



Quality Management Plan

For the

South Carolina Department

Of

Health and Environmental Control

Environmental Quality Control
Ocean and Coastal Resource Management

2600 Bull Street
Columbia, South Carolina 29201

July 2008

TABLE OF CONTENTS

1.1 APPROVALS5

1.2 CONCURRENCES6

1.3 QUALITY ASSURANCE LIAISONS.....7

2.0 INTRODUCTION8

Figure 1 The SCDHEC Quality System9

3.0 SCDHEC QUALITY ASSURANCE POLICY AND OBJECTIVES.....10

3.1 THE MISSION OF SC DHEC.....10

3.2 THE IMPORTANCE OF ENVIRONMENTAL DATA10

3.3 THE SC DHEC QA POLICY10

3.4 OBJECTIVES.....10

4.0 MANAGEMENT AND ORGANIZATION11

4.1 ORGANIZATION11

4.1.1 Ocean and Coastal Resource Management (OCRM)12

4.1.2 Environmental Quality Control12

4.1.3 Associated Bureaus16

4.2 QUALITY ASSURANCE PROGRAM MANAGEMENT16

4.2.1 The SQAMO and the Office of Quality Assurance17

4.2.2 Bureau Quality Assurance Liaison.....19

4.2.3 Project Officers.....20

4.2.4 Technical Staff.....20

4.2.5 Contractors/Contracted Work.....21

4.2.6 Office of Environmental Laboratory Certification21

4.2.6 Regional Quality Assurance Officer.....22

4.3 FEDERAL AND STATE STATUTES AND REGULATIONS22

4.3.1 Agency-Wide Regulations22

4.3.2 OCRM.....23

4.3.2 BAQ23

4.3.3 BOW23

4.3.4 BLWM24

4.3.5 BES.....25

5.0 QUALITY SYSTEM COMPONENTS.....25

5.1 DESCRIPTION OF THE QUALITY SYSTEM.....25

5.1.1 Quality Assurance System for Internal and External Data26

5.2 QUALITY SYSTEM COMPONENTS.....28

5.2.1 Quality System Documentation.....28

5.2.2 Management System Reviews28

5.2.3 Planning29

5.2.4 Project Specific Quality Documentation30

5.2.5 Standard Operating Procedures (SOPs) for Labs and the Field32

Table 1: Elements of the EQC Lab SOPs.....35

5.2.6 Program SOPs.....35

5.2.7 Data Processing, Verification, Validation and Data Handling.....36

5.2.8 Corrective Action.....37

5.2.9 Training.....37

5.2.10 Technical, Project, and Data Assessments37

6.0 QUALIFICATIONS AND TRAINING38

6.1 TRAINING POLICY38

6.2 GENERAL QUALIFICATIONS AND TRAINING REQUIREMENTS FOR EQC STAFF38

6.3 PROFESSIONAL LICENSES AND CERTIFICATIONS FOR SC DHEC PERSONNEL	38
6.4 THE SQAMO AND OQA QUALIFICATIONS	39
6.5 PROCEDURES FOR DETERMINING QA-RELATED TRAINING NEEDS	39
6.6 DOCUMENTATION OF TRAINING	40
6.7 QUALIFICATIONS AND TRAINING OF NON-SCDHEC PERSONNEL	40
7.0 PROCUREMENT OF ITEMS AND SERVICES THROUGH CONTRACTS, GRANTS OR INTERAGENCY AGREEMENTS	40
8.0 DOCUMENTS AND RECORDS	42
9.0 COMPUTER HARDWARE AND SOFTWARE	44
10.0 PLANNING	46
11.0 IMPLEMENTATION OF WORK PROCESSES	47
12.0 ASSESSMENT AND RESPONSE	48
12.1 TYPES OF ASSESSMENTS	50
<i>12.1.1 Performance Assessments</i>	50
<i>12.1.2 Technical System Audits, (TSAs)</i>	51
<i>12.1.3 Data Quality Audits</i>	51
<i>12.1.4 Readiness Reviews</i>	51
12.2 AUDIT REPORTS, RESPONSE AND CORRECTIVE ACTIONS	51
12.3 DISPUTES	52
13.0 QUALITY IMPROVEMENT	52
13.1 ADDRESSING QUALITY PROBLEMS	53
13.2 COMMUNICATION	53
13.3 TRACKING THE QUALITY SYSTEM	54
<i>13.3.1 QMP</i>	54
<i>13.3.2 Annual Report/Work Plan</i>	54
13.4 ENSURING QUALITY	54
APPENDICES	56
APPENDIX A: ORGANIZATIONAL CHART OF SCDHEC	57
APPENDIX B: ORGANIZATIONAL CHART OF THE SCDHEC SQAMO AND OQA	58
APPENDIX C: ACRONYMS AND DEFINITIONS	59
APPENDIX D: REQUEST FOR QA/QC DOCUMENTATION	61
APPENDIX E: PREPARATION FOR AUDITS AND AUDIT CHECKLISTS	62

1.0 PROGRAM PLAN IDENTIFICATION FORM AND APPROVALS

Document Title: Quality Management Plan for South Carolina Department of Health and Environmental Quality Control

Organization Title: S.C. Department of Health and Environmental Control

Address: 2600 Bull Street
Columbia, S.C. 29201

EQC Deputy Commissioner: Robert W. King, Jr., PE
OCRM Deputy Commissioner: Carolyn Boltin

State Quality Assurance
Management Officer (SQAMO): R. Wayne Davis

Address: P.O. Box 2202
Columbia, S.C. 29202

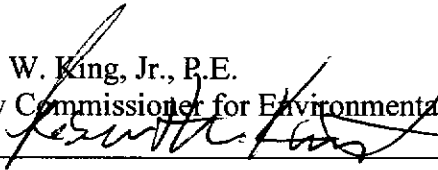
Plan Coverage:

This plan covers all monitoring and measurement activities mandated through EPA regulations and memoranda. This includes all internal and external environmental data generated by activities conducted throughout the South Carolina Department of Health and Environmental Control (SCDHEC). In addition, the plan ensures that environmental technology used for pollution control or waste remediation are designed, constructed, and operated according to defined specifications and protocols.

1.1 Approvals

Name: Robert W. King, Jr., P.E.

Title: Deputy Commissioner for Environmental Quality Control

Signature:  Date: 6/18/08

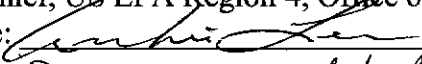
Name: Carolyn Boltin

Title: Deputy Commissioner for Ocean and Coastal Resource Management

Signature:  Date: June 17, 2008

Name: Marilyn Maycock

Title: Chief, US EPA Region 4, Office of Quality Assurance

Signature:  Date: 7/9/08

Region 4 Quality Assurance Manager

1.2 Concurrences

Name: Marvin Pontiff
Title: Assistant Deputy Commissioner, OCRM
Signature: *Marvin Pontiff* Date: 6/16/08

Name: Myra C. Reece
Title: Chief, Bureau of Air Quality
Signature: *Myra C. Reece* Date: 6/19/08

Name: Patrick T. (Pat) Walker
Title: Chief, Bureau of Environmental Services
Signature: *Patrick T. Walker* Date: 6/18/08

Name: Daphne Neel
Title: Chief, Bureau of Land and Waste Management
Signature: *Daphne Neel* Date: 6/19/08

Name: David Wilson, P.E.
Title: Chief, Bureau of Water
Signature: *David Wilson* Date: 6-19-08

Name: R. Wayne Davis
Title: Assistant Bureau Chief, Environmental Quality Control Laboratories
State Quality Assurance Management Officer
Signature: *R. Wayne Davis* Date: 6-18-08

Name: Nydia F. Burdick
Title: Manager, Office of Quality Assurance
Signature: *Nydia F. Burdick* Date: 6/18/08

1.3 Quality Assurance Liaisons

Bureau of Environmental Services
Office of Quality Assurance

Nydia Burdick,
Connie Turner

Analytical and Radiological Environmental Services Division

Micheal Mattocks

Office of Environmental Laboratory Certification

Carol F. Smith

Bureau of Air Quality:

Lynn Barnes

Bureau of Water

David Graves

Bureau of Land and Waste Management

Stephen Burdick

Ocean and Coastal Resource Management

Marvin Pontiff

2.0 INTRODUCTION

The U.S. EPA has developed a mandatory Agency-wide Quality System (or QA program) **Order 5360.1 A2**, which requires the State to assure that:

1. Environmental data collected are of appropriate type and quality for their intended use.
2. Environmental technology used for pollution control or waste remediation is designed, constructed, and operated according to defined specifications and protocols.

The quality assurance requirements for State/Tribal and local government financial assistance agreements are covered in 40 CFR Part 31.45 which states “...*the grantee shall develop and implement quality assurance practices consisting of policies, procedures, specifications, standards, and documentation sufficient to produce data of quality adequate to meet project objectives and minimize loss of data due to out-of-control conditions or malfunctions.*”

The South Carolina Department of Health and Environmental Control (SCDHEC) administers environmental programs and requires adherence with State and Federal regulations that require environmental data to be of documented quality. The Quality Management Plan (QMP) is the document that describes how programs within SCDHEC will plan, implement, and assess the quality of environmental work to be performed as part of the various programs’ function within the Department. The program areas involved are Air Quality, Water, Land and Waste Management, Environmental Services and Ocean and Coastal Resource Management (OCRM). The first four programs are under the Deputy of Environmental Quality Control (EQC), while OCRM has a separate Deputy. The QMP is the “blueprint” that defines SCDHEC’s QA policies and procedures; the criteria and areas of QA application; and the different QA related roles, responsibilities, and authorities of personnel.

SCDHEC’s Quality System is the means by which the Department implements the Quality Management Process. The Quality System (Figure 1) encompasses a variety of technical and administrative elements which are contained in the QMP, such as: organizational structure, policies and procedures, responsibilities, authorities, required documents, and guidance documents.

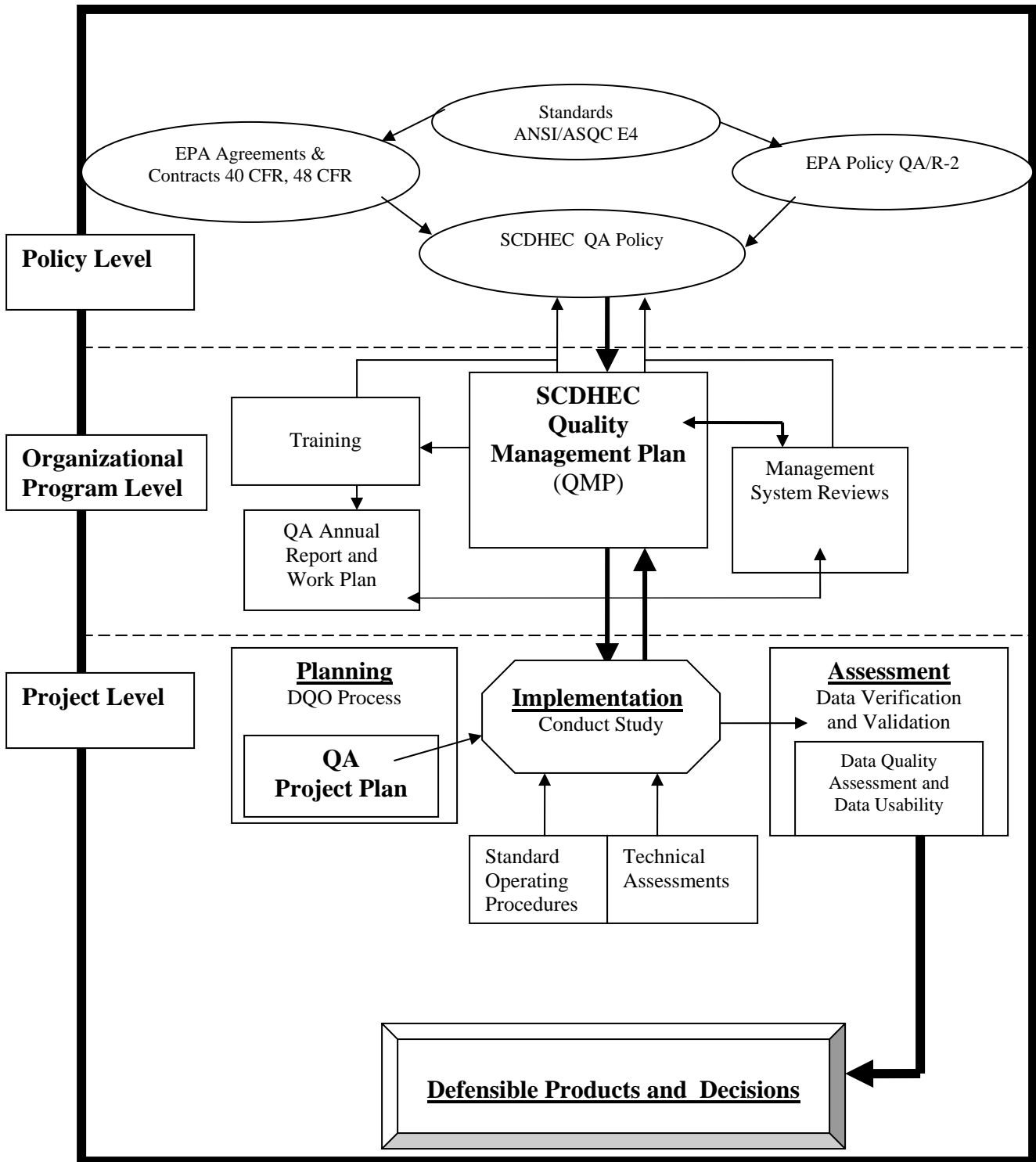


Figure 1 The SCDHEC Quality System

3.0 SCDHEC QUALITY ASSURANCE POLICY AND OBJECTIVES

3.1 The Mission of SC DHEC

The SCDHEC serves the people of South Carolina as the authority, guardian and advocate in all matters relating to public health. The Department's definition of public health includes maintaining and promoting the full scope of environmental protection as well as personal health services that affect everyone's well being. The mission of the Department is to promote and protect the health of the public and the environment.

3.2 The Importance of Environmental Data

Environmental data are critical to decision-making concerning the protection of the public and the environment from the adverse effects of pollutants from natural and man-made sources. Those sources include industrial discharges, air emissions, and waste operations as well as consumer waste. Environmental data are essential to decisions and actions pertaining to environmental protection efforts in the air, land, and all water bodies. The success of environmental technology in abating pollution or remediation of waste sites depends upon the design of technology - its construction and operation. Quality Assurance (QA) which is the documentation of Quality Control (QC) and QC practices are needed to ensure that data involving all environmental efforts – pollution abatement, cleanup, public health protection, and environmental technology – are scientifically valid and defensible. This ensures that the correct decisions are made regarding any and all environmental efforts.

3.3 The SC DHEC QA Policy

It is the quality assurance policy of the Department that there be sufficient QA activities conducted to demonstrate that all environmental data generated, processed, or used will be scientifically valid, legally defensible, and of known and acceptable precision and accuracy. It is also the Department policy that documented precision and accuracy information be made available upon request for all reported data. Data shall be complete, representative, and comparable. The quality of all data generated by and for SCDHEC shall meet or exceed all Department and Environmental Protection Agency requirements.

3.4 Objectives

The following are SCDHEC Objectives which serve to support the QA Policy:

1. The Data Quality Objective (DQO) process shall be used to plan project goals and objectives as they relate to needed environmental data quality prior to the initiation of data collection activities for non-routine sample collection.
2. The DQOs or similar outputs from a systematic planning process shall be documented in a Quality Assurance Project Plan (QAPP), or equivalent project planning document.

3. Special studies involving a potential public health threat or a criminal investigation may not have an approved QAPP due to a limited time frame for obtaining samples. These studies will be handled like routine work requiring adherence to applicable SOPs. Routine work is governed by Regulation, Programmatic Quality Assurance Project Plans (QAPP) or Work Plans and, therefore, individual plans are not necessary.
4. QAPPs or the equivalent planning documents shall be developed by those staff responsible for designing and implementing a project, study or task that requires the collection or use of environmental data. The document shall be approved by the SQAMO or designee. In addition, any laboratory that will be used for the study shall be consulted during the development of the QAPP to determine if the laboratory's analytical capabilities are commensurate with the project/study needs.
5. All Laboratories used for the analysis of environmental samples shall be certified for all parameters for which they are submitting data (where certification exists) by either EPA or the SCDHEC Office of Environmental Laboratory Certification.
6. Quality Staff, Technical Staff and Managers shall receive QA training appropriate for their job responsibilities.
7. Assessments shall be performed to determine the effectiveness of the SCDHEC Quality System.
8. QA processes shall be designed in the most cost effective manner without compromising data quality. Continuous improvement in the quality management system shall be emphasized.

4.0 MANAGEMENT AND ORGANIZATION

4.1 Organization

The South Carolina Department of Health and Environmental Control touches the life of every South Carolinian every day. From making sure that drinking water is clean to assuring immunizations are provided to the most vulnerable populations, the approximately 4000 full-time employees provide services through state, regional, and county offices.

The South Carolina General Assembly created DHEC in 1973 when it reunited the State Board of Health and the Pollution Control Authority. The Agency's Mission is to promote and protect the health of the public and the environment. The Agency is divided into five areas: Administration, Health Services, Health Regulation, Environmental Quality Control (EQC), and Ocean and Coastal Resource Management (OCRM). This document will describe the Quality Management of the Environmental portions of the Department which include OCRM and EQC. A description of the duties of the Bureaus of Business Management and Information Services,

located under Administration, are also included in this document because they provide essential services to EQC and OCRM.

