NORTH CAROLINA
DEPARTMENT OF ENVIRONMENTAL QUALITY

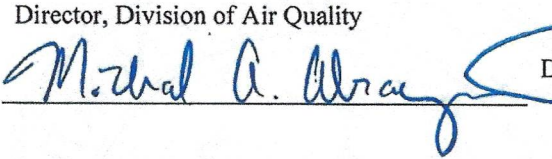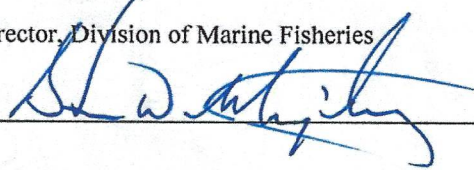# QUALITY MANAGEMENT PLAN

2019

Version 4.19

Revised August 2019

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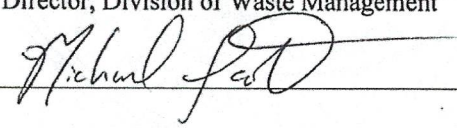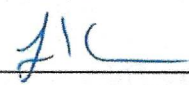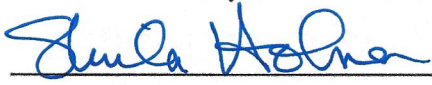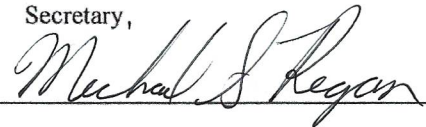Signature   Date   8/8/19

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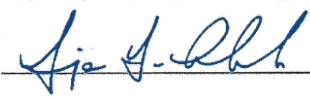<u>Approval for United States Environmental Protection Agency</u>

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1   INTRODUCTION

1.1   <u>Purpose</u>

The North Carolina Department of Environmental Quality (DEQ) has developed this Quality Management Plan (QMP) for data to achieve the following four goals:

- Provide departmental support and context for programmatic quality assurance activities.
- Create an avenue for interdivisional communication on quality assurance issues.
- Create a primary source of information for data quality assurance in DEQ.
- Comply with U.S. Environmental Protection Agency (USEPA) requirements.

This QMP documents DEQ's policy and procedures to ensure the environmental data we collect, and report is of high quality and defensible. Although the specifics of the DEQ quality assurance program are managed at the program level, all of the elements of the required QMP are overseen and approved by DEQ senior management.

The last Quality Management Plan for North Carolina was submitted in April of 2015 and approved by USEPA in September of 2015.

1.2   <u>Importance of Environmental Data</u>

Environmental data are a critical input to DEQ's decisions to protect human health and the environment. Most decisions made by DEQ regarding the management of the environment and reduction of risk ultimately require the use of environmental data generated by DEQ, or by state or local government agencies, and/or private sector organizations. Therefore, it is of critical importance that DEQ decision-makers know the origin and quality of the environmental data used in these decisions. The quality of environmental data is known when all components associated with its derivation (precision, bias, completeness, comparability, sensitivity, representativeness, and usability) are documented.

[Modified from Section 1.1 – Importance of Environmental Data, Page 8 of the USEPA Region 4 Quality Management Plan approved August 2018 (R4QMP-001-082018).]

1.3   <u>Definitions</u>

1.3.1   <u>Quality System</u> - A structured and documented management system describing the quality assurance policies, practices, protocols, and procedures for ensuring that (1) environmental data are of known and documented quality; and, (2) environmental technology is designed, constructed and operated in a manner to produce the desired environmental results.

1.3.2   <u>Environmental Data</u> - Information collected directly from measurements, produced from models, or compiled from other sources such as databases or literature, which are used for decision-making purposes. This data/information may include existing data.

1.3.3   <u>Internal Data</u> - Data generated by or for Department programs where DEQ staff have primary responsibility for project or task decision-making. The Department's quality assurance system requirements apply to these data.

1.3.4   <u>Extramural Data</u> - Data generated by organizations other than DEQ through extramural agreements.

1.3.5   <u>Existing Data</u> - any data or information available that was originally collected for a purpose different from the one for which they are intended to be used. This may be data or information:
- collected by the same project team previously for another purpose;
- produced during other environmental investigations;
- produced by the agency or a contractor to DEQ;
- produced outside DEQ (extramurally);

• obtained from other document information systems;
• obtained from studies.

[See Chapter 3, Projects Using Existing Data, Guidance for Quality Assurance Project Plans, EPA/240/R-02/009, EPA QA/G-5, December 2002, for additional clarification.]

    1.3.6   <u>Environmental Technology</u> - An all-inclusive term used to describe pollution control devices and systems, waste treatment processes and storage facilities, and site remediation technologies and associated components that may be utilized to remove pollutants or contaminants from or prevent them from entering the environment. Examples include wet scrubbers (air), soil washing (soil), granulated activated carbon unit (water), and filtration (air, water). Usually, this term applies to hardware-based systems; however, it also applies to methods or techniques used for pollution prevention, pollutant reduction, or containment of contamination to prevent further movement of the contaminants, such as capping, solidification or vitrification, and biological treatment.

    1.3.7   <u>Quality Assurance (QA)</u> - An integrated system of activities including planning, implementation and assessment to ensure environmental data are of known and documented quality, and environmental technology produces the desired results.

    1.3.8   <u>Quality Control (QC)</u> - The overall system of technical activities that measure the performance of a process or item against defined standards to ensure the process or item meets the pre-defined standards of the customer.

    1.3.9   <u>Quality Assurance Project Plan (QAPP)</u> - A critical planning document for a project, study or task, describing how data collection activities are planned, implemented, and assessed.

    1.3.10   <u>Data Quality Objectives (DQOs)</u> - A systematic planning system designed to produce qualitative and quantitative statements that clarify project objectives, define the appropriate type of environmental data, delineate the decision rules, and specify tolerable levels of decision error.

    1.3.11   <u>Graded Approach</u> - The process of selecting the elements needed in a project-level planning document based on the complexity of the project or study undertaken and the degree of confidence needed in the environmental data, and the intended use of the results. The graded approach is applicable to the development of a quality system and the resulting documentation.

    1.3.12   <u>Primary Quality Assurance Organization (PQAO)</u> – A monitoring organization that is responsible for a set of stations that monitors the same pollutant and for which data quality assessments will be pooled. Each criteria pollutant sampler/monitor must be associated with only one PQAO. Data quality is assessed at the PQAO level.

[Modified from Section 1.2 – Essential Definitions, Page 9 of the USEPA Region 4 Quality Management Plan approved August 2018 (R4QMP-001-082018).]

1.4   **Communication & Distribution**

The DEQ QMP will be distributed and made available to all individuals responsible for implementing the policies and procedures within this document. DEQ will employ a variety of mechanisms to distribute QA information. The QAM will update DEQ senior leadership, division directors and program management on QA issues which may impact the DEQ quality system, as needed. New QA standards, policies, and procedures will be communicated and distributed to all applicable divisions, sections and programs. The QMP will also be posted on the Department's internet site and the DEQ SharePoint site, as applicable. Upon revision of the QMP being approved by the Department and USEPA, the new version will be posted as previously described, with the older versions being archived. Project-specific QAPPs will be posted on the division or program internet or SharePoint site, as applicable.

2 DEPARTMENTAL OVERVIEW

2.1   DEQ Mission
The mission of DEQ is to provide science-based environmental stewardship for the health and prosperity of all North Carolinians.

2.2   The Outcome
That a collaborative stewardship among the citizens, government regulators and the business community will maintain and enhance North Carolina's environment for the benefit and enjoyment of everyone living in or visiting our great state.

2.3   Department QA Policy
The Department is strongly committed to sound science and QA practices which will produce environmental data of appropriate quality to be used for decision making. DEQ programs will employ a quality system for the generation and use of environmental data.   These quality systems provide reasonable assurance that all environmental data generated and processed will be scientifically valid, of known precision and accuracy, complete, representative, comparable and, where appropriate, legally defensible. DEQ is committed to the principle that the measure of that data quality shall be used as an important factor in all decisions arising from that data. DEQ policy also includes a commitment by management that the quality system supporting the generation of data of known quality and effective environmental technology will be implemented as described in this plan. DEQ policy is achieved by ensuring adequate and acceptable planning, implementation, and assessment procedures are utilized through all phases of projects/studies/tasks which require the generation of environmental data and/or the use of environmental technology.

It is the policy of DEQ that all decisions which are made to protect human health and safeguard the environment will be based on data of sufficient known quality to support the level of decision required. Department managers and staff will assure there are sufficient QA activities conducted by the environmental programs to provide reasonable assurance that all environmental data generated are scientifically valid; of adequate quality and quantity for the intended use; of known precision and bias; of acceptable completeness, representativeness, comparability, and usability; and where appropriate, legally defensible. Environmental data quality is the responsibility of all Department staff who are directly or indirectly involved in the collection, production, and use of data. Senior managers in each division will assure adequate resources, including personnel, travel funds, and extramural funds, are available to implement the DEQ quality assurance system and attain the Department's quality-related objectives.

[Modified from Section 2.1 – Regional QA Policy, Page 10 of the USEPA Region 4 Quality Management Plan approved August 2018 (R4QMP-001-082018).]

2.4   Department Quality-Related Objectives
The following are the objectives which serve to support DEQ's QA policy:

> 2.4.1   DEQ QA System activities shall comply with *ASQ/ANSI E4-2014, "Quality Systems for Environmental Data and Technology Programs – Requirements with Guidance for Use" (ASQ/ANSI E4)* with respect to planning, implementing and assessing quality assurance activities. It is DEQ policy that all environmental programs performed by DEQ or for DEQ shall be supported by individual quality systems that comply fully with the *ASQ/ANSI E4* specifications. In addition, all environmental technology constructed for pollution prevention, control, or waste remediation should be designed, constructed and operated according to pre-defined specifications. Specific guidance on environmental technology design, construction, and operation is found in *EPA Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation, EPA QA/G-11.*

> 2.4.2   The data quality objectives (DQO) process, or a similar systematic planning process, shall be used to plan project or study goals and objectives as related to programmatic or regulatory requirements, and needed environmental data quality prior to the initiation of data collection activities. The *Guidance*

on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4), February 2006, provides a standard working tool to develop DQOs for determining the type, quantity, and quality of data needed to reach defensible decisions or make credible estimates. DQOs, or similar outputs from a systematic planning process, shall be documented in a QAPP, or equivalent project-level planning document.

2.4.3   QAPPs or equivalent planning documents shall be developed by those staff responsible for designing and implementing a project, study, or task which requires the collection or use of environmental data. QAPPs and equivalent planning documents shall meet the requirements specified in *EPA's Requirement for QAPP, EPA/240/B-01/003, QA/R-5 (February 2006),* and will incorporate project-specific DQOs. QAPPs will be developed using a graded approach consistent with the complexity of the project and the intended use of the data.

2.4.4   Extramural organizations which receive USEPA funding for environmental data collection activities, shall have an approved QMP with the requirements specified in *EPA's Requirement for QMPs, EPA/240/B-01/002, QA/R-2 (March 2001)* document. This document must illustrate that a quality system is in place to ensure all data collection activities are appropriately planned, implemented, and assessed. If it is determined by the Divisions, Programs or QAM that a QAPP must be provided for a specific data collection activity, then the document must comply with the requirements specified in *EPA's Requirement for QAPPs, EPA/240/B-01/003, QA/R-5 (February 2006)* document consistent with a graded approach.

2.4.5   DEQ managers and staff shall receive QA training appropriate for their responsibilities related to data collection or environmental technology.

2.4.6   Communication on QA issues and activities shall be maintained between the QAM, Senior Management as appropriate, as well as with Division Directors, program managers, quality assurance coordinators, and technical staff.

2.4.7   Assessments shall be performed to determine the effectiveness of the DEQ quality system.

2.4.8   QA processes shall be designed in the most resource-effective manner without compromising data quality.

2.4.9   Projects using existing data will follow the guidance in *EPA/240/R-02/009, EPA QA/G5*.

2.4.10   Continuous improvement shall be emphasized throughout DEQ's quality management system.

[Modified from Section 2.2 – Regional Objectives, Page 11 of the USEPA Region 4 Quality Management Plan approved August 2018 (R4QMP-001-082018).]

2.5   **Departmental Organizational Structure**

DEQ consists of eight environmental protection divisions. Six different programs in four of the environmental protection divisions receive significant support from the USEPA and have included their individual quality management plans within this DEQ QMP. Those divisions (with associated programs) are Air Quality, Water Resources (Public Water Supply and Water Quality), Waste Management (Hazardous Waste, Superfund and UST), and Marine Fisheries (Shellfish Sanitation and Recreational Water Quality Section). These divisions are depicted on the DEQ organization chart below.

NC Department of Environmental Quality
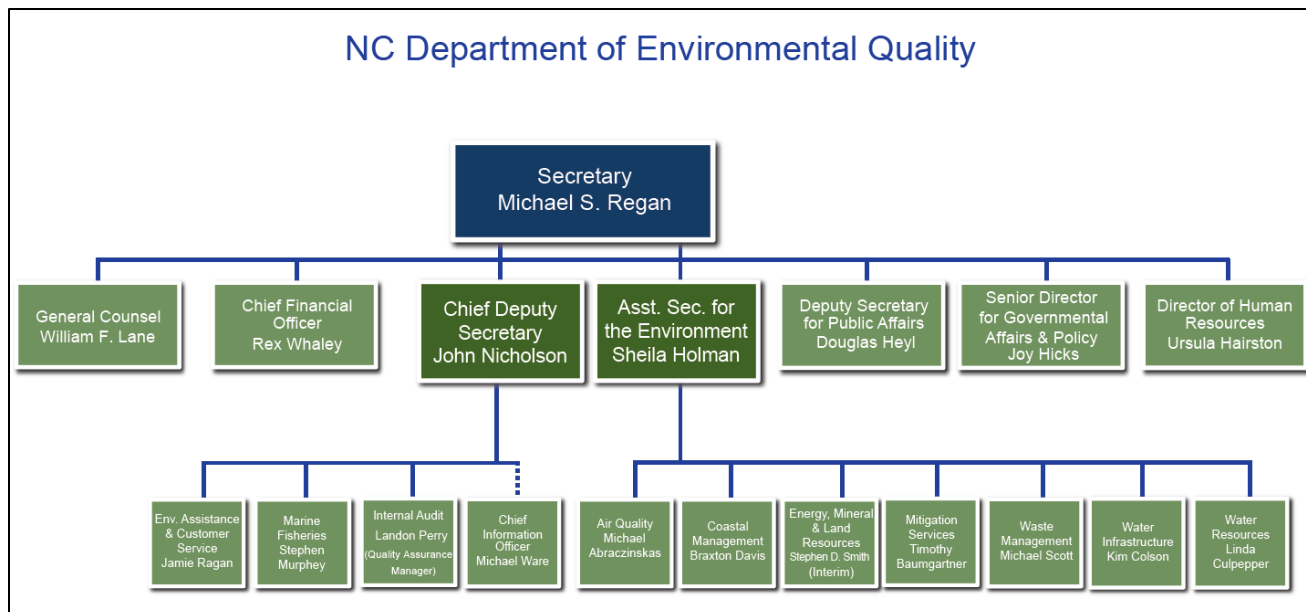
A team of representatives from the programs identified above developed this QMP. This team worked with guidance of the DEQ Internal Audit Director, who is the DEQ environmental data "Quality Assurance Manager." The Assistant Secretary for the Environment, in conjunction with the affected Division Directors, are responsible for all environmental data that is reported by DEQ. All environmental data collected by DEQ is collected by the different divisions under the management and review of the different Division Directors and their section chiefs or unit supervisors. Through various plans, meetings and reports between the Assistant Secretary and the Division Directors, the quality of both the collected and reported environmental data is assured. The organization and responsibilities within each division, including delegation of environmental data quality assurance to the section chief or unit supervisor level, is described in the next section in more detail.

2.6   **Departmental Resource Allocation**

The Divisions allocate sufficient resources through their staff's time to accomplish quality-related requirements. Additionally, the Divisions recommend funding levels for QA activities in each data-related program. There are no line-item funds in the DEQ budget specifically for QA. Distribution of QA-related resources is determined by the Director, Deputy Director, and the Sections.

2.7   **Assignment of Responsibilities**

The following Departmental managers and staff have the responsibilities described for the Quality Management System.

2.7.1   Secretary

The Secretary, in conjunction with the Assistant Secretary for the Environment, has the overall responsibility for the development, implementation, and continued operation of the DEQ Quality Management Plan. The responsibility for managing the day-to-day QA activities lays with the respective Division Directors with recommendations and assistance from the QAM.

2.7.2   Quality Assurance Manager (QAM)

The QAM serves to coordinate, monitor and support the collective QA activities within the Department. The QAM is located in the Office of Internal Audit within the Office of the Secretary. The QAM reports directly to the Chief Deputy Secretary and is independent of any environmental data generation activities within the Department. The QAM may recommend suspension of environmental data collection projects and propose corrective action in the event that data quality/environmental technology QA activities do

not meet Department QA requirements. The QAM may provide impartial judgment regarding data quality, assist internal coordination of QA and quality control (QC) activities among the various organizational units, and mediate disputes that may arise during routine data collection operations, laboratory analysis, and internal audits or assessments. If disputes are unable to be resolved at the lowest possible administrative level through discussion and negotiation, the QAM shall take the issue to Senior Management including the Secretary and Assistant Secretary for the Environment. The Secretary, in conjunction with the Assistant Secretary for the Environment, shall have final dispute authority for all quality issues.

Key responsibilities of the QAM or his/her designee include the following activities:

- Serve as the official contact for the Department on all QA matters.
- Respond to QA needs, provide assistance with problem recommendations, and coordinate requests, guidance or assistance.
- Serve as coordinator for the Quality Assurance Workgroup.
- Assist in coordinating training on QA policies and procedures.

2.7.3 Division Directors

Division Directors are responsible for ensuring that data-related activities are conducted in accordance with this document. Management assures that the applicable elements of the quality system (QS) are understood and implemented throughout their environmental programs through the development and implementation of 1) standard operating procedures (SOPs); 2) internal training seminars; 3) staff meetings; and/or, 4) other appropriate procedures/processes. Daily QA management is delegated to the appropriate line managers (i.e., Section, Branch, and Unit Chiefs). The line managers are accountable for procedures within their areas of responsibility to ensure the acceptability of data generated. Key responsibilities of Division Directors or their designees in this area are:

- Establish planning policies to ensure that QA matters are reflected in program budgets, program plans, and operating plans;
- Approve SOPs;
- Provide Division concurrence with QAPP content by signature of QAPP cover page;
- Review and evaluate internal/external monitoring QA implementation and progress.
- Participate in and/or approve outputs from internal systematic planning process for data-related activities;
- Approve corrective action as required by QA assessments or reviews;
- Oversee the Program/Project Manager's QA activities;
- Report data quality problems to the QAM.

2.7.4 Quality Assurance Workgroup (QAWG)

QAWG members serve as the QA coordinators for their respective Divisions. The workgroup meets periodically to facilitate internal coordination of QA/QC activities throughout the various operational or organizational units within DEQ. Each Division Director whose program is required to participate in the QMP must appoint at least one manager or staff person to the QAWG for each program. Key responsibilities of the QAWG members are:

- Serve as an official Division contact and lead quality assurance staff for QA matters pertinent to the data-related program activities of that Division.
- Attend meetings of the QAWG to keep up-to-date on QA issues affecting the Department and communicate QA issues to Division personnel.
- Coordinate QA activities within the Division and provide updates to the QAM.

- Advise the QAM on changes needed to the Department's QMP and actively participate in the required QMP review/revision process.
- Assist Project Managers (PMs) with development of internal QAPPs. This includes participation in and/or review of the systematic planning processes across the DEQ if needed.
- Review implementation of selected QAPPs and adequacy of the data generated from a quality perspective.
- Coordinate and/or conduct assessments (audits, evaluations, etc.) of selected environmental data projects/programs.
- Respond to quality control (QC) issues/problems and respond to requests for guidance or technical direction within his/her Division.
- Assist the Division's staff in developing and maintaining an effective QA program.
- Attend QA training provided by the Department.

2.7.5 Program/Project Managers (PM)

Program/Project Managers are responsible for their specific internal environmental data-related programs/projects and are accountable for the management of their extramural assistance agreements. Therefore, the PM has the principal responsibility for ensuring that the systematic planning process outputs are met (Data Quality Objectives (DQOs), or other applicable outputs). Key responsibilities of the PM are:

- Prepare and/or direct the preparation of QAPPs for each project and/or program and submit to USEPA for review and approval prior to implementation.
- Prepare or approve DQOs, or other systematic planning output, specifications, and acceptance criteria for the programs/projects.
- Oversee the quality of data generated from external projects funded through financial assistance agreements as required.
- Evaluate the quality of data generated by the monitoring programs/projects
- Participate in conducting assessments of programs/projects as requested by the QAM.
- Coordinate review of external or extramural QAPPs.
- Respond to requests for input or decisions related to the systematic planning process or other quality-related issues in the relevant area of programmatic responsibility.
- Take corrective action that may be required as a result of assessment findings.
- Report data quality problems to the QA Workgroup representative.
- Attend QA training provided by the Department.

2.7.6 DEQ Technical Staff

Technical staff must support the QAM by providing technical assistance in their area of expertise as requested by the QAM. This support enhances the QA program's capability within the Department. The specific duties assigned to the technical staff are as follows:

- Assist the QAM with technical aspects of QA as related to their area of expertise (e.g., air, water, toxics substances, hazardous waste, engineering, chemistry, hydrogeology, radiochemistry, biology, microbiology, field operations, and data operations).
- Identify QA needs, resolve problems, and answer requests for guidance or assistance in area of expertise.
- Conduct and/or participate in on-site field and laboratory assessments.
- Inform the PM of need for new, modified, or improved methods.
- Participate in technical assistance and training, as resources permit.

2.7.7 Contracts and Cooperative Agreements

The oversight process of DEQ contractor's activities for data collection includes the requirement for a scope of services that must be approved prior to contract acceptance and/or initiation of work. Depending on the program, each contractor is either required to use procedures outlined in Departmental standard operating procedures (SOPs) or must have an approved project plan and/or work plan. As part of the field data collection efforts some activities may be observed by Departmental personnel. Final reports are generated by the contractor and reviewed by Departmental personnel. Quality Assurance staff may participate in any of these activities as requested by a Division or the QAM. All contracts issued by DEQ divisions must be processed through the Purchasing Section within the DEQ Financial Services Division. Standard terms and conditions associated with dispute resolution and addressing problems identified during audits are included in the Contract agreements. Additional details are provided in Section 5 (DEQ Procurement Policy).

3   QUALITY SYSTEM COMPONENTS

3.1   Quality System Components

The DEQ has implemented a Quality System (QS) designed to ensure that environmental programs produce the type and quality of data needed and expected. Environmental data are critical to decision-making related to the protection of the public and the environment from adverse effects of pollutants from natural and man-made sources. These data are key to decisions and actions pertaining to environmental protection efforts in air, land, and all water bodies. Quality assurance and quality control practices need to ensure that data involving environmental efforts such as pollution detection, characterization or abatement, cleanup, public health protection, and environmental technology, successfully perform their intended purpose.

The Department quality system includes the organizational arrangements, documents, and processes described in this Quality Management Plan (QMP). This plan documents the approach used to assure the quality of work conducted by DEQ, lines of reporting and communication, and coordination mechanisms. The quality system includes both organizational and project controls. Organizational controls refer to activities that support common functions or functions that encompass several projects and programs. Project controls are specific to work programs and activities.

Environmental programs are administered and performed by qualified personnel using appropriate technologies and techniques. Staff are responsible for planning, executing, documenting, and reviewing work performed to ensure that it conforms to the Data Quality Objectives (DQO), or similar systematic planning process. The DEQ quality system encourages staff to resolve problems in a timely manner. Supervisors assist staff to ensure all facets of a problem are considered and the best options used. The Quality Assurance Manager (QAM), or designee, is responsible for approving quality-related procedures drafted by the QAWG which are then incorporated for use by Departmental staff. The quality-related activities of contractors/consultants are delineated in the respective contracts and QAPPs, if applicable.

The process for implementing QA/QC activities within DEQ (as delineated in DEQ quality documents) begins with training. Personnel receive training in the responsibilities/duties and associated program elements, codes, standards, and procedures of the quality system. The training may include formal instruction, seminars, on-the-job training, participation in technical conferences, and other activities determined to be appropriate. (See also Section 4)

Documentation is critical to ensure work is done correctly and available for review, as needed. Proper documentation saves resources by enabling staff to review proposed work, minimize errors and omissions, and permits future work to build smoothly upon already completed work. Documentation becomes particularly important as staff are reassigned or moved to other positions. New staff must be able to review past work to ensure ongoing project consistency and quality.

Examples of quality assurance processes and documents include:

- DEQ Quality Management Plan (QMP)
- Quality Assurance Program/Project Plans (QAPPs)
- Standard Operating Procedures (SOPs)
- Field Training Manuals
- Data Quality Objectives (DQOs)
- Technical Assessments (TAs)
- Work Plans (WPs)
- Field Sampling Plans/Study Plans
- Quality-Related Training

Figure 1. DEQ Quality System Diagram
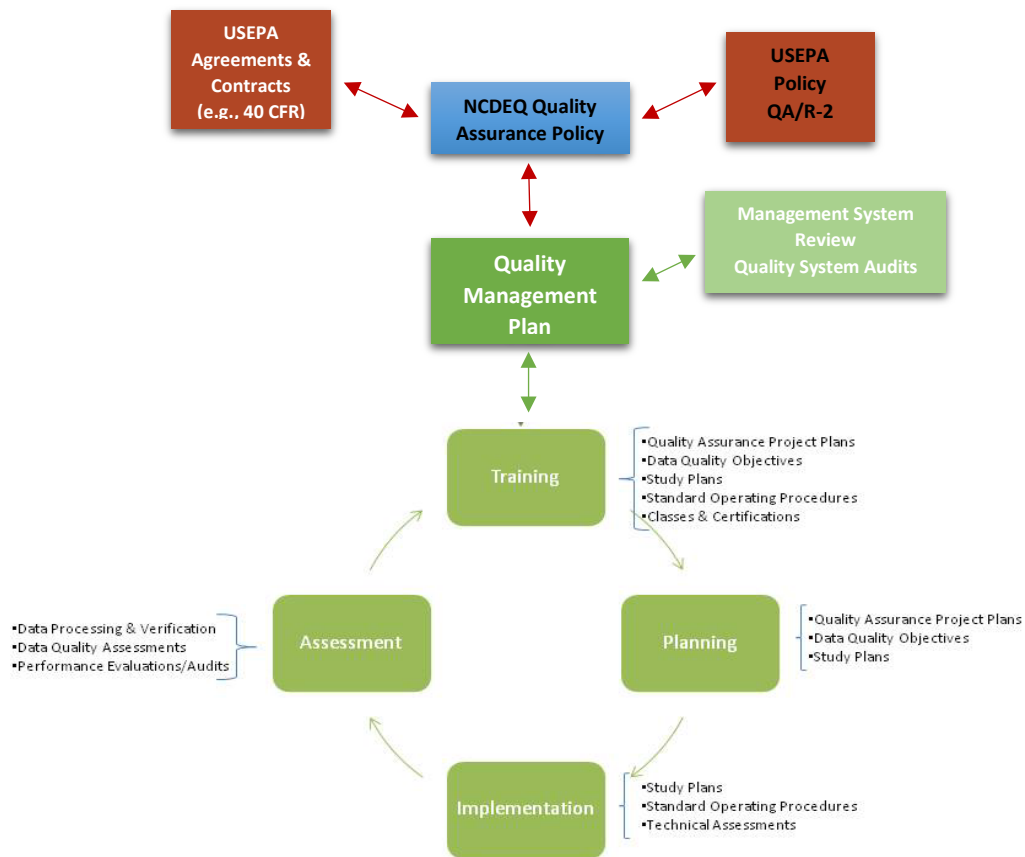
These processes and documents help ensure the work planned and performed meets the associated Data Quality Objectives. The various documents or processes serve to give all parties involved written documentation of the work being performed, their responsibilities and requirements, and information as to how quality is ensured. (See Section 6)

Generally, work flow in the Department involves gathering information from either an internal or an external source, processing information, and sharing it with other relevant staff for assessment and possible implementation. The DEQ Quality System Diagram (Figure 1) illustrates how programs implement this system within the Department.

