review of this field QA/QC (see FOD guidance on SWQM data review) the data collector will complete a Data Correction Request, according to the procedure for data corrections outlined in the SWQM Data Management Reference Guide, to have the data flagged as invalid in the database by a WDM&A Data Manager.

Any errors identified by the TCEQ Houston Laboratory are documented on "Amended Reports," corrected Report of Analysis sheets. WDM&A will correspond with the data collector and perform any necessary data corrections in TRACS on receiving an Amended Report. Amended Reports are considered conclusive and do not require supplemental documentation such as submission of Data Correction Requests.

Non-Reporting of Laboratory Data

There are situations when analyses of samples are not to be run by the laboratory and therefore no data will be reported to the TCEQ SWQM Program. Those situations include: if the sample was received warmer than the prescribed temperature requirement (> 6^{o} C), if the hold time for the parameter expired before the sample was received, if the sample had not been preserved correctly, if the sample was collected in the wrong type of container, or if the sample could not be analyzed within hold time due to instrument failure, for example.

Completeness of Field and Laboratory Data

SWQM Central Office staff review one batch of RFAs and Lab Reports from each regional office annually at the time of the TSA, along with that period's field data. During the audit process, SWQM Central Office staff will confirm data completeness and report findings in the TSA report. The FOD is responsible for correcting any non-compliance noted in the TSA report. Failure to correct the noncompliance or to meet QA protocols may result in the data from that office being noted as inappropriate for stream assessments. Once reviewed, the batch of sample data is returned to the regional office to be returned to the project files.

Data Transformation, Transmittal, Reduction and Retention

Even when accepted protocols are followed in collecting and analyzing environmental samples, a potential for loss of data quality arises in the manipulation and reporting of the data. Certain procedures do allow for lowering the chance of handling errors, such as computer program edits, the use of the LIMS system for reporting of the laboratory analytical results, and the use of forms by the laboratories which are in final format regarding units and parameter codes.

Whenever reported data are reduced in size, it is essential that proper rules for modifying official data be followed. Common tables of conversion factors and rules for significant figures will be used. Reduced data will be identified as such to prevent confusion since the reduced data may inadvertently indicate a violation of analytical or physical measurement methodology.

The TCEQ routinely stores all RFAs and laboratory Analytical Results Forms (ARFs) completed by regional data collectors, in the regional offices. Data records storage procedure is as follows: RFAs and laboratory ARFs will be kept in the Regional Office of origin for a period of five years. For data collected by Central Office staff, the same storage requirements apply except that the records will remain in the data collector's files in Central Office. All records (both regional and Central Office) may then be transferred to the Texas State Library for storage for a period of five years before being destroyed. The TCEQ laboratory must retain files of all QA data for a period of at least nine years and assure that they are available for inspection. Contract laboratories follow their own records retention policy.

The data collector is responsible for assuring that all field activity reports, calibration records, and general information are maintained and properly filed according to particular investigations or projects.

Figure 4 shows a flowchart of SWQM data into TRACS.

Figure 4. Flow Chart of Data Into TRACS

Section C1. Assessments and Response Actions

The commitment to use approved equipment and approved methods when obtaining environmental samples and when producing field or laboratory measurements must have periodic verification that the equipment and methods are, in fact, being employed and being employed properly. The verification is accomplished by conducting performance and systems audits. The audits will be conducted by a person independent of the actual duties of either the data collector or laboratory management. This person will be familiar with the field sampling requirements of the program or laboratory QA. These persons are chosen by the SWQM or WQA program manager, or designee, and the management of the Compliance Support Division.

Before any investigation included in the water quality monitoring program begins, it will be verified that proper equipment is available for all data collectors. This includes sampling equipment, safety equipment, and field measurement equipment (and calibration standards). It will also be verified that all personnel involved in field activities have received sufficient training and are able to properly use the equipment and procedures. The application of procedures and equipment will be verified periodically. This verification is made during the annual field performance audit, also called the annual TSA. The SWQM Program is responsible for auditing individual FOD SWQM personnel annually. In the Houston Region, due to the number of staff in the program, all staff will be audited biannually. They will be observed during an actual field investigation to verify that equipment and procedures are properly applied. Details of the TSA are outlined in the SWQM PM and in the SWQM Program QA Evaluation Guide (Appendix A,) including review of records, field performance audit samples and corrective actions.