Charts or internet links to the charts depicting the Department's organizational structure and diagrams of program areas covered in this document are included in the Appendix. Functions of each program area are listed below. The quality assurance responsibilities of each Bureau include the preparation of QA Project Plans for special studies and generic plans for all routine activities; the monitoring and overview of external environmental programs; and the preparation, review, and revision of Standard Operating Procedures such as the SOP for sampling, entitled Environmental Quality Control Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, 2006 Edition.

It is stressed by Management and by Quality Assurance Staff that environmental data quality is the responsibility of all EQC and OCRM staff who are directly or indirectly involved in sample collection and the generation of data. It is the expectation of EQC and OCRM that employees shall conduct all business with integrity and in an ethical manner. Each staff member and manager is held to the highest ethical standard of professional conduct in the performance of their duties.

The senior managers are responsible for ensuring that adequate resources are available to implement the Quality Assurance System. This includes resources for training and assessment so that applicable elements of the system are understood and implemented by staff.

4.1.1 Ocean and Coastal Resource Management (OCRM)

As previously stated, OCRM has a separate area within SCDHEC, but a similar mission to EQC. OCRM is responsible for protecting the quality of the coastal environment and promoting the economic and social improvement of the coastal zone for all the citizens of the State. Activities of OCRM include the promotion of economic and social improvement of the citizens of the State through the development of coastal resources; protecting and enhancing the resources of the State's coastal zone for current and succeeding generations; formulating a comprehensive tidelands protection program; implementation of a comprehensive beach erosion and protection policy including the protection of necessary sand dunes; and encouraging state agencies, counties, municipalities, and regional agencies to exercise their responsibilities and powers in the coastal zone through the development and implementation of comprehensive programs to assure the wise use of coastal resources while giving full consideration to ecological, cultural, and historic values as well as to the needs for economic and social development and resource conservation.

4.1.2 Environmental Quality Control

Administration

The Deputy Commissioner for Environmental Quality Control (EQC) oversees programs for the Bureaus of Air Quality, Water, Land and Waste Management, and Environmental Services (Regions and Laboratory).

Bureau of Air Quality (BAQ)

The Bureau of Air Quality is responsible for the implementation of the S.C. Pollution Control Act, the Asbestos Abatement License Act, and the Federal Clean Air Act for the purpose of maintaining standards and improving the air quality in South Carolina. The Bureau maintains the State Air Quality Implementation Plan that conforms to state and federal mandates. Activities of the Bureau include air quality monitoring, analysis, and reporting; compliance inspections of emission sources; enforcement actions taken to attain compliance with emission standards and permit requirements; licensing and oversight of asbestos removal and demolition projects, contractors and workers; permit issuance for emission sources; testing and evaluation of emissions; modeling of emissions prior to construction to ensure compliance with national air quality standards; accidental release prevention; and emission inventory. The Division of Air Quality Analysis (DAQA), which includes the Monitoring Staff, is housed in the Bureau of Environmental Services (BES). This Division works in close partnership with BAQ. DAQA is responsible for the analysis of air quality samples and the Ambient Air Monitoring Network. BAQ is also assisted by regional personnel from the BES. Regional personnel collect ambient air samples for DAQA and perform compliance inspections.

Bureau of Water (BOW)

The Bureau of Water is responsible for assuring that public drinking water supplies are safe. BOW ensures that public swimming pools and natural swimming areas are clean and safe; restores and maintains the chemical, physical, and biological integrity of the State's waters to the degree that these water resources may be used to the maximum extent possible. Activities of the Bureau include reviewing plans and/or permit issuance for the construction and discharge of all proposed water, wastewater, stormwater, and agricultural wastewater systems; inspection of such facilities under construction and in operation; reviewing applications for permits to construct/repair/alter/remove any dam regulated under the S.C. Dams and Reservoirs Safety Act and conducting on-going inspection programs for the dams; conducting routine monitoring for bacteriological, organic and inorganic chemical and radiological contamination; conducting biological assessments of natural waters of the State; coordinating activities to prevent the contamination of existing and potential underground sources of drinking water and improving the quality where health or environmental impact exists; establishing specific classifications for all streams and tributaries throughout the State and effluent standards and guidelines for wastewater discharges; developing and promulgating rules and regulations for pollution abatement and for public health regarding sanitation, processing and handling of shellfish, fish, crab meat, lobster and shrimp; initiating enforcement actions to abate any violations including assessment of appropriate civil penalties with reference to the State Safe Drinking Water Act, the State Primary Drinking Water Regulations, the S. C. Pollution Control Act, and the Water Pollution Control Permits Regulation. The Analytical Radiological Environmental Services Division (ARESD) and the Regional Environmental Laboratories located within BES works in partnership with the BOW. These Laboratories are responsible for analyzing the water samples that are collected by field staff from the Regional Laboratories.

Bureau of Land and Waste Management (BLWM)

The Bureau of Land and Waste Management is responsible for ensuring the regulated management of all solid and hazardous waste in the State to protect the health and safety of the public and to protect the environment. Activities of BLWM include regulation, storage, transportation, treatment and disposal of hazardous and infectious waste to assure the safe and adequate management of these wastes. BLWM maintains a fund to ensure financing for contingencies (including appropriate staff oversight of clean-up activities) arising from hazardous waste spills or accidents at permitted facilities or at pre-existing abandoned sites. The Bureau also maintains reasonable enforcement standards to abate control and prevent pollution; regulates the methods of disposition of garbage and any like refuse matter; administers and implements the requirements of the S.C. Mining Act, which involves permitting all mining activities to ensure the environmental protection, public safety and reclamation of all lands and waters involved in mining within the State. BLWM activities include enforcement actions, inspections, and permitting; promoting voluntary waste reduction through source reduction and recycling of industrial wastes; radioactive waste management; providing technical assistance to the Emergency Preparedness Division and the Governor in case of radiological emergencies. The sound use and protection of groundwater; waste assessment; and emergency response and supervision of clean-up activities are also a responsibility of BLWM. As part of this responsibility, the Underground Storage Tank Program has been designated as responsible for statewide compliance and corrective action programs related to underground storage tanks. Exact responsibilities are outlined in the State Underground Petroleum Environmental Response Bank (SUPERB) Act and Regulations 61-92 and 61-98. Specific compliance related services include: review and issuance of underground storage tank permit applications to install and operate; verification of tank owner's financial responsibility for corrective action and third party liability; maintenance of up to date information for all tank systems state wide; annual registration fee collection and decal issuance; oversight of installations, system upgrades, and abandonments; geotechnical services; and statewide inspection and outreach efforts. BLWM utilizes BES Regional Staff to perform compliance inspections. Sampling, however, is done by BLWM Staff or Contractors. The BLWM uses external laboratories as well as internal laboratories for the analysis of samples.

Bureau of Environmental Services (BES)

This Bureau consists of Regional Services, EQC Laboratories, the Office of Environmental Laboratory Certification and the Office of Quality Assurance.

Regional Services

Regional Services is responsible for implementing the various Environmental Quality Control Programs (Air, Water, and Land/Waste Management) throughout the State. Activities include inspection and sampling of drinking water systems; inspection of hazardous waste generation, treatment and storage facilities; approval of water and wastewater systems for operation; ambient sampling of the State's waters and air; inspection and sampling of wastewater treatment systems, inspection of domestic landfill operations; inspection of industrial air pollution facilities; inspection of public swimming pools and bathing areas; inspection of construction sites for

proper storm water and sediment control; sampling and classification of shellfish harvesting areas and inspection of processing facilities; response to oil or chemical spills or other environmental emergencies; investigation of complaints concerning the environment, and including laboratory support.

Environmental Quality Control Laboratories

Environmental Quality Control Laboratories is composed of five entities: ARES (Analytical Radiological Environmental Services Division), Division of Air Quality Analysis (DAQA), the Office of Environmental Laboratory Certification, the Office of Quality Assurance, and the Regional Laboratories. Samples range from water and sediment to ambient air and radiological environmental monitoring. The testing and analyses conducted complement and support all environmental quality control programs. DAQA (in partnership with BAQ) maintains responsibility for implementation of the Ambient Air Monitoring Program for the Bureau of Air Quality and analyzes the ambient air samples that are collected. The ARES and Regional Labs perform laboratory testing and analysis on water, sediment and biological samples to determine if chemical and microbiological properties are consistent with quality standards. ARES directs and supports activities in the Regional Laboratories. The Regional Laboratories exist as follows:

Region 1—Located in Anderson and Greenwood, SC. These Labs perform only field analyses.

Region 2—Located in Greenville and Spartanburg, SC. The Greenville Lab performs laboratory and field analyses while the Spartanburg Lab performs only field analyses.

Region 3—Located in Lancaster and Columbia, SC. The Lancaster Lab performs laboratory and field analyses while the Columbia Lab performs only field analyses. The Columbia Regional Lab is separate from ARES.

Region 4—Located in Florence and Sumter, SC. The Florence Lab performs laboratory and field analyses while the Sumter Lab performs only field analyses.

Region 5—Located in Aiken, SC. The Aiken Lab performs laboratory and field analyses.

Region 6—Located in Myrtle Beach, SC. This Lab performs limited lab analyses as well as field analyses.

Region 7—Located in Charleston, SC. The Charleston Lab performs laboratory and field analyses.

Region 8—Located in Beaufort, SC. The Beaufort Lab performs mostly microbiological lab analyses and field analysis.

Environmental Laboratory Certification

The SCDHEC Office of Environmental Laboratory Certification is located organizationally within the BES. This Office has the responsibility for administering the Laboratory Certification Program for all private, industrial, municipal, commercial, federal and state regional laboratories (excepting those certified by EPA Region 4) that produce data required by the Department or that will be officially submitted to the Department. The Office offers certification for the Safe Drinking Water Act, the Clean Water Act, RCRA, and other parameters as requested by the Program Areas. The Office also certifies Shellfish Waters and Meats under the FDA Certification Requirements.

Office of Quality Assurance

This Office, though located within BES, is directly under the SQAMO (State Quality Assurance Management Officer) and is independent of the Laboratories within the Bureau, OCRM, and other Bureaus within EQC. The Office serves as a liaison with EPA and has QA management and oversight duties for all of the Bureaus discussed above. See Section 4.2 for more information.

4.1.3 Associated Bureaus

Bureau of Business Management (BBM)

BBM is responsible for providing the Department with supportive services in the following areas: procurement of goods and services; facility management; asset accounting and property management; central supply, mail and courier operations; motor vehicle management/maintenance; facility maintenance; printing, photography and graphics; and security services. BBM maintains a continuous review of State and Federal Laws, policies and procedures to assist in the management process of the Department. In addition, BBM procures quality goods and services for all Department entities as requested by the various Program area specifications in accordance with established rules and guidelines for procurement.

Bureau of Information Services (BIS)

Information Systems' role is to provide the technological leadership that both complements and enhances the Department's ability to accomplish its strategic plan. BIS is responsible for the management and development of all networks, both data and voice. The Bureau constructs and implements, in cooperation with other Deputy areas, common standards for technical systems, applications and databases. BIS is also responsible for the development and implementation of programmed solutions that allow various areas the integrity and security of data for the Department.

4.2 Quality Assurance Program Management

Internal coordination of QA/QC activities among the various programs, departments, and bureaus located within SCDHEC is provided through several means:

- Use of Standard Operating Procedures for routine work. These are approved by management. In the case of analytical or sample collection activities these are also approved by the OQA. See Section 5.2.5.
- Use of Quality Assurance Project Plans for non-routine work. All QAPPs must be approved by the OQA. Some must also be approved by EPA. See Section 5.2.4.
- Roles of the QA Liaisons. See Section 4.2.2

Management ensures that the applicable elements of the quality system are understood and implemented by staff that are responsible for carrying out the policies, procedures, practices and protocols specified in this document by:

- Dissemination of the Quality Management Plan to all Divisions of the Department.
- Appointing Staff to serve as QA Liaisons to ensure that information coming from the SQAMO or EPA is broadcast to Staff and to also ensure that the QMP has been appropriately implemented in their own bureaus.
- Internal meetings and permanent committees (like the Monitoring Committee) to act as oversight for QA/QC activities.
- Constant contact from the SQAMO or designee with management from the front line manager to upper management.

4.2.1 The SQAMO and the Office of Quality Assurance

The Assistant Bureau Chief (ABC) is given the responsibility over the Department's Environmental Labs, the Office of Quality Assurance (OQA), and the Office of Environmental Laboratory Certification and is also the State Quality Assurance Management Officer or SQAMO (See Appendix B). Although the Office of Quality Assurance is in the same Bureau as the Laboratory, the Office is independent and answers directly to the SQAMO and usually acts as the "designee" for the duties listed below (See also Appendix B for the Organization Chart). In addition, OQA oversees environmental monitoring throughout EQC and OCRM. Both the SQAMO and the OQA routinely interact with upper management in EQC and with EPA's Quality and Technical Staff through formal and informal meetings, email, and by telephone.

The SQAMO or designee shall:

1. Be informed of each environmental monitoring study.
2. Ensure that the level of needed data quality will be determined and stated before the generation effort begins.

3. Be provided with a written study plan for special studies for approval. OQA shall maintain a list of QAPPs submitted to the Office with the date the QAPP was approved.
4. Ensure that all environmental samples collected and the data generated from them will be of the quality and integrity specified by the QAPPs.
5. Identify and respond to QA needs, resolve problems, and answer requests for guidance and assistance internal and external to the Department.
6. Ensure that all Bureaus or Offices are made aware of any program or SOPs that could affect their activities and responsibilities.
7. Ensure that all QA requirements are integrated into the overall State/EPA Agreement Process.
8. Communicate and disseminate information to all Program Areas, Bureau Quality Control Liaisons, Bureau Project Officers, Bureau Chiefs, Assistant Bureau Chiefs, and the Regional Quality Assurance Officer. Communicates with local Agencies' QA Officers and Industries' QA Officers.
9. Serve as the environmental monitoring clearinghouse in the preparation, implementation, and revision of all Quality Assurance Program Plans and SOPs. Review and approve all plans and SOPs.
10. Oversee the QA activities associated with special environmental studies. However, the program area requesting the activity has a designee(s) directly responsible for ensuring that the data quality objectives are met.
11. Attend quality assurance training courses.
12. Delegate peer reviews and other Bureau specific QA tasks to the Quality Assurance Liaison.
13. Provide guidance and technical assistance to Department personnel on matters effecting data quality.
14. Work with Department Staff to develop and maintain an acceptable QA Program.
15. Resolve disputes regarding quality assurance issues within the Department and also with external data producers. (See Section 12.3)
16. Report QA concerns to the BES Bureau Chief, Deputy Commissioner of EQC, or Deputy Commissioner of OCRM.

In addition, a variety of quality assurance activities are used to administer the Department's QA program. The SQAMO or designee shall:

1. Perform Technical System Audits and Data Quality Audits of Departmental programs and projects and recommending corrective actions when necessary. For the Regional Laboratories, these audits are also Laboratory Certification Audits.
2. Perform field sampling audits and/or audits of field documentation.
3. Administer the Proficiency-Testing Program for all EQC Laboratories.
4. Provide blind or double blind QC samples to assess the capabilities of the internal Laboratories.
5. Develop training programs for all levels of departmental staff to ensure that QA activities are understood and implemented.
6. Provide technical assistance to internal and external clients.

4.2.2 Bureau Quality Assurance Liaison

Internal coordination of QA and QC activities can be difficult among organizations. Therefore, each program area with environmental monitoring responsibility shall designate a person as the Bureau Quality Control Liaison with the SQAMO and a Bureau Project Officer. The presence of a QA Liaison in the Bureaus assists in coordination and helps the SQAMO and OQA ensure understanding and implementation of the Quality System.

The Bureau Quality Control Liaison shall:

1. Work with OQA, the SQAMO and other Bureau Liaisons to coordinate QA/QC activities.
2. Identify and respond to QA needs, resolve problems, and answer requests for guidance or assistance.
3. Work with the Bureau's Staff to develop and maintain an acceptable QA program.
4. Be a peer reviewer for QAPPs from within their Bureau. However, in the case where there would be a conflict of interest (for example, the Liaison is developing a QAPP or is the Project Manager), an alternate peer reviewer for the QAPP must be chosen. The Bureau Liaison may delegate QAPP review to a colleague in his/her Bureau that has the greater expertise, but this delegation must not cause a conflict of interest.
5. Work with the Office of Environmental Laboratory Certification to ensure that laboratories generating data are certified for the applicable parameters and methods employed for the analysis and to ensure consistency among laboratory reporting requirements, quality control practices, etc.

6. Establish a standardized data reporting format for the specific program areas so that data packets are complete and easily reviewable.
7. Disseminate information regarding QA issues to their respective Bureaus as well as bring issues to the table at the Monitoring Workgroup meetings or with the SQAMO or the OQA.

4.2.3 Project Officers

Each Project Officer is responsible for specific internal (see Section 5.1 for definition) environmental data collection projects, and is accountable for the management of the external (see Section 5.1 for definition) data collection projects. Therefore, the Project Officer has the principal responsibility for ensuring that project data quality objectives are met. Bureaus may have more than one Project Officer. Key responsibilities of the Project Officer are to:

1. Prepare and/or direct the preparation of QAPPs for special projects and submit the plans to SQAMO or designee for review and approval. Prepare or direct the preparation of QAPP updates and the distribution of the updates.
2. Prepare and/or approve the Data Quality Objectives, specifications, and acceptance criteria for all special projects.
3. Oversee the quality of the data generated from external projects funded through financial assistance agreements as required.
4. Informally assess the adherence of all parties to the QAPP.
5. Participate in conducting QA System/Performance Audits of projects as requested by the SQAMO or designee.
6. Take corrective actions that may be required by audit findings and document the corrective actions.
7. Report data quality problems to the Bureau Quality Control Liaison and OQA (if needed).
8. Attend QA training provided by the SQAMO or other appropriate external training as funding is available.