The DEQ quality system includes components that establish requirements and specifications for environmental programs and projects, planning, implementation, and assessment/response activities. The Department has a variety of tools available to assist with the process of ensuring quality through the DEQ Quality System.

3.2   Quality System Tools

3.2.1   Quality Management Plan

This Quality Management Plan documents the DEQ strategy for building quality into its environmental programs. The quality system includes planning, implementing, and assessing the quality assurance and quality control operations as they are applied to the DEQ environmental data programs. The DEQ QMP and its revisions are developed by the Quality Assurance Workgroup (described in Section 2.5.4). Management oversight associated with preparing, reviewing, issuing, and authenticating is described in Sections 2.5.1 – 2.5.3.

3.2.1.1   *DWR Water Sciences Quality Assurance Manual*

The Division of Water Resources (DWR) Water Sciences Section operates under additional program-specific Quality Assurance Manual and QAPPs. The *Laboratory Operations Quality Assurance Manual* (LOQAM) for the Division of Water Resources Water Sciences Section Chemistry Laboratories, deal specifically with the laboratories' quality system. The field monitoring operations follow program-specific QAPPs. The Water Sciences Section has both a Laboratory Quality Assurance Officer (LQAO) and an Ecosystems Branch QA Coordinator (EBQAC). They have the authority to establish policy for the generation and assessment of environmental data. The LOQAM and QAPPs are developed and maintained by the LQAO and EBQAC, respectively. With final review and approval by the Water Sciences Section Chief, Branch Managers.

3.2.1.2   *DMF Shellfish Sanitation and Recreational Water Quality Section Quality Assurance Plan*

The Division of Marine Fisheries (DMF) Shellfish Sanitation and Recreational Water Quality Section also operates under an additional program specific Quality Assurance Plan. This plan, the North Carolina Beach Monitoring Project Quality Assurance Plan, is necessary for compliance with USEPA's National Beach Guidance and Required Performance Criteria for Grants. This document is developed by the Recreational Water Quality Monitoring Program Manager and is approved by the Section Chief and DMF Director prior to submission to USEPA.

3.2.1.3   *Western North Carolina Regional Air Quality Agency (WNCRAQA) Quality Management Plan*

DEQ serves as the Primary Quality Assurance Organization (PQAO) for The Western North Carolina Regional Air Quality Agency (WNCRAQA). WNCRAQA is a local government agency operating as a department of the Buncombe County Government in North Carolina. Consequently, WNCRAQA follows the administrative policies of the Buncombe County Government. The administrative policies of Buncombe County Government are not related to the Quality Assurance/Quality Control activities specific to the collection of environmental data. Unless specifically identified in the WNCRAQA QMP as a deviation from DEQ practices, WNCRAQA follows the quality management procedures outlined in this QMP for activities involving the collection and use of environmental data. Additional information about WNCRAQA roles, responsibilities, organizational structure, monitoring activities, oversight and quality assurance is available in the Division of Air Quality appendix to this QMP.

3.2.2   Quality Assurance Program/Project Plan

The Quality Assurance Program/Project Plan (QAPP) is the fundamental DEQ quality assurance document for environmental data related activities. When fully implemented across the Department, Programs/Projects funded by USEPA and involving environmental data used for decision-making shall have an approved QAPP. A QAPP specifies the data quality objectives or other systematic planning output (See Section 8), minimum project management requirements regarding data measurement, acquisition, assessment, oversight, validation, and usability. The QAPP includes the main elements

listed in the document *USEPA Requirements for Quality Assurance Project Plans (USEPA QA/R-5).* Additional guidance for developing QAPPs may be found in the document, *Guidance for Quality Assurance Project Plans (USEPA QA/G-5).*

All DEQ QAPPs are USEPA approved and available online as indicated. QAPPs for external contracts and grants involving monitoring are also required and are provided to USEPA after approval by appropriate DEQ staff per grant requirements. DEQ staff and contractors performing specific tasks associated with environmental measurements or assessments are supplied with or provided access to QAPPs. Those QAPPs are maintained by each program.

DEQ QAPPs and SOPs are developed in accordance with USEPA guidance documents and describe procedures associated with data verification, review, and validation. All DEQ QAPPs are approved by USEPA and identify personnel responsible for adhering to requirements for data collection, review, and analyses. The Department's QAPPs also include data qualifiers and definitions assigned to non-compliant data. Specific elements contained in these documents and roles and responsibilities of pertinent staff are discussed in greater detail in Section 10.2.4.3.

3.2.3 Standard Operating Procedures

DEQ Standard Operating Procedures (SOPs) are developed using the USEPA document, *Guidance for Preparing Standard Operating Procedures (SOPs), USEPA QA/G-6*, as a guide. Where applicable, Departmental monitoring activities and data collection procedures are documented in SOP format. The SOPs help ensure work standardization by documenting processes that are consistently, effectively, and regularly performed including sampling and analytical procedures. DEQ staff and contractors performing specific tasks associated with environmental measurements or assessments are supplied with or provided access to SOPs. References to applicable SOPs are included in internal and external QAPPs. SOPs are developed and maintained by each program and are available through the program's website.

3.2.4 Quality-Related Training

Quality-related training is an important component of the Department's quality system. Quality training is determined by specific program needs and supervisory mandate. Frequencies of training are referenced in the appendices at the end of this document. Quality issues are generally addressed as part of technical training sessions. Specific quality assurance training sessions are developed in response to specific requests by Departmental programs or in response to needs as determined by internal or external audits. A training session covering an overview of the DEQ Quality System is being developed. In addition, the Quality Assurance Work Group will conduct annual training with its membership on emerging quality issues.

Individual programs within the Department conduct program specific quality related training on a regular basis to ensure new and current employees understand and implement the program's QAPP and SOP requirements.

3.3 Assessments

Assessments of environmental data-related programs provide information that is used in planning and implementing environmental programs and projects and in improving the quality system. These assessments, processes for improvement and audits are discussed in Sections 9 and 10.

4   QUALIFICATIONS AND TRAINING

4.1   General

DEQ personnel, contractors, and cooperative agreement holders performing work on environmental programs will be provided access to the DEQ QMP approved by USEPA and other related quality documents via public website.

For DEQ staff, initial and ongoing personnel qualifications and training needs shall be identified. Access to appropriate training opportunities shall be provided as resources allow, and the acquisition of needed knowledge and skills should be verified through on-site evaluations performed by program technical staff. Qualifications of contractors are assessed during the procurement process. Adherence to quality system requirements is verified by confirming compliance with program QAPPs and SOPs. On-site evaluations and training (if required) are performed by DEQ program technical staff.

Training requirements are addressed in Section 4.4 and 4.5. Additionally, the QAWG has initiated an exercise to identify specific training needs of different program offices. The group's findings and recommendations will be communicated to QAM for implementation. Future trainings organized through this effort will be made available to appropriate DEQ staff.

4.2   Position Descriptions

The North Carolina Office of State Human Resources administers and maintains a *Job Classification Plan* to which all positions within DEQ are allocated. Each position within the Department is described in a Job Classification that lists the job duties, the percentage of time devoted to each job duty, decision-making responsibilities, equipment regularly used, commonly used written work-guideline documents, financial responsibilities, and any required licenses, registrations or certifications necessary. Job Classification forms with the associated Americans with Disabilities Act (ADA) Physical Efforts Checklist are maintained by the DEQ Human Resources Staff.

4.3   Personnel Qualification

Personnel that are hired by DEQ must meet the specific requirements of the job classification. Each classification has minimum quality-related criteria including educational requirements, technical and non-technical knowledge and skills, certifications, professional experience, and other requirements for entry-level and advanced positions within a series of related jobs (e.g., environmental scientists, environmental engineers, geologists, and chemists). The State Human Resources Commission for North Carolina is responsible for establishing the qualifying criteria.

4.4   Employee Training Needs

It is the responsibility of each PM to ensure that all personnel performing tasks and functions related to data quality have the necessary education, training, and experience. Training needs, including QA Training, are determined on an individual basis by supervisors in consultation with employees. Training determinations are based on statutory requirements, management directives, audit findings, and mid-year/annual employee performance appraisals. The quality-related training needs are not static but are a dynamic function of program requirements and are addressed on an as-needed basis by the PMs and the QAM. The QAM may, in consultation with senior management, require staff to participate in specific QA-related training as a result of an internal audit, significant modification to Departmental or program procedure, or other quality-related issue. Additionally, senior management may request training assistance from the QAM.

4.5   Training Programs

Providing internal training is a priority to ensure that DEQ staff retain and enhance their technical competence, and perform their jobs efficiently. Notwithstanding funding limitations, DEQ remains committed to training staff. Currently, the responsibility for coordination of DEQ training lies within the individual Divisions and programs. The responsibility for developing, planning, and conducting training is shared among supervisors and staff. In addition to this, the QAWG is currently working to identify specific quality systems training needs across the department and will communicate the group's recommendations to the QAM for implementation. Management and staff receive quality systems training which helps ensure that programs produce and use quality data during the decision-making process. Staff enhances their quality system skills both in-house through QAM-coordinated instruction and externally, as resources allow, through classes, seminars, and conferences to learn both fundamental concepts and new procedures. Training may be formal or informal, mandatory or voluntary. Quality-related training may be obtained from: 1) an external vendor (if available and Departmental resources permit); 2) USEPA; or 3) from other available sources. The effectiveness of any QA-related training will be determined through course evaluations, testing, review of subsequent audits, and/or management reviews.

USEPA Region 4 funded training classes provide important opportunities for DEQ staff to develop skills consistent with other states and USEPA. Employees and supervisors also determine whether training programs and courses offered outside of DEQ and USEPA by educational institutions, professional associations, and other providers are useful for enhancing job performance or professional development. These programs and courses may include such activities as instructional courses, seminars, professional meetings, and workshops; many are provided at no cost and do not require travel.

Examples of training opportunities include:

- DWR Surface Water Quality Monitoring Program Training Workshop
- Air Pollution Control Orientation
- Air Pollution Source Inspection
- Computer Applications – Data Quality Objectives Training
- Performance Audit Inspection Training (USEPA)
- Computer Modeling Applications & Training
- Web-based USEPA-sponsored Training Seminars
- USEPA Region 4 Monitoring Managers Workshops
- USEPA Region 4 Air Monitoring Workshops
- National Air Monitoring Conferences
- National Air Quality Conferences
- National Site Assessment Conferences
- USEPA Region 4 Site Assessment Conferences
- USEPA Annual Quality Assurance Conferences
- USEPA Region 4 Site Assessment QAPP Training
- Air Toxics Data Analysis Workshop
- USEPA Air Quality Systems (AQS) Training/Workshop
- Mid-Atlantic Regional Air Management Association (MARAMA) Conference
- National Association of Clean Air Agencies (NACAA) Conference
- DAQ Annual Ambient Monitoring Workshop
- USEPA DQO Course (Managing Uncertainty and Systematic Planning for Environmental Decision Making)
- USEPA 9000 Lead Auditor Certificate Course
- Air Toxics Data Analysis Training (USEPA certified training)

- USEPA Managing Environmental Quality Systems Conference, Introduction to QA Project Plans
- USEPA QMP Quarterly Webinar
- USEPA QAPP Quarterly Webinar

4.6 <u>Training Records</u>

The Sections maintain records of job-related training for all DEQ staff. Programs, Divisions, Sections, and supervisors may also maintain individual training records for their staff members.

5   DEQ PROCUREMENT POLICY

5.1   General

The procurement of items and services is controlled and documented to ensure conformance with specified requirements, i.e. that contracted and sub-contracted activities produce results of acceptable quality and products received meet the specified requirements. Requirements and specifications are included or referenced in procurement documents. The acceptability of purchased items and services is documented.

5.2   Authority and Procedures

The North Carolina Department of Administration has purchasing requirements that the Department must follow *(North Carolina Agency Purchasing Manual, http://www.pandc.nc.gov/documents/wholeapm.pdf)*. These procedures ensure that State agencies procure goods and services efficiently and in accordance with State law. The North Carolina Department of Administration also establishes various commodity and service contracts with supplying vendors, which permit all agencies to buy goods in a legal, efficient, cost-effective manner without concern for local purchase authority. Contracts are awarded to the lowest responsible bidder meeting specifications and other conditions imposed in the solicitation document. If an item is not available through a contract, then the item is purchased following State Fiscal Policies and Procedures. Depending on cost, this may include an open competitive bid process *(01 North Carolina Administrative Code 05B).* Extramural agreements may include grants, cooperative agreements, inter-agency agreements, memorandums of agreement, and contracts.

5.3   Procurement Documents

Program/Project Managers (PMs) have the primary responsibility for defining in writing the requirements for all procurements in one or more procurement documents (e.g., purchase orders, invitations for bid, requests for proposals, requests for quotes, procurement contracts, etc.). Purchase requests for goods and services should include adequate detail to specify the quality and performance expectations of the acquired items (ranging from specific catalog item number through bid specification). These documents specify tasks and/or products, as well as technical, quality, administrative, and other requirements. All services and grant procurements are reviewed and approved through the supervisory chain-of-command prior to issuance via an electronic tracking system in the DEQ IBEAM database system. All procurements for goods are approved via e-Procurement.   DEQ Purchasing staff review all procurement documents to assure that they follow applicable State and Federal procedures. Approval requirements vary depending on the nature and cost of the item or service being purchased.

Changes to procurement documents generally receive the same reviews and approvals as original procurement documents. Contract changes are approved based upon the type of change (i.e., scope-of-work change, increase/decrease in contract amount, extension or renewal of contract end date).

5.4   Technical Requirements for Items and Services

Technical requirements are determined by PMs, or designees, and documented in procurement documents. Purchases of specified hardware and software are also reviewed and approved by the DEQ Information Technology Chief Operating Officers or designee. Project managers include technical and QA/QC requirements in the Scope-of-Services that is attached to the state contract. This Scope-of-Services document is reviewed and approved by the chain-of-command.

5.5   Solicitation Responses and Supplier Selections

Responses to solicitations are evaluated by Section Chiefs, or designees, in writing. These sheets specify cost, technical, quality, and other criteria used to evaluate the adequacy of responses to solicitations, to qualify potential suppliers, and to select vendors.

5.6   Acceptance of Items and Services

Program/Project Managers (PMs) have the primary responsibility for determining that goods and services procured to meet program/project deliverables are of sufficient quality to provide reliable and consistent performance. Items and services affecting quality received from suppliers are evaluated upon delivery against acceptance criteria (i.e., task and product specifications and technical, quality, administrative, and other requirements) contained in procurement documents. Program managers, or designees, determine whether acceptance criteria have been met and whether items and services are adequate and appropriate for use.

Items and services that do not meet acceptance criteria are not accepted for use. Corrective actions are initiated in accordance with State purchasing procedures, contract provisions, and North Carolina procurement procedures. Corrective actions may range from repair or replacement of defective deliverables to re-award of procurements.

5.7   Quality Requirements

5.7.1   Equipment and Supplies

Quality requirements for procurement of equipment and supplies are determined by PMs, or designees, and delineated in procurement documents. These documents include or reference appropriate requirements necessary to assure adequate quality and, to the extent necessary, require suppliers and subcontractors to have quality assurance programs consistent with DEQ requirements.

5.7.2   Grants, Cooperative Agreements and Contracts to Produce Environmental Data

Some environmental data are generated by other agencies, organizations, and companies though grants, cooperative agreements, and/or contracts with DEQ. These agencies and organizations must meet the QA specifications of 40 CFR Part 31.45, which require that 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..."

The originating program office should coordinate with the QAM or their designee regarding contracts and interagency/formalized agreements involving environmental data generation during the planning phase. The PM shall ensure that all requests for proposals contain an acceptable description of the QA requirements (usually in the form of a QAPP or detailed study plan) if the contracts require data generation. In addition, the PM shall ensure that a QA review has been completed.

For interagency agreements, before environmental measurements or data collection activities begin, DEQ and other involved agencies must have agreed upon and documented the QA requirements for the project. The PM in consultation with the QAM should ensure that QMP/QAPPs are acceptable prior to recommending award of the contract or interagency/ formalized agreement.

The PM shall review and evaluate the use of these plans. Upon completion of the data generation the PM should conduct a data quality review.

5.7.2.1   *Quality Assurance Program/Project Plan (QAPP)*

Quality Assurance Program/Project Plans are submitted to DEQ for all projects generating environmental data and must be reviewed and approved by the appropriate PM(s) or designee(s). QAPPs

should be reviewed prior to award of the financial assistance. However, if the QAPP is not reviewed prior to award, then the assistance agreement should be conditioned to require an approved QAPP before the beginning of data collection. If grantees make sub-awards (either sub-grants or procurement) under an assistance agreement, they must ensure that the sub-awards meet the applicable quality assurance requirements as appropriate.

6   DEQ DOCUMENTS AND RECORDS

6.1   General

Documents that specify requirements and instructions affecting the quality of environmental programs shall be adequate for the intended purpose and shall be controlled as required by federal or state programs. Documents are controlled by the use of information such as title, date, version, etc. Quality assurance records shall be produced, controlled, and maintained so as to reflect the achievement of the required quality for completed work and to fulfill statutory, regulatory, and contractual requirements. The most current version of controlled documents shall be made readily available to staff and posted online.

DEQ programs have retention schedules for all documents and records (printed and/or electronic) that must be approved by the Department Secretary and the North Carolina Division of Archives. Documents identified to be older versions or obsolete will be archived according to each program's document retention schedule.

The process for maintaining chain-of-custody and confidentiality is a component of QAPPs and SOPs. As such, they are addressed in these documents, including identifying the individuals responsible for maintaining and protecting this information.

6.2   Identification of Quality-Related Documents

Quality related documents and records that are outlined in the records retention policy, federal/state regulations or identified by PMs are controlled. The quality-related documents listed below currently require control:

- DEQ Quality Management Plan (QMP)
- Laboratory Operations Quality Assurance Management Plan for the North Carolina Division of Water Resources Water Sciences Section Chemistry Laboratories
- Laboratory Operations Quality Assurance Manual for the North Carolina Division of Water Resources Water Sciences Section Chemistry Laboratories
- North Carolina Division of Marine Fisheries Recreational Water Quality Assurance Management Plan
- Quality Assurance Project Plans (QAPPs)
- Standard Operating Procedures (SOPs)
- Field Sampling Plans/Study Plans
- Environmental Data Program Guidance Documents

Any of the following may be controlled as required by the applicable QAPP:

- QA/QC Records
- Audit Records
- Calibration Records
- Maintenance Records

QAPPs and SOPs are prepared, reviewed, approved, issued, distributed, maintained, and revised according to USEPA requirements and guidance (QA/G-5 and QA/G-6). Field Sampling Plans/Study Plans specify quality-related requirements/instructions or record quality-related information (per approved QAPPs and SOPs) and are drafted by the appropriate managers and staff. Each document undergoes a peer and chain-of-command review process as described in the program-specific sections below, including archive and document control measures.

Quality Management Plans, QAPPs, and SOPs are prepared, reviewed, approved, issued, distributed, maintained, and revised according to procedures described in Division specific SOPs. Field Sampling Plans/Plans of Study are prepared, reviewed, and approved according to the same procedures as QAPPs. These documents specify

quality-related requirements/instructions or record quality-related information and are drafted by the appropriate managers and staff. Each document undergoes a peer and chain-of-command review process.

Quality documents valid for more than one year generally undergo an annual review process to ensure applicability and are revised as needed using the same peer and chain-of-command review process. As per SOPs regarding development of QAPPs and SOPs, critical revisions to QAPPs, SOPs, and Sampling Plans are tracked in the Change Tracking table located in each document. Program/Project Managers are responsible for distributing QAPPs/Study Plans with critical revisions to each person listed in the QAPP Distribution List. Critical SOP revisions, as well as new SOPs are listed in either program specific or Department-wide emails distributed to appropriate Departmental staff when the documents are posted to the DEQ or Division portal.

The PM is responsible for ensuring the appropriate use of quality-related documents by program/project staff and that these documents and records accurately reflect the completed work. The methods used to accomplish these activities are determined by the individual program/project managers. The PMs are responsible for documenting that those implementing the SOPs have documented that they have read and understand the new SOP or the revisions to an existing SOP. This documentation is maintained by their supervisor.

The QAM coordinates development of Department-wide data-related quality assurance procedures. At a minimum, the QAM maintains procedures for review, approval, distribution, revision, and control of:

- Departmental QMPs
- Departmental QAPPs
- Departmental SOPs

Email notification to the QAM of approved new or revised QAPPs is the responsibility of the approving Division signatory or his/her designee.

6.2.1 Availability

The current versions of the QMP, QAPPs, and signed SOPs are maintained on the DEQ website and/or SharePoint site to facilitate availability to all DEQ staff. The Division of Air Quality Monitoring Section makes available all of its QAPPs and SOPs to regional office technical staff via website posting (http://deq.nc.gov/about/divisions/air-quality/air-quality-data/ambient-monitoring-quality-assurance-documents). Only the most current versions are maintained on the website for use by Departmental staff. When a new version of any of these documents is finalized, it is forwarded to the QAM/designee and posted to the DEQ website. Previous versions are removed from the website and archived as described below.

6.2.2 Archival

Electronic versions of available historical quality-related documents are maintained on the DEQ SharePoint site. The QAM is responsible for ensuring archival of the QMP documents. Maintenance and archival of SOPs, program/project QAPPs/study plans, and quality-related records is the responsibility of the program management, in coordination with the QAM.

6.3 Quality Assurance Records

Quality assurance records are items that furnish objective evidence of the quality of items or activities that have been verified and authenticated as technically complete and correct. Quality assurance records may include photographs, drawings, forms, reports, and electronically recorded data.

The PM in conjunction with the QAM, under advisement by the DEQ Office of the General Counsel and the Attorney General's Office, ensure that quality-related documents and records are in compliance with applicable statutory, regulatory, and USEPA requirements. Sample chain-of-custody procedures are described in each program's SOPs and are USEPA approved.

6.4 Official State Records

Records produced by DEQ and maintained as official records of the State of North Carolina are documented in the Department's Records Retention Schedule. Division directors, or designees, determine what records are needed to reflect the achievement of required quality for completed work and to fulfill any statutory, regulatory, or contractual requirements for environmental programs.

The QAM, or designees, maintain quality assurance records relating to the Department's quality system and recommend that these records be identified in the Records Retention Schedule. Program managers, or designees, shall maintain quality assurance records relating to their respective programs and recommend that these records be identified in the Records Retention Schedule. Project managers, or designees, should maintain quality assurance records relating to their respective projects and recommend that these records be identified in the Records Retention Schedule. These individuals should specify the location of and procedures for identifying, verifying, authenticating, handling, retaining, and disposing of these records and should also maintain a listing of the various types of quality assurance records relating to their respective areas of responsibility.

7   DEQ COMPUTER HARDWARE AND SOFTWARE

7.1   General

Information technology is critical to the performance of the mission of the Department. Computer systems are used to gather, store, analyze, retrieve, visualize, archive, and publish data for use by DEQ staff, interested parties, and the general public. Computer software and hardware used to calculate or develop data for environmental programs included in the Quality Management System are managed to ensure that data are of acceptable precision and accuracy and that data are not corrupted or lost.

Equipment and systems covered under this section include:

- Desktop hardware and software used by DEQ staff
- Server hardware and software used to store and access environmental data and documents
- Communications hardware and software used to interconnect desktop and server equipment including local area networks (LANs), wide area networks (WANs), the Internet, and other remote networks.

7.2   Roles and Responsibilities

The DEQ Information Technology Services Division has been consolidated with other agencies across North Carolina into the North Carolina Department of Information Technology (DIT). DEQ IT staff are functionally in the DEQ organization and report administratively to DIT. This staff retains responsibility for managing computer hardware, software, and data telecommunication infrastructure for the Department through existing agreements. Specific processes, procedures, and individuals responsible for determining the quality of environmental data residing in DEQ databases and information systems are available in program-area QAPPs and SOPs. Some programs utilize computer models to perform environmental data analysis. The individuals and their responsibilities regarding quality-related activities are identified in the QAPPs.

7.2.1   Infrastructure and Security Section

The Infrastructure and Security Section is responsible for the planning and procurement of the Department's LAN/WAN infrastructure (firewalls, routers, switches, hubs, etc.). Installation, operation and maintenance of the LAN/WAN infrastructure is the responsibility of the NC Department of Information Technology (DIT), with the Infrastructure and Security Section coordinating and validating the work done by DIT.

The Infrastructure and Security Section shares responsibility for server support with DIT. DIT installs, operates, and maintains DEQ servers up to the operating system layer; as with the LAN/WAN infrastructure, Infrastructure and Security coordinates and validates DIT work. Infrastructure and Security is solely responsible for operations and maintenance at the application level. This applies to database servers, file and print servers, system management servers, endpoint security servers, geographic information system (GIS) servers, and web servers.

Operations Section is responsible for PC hardware and software maintenance, printer maintenance and other Information Technology hardware and software maintenance. DEQ program staff request software and/or hardware maintenance from the Operations Section by the use of a web based "Help Desk" application called DOTS. In the event that maintenance and/or repair needs exceed the capability of the Operations Section, a vendor or the services of a state-wide maintenance insurance policy may be utilized. Personnel in the Operations Section are typically classified as IT User Support Specialists, Analysts or Technicians.