Those laboratories contracted to perform analytical measurements on samples collected during any water quality monitoring investigation are routinely conducted by the TCEQ's laboratory inspection staff on average once every year. During these laboratory systems audits, it is noted what equipment is available, what personnel are available, and what procedures are followed for data quality verification. Any inadequacy is noted in a response letter to the laboratory management. The laboratory management is then responsible for making any corrections needed and to report these corrective actions to the TCEQ laboratory QA Specialist. Follow-up inspections confirm that deficiencies have been addressed.

Performance Evaluation Audits and Responses

Performance evaluation and audits for field activities are summarized above. Performance audits for all laboratories providing analytical service for water quality monitoring investigation will be conducted by the TCEQ Quality Assurance Section.

Whenever the procedures and guidelines established in this project plan do not meet the specified levels of data quality or are not successful, corrective action is required. In addition to corrective actions outlined in the agency's QMP, the SWQM Program employs the following for field and laboratory corrective actions:

The responsibility to see that the required corrections are made will be the FOD SWQM personnel or laboratory manager. Each manager may also initiate corrective action.

Variances which require corrective action include but are not limited to:

(1) equipment failure;
(2) excursions from precision and accuracy control limits;
(3) samples arriving at the laboratory with sample integrity in doubt;
(4) samples lost in transit or in laboratory accidents;
(5) failure to meet acceptance criteria when analyzing Performance Evaluation Samples;
(6) reporting data in wrong units; and
(7) calculating data by wrong formula.

Most corrective action can be some combination of the following: repair or replacement of faulty equipment; re-analysis of samples and standards; checking reagents for proper strength; re-sampling; or contacting data collector or project QA Specialist for advice. A formal corrective action program is difficult to establish which would cover all possible problems. Unique problems which cannot be corrected by the procedures listed above will require corrective actions defined when the need arises. A record of corrective actions is maintained by the laboratory manager and FOD SWQM personnel.

Each regional SWQM staff member is evaluated once per year through a TSA conducted by a member of the central office SWQM Team. The evaluation is conducted in accordance with the TCEQ SWQM Program QA Evaluation Guide (Appendix A.) Each TSA will be followed up on by the SWQM staff responsible for conducting the review. A verbal and written assessment of the findings of the TSA is conducted with the water quality monitoring personnel. The verbal assessment is conducted immediately at the conclusion of the TSA and prior to leaving the office in which the review was conducted. If possible, the verbal assessment is conducted in the presence of the person's immediate supervisor. The following topics are discussed during the verbal assessment: (a) materials and procedures checked during the TSA, (b) suggested and/or necessary changes in sampling procedures, and necessary action to correct data quality deficiencies.

An Interoffice Memorandum is directed from the person on the SWQM Team that conducted the TSA to the regional director of the appropriate office and to the attention of the FOD SWQM personnel and his or her supervisor. The memo shall be sent to the regional director within 60 days following the TSA and will provide the following information: (a) description of sampling materials and procedures checked during the TSA, (b) required action to correct water quality data collection deficiencies, (c) proposed action(s) based on changes in sampling programs, and (d) actions to correct or remove deficient data from the SWQM database in TRACS.

Corrective actions discussed during the verbal review are effective immediately following the verbal review. Corrective actions addressed in the follow-up memo are effective upon the date of the

memo unless otherwise specified in the memo. If it is determined that the quality of the data may have been compromised, a thorough review is conducted and questionable data are removed from the database.
Regional directors are responsible for seeing that all letters, memos or verbal assessments citing deficiencies in the regional monitoring program are addressed and that corrective action is implemented. A written response from the regional manager to the SWQM project manager and to the attention of the SWQM Team member who conducted the TSA outlining the corrective action(s) and timeline for implementation of the corrective action(s) will be sent within 30 days of receipt of the deficiency notification (verbal or written).