4.2.4 Technical Staff

Program Managers and their staff are responsible for the daily implementation of the Quality Management Plan. This includes organizing and planning activities to meet quality requirements consistently; coordinating work performance for specific projects; and training personnel through SOPs. All program area technical staff will assist the SQAMO or designee in their area of

expertise as requested. This will enhance the QA capability of this Plan. The assistance may include, but not be limited to, the following:

1. Assist the SQAMO or designee with the technical aspects of QA as related to his/her expertise in air, water, chemical toxicity, toxic substances, hazardous waste, engineering, chemistry, biology, microbiology, field operations and data operations.
2. Identify QA needs, resolve problems, and answer requests for guidance or assistance in his/her specific area of expertise.
3. Attend QA training provided by the SQAMO or other applicable external training as funding is available.

4.2.5 Contractors/Contracted Work

At times, the Department will use contractors for data collection through either sampling and/or analysis, or for simply analyzing samples collected by Department Staff. When data collection is contracted by the Department by either a formal contract or grant, the contractor is expected to follow the conditions of the QAPP for the project or must provide a QAPP to SCDHEC OQA to be approved, and must use a laboratory certified by the SC DHEC Office of Environmental Laboratory Certification for the analysis. Oversight of the contractors is provided by the Department Liaison appointed to that project or by the internal SC DHEC Project Manager.

4.2.6 Office of Environmental Laboratory Certification

The Department maintains an Office of Environmental Laboratory Certification. The Director of this Office is the Certifying Authority for environmental laboratories located in South Carolina and out-of-state facilities that have been adjudged to be substantially equivalent by the Office.

The responsibilities of the Certification Staff are to:

1. Conduct technical system audits at least every three years of the in-state laboratories and review technical system audits of out-of-state laboratories certified under an equivalent state certification program at least every three years. The audits are qualitative assessments of personnel, equipment, facilities, procedures, and QA activities. Provide quality assessments for laboratories generating data to the affected Project Officers and other interested parties upon request from the program areas.
2. Perform Data Quality Audits in which data are reviewed and evaluated to determine the quality and usability of the data. These are performed at the request of the program areas or other parties of the Department.
3. Maintain a database that documents the certification status of all laboratories certified by the Office. The database will include the certification status of parameters and test methods employed by the laboratory.

4. Inform the program areas and the public of the certification status of laboratories generating environmental data.
5. Conduct the Annual Performance Audits using the Water Supply PT Studies, and Water Pollution PT Studies. The results for required performance audit testing are reviewed and follow-up or decertification actions taken as required by Regulation. Results of the performance audits are tracked for all laboratories certified by the Office.
6. Administer the EPA's NPDES DMR-QA studies for major dischargers and significant minor dischargers. Annually submit a list of selected NPDES dischargers for participation to the EPA. Perform the necessary follow-up actions required to submit the non-responders and partial responders to the EPA.
7. Inform the program areas, OQA, and laboratories of changes in regulations that affect certification requirements.
8. Participate in the Monitoring Workgroup meetings, Permitting Director's meetings, and State Assessor's Teleconferences.

4.2.6 Regional Quality Assurance Officer

The U.S. EPA Regional Quality Assurance Officer shall:

1. Provide technical assistance, training, and directives and communication to the SQAMO or designee.
2. Approve the State's Quality Management Plan.
3. Serve as the Laboratory Certification Officer for the State's Central Laboratory Divisions. The State's Microbiology, Chemistry, Air and the Laboratory Certification Programs are reviewed at three year intervals by Region 4 EPA's Quality Assurance Division associated with the Science and Ecosystem Support Division in Athens, GA.

4.3 Federal and State Statutes and Regulations

Below is an extensive list by Bureau of Federal and State Statutes and Regulations that the Department adheres to for compliance monitoring and data collection activities:

4.3.1 Agency-Wide Regulations

1. SC Code Title 1, Chapter 23, State Department Rule Making and Adjudication of Contested Cases
2. S.C. Consolidated Procurement Code and Regulations, S.C. Reg. 11-35
3. State Procurement Regulations, S.C. Reg. 19-445.2000 thru 19-446.1000

4.3.2 OCRM

1. Federal Coastal Zone Management Act (1972)
2. 15 CFR Part 930, Federal Consistency with Approved Coastal Management Programs (2007)
3. 40 CFR Part 230, Compensatory Mitigation for Losses of Aquatic Resources (2008)
4. State Coastal Tidelands and Wetlands Act (1977)
5. Specific Project Standards for Tidelands and Coastal Waters, S.C. Reg. 30-12
6. Specific Project Standards for Beaches and the Beach/Dune System, S.C. Reg. 30-13 through 18
7. Standards for Stormwater Management and Sediment Reduction S.C. Reg. 72-300 through 316
8. SC Coastal Management Plan

4.3.2 BAQ

1. 40 CFR Parts 60 - 76
2. 40 CFR Parts 50, 53, and 58 (Ambient Monitoring)
3. Federal Clean Air Act (as amended, 1990)
4. S.C. Pollution Control Act (1976)
5. S.C. Reg. 61-62 "Air Pollution Control Regulations and Standards"
6. Emergency Planning Community Right to Know Act
7. S.C. Reg. 61-86.1 "Standards of Performance for Asbestos Projects"
8. SC Code of Laws, Title 44, Chapter 87, Asbestos Abatement License
9. 40 CFR Part 93, Transportation Conformity
10. 40CFR Part 51, SIP Requirements
11. 40 CFR Part 52, Approval and Promulgation of Implementation Plans, Subpart PP - South Carolina
12. 40 CFR 96, NOX Budget Trading Programs And CAIR NOX and SO2 Trading Programs for State Implementation Plans
13. SC Code Title 48, Chapter 1, Pollution Control Act

4.3.3 BOW

1. 40 CFR, Parts 141 and 142 Safe Drinking Water Act as amended 1996 (State Primary Drinking Water Regulations)
2. Federal Clean Water Act (1977)
3. State Pollution Control Act (1976)
4. Water Pollution Control Permits (R.61-9)
5. Water Classifications and Standards (R.61-68)
6. 40 CFR, Part 136 (1995)
7. Shellfish Sanitation Regulation, S.C. Reg.61.47 (1997)
8. Proper Closeout of Wastewater Treatment Facilities, S.C. Reg 61-82 (1979)
9. Underground Injection Control Regulation, S.C. Reg. 61-87
10. Groundwater Use Act
11. Public Swimming Pools, S.C.Reg. 61-51
12. Standards for Wastewater Facility Construction, S.C.Reg. 61-67
13. Dams and Reservoirs Safety Act, S.C. Reg. 72-1 through 72-9

14. Permits for Construction in Navigable Waters, S.C. Reg. 19-450
15. Water Quality Certification, S.C.Reg. 61-101
16. Standards for the Permitting of Agricultural Animal Facilities, SC Reg. 61-43
17. South Carolina Well Standards and Regulations, S.C. Reg. 61-71
18. Rules and Regulations Relating to Natural Public Swimming Areas, S.C Reg. 61-50
19. Standards for Stormwater Management and Sediment Reduction S.C. Reg. 72-300 thru -316
20. Confined Swine Feeding Operations [47-20-10]
21. Crabmeat Sanitation Standards, S.C. Reg. 61-4922. Erosion and Sediment Reduction and Stormwater Management, S.C. Reg. 72-101
22. Standards for Stormwater Management and Sediment Reduction, S.C. Reg. 72-405
23. Capacity Use Declaration, S.C. Reg. 121-1
24. Capacity Use Declaration, S.C. Reg. 121.2
25. Water Use Reporting and Coordination, S.C. Reg. 121-10
26. Interbasin Transfer of Water, S.C. Reg. 12 1.12

4.3.4 BLWM

1. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986;
2. The Solid Waste Disposal Act as Amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA); the Safe Drinking Water Act Amendments of 1986; and SARA of 1986;
3. 40 CFR Parts 260-270 Resource Conservation and Recovery Act (RCRA)
4. S.C. Hazardous Waste Management Act (S.C. Code Ann. 44-56)
5. S.C. Oil and Gas Exploration, Drilling, Transportation and Production Act (S.C. Code Ann. 48-43)
6. S.C. Mining Act (S.C. Code Ann. 48-20)
7. S.C. Mining Act Regulations (R.89-10 thru 350)
8. S.C. Hazardous Waste Management Regulations (R.69-79)
9. S.C. Solid Waste Policy and Management Act (S.C. Code Ann. 44-96)
10. S.C. Solid Waste Management Regulations (R.61-107, et al)
11. S.C. Oil and Gas Exploration, Drilling, and Production Regulations (R.121-8)
12. Infectious Waste Management Act (S.C. Code Ann. 44-93)
13. Infectious Waste Management Regulations (R.61-105)
14. 40 CFR, Parts 280-281
15. S.C. UST Regulations (R.61-92, Part 280) Promulgated Pursuant to S.C. Code Ann. 44-2-50 (Supp. 1997)
16. State Underground Petroleum Environmental Response Bank Act S.C. Code Ann. 44-2-10 et seq. (Supp. 1997)
17. State Underground Petroleum Environmental Response Bank (SUPERB) Site Rehabilitation and Fund Access Regulations R. 61-98 Promulgated Pursuant to S.C. Code Ann. 44-2-50 (Supp. 1997)

4.3.5 BES

1. S.C. Reg. 61-81 (State Environmental Laboratory Certification Program).
2. In addition, most of the Regulations that govern the other Bureaus are also applicable since samples submitted/collected to the Labs (on the part of the other Bureaus in EQC) are often compliance related.

5.0 QUALITY SYSTEM COMPONENTS

5.1 Description of the Quality System

The Deputy Commissioners for Environmental Quality Control and OCRM have the overall responsibility for the development, implementation, and continued operation of the Department's Environmental Quality System. To ensure that the Department's QA Policy is uniformly applied to the generating and processing of all environmental data, the State Quality Assurance Management Office has been established (see Section 4.2). This Office, which includes the Office of Quality Assurance, is independent of the Program Offices it supports and shall be delegated the authority and responsibility for the Quality Assurance Program. The BES Assistant Bureau Chief responsible for the EQC Laboratories shall serve as the State Quality Assurance Management Officer (SQAMO). In addition to the SQAMO and the OQA, the System also utilizes a QA Liaison in each of the Department's other Bureaus. This allows for internal coordination of QA and QC activities throughout EQC. This effort is essential for projects which involve more than one Bureau.

Contractors or consultants, while not required to have comparable quality systems, must demonstrate their ability to produce data of the required quality. This is ensured by:

- The contract bid system in which the requirements are spelled out (see Section 7) and a committee which reviews the proposals from the contractors to determine if they meet the requirements.
- The insistence that contractors must adhere to the requirements of the SC DHEC approved QAPP under which they work. In some cases the QAPP may include internal SC DHEC SOPs.

Planning, implementation and assessment processes are necessary to effectively conduct environmental data collection operations and the use of evolving environmental technology. The elements of the SCDHEC Quality System include activities in the planning, implementation and assessment phases. The planning process is documented in QAPPs and Work Plans. During the implementation phase, samples are collected, analyzed and data received as per the planning document. This process is overseen by the data user and/or project manager/leader. The assessment phase is conducted as specified in the QAPP and other applicable planning or quality documents (the QMP, for instance). This discussion is a generalization, however. A more detailed discussion of individual components and tools for implementing the Quality System are described below.

5.1.1 Quality Assurance System for Internal and External Data

Data used within DHEC EQC will generally be:

- 1) Internal analytical data generated by the Department's laboratories, field activities described in the EQC Environmental Investigations Standard Operating Procedures and generated by private laboratories as part of a QAPP or contract;
- 2) External analytical data generated in support of Program Grants, Cooperative and Interagency Agreements, and data generated by facilities in fulfillment of permit or regulatory requirements; and
- 3) Data such as meteorological information, emissions profiles, or standards recognized by national (or regional organizations) for specific purposes (such as air modeling).

All analytical data used in support of environmental decisions must be generated in a laboratory that is certified by the SC DHEC Office of Environmental Laboratory Certification or by EPA, where such certification exists. Analytical data from a laboratory that is not certified for the specific analysis that was reported will be considered as information only and will not be used for decision making unless specified in the associated QAPP to be of appropriate quality for project objectives.

Internal Data

ARESD and DAQA are certified by EPA Region 4. The Regional Labs are certified through the Office of Quality Assurance and by the SCDHEC Office of Environmental Laboratory Certification. The generation and QA of routine data are described in associated SOPs and Programmatic QAPPs.

The steps outlined in the **Guidance Document for Preparing QAPPs for Monitoring Projects/Studies** are to be used for planning and implementing environmental projects requiring departmental or internal non-routine data collection. This document describes a graded approach that allows an appropriately detailed DQO process and QAPP appropriate for the scope of an internal project. Project Officers for the Programs will be responsible for preparing QA Project Plans for special projects. The SQAMO or designee will be available to assist in the development of these documents. The SQAMO or designee shall review and concur on plans for internal data generation prior to sample/data collection. For more information see Section 5.2.3.

EQC's sampling manual is entitled Environmental Quality Control - Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. This document is reviewed annually and revisions are incorporated and disseminated to staff. The Office of Quality Assurance has established protocols to incorporate and distribute any urgent changes that require immediate implementation. It is unnecessary to review routine sample collection protocols included in a project QAPP but the appropriate protocols and SOPs must be referenced. This Manual is an internal document, but portions may be provided to parties

outside of SCDHEC with the permission of the SQAMO. This will promote project implementation and data quality consistency.

When this Department enters into a cooperative agreement with another agency, the lead entity will be responsible for generating the QAPP, unless otherwise agreed upon. Elements as described in the current revision of the SC DHEC EQC Guidance Document for Preparing QAPPs for Monitoring Projects/Studies must be clearly outlined. Data quality objectives must be established to ensure the appropriate data quality is specified for the data collected. Although an external activity may not originate within this Department, a QAPP is necessary and should be completed in accordance with guidance documents and the Department's QMP at a minimum for the data generation or collection activities that are the responsibility of the Department.

Contract Labs and Interagency Agreements

Project Managers shall ensure all Requests for Proposals (RFPs) for environmental sampling or analytical services contain a description of the QA requirements required to meet project objectives. An outline of the required elements needed to evaluate laboratory QA/QC is included in Appendix D. Quality Assurance procedures must be established and clearly described. Any laboratory producing analytical data for a Program's utilization must have Standard Operating Procedures (SOPs) available for review. The SOPs must contain the general elements as given in EPA QA/G-6 Guidance for the Preparation of Standard Operating Procedures, April 2007. These elements are listed in Table 1 of this document. The laboratory organization, structure, areas of responsibility, must be available for review by the Program accepting the data. The laboratory must be certified by the EPA or the State's Office of Environmental Laboratory Certification for all parameters, including parameters measured in the field, where such certification exists. Any laboratory that sub-contracts to another lab must assure that the affected laboratory has the required certifications and will meet the data quality requirements of the project. Upon completion of the project, the Project Manager shall assess the data quality of the environmental monitoring activity. SCDHEC and participating Federal and State Agencies must agree upon the QA requirements in project contracts and interagency agreements before environmental measurements or data collection activities begin.

External Data

Generally, analytical data generated by activities external to DHEC will be required to meet the same data quality requirements as internal activities. Project related SOPs for collection and analysis must be available and must contain the same general elements as given in the EPA's QA/G-6 Guidance for the Preparation of Standard Operating Procedures, April 2007. These elements are listed in Table 1 of this document. Any laboratory generating monitoring data, etc. that are reported to the Department must have an established Quality Program appropriate for the expected data use. The laboratory must be certified for all effected parameters by the EPA or the SCDHEC Office of Environmental Certification where such certification exists. Routine data generated by facilities, etc. that are required by permit, agreement, order, or regulation must be generated using approved methods and certified laboratories or meet the requirements specified in an associated approved QAPP. After a review of the permit and a facility's proposed project, SCDHEC may determine that a QAPP is required because the proposed project is for non-routine

monitoring and not covered by their permit. The data received must be in a format determined by the Program area and must be of acceptable quality. A data quality determination must be able to be supported by Department or Program examination of all related documents including SOPs, field records, sample handling, analytical records, and data review.

Supporting data used in Program activities may include non-analytical or 'standard' data sources that are generally recognized or specified by a national or regional organization as appropriate for the intended use. Examples include historical and interpolated data used as boundary conditions or inputs to models and established typical emissions, discharges or species profiles associated with a source type. National inventories of emissions and discharge recognized by EPA or improved datasets based on those inventories, may be used in SC DHEC projects or data analysis. The source data and the process used to incorporate any changes to the source data must be specified in the QAPP, an associated SOP or project documentation.

5.2 Quality System Components

Components of the Quality System are shown in Figure 1. At the Policy Level, regulations and EPA Agreements, Contracts and Policies dictate to the Department how Quality shall be assured. These affect the overall QA Policy for the Department which is stated within this document (the QMP) and also dictates what shall be required in the QMP.

The components of the Quality System (and the tools for implementing it) described below are to be used for planning projects requiring data collection. The QA Annual Report and Work Plan are covered in Section 13.3.2.

5.2.1 Quality System Documentation

Quality Management Plan (QMP)

The SCDHEC QMP serves as the umbrella over all of the components listed below. At no time must any document or process under the QMP conflict with it. It should be noted that this QMP stands as the single QMP for the Department although programs may have Programmatic QAPPs. The Quality Management Plan is developed in the Office of the SQAMO and Quality Assurance. It is reviewed and approved by upper management. From there the QMP is broadcast to Staff through hard copies and electronically. Management is responsible for ensuring that staff understands that they are responsible for what is in the QMP and for implementation of this document.