7.2.2   Enterprise Applications & GIS Section

The Enterprise Applications and GIS Section is responsible for development and maintenance of mission-critical database applications that interface with financial and personnel management systems operated by the State of North Carolina, USEPA, and the Exchange Network. Employees working in this area are typically classified as Application Systems Analysts. Examples of systems that are maintained by personnel in this Section are: IBEAM application infrastructure and business applications, GIS enterprise software, and management for application development projects. The Application Development staff use a variety of software development tools, depending on the requirements of the application. Databases used include Oracle, DB2, and Microsoft SQL Server. Java Enterprise Edition applications, Oracle Forms, Access, or Visual Basic/.NET may be used for the "front-end."

The team is responsible for the development, maintenance, and support of DEQ's Internet sites and website interfaces to internal and external systems, including the submission of DOTS requests, data retrieval, e-Payment, and data visualization.

7.2.3 Environmental Data System Development and Maintenance

The Internet-based Enterprise Application Management (IBEAM) framework is consistent with the State Technical Architecture and is documented in the Agency Technical Architecture. Applications built within the IBEAM framework use DEQ's System Development Lifecycle (SDLC) processes and implement business rules consistently across DEQ applications. Data standards are also implemented within the framework and are built on national Exchange Network and USEPA standards. Consistent standards for reporting are also available to the framework as well as department-wide control and access to information within the IBEAM framework. This ensures that the environmental data comes directly from the divisions' databases, whose integrity is maintained by the division IT staff, and is not exposed to any outside tampering.

Division application development teams in Water Resources, Air Quality, Waste Management, and Marine Fisheries develop applications using a standard SDLC, standard tools, and standard practices. DIT provides support for divisional teams to ensure security consistent with State and DEQ security plans and authentication using the state authentication framework. The framework ensures application development standard methodology, application interface standards, and data conventions and standards.

The DIT GIS Branch provides support to the Department's GeoTeam in coordination with federal, state, and local initiatives. The GIS Branch supports enterprise-level GIS activities such as enterprise software license management, database analysis, and GIS application framework support and maintenance.

7.2.4 Enterprise Data Services (EDS) Team

The EDS team administers the Department's relational database management systems, which include Oracle, DB2, MS SQL Server, and MySQL. Responsibilities include monitoring, storage management, backup/recovery of specific database objects, and maintaining a secure data environment in accordance with NC and Department security policies and standards. EDS is also responsible for administration of the Department's enterprise reporting platform, Business Objects XI. Employees working in this area are typically classified as Database Analysts.

7.2.5 Digital Services Team

The Digital Services Team is responsible for the development, maintenance, and support of all Internet and intranet websites that have been implemented on our consolidated Portal platform, as well as all website interfaces to internal and external systems, including the submission of DOTS requests, data

retrieval, e-Payment, and data visualization. The Portal serves as a content repository for information DEQ communicates to employees, the media, and the citizens of North Carolina. All DEQ web sites on the Portal are fully-integrated, which provides a seamless user experience for every visitor. The team consists of Business and Technology Applications Specialists and Analysts. The Portal platform is comprised of a wide variety of technologies including Oracle Database, Apache Tomcat, Liferay Portal, Java, JavaScript, jQuery, AJAX, and JSON.

7.3   Developing Computer Hardware and Software Requirements

7.3.1   Computer Hardware

The specifications for computer hardware are gathered by the DIT staff supporting DEQ and passed on to DIT to be included on the State contract bulk purchase. The variety of hardware available for purchase is reviewed and updated when a departmental need is not being met.

7.3.2   Computer Software

Computer software is developed on the basis of a Scope document that provides a top-level view of the desired application. The Scope document should include quantifiable measurements that can be used to evaluate the success of the application development effort and clearly delineate the limits of the application.

The functional requirements described by the Scope document are used to develop a Business Application Requirements notebook. Both the Scope and notebook are developed by a Programmer Analyst in collaboration with the end users, management, and other stakeholders. The notebook document provides a detailed overview of the required features and functions and may include a description of the desired user interface, database design/data dictionary, portability requirements, security requirements, reporting capabilities, accessibility requirements, and other features. Once agreement has been reached among the principals that the Systems Requirements notebook adequately describes the application, a Project Plan is developed. The Project Plan enumerates the priorities, sequence of tasks, and roles/responsibilities. Actual application development takes place with iterative cycles of development and testing. Successful implementation of the Project Plan culminates with final application testing and debugging with the users-at-large and, finally, production implementation of the application.

7.4   Evaluating Purchased Hardware and Software

The Operations Section staff is responsible for specifying, procuring, installing, and maintaining computer hardware and software so that they meet the needs of the Department's programs and are consistent with the policies and standards promulgated by the North Carolina Department of Information Technology. PCs, laptops, and other mobile devices are procured via a state-wide contract let by the State of North Carolina Department of Administration and utilized by agencies throughout the State as a block purchase. Specifications are updated at least annually to reflect the state of current technology. Operating system (Microsoft Windows) and office productivity software (Microsoft Office Professional suite) is obtained via a state-wide Enterprise Agreement let by the North Carolina Department of Information Technology. The Enterprise Agreement entitles the Department to all current versions as well as updates.

Standardized disk images that encompass the operating system, office productivity software, and endpoint security software are created for each client hardware platform and tested for proper operation and configuration. Once operationally stable configurations are achieved, images are released for subsequent installations to a particular hardware platform. Images are periodically updated to incorporate critical software updates. System

images are accessible only to authorized Operations Section staff responsible for deployment and maintenance. All operating system and application software is installed from the DEQ network where it is secured against unauthorized use or access.

7.5   Evaluating Hardware and Software Changes

The acceptability of hardware/software configuration standards for Department staff is evaluated by the Chief Information Officer in conjunction with the DEQ Technology Management Committee (TMC). Information about concerns or problems is transmitted to Operations Section staff.

7.6   Data and Information Requirements & Standards

Responsibility for the quality of data produced from or collected by computers, computer systems, and/or databases lies with the related program staff. Depending on the age and design of the database, the system may have fields within the data records documenting the conduct of applicable data review and validation processes. Guidance documents (QAPPs, SOPs and other operational documents) set forth the procedures and means of managing data to ensure their quality during their useful life.

User requirements for developed or purchased systems identify the requirements for data quality and the inspection and testing procedures needed to ensure that the delivered system meets those requirements. The Enterprise Applications Section staff review requirements documents to assure that data quality requirements are met.

The DEQ TMC has the highest level of influence on the relationship between the business direction and the day-to-day technology decision making, including:

- Approval of amendments to the Technical Standards Document;
- Review of projects through the architecture assurance process to ensure compliance with the Technical Standards; and
- Issuing of waivers to projects for exceptions to the Technical Standards.

The TMC members are the Division Directors or their delegates.

7.7   System Safeguards

Systems and data are protected against malicious and unintended loss and corruptions through measures designed to restrict access, detect threats, and reduce the probability of loss.

7.7.1   System Access

Access to systems is administered through the DEQ Computer Access Form. Users are set up to access only the systems they need to do their work. Access is controlled by user id/password authentication both at the desktop level and program application level.

7.7.2   Endpoint Security

Computer malware poses a significant threat to computer systems and the data stored on them. The Department maintains an endpoint security server that pushes antivirus software updates to all client systems connected to the Departmental LAN/WAN. The updates are obtained daily or more frequently if necessary, from the antivirus software vendor.

7.7.3   Backup and Recovery

Server backup and recovery are the responsibility of DIT. Server operating configurations, software, and data are backed up on a daily basis. Multiple generations of media are maintained to support roll-back to prior versions. Backups are scheduled, tested and media stored according to standardized procedures and validated in the Continuity of Operations plans. Users are directed to store all non-volatile data on servers that are covered by the backup plan or to create and maintain a system with equivalent safeguards. Only temporary copies of data are to be stored on hard drives not covered by a backup plan.

8   DEQ PLANNING

Consistent with the Governor's leadership, the strategic planning process identified the following four priority areas for departmental focus:

- Environmental stewardship, including the protection and restoration of water quality, protection of air quality and land quality through the implementation of regulatory and voluntary programs is a central focus for NCDEQ.
- Create a 21st Century NCDEQ that provides a better customer service experience for North Carolina's regulated community and more user-friendly data sources for interested parties.
- Support North Carolina's commitment to address climate change and transition to a clean energy economy as outlined in North Carolina Executive Order 80 (EO 80).
- Promote the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies through the DEQ's Environmental Justice Program.

Quality assurance is supported under the mission and quality priority, as through this objective, DEQ is working to incorporate better planning and management in each program and across divisional lines.

Planning efforts for environmental data are covered under all departmental and divisional strategic planning.

8.1   General

Environmental data-generating programs shall be planned in accordance with State and federal laws and rules, Department guidelines, and contractual requirements. Environmental programs and projects are planned through the development of the Departmental program plans/strategies and budgets, grant work plans, QAPPs, Study Plans, and contracts/cooperative agreements executed by DEQ and external organizations. These documents translate requirements and expectations into measurable specifications, commitments, and performance criteria.

8.2   Planning

8.2.1   Program Planning

Planning is an integral part of each DEQ program; however, the frequency and mode of the planning process varies between Divisions and programs. Many Division programs conduct planning as part of the annual grant continuation/commitment process or conduct ongoing program planning/strategy development sessions as part of their routine activities, while others have dedicated personnel whose primary focus is specifically on planning Division activities.

Programs that require adherence to the QMP are a key component of DEQ's strategic plan. By executing this QMP and achieving the Data Quality Objectives (DQOs), we are ensuring that the goals identified in the strategic plan are met. Annual reviews are conducted to evaluate goals and resources to determine if adjustments are needed. DEQ management and Division directors assess the effectiveness of this process on an annual basis.

8.2.2   Systematic Project Planning

Projects involving the generation, acquisition, and use of environmental data should be planned using a systematic process. A systematic planning process such as the one outlined in the document, *Guidance on Systematic Planning using the Data Quality Objectives Process*, USEPA QA/G-4, or other comparable process, may be used for DEQ programs or projects. DQOs are qualitative and quantitative statements of the quality of data needed to support specific decisions or regulatory actions. Each DEQ

Program/Project Manager (PM) is responsible for initiating a systematic planning process, as appropriate. During the early phases of planning the PM clearly establishes the intended use of the data needed. The process requires significant interaction between the PM, field and laboratory managers and technical staff with significant expertise in the type of activities planned for the program/project. QA staff and data end-users in project planning meetings may include the use of a project-specific planning database. The laboratory managers are a critical component in the planning phase and provide valuable input related to detection limits, methods, and sample loading limits. Quality staff provides guidance on procedures and processes required to ensure the quality of the generated data and on QAPP preparation and review. Technical expertise in other areas, such as engineering design, risk assessment, data validation and data quality assessment activities is provided in the form of written comments to the draft QAPP or may be provided early in the planning phase during meetings, conference calls, or emails.

These Planning activities are conducted to:

Ensure that data collected are of the type and quality appropriate to their intended use, and therefore support decision-making, by defining the project goal(s) and objective(s);
Generate the sampling design to include the type and quantity of data needed, a project schedule, resource requirements and availability, milestones, and any applicable requirements (e.g., what, how many, when, where, and how to collect samples);
Determine what and if any existing data could be used to support decision-making; and
Optimize the data collection efforts by ongoing evaluation of the program needs, data collection activities that support these program needs, and technology advancements available for generating data; and by promoting communication among all involved parties before, during, and after project completion. This method is also used to assess the effectiveness of the systematic planning process.

If expertise in sampling, statistics, risk assessment (both human health and ecological), laboratory analytical services, engineering, or other services are not internally available, external expertise may be sought. Contractors are only sought when sufficient resources are available in accordance with DEQ Procurement Policy in Section 5.

The outputs of the systematic planning process are used for the detailed design of the program/project and preparation of the associated QAPP(s). The QAM, or designee, may provide guidance and review of the process. QAPP documents shall be developed following the procedures outlined in current USEPA guidance. The QAPP is peer reviewed and compared to the QAPP Requirements Checklist. QAPPs are also submitted to the QAWG if there are significant changes. The QAWG or QAM provides any necessary comments to the PM for modification to the draft QAPP. Upon concurrence, the QAPP prepared for DEQ environmental data collection operations/programs funded through USEPA cooperative agreements, etc., must be approved by USEPA.

External or Extramural QAPPs submitted to the applicable Departmental PM are initially reviewed by the program staff/managers. The PM coordinates review of these QAPPs and may submit them to the QAM for review/concurrence/approval.

9 IMPLEMENTATION OF WORK PROCESSES

9.1 General

Environmental programs shall be performed so as to ensure that customer needs and requirements are met, and products and results are produced in a timely manner. Environmental programs conducted by or on behalf of DEQ should be implemented in accordance with approved plans. Exceptions, deviations, and changes to these plans must be documented.

9.2 Planning

The Department ensures environmental work is performed according to plan through the following:

- implementation of a quality assurance program;
- program and project planning;
- staff development and training; and,
- ongoing oversight of performance.

The quality system implemented by DEQ is described in Sections 2 (Departmental Overview) and 3 (*Quality System Components*) and elsewhere in this QMP. Program and project planning inputs, processes, and results are described in Sections 6 (*Documents and Records*) and 8 (*Planning*) of the QMP. Staff development and training activities are described in Section 4 (*Qualifications and Training*) of the QMP. Assessment and response (oversight) programs implemented by DEQ are described in Sections 10 (*Assessment & Response*) and 11 (*Quality Improvement*) of the QMP.

9.3 Implementation of QA Program/Project Plans

At DEQ, QAPPs are "data-focused" plans that are designed to ensure that data gathered or generated to support Department decisions are scientifically sound. The implementation of these plans is the responsibility of the PM and generally includes a meeting of all project managers and staff to discuss the technical and QA/QC requirements specified in the QAPP. The approved QAPPs are placed on the DEQ website to allow continued easy access by all Department staff to the most current version.

Program/Project managers are responsible for assuring that their respective QAPPs are implemented properly and conducted within the specified timeframes. Additionally, they are responsible for documenting any significant departures from the QAPP requirements. The latter may also be documented as part of a Management Self-Assessment or during any associated technical audits.

In general, QAPPs are reviewed annually, and whenever any modifications are made to an existing QAPP, these changes are transmitted to all staff included on the QAPP distribution list. Any new SOPs or modifications to existing SOPs required to correctly document procedures used in a QAPP are prepared/modified and approved. Current SOPs and guidelines are maintained on the Department's website.

10 ASSESSMENT AND RESPONSE

10.1 General

An assessment and response program designed to monitor conformance to, and assess the effectiveness of, the Department quality system continues to be developed and implemented as resources allow. Program development information is available in USEPA Quality Documents such as *Guidance on Assessing Quality Systems (USEPA QA/G-3)*.

An assessment is designed to provide objective feedback about the quality system. It evaluates and documents the management policies and procedures that are used to plan, implement, assess, and correct the technical activities for environmental programs. It may include a quality system document review, file review, and discussions with managers and staff responsible for environmental data operations.

Assessments can be conducted for specific DEQ environmental programs or can apply to entire organizations or sub-organizational units. Some assessments are regularly scheduled (e.g. Select Laboratory Internal Audits as defined in the LOQAM, Quarterly Air Monitoring Performance audits, and Annual Surface Water Sampling Field Technical Audits) or may be specifically scheduled as the result of a trend noted during a data validation procedure (e.g. laboratory method audit). Assessments generally follow a prepared checklist. The assessment results are documented in formal reports and provided to appropriate management personnel for review, response as necessary, and follow-up corrective actions as appropriate. Various assessments may be used by the Department, as appropriate, to assist in determining the status of measurement systems, the adequacy of the data collection systems, the completeness of data collection activity documentation, and the abilities of program management to meet mandated data collection and data quality objectives.

10.2 Assessment Tools

The following tools may be used by the Department to assess its quality system.

10.2.1 Quality System Assessments

System assessments (i.e., audits) are typically conducted as part of a corrective action or when a significant problem is identified or suspected. Program practices and procedures may be assessed by management through a routine random performance evaluation when the quarterly management report data indicate that certain program objectives are not being met (indicated through quarterly "bean counting" or other measures). Additional information is available in the USEPA document *Guidance on Assessing Quality Systems (USEPA QA/G-3)*.

10.2.2 Management Assessment

Management Assessments engage the program/project manager or coordinator and appropriate senior staff to determine if objectives are being met. Internal programmatic evaluation meetings with the QAM and QAWG take place on an annual basis to facilitate communication between management and program staff, address quality concerns and recommend corrective actions. These recommendations are reported to the appropriate management.

10.2.3 USEPA Program Audits

USEPA-sponsored programs may be subject to review or audit by USEPA. Scope and timing of audits may vary depending on the program. Formal assessment of performance by USEPA may occur as part of a comprehensive review and evaluation of Department programs. The process is governed by

USEPA's *Policy on Oversight of Delegated Programs*, which states evaluations should focus on overall program performance.

10.2.4   Technical Audits and Assessments

A technical audit or assessment is a systematic and objective examination of a program or project to determine whether environmental data collection activities and related results comply with the program/project's QAPP and other planning documents (such as SOPs), are implemented effectively, and are suitable to achieve its data quality goals. Additional information is available in the USEPA document *Guidance on Technical Audits and Related Assessments for Data Operations (USEPA QA/G-7).* Technical audits are qualitative assessments of personnel, equipment, facilities, procedures, and QA activities. DEQ data generation activities are audited by Division staff as resources permit or when evidence of an inadequate performance or data quality concerns arises for a particular activity, or according to the schedules outlined in the applicable QAPPs. These audits may cover such programs as ambient air, ambient water, water quality enforcement, drinking water, environmental site assessments, and hazardous waste monitoring activities.

10.2.4.1 *Laboratory Audits*

DWR Laboratory Certification Staff conduct external laboratory audits, including *Laboratory Certification Inspections and Performance Audit Inspections (PAIS)*. Performance Audit Inspections are conducted at the request of and in conjunction with DWR Water Quality Regional Operations staff. These activities are conducted at laboratories performing analyses, test, measurements or monitoring subject to G.S. 143.215.1 and 143.215.63, *et seq*. facilities and as part of the North Carolina Wastewater/Groundwater Laboratory Certification (NC WW/GW LC) processes. PAI candidates are chosen by Department staff in light of facility performance in Proficiency Testing Studies, results of inspections, and review of submitted DMR data. Other audits are conducted at select facilities at the request of the Division.

Laboratory Certification Inspections are conducted by the DWR Laboratory Certification Staff. These activities are conducted at laboratories performing analyses for permitted NPDES facilities and as part of the North Carolina Wastewater/Groundwater Laboratory Certification (NC WW/GW LC) process. *Laboratory Performance Evaluations* (PE) are quantitative audits of the ability of an analytical system to obtain acceptable results. The laboratories must obtain proficiency testing samples (PTs) that are part of an official study obtained from an American Association for Laboratory Accreditation (A2LA)-accredited PT supplier. These audits are used for external QA overview of grantees, NPDES Permittees, and certified wastewater/groundwater laboratories. It should be noted that in 2008, the NC WW/GW LC program appealed to the USEPA Clean Water Enforcement Branch, Water Protection Division for exemption from the National Pollution Discharge Elimination System (NPDES) DMR-QA PT program. After a thorough review of the NC WW/GW LC program, it was deemed that the NCDEQ proficiency testing program provides adequate quality assurance to replace USEPA's DMR-QA PT study program. In addition to these PTs, the Laboratory Section may administer round robin studies and split sample testing. Special audits may be requested by a DEQ program.

The NC WW/GW LC staff track all PE results for NPDES Permittees and certified environmental laboratories and ensures the NPDES Permittees and laboratories conduct follow-up activities for any noted PT deficiencies until they are remedied.

Internal Laboratory Audits of various laboratory activities are conducted by the LQAO or designee to verify that operations continue to comply with the requirements of the laboratory's quality system. The

DWR Water Sciences Section routinely participates in proficiency evaluations through its analysis of PT samples. The LQAO tracks all PT results for the DWR Water Sciences Section and conducts follow-up activities for any noted PT deficiencies to ensure they are remedied. Additionally, audits of analytical methods are conducted by the LQAO.

Triennial audits are conducted of the Division of Air Quality's laboratories in the Ambient Monitoring Section by USEPA Region 4 Quality Staff. Any deficiencies that are identified by USEPA Region 4 staff will be addressed through the Division Director and appropriate Section staff.

10.2.4.2 Technical Audits

Technical System Audits (TSAs) are thorough, on-site, independent quantitative and/or qualitative evaluations of the "*total measurement*" and QA system of a project or program for the purposes of determining (a) the capability of the measurement system to generate data of the required quality and (b) the extent of compliance of an operational system to its applicable QAPP. TSAs may incorporate qualitative reviews of facilities, equipment, training, procedures, recordkeeping, data validation, data management and reporting, as well as quantitative analyses (i.e., performance-based determinations) of measurement system accuracy. The quantitative portion may involve challenging the sampling and/or analytical systems with audit standards, audit equipment, and where possible, personnel who are different from those routinely involved in the operation of the program or project. TSAs are typically conducted on well established, long-running projects or programs on an every 2-, 3-, or 5-year cycle. Results are reported to the PM.

Field Technical Audits (FTAs) are periodic evaluations at the discretion of the Departmental QA staff used to determine field personnel's adherence to QA/QC procedures and QAPPs/SOPs. The DEQ quality staff document their assessments by marking any discrepancy(s) found on the applicable FTA Checklist. These findings are discussed immediately with the field personnel and corrections are implemented. During this process the effectiveness of QC procedures is assessed. These findings are documented in a report format by the DEQ quality staff and provided to the appropriate management and program staff through the chain-of-command. Corrective actions are implemented as determined by the applicable findings.

Field Performance Audits of manual/automated measurement monitoring systems are performed routinely by DEQ quality staff. These may include internal or program-external audits of ambient air monitoring systems or audits of field personnel's adherence to procedures defined in the applicable SOPs. Additional air program field performance audits are conducted during stack testing and as a part of the *air source-monitoring networks* to ensure compliance with USEPA and ADEM air monitoring regulations. Specific program QAPPs may also include audit frequency and other field performance audit requirements.

USEPA Field Audits may be conducted for specific individual programs. Department-external field air audits also include participation in the National Performance Audit Program (NPAP) and Performance Evaluation Program (PEP) as prescribed by regulatory requirements. Any corrective actions will be addressed by the respective Division Director and assigned staff.

Data Management Reviews may be conducted by DEQ quality staff on regular intervals to evaluate the effectiveness of data quality assurance procedures. These include auditing of field staff data entry into various databases as a means of verifying and evaluating *data entry accuracy* and *completeness* quality measures.

10.2.4.3 Data Quality Evaluations

Laboratory and field data generated by or for DEQ staff are assessed based upon the intended use of the data and in accordance with the applicable quality document, where such exists. Evaluations of data quality vary by program; however, any findings are used to determine whether changes in future sampling or analytical work are warranted. If an evaluation identifies a major sampling or analytical problem, associated data may be rejected resulting in re-analysis or re-sampling.

Each program or Division should establish and document data quality assurance procedures and acceptance criteria needed for data assessment in the program or project QAPPs. Each QAPP should include procedures that may be used for assessing the quality of all environmental data generated and processed for bias, precision, completeness, and representativeness. (Refer to USEPA QA/G-9R document, *Data Quality Assessment: A Reviewers Guide* and USEPA QA/G-9S document*, Data Quality Assessment: Statistical Tools for Practitioners*). Program managers are responsible for assuring that data received are checked for completeness and assessed for usability in meeting project objectives. Data qualifier flags are assigned based on each program's and project's QAPP and are specified in SOPs. Project managers assign data reviewer(s) for their projects; these individuals are identified in the organizational chart(s) and organization discussion in each QAPP.

Examples of data quality evaluations include: data validity audits which are conducted for the Department's ambient air monitoring network, other local ambient air monitoring programs, and stack testing program. Also, data submitted by the regulated community pursuant to a license or permit condition are reviewed and verified by technical staff. Each program receiving such data establishes and documents its own standards and procedures.

10.3 **Frequency of Assessments**

The DEQ QMP is reviewed at least once during its five-year review cycle by the QAM, Division Directors, QAWG members and technical staff. Project QAPPs are reviewed annually and Program QAPPs are reviewed every five years.

In addition, the Department relies on several tools or processes to assist with the review of its Quality System.

- The QAM and QAWG conduct periodic evaluations of various quality system components to ensure continued application and expansion of quality system principles.
- Program managers conduct ongoing, real-time surveillance assessment of the quality of work product during the management review that occurs as part of the existing chain-of-command review and approval process. Significant problems with work products trigger a re-evaluation of any associated quality system tools. In such instances, the Department does not intend that program areas await scheduled assessments and corrective actions, but instead recommends the immediate correction of problems discovered during real-time surveillance.
- Any USEPA Region 4 assessments, such as a program review, or laboratory audit serve as a highly-valued critique of the Department's quality system.
- The USEPA Region 4 staff review, provide comments, and approve Departmental program/project QAPPs.

Table 1. Internal & External Assessment Commitments

Program	Audit Type	Frequency	Internal/External
Laboratory	Laboratory Audits (General Procedures)	Triennial	Internal and external
Laboratory	Laboratory Audits (Method)	Annual	Internal and external
Laboratory	Laboratory Performance Evaluations	Annual	Internal and external
Surface Water Quality Monitoring	Data Management Reviews	Quarterly	Internal
Surface Water Quality Monitoring	Field Technical Assessment (Crew Leaders)	Annual	Internal
Surface Water Quality Monitoring	Field Performance Audits	Annual	Internal
Ambient Air Quality Monitoring	EPA Technical Systems Audit	Every 3 years	External
Ambient Air Quality Monitoring	Internal Systems Audit	As needed	Internal
Ambient Air Quality Monitoring	Network Assessment	Every 5 years	Internal and external
Ambient Air Quality Monitoring	Network Review (40 CFR Part 58, Appendix A, D and E evaluations)	Annually	Internal and external
Ambient Air Quality Monitoring	Network Plan	Annually	Internal and external
Ambient Air Quality Monitoring	Quarterly Data Completeness	Quarterly	Internal
Ambient Air Quality Monitoring	Annual Data Certification	Annually	Internal
Ambient Air Quality Monitoring	Quality Assurance Project Plan Review and Updates	Review annually and update as needed and at least every 5 years	Internal
Ambient Air Quality Monitoring	Standard Operating Procedures Reviews	Review annually and update as needed and at least every 5 years	Internal

Program	Audit Type	Frequency	Internal/External
Ambient Air Quality Monitoring	Data Quality Assessment	AMP256 and AMP600 review quarterly and annually; control chart review daily for CO and NO_2 and monthly for $PM_{2.5}$	Internal
Ambient Air Quality Monitoring	National Performance Audit Program	20 percent of sites per year/each site once every six years	External
Ambient Air Quality Monitoring	$PM_{2.5}$ Performance Evaluation Program	8 valid audits per year/each monitor audited every 6 years	External
Ambient Air Quality Monitoring	Annual Performance Evaluation for Gaseous Monitors	At least once per calendar year and every 365 days	Internal
Ambient Air Quality Monitoring	Semi-annual Flow Rate Audits for PM Monitors Procedural	Twice per year, separated by 5 to 7 months, preferably every quarter	Internal
Information Systems: Permit Compliance System (PCS)*	Data Management Review	Annual	
Air Toxics Laboratory	Technical Systems Audit	Every 3 years	External
Air Toxics Laboratory	Internal Systems Audit	As needed	Internal

Program	Audit Type	Frequency	Internal/External
Air Toxics Laboratory	Network Assessment	Every 5 years	Internal and External
Air Toxics Laboratory	Network Review and Network Plan	Annually	Internal and External
Air Toxics Laboratory	Quarterly Completeness	Quarterly	Internal
Air Toxics Laboratory	Annual Data Certification	Annually	Internal
Air Toxics Laboratory	Quality Assurance Project Plan Review and Updates	Review annually Update every 5 years	Internal
Air Toxics Laboratory	Standard Operating Procedures Reviews	Annually	Internal
Air Toxics Laboratory	Data Quality Assessment	AMP251 Review Quarterly and Annually Control Chart Review Daily and Monthly	Internal
Air Toxics Laboratory	NATTS Proficiency Testing	Performed twice per year for VOC and Carbonyls or as available by EPA contractor	External

This audit may be re-evaluated with the implementation of the ICIS database

10.4   Selection of Assessment Personnel

All Departmental program areas have substantial workloads associated with: 1) the core program work functions; 2) ongoing development of SOPs and other quality system tools; and 3) self-assessment within the program areas. Program areas designate un-biased experienced staff to participate in Department-wide quality assessment efforts. Current financial resources are not sufficient to allow independent/external assessors or auditors. However, each program office strives to assign quality assurance personnel that have minimum perceived conflict of interest. Each QAPP approved by USEPA defines the roles of such assessors/auditors and any major issues are resolved prior to approval of the plans.