The next TSA (the following fiscal year) includes a review to insure that required corrective actions were initiated and continued since the previous TSA. If required corrective actions have not been completed, the SWQM Team recommends that sampling personnel responsible for the inadequacies be transferred to other duties with less stringent data quality needs. If corrective actions are not taken and sampling personnel are not transferred, the SWQM Team may stop accepting surface water quality data from that office, effective the date of the TSA, until corrective actions are completed. Records of the TSAs and memos describing performance by FOD SWQM personnel and training activities are reported to TCEQ management and the USEPA Region 6 project manager. TSAs and performance evaluations are discussed in detail in Sections B5, B6 and B7 of this QAPP.

TSAs are planned and conducted in accordance with TCEQ Operating Policies and Procedures 18.9.1 and 18.9.2, respectively. The Project Quality Assurance Specialist maintains a current list of planned TSAs. Nonconformances are identified and corrective actions implemented in accordance with the TCEQ QMP (Chapter 10). The Project Quality Assurance Specialist maintains a current list of corrective actions.

Section C2. Reports to Management

Project-related deliverables and reports, are described in Section A7.

Section D1. Data Review, Validation, and Verification Requirements

Only data meeting each of the applicable data quality indicator requirements contained in Section A7 or conforming to acquired data requirements as stated in Section A9 are accepted for inclusion in the TRACS database. Data which do not meet these requirements are excluded from TRACS and from being used in the 305(b) Water Quality Inventory Report. Details of the data review, validation, and verification processes are detailed in Section B10 of this document. The data collector, Laboratory Manager, SWQM team staff, or WDM&A team staff, as appropriate, will authorize all corrections or invalidations of data. Any data discovered to be invalid after it has been loaded into TRACS must be flagged or corrected following the Data Correction Request procedure documented in the SWQM DMRG (2003 or latest version). Any TCEQ staff aware of errors either through data review or from communication with data submitters should submit a Data Correction Request to WDM&A staff

Section D2. Validation and Verification Methods

All data reported for the SWQM Program will be subject to checks for errors in transcription, calculation, and computer input as described in Section B10 of this document. Field data are initially validated by built in checks in the TRACS system which alerts the data collector immediately of outlier values for verification. These checks are also described in Section B10 of this document. If a question arises during loading and verification of field data, the WDM&A Data Manager returns the data to the collector via the FDE System for correction or verification. If an outlier or question arises during loading and verification of laboratory data, the WDM&A Data Manager refers the data to the collector via e-mail for review and verification. The Data Manager documents in the comments section of the sample in the TRACS database that the measurement has been verified by the data collector. Any corrections initiated by the data collector after data has been loaded into TRACS will be documented via the Data Correction Request process defined in the SWQM DMRG (2003 or latest version). Any corrections from the Houston Laboratory are initiated and documented on amended Report of Analysis forms. In the event that the data collector has been reassigned or is no longer employed by the TCEQ, the responsibility for these data falls to their immediate supervisor. The supervisor will notify the WDM&A Data Manager of the change in personnel so that the former employees identifier (E-mail ID) can be removed from the system. The WDM&A Data Manager follows the most current SOPs for both data verification and loading in FDE and processing Data Correction Requests. All laboratory data forms must be accurate and complete. Any changes to the data forms will be noted, initialed and dated on the form. Any actions taken as a result of the data review will also be noted by the data collector on the data sheet. Refer to Section B10 of this document for additional discussion of data problem resolutions.

Section D3. Reconciliation with User Requirements

These data, and data collected by other organizations (e.g., USGS, CRP contractors, etc.), will be subsequently analyzed and used by the TCEQ for water quality assessments, TMDL development, stream standards modifications, and permit decisions. Data quality is reconciled with objectives of the project following the procedures outlined in Section B10.