5.2.2 Management System Reviews

Assistant Bureau Chiefs or designees are required to assess (at least annually) the adequacy of the quality system. This assessment referred to as a Management System Review provides a means for determining and taking necessary response actions regarding: the effectiveness of the system of management controls that are established to achieve and assure quality and the adequacy of resources and personnel provided to achieve quality objectives in all activities to which the Quality System applies. Typically the assessment is done far more frequently and by

a case-to-case basis. In every Bureau, the Management team meets at least monthly. Any quality assurance issues are raised and addressed on a continual basis.

5.2.3 Planning

In order to conduct environmental data collection and associated environmental monitoring activities effectively, program planning, implementation, and assessment of the activities is necessary. Planning may involve every person in the Department, from upper management to front line staff. It also includes stakeholders and others involved with internal and external projects. Even DQOs and QAPP development start with scoping meetings that can involve upper, middle and lower management plus technical staff and stakeholders. Effectiveness of planning is informally assessed by the Project or Program Managers.

Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements of the quality of data needed to support specific decisions or regulatory actions. DQO's should include statements about the level of accuracy required for the project data by outlining Method Detection Limits (MDLs), Reporting Limits, and Limits of Quantitation (LOQ), etc. Detailed guidance for developing DQOs is provided in Guidance on Systematic Planning Using the DQO Process, EPA QA/G-4, February 2006.

Having identified the need for an environmental investigation, each Bureau's Project Officer is responsible for initiating the DQO Development Process. During the early planning phase of the investigation, the Bureau Project Officer must clearly establish the intended use of the data generated. The DQO Process requires significant interaction between the Project Manager, field and laboratory technical staff, QA staff, and data users. This is necessary because the Project Manager knows what is needed for the project, but may not know the capabilities of the laboratory. The laboratory must be informed of the requirements of the project, so that they can select the necessary methodology and instrumentation in order to meet project requirements. Familiarity with the methodology and the data quality elements associated with them is necessary in order for those elements to be included in the project plan. Field Staff must be informed of the requirements for preserving samples and maintaining sample integrity. In turn, the DQOs will be used for the detailed design of the investigation and also in the preparation of the QAPP. The SQAMO or designee will be the contact for providing guidance and review of DQO development. Tracking DQO development and implementation will occur as a part of the QAPP review process.

Because many of the EPA methods have defined data collection activities and quality indicators specified in the method write-up, it may not be necessary to proceed through all formal phases of the DQO Process. It should be noted that the DQO Process can be different for an investigative type study, where the goal is to find out simply what is present, rather than what decision must be made from the results of the study.

5.2.4 Project Specific Quality Documentation

Quality Assurance Project Plans (QAPPs)

EPA and SCDHEC Policies require that all projects involving the generation, acquisition, and use of environmental data be planned and documented and have a Department approved QAPP prior to the start of data collection. The exceptions to this are routine work, situations involving immediate public health threats or situations involving a criminal investigation. For routine work, an immediate public health threat, or criminal investigation, a generic document (SOPs) outlining acceptable methods for sampling and analysis will suffice.

QAPPs are developed by staff implementing the project. However, the staff is told to include: the laboratory that will be used, contractors, stakeholders, the OQA and other parties who are either involved or can supply technical expertise to assist in QAPP development. All QAPPs (whether they are from internal or external parties) are reviewed and approved by a QA Officer or the SQAMO.

Although it is the goal to have an approved QAPP in place prior to any data generation, it is allowable, with authorization from OQA, to generate preliminary data in order to determine possible sampling sites or other needed information for the QAPP. However, such data generation must consist of only one or two sampling events. The results of this sampling should be discussed in the QAPP and how the results affected the study (sampling site locations, etc).

Special studies involving an immediate public health threat or a criminal investigation may not have a Quality Assurance Project Plan (QAPP) due to a limited time frame for obtaining samples. These studies will be handled like routine work requiring adherence to applicable SOPs. Other special studies involving environmentally-related measurement activities conducted by or for EQC shall be performed with the approval of the State Quality Assurance Management Officer (SQAMO) or designee. Routine work such as, but not limited to, data reported in accordance with the National Pollutant Discharge Elimination System, shall be conducted in accordance with SOPs and do not require pre-approval by the SQAMO or designee. Refer to Section 4.3 for a detailed list of regulations utilized for the routine compliance work done by or for the Department. The SQAMO or designee will ensure that:

1. The level of needed data quality will be determined and stated before the generation effort begins.
2. All environmental samples collected and data generated and processed will be of the quality and integrity specified by QAPPs or SOPs.

To accomplish the above, each environmental monitoring organization shall develop and implement SOPs, approved by the SQAMO or designee, for all monitoring activities.

QAPPs, coupled with SOPs, define specific project QA/QC requirements. This approach identifies the parameters to be measured and discusses the QA activities to be conducted during

sampling, analysis, and data validation stages of the project. The document entitled Requirements for Quality Assurance Project Plans, EPA QA/R-5, Final; March 2001 provides detailed instructions for preparing QA project plans.

In order to be effective, the QAPP must specify the level or degree of QA/QC needed for the particular environmental data operation. Because this will vary according to the purpose and type of work being done, SCDHEC will evaluate QA/QC applied to a project commensurate with:

- Purpose of the environmental data collection
- Type of work to be done
- The intended use of the data

Each QAPP shall include procedures for assessing the quality of all environmental data generated and processed for accuracy, precision, completeness, comparability, and representativeness.

For more information regarding format and requirements for writing a QAPP, OQA has published The Guidance Document for Preparing Quality Assurance Project Plans (QAPPs) For Environmental Monitoring Projects/Studies. This has been recently revised. The revision of the QAPP Guide uses a graded approach to QAPPs, utilizes the G5 Checklist to provide a stepwise method of responding to each element, and incorporates the use of tables, when possible. The latest version of this document is available on the QA Office Web Site at:

<http://www.scdhec.gov/environment/envserv/qa.htm>

QAPP Approvals

All of the State's QAPPs must be approved by the Office of Quality Assurance (OQA) prior to data collection. The OQA shall review all plans, provide input, recommend changes, and approve final plans. Upon request, QA Liaisons or designated technical staff shall serve as peer reviewers for QAPPs with regard to their area of expertise. QA activities are to be tracked by the Program's Project Officer.

None of the environmental data collection work addressed by the QAPP may be started until the initial QAPP has been approved by the DHEC Sponsoring Program and the OQA (except as discussed in the beginning of this section). In some cases, DHEC may grant conditional or partial approval to permit some of the work to begin while non-critical deficiencies are being resolved. The QA Officer should be consulted to determine the nature of the work that may continue and the type of work that may be performed under a conditionally approved QAPP. The following approvals are granted:

- **Full Approval:** No remaining identified deficiency exists in the QAPP and the project may commence
- **Partial Approval:** Some activities identified in the QAPP still contain critical deficiencies while other activities are acceptable. If the acceptable activities are not contingent upon the completion of the activities with deficiencies, a partial approval is granted for those activities to proceed. Work should continue to resolve the portions of the QAPP that are deficient
- **Conditional Approval:** Approval of the QAPP or portions thereof will be granted upon agreement to implement specific conditions, specific language, etc. by parties required to approve the QAPP in order to expedite the initiation of field work. In most situations, the conditional approval is upgraded to final approval upon receipt, review, and sign off by all parties of the revised/additional QAPP pages

Once approved, the organization performing the work is responsible for implementing the QAPP. This responsibility includes ensuring all personnel involved in the work have copies of or access to the approved QAPP along with all other necessary planning documents. Personnel should understand their responsibilities prior to the start of data generation activities.

Revisions

Organizations are responsible for keeping the QAPP current when changes to technical aspects of the project change. QAPPs must be revised to incorporate such changes. Any revisions or additions to the QAPP must be re-approved by the Program and the SCDHEC Office of Quality Assurance and distributed to all participants in the project. (See the Guidance for Preparing QAPPs).

5.2.5 Standard Operating Procedures (SOPs) for Labs and the Field

SOPs are compiled into a document that describes how the affected methods (EPA, Standard Methods, etc.) are to be routinely implemented. Although SOPs are usually written for field and laboratory procedures, an SOP is not necessarily just for those environments (see Section 5.2.5). The format for the Laboratory SOPs is given below, but a format for non-laboratory areas should be defined within that area or Program. All SOPs from within that entity should adhere to that format. Staff are expected to follow applicable procedures while conducting technical operations. Personnel can depart from existing written procedures on a project-specific basis with approval from the Division (or Regional) Director and the SQAMO or designee. Such departures must be documented so that the data user is aware of the change.

SOPs should be routinely reviewed at a minimum of every 2 years. However, in the event of a change to a procedure, the SOP must be updated prior to implementation of that change. Minimally, every time the document is changed the document control information must be update to show the date of the last revision.

SOPs involved with field sample collection and field analysis are compiled in The EQC Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, 2006. This document is used by both OCRM and EQC. It is produced by the Monitoring Workgroup and is housed in the OQA. Laboratory SOPs are generated within the laboratories by the analyst(s) and his/her manager(s). The Division (or Regional) Director of the Laboratory and OQA reviews these SOPs and the SQAMO approves them.

Field Sampling/Analysis SOPs

SOPs for sampling must contain sampling design and methodology, general site selection, sampling equipment and cleaning requirements, and safety issues. SOPs for field sampling and field analysis must be written in accordance with associated regulations and the EQC Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, 2006.

Analytical SOPs

Any Analytical SOP contains information such as scope and application, method summary, safety procedures, interferences, sampling and storage, apparatus and materials, reagents and solvents, sample preparation and instrumental analysis protocols, calculations, analytical performance control requirements and documentation, and data reduction. Analytical SOPs are written/updated by the analyst(s) and his/her manager(s). Then the SOP is reviewed by the Division (or Regional) Director and a QA Officer. The SOP is signed by the Manager, the Director and the QA Officer. Each time that a SOP is reviewed, the Signature Page must be resigned and dated to show the date of the review. Actual changes in the SOP will be indicated by the document control information, which will include the revision date. The laboratory manual containing SOPs for analytical methodology used by EQC Laboratories must include the following information, as applicable:

- Table(s) of organization
- The chain of custody procedures and a description of the associated forms
- The type of sample containers to be used
- The preservation that is required
- The volume of sample required to complete the analysis
- A summary of the holding times for all affected parameters
- The cleaning and preparation of containers

- The types of parameters requiring field or trip blanks
- Field notebooks, workbooks or paperwork used internally for tracking sample analysis
- Data control recording notes
- Use of significant figures and rounding scheme
- Reporting requirements for analytical results
- The lower limits of detection
- The sample and data management which includes form design, filing and storage
- Laboratory services, instrumentation, and equipment which involves laboratory pure water, preventative maintenance in the lab, and record keeping
- Glassware types, uses, and cleaning protocol
- Grades and quality of reagents, solvents, fuels, and compressed gases
- For each method used, a SOP must be available. SOPs must include data reduction and validation criteria to minimize data transcription and interpretation errors
- And a list of attachments included in the document

Format for SOPs Utilized by EQC Laboratories for analytical procedures

All analytical (non-field) SOPs will include the elements in the order specified in Table 1. A general description of content material for each element is included as guidance. If an element is not applicable to that SOP, this should be stated in the SOP. Procedural steps must be numbered sequentially by subsection and step (for example: 1.1, 1.2, 1.2.1, and so on). All SOP pages must be identified at a minimum by section number, month/year, and page number. Formatting of page and page numbering is left to the discretion of the Division or Bureau. SOPs are reviewed by the Director of that area and the OQA prior to implementation. SOPs are reviewed at a minimum of every two years. Once the document is reviewed, the signature page is re-signed.

Element	Contents
<i>Title Page</i>	SOP title, SOP number or designation, review date, signatures of the Reviewer, Director and QA Officer. This page is re-signed with every review.
<i>1.0 Scope and Application</i>	Identify analyte(s), matrices, applicable concentration and applicable detection limit.
<i>2.0 Summary of Method</i>	Describe the analytical process and technology needed.
<i>3.0 Interferences</i>	Describe interferences and treatment to reduce them.
<i>4.0 Safety</i>	Include any safety precautions and warnings needed.
<i>5.0 Equipment and Supplies</i>	Instruments, apparatus, and materials required.
<i>6.0 Reagents and Standards</i>	Preparation guidelines for each standard/reagent made (including standardization instructions), specifics for use, etc.
<i>7.0 Sample Collection, Preservation, and Storage</i>	Describe appropriate collection, preservation and storage of sample including holding times where relevant. Please note that care must be taken to ensure that agreement is maintained between laboratory and field SOPs on matters of preservation and hold times.
<i>8.0 Performance Criteria and Quality Assurance</i>	Include QC Checks required, frequency, acceptance criteria, and corrective actions for out of control data.
<i>9.0 Calibration</i>	Describe calibration procedures for all instruments and the frequency of the calibration including continuing calibration checks, if applicable.
<i>10.0 Procedure</i>	List sequential steps for sample preparation and analysis—this can include repeated information from the calibration if this makes the sequential steps more easily understood.
<i>11.0 Calculations and Data Reporting</i>	Describe data acquisition, data reduction, and reporting.
<i>12.0 Waste Management</i>	Describe protocols for treatment of hazardous waste generated by the analysis, and proper disposal guidelines or appropriate SOP reference.
<i>13.0 References</i>	List method reference. There should be only 1 reference, but if more than one reference is used then each reference must contain information that details what each reference is used for in the SOP. For instance and EPA and Lachat methods are listed. The EPA method is used for everything but the automated analysis. The Lachat method is used for the set up of automated analysis.
<i>14.0 Tables, Diagrams, Flowcharts, etc</i>	Attach as appropriate.
<i>Letters from EPA</i>	Any letter concerning the SOP sent by EPA allowing a change in the method must be included with the SOP.

Table 1: Elements of the EQC Lab SOPs

5.2.6 Program SOPs

SOPs are to be prepared by the various Program (Bureau) areas as determined by the specific Program needs. SOPs are to be reviewed by appropriate senior staff in the user organization, the QA staff, and by technical specialists in the specific work area(s). They are dynamic documents, requiring revisions as determined by regulation, changes in equipment or protocol. EPA QA/G-6, Guidance for the Preparation of Standard Operating Procedures, April 2007 provides details for preparing SOPs.

The objectives of SOPs are:

- To establish traceability of standards, reference materials, instrumentation, samples and environmental data
- To train a user with basic education and experience to properly use them
- To establish consistency with sound scientific/engineering principles
- To establish consistency with EPA Regulations and Guidelines
- To establish consistency with an instrument manufacturer's specific instruction manual(s)

All QA Programs and SOPs shall have a document control system to provide for periodic updating and to ensure that all affected personnel receive all revisions.

5.2.7 Data Processing, Verification, Validation and Data Handling

The Department utilizes both primary and secondary data. Primary data includes the internal and external data previously defined in Section 5.1.1. Secondary data includes environmental data from other sources such as published literature, industry surveys, compilations from computerized data bases and information systems, and results from computerized or mathematical models of environmental processes and conditions. Data processing includes collection, validation, storage, transfer, and reduction. Precautions shall be taken each time the data are reduced, recorded, calculated, and transcribed to prevent the introduction of errors and the loss of information. Both Management and Staff help ensure that the data is of the appropriate quality. This is done by insisting that external and internal labs are assessed by either EPA or SC DHEC Office of Environmental Laboratory Certification, by developing QAPPs that specify the quality that is needed, and by oversight of the data.

Data processing requirements are as follows:

1. Collection: Each field and laboratory SOP, as appropriate, shall address the checks which must be used to avoid errors in the data collection process.
2. Verification: This is the process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual requirements. Data verification procedures are specified in the Laboratory SOP Manual and in QAPPs.
3. Validation: Data validation is defined as "an analyte and sample specific process that extends the evaluation beyond method, procedural, or contractual compliance to determine the analytical quality of a data set". Currently validation procedures are outlined only in QAPPs and performed on a very limited basis. The Department is pursuing the use of Electronic Data Deliverables and the goal is to achieve a Stage 2A Validation for 100% of the internal and external data used in Departmental decision making.

4. Transfers: Each SOP, as appropriate, shall describe procedures which shall be used to ensure that data transfer is error-free, and that no information is lost in the transfer. Data transfers shall be kept to a minimum.
5. Reduction: A SOP, as appropriate, shall contain procedures for ensuring and verifying the correctness of data reduction processes. Data reduction includes all processes which change either the form of expression or quantity of items. It is distinct from data transfer in that it entails a reduction in the size of the data set. Each SOP, as appropriate, must identify the processes used to obtain the reduced data set.
6. Storage: Each Program (as appropriate) shall either have a SOP or written plan indicating how specific types of data will be stored, and the duration of the storage. This is determined in accordance with Department and Federal guidelines. For each stage of data processing at which data are stored, procedures shall be established to ensure data integrity and security.

5.2.8 Corrective Action

Each QAPP and SOP shall include provisions for written requirements establishing and maintaining QA reporting and feedback mechanisms to the appropriate Program personnel to ensure that early and effective corrective action can be taken when data quality falls outside established data quality objectives (acceptance criteria). Each QAPP shall also include provisions to keep the SQAMO, Assistant Bureau Chiefs and Program Managers informed of the performance of all data collection when corrective actions are necessary. Corrective action shall relate to the overall QA management scheme and shall specify not only who is responsible for implementing the corrective actions, but also who will be responsible for providing oversight to ensure that actions have been taken, and that these actions have produced the desired results.

5.2.9 Training

Training is an important component of the Quality System. SCDHEC has a system for determining the training needs of the Staff. Please refer to Section 6 for more information.