10.5   Assessment Planning

The Department does not currently have a specific established assessment plan in place because some of the essential features of a set plan continue to expand and improve. Section 10.2 demonstrates that the Department has a reliable inventory of assessment tools available for use. As demonstrated in Section 10.3, the Department also has a basic schedule under which assessments are carried out. The planning and implementation of each future assessment type will be documented in an assessment report presented to DEQ management.

10.6   Response

Responses to the findings of an audit or assessment are anticipated at several levels. The Program/Project Manager has the responsibility to review the assessment findings and take the necessary corrective action(s) if

any deficiencies are found during the audit. The results of all assessments/audits performed by DEQ are documented in an audit/assessment report along with required corrective actions.

10.6.1 Corrective Actions

Corrective actions address findings identified during an audit or assessment or as a result of informal management reviews. Written responses to the formal assessment finding should be prepared and the effective dates of all corrective actions noted. Formal corrective actions are documented and tracked through completion by quality staff. Follow-up review of all corrective actions should be conducted to confirm that the prescribed action was adequate to address any deficiencies noted in the audit report.

Some corrective actions are initiated and completed immediately by the PM or supervisory staff. Significant problems with work products trigger re-evaluation of any associated quality system tools. In such instances, the Department does not intend that program areas await scheduled assessments and corrective actions, but instead recommends the immediate correction of problems discovered during real-time surveillance.

Corrective actions written and presented to the Department by USEPA Region 4 QA Managers (such as a Laboratory Audit) are always a priority for senior Management. Either the Department QAM implements the USEPA Region 4-recommended corrective actions through direct involvement at the Department-wide level, or Branch and program managers implement the USEPA Region 4-recommended quality system corrections with QAM and senior management input and oversight.

10.6.2 Dispute Resolution

In order to resolve disputes related to quality assurance, DEQ will strive to resolve the issue at the lowest practicable administrative level. The dispute resolution process shall begin when either disagreeing party declares an issue to be irresolvable and sends written correspondence to the other party defining the disputed issue and presenting supporting arguments for the first party's position on the issue. All parties shall make every reasonable effort to resolve disputes through discussion and negotiation. Should an agreement not be reached at this level, the issue will be directed to the Division Director. If the issue is not resolved, it will be directed to the QAM who will work to resolve the problem with appropriate Division management and, if needed, the Assistant Secretary for the Environment and the Secretary. The resolving officials will document the resolution and provide it to the disputing parties. Department senior management, including the Secretary and Assistant Secretary for the Environment, may take the lead in resolving any resource or policy issues that inhibit pursuit of corrective action measures by any Departmental program area. The Secretary and Assistant Secretary for the Environment may modify the assessment recommendation.

11   QUALITY IMPROVEMENT

11.1   General

Quality system deficiencies shall be prevented wherever possible. Identified deficiencies shall be documented and corrected in a timely manner as resources allow. Corrective actions should be verified to ensure timely and effective implementation. Efforts are made to continuously improve the Department's quality system. Systems, documents, and tools described in preceding sections summarize the approach taken by DEQ to plan, organize, implement, monitor, and assess quality systems for environmental programs. All personnel working on environmental programs are encouraged to identify, plan, implement, and evaluate quality improvement activities for their areas of responsibility. Examples of communication may include: coordination meetings, conference calls, electronic (email, fax), letters and memos, etc. Personnel should prevent quality problems wherever possible and report opportunities for improvement as well as quality problems as they are identified.

11.2   Quality System Implementation

The Secretary, in conjunction with the Assistant Secretary for the Environment, has the overall responsibility for the development, implementation, and continued operation of the DEQ Quality Management System (Section 2.7.1). The QAM has the authority and responsibility for managing the QA activities within the Department (Section 2.7.2). The DEQ quality staff (QAWG) have the overall responsibility for evaluating the effectiveness of the Department's quality system. In addition, DEQ PMs have the responsibility for continual monitoring of the effectiveness of their individual program's quality system.

11.3   Process(es) for Continuous Improvement

Internal reviews per schedule in 10.3 provide a cycle of continuous improvement. Ongoing interaction with USEPA Region 4 managers, along with annual USEPA reporting requirements and periodic program reviews and audits performed at DEQ by USEPA also enable the Department to continue steady, long term improvement of its quality system. Additionally, quality system issues detected during the real-time surveillance (inherent in the Department's operations and chain-of-command for review and approval) further ensures steady improvement of the Department's quality system development, implementation, assessment, and improvement cycle.

11.4   Process(es) for Preventing or Improving Conditions Adverse to Quality

11.4.1   Preventing Conditions Adverse to Quality

The Department's use of standard procedures/guidelines and a chain-of-command review and approval process serve to ensure quality work products and also help guarantee the effectiveness of existing and new quality system tools. Various internal and external quality training activities are used by the Department in preventing conditions adverse to quality. Specific quality training sessions are developed in response to requests by Departmental programs or in response to needs as determined by internal or external audits.

11.4.2   Identification of Conditions Adverse to Quality

The chain-of-command for review and approval also serves to detect problems with the quality system. Any perceived decline in the quality of work products triggers a review of quality system tools and methodologies. For example, if a work product does not meet established standards it could be an indicator that management and staff should revisit and perhaps revise one or more of the written SOPs. The tools to ensure quality work products —the QMP, QAPPs, and SOPs—are systematically put into place at DEQ as a result of the Department's commitment to expanding the quality system. These tools

lead to standardization and help put widely accepted business practices into common use. Various assessments conducted by QA staff also keep quality system development on track and help to identify problems, or gaps in the Department's quality system.

11.4.3 Correction of Conditions Adverse to Quality

The Department intends that any quality system problems detected by the chain-of-command for review and approval process, QA staff assessments, or USEPA Region 4 audits will be   addressed in a timely manner. Corrective actions should be implemented by the affected program and tracked by the appropriate quality staff to ensure the effectiveness of quality system tools (i.e., SOPs and QAPPs) is addressed within a reasonable time after problems are detected and reported.

11.4.3.1 Deficiencies and Non-conformances (Informal Corrective Actions)

Significant deficiencies and non-conformances to QAPPs, SOPs, or Department requirements observed outside of a formal audit or assessment process are reported by Department staff to supervisors. Each Section Chief or PM should establish who has authority to suspend or stop work upon detection and identification of an immediate adverse condition affecting quality or health and safety. The deficiency or non-conformance should be documented by the supervisor or designee and forwarded to the appropriate project manager and lead quality assurance staff. A formal Corrective Action Plan (CAP) may be required, and if so, tracked until closure. Any documentation should be included in the project or program file(s) to ensure that future individuals involved with the project or activity are able to trace the evolution of procedural or policy change (including what was done, by whom, and why).

11.4.3.2 Formal Corrective Actions

When significant deficiencies and non-conformances to QAPPs, SOPs, or Department requirements are observed during a formal audit or assessment process a corrective action system should be employed. Corrective actions may be immediate or long term. Immediate corrective actions form part of normal operating procedures such as to correct data or repair nonconforming equipment. Long-term corrective actions may be required to eliminate the cause(s) of nonconformance through training, or development of, or revision to, an SOP. In either case, the occurrence of the problem, the corrective action employed, and the verification that the problem has been eliminated should be documented. In the event quality problems are identified, the quality staff, in consultation with the PM, or designee, determine whether attainment of acceptable quality requires either immediate or long-term actions, or both.

The Steps comprising a closed-loop corrective action system typically include:

Define the problem and any programmatic impact;
Assign the responsibility for investigating the problem;
Document the means by which corrective action completion is documented and verified;
Investigate and determine the cause(s) of the problem;
Determine a corrective action to eliminate the problem including action(s) needed to prevent recurrence;
Estimate a timetable;
Assign and accept responsibility for implementing corrective action;
Establish effectiveness of the corrective action and implement the correction; and,
Verify that the corrective action has eliminated the problem.

12   COMPETENCY OF DATA GENERATED UNDER USEPA ASSISTANCE AGREEMENTS

This section addresses the USEPA's *Policy to Assure the Competency of Organizations Generating Environmental Measurement Data Under Agency-Funded Assistance Agreements (FEM-2012-02)*. The policy requires organizations performing activities involving the use or generation of environmental data under covered assistance agreements shall provide the Agency with:

- Quality documentation such as a quality management plan (QMP), and/or other documentation that demonstrates conformance to U.S. EPA quality program requirements; and
- Demonstration of competency in the field(s) of expertise.

The USEPA policy directive (FEM-2012-02) states that demonstration of competency may include, but is not be limited to:

- Current participation in accreditation or certification programs that are applicable to the environmental data generated under the Agency-funded assistance;
- Ongoing participation by the organization in proficiency testing (PT) or round robin programs conducted by external organizations;
- Ongoing U.S. EPA accepted demonstrations and audits/assessments of proficiency; and
- Other pertinent documentation that demonstrates competency (e.g., past performance to similar statement of work [SOW]).

Competency is achieved through implementing the quality system components for those DEQ programs that generate data under USEPA assistance agreements. Quality system components include Quality Assurance Program Plans (QAPPs) and Standard Operating Procedures (SOPs) or other quality system components that are described for each Division in the appendix.

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NC DWR. 2006. Standard Operating Procedures for Benthic Macroinvertebrates (July 26, 2006) Updated and approved 12/27/2017

NC DWR. 2006. Standard Operating Procedures for Fish Tissue Assessments (July 26, 2006) Updated and approved 3/28/2014

NC DWR. 2007. Ambient Lakes Monitoring System Quality Assurance Project Plan (February 1, 2007) Updated and approved 3/28/2014

NC DWR. 2007. Benthic Macroinvertebrate Monitoring Quality Assurance Project Plan (July 3, 2007) Updated and approved 3/28/2014

NC DWR. 2007. Fish Tissue Quality Assurance Project Plan (July 3, 2007) Updated and approved 3/28/2014

NC DWR. 2007. Stream Fish Community Assessment Quality Assurance Project Plan (July 3, 2007) Updated and approved 3/28/2014

North Carolina Administrative Code, Title 15, Department of Environmental Quality, Chapter 2, Environmental Management Division, Subchapter 2H, Procedures for Permits, Approvals, Section .0800, Laboratory Certification.

USEPA. 2018. Region 4 Quality Management Plan (August 2018) Updated and approved 8/17/2018.

APPENDICES – DIVISIONAL DATA QUALITY ASSURANCE STRATEGIES

APPENDIX A: DIVISION OF AIR QUALITY

Management and Organization

The Division of Air Quality (DAQ) is one of the divisions within the North Carolina Department of Environmental Quality (DEQ). The DAQ is comprised of four sections (Ambient Monitoring, Permitting, Planning, and Technical Services) and seven regional offices (Asheville, Fayetteville, Mooresville, Raleigh, Washington, Wilmington, and Winston-Salem). Each DAQ Section Chief and Regional Supervisor is responsible for ensuring compliance with the DAQ Quality Assurance Program Plans (QAPPs) for their respective areas. The Section Chiefs report to the DAQ Director while the Regional Supervisors report to the DAQ Deputy Director who reports to the DAQ Director, as illustrated in the organizational chart below.

The Director of the DAQ is responsible for the broad, overall management of the DAQ-related portions of the NCDEQ Quality Management Program (QMP). Each DAQ Section Chief is responsible for ensuring compliance with the QAPPs and standard operating procedures (SOPs) for their respective sections. No designated DAQ staff member is solely responsible for quality assurance; rather quality assurance is considered an integral component of all work performed by DAQ staff.
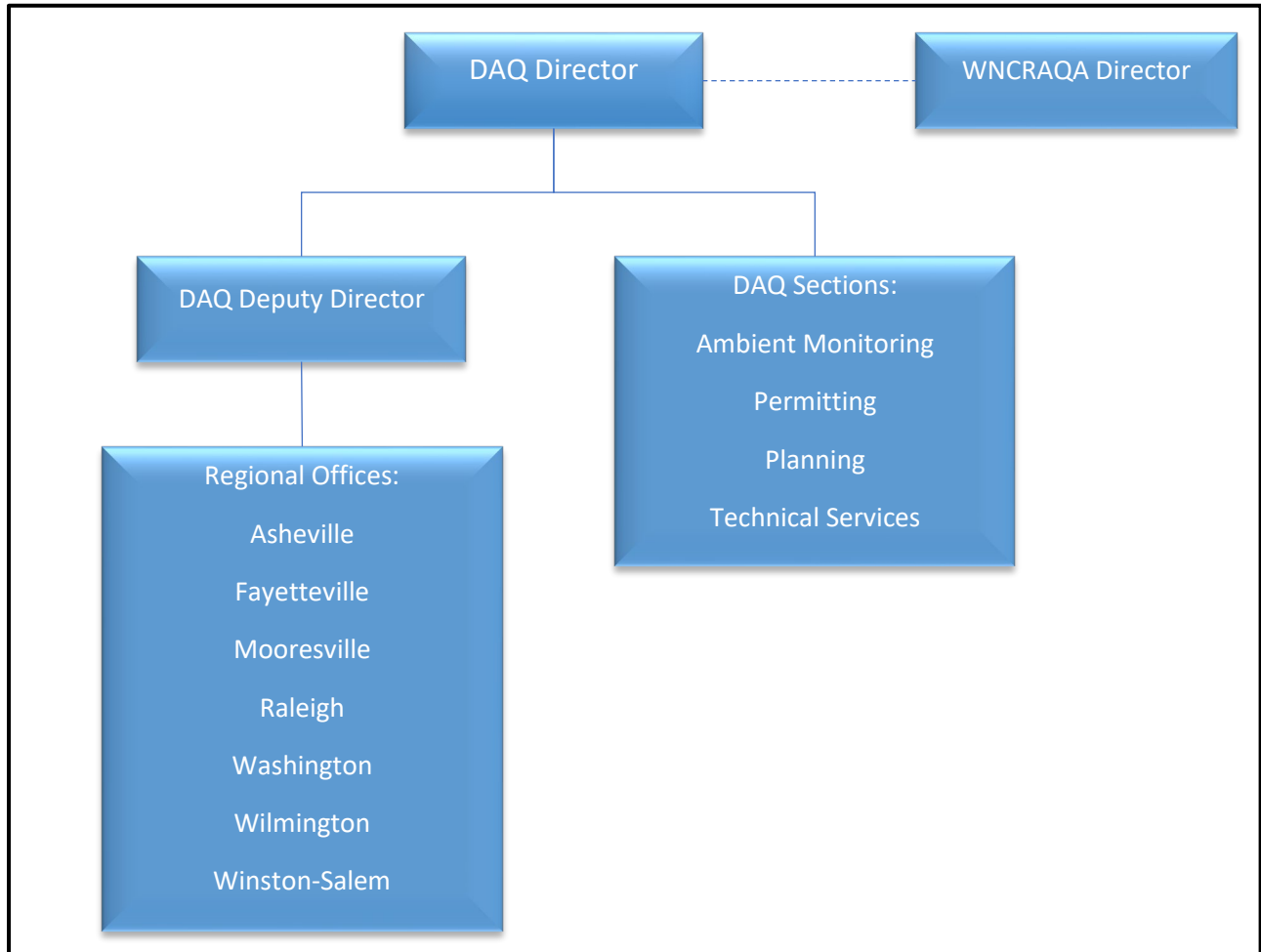
RELATIONSHIP WITH WESTERN NORTH CAROLINA REGIONAL AIR QUALITY AGENCY (WNCRAQA)

Roles and Responsibilities:

The WNCRAQA is a local agency operating as a department of the Buncombe County Government in North Carolina. Consequently, WNCRAQA follows the administrative policies of the Buncombe County Government. The administrative policies of Buncombe County Government are not related to the Quality Assurance/Quality Control activities specific to the collection of environmental data. Unless specifically identified in the WNCRAQA QMP as a deviation from DEQ practices, WNCRAQA follows the quality management procedures outlined in this QMP for activities involving the collection and use of environmental data. The WNCRAQA air monitoring program follows the NCDAQ's QAPPs and SOPs relevant to the pollutants sampled as documented in the WNCRAQA QMP. These QAPPs and SOPs are listed in the table below "Air Quality Monitoring Site Information."

Structure:

Western North Carolina Regional Air Quality Agency
Staff Organizational Chart

David Brigman — Director

Accounting Technician

Ashley Featherstone — Permitting Program Manager

Kevin Lance — Field Services Manager

Betsy Brown — Air Quality Supervisor

James Raiford — Senior Air Quality Specialist

Mike Matthews — Senior Air Quality Specialist
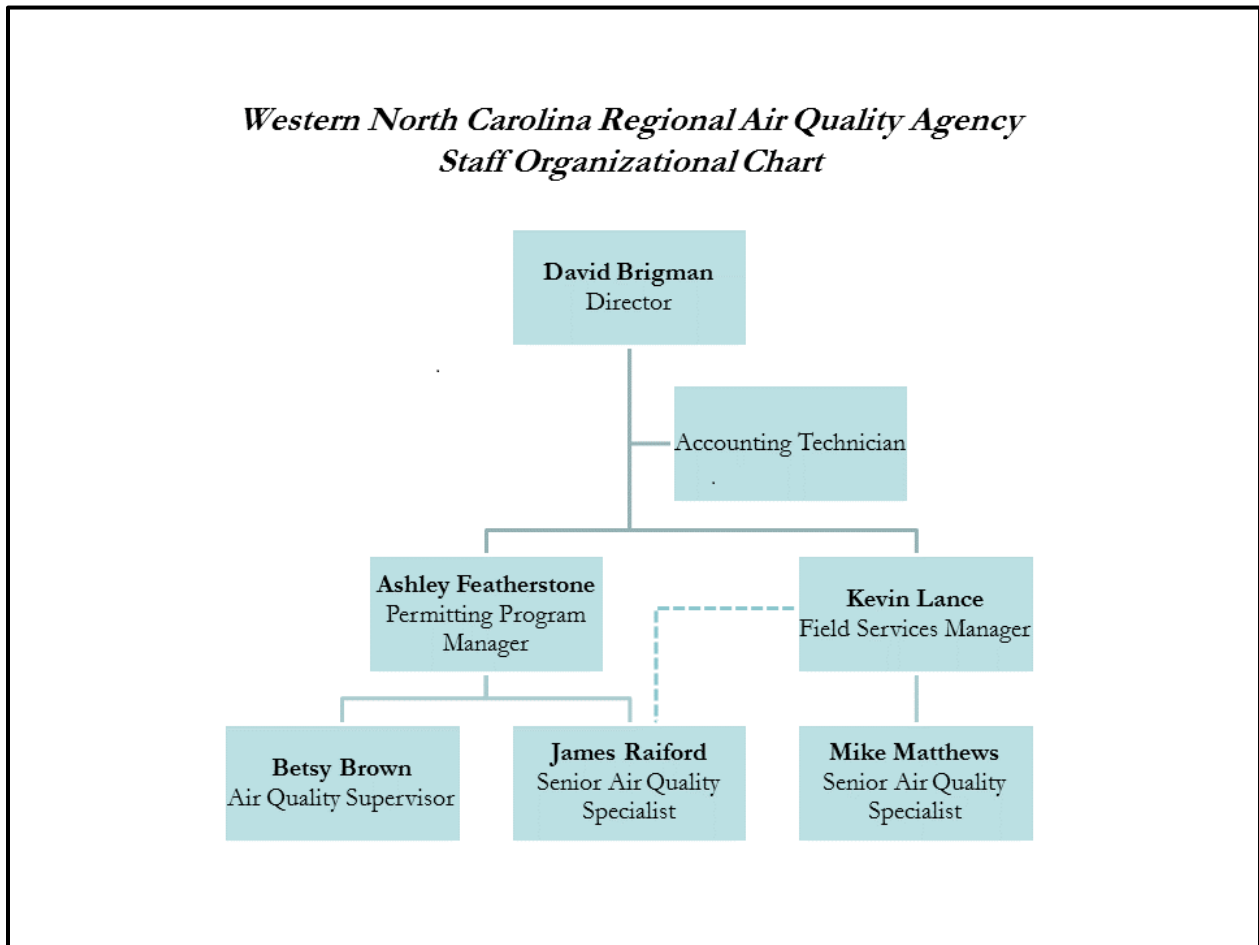
Oversight & Quality Assurance:

The NCDAQ Ambient Monitoring Section (AMS) provides oversight to the WNCRAQA as discussed below to ensure the agency collects valid data that meets the EPA's required data quality objectives.

The AMS includes the WNC monitors in its annual request each year to EPA Region 4 for National Performance Audit Program (NPAP) and Performance Evaluation Program (PEP) audits. Both of these programs are described in more detail later in this appendix, but they both provide independent performance evaluations on individual monitors. In addition, the Electronics and Calibration Branch (ECB) conducts quarterly performance evaluations on the WNCRAQA ozone monitor. The WNCRAQA Board of Education site serves as the PQAO's collocated federal reference method, or FRM, and beta attenuation monitor, or BAM, 1022 site. This collocated site also helps the NCDAQ to evaluate the quality of the data produced by the WNCRAQA monitoring staff. The AMS also conducts technical systems audits on the WNCRAQA program at least once every three years, and ideally annually, to ensure the program is following the QAPPs and SOPs and properly maintaining all of their documentation. Every year the WNCRAQA conducts 40 CFR Part 58, Appendix A, C, D and E evaluations on their monitoring stations and monitors and sends the completed reports to the NCDAQ. The NCDAQ reviews these reports and submits them to EPA Region 4 as part of the North Carolina annual network monitoring plan. Besides being included in the NCDAQ annual network monitoring plan, the WNCRAQA sites and monitors are also included in the NCDAQ five-year assessment performed on the monitoring network in years ending in 5 or 0.

The ECB also provides maintenance and training on an as needed basis. The NCDAQ AMS assists the WNCRAQA when requested and extends invitations to workshops, training events and workgroup calls to exchange information and ideas and help ensure consistency. Ambient monitoring data collected by the WNCRAQA is polled every hour by the NCDAQ polling system and evaluated daily for anomalies or issues that need immediate attention. The WNCRAQA staff verify data monthly for continuous monitors and weekly or semi-monthly for the sequential monitors. The NCDAQ validates all of WNCRAQA data and reports it to the AQS. Data are validated monthly for continuous monitors and quarterly for sequential monitors. The NCDAQ validation process includes reviewing WNCRAQA e-logs, chain-of-custody forms, and filter and canister datasheets. The WNCRAQA data are included in quarterly audits of data quality as well as completeness, annual assessments of data quality, and the review process conducted before certifying the data on May 1 of each year. When requested, the Projects and Procedures Branch personnel within the AMS are available to offer assistance for any anomalies or incongruities that are encountered. Additionally, the WNCRAQA does not perform in-house laboratory work. Therefore, laboratory work needed by the WNCRAQA is performed by the NCDAQ laboratories, including the weighing of filters and analysis of toxic air samples.

Monitoring Activities:

Air Quality Monitoring Site Information				
Site Name / Location	Pollutants Monitored	QAPPs	Monitor Type	SOPs
Bent Creek / South Buncombe County	Ozone	Criteria Air Pollutants QAPP, approved 11/2/2006; Ozone QAPP, EPA approval pending	Thermo 49 i ozone monitor	Ozone operator's SOP, 2.7.1
Board of Education / Central Buncombe County	$PM_{2.5}$ (2 Monitors)	PM 2.5 Ambient Monitoring, approved 12/19/1998;	Thermo 2025 I sequential PM monitor	FRM operator's SOP, 2.24.2

		Particulate Monitoring QAPP, EPA approval pending	MetOne BAM 1022 continuous PM monitor	BAM1022 operator's SOP, 2.46.2
Asheville-Buncombe Technical Community College / Central Buncombe County	Toxics Special Purpose Monitor	Urban Air Toxics Monitoring	Xontech Model 911 Canister Sampler	VOC operator's SOP

DAQ Quality System Components

The first comprehensive DAQ QAPP was finalized by the DAQ on August 15, 1984 and approved by the U.S. Environmental Protection Agency, Region IV, Regional Administrator, on October 3, 1984. Since that time, several additional QAPPs have been written to replace the original DAQ QAPP. These QAPPS, detailed in Table 1 below, serve as the foundational building blocks for the DAQ's quality assurance effort.