5.2.10 Technical, Project, and Data Assessments

Assessments of both full projects and actual data generated either routinely or through a project are also components of the Quality System. Tools used for these assessments are discussed in Section 12.

6.0 QUALIFICATIONS AND TRAINING

6.1 Training Policy

Each Program area will ensure that all personnel performing tasks and functions related to data quality will have the needed education, training, and experience. Minimum personnel requirements are established by the Office of Personnel Services. Any special preferences are determined by the hiring authority. Ensuring that personnel requirements have been met is the responsibility of the hiring authority.

6.2 General Qualifications and Training Requirements for EQC Staff

Once hired, every employee attends generalized training required by the Department. There could also be additional training determined by the job itself. For example, a laboratory staff member would need Hazard Communication; while a staff member that has field related duties may be required to take Confined Space Training. Some job duties entail training outside of SCDHEC. For instance, the Office of Environmental Laboratory Certification requires the successful completion of the Chemistry and Microbiology Drinking Water Certification Courses given by EPA. The employee attends most required classes as soon as possible. However, there are situations in which the employee must obtain experience in the job prior to attendance of some classes. Section Managers, along with the Division (or Regional) Directors, determine what job-related classes are needed for specific personnel.

For continuous education/training, Regional Lab staff are required once a year to attend an update conference given by OQA and ARES. In addition, EQC requires that both lab and field staff annually read the SOPs for which they are responsible. The field staff's SOPs are located in the EQC Field Investigations SOP and QA Manual (EISOP). Upon receipt of the EISOP, Staff must sign a form that indicates that they have read, understood, and will abide by the requirements in the EISOP. Lab staff also sign a form that indicates that they have read the SOPs. This is part of their annual evaluation and is signed at that time.

To emphasize the proper procedures to be used in the field, PowerPoint Modules have been developed for all field procedures and analyses covered in the EISOP. These SOPs and Modules are reviewed at least every two years and Staff are provided with the updates for which they are also responsible.

6.3 Professional Licenses and Certifications for SC DHEC Personnel

Positions which require professional licenses, certifications, or other formal qualifications in order to be compliant with the specifications stipulated in state or federal statutes/regulations are limited to what is specified in the Position Description for the employee's job. For instance a Physician must have a license to practice in South Carolina, as must a Registered Nurse. A position, however, may be advertised with preferences such as Professional Geologist, but this will not eliminate persons without that certification. The only exceptions are as follows:

1. The Office of Environmental Laboratory Certification: Laboratory Certification Officers (LCOs) are required to successfully complete the EPA's Drinking Water Certification courses for microbiology and chemistry. This certification can, however, be completed after on the job training. LCOs are certified through EPA Region 4.
2. The Shellfish Program: The shellfish program uses certified Law Enforcement Officers for the patrol and enforcement components of the program. The law (SC Code of Laws Section 44-1-151) makes violations of shellfish laws and regulations criminal acts. Enforcement for criminal acts (tickets, arrests, etc.) can only be performed by a certified Law Enforcement Officer.
3. The Underground Storage Tank Program: The SCDHEC UST Program is a Certified Site Rehabilitation Contractor (# UCC-0116) and the requirements stipulate registration as a P.E. or P.G. in South Carolina. Several UST Program staff with SC P.G. certifications are listed in the contractor file. We are certified because of our involvement in limited State-Lead investigations and Brownfields work. The Position Descriptions, however, do not require this certification, but the program ensures that a P.E. or P. G. certified staff member works as a Site Rehabilitation Contractor.

6.4 The SQAMO and OQA Qualifications

Besides the qualifications required for technical staff, the State Quality Assurance Management Office shall be staffed by professional personnel having at a minimum the following qualifications at a minimum:

1. They shall have sufficient professional and administrative authority to deal effectively with the Program Managers and Project Officers.
2. They shall have a knowledge gained through a combination of training and experience in a scientific discipline and shall have a knowledge of statistics.
3. They shall be knowledgeable of appropriate Federal Laws, EPA Regulations and Guidelines for environmental monitoring, and related EPA requirements.
4. They shall have good written and oral communication skills in meeting and dealing with the general public, private industry, and officials of Federal, State, and Local Governments.

6.5 Procedures for Determining QA-Related Training Needs

The SQAMO shall assess the training needs of all Quality Assurance Management Office Staff annually. Training shall include attendance at job-related and QA training courses, workshops, and professional meetings. Active membership in associated professional organizations is encouraged.

For other areas and Bureaus the Division Director, sometimes jointly with the SQAMO, shall determine the need for staff to attend QA – Related training. The Section Manager is responsible for ensuring that staff have obtained the required training. Training is obtained internally from the Office of Quality Management, the OQA, and the Information Technology Staff. The effectiveness of the training can be assessed by testing, assigned homework, class participation, or by an audit.

6.6 Documentation of Training

Training information on each employee in SCDHEC is stored in the Learning Management System (LMS). This is a new system within SCDHEC. In the future, “Learning Plans” will be set up for each employee. The System will not only hold the training records for each employee, but will set up a schedule in order to ensure that the staff member takes all the required courses within a specific time-frame. It is planned that the System will actually send the employee reminders of needed training and the employee will be able to sign up for the training directly via the LMS. In addition, the employee will have access (read-only) to his own records.

In order to add a record to the LMS, documentation of training is given to the Training Coordinator in each Bureau or Region. This documentation can either be in the form of a hard copy certificate or an email from the course instructor. The Training Coordinator will be responsible for entering the information into the LMS. For courses not given by the Department, the employee will be required to produce a certificate of training and an agenda of the course that was taken.

6.7 Qualifications and training of non-SCDHEC personnel

The qualifications and training of personnel used by contracts, industry, etc. involved in environmental monitoring shall be evaluated through System and Performance Audits and through submitted QAPPs.

7.0 PROCUREMENT OF ITEMS AND SERVICES THROUGH CONTRACTS, GRANTS OR INTERAGENCY AGREEMENTS

All Departmental grants, contracts, and cooperative or interagency agreements that generate environmental data must include requirements for the preparation of QAPPs and SOPs. The Grant or Contract Officer is responsible for obtaining Departmental approval of the QAPP from OQA (Section 5.2.3) before any data generation can be initiated. When a project is performed using total or partial US EPA Funding, the affected Program shall comply with State and Federal Regulations as listed in Section 4.3 of the QMP.

Within the Bureaus, the process for ensuring that the procurement documents contain clear descriptions of the items and services required, and for specifying the technical and QA/QC requirements for items and services is performed at the level of Division Director or their designee(s). This individual (or group) reviews what is needed, writes a full description of what

is required, and ensures the procurement documents contain the appropriate technical and QA/QC requirements prior to sending them through bid/quote process. For EQC, the Assistant Bureau Chief approves the procurement request and for OCRM the approval comes from the Deputy Commissioner or the Assistant Deputy Commissioner. Should the item be less than \$10,000 only three quotes are needed. If the procurement exceeds \$10,000, it is advertised and put out on bid. Unless there is a problem with the quality, the lowest quote/bid is accepted. The quality of the quotes/bid is ascertained by the same individual(s) who wrote the description or by someone technically able to ensure that the item to be purchased meets all the requirements. If the lowest quote or bid does not fit the requirements, a formal memo must be written by that person and this is sent to the Purchasing Office. The Purchasing Office will contact the vendor submitting the low bid.

Post award, the contractor must demonstrate compliance with Workplans and QAPPs. This can be done via reports and/or meetings with the Project Manager. These reports and meetings help to assess that progress is being made and that the contractor is adhering to agreed QA/QC and other technical requirements.

The bid process begins with determining the qualifications and minimum criteria that would be acceptable, and, in most cases, be in compliance with SCDHEC and USEPA requirements. Each solicitation for bid contains the qualifications, minimum criteria and required scope of services for submitting a response. All contract bidders must submit a single data package that proves the bidder can perform the work required of each task bid. The evaluators chosen to review the bids are selected for their expertise. They evaluate each bid against the minimum criteria and rank each respondent accordingly. Usually, the highest ranked contractor receives the contract/grant. The Contract Monitor (assigned to each contract/grant by area) keeps track of the Contractor(s) and their ability to meet the requirements of the contract. The Contract Monitor must report quarterly to Business Management on Contractor compliance.

No analytical services should be accepted without verification of the laboratory's current certification status with the SCDHEC Office of Environmental Laboratory Certification (OELC). Laboratories must be certified for each parameter for which data will be provided to the Department. Verification of certification status may be obtained either from the Office of Quality Assurance or the SCDHEC OELC. Departmental staff should obtain technical assistance for SOP and QAPP preparation, analytical method selection or data quality problems from the OQA or their QA Liaison.

The purchase of field monitoring equipment, reagents and laboratory instrumentation shall follow the requirements set forth in the approved QAPP and the purchasing requirements set forth by the South Carolina Consolidated Procurement Code. The selection of a vendor is based on competitive cost, product performance, standardization on brand, and proximity to project location.

8.0 DOCUMENTS AND RECORDS

Quality-related documents that require control within EQC are SOPs, QAPPs, Quality or Technical Guidance Documents and the QMP. Access to these documents is controlled by various means and can include items like:

- Converting the documents to PDF prior to electronic transmission
- Housing the original documents in the OQA
- Including revision numbers and/or dates on the documents
- Tracking changes on the documents by archiving earlier versions
- Including a record that documents the history of revisions (as is done with the SOPs). This record documents the changes made and who made them
- Computer files documenting where the quality document is housed or who has it

The Division Director or SQAMO are responsible for identifying Quality-Related Documents and Records in their area of EQC. These documents can range from guidance documents, to SOPs, to QAPPs, and also actual Data. The Division Director, in consultation with the ABC, determines what sorts of controls are required for these documents. The ABC and Division Director are responsible for approving these documents. OQA must be an approving party for QAPPs and Lab SOPs. Quality Documents such as SOPs and Guidance Documents are controlled during electronic transmission by sending these documents only as PDFs. Access to the electronic versions of these documents is controlled by either pass-wording the document or by limiting full access to only authorized personnel.

SOPs and technical guidance documents are usually prepared by staff with the background and experience to do so. Quality related guidance documents usually come from OQA. Technical guidance documents and SOPs are generated by the manager or designee in the Lab or Office for which they are being written. These are reviewed and approved by the Division (or Regional) Director.

OQA reviews the SOPs, QAPPs and some, but not all technical guidance documents. OQA's SOP review includes a check to ensure that the method cited in the SOP conforms to federal regulations and that the SOP is in conformance with the cited method. OQA also reviews SOPs and QAPPs to ensure that the documents conform to technical and quality system requirements. When Quality Documents are taken out of service, replaced or revised, the older version of the document is archived electronically. Hard copies of most of the documents are usually kept, but this is not required.

The SOPs are reviewed at a minimum of every two years. The signature page is resigned to indicate that a review has been done. Revisions are indicated by the Revision Number and

Revision Date. Generally, SOPs are only distributed within the Department and usually only to the Staff that will use them.

Technical guidance documents and quality-related guidance documents are distributed outside of the Department. This can be done either electronically or by mailing hard copies. Guidance documents from OQA (including the QAPP Guide) are on the Department's website at:

<http://www.SCDHEC.com/environment/envserv/qaguidance.htm>

QAPPs are authored by the Project Manager or designee. Signatures of approval must include a signature from the Lab(s) of record and the OQA. This signature from the Lab(s) indicates that the Lab(s) has been consulted during the development process and that they agree with what is written in the QAPP regarding the affected methods, QC requirements and sampling handling. In the review of the QAPP, OQA determines that the QAPP follows the correct format, is complete, that the methodology cited in the SOP conforms to federal regulations, that the DQIs are appropriate for the project, and that the laboratory to be used is certified by the SCDHEC Office of Environmental Laboratory Certification (or other recognized Accreditation Authority such as EPA, NVLAP, TNI) for the parameters they will be testing if certification exists. The Organization(s) responsible for developing the QAPP is also responsible for keeping the QAPP current when changes to technical aspects of the project change. QAPPs must be revised to incorporate such changes. Any revisions or additions to the QAPP must be re-approved by SCDHEC Office of Quality Assurance and distributed to all participants in the project as per the Guidance Document for Preparing Quality Assurance Project Plans (QAPPs) For Environmental Monitoring Projects/Studies.

Having complete documentation of a process, and ensuring that the work is complete and accurate--whether it is field or laboratory work or in writing permits, plant inspections, or any work in the Department is critical. An important part of this is Chain of Custody. This covers the process of a sample from collection time, to arriving at the laboratory, to analysis and final disposal. For Field Staff this is covered in a SOP in the EISOP. For Lab Staff this is covered in the Laboratory SOPs. Both Field and Lab Staff are responsible for following the Chain of Custody procedures so that at any specific time the person(s) responsible for custody of the sample is documented.

To assure complete documentation training is included in order to ensure that staff understands what must be done to complete paperwork and to correctly do the work. Training varies depending on the process. Some examples of the types of training available include informal on the job training, online PowerPoint Modules, annual review of the SOP, and dedicated classroom training. Checks must be done on staff to ensure that records and documents produced accurately reflect completed work; this includes anything from the manager verifying the work to a formal audit.

In the case of a criminal investigation, Appendix F of the EISOP provides detailed information about how to proceed including chain of custody and confidentiality procedures for evidentiary records. Following completion of the field activities, the Project Leader or designee must

account for all field documentation, such as field logbooks, and chain-of-custody records, and verify that they are complete. When requested by the Criminal Investigator, all final analytical data from the lab must be documented in a memorandum stamped "CONFIDENTIAL", and transmitted to the Project Leader, Technical Support Team, and Criminal Investigator.

Each Bureau has assigned record keeping responsibilities in accordance with its functional responsibilities and duties. These responsibilities include what records and documentation must be created and maintained as well as the security and integrity of the records (whether hardcopy or electronic) from their creation to their final disposal. The manner in which information is documented is mandated by the requirement that staff use approved SCDHEC Forms. Each official SCDHEC Form is reviewed by the Forms Committee and when approved, is assigned a unique number. Only then can the form be reproduced and used. These official forms are used in sample collection, documentation of field activities, analysis request forms, laboratory analysis, and chain of custody. The use of official forms standardizes the documentation and this helps to ensure that documents are accurate, complete and legally defensible. Furthermore, Managers are routinely required to review records and documentation produced by their staff.

Although retention schedules can vary in EQC and OCRM, the records and information created, received, maintained, or acted upon shall be maintained in compliance with State Record Retention Schedules or EPA requirements, whichever is longer. Quality documents are not managed separately but are included in retention schedules in many Bureaus. For special projects, the Project Officers shall be held responsible for ensuring that any project for which they are responsible (external or internal) is adhering to their Bureau's record keeping practices. SCDHEC employees leaving the Department must return all records to their Manager prior to their severance from the Department. Electronic records and information held in electronic form and format shall be held in accordance with approved guidelines from BIS.

Files, records and information shall not be destroyed except in accordance with SCDHEC or State Record Retention Control Schedules and Procedures.

9.0 COMPUTER HARDWARE AND SOFTWARE

The Department is committed to following Federal/State mandates regarding protection of data, and software/hardware requirements.

The Department's Chief Information Officer (CIO) manages the process of identifying Management Information Technology (IT) needs and developing a cost-effective Management Information System to satisfy those needs. A core group of technical representatives known as IRCJV – Information Resource Consultant Joint Venture Committee, assists the CIO in this effort. Members are from each Deputy area within the Department. The CIO and the IRCJV Committee are responsible for providing standard operating procedures and for identifying and prioritizing IT needs. Together they also evaluate proposed changes that may have the potential for cross-program impact.

The CIO and the Core Group or the appropriate Deputy Managers will identify and prioritize the Department's needs. The Department's Bureau of Business Management is involved in all aspects of procurement dealing with any and all IT projects. Depending on the cost of the project, the State's CIO office within the Budget and Control Board may be involved in the process as well. This process is completed via a work plan that specifies the requirements, responsibilities, and the schedule(s) of deliverables.

All hardware and software solutions are evaluated prior to purchase using industry best practices, experience from other states and demonstrated performance. The Department adheres to all mandatory State procurement guidance to ensure the best price via appropriate market competition for the selected product or service.

A Data Quality Team has been established to ensure the effectiveness and quality assurance of the information produced from or collected by our Environmental Facilities Information System (EFIS) is uniform. The group's long-term goal is to maximize the use of the Department's Enterprise Wide Information Management System. EQC also works closely with EPA to ensure complete and accurate data is submitted through the Exchange Network Node System. The workgroup is currently improving cross program access to data, improving data extraction results and implementing improved public access to Departmental information.

In each Bureau, IT (Information Technology) Staff are assigned to be responsible for maintaining the integrity of the computer databases and information systems within that Bureau. They ensure that the records are backed up routinely and that transfers from one area to another of electronic records are done accurately. This Section also ensures that virus protection is kept up to date on each computer in the Bureau.

Prior to data being input to computer databases, it is checked by the analyst and their supervisor. This review includes a check on the calculations and raw data. A percentage of data is checked by a third data verifier. Once the data is transferred to the Program Areas (the Bureau of Water for example), that Program area is responsible for the data integrity.

The EQC Monitoring Workgroup is currently leading the effort to enable the Department to receive electronic data deliverables (EDDs) from external laboratories as well as developing a method of producing EDDs from the EQC Laboratories LIMs (Laboratory Information Management System). Our goal is to be able to generate a SEDD Level 2A deliverable within two years. We will begin this effort by implementation on a small project. The Data Quality Team and the EPA will be consulted during this process. The goal of this (ADR) is to further certify that the data quality is sufficient to make sound environmental decisions.