Table A1. DAQ QAPPs and USEPA Approval Dates

QAPP	**DAQ Approval Date (revision)**	**USEPA Approval Date**	**Comments**
Ambient Air Monitoring			
Criteria Air Pollutants	September 30, 2006 (0)	November 2, 2006	Will be replaced by individual QAPPs
SO_2 Data Requirements Rule (DRR) QAPP	December 1, 2016 (0)	December 21, 2016	Separate QAPP required by EPA for DRR monitoring
Population-Weighted Emission Index SO_2 QAPP	February 22, 2019 (0)	USEPA approval pending	Will replace part of Criteria QAPP
Ozone QAPP	May 16, 2019 (0)	July 11, 2019	Replaces part of Criteria QAPP
Near-road Monitoring QAPP	May 29, 2019 (0)	July 9, 2019	Replaces part of Criteria QAPP
NCore Multipollutant Network	February 18, 2019 (1)	USEPA approval pending (1)	Update to original NCore QAPP
Northampton County Background Monitoring Program	May 13, 2019 (0)	USEPA approval pending	New QAPP for new monitoring project
Rotating Background Monitoring Program	May 24, 2019 (0)	USEPA approval pending	Will replace part of Criteria QAPP

PM 2.5 Ambient Monitoring	November 24, 1998 (0)	December 19, 1998	Will be replaced by PM QAPP
Particulate (PM) Monitoring QAPP	September 6, 2018 (0)	USEPA approval pending	Will replace part of Criteria QAPP and PM 2.5 QAPP
PM 2.5 Speciation	December 12, 2001 (0)	January 16, 2002	Update is in progress
Urban Air Toxics Monitoring	April 27, 2012 (0), August 11, 2014 (1) March 29, 2018 (2)	August 20, 2012 USEPA comments received May 15, 2018	Update is in progress
Planning			
Emissions Inventory	August 12, 2010 (0)	August 30, 2010	None
Photochemical Air Quality Modeling	August 2, 2011 (0)	August 22, 2011	None

The DAQ collects environmental data through their ambient monitoring program. They also use environmental data collected and reported by external sources to develop a state emissions inventory and to conduct air quality modeling. Therefore, the DAQ has developed QAPPs for both environmental data acquisition and environmental data use. Detailed SOPs, field logbooks, and e-logs are important quality assurance components for data acquisition/generation while electronic data transfer and spot checking of data are used in modeling exercises and emissions inventory work.

Personnel Qualifications and Training (See Section 4 also)

DAQ staff working in positions responsible for generating or using environmental data are initially selected for their position using a skills-based job classification and hiring process. Once hired, DAQ staff learn their position's responsibilities using established SOPs and on the job training. Workshops and training courses offered by USEPA and other entities are used to maintain and enhance technical knowledge and expertise. The DAQ managers and staff work collaboratively to identify relevant training opportunities. Job knowledge and quality of work are included as critical components of yearly employee performance plans.

Currently, the DAQ has a full-time Safety Consultant who coordinates and/or conducts OSHA and other safety related training. The DAQ has recently established a half-time Training Coordinator to facilitate other work-related training. The Training Coordinator will maintain electronic training records for sessions which he/she coordinates and for those educational offerings included in state on-line training modules.

Procurement of Items and Services

See Section 5.

Documents and Records (See Section 6 also)

The DAQ's records retention program is conducted in accordance with the State's records retention program. Records and correspondence related to permitted sources of air pollution and public hearings are stored in electronic databases and/or kept in a secured central file room under supervision.

Hard copy sample-related documents and records (i.e. sample run data sheets and filters) are stored at the DAQ Raleigh headquarters following receipt from regional offices. Chain of custody documentation is stored at the

laboratory receiving the sample and conducting the analysis. Calibration and ambient monitor maintenance records are stored at the Raleigh Electronics and Calibration Branch (ECB) headquarters or at the appropriate organizational unit. Field data are transferred to EXCEL documents and stored on a network shared area and organized per regional office. Collected real-time ambient data are transferred and stored in an electronic data acquisition system, Envidas. Electronic files are stored and backed-up nightly on a secured network drive housed in Raleigh. Electronic copies of ambient lab data, field data, certification documents, and QA data are also stored in the DEQ IBEAM database.

Supporting documentation and data certification forms for electronic emission inventory data are stored in the appropriate regional office and adhere to the State's records retention schedule.

In DAQ, all management and supervisory staff are responsible to ensure these documents are developed and maintained.

Computer Hardware and Software

See Section 7.

Planning (See Section 8 also)

Ambient Monitoring

The Ambient Monitoring Section Chief is responsible for ensuring that an ambient air monitoring system-wide review is conducted at least annually to confirm that collected ambient data are of the expected quality. This generally takes the form of a yearly evaluation of the state-wide monitoring network, air monitoring and laboratory equipment, and procedures. Such reviews include assessing the goals and implementation of the air monitoring network, the condition of equipment, identifying parts and replacement instrumentation, and publishing the recommended Annual Network Plan and Five-year Network Assessment for public comments and federal approval.

Planning Section

The DAQ's Planning Section conducts on-going air quality program planning activities driven in large part by state-wide initiatives and federal requirements. Staff compiles and assesses environmental data reported by permitted stationary point sources in addition to other point (i.e., aircraft and rail yards), nonpoint (area), mobile (on-road and non-road), and wildland fire (i.e., prescribed and wildfire) source emissions data. These data are utilized in reporting of annual air emissions inventories to federal agencies, developing state-wide emissions inventory reports, formulating air quality control strategies and computer modeling atmospheric concentrations of pollutants. The DAQ Planning Section Chief is responsible for producing work products used to ensure that air program requirements and deadlines are met.

Implementation of Work Processes

Implementation of work processes is described in the quality assurance documents and SOPs. In addition, reports of quality assurance activities are produced for USEPA as a part of satisfying grant commitments and reporting requirements

Ambient Monitoring Section

Two types of samples are collected by the ambient monitoring program. Scheduled samples are collected via canister, cartridge, or filter during defined time intervals and sent to state and external laboratories

for analysis. Continuous samples are collected and analyzed by automated instrumentation at each monitoring site and the data are reported electronically as real-time concentrations. Work processes described in sample and monitor-specific SOPs assure that samples are collected, processed, and analyzed consistently and correctly. Operation, calibration and maintenance-specific SOPs contain detailed procedures describing these processes.

<u>Planning Section</u>

Stationary source emissions inventory data from permitted facilities are collected primarily via web-based self-reporting program. The DAQ provides instructions, forms, spreadsheets, informational links and emission factors to facilities to aid in communicating DAQ's data quality expectations and to assure that reporting facilities are using the most current assumptions and emission factors. Emissions data are electronically reported by facilities to the appropriate regional office at defined intervals. Data are reviewed by DAQ staff in accordance with quality procedures described in the QAPP and related SOPs. Quality assurance evaluations are captured using a common checklist developed with input from all regional offices.

Other stationary point (aircraft and rail yards), nonpoint, mobile, and wildland fire source emissions inventory data are compiled by Planning Section staff. They follow USEPA approved inventory development procedures, modeling guidelines, and calculation templates to generate source-specific emissions inventories for a given pollutant. The state-wide emissions inventory data for all source sectors are reported in three-year increments to USEPA based on the process and procedures established in USEPA's Air Emissions Reporting Requirements Rule.

Assessment and Response

The DAQ relies on workgroups and internal and external audits to assess the effectiveness of its air quality program. Workgroups meet periodically and are composed of representative staff from the central office, regional offices, and where appropriate, local program agencies. Workgroups evaluate DAQ policies and procedures and suggest improvements in program areas such as permits, compliance, monitoring, emissions inventory, information technology and database management activities.

The DAQ conducts periodic internal audits to confirm that quality measures are followed and to identify areas for improvement. The DAQ Ambient Monitoring Section conducts monthly field instrument quality audits and the air monitoring program is audited once every three years by the USEPA in accordance with procedures detailed in its own policies, QAPPs and SOPs. The DAQ Planning Section conducts internal audits of data and the data analyses used to prepare emission inventories.

Quality Improvement

Continuous quality improvements result from on-going training and the assessment and response activities described in the preceding paragraph. In addition, DAQ staff attends regional and national meetings, workshops, and training courses where new methodologies and quality-related concepts are shared. This exchange of ideas supports further improvement in quality management. The DAQ also identifies and implements work processes where utilizing electronic transfer of data and electronic calculations improve efficiency, help to minimize errors and improve quality results. The DAQ's USEPA-approved QAPPs contain additional details on quality improvement such as the development and use of SOPs. Updates and modifications to QAPPs and SOPs are communicated to staff to ensure that improved processes and procedures are uniformly incorporated into the work flow.

Competency of Data Generated Under USEPA Assistance Agreements

<u>Ambient Monitoring</u>

The supervisor of the DAQ's Projects and Procedures Branch (PPB) is responsible for conducting an informal management system review (MSR) annually when compiling the Ambient Monitoring Network Plan. The Monitoring Network Plan is a periodic network assessment that ensures that DAQ is operating appropriate monitors in the correct locations under approved conditions. The network plan contains information such as sampling and analysis methods, operating schedules, and detailed siting parameters. The document is approved by the DAQ Director prior to being posted for public comment and then forwarded to USEPA for annual approval.

Technical assessments are conducted by field personnel for each monitor according to the minimum requirements listed in the Code of Federal Regulations. Examples of such assessments include monthly verifications, quarterly audits, and/or daily span checks. Each monitor has a detailed SOP that specifies the type and frequency of technical assessments. The DAQ has a three-tier quality assurance system for field-generated environmental data that includes review by the site technician, the regional ambient monitoring coordinator, and the central office chemist. Furthermore, the DAQ participates in USEPA's National Performance Evaluation Program (NPEP), which includes the NPAP for gaseous monitors and the PEP for PM2.5 monitors. The NPAP and PEP provide independent assessments that examine the objectivity and consistency of DAQ's data quality by having an USEPA contractor visit sites to audit ambient monitors. The DAQ participates in National Air Toxics Trend Stations (NATTS) Performance Tests (PTs) and 'round robins' when funding is available. These USEPA-sponsored programs provide independent assessments of the DAQ's laboratory results.

Technical reviews are performed by QA chemists on a monthly or quarterly basis. The chemists complete an in-depth analysis and evaluation of documents, activities, and data to ensure adherence to procedures outlined in the SOPs and QAPPs. A detailed SOP in Ambient Monitoring's QAPP details the procedures for validating data. These reviews often differ based on pollutant monitoring methods, however, most reviews are conducted using established guidelines. Errors are documented in a monthly parameter report according to USEPA's Air Quality System guidelines. Corrective actions to fix or address problems may include: contacting the regional ambient monitoring coordinator or alerting the Project and Procedures Branch supervisor and the Ambient Monitoring Section Chief. The Ambient Monitoring Section Chief is responsible for communicating issues of concern to the DAQ Director. Historically, such concerns have focused on attainment of National Ambient Air Quality Standards (NAAQS).

USEPA Region 4 representatives perform a Technical Systems Audit (TSA) on DAQ Ambient Monitoring activities triennially. The USEPA Region 4 staff audits monitoring sites, regional office procedures, laboratory analysis branch operations, central office procedures, equipment, monitors, personnel, records, and various other parameters influencing data generation. Audits are an in-depth process that can last up to a week. USEPA summarizes their findings and highlights areas which did not meet regulatory requirements or USEPA guidance. It is DAQ's responsibility to address the TSA findings and make the necessary adjustments.

<u>Emissions Inventories</u>

North Carolina develops emission inventories for six distinct sources of air pollution: permitted stationary point sources, other stationary point sources (i.e., aircraft and rail yards), stationary nonpoint (area) sources, on-road mobile sources, non-road mobile sources, and wildland fires. The DAQ uses three fundamental quality assurance measures to ensure the accuracy and quality of its emission

inventories given that the development of each inventory requires vastly different data inputs and analyses. As data compilation, data analysis and reporting requirements for emission inventories are continuously being updated and refined, competencies focus on broad quality assurance measures rather than detailed SOPs. The DAQ emission inventory estimation procedures are revised periodically to incorporate new data/methods, USEPA calculation tools, and quality directives.

1) The DAQ uses a two-tiered internal quality assurance protocol for cross-checking data used in developing emissions inventories. This protocol involves quality assurance checks by the original staff member responsible for the specific step in the emission inventory development procedure. Upon completion of these checks, an independent quality assurance reviewer performs spot quality assurance checks of the most important data transformation steps to ensure that procedures were implemented properly.
   - For permitted stationary point source emissions, data are submitted electronically and on paper by facilities, spot-checked by the regional offices and then checked once more by the headquarters emissions inventory coordinator. Stationary point source emissions data for aircraft and rail yards are processed like data for nonpoint sources.
   - For stationary nonpoint (area) source emissions inventories, input data are retrieved from designated government sources and input into emission calculation databases and spreadsheets. The DAQ staff compares state/county totals between the original data set and the DAQ data set to ensure that no errors were introduced during the data compilation step. A quality assurance reviewer may also perform independent cross-checks of the data between the two sources to ensure that no errors have been introduced during the data transformation.
   - For on-road and non-road mobile source emissions inventories, input data are retrieved from numerous designated government sources and cross-checked by an independent quality assurance reviewer as described above in accordance with the specific model requirements of the designated data.
   - For wildland fires, activity data for prescribed burning and wildfires are collected from the North Carolina Forest Service and federal agencies, compiled into a single data set, and mapped in GIS to check if the coordinates for each fire place the fire in the county designated. The agencies from which the data were collected are asked to correct any errors identified. The DAQ staff also checks for duplicate fires and eliminates any double-counting identified. A quality assurance reviewer may also perform independent cross-checks of the data in GIS to verify that duplicate fires and erroneous coordinates do not occur in the data set.

2) Due to the large volume of emissions input data and estimates that are generated, manual checking of all data is not feasible. DAQ relies on electronic data validation whenever possible. This approach facilitates review of a greater volume of data and reduces the likelihood of human error.
   - The DAQ utilizes electronic comparisons of yearly stationary point source emissions data with previous years' emissions. A ten percent difference in emissions has generally been established to flag potential outlier data for further review. In addition, there are electronic range checks for data elements reported in the electronic system. For example; flow rates must be within acceptable engineering ranges, control efficiencies must be within the range accepted by EPA. Emission factors are reviewed for appropriateness and if the emission factor is generated from a facility stack test, the stack test must have been previously approved by the DAQ. Stationary point source emissions data for aircraft and rail yards are processed like data for nonpoint sources.
   - Where available, nonpoint (area) source data inputs/emissions data are subjected to available USEPA-provided quality assurance algorithms prior to submission to ensure that minimum data requirements are met. The DAQ also routinely checks record counts and uses other means to

ensure that data are comprehensive (e.g., confirm all expected pollutants are reported for a given source category in each county) and reasonable (e.g., by comparing to values in previous years).

- For mobile source emissions inputs, computer scripts are used to ensure that all appropriate county-level data are retrieved and compiled correctly in a database prior to submission to USEPA for use in their emissions estimation models.
- Wildland fire emissions are calculated by USEPA using DAQ-supplied activity data. The DAQ staff review the emissions and activity data provided by USEPA against the original data inputs the DAQ submits to USEPA and reconciles emissions data issues identified with USEPA staff.

3) The DAQ emissions inventory staff attend USEPA training on emissions inventory software and reporting updates. This training generally coincides with triennial reporting requirements. Emissions inventory staff working with USEPA tools attend introductory and periodic refresher training to ensure their proficiency in use of the software. USEPA and DAQ-related training is documented and stored in the DAQ Learning Management System (LMS) database.

Emission inventories produced by DAQ staff are routinely validated by USEPA. For example, emissions inventories and associated documentation submitted as part of a new or revised State Implementation Plan (SIP) are reviewed and approved by USEPA Region 4 staff as part of a federally enforceable air quality plan review process. The inventories are also provided to the public during the SIP review process, during which the public can comment on the DAQ's assumptions and methodologies. Where applicable, the DAQ makes revisions to its inventory development process based on public comments received.

APPENDIX B: DIVISION OF MARINE FISHERIES – RECREATIONAL WATER QUALITY PROGRAM

Management and Organization

The overall responsibility of the Recreational Water Quality (RWQ) Program is to be in full compliance with the federal BEACH Act which requires the protection of public health by monitoring the quality of North Carolina's coastal recreational waters and notifying the public when bacteriological standards for safe bodily contact are exceeded. The RWQ Program is required to report both monitoring and notification data annually to the United States Environmental Protection Agency.

The RWQ Program management is located in Morehead City, North Carolina.

The North Carolina Beach Monitoring Program Quality Assurance Project Plan contains the program's organization and reporting relationship and can be accessed on the Division of Marine Fisheries website:

http://portal.ncdenr.org/web/mf/educational-materials

Background and Project Task

The coastal counties are divided into three regions. The Northern region includes coastal waters from the Virginia state line to Ocracoke Inlet with a small laboratory located at the North Carolina Coastal Reserve in Kitty Hawk for processing recreational water quality samples. The Central region includes coastal waters from Ocracoke Inlet to New River Inlet with the programs main office located in Morehead City, NC. Finally, the Southern region includes coastal waters from New River Inlet to the South Carolina state line with the regional office located in Wilmington, NC. The three regions combined have approximately 209 sites that are monitored either weekly or twice monthly during the swimming season. Monitoring sites that are adjacent to resort areas and public accesses are considered high usage (Tier I beaches) and are sampled weekly. Medium usage sites, (Tier II beaches) sampled twice monthly, constitute areas such as those in the ICWW, tidal creeks, summer camps and exposed shoals. People frequent Tier II sites mostly on weekends and they are usually accessed by watercraft. Tier III designations are areas that are used infrequently, where people have minimal full body contact. Tier III sites are also sampled twice monthly.

The Shellfish Sanitation and Recreational Water Quality Section (SSRWQ) has a State and Food and Drug Administration (FDA)-accredited laboratory in the Morehead City and Wilmington regions. Sample collection, laboratory analysis, and beach monitoring activities are conducted entirely by the SSRWQ staff; however, Dare County Health Department in the northern region has an agreement with the SSRWQ to issue the public notification locally for the Dare County swimming advisories. The state Division of Marine Fisheries then follows up with public notification to the Associated Press.

The State will continue to fund the Tier II and Tier III monitoring sites, approximately 50% of all the swimming areas, while the USEPA grant will be used to fund the monitoring of the Tier I beaches. The USEPA grant is also used to fund public education and outreach.

Quality System Components

Quality Objectives:

- To identify swimming areas/beaches and classify them based on human recreational usage.
- To identify monitoring sites that exceed the enterococci geometric mean and single-sample maximum criteria using the Enterolert MPN method for enumeration.
- To evaluate the public health significance of approximately twenty (20) ocean storm drains.

- To document trends in coastal bacteriological water quality.

Personnel Qualifications and Training

Shellfish Sanitation and Recreational Water Quality laboratory personnel have been instructed in specific health and safety needs as required for employment. The laboratory maintains the required United States FDA and State certifications.

Field personnel are trained in small boat handling and navigation in coastal waters. Users of GPS equipment must be trained and certified before collecting field data for boundaries and monitoring sites. Personnel are trained in sample collection, transporting samples, recording field data, keying data into the database and following QA/QC protocols.

Procurement of Items and Services

Laboratory procedures use the Idexx Enterolert method that involves fluorogenic substrate technology. This procedure requires three steps that are discussed in the laboratory quality assurance plan. Supplies needed to perform this method annually include 30 boxes of the 200 count Enterolert and 60 boxes of the 100 count Quanti-trays. These supplies are enough to conduct an average of 6,000 samples per year and cost approximately $27,000.

Documents and Records

SSRWQ performs all sample collections and carries responsibility for handling all data collected in the field. The SSRWQ laboratory is responsible for recording the bacteriological data on the field sheet. After laboratory staff records the bacteriological data, the project manager then reviews the bacteriological results and field data before passing the field sheet to the data entry person. Currently, the data is entered into an Excel spread sheet and Oracle database which includes a data exchange node that meets reporting requirements to the U.S. USEPA.

Hard copies of the laboratory data, laboratory quality assurance forms, and field sampling data sheets are archived indefinitely at the Morehead City office. Electronic copies of the bacteriological data are backed up and stored on the server in Morehead City as well as backup copies stored at the Western Data Center. Sanitary survey reports of recreational waters and any other reports or audits are kept on file in the same manner. Documentation of public notification, original press releases, are filed for one year; however, a spreadsheet documenting advisories and rescinds will be filed electronically indefinitely.

Computer Hardware and Software for Data Management

The data is entered into an IBEAM database in which the public interface is in use. The IBEAM database is web-enabled and has both numerical and **Pr**ogram tracking, beach **A**dvisories, **W**ater quality standards, and **N**utrients (PRAWN) data.

Data is entered into the IBEAM database at each regional office and is stored in an ORACLE database housed in the DEQ Archdale building in Raleigh, NC which is backed up nightly. All of the data from each region is entered into the Excel spread sheet from staff at the Morehead City Office for redundancy. Entries from the spreadsheet and the IBEAM database are compared to one another as a check (see appendix 7). When data entered into IBEAM from the Northern Region and Southern Region does not match with the Central Region spread sheet, the data entry staff is required to find and correct the mistake. Advisories are not posted until both databases can verify the geometric mean. The project

manager reviews the database daily to look at the geometric mean data and orders the posting of advisory signs and the issue of press releases accordingly.

All of the data on the server have timed backups that are stored on a backup device. Redundancy in data entry prevents incorrect data from being stored. Current copies of the data are also available on employees' desktop computers.

Public Notification and Risk Communication Plan

The health director or the environmental health supervisor of the local health department is the first to be informed of a swimming advisory. Discussion with the health department determines who the next contact should be, such as a town or county manager. The media are not contacted concerning a swimming advisory before local and state officials are aware of the situation. The North Carolina Division of Marine Fisheries (NCDMF) then sends out the press release to the Associated Press and local community newspapers at the same time the advisory sign is posted. The press release advisories are aired on TV, radio stations and web sites.

Rescinding an advisory follows the same procedures in reverse. The first communication involves the local health department, then the sign is removed, and another press release is issued, declaring the waters are within the swimming standard. If an advisory sign is needed on the ocean beaches, the sign will be placed on a post or posts at the interface of the wet and dry sand area of the beach. For estuarine waters, the sign may be posted by boat just offshore of the beach or on the shoreline. There may be instances where permission will have to be obtained to post signs on private property, such as on bulkheads or at entrances to marinas. Local Environmental Health Specialists or other local officials may be present when the signs are erected.

Implementation of Work Processes

The method for monitoring the 209 sites throughout coastal North Carolina began by grouping the sites in each region to create "sampling runs" or routes that the staff would travel for a particular day of sample collection. The northern region has three sampling runs consisting of 48 monitoring sites, the central region has nine sampling runs consisting of 85 monitoring sites and the southern region has six sampling runs with 76 monitoring sites. It is common for a sampling run to have a combination of Tier I, II and III swimming areas. Half of the sampling runs are accessed by boat and half are reached by car and then wading into water from the beach. Weather conditions and tides have a strong influence on choosing a sampling run; therefore, the person collecting the water samples must plan his/her day accordingly. The sampling runs are close enough to one of the three regional laboratories to have water samples in the testing media before 2:00 p.m. each day.

There are several parameters of interest that are measured at each monitoring site that influence the transport and survival of microorganisms. Data is collected for rainfall, air and water temperature, water depth/sample depth, wind speed and direction, current direction, tidal stage, time of sample collection and salinity. Time of sample collection is critical for determining holding times. The other parameters are for information only and do not affect management decisions concerning public health. Rainfall data are collected from rain gages scattered throughout the watersheds. Tidal stage and wind speed are determined by personal observation and verified by NOAA weather service. The presence of waterfowl and wildlife in proximity of the monitoring site is also recorded on the field data sheet.

Sampling Methods

Water samples are collected in autoclaved bottles with the site identification on the lid. Once the water sample is collected, the bottle is tipped to give one (1) inch of air space in the bottle. The water samples are stored immediately on ice in a cooler until all the samples are returned to the laboratory. The six-hour holding time for enterococci samples is not an issue because of the relative proximity of the sampling runs to one of the three laboratories. Quanti-trays with positive wells for enterococci are disposed of by placing them in orange biohazard bags and then autoclaving. The autoclaved bags are then taken to the landfill.

Approximately half of the beach monitoring will be accomplished by wading into the surf to collect the sample. When wading, the sampler will use a telescopic golf ball retriever, modified to hold the sample bottle, to reach out approximately 16 feet from the body in knee-deep water to collect the sample. Many of the camps on the coastal rivers and sounds have long piers that extend out over the water. The sample should be taken 6 – 12 inches below the surface of the water at a location along the pier that receives the most use, e.g., ladders, etc. Sampling by boat takes place in approximately three feet of water with the sample collected 12 inches below the surface. A stainless-steel rod with a sample holder will be used to collect the sample from the boat. Sampling personnel should avoid disturbing bottom sediment in either approach, to collecting the sample.

Dare County has nine ocean storm drains that extend to the water's edge at low tide. The mouths of these storm drains are partially or completely submerged at high tide. Samples are to be collected approximately 10 feet to either side of the Dare County drains when practical. At times, surf conditions may not be safe to be within 10 feet of the pipe. The water sample collected at the Hanby Beach storm drain in New Hanover County will be sampled in the same manner. The remaining storm drains in New Hanover, Brunswick and Carteret counties do not extend to the water's edge. These drains are sampled where the swash enters the surf. The water depth for sample collection at all storm drains is the same as the other monitor sites in the surf, just below the surface in approximately "knee- deep water".

It may be necessary at some sites that exceed the geometric mean protocol to conduct additional sampling to define the extent of the pollution. Once the advisory sign is posted, sampling may be initiated at a point 200 feet on either side of the sign. The program manager determines when, if any, additional sampling will be conducted.

Personal watercraft rental sites in most cases are classified as Tier II sites. The samples are collected in the area of the sound where the renters are allowed to ride. This is usually a sectioned-off area marked by buoys. If an advisory is needed, the sign will be posted near shore where watercraft users can see the sign before entering the riding area.

Sample Handling and Custody

The sample collectors are responsible for ensuring the samples are stored and handled properly while in the field. The samples are stored immediately on ice in a cooler to chill the sample and to limit the exposure to UV light. The time is recorded on the field-sampling sheet for each sample collected. The six-hour holding limit for enterococci is not a factor because each sampling run can be completed with samples back to one of the three laboratories within 3 – 4 hours. Laboratory personnel are responsible for recording the time on data sheets when samples are planted into the media and the times samples can be analyzed after incubation. Both laboratory and field personnel are responsible for signing off on the chain of custody checklist on the backside of the field-sampling sheet.

Assessment and Response

The Section Chief has oversight for the shellfish and beach monitoring programs. An Environmental Supervisor is the Beach Monitoring Project Manager and is responsible for regularly reviewing the progress of the project, compiling data and supervising employees. The project manager is responsible for posting swimming advisory

signs, directing public notification activities, and visiting the field offices regularly to assure adherence to the quality assurance project plan. Performance reviews are scheduled every six months for individual employee assessments. The project manager is responsible for any corrective action needed to ensure that the staff in the recreational water quality program is adhering to the QAPP and program objectives. The Environmental Specialist is responsible for notification of health departments, local, state and federal governments as well as interest groups and the public; analyzing and preparing data for submittal to the U.S. Environmental Protection Agency and public outreach and education about the program.

The SSRWQ staff monitors the documentation of laboratory/field procedures and data analysis for their specific region throughout the beach-monitoring project.

Quality Improvement

Data Review, Verification, and Validation

Each region has standardized field and laboratory procedures. Sample collection, handling of samples and lab analysis are all conducted in the same manner. Splitting samples and sharing them with each of the three labs to analyze helps verify that protocols are followed properly. Bacteriological data that is derived from samples where quality assurance is questionable will be rejected. Morehead City and Wilmington laboratories are state- and FDA- certified.