10.0 PLANNING

The document entitled Requirements for Quality Assurance Project Plans, EPA QA/R-5, Final; March 2001 provides detailed instructions for preparing QAPPs and is the critical document for the planning process. The Office of Quality Assurance has published the Guidance Document for Preparing Quality Assurance Project Plans (QAPPs) For Environmental Monitoring Projects/Studies, Rev. 1, October 2007. This guide discusses QAPP development, QAPP approvals, revisions, evaluating data from other sources as well as the roles and responsibilities of parties involved in a project.

This revision of the QAPP Guide also discusses “scoping meetings” as a way of beginning the planning process. The “scoping meetings” promote involvement with all parties involved with the project or impacted by the environmental problem that the project addresses. These meetings can include all or some of the following: laboratory staff, field collectors, management, OQA, stakeholders, and suppliers. The purpose of scoping meetings is to determine:

- Project goals
- Project milestones
- Project staff
- Regulatory requirements that will impact the project
- The identification of the type and quantity of data needed
- How, when, and where the data will be obtained
- Data Quality Indicators (DQI) requirements (including sensitivity requirements)
- Needed QA and QC and associated acceptance requirements
- Scope of the project covering boundaries of time, geography, and other items.
- The existence and location of existing data and the quality of that data
- Who will write and who will maintain the QAPP

All of the above will be incorporated in the QAPP. In addition, either the members of the scoping meetings or a designee will be responsible for formalizing the DQO Process. Acquired data will be analyzed, evaluated and assessed according to the performance criteria given in a specific QAPP. However, this information is reviewed by OQA for conformance to State and Federal Regulations as well as the documented needs of the project.

The procedures for obtaining technical expertise for sampling, engineering design, risk assessment, QAPP preparation-review-approval, laboratory analysis, data validation and data quality assessment activities varies. However, the Office of Quality Assurance is often the

clearing house for many of these questions. When a question or problem is brought to the OQA, the Office will use some or all of the following: the expertise of the QA Officers, research, and the expertise of Bureau Liaisons, other technical Staff, and EPA. In particular, the OQA houses the Department's expertise for QAPP Development and is responsible for review and approval of QAPPs prepared by internal or external organizations. In addition, technical expertise for sampling and design is planned through the use of field SOPs and scoping meetings for QAPPs.

Currently the OQA does not evaluate the effectiveness of the planning process as implemented by SC DHEC Staff. However, Project Managers are responsible for their individual Projects as are Program Managers for the work their staff performs.

11.0 IMPLEMENTATION OF WORK PROCESSES

Routine repetitive work in the laboratory or field is a process requiring a SOP. Occasionally Office work such as computer operations may also require a SOP. Some special studies which do not require sample collection may require only a Work Plan and/or QAPP. Special studies involving environmental data generation through field and laboratory analysis not only require QAPPs, but SOPs and/or a Work Plan. Once SOPs, Work Plans, or QAPPs are approved, the work may begin. Occasionally the QAPPs and SOPs require a short "shake-down" period in order to ascertain if those quality documents have sufficiently dealt with problems and staff are able to handle unforeseen circumstances within the boundaries of what is being required. Revisions may be needed as a result of the shakedown process.

As discussed in the QAPP Guidance Document, the person charged with maintaining the QAPP must distribute the approved QAPP to everyone listed in the Distribution List in Section A3. This list is reviewed by OQA during the QAPP Approval Process for completeness—to ensure that applicable parties such as stakeholders, lab staff, sampling staff, end data users and EPA are included. If revisions are necessary, then the revisions must first be approved by OQA and then the QAPP is redistributed to those on the Distribution List. If the revision has major changes, then the entire QAPP must be redistributed. If there are only minor changes either the pages that have changed must be distributed, the changes are given as an addendum or the personnel are given a Memo stating what the changes are. In every case, an approval page must be signed by the Project Manager and OQA as a minimum. In the case of a Memo, it must be at least initialed by both the Project Manager and OQA.

To ensure that staff have a proper understanding of what is required by a QAPP or SOP, each person involved must have access to a copy of the appropriate quality document. Personnel routinely sign forms stating that they have read the SOP and agree to adhere to it. Some QAPPs also require the same from all personnel involved in the project. In addition, Section Managers, Project Managers and some designated Bureau staff members will routinely review documentation and records as well as schedule visits of work sites. OQA routinely audits records and documentation of regional laboratories and field staff (see also Section 12). This helps to ensure that the work is being performed according to the governing quality documents.

SOPs used by SCDHEC staff for collecting and analyzing environmental samples are routinely reviewed at a minimum of every two years. Field SOPs are reviewed by Bureau Staff appointed to serve on the Monitoring Workgroup. These documents are approved by the SQAMO and Senior Management. They are sent to OQA to be housed and published. Internal SCDHEC Laboratory SOPs are written and revised by the affected analyst(s) and manager(s). These SOPs are subsequently reviewed by the Section Managers, the Division (or Regional) Director and the OQA. The OQA assesses that an approved method is being used/cited and that the SOP conforms to the EPA approved method. SOPs are withdrawn when the SOP will no longer be used and/or when the method cited is withdrawn by EPA. The analyst is responsible for ensuring they have a copy of the most recent published revision of the SOP. This is reviewed by the manager and OQA. The manager is expected to ensure that the employee has implemented any changes dictated by an approved change in a SOP.

Both field (EISOP) and laboratory SOPs are internal. There are circumstances in which the EISOP must be released outside of SCDHEC due to a QAPP or other requirements. **This is allowed only if the SQAMO has approved the release of the information.** The portions of the EISOP sent out must include a disclaimer stating that the document is subject to “change without notice”.

Withdrawal of these procedures must include archiving the withdrawn SOPs and finished Work Plans. SOPs are rarely removed unless the methodology has been withdrawn or the specific instrument used has been retired. Withdrawal of a QAPP requires notification of the OQA and includes the reasons for the withdrawal.

12.0 ASSESSMENT AND RESPONSE

The Department has numerous tools in place to identify the effectiveness of the Quality System. One process for assessing the adequacy of the quality system is done through the annual assessment of time and effort expended in QA throughout EQC. The QMP Work Outputs will be reported to the Senior Staff and the USEPA Region 4 by OQA. The report shall include a summary of Work Outputs achieved. This report will be issued annually in November of each year.

For the Quality System to be effective, personnel within the System must adhere to quality documents such as QAPPs, SOPs, Work Plans, and Technical Guidance. Assessments are the principal means in this Department's QA Program to determine the compliance with the established SOPs and QA Study Plans. Detailed guidance for assessments may be found in Guidance for Data Quality Assessment, EPA QA/G-9, July 2000. Audits are essential to monitor the effectiveness and the efficiency of the QMP. Therefore it is essential for auditors to have extensive background, experience, and training. An auditor must not have a conflict of interest, direct involvement, or responsibility for any work being assessed. This however, does not preclude informal assessments by laboratory managers and project managers who may assess personnel or projects to determine compliance with a QAPP or SOP.

The OQA audits the environmental laboratories of the Department. OQA has the authority and sufficient access to all managers, personnel, and records in order to perform thorough audits. For the EQC Regional Laboratories these serve as Lab Certification Audits for the SCDHEC Office of Environmental Laboratory Certification. OQA personnel also audit the ARES and DAQA in the role of QA Officers. For the ARES and DAQA, the audits are internal only because these Labs are audited and certified by EPA Region 4. EPA Region 4 works interactively with OQA to perform audits of the programs over which they have jurisdiction. Recommendations will be made in the OQA and USEPA audit reports to improve the overall effectiveness of Departmental programs. The audited programs will address recommendations and findings in a response to the audit. Whether internal or external, audits accomplish the following:

- Defines and/or revises Quality Systems
- Verifies compliance with SOPs and the QAPP during the term of the project
- Identifies, prevents or remedies quality assurance problems
- Monitors the policies and procedures involved in data gathering, generation, review, and use
- Reviews the training effectiveness of the staff
- Recommends activities to improve the overall effectiveness of Departmental Programs and,
- Ensures that consistent policies are administered across organizational boundaries

Informal assessments are routinely done by Managers in verifying work and provide general oversight of their Section. In the event that corrective actions are needed, the corrective actions will be documented along with whether the actions were effective or not.

During the term of this Departmental QMP, the resources needed to support the activities of this plan will be provided by sharing the responsibilities between the entire OQA Technical Staff. Depending on the project, OQA Staff will be acting in the capacity of either a Laboratory Certification Officer or Quality Assurance Officer.

In the capacity of assisting with QAPP development, OQA is aware of the need to document assessment activities conducted by the Project Manager. There can be a “disconnect” between what is typically done in supervising a project for compliance to the QAPP and the actual documentation of this assessment and subsequent corrective action. OQA will assist in formalizing the assessment process through the QAPP development process.

Assessors who perform internal audits are either Senior Scientists in their area of expertise or are QA Officers in the OQA. For Laboratory Certification Audits, the Assessors must be recognized EPA Drinking Water Laboratory Certification Officers for the areas in which they are auditing (Chemistry, Microbiology, and Rad Chemistry). For audits/assessments done by Senior

Scientists, the manager explains his expectations. Sometimes, but not always, the OQA is informed of the assessment and its results. The OQA Laboratory Certification Officers were explained their responsibilities by EPA during the Drinking Water Laboratory Certification Officers Training. Laboratory Certification Audits given by OQA follow the guidance as given by the 5th Edition Laboratory Certification Manual promulgated by EPA. The checklist for Microbiology is taken directly for the Lab Cert Manual, but only those portions that are applicable to the specific Lab being audited are used during the assessment. The checklist for Chemistry is taken directly from the SOPs for which the Staff are responsible. An example is shown in Appendix E. The Microbiology Checklist is omitted because it is available in the Lab Cert Manual (5th Edition). OQA certifies Wastewater Parameters as well as Drinking Water Parameters. Results of both internal and Laboratory Certification Audits are reported to the Laboratory Director, Regional Director, the SQAMO, and the Bureau Chief for the Bureau of Environmental Services (BES). For the Regional Laboratory Audits the ABC over the Regional Laboratories also gets a copy of the report.

An example Chemistry Checklist for the internal Laboratory Certification audits is provided as Appendix E. The Microbiology Checklist is almost verbatim what is given in the 5th Edition of the Laboratory Certification Manual. Not every Regional Lab is certified for all Micro or Chemistry parameters, so the checklists for those labs is adjusted accordingly for those audits (in other words, we audit only on those parameters for which the Lab is certified).

Findings that identify deficiencies in the analytical, biological or physical data generated within SC DHEC shall be communicated to the SQAMO and the Program Area. The Program Area is responsible for notifying EPA or other end data users.

Assessors for External Laboratories are located in the SC DHEC Office of Environmental Certification. Again these Auditors must be recognized EPA Drinking Water Laboratory Certification Officers for the areas in which they are auditing.

12.1 Types of Assessments

12.1.1 Performance Assessments

Performance Assessments are quantitative assessments of the ability of an analytical system to obtain reliable data. These audits involve proficiency testing (PT) samples as unknowns obtained by laboratories or other analytical systems. These are annual assessments that are part of national proficiency testing programs such as EPA's Water Supply PT Studies, Water Pollution PT Studies, DMR QA Studies, Radiological PT Studies, etc. The American Association for Laboratory Accreditation (A2LA) accredits suppliers. EQC utilizes national programs recognized by the EPA for PT Sample Providers. The results of PT Studies are graded by the PT Provider then made available to study participants and to the government organizations that have the responsibility for administering programs supported by the Studies. The Department's EQC Laboratories and Regional Drinking Water, and Wastewater Field Staff currently participate in annual WS and WP PT Studies.

12.1.2 Technical System Audits, (TSAs)

TSAs are internal and external on-site audits of environmental data gathering activities. The audits are qualitative assessments of personnel, equipment, facilities, procedures, and QA activities. Internal audits of the ARES or DAQA Laboratories are done routinely or as requested by the SQAMO. An external audit (also known as a performance audit inspection) of SC DHEC's Central Laboratory is conducted at three year intervals by the Region 4 US EPA Office of Quality Assurance.

Internal Audits

Audits of the Department's Regional Laboratories are conducted by the OQA at a minimum of every two years and serve as a certification audit. Certification is through the State's Office of Environmental Laboratory Certification. Audits of external (non-SCDHEC) laboratories that provide data to the State of South Carolina are conducted by Certification Officers within the State's Office of Environmental Laboratory Certification. Certification Audits not exceed three year intervals. These audits shall be conducted according to standard documents such as The Manual for the Certification of Laboratories Analyzing Drinking Water, 5th Edition, January 2005. An example Chemistry Checklist for the internal audits is provided as Appendix E. The Microbiology Checklist is almost verbatim what is given in the 5th Edition of the Laboratory Certification Manual. Not every Regional Lab is certified for all Micro or Chemistry parameters, so the checklists for those labs is adjusted accordingly for those audits (in other words, we audit only on those parameters for which the Lab is certified).

12.1.3 Data Quality Audits

These are quantitative audits in which data are reviewed and evaluated following collection to determine the quality and usability of the data. This type of audit is done by the Office of Quality Assurance and/or the respective Bureau's Project Officer or personnel designated by the Project Officer to perform this duty who actually utilize the data. The data must be of acceptable quality as outlined in the Laboratory QA Manual and/or the DQOs of the QAPP.

12.1.4 Readiness Reviews

Prior to the beginning of a project, the Project Manager may elect to perform a readiness review. This can be something as simple a checklist of items that must be in place prior to the beginning of a project, to as complex as a full "shake-down" period of time, documented in the QAPP, where project staff perform the work associated with the project. If problems are found during this period of time, then corrective actions are put into place. If the corrective actions support a change in a QAPP, then the QAPP must be revised as per the QAPP Guidance Document.

12.2 Audit Reports, Response and Corrective Actions

Results of these various audits will be reported to the appropriate Bureau Chief, ABC, Regional Director, Division Director, Project Officer, etc., with recommendations for corrective action. Tracking of corrective action will be conducted in a number of ways (a response to an audit

report, a mid-year review by the specific Program area, or an annual review, for examples) and the results of this tracking reported to appropriate management. In any case, corrective actions should be made promptly. OQA typically gives a month for a response to a TSA. This response serves as documentation of the corrective actions taken and their effectiveness. The effectiveness of the corrective actions can also be assessed by scheduling of additional audits if necessary, by analysis of a single blind QC sample or by participation in additional PT studies. Findings that identify deficiencies in the analytical, biological or physical data generated within SC DHEC shall be communicated to the SQAMO and the Program Area. The Program Area is responsible for notifying EPA or other end data users.

12.3 Disputes

Oversight responsibilities for QA/QC may sometimes result in disagreements between OQA and the audited entities regarding its activities. Disputes concerning Quality System requirements, QA/QC requirements, internal assessments, or required corrective actions are resolved by getting all parties together at the table to discuss and solve the problem. The SQAMO may choose to be a part of this discussion or delegate this duty. However, in the event of an impasse; the SQAMO will have the final decision. In cases of QA-related matters, all decisions are approved by the SQAMO.

13.0 QUALITY IMPROVEMENT

Quality improvement is achieved by:

- Anticipating problems and moving to prevent them
- Identifying problems quickly and determining the nature and extent of the problem
- Correction of problems as soon as practical, by implementing the appropriate corrective actions and actions to prevent further occurrences
- Documentation of all corrective action(s)
- Tracking corrective and preventative actions to closure
- Promoting open communication among staff at all levels
- Promoting excellent customer service by improving communication between staff and their customers (internal or external) so that the customer's needs are understood
- Improving communication between the Department's suppliers in order to meet the needs of the Department for defensible data, identify process improvement opportunities and identify and offer solutions to problems
- Tracking the QA System

13.1 Addressing Quality Problems

Identifying quality problems and improving performance are key components of our quality improvement efforts. The implementation of Bureau QA Liaisons helps to ensure that conditions adverse to quality are either prevented or identified quickly. The SQAMO, the OQA and the Bureau QA Liaisons are responsible for responding to and resolving all quality assurance problems and needs, and have oversight over improvement activities. To ensure a continuous quality system, the Department:

- Conducts routine internal and external audits of its program activities
- Initiates corrective actions to adverse conditions that compromise quality
- Promotes problem solving and process improvement activities/suggestions
- Encourages input and feedback throughout the planning, implementation, and evaluation processes by all staff and customers
- Promotes tracking and documentation of corrective actions

Note: Also see Section 12.3.

13.2 Communication

Effective communication is essential to assure the success of a Quality System. SCDHEC is committed to maintaining open communication in all aspects of planning, implementing, and evaluating its environmental programs. This is accomplished by:

- The exchanging of information between the SQAMO or designee and Bureau Chiefs, Assistant Bureau Chiefs, Bureau Quality Control Liaisons, Project Officers, Program Managers, Technical Staff, and EPA/ Federal Staff and State Agencies/Departments
- The interaction of the Bureau Quality Control Liaisons as outlined in section 3.2.2. The Liaisons are responsible for disseminating information through SOPS, Guidance Documents, Directives, Policies, and Procedures
- The meetings conducted by Bureau and Interdepartmental Committees, Teams, Taskforces, and Workgroups
- Program training initiatives, Workshops, Meetings, Telecommunication, and Email

13.3 Tracking the Quality System

13.3.1 QMP

The QMP shall be kept current and revised as necessary. The SQAMO or designee shall review the QA Program annually to ensure consistency with the EPA QA Program Guidelines and Objectives. The QMP is to be revised on a five year basis, at a minimum.

13.3.2 Annual Report/Work Plan

The SQAMO or designee shall report QA implementation problems and progress to Management and the Regional Quality Assurance Officer. By October 31 of each calendar year, each environmental monitoring program shall submit a QA Report to the SQAMO or designee. By November 15 of each year, the SQAMO or designee shall submit a QA Report to the EPA's Regional Quality Assurance Officer. QA reports shall contain at a minimum the following information:

- Status of QA Program
- Status of Standard Operating Procedures
- Data quality assessments performed to include both internal and external assessments
- QA Program Resources
- Performance audit results for the EQC Environmental Laboratories
- Summary of QA-related training received and provided.
- Summary of the significant QA-related problems and the associated corrective actions, plan(s) and the progress of on-going corrective actions, if any
- Recommendations

13.4 Ensuring Quality

In order to ensure that conditions adverse to quality are prevented, identified promptly, and corrected as soon as possible the following processes/procedures are used:

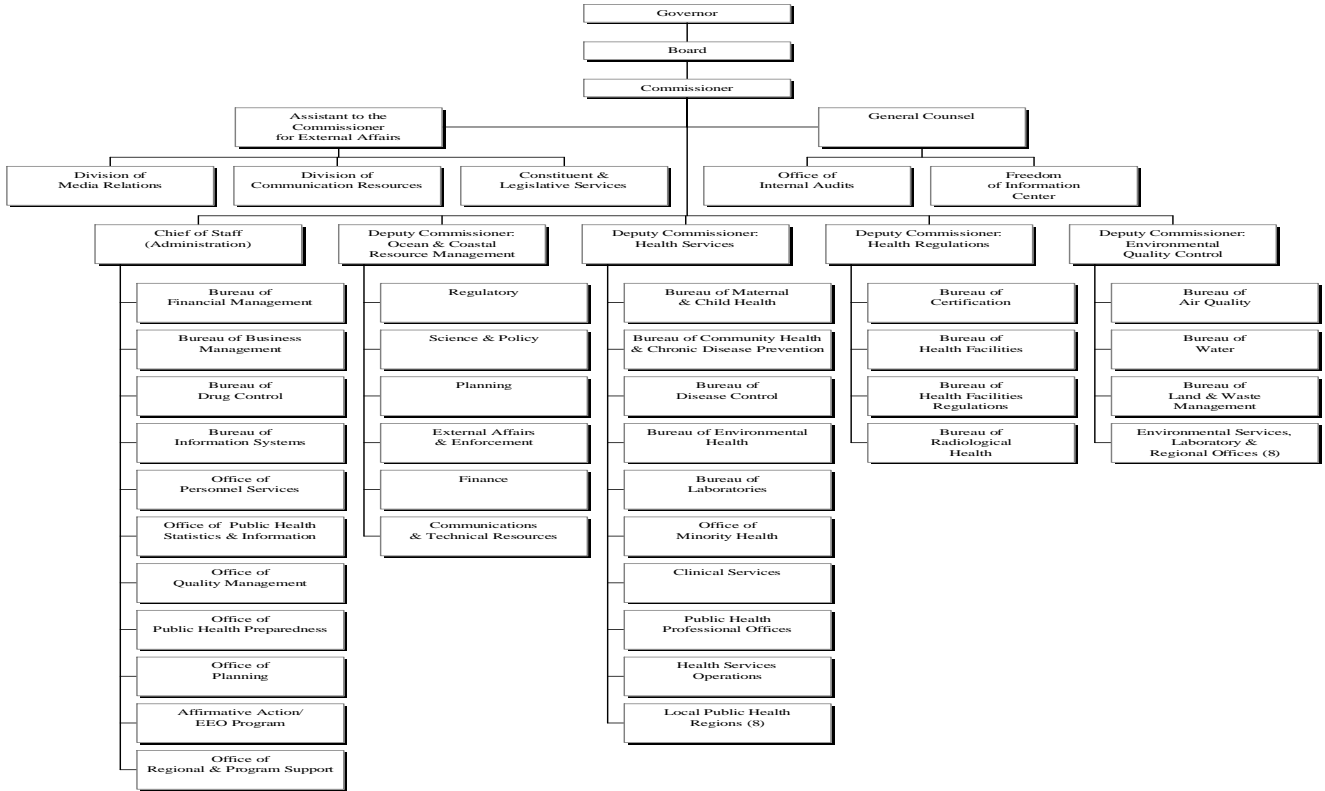
- Review of Data by a second analyst or the Manager
- Review of Data by the data users—particularly if the data is external.
- Review of SOPs, procedures and data by the OQA
- Meetings with Staff to determine the extent of the problem

- Workgroups to find solutions to the problems
- Discussions with technical experts to solve problems

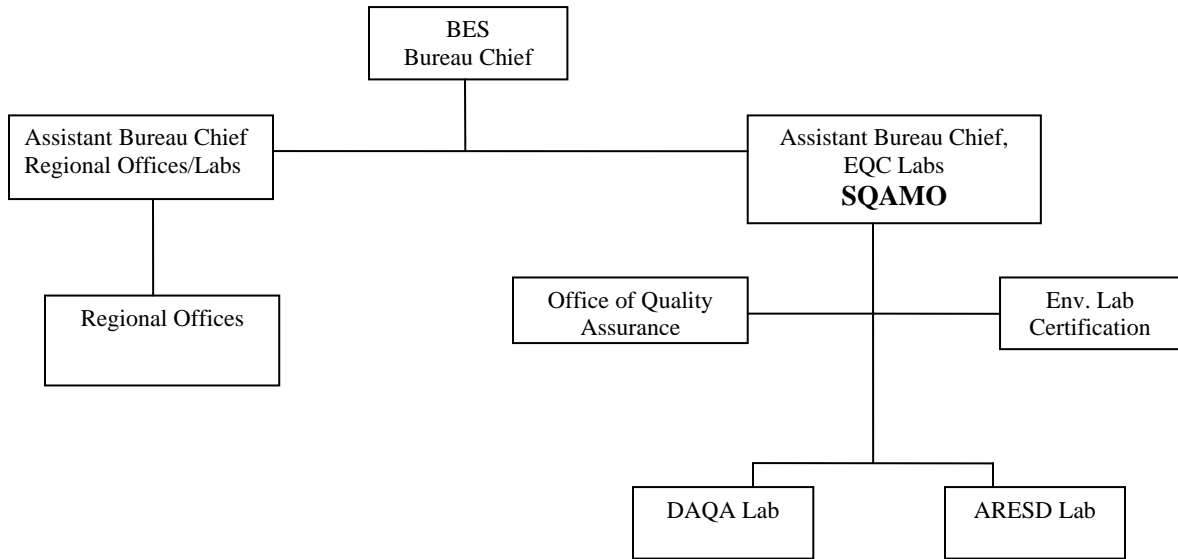
Constant review of the work and work processes help to quickly identify conditions that would cause decreased data quality. Workgroups, meeting, and the help of the experts help to identify the complete problem and provide solutions so that the problem is quickly and effectively handled.

Appendices

Appendix A: Organizational Chart of SCDHEC



Appendix B: Organizational Chart of the SCDHEC SQAMO and OQA



***Current personnel are:**

BES Bureau Chief:	Patrick T. Walker
Assistant Bureau Chief (ABC) - Regional Offices:	Richard Caldwell
SQAMO/ABC EQC Labs :	R. Wayne Davis
QA Manager:	Nydia F. Burdick
QA Officer:	Constance P. Turner

The above is the Organizational Chart showing the placement of the SQAMO and the Office of Quality Assurance (OQA). Both the SQAMO and OQA are in constant communication with OCRM and all Bureaus in EQC. Both the SQAMO and OQA have access to upper management to the level of Assistant Deputy Commissioner in both EQC and OCRM.

Appendix C: Acronyms and Definitions

-A-

ABC	Assistant Bureau Chief
ARESD	Analytical Radiological Environmental Services Division

-B-

BAQ	Bureau of Air Quality
BES	Bureau of Environmental Services
BBM	Bureau of Business Management
BIS	Bureau of Information Services
BLWM	Bureau of Land and Waste Management
BOW	Bureau of Water

-C-

CIO	Chief Information Officer
-----	---------------------------

-D-

DAQA	Division of Air Quality Analysis
------	----------------------------------

DQI	Data Quality Indicator, examples would be precision, accuracy, sensitivity, comparability, and representativeness.
-----	--

DQO	Data Quality Objective – A systematic planning system designed to produce qualitative and quantitative statements that clarify project objectives and define the appropriate type of environmental data and specify tolerable levels of decision error.
-----	---

-E-

EDD	Electronic Data Deliverable
EQC	Environmental Quality Control
EFIS	Environmental Facilities Information System - the computer database that houses facility/lab information (addresses, contacts, owners), permit, and certification information.
EISOP	Environmental Investigations SOP and QA Manual

-I-

IRCJV	Information Resource Consultant Joint Venture Committee
IT	Information Technology – computers - hardware, software

-L-

LIMS	Laboratory Information Management System- this is the computer system that tracks samples and houses their analytical results and provides lab reports.
------	---

LCO	Laboratory Certification Officer
	-M-
MDL	Method Detection Limit- this is a measurement of sensitivity of the instrument/method used
	-O-
OCRM	Ocean and Coastal Resource Management
OQA	Office of Quality Assurance
	-P-
PT	Proficiency Testing – Blind study samples obtained from an external vendor. These are needed by a laboratory to show proficiency for an analysis and to maintain certification. These are annual assessments that are part of the national proficiency testing programs such as the Water Supply PT Studies, Water Pollution PT Studies, DMR QA Studies, Radiological PT Studies, etc.
	-Q-
QAPP	Quality Assurance Project Plan
QMP	Quality Management Plan
	-R-
IRCJV	Information Resource Consultant Joint Venture Committee – this committee ensures that IT needs are met in a cost effective manner.
	-S-
SCDHEC	South Carolina Department of Health or Environmental Control (aka “the Department”)
SQAMO	State Quality Assurance Management Officer
	-T-
TSA	Technical Systems Audit - TSAs are internal and external on-site audits of environmental data gathering activities.

Appendix D: Request for QA/QC Documentation

Bureau of Environmental Services

Office of Quality Assurance

EQC Laboratories, 8231 Parklane Road, Columbia, South Carolina 29223

Office: (803) 896-0981 Fax: (803) 896-0980

In compliance with SCDHEC's Quality Assurance Management Plan and QA Policy that there be sufficient QA activities conducted to demonstrate the validity, defensibility, and quality of data submitted for Departmental use, the following information should accompany any private laboratory's proposal and/or contract for work requested by the Department. This information conforms with EPA QA/R-5 Quality Assurance Project Plan requirements.

<i>Contract Laboratory Name:</i>
<i>Laboratory Address:</i>
<i>Laboratory Contact: Title:</i>
<i>Phone/Fax/E-mail:</i>
<i>Project Name:</i>

Please describe your laboratory's policies, protocols, and procedures as related/applicable to the following quality assurance/quality control topics. If an item is not practiced in your laboratory, please note as "N/A". Be as specific as possible for proper evaluation of your QA program. Examples of forms, worksheets, etc. used are encouraged.

<i>1. Project/Task Description</i>	-Give and overview of the scope of work to be performed.
<i>2. Certifications</i>	-List any laboratory certifications held and the expiration date of each.
<i>3. Sample Handling and Custody</i>	- Describe procedures for within-laboratory chain-of-custody including sample identification, handling/storage protocols and documentation.
<i>4. Analytical Methods</i>	- Cite the analytical methods and reference for each. Written SOPs must be attached or available for review.
<i>5. Quality Control Procedures</i>	- Identify QC checks and frequency for each analysis, as well as associated acceptance criteria and corrective actions if QC fails. (Examples include blanks, check standards, duplicates, spikes, reference samples, etc.).
<i>6. Instrument Calibration and Frequency</i>	- Identify equipment needing calibration and the frequency for such calibration, including calibration records maintained.
<i>7. Calibration Standards</i>	- Identify any certified or national reference standards used. Document the traceability of lab standards used to calibrate each instrument.
<i>8. Assessments</i>	- Identify any internal and external assessments performed. (Examples are Performance Evaluation Study Samples, Data Quality Audits, Peer Review, etc). Identify individual(s) responsible for corrective actions.
<i>9. Data Review and Validation</i>	- State criteria for accepting, rejecting, and qualifying data.
<i>10. Data Management and User Reports</i>	- Document protocols used in data reduction, transfer, and storage. Describe the reporting format and how any limitations on data use will be conveyed.

Appendix E: Preparation for Audits and Audit Checklists

Preparation for Regional Lab Audits

To assist labs in preparing for the annual audits, the following has been developed. This may not be exhaustive but should help personnel prepare and know what to expect.

1. All personnel analyzing parameters in the field (pH, chlorine, DO, temperature, and conductivity) should be present for the audit so that they can be interviewed. If anyone cannot be present, please contact the auditor as soon as possible.
2. All logbooks, field books, and equipment need to be available during the audit.
3. ICV data (total and free) for residual chlorine for each meter and person using it need to be available for review.
4. Sample request sheets need to be available for review. Some may be requested randomly during the audit.
5. pH and chlorine analysis books need to be available for review.
6. Quarterly and annual thermometer check records for each instrument need to be available for review.
7. NIST-traceable thermometer certificates need to be available for review. If a Regional Lab does this, have them fax a copy to the Office. This should be maintained as part of the temperature records.
8. All reagents such as pH buffers, potassium permanganate, etc will be inspected to ensure that they are not expired and are in good condition.
9. Glassware and plasticware will be inspected to ensure they are in good condition.
10. All equipment will be inspected to ensure requirements are met and they are in good working order. This includes balances, refrigerators, deionized water systems, etc.
11. Staff may be asked to demonstrate some of the routine tasks they perform during the audit. An example is pipetting.
12. Proficiency Testing (PT) sample results will be reviewed. These samples are to be recorded in the logbooks as if they are actual samples. This provides a permanent record of the analysis and by whom it was performed.
13. On-site copies of the SOPs will be reviewed to ensure they are the current versions.
14. A copy of the Safety manual will be requested to ensure staff have a copy of it and it is current.

Randomly selected LIMs reports will be pulled prior to the visit. The data reported in LIMs will be traced back to the actual analysis records which are located in lab books, field logbooks, and/or sample request sheets. Some of these will be requested to be sent to the QA Office prior to the visit to help minimize the time spent with field staff and to allow more technical assistance when needed.

A copy of the checklists used to evaluate the field personnel and microbiology labs is sent to the lab for review. Currently, there are no chemistry checklists but the SOPs are used to perform the audit.

Please ask during the audit if there are any questions regarding SOPs, the audit process, regulations surrounding analytical work or monitoring, technical questions, etc. This assists the QA Office in improving the audit process and SOPs and hopefully assists getting questions answered and concerns addressed.

Audit Preparation Checklist

Wastewater Staff (each person)	√
Meters available: chlorine, pH, DO, conductivity, thermometers, etc	
Field logbooks available	
Chlorine calibration checks (ICV and daily calibration)	
WP Study analysis records	
Drinking Water Staff (each person)	
Meters available: pH, chlorine	
Sample collection sheets with sample results	
pH and chlorine field logbooks	
Chlorine calibration checks (ICV and daily calibration)	
WP Study analysis records	
Office (Reviewed once)	
Potassium permanganate	
pH buffers	
Glassware/plasticware	
Temperature records: quarterly check, NIST-traceable thermometer certificate	
Refrigerator temperature records	
Deionized water system/source	
SOPs	
Sample Request Sheets available for random selection if requested	
Safety Manual	

Laboratory _____ Date _____

Laboratory Personnel

Position/Title	Name	Education Level Degree/Major	Specialized Training	Present Specialty	# yrs at current position
Laboratory Supervisor					
Primary Analyst					
Analyst 2					
Analyst 3					
Others					

Element- Chemistry Laboratory	YES	NO	NA	Comments
1. Laboratory Facilities				
Areas clean and neat.				
Lighting satisfactory.				
Health, Safety and Waste Disposal procedures current.				
2. Equipment Controls				
All thermometers checked against NIST certified thermometer annually and documented.				
NIST certified thermometer recalibrated every 5 yrs.				
Temperature recorded twice daily for all lab equipment, with readings separated by at least four hours.				
Balance(s) calibrated monthly using Class S or S-1 reference weights or weights traceable to Class S or S-1 and balance log is up to date. (10mg level)				Type:
Deionized water system is operational.				
Oven(s)				
Refrigerator(s) ($1^{\circ}\pm 6^{\circ}\text{C}$)				
Freezer(s)				
Lab Washer				
Hoods (Instrument shop checked quarterly > 100 fpm)				
Analyst has a complete and current SOP.				
Class A glassware used only. Glassware used according to the SOP. Only volumetrics are used spiking and making standards.				
3. Logbooks/Workbooks/Forms				
Samples logged daily upon receipt.				
Samples inspected for proper bottles, proper preservative and information.				
Data entered in is neat, accurate, and complete.				
Errors have single strikeouts and are initialed and dated.				
Logbooks/workbooks can be used as evidence in court. There is a initial page in the front of each log book designating which initials go with whom.				
4. Work Review/Data Quality Assessment				
Alkalinity DL = 1.0 mg/L SM2320B				
Analyst has a complete and current SOP.				
Class A glassware used only. Glassware used according to the SOP. Only volumetrics are used spiking and making standards.				
Titration assembly; 5 or 10 ml microburet is used for low levels (<20mg/L).				
Samples are stored at $4^{\circ}\pm 2^{\circ}\text{C}$ and were run within 14 days of collection.				
Sodium carbonate was heated to 250 for 4 hours then cooled in a desiccator prior to weighing it out. If kept in a dessicator this is good for about 3 months.				
Sodium carbonate solution is kept no longer than one week.				
Sulfuric acid was standardized & calculated correctly or a commercial acid was bought.				