Verification and Validation Methods

Verification and validation are conducted by the staff members who record and enter the data. At least two people are involved in the laboratory analysis to ensure that samples are read and recorded correctly on to the field/lab form. The laboratory staff responsible for resolving laboratory issues are: Environmental Supervisor and a field technician in Nags Head, Microbiological Lab Technician III and a field technician in Morehead City, Microbiological Technician III and a field technician in Wilmington.

Controls are setup to verify that samples are being read properly. The laboratory results are entered into the database by technicians. Two technicians from the Morehead City and Wilmington regional offices are responsible for ensuring the data is entered into the system free of mistakes. Each technician's work is reviewed by the other technician for 100% verification. The Morehead City office is responsible for entering data generated by the Nags Head staff. The project manager performs random spot checks on 5% of each office's data handling. The database is set up so that data summaries are verified by having the program to automatically calculate geometric means.

APPENDIX C: DIVISION OF WASTE MANAGEMENT – HAZARDOUS WASTE PROGRAM

Management and Organization

The Hazardous Waste Section (HWS) of the Division of Waste Management administers the Resource Conservation and Recovery Act (RCRA) program for the State of North Carolina under the statutory authority of the North Carolina Solid Waste Management Act, N.C.G.S. 130A Article 9 and the Rules codified at 15A NCAC 13A.

It is the policy of the Section that all decisions which are made to safeguard the environment and protect public health will include a consideration of the quality of environmental data and/or environmental technology which supports the decision. Environmental data quality is the responsibility of all staff who are directly or indirectly involved in the generation and review of data. Senior managers in each Branch are responsible for assuring that adequate resources are available to implement the Section quality assurance system. Most of the decisions which are made concerning the management of the environment and the reduction of risk ultimately require the use of environmental data which are generated primarily by private sector organizations. Therefore, it is critically important that decision makers know the origin and quality of the environmental data used in these decisions.

The HWS Chief is responsible for the Section's quality programs. The Section Chief, as Quality Assurance Manager (QAM), has full responsibility for the development, implementation, and continued operation of the quality system. The responsibilities for managing the day-to-day QA activities within the state are assigned to the Section Supervisors and Branch Heads.

The Section Supervisors and Branch Heads have the authority and responsibility for managing the daily QA activities within their respective Branches, independent of any data generation activities within the Section. They may require suspension of environmental data collection projects and request corrective action in the event that data quality/environmental technology QA activities do not meet Section or USEPA QA policy or requirements. In the event that a Section Supervisor or Branch Head determines that any data collection activities (at the project or program level) do not meet quality assurance policies or requirements, they shall have the prerogative to meet with the Section Chief or Division Director.

The Compliance Branch provides guidance services to the other units in the Section to meet common needs for overall program performance, and provides technical assistance to the public with informational, regulatory and technical assistance. The Compliance Branch provides direction and technical support during emergency response situations and responds to hazardous waste complaints arising from manufacturing practices, criminal activity and/or accidental releases by businesses and homeowners, conducting only preliminary sampling where necessary. The Facility Management Branch issues operating, and post-closure permits and provides oversight for facilities that must investigate and clean up hazardous waste releases to the environment.

The Section utilizes analytical data from commercial environmental laboratories. The DWR Laboratory Certification Program audits laboratories periodically and certified laboratories must participate in periodic proficiency testing by analyzing unknown standards distributed by approved vendors and/or Lab Certification. Audits cover the laboratory's QA/QC Program. The HWS has a list of analytical reporting requirements that are important to document the quality of all data submitted. Analytical results are reviewed to ensure reporting requirements appropriate for the intended use of the data are met. Additional information is required for laboratories that are not certified.

Quality System Components

The elements of the Section quality system include activities in the planning, implementation and assessment phases. The planning process is documented in QAPPs, the implementation phase is performed and overseen by

the data user and/or project manager, and the assessment phase is conducted as specified in the applicable project planning document. Within the Section, QA data generation activities fall into two broad categories:

- External: data generated by environmental consultants and commercial laboratories contracted by responsible parties regulated by the Section; and
- Internal: data generation projects designed and conducted by Section staff and/or State contractors.

The overall quality system policies, procedures, roles, and responsibilities are described in the QMP. The Section relies on a project level quality document to describe project quality assurance and quality control procedures; the quality assurance project plan. In reviewing QAPPs, the QAM or his/her designee will use the graded approach, recognizing that each data collection project is different. The QAPP must satisfactorily address the main topic areas covered in the document entitled "USEPA Requirements for Quality Assurance Project Plans," USEPA QA/R-5, Final, March 2001 or subsequent edition. All projects overseen by the section requiring collection of environmental data or the use of environmental technology must have an approved QAPP prior to data collection. Exceptions to this requirement are those projects where immediate danger to human health or the environment is present or suspected.

Branch Heads and Supervisors are responsible for ensuring that internal and external data collection activities within their branches are conducted in accordance with QA policy. The managers are responsible for procedures within their area of responsibility to ensure the acceptability of data and the suitability of environmental technology. Key responsibilities of managers are:

- Establish planning policies to ensure that appropriate QA procedures are reflected in budgets, program plans and operating plans.
- Encourage the development of Data Quality Objectives (DQO's) for data collection activities.
- Require the development of QAPPs or an equivalent project-level planning document for projects involving data collection.
- Support quality system implementation and assessment.
- Take corrective action as required by QA assessments or reviews.
- Report data quality problems to the QAM.
- Assure staff receive appropriate QA training.

Technical Staff will support the QAM by providing technical assistance in their area of expertise, if requested by the QAM. This will enhance the QA capability in the Section. The specific duties which will be assigned to the technical specialists are as follows:

- Assist the QAM with technical aspects of QA as related to their area of expertise.
- Identify QA needs, resolve problems, and answer requests for guidance or assistance in areas of expertise.
- Conduct and/or participate in system and technical audits.
- Serve as the official Section/Office contact for quality assurance matters pertinent to the data collection activities as assigned.
- Attend called meetings as assigned, to keep abreast of QA issues affecting the Section. Communicate QA issues to Division/Office personnel.
- Advise the QAM on changes needed to the Section Quality Management Plan. Coordinate program input for reports submitted by the QAM to the Division Director.
- Respond to quality control issues and problems and respond to requests for guidance or technical direction.

The responsibility for identifying and documenting out-of-control situations in the quality system in the HWS lies with the Supervisors and Branch Heads. However, other persons are responsible for QA in specific areas of

the HWS. The Division health and safety officer maintains QA for the HWS' hazard assessments and all HWS air/environmental monitoring equipment. The designated staff members on the Compliance Branch sampling team maintain QA for sample collection equipment preparation, sampling procedures and in-field decontamination procedures. Computer hardware and software QA is maintained by the Division Network Administrator.

The employee work plan is a basic component of the Quality System. The mechanism used in implementing work processes is the employee work plan. The work plan documents key responsibilities and expectations along with the frequency and method of tracking and evaluating performance. The HWS follows various guidance manuals and standard operating procedures (SOPs) in its day-to-day activities, which are the foundation of the Quality System. Typically, every SOP that the HWS develops or follows has a corresponding guidance manual that explains the procedure and the rationale for the procedure in more detail. Some of these SOPs and guidance manuals are described below.

Documentation for HWS sampling protocols includes the Environmental Investigations SOP, the QA Manual (USEPA Region 4), the HWS Sample Collection Guidance Document, the Hazardous Waste Management Rules, SW-846 Methods guidance and the RCRA Field Inspection Manual (published by USEPA Region 4).   Sample documentation is recorded through the use of the "Field Log Books," "Sample Documentation Forms," "Chain of Custody Forms," and "Sample Analysis Request Forms."

In addition, each HWS Branch maintains SOPs for various processes and procedures specific to each Branch. Since the HWS is an USEPA-authorized program, most of the HWS procedures are set by USEPA national or regional policy and procedure. The data management staff ensures that the databases are maintained to USEPA standards through USEPA guidance and oversight. Procurement procedures are implemented per Department policy.

Personnel Qualifications and Training (see Section 4 also)

Personnel Development is included as one of the key responsibilities in employee work plans. Work plans are reviewed biannually to establish training requirements to ensure retraining based on changing requirements. The health and safety officer is responsible for all of the required health and safety training for HWS staff, which includes the 40-hour HAZWOPER, 8-hour refresher courses, Adult CPR/Standard First Aid, Use of Environmental Monitoring Equipment, Level B PPE training, etc. Attendance in these courses are recorded and monitored. Certificates may be issued by the Safety Officer to trained staff. The HWS environmental chemists conduct in-house data review and quality assurance training for HWS staff. In addition, USEPA provides a vast number of webinars and training courses designed to maintain the high standard program quality in all areas of the HWS program.

Procurement of Items and Services

See Section 5.

Documents and Records (See Section 6 also)

Records are maintained by the Public Information Assistant (PIA) in a manner consistent with USEPA records retention rules as required by the Code of Federal Regulations (CFR) 40, Part 31.42, Retention and access requirements for records; Part 35.6705, Records retention; and Part 35.6710, Records access as well as North Carolina's Public Records Law, N.C.G.S. Chapters 121 and 132; Department policy; and Section policy. These records may be accessed online at https://deq.nc.gov/about/divisions/waste-management/waste-management-rules-data/e-documents and in a controlled area where members of the public may review and copy documents by appointment only while accompanied by the PIA or another staff member. The computer database is

maintained per USEPA guidelines and oversight. Quality documents and SOPs are maintained by staff in each HWS Branch who are designated to be responsible for preparation, review, approval, revision and withdrawal of various SOPs and QAPPs. Current and electronically archived versions of these documents are available to staff online through the internal portal.

Computer Hardware and Software

See Section 7.

Planning (See Section 8 also)

Systematic planning processes are to be followed and documented as described in various guidance manuals and OSWER directives. The implementation of these procedures are required by Supervisors and Branch Heads of all staff involved in environmental data operations and are continually encouraged and reinforced through performance reviews and internal and external training. Technical expertise in sampling, statistics, analytical services and QA/QC are provided either by Section, Division or Departmental staff or Environmental Laboratories and/or Consultants contracted by responsible parties. The HWS has online access to USEPA training modules for systematic planning using the USEPA Data Quality Objectives Process. The Section is developing templates for standard activities with routine problem statements to use in the documentation of the DQO process and aid in the institutionalization of the process.

The employee work plan is a basic component of the Quality System for measuring the effectiveness of the planning process by management. The annual work plan documents key responsibilities and expectations along with the frequency and method of tracking and evaluating performance. In reviewing QAPPs, the QAM or his/her designee will use the graded approach, recognizing that each data collection project is different. Simpler projects may require QAPPs which are not as detailed as those of more complex projects. The QAPP must satisfactorily address the main topic areas covered in the document entitled "USEPA Requirements for Quality Assurance Project Plans," USEPA QA/R-5, Final, March, 2001. All projects that require collection of environmental data or the use of environmental technology must have a reviewed and approved QAPP prior to data collection. Exceptions to this requirement are those projects where immediate danger to human health or the environment is present or suspected. These are the only type of projects for which sampling is conducted by Section staff. All projects overseen by the Section that require collection of environmental data or the use of environmental technology must have a reviewed and approved QAPP prior to data collection. Since the HWS is an USEPA-authorized program, most of the HWS procedures are set by USEPA national or regional policy and procedure. Some of these directives and guidance manuals are described below.

Every HWS employee involved in the oversight of site characterization, risk assessment, remedy selection, implementing a removal action or site mitigation, has access to the USEPA directives and guidance manuals outlining systematic planning processes for environmental data operations. Some of these documents include OSWER Directive 9355.4-28 Guidance for Monitoring Hazardous Waste Sites, USEPA QA/G-4HW Data Quality Objectives Process for Hazardous Waste Site Investigations, USEPA QA/R-5 Requirements for Quality Assurance Project Plans, and USEPA QA/G-9 Guidance for Data Quality Assessment.

Implementation of Work Processes

The review and approval process is used for implementing QAPPs or other planning documentation for environmental data operations. The mechanism used in implementing work processes is the employee work plan. Each work plan outlines key responsibilities and expectations along with the frequency and method of tracking performance. Work processes are described in the various SOPs and guidance manuals previously listed. The implementation of these procedures are required of all staff and are continually encouraged and reinforced

through performance reviews and internal and external training. Employees in each HWS Branch who are designated as being responsible for preparation, review, approval, revision and withdrawal of various SOPs and QAPPs have the key responsibilities and expectations outlined in their work plans. Required revisions to QAPPs, SOPs, and other planning documents are made, documented and communicated to parties involved. Consistency and quality of data collection and maintenance is a key component of the HWS' implementation of an authorized federal program.

Assessment and Response

The HWS continually looks for opportunities to improve its program implementation and quality assurance. Several committees within the HWS or the Division are dedicated to improving different parts of the HWS program: SOP Committees, Rules Review Committee, Quality Management Steering Team, , and various data management teams.   These committees not only assess the current policies and procedures for program implementation, but also look for opportunities for improvement. Participation on committees is included as a key responsibility under Special Projects in an employee's work plan, along with a description of the purpose of the committee. Supervisors evaluate the employee's participation in and progress of the committee as described under frequency and method of tracking in the work plan. USEPA also conducts annual program audits, which are used as an assessment tool.

An effective QA System requires periodic assessment to determine if the system is operating as designed and to establish a basis for corrective action. The QAM or designee shall review and evaluate the implementation of the QMP through performance evaluations and system and/or technical audits. The QAM or designee shall review and evaluate the implementation of selected QAPPs during the operational phase of the monitoring activity. Selection of projects will depend on the following criteria: projects supporting litigation, high visibility projects, and requests from Project Managers. Upon completion of the project activity, the Project Manager shall assess the actual performance of the planned activities and subsequent results. The final project report shall contain the results of this assessment and state whether the data collected meet the objectives of the project.

Technical Staff will support the QAM by providing technical assistance in their area of expertise if requested by the QAM. The specific duties which will be assigned to the technical specialists are as follows:

- Conduct and/or participate in system and technical audits.
- Advise the QAM on changes needed to the Section Quality Management Plan. Coordinate program input for reports submitted by the QAM to the Division Director.
- Respond to quality control issues and problems, and respond to requests for guidance or technical direction.

The responsibility for identifying and documenting out-of-control situations in the quality system in the HWS lies with the Supervisors and Branch Heads. This is done primarily through performance evaluations conducted twice a year against employee work plans.

Quality Improvement

Results of these assessments are reported to the appropriate Section Chief, Branch Head, Supervisor, etc. The QAM or designee will submit written findings and corrective actions, along with a specific timeframe for responding to the findings. Assessment corrective actions will be tracked by the QAM or his/her designee. A written response with a satisfactory corrective action from the affected organization or project shall be considered as an appropriate response.

Branch Heads and Supervisors are responsible for ensuring that internal and external data collection activities within their branches are conducted in accordance with QA policy. The managers are responsible for procedures

within their area of responsibility to ensure the acceptability of data and the suitability of environmental technology. Key responsibilities of managers relating to corrective actions are:

- Take corrective action as required by QA assessments or reviews.
- Report data quality problems to the QAM.
- Assure staff receives appropriate QA training.

The HWS quality improvement efforts are intricately linked to assessment efforts and are described above. Key elements of continual improvement are the update of SOPs, and ongoing assessment of employee performance with work plan revision, as needed. In addition, many of the HWS staff are involved in different USEPA and state associations, groups or teams that look at ways to improve the HW program on a national scale, while maintaining a quality regulatory program. This information is brought to the NC program and implemented as needed and as warranted.

APPENDIX D: DIVISION OF WASTE MANAGEMENT – SUPERFUND PROGRAM

Management and Organization

The Section Chief, as the senior manager of the Superfund Section, is responsible for the Section's quality programs. The Section Chief has designated the Quality Assurance Officer (QAO) as having authority to establish policy for data quality issues for the Section. The Section Chief, as Quality Assurance Manager (QAM), has the overall responsibility for ensuring that the quality systems documented in the Section Quality Assurance Program Plan meet statutory, contractual and assistance agreement requirements for United States Environmental Protection Agency (USEPA) derived work. The QAO, under the supervision of the QAM, oversees the development, implementation and continued operation of the Section's QA policy.

The QAO is responsible for ensuring that the QA policy is uniformly applied by Section staff in the generation and assessment of environmental data. In addition, the QAO ensures that any specific requirements arising from USEPA grant conditions, contracts and cooperative agreements are fulfilled. The QAO reviews site-specific quality assurance project plans (QAPPs); assists project managers in the development of data quality objectives (DQOs); develops and maintains Section SOPs for field and laboratory work; performs data reviews, audits, verifications and validations; and conducts laboratory and field audits. The QAO serves as a liaison between the Section and USEPA, Division Management and Department Management on matters pertinent to QA policy and procedures.

Each project manager in charge of an investigation or oversight is responsible for ensuring that data generated under the oversight of the Section are of appropriate quality for the intended use of the data. Project managers overseeing contractors will require and review from those contractors any applicable activities conducted under authority of the Section, including scientific study design; QA planning; development of DQOs; preparation of QA planning documents, e.g. site-specific QAPPs; and the coordination of technical and data quality issues among field, laboratory and data assessment staff involved in the activity.

Quality System Components

The Superfund Section quality system includes policies and procedures designed to assure that environmental data generated by the Section are of appropriate quality to meet their intended use. Quality assurance project plans, reviews, standard operating procedures and data quality assessments are among the quality assurance tools included in the quality system. System components address matters of quality planning, implementation and assessment.

DQOs are established for each site to define the quantity and quality of data to be collected to support the objectives of the sampling event. DQOs are developed using the seven-step process outlined in the following USEPA guidance documents: "Guidance on Systematic Planning using the Data Quality Objectives Process, " USEPA QA/G-4 (https://www.epa.gov/sites/production/files/2015-06/documents/g4-final.pdf), February 2006: "Guidance for Quality Assurance Project Plans," USEPA QA/G-5 (https://www.epa.gov/sites/production/files/2015-06/documents/g5-final.pdf), December 2002; "USEPA Requirements for Quality Assurance Project Plans", USEPA QA/R-5 (https://www.epa.gov/sites/production/files/2015-07/documents/r5-final.pdf), March 2001; and "Guidance for the Preparation of Standard Operating Procedures (SOPs)", USEPA QA/G-6 (https://www.epa.gov/sites/production/files/2015-06/documents/g6-final.pdf), April 2007.

- **Planning.** Each project manager in charge of an investigation or oversight is responsible for ensuring that data generated by or under the oversight of the Section are of appropriate quality for the intended use of the data. In carrying out this responsibility, the project manager must plan for determining the

necessary data quality and the process by which it will be attained. In this regard, the project managers' responsibilities include: scientific study design; QA planning; development of DQOs; preparation of QA planning documents, e.g. site-specific QAPPs and the coordination of technical and data quality issues among field, laboratory and data assessment staff involved in the activity. Project managers, with the support of the QAO and QAM, are encouraged to continually explore improved methods to conduct sampling and field measurement activities in order to efficiently and accurately collect the appropriate environmental data while still meeting the requirements of the Section's Data Quality System. If project managers elect to use new sampling methods or environmental technologies, it is the responsibility of the project manager to define how the selected methods or equipment support the objectives of the sampling event. Project Managers overseeing contractors will require and review the same from those contractors.

- **Oversight.** The QAO, under the supervision of the QAM, is responsible for ensuring that the QA policy is uniformly applied by Section staff in the generation and assessment of environmental data. The QAO reviews quality assurance project plans (QAPPs) and sampling plans; assists project managers in the development of data quality objectives (DQOs); develops and maintains Section SOPs for field and laboratory work; performs data reviews, audits, verifications and validations; and conducts laboratory and field audits. The QAO serves as a liaison between the Section and USEPA, Division Management and Department Management on matters pertinent to QA policy and procedures.

- **Implementation (Manuals/References).** The NC Superfund Section Quality Assurance Program Plan (QAPP) includes the U.S. Environmental Protection Agency, Region 4 Quality System and Technical Procedures for SESD Field Branches (https://www.epa.gov/quality/quality-system-and-technical-procedures-sesd-field-branches), adopted by reference. Other, more detailed and Section specific standard operating procedures (SOPs) pertinent to laboratory, sampling and field operations have been incorporated into the NC Superfund Section Quality Assuranbce Standard Operating Procedure Manual (QASOP). These Section specific SOPs are developed and maintained by the QAO, using such guidance as that found in USEPA QA/G-6: Guidance for the Preparation of Standard Operating Procedures (SOPs), April 2007 (https://www.epa.gov/sites/production/files/2015-06/documents/g6-final.pdf). These Section QA related SOPs cover laboratory activities; decontamination of equipment; sampling training; sampling activities; sample shipment; maintenance of sample custody; field documentation, e.g. log books, photographs, and photographic logs; QA audits (described below in more detail); and other procedures that pertain to the collection of analytical data that can be documented as meeting the DQOs appropriate for a given study. A copy of internal SOPs are made available to employees via the intranet.

- **Assessment.** Assessment activities are used to verify that measurement systems are operating properly and that the data generated by these systems are appropriate for their intended use by the Section QAO. These documents are maintained by the QAO for the Section.

  - **Data Quality Audits (Data Verification/Validation).** The USEPA Region 4 Science and Ecosystem Support Division (SESD) performs data validation on analytical data generated for the Section by the Contract Laboratory Program (CLP). Project managers are responsible for performing data verification on all site-specific studies. The QAO is responsible for performing analytical data verification on routine equipment rinsate checks or other QA/QC samples not associated with a specific site investigation. The QAO is also available to perform data quality verifications, validations, and audits in cooperation with the project managers for site studies at the request of management. Records of all data quality audits will be maintained and reviewed by the QAO for any trends which would suggest corrective action is required. Where appropriate, the QAO will make recommendations to Section management in this regard.

- **Performance Audits.** Performance audits are quantitative evaluations of the ability of a system to produce appropriate, accurate and reliable data. Performance audits involve submission of blind split and duplicate samples to laboratories generating data for the Section. The Section utilizes analytical data from two main sources, CLP laboratories and the N. C. State Public Health Laboratory (Public Health Laboratory) in the Division of Laboratory Services, Department of Health and Human Services. The Public Health Laboratory has been granted primacy under the federal Safe Drinking Water Act (42 U.S.C. Sec. 300f, et seq). The North Carolina counterpart of the federal Safe Drinking Water Act is N.C.G.S. 130A-311, et seq. The USEPA Region 4 SESD routinely conducts performance audits on CLP laboratories. The Public Health Laboratory is reviewed annually by USEPA Region 4 SESD and participates in periodic proficiency testing by analyzing standards and unknowns distributed by USEPA. Annual reviews by SESD cover the laboratory's QA/QC Program, sample preparation and handling, methodology, SOPs, record keeping, personnel qualifications, and instrumentation pertinent to water, solid waste, and hazardous waste analysis.
- **Systems Audits**. Systems audits are on-site, qualitative assessments of an organization's facilities, equipment, personnel, procedures and quality processes. Field Audits verify that sample collection procedures are conducted according to SOPs and QA policies. These audits are conducted by the QAO in accordance with the QAPP and the QASOP at random site investigations performed by the Section. The USEPA Region 4 SESD conducts periodic audits and overviews of the Section's sampling program for the regional Office of Quality Assurance. Comments, critique, questions and suggestions for improvement are transmitted by SESD to the Section Chief (QAM) for response. The QAM designates to the QAO the responsibility of taking appropriate actions to correct any deficiencies noted in the audit report and responding to any SESD questions and comments. The QAO responds to USEPA by reports transmitted through the QAM.
- **Procurement.** The NC Superfund Section QAPP, which includes the U.S. Environmental Protection Agency, Region 4 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (http://www.epa.gov/quality/quality-system-and-technical-procedures-sesd-field-branches), adopted by reference, contains instructions on evaluating the suitability of manufactured items which are critical to the data generation process (e.g. sampling equipment, reagents, and supplies). The QAO is responsible for including quality specifications in purchase requests and for inspecting or delegating the inspection of equipment and consumables to assure the items meet the quality specifications.

Personnel Qualifications and Training (see Section 4 also)

- **Hiring Practices.** The Section complies with State and Departmental hiring practices for each position filled. Position listings and discussion at time of interview include education and experience requirements as well as preferences for certain skills and experience directly pertinent to the specific position. Preferences include familiarity and experience with policies, systems, and procedures for assuring data quality.
- **Continuing Education.** Technical staff attends USEPA SESD training on proper sampling procedures to assure that data obtained from sampling events are appropriate for the intended purpose. Section management reports sent periodically to USEPA document the educational background and training of sampling personnel. This information is reviewed during SESD audits of the Section. Consistent with the Section's QAPP, the QAO maintains records of all staff training that are pertinent to sampling procedures and QA/QC. The QAO maintains knowledge of and alerts management and staff to changes in USEPA and State SOPs, policies, and procedures regarding QA/QC matters. The QAO ascertains whether staff is staying abreast of these changes by reviewing training and field operations records. The QAO recommends a continuing education program on an annual basis for technical staff, which includes

reviews and distribution of the QMP and the Section QAPP and any related updates. This continuing education training includes USEPA sponsored courses, seminars and workshops held in-house or at remote locations. The QAO advises management of specific training needs for certain individuals or groups, and will arrange for in-house training sessions, if warranted.

Procurement of Items and Services

See Section 5.

Documents and Records (see Section 6 also)

Records of field operations are maintained by the Public Information Assistant (PIA) in a manner consistent with USEPA records retention rules as required by the Code of Federal Regulations (CFR) 40, Part 31.42, Retention and access requirements for records; Part 35.6705, Records retention; and Part 35.6710, Records access as well as North Carolina's Public Records Law, N.C.G.S. 132; Department policy; and Section policy. These records are located online at https://deq.nc.gov/about/divisions/waste-management/waste-management-rules-data/e-documents and in a controlled area where members of the public may review and copy documents by appointment only while accompanied by the PIA or another staff member. The file for a given site contains such items as reports, maps, photographs, field operations logs, analytical data, historical maps, aerial photographs, other background information, and correspondence pertinent to the site. It is the responsibility of the PIA to ensure that these information review appointments are conducted in a manner that preserves the security of the public record and the quality of the data on file.

Site-specific QAPPs are completed by individual project managers and reviewed by the Section QAO and QAM. Copies are maintained by the individual project managers and provided to the public through the online records system. Section-specific QAPPs and other QA documents are generated and updated annually and maintained by the Section QAO, under the direction of the Section QAM. All Section QA-related documents are provided internally once they have been approved by USEPA.

Computer Hardware and Software

See Section 7.

Planning (see Section 8 also)

Each project manager in charge of an investigation or oversight is responsible for ensuring that data generated by or under the oversight of the Section are of appropriate quality for the intended use of the data. In carrying out this responsibility, the project manager must plan for determining the necessary data quality and the process by which it will be attained. In this regard, the project managers' responsibilities include: scientific study design; QA planning; development of DQOs; preparation of QA planning documents, e.g. site-specific QAPPs; and the coordination of technical and data quality issues among field, laboratory and data assessment staff involved in the activity. Project managers overseeing contractors will require and review the same from those contractors.

Implementation of Work Processes

In order to ensure that quality assurance processes are carried out according to plan, a quality system must implement methods for controlling, documenting, and monitoring the generation and recording of data.

In accordance with the NC Superfund Section QAPP, combination quality assurance project plans (QAPPs) are required for planned site investigations. Exceptions may be made for unplanned, time-critical sampling events. These QAPPs are developed by project managers and reviewed by the QAO.

Sample handling and records management systems described in the QAPP are used in all investigations. For those investigations with a sufficient number of environmental samples to make manual records management unwieldy, the records management system will include the use of the Scribe program developed by the U.S. EPA Region 4 SESD to use in records management for field operations, especially when sampling for CLP analysis. This program is used for producing sample labels, chain of custody forms, and sample traffic reports for expanded site inspections and some other sampling events involving 10 or more sampling locations. Use of Scribe minimizes human error in the paper work and record keeping process. For those investigations without sufficient numbers of samples to make Scribe practicable, sample record management will be done manually as described in the QAPP. The QAPP includes the procedures for field logs, photographs, diagrams, chain of custody records, sample analyses request sheets, and other handling procedures. Comparability is dependent upon the proper design of a sampling plan and are satisfied by ensuring that the protocols outlined in the QMP and each site-specific QAPP are followed and that proper techniques, as outlined in all applicable SOPs in SESD Field Branches Quality System and Technical Procedures (https://www.epa.gov/quality/quality-system-and-technical-procedures-sesd-field-branches), are used.

In addition to site specific duplicates, blanks, and other QA/QC samples, the Section submits periodic QA/QC samples for laboratory analysis to check the condition of its containers and its laboratory water quality. The QAO is responsible for submitting these non-site specific QA/QC samples to the Public Health Laboratory in order to verify that sampling containers and equipment are cleaned to the level required to assure that samples are collected and stored in a manner that prevents contamination of samples. The QAO collects and submits these samples on a periodic schedule described in the QASOP.

These QA/QC samples include container blanks for QC of certified quality assured containers cleaned according to USEPA requirements; rinsate blanks to document that proper decontamination of equipment has been achieved; laboratory water blanks to assure that intended water quality is maintained; and trip, field, and preservative blanks used in site specific investigations. Container blanks are collected from each new production lot purchased, before containers from each new lot are used. In order to provide a "paper trail" to document that QA approved containers are used in a given investigation, project managers are responsible for recording container lots used during sampling in field log records. Equipment rinsate blanks are collected at least quarterly unless no investigations have taken place in that quarter. Laboratory water blanks are collected routinely after each periodic change out of deionizing and carbon cartridges. In accordance with the QAPP, field blanks are collected as needed.

The QAO maintains the Section data management system (described in the QAPP) that is used for tracking analytical results from QA/QC samples.

Assessment and Response

Internal review audits are conducted by the QAO in accordance with the QAPP. External audits are performed by USEPA Region 4 SESD. These audits are described above. Work of the QAO is monitored by the QAM. This occurs through meetings and reviews of databases (described in the QAPP) used to track QA/QC records. Further information concerning assessment is included in the next section.

Senior Management within DEQ and DWM, as well as the Section QAM, actively support continual quality improvement by encouraging staff to continually evaluate the adequacy, implementation, and effectiveness of current policies, procedures, and practices through preventive actions and internal auditing. Staff are also encouraged to apply innovative approaches while maintaining integrity and accuracy of environmental data and associated activities.

Quality Improvement

The Section QA Program Plan must be maintained and improved as changes occur that affect the quality system. Communication of QA information is especially important in the process of continual improvement of the Program Plan. Important elements of a continual improvement process include the SOPs, audits, and other QA "tools."

- **SOPs.** Section specific SOPs are developed, appended to the QASOP, and distributed to Section staff by the QAO. The QAO ensures that the staff reviews and understands these procedures. These procedures represent an effective tool for QA communication. They may be incorporated into staff-prepared site-specific QAPPs by reference. The SOPs are a "living document" subject to review and revision by the QAO with approval of the QAM. Comments and revision suggestions from project managers and staff are encouraged.
- **Audits.** All of the audits performed by the QAO result in reports of audit findings. The QAO is responsible for making recommendations pursuant to audit findings to the QAM. Audit reports may identify areas of improvement and corrective actions required of the audited parties. Depending on the nature of the deficiency, audited parties may be required to submit an improvement plan for noted deficiencies. Audit reports, improvement plans, and corrective actions are available for review by data consumers from the QAM. The QAO debriefs staff after field operations in order to identify areas for improving the QA guidance documents.
- **Other QA Information Communication Tools.** There are a number of tools used by the QAO to keep Section staff and management informed on QA/QC matters. These include modifications to QA guidance documents and notices by the QAO; orientation of new technical staff on arrival; electronic mailings and memoranda to technical staff and management; technical assistance to management and staff on QA/QC issues; periodic reports to management; reports at branch meetings; notices to branch heads for announcement or distribution at routine branch meetings; presentations at annual Section planning conferences; and periodic written reports to supervisor and QAM.

APPENDIX E: DIVISION OF WASTE MANAGEMENT – UNDERGROUND STORAGE TANK PROGRAM

Management and Organization

The Underground Storage Tank (UST) Section implements and enforces federal regulations and state statutes and rules governing USTs. The UST Section issues permits for operating USTs, inspects UST facilities for compliance with technical requirements (e.g., leak detection, corrosion protection), oversees responsible party-lead cleanups of contamination from USTs and issues soil remediation and monitoring well permits. In addition, the UST Section administers the Leaking Petroleum Underground Storage Tank Cleanup Fund ("the State Trust Fund" or "STF") and reimburses tank owners and operators for eligible cleanup costs from this fund. The UST Section also administers the Federal Trust Fund which is used to provide alternate water supplies for people whose water supplies have become contaminated by a leaking UST. The UST Section uses both funds to perform cleanups ("state-lead cleanups") at UST contamination sites where the responsible party cannot or will not perform necessary cleanup. The UST Section seeks to recover costs of funds used to perform these cleanups.

The UST Section has 93 total staff. It consists of the Section Chief, his administrative staff, three branches (Permits and Inspections Branch, Trust Fund Branch and Corrective Action Branch) and seven regional offices. The UST program has no dedicated QA Manager. Each Regional Office Supervisor is responsible for overall QA in his/her office. Each Branch Head is responsible for overall QA in their Branch and the Section Chief is responsible for the work of the section.

- **Section Chief.** The UST Section Chief has overall responsibility for the section and reports to the director of the Division of Waste Management. Two administrative staff and the three branch heads report directly to him. The administrative staff provides clerical support to the section.
- **Permits and Inspections Branch.** The Permits and Inspections Branch consists of a branch head and three groups with a total of 33 staff. The branch head is responsible for assuring the quality of service and work products developed by the branch. The Permits and Inspections Branch is primarily responsible for registering USTs, invoicing tank owners and operators for operating fees, issuing operating permits, providing inspection and enforcement program support and developing and implementing public assistance and education programs. The Permits and Inspections Branch maintains the registration database. The registration database is a very large database containing information on more than 90,000 tanks. This database stores information on tank materials of construction, product type stored, annual operating fees owed/paid, permits issued, leak detection and other compliance information and inspection/enforcement information. Most of the tank information is supplied by the tank owner/operator. The tank information and the permit and fee information is entered into the database by accounting/clerical permitting staff. Once entered, the fee information is printed in a report and checked to verify that it was recorded properly. The inspection/enforcement information is input directly into the database by inspection staff. In addition, the branch head has been delegated authority to assess civil penalties.
- **Trust Fund Branch.** The Trust Fund Branch consists of a branch head, and 12 staff. The branch head is responsible for assuring the quality of service and work products developed by the Branch and taking a lead role in policy development and implementation. In addition, the branch head has been delegated authority to deny eligibility and reimbursement requests and seek cost recovery against tank owners, operators and landowners. The Trust Fund Branch is primarily responsible for making STF eligibility and reimbursement determinations, program development and training, providing public assistance for STF reimbursement, managing state-lead cleanups and performing cost recovery activities. The databases maintained by the branch include the STF Eligibility database, STF Reimbursement database,

the STF State Lead database and the Federal Trust Fund ("FTF") databases. The STF Eligibility database is used to track applications for state trust fund coverage and generate data for weekly reports. Data entry is accomplished by three primary technical staff with additional data added as the review of the application progresses. Quality control is maintained by one of the technical staff and the Branch Head via weekly reports. The STF Reimbursement database is used to track the status of leaking petroleum UST reimbursement claims, compile costs incurred for specific assessment and cleanup tasks and generate data for inclusion in a semi-annual report to the N.C. General Assembly. Data input occurs during different phases of reimbursement review by a processing assistant, three accounting technicians and the branch head. Quality control is maintained by the processing assistant, who verifies the data input at the time the reimbursement process is completed and also runs weekly and quarterly reports to reconcile claim status. Technical auditors review a selected number of claims to ensure accuracy of reimbursement for assessment and cleanup tasks. The STF State Lead and FTF databases contains all information related to state and federally funded state-lead cleanup sites and is used to track the status of cleanups for cost recovery purposes and in the case of the FTF database for reporting to the Environmental Protection Agency. Data entry is accomplished by seven project managers and a cost recovery administrator. Data verification is conducted via site project summary reports and cost recovery activities, which are on-going processes.

- **Corrective Action Branch.** The Field Operations Branch consists of a branch head, who supervises three technical support staff and six regional office supervisors for a total of 42 staff. This position is responsible for promoting release investigation and corrective action consistency among the regional offices, ensuring adequate training for regional office staff, serving as a communication link between the regional and central offices and taking a lead role in policy development and implementation. In addition, the branch head has been delegated authority to assess civil penalties. The branch head provides feedback to the regional supervisors on the quality and consistency of work performed by the regional offices. The branch head communicates at least once a quarter with all regional supervisors via conference calls. In addition, the branch head holds regional supervisor meetings at least once a year and visits the regional offices on an as needed basis. The branch head also tracks regional office performance measures such as numbers of reports reviewed, inspections performed and enforcement actions initiated. In addition, the Corrective Action Branch staff manages the Regional UST database. The Regional UST database contains information on pollution incidents and USTs closed without a release, regulated by the UST section. Forms containing information on each contamination incident are provided by consultants and the regional office staff. Regional office staff checks to make sure the forms are filled out correctly and enter the information into the database. Many quality assurance checks (e.g., file non-duplication) are built into this database. Hard copies of information related to active incidents are stored in the regional office files. The regional office staff issues soil remediation and monitoring well permits. Designated technical staff in the Corrective Action Branch input the appropriate information into a database. Fee information pertaining to the soil remediation permits is entered into a database.
- **Regional Offices.** The seven regional offices for the UST Section are part of the Corrective Action Branch and they consist of a regional supervisor and from 3 to 8 technical staff. The regional supervisor ensures the quality of work performed by the regional office staff. The regional offices are primarily responsible for responding to reports of contamination incidents, investigating complaints, reviewing site assessment and corrective action plans and reports, issuing Notices of Violation, initiating enforcement actions and providing technical assistance to the public and the regulated community. The regional offices also, pre-approve STF cleanup work, issue soil remediation permits and well construction permits.

Quality System Components

The UST Section ensures work/data quality through staff training, policy memorandums, guidance documents and forms, and workgroup activities. Documents used by the section include:

- UST Section Guidelines for Assessment and Corrective Action for UST Releases
- UST Section Guidelines for Site Checks, Tank Closure and Initial Response and Abatement for UST Releases
- UST Section Guidelines for Ex Situ Petroleum Contaminated Soil Remediation
- UST Section Guidelines for Sampling
- New Inspector Training Manual
- Compliance Manual
- Enforcement Manual
- UST Database Manual
- STF Reasonable Rate Document
- STF Technical and Accounting Procedures Manual
- FTF Cost Recovery Manual

Personnel Qualifications and Training (see Section 4 also)

The qualified and trained nature of the UST Section staff are first assured through the requirements and operation of the job classification and hiring process. Supervisors and experienced staff within each branch and regional office then train the new and inexperienced staff. The UST Section holds training sessions for new compliance inspectors and for all staff on new rules, policies and changes to the program. Annual OSHA health and safety training courses are provided to all staff. HAZWOPER training is provided as required to new staff through a contractor. The DWM has a full-time Safety Consultant to carry out OSHA and other safety training and work requirements. Workshops and training courses offered by USEPA and other entities are used frequently to maintain and update the quality of the program.

Procurement of Items and Services

See Section 5.

Documents and Records (see Section 6 also)

The information on the UST Section databases is maintained continuously. The UST registration records (hard files) in the Permits and Inspections Branch are placed into inactive files only after a UST facility has been closed for more than 2 years. The UST incident files are archived only after an incident has been closed. The STF and FTF files are archived only after an incident has been closed. The STF and FTS files are maintained in the central office, and UST incident files are maintained in the regional offices (active and inactive) on file and available for public review. Section-specific QAPPs and other QA documents are generated and updated as necessary or on a five-year cycle and maintained by the Section QAO, under the review and approval of the Section QAM. All Section QA-related documents are provided electronically to staff and consultants involved in producing data for the program once the QAPP and the QA documents have been approved by USEPA. Current and electronically archived versions of these documents are also available on request or online through the internal portal.

Computer Hardware and Software

See Section 7. The UST Section currently uses MS Access databases, web based Oracle databases, Laserfiche repository and SQL server to maintain and manage program data.

Planning (see Section 8 also)

Tank registration data is collected through a self-reporting program (permitting) using forms produced by the UST Section. The tank owners and operators are required by law to be permitted and to pay tank fees. If the tanks are not permitted and the tank fees are not paid the owners and operators will be ineligible to access the state trust fund when a release occurs. Some of the information collected here is the number and volume of tanks, product contained by the tank, facility location, owner/operator, and type of leak detection system.

Tank inspection data is produced and overseen by the state inspectors of the Permits and Inspection Branch. The inspectors ensure that the tank registration data is accurate. They inspect the facilities to determine if the tanks are appropriately permitted, leak detection is being conducted properly, the tanks have overfill/spill protection and the owner/operators are keeping the required records.

Incident data is collected and posted by incident managers. Each incident manager is in charge of release investigation and the oversight of release remediation. Each manager is responsible for ensuring that data are of appropriate quality for the intended use of the data. In carrying out this responsibility, the project manager must determine the necessary data quality and oversee the process by which it will be attained. In this regard, the incident managers' responsibilities include: investigation and remediation design oversight and the coordination of technical and data quality issues among field, laboratory and data assessment staff involved in the activity. State and Federal lead managers overseeing contractors will require and review the same from those contractors.

The data from the above activities that is necessary to track UST Section goals, progress and workload is contained in databases. Significant planning was conducted to determine what data was necessary to be tracked in the databases. Detailed flow charts were developed for each process. The databases are currently undergoing modification to allow more efficient use of the data available. QA/QC specifications as required are built into the data entry process. The databases are expected to continue to be modified as it is planned to integrate them both at a Section as well as a Department level.

Implementation of Work Processes

Implementation of work processes is described in the various SOPs and guidance previously mentioned. The supervisors are responsible for checking on staff to verify employees are following the set SOPs and guidance. The managers and other staff members are responsible, as well, to point out any errors noted.

See Sections on Management and Organization and Quality System Components as well.

Assessment and Response

The section assesses the effectiveness of the program and its quality assurance mechanisms in several ways. The section has standing workgroups (e.g., regional UST database workgroup, innovative technology workgroup, reimbursement workgroup, compliance workgroup, and enforcement workgroup) that review current procedures and policies and recommend changes to improve the efficiency and effectiveness of the program. These review results and recommended changes are presented to the steering committee, which determines if the recommended changes can be implemented and directs the appropriate group to implement the approved changes. In addition, the section sends out customer surveys to evaluate outreach efforts. The section also receives input from division management, staff, public and regulated community and makes adjustments to the program as needed based on this input.

Quality Improvement

The section has participated in total quality management training and quality assurance initiatives. See Sections on Management and Organization and Quality System Components as well.

APPENDIX F: DIVISION OF WATER RESOURCES

Program Goal

DWR's mission is to protect, enhance and manage North Carolina's surface water and groundwater resources for the citizens of North Carolina, and the economic well-being of the state. In order to support this mission, high quality data collection and data management systems are essential. The Division of Water Resources (DWR) is proud of the policies, procedures and programs that are in place to assure quality management.

Management and Organization

The Division of Water Resources is divided into administrative offices and five sections that work together to efficiently and effectively protect the state's surface water and groundwater resources through quality monitoring programs, efficient permitting, responsible management, fair and effective enforcement and excellence in public service. The Sections are:

- Public Water Supply
- Water Planning
- Water Quality Permitting
- Water Quality Regional Operations
- Water Sciences

The Division of Water Resources organization chart is available at:
    https://files.nc.gov/ncdeq/Water%20Resources/DOCs/DWR-Org-Chart-November-2018.pdf

Public Water Supply

> The Public Water Supply Section regulates public water systems within the state under the statutory authority of North Carolina General Statute 130A Article 10. Public water systems are those which provide piped drinking water to at least 15 connections or 25 or more people for 60 or more days per year.
>
> There are nearly 5,500 regulated public water systems in the state. About three-fourths of the state's population lives in areas served by community water systems, while many others and visitors to the state are served by other types of public water systems, such as workplaces, schools, parks or restaurants. The section has branches and programs for:
>
> - Implementation of the mandates of the federal Safe Drinking Water Act;
> - Review and approval of plans and specifications for new and expanding or improving water systems;
> - Inspections, investigations, and technical assistance for water systems;
> - Emergency responses and complaint investigations;
> - Source water assessment, protection, and wellhead protection;
> - Capacity development; and
> - Administration of an operating fee permit program.

Water Planning

> The Water Planning Section develops standards, rules and management strategies to protect water quality, carries out water supply planning, provides guidance to local water systems and monitors drought conditions. The section supports the division's mission through a number of programs including:
>
> - Developing Basin Water Quality Plans for each of the state's 17 river basins;

- Preparing and administering rule-making for stream classifications, nutrient sensitive waters and several other division initiatives;
- Evaluating and implement surface water and groundwater standards in line with the latest scientific information and federal Environmental Protection Agency requirements
- Administering state and federal grants for non-point sources of pollution and water quality planning.
- Compiling and evaluating data to be used in reports on surface waters and ground waters of the state and identifying those waters that are impaired or have quantity issues.
- Developing TMDL - Total Maximum Daily Load - plans for waters where sources of pollutants that cause water quality impacts that exceed state and federal standards have been identified.

Water Quality Permitting

The Water Quality Permitting Section, with staff in Raleigh and DWR's seven regional offices, is responsible for:

- Implementing state and federal permitting and compliance programs for point source wastewater treatment.
- Administration of the federal pretreatment program for industrial wastewater going to municipal treatment facilities
- Permitting for the operation and maintenance of sewage collection systems.
- Permitting and compliance for wetlands and stream impacts including waterside buffer protection,
- Development of programs for stream and wetlands protection and enhancement.
- Developing DWR Emergency Response for sewage system overflows, oil spills, hurricanes, industrial explosions, and other instances where water quality may be acutely imperiled.
- Implements permitting and compliance for wastewater that is applied to land, whether it is from municipal, industrial or animal feeding operation treatment systems.

Water Quality Regional Operations

The Water Quality Regional Operations section, with offices in Raleigh and seven regional offices, focuses on the protection and enhancement of the state's surface water and groundwater. The regional office personnel are often the public's first contact with the agency for environmental permit acquisition and compliance, and for environmental emergencies. In addition, this program is responsible for groundwater well permitting and compliance. The section:

- Staffs regional offices in Asheville, Mooresville, Winston-Salem, Raleigh, Fayetteville, Washington and Wilmington.
- Permits construction of wells for monitoring groundwater quality and for extracting or treating contaminated groundwater.
- Permits construction of injection wells, such as those used for heating and cooling, or aiding in remediation.

Water Sciences

The Water Sciences Section (WSS) supports the Division through chemical and biological laboratories in Raleigh (Central Laboratory) and Asheville, NC (Asheville Regional Office Laboratory) and biological laboratories in Raleigh. The laboratories provide DWR with the biological, chemical and technical support required to regulate and manage water quality throughout the state. The Water Sciences Section:

- Monitors chemical, physical and bacteriological parameters in the state's streams, rivers and lakes, and interprets the data for use by the other division programs.
- Analyzes routine samples from a variety of sources including monitoring wells, wastewater discharges, streams, lakes, rivers, sediment, fish tissue and compliance monitoring activities.
- This section has the responsibility of entering laboratory result data into the Laboratory Information Management System (LIMS; LABWORKS™) where it is available to be accessed by departmental end users. Standards for data QA/QC are presented in the Division's LOQAM which is available as an appendix to the Ambient Monitoring QAPP.
- Helps the division to respond to emergency episodes through aiding in sampling plan design and conducting sample analysis.
- Certifies commercial, industrial, municipal and field laboratories that submit data for state permitted clients.
- Evaluates waters of the state based on the aquatic insect and fish communities they support, and the examination of fish tissue.
- Studies the effect of complex wastewater on the aquatic communities.
- Administers discharge coalition monitoring for entities permitted through the federal NPDES program.

The DWR Water Sciences Section Chemistry Laboratory is a technical support organization with the following functions:
- Provides analytical laboratory support to the Department of Environmental Quality in the form of physical and chemical analyses of surface water, wastewater, groundwater, soil, sediment and fish tissue samples.
- Provides consultation and assistance to state and local agencies, private laboratories and individuals in matters of analytical methodology and quality assurance.
- Operates a laboratory certification program to control the quality of state-required monitoring analysis.

The North Carolina Division of Water Resources' Water Sciences Section Chemistry Laboratories provide chemical, physical and microbiological analyses of surface water, groundwater, sediment, fish tissue and spill samples from around the state for the Division of Water Resources' Water Quality Section and the Division of Waste Management. The Quality Assurance/Quality Control (QA/QC) office is responsible for establishing, implementing and coordinating a comprehensive QA/QC program for environmental sampling and analyses performed by the North Carolina Division of Water Resources Water Sciences Section. The QA/QC office is dedicated to ensuring that environmental data operations are of a quality that meet or exceed requirements for informed decision making. This office is responsible for providing information, guidance and expertise in quality control and regulatory compliance issues to ensure the laboratories of the Water Sciences Section adhere to standards that meet federal and state monitoring requirements allowing for appropriate decisions to be made to protect human health and the environment. Analytical results produced by the laboratories are utilized by a variety of state and federal agencies including the NC Division of Water Resources, NC Division of Waste Management, NC Division of Marine Fisheries, NC Department of Health and Human Services, municipal governments, USEPA, and US Centers for Disease Control.

The main laboratory (referred to as the Central Laboratory) is located in Raleigh, NC. One satellite laboratory is strategically located in western (Swannanoa, NC) region of the state to provide assistance with time-sensitive tests. The lab is referred to as the Asheville Regional Office (ARO) Laboratory.

The Central Laboratory is divided into two analytical programs: the Organic Chemistry Branch and the Microbiology & Inorganic Chemistry Branch. The Organic Chemistry Branch is subdivided into two analytical units: Volatile Organics and Pesticides/µg/Sample Preparation. The Microbiology & Inorganic Chemistry Branch is subdivided into three units and a regional laboratory: Chemistry Unit, Microbiology and Metals Unit, Support Unit and the ARO Regional Lab. The Chemistry Unit is further subdivided into two analytical units: Wet Chemistry and Nutrients. The Microbiology and Metals unit is further subdivided into Microbiology and Metals. The Certification Branch is responsible for certifying commercial, industrial, municipal and field laboratories engaged in wastewater analyses and monitoring for North Carolina facilities.

The Water Sciences Section (WSS) is headed by the Section Chief, who is responsible for both the technical and administrative direction of the Section and is committed to the Quality Assurance program described in this manual. The Section Chief is supported by the Environmental Program Supervisors. The Quality Assurance/Quality Control (QA/QC) Coordinator (also referred to as QA Officer) has the responsibility of establishing, implementing and coordinating all activities related to the quality assurance program. The QA/QC Coordinator works independently from groups generating, compiling, and evaluating environmental data and reports directly to the Certification Branch Environmental Program Supervisor III. The QA/QC Coordinator manages the QA/QC program for the two laboratories, including working with lab management and staff to identify improvements to QA systems, and establishing policy for the Water Sciences Section's QA program. The QA/QC Coordinator documents these objectives in the Quality Assurance Manual (QAM) which includes procedures for sample handling, method validation, statistical analyses, and data verification. Quality assurance procedures for other branches of WSS are available online.

Competency of Data Generated Under U.S. EPA Assistance Agreements

The Water Sciences Section (WSS) supports the division through providing laboratory and ecological services. Chemical laboratories in Raleigh and Asheville, NC provide laboratory services and ecological (surface water quality monitoring) services are provided through a laboratory in Raleigh and by staff in regional offices that conduct surface water quality monitoring. These laboratories, and regional office monitoring staff, provide DWR with the biological, chemical and technical support required to regulate and manage water quality throughout the state. Services provided through the analytical and ecological components of the Water Sciences Section are described below:

Laboratory services include the analysis of samples for inorganic and organic compounds, bacteria and certification of laboratories providing data for DWR's programs. Chemical and Biological analyses include:

- Nutrients
- Metals
- Semi-volatile organic compounds
- Volatile organic compounds
- Bacteria
- Wet chemistry
- Pesticides

Ecological/monitoring services include the collection of surface water samples to ascertain the physical/chemical water quality, the assessment of benthic macro-invertebrate and fish communities and collection of fish for fish. Staff that provide ecological services may conduct the following duties:

- Collection of chemical, physical and bacteriological samples in the state's streams, rivers and lakes, and interprets the data for use by the other division programs.

- Analyze data from water samples collected from monitoring wells, wastewater discharges, streams, lakes, rivers, compliance monitoring activities.
- Assist the division to respond to emergency episodes through aiding in sampling plan design and conducting sample analysis.
- Evaluate aquatic insect (benthic macroinvertebrate) and fish communities
- Collect fish for to determine concentrations of compounds in fish tissue.
- Study the effect of wastewater on the aquatic communities

Many of these functions generate data under USEPA funded assistance agreements. Thus, under USEPA Policy Directive Number FEM-2012-02, the Water Sciences Section must document competency prior to receiving any USEPA funded assistance. Documentation of competency is described below.

Documentation of Competency - Laboratory Services

The chemistry laboratory currently has in place a WSS Laboratory Quality Assurance Management Plan (LQAMP) and a LOQAM which covers both the central laboratory and the Asheville regional office laboratory operations. These documents, in addition to Laboratory Standard Operating Procedures, satisfy the first bullet requirement of the policy. The WSS Laboratories Quality Assurance Management Plan revision was finalized May 30, 2016. The WSS LOQAM revision was finalized June 30, 2018. The NC DWR WSS Laboratory updates the QAMP and LOQAM every three years or anytime there are changes to procedures.