Element- Chemistry Laboratory	YES	NO	NA	Comments
Samples are titrated to pH 4.5 except for samples with pH above 8.3.				
Samples with pH > 8.3 were titrated to a phenolphthalein endpoint of 8.3, the volume of acid was recorded and then titrated to 4.5. The total volume is used for the calculation				
For alkalinities < 20mg/L , titrate another portion to between 4.3 and 4.7 with a 10ml buret, record the volume of titrant and exact pH. Then reduce the pH exactly 0.3 units and record the total volume of titrant.				
QCS was analyzed monthly or when samples were analyzed.				
A replicate is analyzed with each set or every 10 samples and was in control.				
Calculations and reporting were accurate				
BOD₅/CBOD(facility) DL = 2.0 mg/L SM5210A-B				
BOD air or water incubator is at 20±1°C				
DO meter and probe storage (partially filled bottle)				
The DO meter is calibrated before use. During long periods of use the calibration should be checked and recalibrated if necessary.				
For DO meter calibration the date, time, % sat, DO reading, temp and barometric pressure are recorded.				
The calibration is checked after the last sample is read and should be within 2% of the initial calibration.				
Samples were stored at 4°± 2°C and analyzed within 48 hrs of collection.				
Samples were brought to 20 ± 3 degrees before analysis.				
If the DO >9, the samples were reaerated and warmed to a max of 23 deg C. Before taking DO, cool to 20 deg.				
If the pH is <6 or >8.5, adjust to 6.5-7.5 using a strong enough acid/base so no more than 0.5% volume change.				
Chlorine is checked for with DPD and sodium sulfite is used to remove it.				
How does the Lab remove Cl?				
Dilution water is prepared weekly or if the blank depletion is ≥ 0.5 mg/L.				
Dilution water is stored in the BOD incubator or a cool dark place.				
If GGA is prepared, it is dried for 1 hour at 103 degrees and dessicated prior to weighing.				
If GGA is purchased, the analyst does not pipet directly from the bottle.				Expiration:
Facility samples are seeded and samples read within 15 min of dilution				
3 to 5 GGA controls were analyzed daily.				
To average GGAs, all must be identical, same dilution, same lot and same amount of seed.				
Average GGAs(that meet 2-1) are within 198±30.5 mg/L.				
Dilution water depletion was 0.2 mg/l or less. (0.2 up to 0.5 can still release results) If ≥ 0.5-- no results were reported.				
Seed Controls meeting 2-1 rule averaged; (0.6-1.0mg/L) seed depletion in each bottle?				
Precision/Facilities:				

Element- Chemistry Laboratory	YES	NO	NA	Comments
RPD control charts are kept for either GGA duplicates or duplicate dilutions of the facilities that are being run. To report samples, only the results that meet the 2-1 rule and RPD controls are used. If no duplicates/GGA controls fall within the RPD control limits, then no data was reported.				
A minimum of 3 dilutions of each sample were run.				
A QCS sample is analyzed every 6 months.				
Calculations and reporting were accurate.				
Nitrification inhibitor: 2-chlor-6-(trichlormethyl)pyridine is on hand and not expired.				
BOD₅ (stream) DL = 2.0 mg/L SM5210A-B				
BOD air or water incubator is at 20±1°C				
Samples were stored at 4°± 2°C and analyzed within 48 hrs of collection.				
Samples were pretreated (oxygenated, pH adjusted) as needed.				
Samples were 20 ± 3 degrees when DO is read (within 15 min of preparation)				
Three dilution water controls were run.				
Depletion of dilution water was 0.2 mg/l or less. (0.2-0.5 can still release results) If above 0.5-- no results were reported.				
One stream sample is duplicated for each batch of 10.				
RPDs of the duplicates are calculated. Enter a value of 2 mg/l for samples that read below the detection limit for this calculation.				
If the RPD for the duplicate analysis was out of control, results from that sample set were not reported. Other sets samples could have been reported if the QC for those samples sets was fine.				
Calculations and reporting were accurate.				
Color—Visual DL = 5.0 CU SM 2120B				Range = 5-70 CU
Samples were stored at 4°± 2°C and analyzed within 48 hrs of collection.				
Stock standard is < 12 months old.				
Calibration standards made monthly as needed and documented.				
Samples over 70 units were diluted with DI water.				
pH was taken and recorded.				
Calculations and reporting were accurate.				
Color—Spec DL = 5.0 CU SM 2120B				Range = 5-500CU
Spectrophotometer: 1 or 5 cm cells, matched				
The analyst has performed an IDC.				
Samples were stored at 4°± 2°C and analyzed within 48 hrs of collection.				
pH is recorded and then adjusted (if needed) to 7.6 prior to analysis.				
If overall volume change is >1% with pH adjustment, then discard and use stronger HCl or NaOH to make the adjustment.				
Adjusted sample is filtered with a 0.45 um porosity membrane filter that has been rinsed with DI water.				
Any sample having a reading > 500 CU is diluted with DI water.				

Element- Chemistry Laboratory	YES	NO	NA	Comments
Stock standard is < 6 months old.				
Calibration standards made every month as needed and documented.				
Calibration curve should have at least 5 pts and should have a corr. coeff of at least 0.991.				
For every 20 samples a blank is analyzed and the blank should be < 10% MDL.				
Per batch, one sample is analyzed in duplicate. RPD < 14%.				
A working standard was analyzed and within 81-108% recovery.				
Calculations and reporting were accurate. pH was also reported.				
pH SM4500-H+B				
pH meter - type				
Calibrated with at least 2 buffers, 3 rd buffer read				
A buffer is analyzed as a sample following calibration, after every 10 samples, & at end				
Buffers are within the expiration date and dated and initial when they were received and opened.				
A duplicate sample every 10 samples as applicable.				
RPD charts are maintained and the duplicates are in control.				
pH units are reported to the 0.1 unit.				
Phenol DL = 10 ug/L (500 ml samples) SM510 A-B-C				
Phenol apparatus –How many? Clean?				
Spectrophotometer at 460nm for analysis.				
Samples are preserved with sulfuric acid to pH <2 within 4 hours of collection and stored at 4°± 2°C until analysis.				
Samples are analyzed within 28 days .				
The intermediate standard (10 mg/L) is made fresh on each day of use.				
Aminoantipyrine is made daily.				
Intermediate Phenol solution is made that day.				
Potassium ferricyanide is made weekly. Store in brown bottle in fridge.				
Copper Sulfate is present/made?				
The analyst has performed an IDC and a MDL.				
A blank and 6 (now 5) working standards ranging from 5-50 (now 5-40 ug/L) ug/500ml were run. Curve 0.995 correlation coeff.				
Samples and Stds pH adj. to 4.0 prior to distillation add 5 ml Copper sulfate to samples and standards.				
When distilling, collect 450 ml then add 50 ml hot DI phenol free water. Collect 500 ml total. Now add 500 ml sample and 50 ml DI water and collect 500 ml.				
Do they check the flow rate? Supposed to be 6-7 ml/min or it should take at least 1 hour 10 min.				
If the extraction was done the next day the distillate was preserved by reducing pH<2, covering with foil and refrigerating. Do not reduce the pH now and monitor the LFBs and LFM.				
500 ml is extracted or no more than 50 microgram phenol. Dilutions must be done prior to adjusting the pH.				

Element- Chemistry Laboratory	YES	NO	NA	Comments
After adjusting the pH to 10 for extraction, 3 ml of both aminoantipyrine and potassium ferricyanide solutions were added.				
The color is allowed to develop 3 min.				
Samples and standards were extracted with chloroform and the chloroform is filtered with either filter paper with 5 g of anhydrous sodium sulfate				
If the color developed exceeds the color of the highest std dilute a portion of the distillate and proceed. Or dilute original sample and redistill.				
One duplicate is analyzed with each batch of ten samples. RPD is within control, if not no samples are reported. NOW it has to be a LFB or LFM.				
One LFB is distilled with each batch of 10 and are within control limits or 80-120% recovery. (only 80-120%)				
A QCS is analyzed with initial curve and quarterly. If outside acceptance limits, curve must be rerun and no data reported.				
A LFM is analyzed with each batch of 10 samples and is within control limits or 70-130% recovery. If the LFM is not within control limits and other QC is acceptable only the spiked sample is rejected. Should rerun however.				
MDL must be done for each lab annually.				
A reagent blank is run with each analysis batch.				
Calculations and reporting were accurate.				
Residue, TSS DL = 0.50 mg/L SM2540D				
TSS Apparatus; Oven (103-105 degrees C)				
The balance calibration was verified on the day of analysis.				
Samples are stored at 4°± 2°C (0-6) and analyzed within 7 days.				
Filter is placed wrinkled side up in the filtration apparatus.				
Forceps are used for handling the filter paper.				
Filters are washed with 3- 20 ml aliquots of DI water. The filters are dried in the oven for 1 hr and cooled in a desiccator.				
The filters are weighed and the heating cooling cycle is repeated until the weight change is < 0.5 mg. The drying dish can be included in the weighings.				
The filters are placed in the filter apparatus and pre-wet with DI water.				
The sample is well shaken and the analyst starts with 200 ml of water. But at least 10 mg is desirable —go to that or until all water is used—up to 1 L. If 1 L is not available note in workbook all available sample is used.				
The graduated cylinder used to aliquot the water and the filter apparatus are rinsed with 3 10 ml portions about 45 ml DI water (in 3 rinses) and this is pulled through the filter. Any large floating or submerged particles that are not representative are excluded.				
If the filtration rate drops or filtering takes more than 10 minutes due to large amounts of particulate, the sample is reanalyzed using a smaller volume.				
At least 1.3 mg of residue was collected or note that the entire sample was used. The analyst should see faint particulate with a 1.3 mg residue.				

Element- Chemistry Laboratory	YES	NO	NA	Comments
The filter is removed and placed in a drying dish and dried at 103-105 °C for at least 1 hour or overnight and weighed.				
A constant weight (± 0.5 mg) was obtained.				Is the filter weighed in a weighing boat?
A QCS is analyzed quarterly. (APG or vendor) If results are outside the acceptance range, results are not reported. A QC Sample is analyzed with every batch of 10.				
A prepared QC sample is duplicated with each group of 10 samples. RPD is in control. (Filter Aide or Whatman Ashless Powder). If not, no samples are reported.				
Calculations and reporting were accurate				
% Volatile Solids DL= 1.0 % solids SM 2540E				
Balance was checked on the day of analysis.				
Muffle furnace set to 550 °C. Drying oven set to 103-105°C				
<i>Water Samples are stored at 4 ± 2 °C analyzed within 7 days for water. Sediments, sludge etc are to be kept cool until analysis—no hold time.</i>				
Sediments are dried in a 103-105°C oven overnight. 30 min in dessicator. Then weighed to get the wt of crucible and sample. Repeat heating until constant weight is obtained (<4% or ± 50 mg). Duplicate determinations must agree within 5% of the average.				
Water: Ignite residue from water for 15-20 min. and dried sediment for 60 min in the muffle furnace.				
Heat in muffle furnace 60 min. Cool in air 5 min, 30 min in dessicator. Heating cooling cycle repetition is done until a constant weight is obtained <4% or .50 mg –water; 50 mg-sediments; or whichever is less.				
At least one duplicate set is analyzed with each set of 10 samples. Duplicates must agree within 5% of their average.				
Calculations and reporting were accurate.				
Sulfide DL = 1.0 mg/L SM4500-S²-F				
25 or 50 ml buret, glass fiber filters				
Zinc acetate and NaOH are used to preserve the sample upon collection. pH >9.				
Samples are stored at 4 ± 2 °C and analyzed within 7 days.				
Sodium thiosulfate and Iodine solutions are standardized correctly (before each use or at least monthly).				
Sodium sulfide reagent is less than a year old.				
The sodium sulfide standard is made monthly or before use.				
The entire sample is filtered through a glass fiber filter. More than 1 filter may be required.				
Does the analyst use the same number of filters for the reagent blank as the sample?				
The filter(s) from the sample is added to an Erlenmeyer and 100 ml of DI water is added to the original sample bottle and then transferred to the Erlenmeyer. The DI water/filter mixture is titrated.				
One duplicate is analyzed with each batch of 10 samples. This can be samples or LFBs that are duplicated. RPD is in control, if not samples are not reported.				
A LFB is run with the samples and is within the control limits				

Element- Chemistry Laboratory	YES	NO	NA	Comments
or 80-120% recovery. No samples can be reported if the LFB is out of control.				
A LFM is run quarterly and is within control limits or 70-130%. If the LFM is out of control, the sample must be rerun, but the rest of the samples may be reported provided the rest of the QC is acceptable.				
Calculations and reporting were accurate.				
Surfactants MBAS DL = 0.10 mg/L LAS SM 5540C				
Analyst has a complete and current SOP.				
Class A glassware used only. Glassware used according to the SOP. Only volumetrics are used spiking and making standards.				
Samples read on spec at 652 nm				
Intermediate and cal standards made fresh daily .				
Samples are stored at 4°± 2°C and analyzed within 48 hours of collection.				
The volume of the sample to be extracted is determined by the amount of foaming. Sample size can be as large as 200 ml.				
If <100 ml of sample is used, the sample volume is brought up to 100 ml using DI water.				
Samples are poured into sep funnels and made alkaline by NaOH which is determined by phenolphthalein indicator.				
10 ml chloroform and 25 ml methylene blue are added to the samples. This is shaken for 30 sec and allowed to separate. The chloroform is drawn off to a second sep funnel.				
The extraction is repeated 3 times using 10 ml chloroform each time and combining the extracts.				
The combined extracts are washed with the "wash solution"(sulfuric acid/ NaH ₂ PO ₄ *H ₂ O solution) and shaken 30 sec. The chloroform is drawn off into a volumetric flask. The wash solution is extracted with 2 10 ml aliquots of fresh chloroform.				
The volumetric is diluted to the mark with chloroform and the solution is read at 652 mm against a chloroform blank.				
The calibration curve is done annually.				
The calibration curve consists of 6 pts from 0-200 ug LAS. R=0.995 or better				
Stock LAS standard is made yearly.				
Daily standards of 0.10 mg/L and one standard above the expected sample conc are prepared. The 0.1 should be with 25% rec and the other standard within 10%.				
If either standard was out, then no samples are reported and the calibration curve is rerun.				
Precision controls can be duplicated samples, or since samples are rarely detectable, LFBs. At least one duplicate for every 10 samples. Duplicates are in control. If not, samples are not reported.				
A QCS reference standard is analyzed quarterly or with each analysis if performed less frequently. If results are not acceptable, samples are not reported, but should be reanalyzed.				
The calculations and reporting were correct.				
Turbidity DL = 1.0 NTU SM 2130B				

Element- Chemistry Laboratory	YES	NO	NA	Comments
Samples stored at 4°± 2°C and were analyzed within 48 hrs of collection.				
Sample Cells were indexed and marked.				
Cells are clean.				
Prior to analysis the instrument warms up 30 min.				
The lab is using AMCO Clear Standard or other EPA approved primary standards.				
The Turbidimeter is calibrated on each day of analysis with the 100, 10 and 0.02 NTU Standards.				
After calibration the meter is checked with the 0.02, 1.0 ,10, 100 and 1000 NTU standards. If DW- then the 0.50 NTU is also checked. If outside of 90-110% then recalibrate.				
One sample is poured up at a time.				
For values between 0-1.0, report 1.0.				
Pour up no more than 5 samples so that no suspended matter has time to settle.				
Per batch of 10, one sample is analyzed in duplicate and duplicate was in control.				
Per batch of 10, a standard is analyzed. Vary the concentration over the range of samples analyzed. Must be within 10% or that set must be reanalyzed after recalibration.				
Calculations and reporting were accurate.				
Residual Chlorine SM 4500-CLG				
Hach Pocket Colorimeter or Comparator used?				
PT samples analyzed successfully during calendar year?				
Initial Calibration Verification with 5 stds. on file and current?				
Calibration checked daily with blank and two stds?				
Are Standards within 10% of true values?				
Analysis conducted within 15 minutes of collection?				
Specific Resistance/ Conductance/Salinity SM 2510B				
PT samples analyzed successfully during calendar year?				
Samples analyzed within 28 days? Stored at 4° C?				
Cell constant determined monthly? .01N KCL used?				
QC sample analyzed each day of analysis?				
10% of samples are duplicated. RPD control charts prepared annually?				
Salinity results reported to 2 significant figures?				

Audited by _____ Date: _____

Samples Tracked:

Parameter	Sample ID/LIMS	Comments
Micro-DW		
Micro-Facility		
Micro-Stream		
Micro-Beach		

pH		
Alkalinity		
Color—Visual		
Color—Spec		
Turbidity		
BOD₅ (Facil.)		
BOD₅ (Stream)		
TSS		
TDS		
Phenol		
Sulfide		
MBAS		
% Vol Solids		

Audited by _____

Date: _____

FIELD DOCUMENTATION

Field Parameters/Data Quality		Comments
<p>pH meter- calibrated init/final; samples analyzed within 15 min. of collection. --- Meter recalibrated if a NPDES violation detected. --- Record results to .05 SU-analog ; 0.01 SU for digital</p>		
<p>DO meter calibrated initially, 3rd station, end of day.</p>		
<p>Thermometers/probes- Checked against NIST quarterly.</p>		
<p>Conductivity meter calibrated daily with two KCL stds.</p>		
<p>Chlorine meter- calibrated daily with two stds bracketing range of measurement; ICV performed; samples analyzed within 15 min.</p>		
<p>Hydrolab- calibrated am/checked pm.</p>		
<p>All calibrations recorded in field logbook/workbook</p>		
<p>Results were reported correctly.</p>		
Chain of Custody		Comments
<p>SOP protocols for collection followed.</p>		
<p>Samples properly preserved.</p>		
<p>COC information complete.</p>		

Audited by _____

Date: _____