Laboratory SOPs are written by laboratory staff and reviewed (also reviewed annually after finalization) by supervisors/managers and LQAO before finalization. The LQAO maintains SOPs on a SharePoint Team Site, issues finalized revisions and distributes new revisions via hard copy and email. Hard copies of previous revisions are archived within each unit. Digital copies of previous revisions are archived on a server at NC's Western Data Center. An SOP for developing SOPs is maintained.

The NC DWR-WSS Laboratories pay to participate in blind proficiency testing (PT) studies administered by vendors with ACLASS and/or A2LA accreditation, usually in the 3rd quarter of each year and participates in round robins for chlorophyll *a* and mercury analyses annually. Corrective action is taken, and remedial PTs are analyzed anytime any parameter is found to be "Not Acceptable" to demonstrate that systems are back in control.

The NC DWR-WSS Laboratories conform to the regulatory requirements of the NC WW/GW Laboratory Certification Program [15 NCAC 2H .0800]. Each year PT and round robin results are available upon request as on-going demonstration of competency as completed.

Laboratory staff are encouraged to monitor for/ explore upgraded analytical instrumentation/ methodologies and quality management tools to improve laboratory processes without sacrificing data quality or integrity. Staff are canvassed periodically for suggestions of beneficial training topics.

The LQAO will monitor and track laboratory employee training to ensure that training is logged and completed. Quality-related training may be obtained from: 1) an external vendor (if available and Departmental resources permit); 2) USEPA; or 3) from other available sources.

The following bullets summarize frequency of audits, documentation of results, corrective actions, management briefings, etc.:

- System Audits at NC DWR WSS Laboratories are performed annually internally and externally every three years by USEPA region IV whenever USEPA budget allows.

- Internal audits are performed by the QA officer and/or the Laboratory Certification Unit and/or members of the professional laboratory staff that do not normally work in the section or analytical unit being audited.
- The Quality Assurance Coordinator/Officer may conduct several systems audits during each calendar year but will conduct at least two systems audits a year. During each system audit, at least one component of the laboratory will be reviewed to determine if that part is functioning in compliance with this QMP. Subsequent to each system audit, the laboratory staff and managers will receive training by the LQAO regarding each part of the QMP covered during the system audit via the Corrective Action Response (Root Cause Analysis) process. The QMP is available to all laboratory staff and managers via DEQ's website and hard copies found in the laboratory.
- The NC DWR WSS Laboratory Certification Staff performs a Laboratory Audit every three years.
- These audits are documented through checklists and interviewing lab staff and the generation of an inspection report listing each incident of non-compliance to state and federal regulations. The LQAO is responsible for ensuring effective root cause analysis is performed and corrective actions are implemented by laboratory staff. The LQAO monitors the effectiveness of the corrective actions by tracking the progress and completion of each in a corrective action response (CAR) report utilizing MS Excel. The LQAO submits a CAR report to the NC DWR WSS Laboratory Certification Program to verify compliance is met.
- Lab performance is monitored through semi-annual participation in Proficiency testing, Round Robin Studies and commercially prepared blind samples.
- External audit and internal audit reports are documented and reported to the Supervisors, Branch Manager, Section Chief and the Quality Assurance Manager so that any necessary adjustments can be made.
- All deficiencies found during audits are reported to the Section Chief and the Quality Assurance Manager. Audit information is also provided to the appropriate Program Supervisor(s) and Unit Supervisor(s). The Section Chief, Program Supervisor(s) and/or Unit Supervisor(s) and QA/QC Coordinator agree upon a time frame for correction. The lab's response and corrective action procedures are evaluated by the QA/QC Coordinator and when acceptable, are attached to each audit and filed. If issues arise that may require method suspension or restriction, the procedures in Section 13 of the Water Sciences Section LOQAM are followed.
- External audits often require written reports that include proof of correction. The QA/QC Coordinator coordinates this written response.
- Written Corrective Action Reports (CARs) to Proficiency Testing (PT) samples and/or other blind samples may also be required. These responses must address root cause for any "unacceptable" result. In most cases it may be necessary for remedial Proficiency Testing samples or blind QC samples to be submitted to the laboratory to show a return to control.

Documentation of Competency - Ecological Services

Quality Assurance Project Plans (QAPP) are in place for each of the Water Science Section's ecological (water quality) monitoring programs. Table 1 provides a summary of the dates on which the Environmental Protection Agency approved a specific QAPP. The most recent versions of the QAPPS were approved by USEPA in March 2014. These documents, in addition to Standard Operating Procedures, document DWR's WSS-Ecology's commitment to USEPA's quality assurance program requirements.

Table A2. DWR-WSS (Ecology) QAPPs and USEPA Approval Dates

QAPP	Version 1.0	Version 1.1	Version 1.2 or 2.0

Ambient Monitoring System (AMS)	Jan. 10, 2005	July 10, 2012	Version 2.0: July 11,2017
Benthic Macroinvertebrate Community Assessment Program (BMCAP)	October 2, 2006 & July 3, 2007	Feb, 2012	December 27, 2017
Stream Fish Community Assessment Program (SFCAP)	October 2, 2006 & July 3, 2007	Feb. 2012	March 31, 2014
Fish Tissue Monitoring Program (FTMP)	October 2, 2006 & July 3, 2007	Feb, 2012	March 28, 2014
Ambient Lakes Monitoring Program (ALMP)	Feb. 1, 2007	July, 2012	Version 2.0: March 28, 2014 (Currently updating)

In addition to the QAPPs, staff competencies in areas of expertise are demonstrated at least annually. All staff involved with physical and chemical water quality sampling participate annually in the US Geological Survey's National Field Quality Assurance (NFQA) program. Any deficiencies identified are addressed immediately. Meter training is held periodically - most recently in April 2015 for Ambient Monitoring System (AMS) sample collectors. Annual refresher trainings are on ongoing at the regional offices, most recently in the Asheville region in September 2016. Reviews of "Good Laboratory Practice" files that are saved on some meters are reviewed for calibration issues. Staff involved with biological sampling have 10% of samples independently reviewed by another staff member. Additionally, biological sample sites may be sampled independently by two sample teams and the two results are compared. All discrepancies are addressed. Documentation of these quality assurance activities are maintained by the branches and quality assurance staff.

The following bullets summarize frequency of audits, documentation of results, management briefings, etc.:

- Technical reviews – technical reviews of data are ongoing and employ the use of statistical analysis for quantitative (physical/chemical) data, and peer assessment for taxonomic data.
- Audits
  - Physical/chemical data

    Monitoring Coalitions: Monitoring staff employed by external contract laboratories are audited annually. Checklists are used as part of the audits to assure data are collected in compliance with the *Monitoring Coalition Program - Field Monitoring Guidance* Version 2.0 (December 2012). Results are summarized in memoranda, and corrective actions are implemented when needed. Follow-up on corrective actions is always taken.

    DWR Ambient Monitoring: Field meter calibration sheets are audited quarterly. Good laboratory practice files are audited periodically. Field audits of staff collecting data are conducted as-needed to assure compliance with SOPs and QAPPs. Results are summarized in memoranda, and corrective actions are suggested when needed.

  - Biological data (benthic macroinvertebrate)

Assessment of sample teams is conducted annually dependent on staff resources.

- - Communicating audit results: Written results of audits are always communicated to the immediate supervisor. The next-level supervisor is informed of results on an as-needed basis.

- ▪ Management system reviews are on-going to assure legally and scientifically defensible data.

Quality System Components- Public Water Supply

The Public Water Supply (PWS) Section follows various USEPA implementation guidance and standard operating procedures (SOPs) in its daily operations. The bulk of the SOPs are geared toward the data entry staff. There are also some edit checks that are programmed into the data entry routines in Safe Drinking Water Information System (SDWIS). The rest of the SOPs are followed by each of the Rule Managers who handle the different contaminants that are tested in the public water systems. The majority of the PWS Section's databases are designed around USEPA's formats to assure that North Carolina reports the needed information and that this information is in the format desired by USEPA.

The PWS Section employs full electronic reporting of analyses by labs which was effective early 2015 for all contaminants. Systems either use a data entry portal created by the state to create CSV files or by creating their own CSV files, which are then uploaded to SDWIS using USEPA reporting tools. The Section uses USEPA's "Lab to State" module and XML program and protocols for transferring the data. This improved data quality by eliminating hand keying, and by returning error reports immediately to the submitting lab. In addition, compliance routines are run much more quickly after the end of the compliance period without backlogs of data entry to process. The Compliance Services staff and the SDWIS data QA Manager also review lab error reports and ensure labs both understand how to and do make needed corrections. During quarterly submittal to USEPA, the PWS Section receives error reports from USEPA's FedRep program. The DPB supervisor, Compliance Branch Staff and Business and Technology Applications Analyst review these error reports for problems that need correction in a timely manner or that can wait until the next quarterly submittal. USEPA sends other reports to the PWS Section for verification throughout the year since the USEPA's ODS system is not as current as the States' computer systems because reporting is on a quarterly basis.

USEPA makes on-site data verification audit checks on the PWS Section's databases verses the USEPA databases on a roughly four (4) year cycle. Any discrepancies found are corrected or explained as to why there is a difference in the two computer systems. In addition, the PWS Section must send to USEPA an "Annual Compliance Report" which cites the number of systems, number of violations, and the type of violations that the PWS Section has in its database for that particular year. This report compares the information that is in the State's database to the information in the USEPA's databases. After comparing the data, North Carolina uses the information that is in the PWS Section's databases which is more current than what is in USEPA's since the USEPA's database is at least a quarter behind the State's.

The PWS Section has a program called the "Monitoring Status & Sampling Schedule" which is available online for all water systems in North Carolina informing the public water systems the last test results our database contains and the compliance schedule based on the particular contaminant group and is available on our web page. This report helps the public water system stay in compliance with the Safe Drinking Water Act (SDWA) and gives the public water system an opportunity to verify the data in the PWS Section's database verses the records the public water system has on hand to make sure the State and the public water system have the same records. The PWS Section also used a customized version of Drinking Water Watch to interface with SDWIS and provide inventory, analytical, and enforcement information to the water systems and the consuming public.

Personnel Qualifications and Training (See Section 4 also) – Public Water Supply

Each employee is given the appropriate guidance or SOP for his/her area of "expertise." The Rule Managers handle the violation and enforcement SOPs and guidance. The employee is shown how to key in his/her data and how to view the data according to the particular Rule. If a correction is needed, the employee is shown the proper procedure for making the correction. Only certain staff members are given access to the particular databases to ensure only trained staff members can manipulate the data. In addition, USEPA provides training courses designed to assist the PWS Section in maintaining the quality of data needed in a State and National computer system. Results of the data entry QA/QC procedures, the SDWIS upload error reports, or USEPA audits all are used to identify additional training needs for staff. Providing training is the responsibility of the respective supervisors. Effectiveness is measured by improvements in these measures.

Procurement of Items and Services – Public Water Supply

See Section 5.

Documents and Records (See Section 6 also) – Public Water Supply

All records and correspondence for each public water system is maintained in the Division until they are sent over to the State Records Center for storage. The record retention schedule for these files is in accordance with the State's and USEPA's record retention schedule, as approved by the Division of Archives and History. Inspection/inventory forms items are kept in the Data Processing Work Area for certain time periods before they go to Central Files. This is done for easier access for the Rule Managers, data entry personnel, and other staff members who need to access this information on a daily basis. The quality of the files in the Data Processing Work Area falls ultimately under the responsibility of the supervisor of the DPB.

Computer Hardware and Software (See Section 7 also) – Public Water Supply

The Division has a Water Resources IT Manager as well as three Business and Technology Support Analysts supported by the PWS Section program responsible for assuring computer hardware and software work as needed to support program operations. These positions are housed in a centralized IT unit in the Department. The Section uses USEPA's SDWIS data management system. Data quality in the data base is verified as described in the preceding "Quality System Components – Public Water Supply" section.

Planning (See Section 8 also) – Public Water Supply

The Public Water Supply Section participates with the Department's strategic planning process as well as planning with USEPA for the PWS Section work plan. No data collection is performed by the agency.

Implementation of Work Processes – Public Water Supply

Implementation of work processes is described in the various SOPs and guidance previously mentioned. The supervisor of the DPB is responsible for conducting random checks on staff to verify the employee is following the set SOPs. The Rule Managers, the Business and Technology Applications Analyst, and other staff members are responsible, as well, to point out any errors noted. Thus, the appropriate staff member can be corrected in the appropriate SOP. Consistency and quality of data collection and maintenance is a key component of the PWS Section's implementation of a federally authorized program.

Assessment and Response – Public Water Supply

The PWS Section continually looks for opportunities to improve its program implementation and quality assurance. The PWS Section created an electronic data submittal system for the commercial laboratories to help eliminate keying errors and speed data entry. Thus the error of mistakes made by the laboratories of putting the data on a State reporting form and the error of mistakes made by the PWS Section staff of re-keying this information into the PWS Section computer system has been eliminated. Rules were passed to mandate electronic reporting of analytical results from laboratories in 2010, and necessary data transfer tools to support the requirement for smaller labs were completed in early 2015. This has resulted in great improvements in data quality and the timeliness of compliance determinations.

Quality Improvement – Public Water Supply

As mentioned previously, the PWS Section is greatly involved in assuring data quality. Through the last few years, the Rule Managers and the PWS Section field staff have become more involved with the computer system and are realizing the need for better data quality. With the data quality becoming more and more part of the Rule Managers responsibility, the Rule Managers are more involved and are making several recommendations to improve the quality of their data in their databases. Also, with the public becoming more aware of the answerability of the government of public information, the public water systems want to make sure their information is represented accurately. As an agency, our data is continuing to get better and further enhancements to our computer system will allow easier and more accurate assessments to insure quality assurance. Each Branch Head is charged with seeking changes and improvements in the organization under their responsible control. If policy changes are required, then those must be approved by the Section Chief.

Laboratory Certification Program – Public Water Supply

The laboratory certification program is performed by the Environmental Sciences Certification Office, which is housed in the Department of Health and Human Services, State Laboratory of Public Health/Office of Chief Medical Examiner Section.

For the purpose of determining compliance with the requirements of this Section, samples may be considered only if they have been analyzed by a laboratory certified by the Division of Public Health Laboratory Certification Branch. (Title 15A, subchapter 18C.1527 NC Administrative Code.) In other words, anything reported from laboratories to Public Water Supply for regulatory reporting must come from a certified laboratory.

Laboratories interested in certification initiate the process by completing an application found on the SLPH website. Laboratories must show competency by providing to the Certification Office reports from analysis of unknown performance samples. For Coliform group Microbiological certification, 80% of the samples in a 10-unit set must be correct. For *E. coli* enumeration, Heterotrophic Plate Count and for Radiological and Chemistry certification, the analyte of interest must be successfully analyzed in two of the last three attempts. North Carolina is analyte and method specific, therefore performance samples must be successfully analyzed by each method for which the laboratory desires certification. Any method specific Demonstration of Capability/Performance studies must also be provided to the Certification Office for review.

After the laboratory has successively completed the data requirements, an on-site evaluation is conducted to: (1) verify the laboratory's ability to analyze compliance samples, (2) review equipment, SOPs, methodology, quality control, sampling, and reporting criteria, and (3) interview the analysts, quality control officers, and laboratory directors. After the on-site evaluation, the Certification Unit submits a report to the laboratory detailing any deviations from the USEPA approved methodology, or

deviations from any additional North Carolina requirements. After a laboratory responds to the Certification Unit report satisfactorily detailing how any deviations will be corrected, they may become certified. Laboratories outside of North Carolina must document certification in their home state for the analytes of interest. Their home state on-site evaluation may be used in the interim in lieu of a visit by a North Carolina auditor. Once a laboratory has achieved certification status, the Certification Office enters the necessary information into SDWIS. The Office continues to update this database as the certification status changes for the laboratory, or for a particular analyte/method combination for which the laboratory is approved to use on compliance monitoring samples.

To remain certified, a laboratory must successfully pass two Performance Evaluation Water Studies a year for coliform presence/absence and *E. coli* enumeration testing, and for the acute health contaminants nitrate, nitrite, and chlorine dioxide, and one performance sample a year for HPC and all other chemistry and radiological contaminants. Except for the coliform set, the Certification Unit reviews the last three data points from these PE studies to determine continued laboratory certification. A laboratory must have two of the last three data points as correct analyses to retain its certification. As with initial certification, 80% of the 10 samples in the coliform set must be correctly reported to retain certification. Additional certification requirements include a successful on-site evaluation at least every three years.

The Certification Unit currently certifies laboratories that wish to perform Microbiological testing for the presence/absence total and fecal coliforms and *E. coli*, enumeration of *E. coli* for LT2 and Heterotrophic Plate Count, laboratories performing Radiological analyses, and laboratories analyzing for the Inorganic and/or Organic chemical parameters. There are roughly 68 organic contaminants (pesticides, herbicides, dioxin, volatiles, DBP, etc.), 16 trace metals, and 12 wet chemistry inorganic analytes that comprise the regulated chemistry analytes. The Certification Office monitors testing of analytes which do not require full certification but must be done by personnel approved by the State to verify that USEPA accepted methodology is used. Unregulated contaminants that are reported in proficiency studies are tracked for use if USEPA elects to make these regulated contaminants in the future. Currently, in North Carolina there are approximately 230 laboratories certified for one or more parameters. These laboratories are private commercial facilities, water plants, waste water plants, academic institutions, military establishments and Health Departments.

In addition to the laboratory certifications, the Certification Unit holds workshops: three times a year on Microbiological methods; twice a year on Process Control chemistry workshop for water plant operators; and assists with waterworks operator and other training events.

Quality System Components - Water Quality Regional Operations, Water Sciences, Water Planning, and Water Quality Permitting

All of the work done by the DWR is performed under this DEQ umbrella quality systems document, the Quality Management Plan. Each component program in DWR is currently given the flexibility to develop their own quality system requirements that will produce data of sufficient quality for their needs and objectives given current resources. The majority of programs in DWR detail QA/QC requirements in their Standard Operating Procedures (SOPs) or other documentation. Certain component programs have initiated development of USEPA-approved Quality Assurance Project Plans (QAPPs). These plans are developed in accordance with US*EPA Requirements for Quality Assurance Project* Plans (USEPA QA/R-5, 2001). The QAPPs are intended to serve as a vehicle for transparent methodology to outside parties and to provide project-specific documentation of objectives, planning activities, and assessment methods. Current copies of all SOPs, QAPPs, and other program QA documentation are kept on file by the component Program Manager, generally the applicable

Branch Supervisor, and are also made available on the component program's web page. Following is a list of major quality assurance and management documentation for DWR:

- The Water Sciences Section (WSS) has developed several program-specific QAPPs, all of which have been approved by USEPA. The WSS also maintains SOPs for biological monitoring, physical and chemical monitoring, algal and aquatic plant assessment, and aquatic toxicity testing. This Section certifies commercial laboratories for aquatic toxicity testing. Aquatic Toxicity testing is required by NPDES permits issued to dischargers in North Carolina. The WSS's analytical chemistry lab follows a Quality Assurance Manual (QAM) which includes procedures for sample handling, method validation, statistical analyses, and data verification.

- The Water Quality Permitting Section uses a Guidance Manual for Permit Writers, an SOP for Wasteload Allocations, and various guidance documents for compliance activities, such as the Inspectors Training Manual. The Pretreatment program in that Section uses a Comprehensive Guidance Manual for North Carolina Pretreatment Programs, a Regional Office Pretreatment Guidance Manual, a SOP for the Pretreatment Group, and a Pretreatment Annual Report Workbook. The 401 Oversight and Express Permits Unit and Transportation Permitting Unit, also in the Surface Water Protection Section, follow a SOP for all technical reviews for 401 Certifications, non-404 wetlands permits and the various buffer rules.

- Wetlands/401 Unit, also in the Surface Water Protection Section, follows a SOP for all technical reviews.

- The NPDES program has been delegated to North Carolina by the USEPA. In addition to Division SOPs, many critical procedures are set by USEPA national or regional policy and procedure.

- The Groundwater Protection Branch of the Water Quality Regional Operations Section has USEPA-approved QAPPs for the following programs:

- North Carolina Groundwater Quality Resource Evaluation Program

- Complaint Investigations

- Regulated Facility Inspections.

- The "Aquifer Protection Section QA/QC and Standard Operating Procedures Manual for Sample Collection" provides the basis for the Aquifer Protection quality system. The manual serves as a source book for training new employees, as well as a reference for current employees. The standard operating procedures and specific QA/QC requirements of the manual are incorporated by reference into all program plans administered by Section personnel.

- The Planning Section, Section 319 nonpoint source grant program, has established a QAPP form, which must be submitted to and approved by the Division of Water Resources before a grant recipient can commence monitoring under a 319-funded project.

Personnel Qualifications and Training (see Section 4 also) - Water Quality Regional Operations, Water Sciences, Water Planning, and Water Quality Permitting

Staff is recruited in accordance with polices established by the NC Office of State Personnel. Each staff member must meet at least the minimum personnel qualifications described in the "Training and Experience Requirements" section of each posted position. In addition, all Groundwater Protection Branch field employees must obtain the equivalent of three months of field experience gained through on-the-job training under the direction and supervision of senior technical staff before they are designated as permanent employees. All technical field personnel are required to undergo 24-hour OSHA safety training updated with an 8-hour refresher course annually. This training is administered and documented under the direction of the DWR Safety Consultant. Section staff is also required to follow all safety regulations as outlined in applicable safety manuals or policy guidelines issued by the Branch, WQRO Section, and the Division. WSS Laboratory staff are offered at least two internal training sessions per year. WSS Laboratory administration is in the process of developing training modules via the NC Learning System and will be implementing annual Ethics and Data Integrity training

sessions for all laboratory personnel. The effectiveness of these training sessions is evaluated through direct observation, internal audits, documented initial demonstration of capability studies, method detection limit studies, ongoing quality control samples, and double blind proficiency testing samples.

Procurement of Items and Services - Water Quality Regional Operations, Water Sciences, Water Planning, and Water Quality Permitting

See Section 5.

<u>Documents and Records - Water Quality Regional Operations, Water Sciences, Water Planning, and Water Quality Permitting</u>

It is the responsibility of the WSLQAO and the EBQAC to maintain control (i.e., schedule/supervise the review process and approve/distribute final drafts) of the Laboratory's and Field's SOPs. All laboratory personnel are required to prepare all SOPs that pertain to the work they perform within the laboratory. In the Water Sciences Section (WSS) Laboratories, SOPs are written by the Chemistry Technician, Chemist or Lead Chemist involved in carrying-out the procedure. The Unit Supervisor is responsible for the first tier of review, followed by the Branch Head and finally the Quality Assurance/Quality Control (QA/QC) Coordinator or SOP Review Committee. The EBQAC prepares all of the SOPs that pertain to field work. The field SOPs are reviewed by the Field SOP Committee for approval The official copy of a SOP is the on-line version housed on the intranet portal or SharePoint. All other copies are considered unofficial and uncontrolled. The LOQAO and EBQAC will serve as SOP custodian and will keep a controlled list of the all current SOPs and revisions. The SOPs follow a prescribed format containing each of the following sections:

- Scope and Application
- Summary of Method
- Safety and Waste Handling
- Definitions
- Interferences
- Apparatus and Equipment
- Reagents and Chemicals
- Sample Collection, Preservation, Shipment and Storage, etc.
- Revision History Tracking

The WSLQAO and EBQAC maintains control of the documents via a "control documentation notation" found on each page of every SOP. It contains the following information: Revision Date, Effective Date, Author, Revision Author, a Short Title/ID which serves as a unique reference designation and page number (i.e., page 123 of 123). The revision number, date and detailed revision history are useful in identifying the SOP in use when reviewing historical data and critical for evidentiary record. The WSLOQA and EBQAC maintains a centralized list of every SOP documenting each of the items found in each SOP's control documentation notation. Approved versions of SOPs are posted on the DEQ Intranet Portal or SharePoint website in either .pdf or are write-protected format.

After a new version of an SOP is approved and posted the previous version is archived on the wqChemLab or wqEU portion of the wv1dnfp01 shared server or on the EBQAC OneDrive account. Archived documents are retained per the General Schedule for State Agency Records document issued by NC Dept. of Cultural Resources.

Computer Hardware and Software - Water Quality Regional Operations, Water Sciences, Water Planning, and Water Quality Permitting

See Section 7.

Planning (see Section 8 also) - Water Quality Regional Operations, Water Sciences, Water Planning, and Water Quality Permitting

Water quality data and information collection and assessment comprise an essential element of the water quality protection program in North Carolina. The Division collects, assesses and publishes significant amounts of data and information each year. Because much of this data and information is used for civil or criminal enforcement processes, the Division has mandated a strong quality assurance program for all data collection and assessment. Each program has mandatory SOPs and QA documents. Furthermore, since most programs contain some federal grant funding, similar federal provisions for quality assurance are also mandated. Continued planning and update of these documents are essential.

Each unit supervisor has direct responsibility for ensuring that data generated by the Section is appropriate for its intended use. This responsibility includes scientific study design, appropriate QA planning, development of data quality objectives, preparation of QA planning documents where appropriate, and the coordination of technical and data quality issues among field, laboratory and data assessment staff involved in the activity.

Implementation of Work Processes - Water Quality Regional Operations, Water Sciences, Water Planning, and Water Quality Permitting

Implementation of work processes is described in the various QMPs, QAPPs, SOPs, and guidance manuals previously described. The implementation of these procedures is required of all staff and are continually encouraged and reinforced through internal and external training. Adherence to the Quality System components outlined above by DWR staff result in the implementation of the processes. Often these work processes are outlined in the individual employee's annual work plan.

Assessment and Response - Water Quality Regional Operations, Water Sciences, Water Planning, and Water Quality Permitting

Different types of assessment activities are used to verify that data measurement systems are operating appropriately and that the data generated by these systems are appropriate for their intended use.

In the areas of data analysis, internal and external audits are conducted regularly to ensure that the guidance provided in this document and in other related documents is followed. Internal audits are performed by the QA manager, who is responsible for all QA/QC functions in the laboratory, and/or members of the professional laboratory staff that do not normally work in the section or analytical unit being audited.

Quality Improvement - Water Quality Regional Operations, Water Sciences, Water Planning, and Water Quality Permitting

The various data-producing sections continually seek to find ways to improve the overall water quality program. The meetings described above are just part of the communications links being developed to seek better methods of dealing with current and anticipated problems within the resources available. In addition, many water quality program staff are involved in various state and national associations, groups or teams that look at ways to improve the water quality program on a national scale, while maintaining a quality regulatory program. North Carolina has always sought innovative solutions to the ever-increasing environmental stresses placed on the state's surface waters. North Carolina was one of the first states to initiate the basin wide concept for water quality management, a concept that was later fully embraced by USEPA and implemented nationally.