

4 QUALITY ASSURANCE

4.1 INTRODUCTION

BNL has established a Quality Assurance/Quality Control (QA/QC) Program to ensure that the accuracy, precision, and reliability of environmental monitoring data are consistent with the requirements of 10 CFR 830, Subpart A, Quality Assurance Requirements, and DOE Order 414.1B (2004), *Quality Assurance*. Responsibility for quality at the Laboratory starts with the director, who approves the policies and standards of performance governing work, and extends throughout the entire organization. The purpose of the BNL Quality Management (QM) System is to implement QM methodology throughout the various Laboratory management systems and associated processes, in order to:

- Plan and perform BNL operations in a reliable and effective manner to minimize any impact on the health and safety of the public, employees, and the environment
- Standardize processes and support continual improvement in all aspects of BNL operations
- Enable the delivery of products and services that meet customers' requirements and expectations

For environmental monitoring, QA is deployed as an integrated system of management activities that involve planning, implementation, control, reporting, assessment, and continual improvement. QC activities measure each process or service against the QA standards. QA/QC practices and procedures are documented in detail in manuals, plans, and a comprehensive set of standard operating procedures (SOPs) for environmental monitoring (EM-SOPs). Staff members who must follow these procedures are required to document that they have reviewed and understand them.

4.2 ENVIRONMENTAL SAMPLE ANALYSIS AND QUALIFICATIONS?

The Laboratory's environmental QA practices and procedures are documented in manuals and SOPs, and govern sample collection, radiation measurements, chain-of-custody (COC) requirements, and analytical chemistry standards. Environmental samples are analyzed through contracts with seven off-site analytical laboratories. General Engineering Lab (GEL) and Test America (TA) perform radiological and non-radiological analyses; Ecotest Lab, H2M, and Chemtex Lab perform nonradiological analyses; American Radiation Services (ARS) perform radiological analyses; and Caltest Analytical perform mercury and methyl mercury analyses. All seven laboratories are certified by the New York State Department of Health (NYSDOH) for the relevant analytes, where such certification exists, and are periodically audited to ensure that quality standards are maintained. The labs are required to incorporate QA guidelines into their operations when performing work and participate in several national and/or state performance evaluation (PE) testing programs. Results of the PE tests provide information on the quality of a laboratory's results and allow comparisons to be made between labs. In addition, BNL has established a program of internal and external audits to verify the effectiveness of the environmental sampling, analysis, and database activities. Contractor laboratories are also subject to audits by DOE personnel.

4.3 Specific Groundwater and Air Monitoring QA

The BNL groundwater monitoring program, Quality Assurance Program Plan (QAPP) (BNL 1999b), describes the QA program and QC requirements followed for monitoring groundwater quality. The plan defines the project organizational structure, documentation requirements, sample custody requirements, acceptance criteria, auditing functions, corrective action provisions, and guidance on the collection of QA/QC samples. The QAPP was developed using guidance provided in EPA QA/R-5, EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations (EPA 1998). The QAPP for radiological air emissions (2002) was developed and implemented to provide direction for collecting air samples in accordance with the ANSI/HPS N13.1-1999 standard and, where applicable, Sampling and Monitoring Release of Airborne Radioactive Substance from the Stacks and Ducts of Nuclear Facilities.

4.4 Data Quality Objectives

The Data Quality Objectives (DQOs) included in this plan follow the DQO process, a seven-step planning approach to develop sampling designs for data collection activities that support decision making. This process uses systematic planning and statistical hypothesis testing to differentiate between two or more clearly defined alternatives. The DQO process provides the following benefits:

- Promotes understanding of the real purpose of collecting data (i.e., why the data are needed and what questions the data may help answer)
- Provides a convenient way to document activities and decisions
- Facilitates rapid review and approval by regulators and stakeholders
- Fosters communication between interested parties
- Promotes efficient use of limited resources
- Outlines methods of assessing performance and states the consequences of decision errors

4.5 Sample Collection

Trained technicians follow procedures outlined in EM-SOPs, which are developed using information in the media-specific DQOs. Technicians use bound logbooks and media-specific log sheets to document sample collection. COC procedures are followed to ensure that each sample is properly handled and controlled.

4.6 Data Management

Each environmental sample collected is identified with a unique number and accompanied by a COC. The sampling data are reported in electronic and hard copy formats. All electronic data are maintained in the BNL Environmental Information Management System (EIMS). The EIMS consists of an environmental data management system platform that is linked with a geographic information system (GIS). Analytical data in the EIMS can be retrieved and evaluated using custom applications, and paper records are filed for future reference.

The EIMS became the sole repository of all environmental data in 2002. Previously, the EIMS held environmental data collected only from environmental restoration activities. Compliance and environmental surveillance data from 1995 to 2002 were housed in the environmental database shared with BNL's on-site Analytical Services Laboratory (ASL). The ASL stopped operations in the first quarter of 2004, and the data was then transferred to EIMS. This transfer involved changing the identification scheme for sampling locations. Appendix C provides a cross walk between the sampling location identifications used between 1995 and 2002, and those which are currently used. It

also details the framework for assigning identification codes to newly designated sampling locations.

4.7 Electronic Data Quality Assurance

Data quality assurance steps are detailed in the EIMS Data Management Description and in applicable SOPs. When data are entered into the EIMS, completeness checks are automatically performed to ensure that analyses are provided for all samples, required data fields are not empty, and that certain fields contain only predefined legal values or formats. For analytical results from the groundwater monitoring program, outlier values are automatically flagged and project managers are notified in order to expedite evaluation of these data. For all other programs, the subject matter experts (SMEs) periodically review the data to ensure that concentrations are within typical levels.

4.8 Data Validation

Data packages are received from contractor analytical laboratories and the type of review conducted is determined by the data quality objectives of the individual project. Reviews range from Project Manager reviews to full validations conducted by SMEs in either radiological analyses or analytical chemistry to ensure compliance with contract specifications. Projects may require that the data packages are examined to ensure that samples do not exceed holding times, there are no poor recoveries, the proper sampling method was used, and field blanks were less than the Minimum Detection Limits (MDL). Nonradiological data analyzed off site are verified and validated using Environmental Protection Agency (EPA) contract laboratory protocols (EPA 2006a, 2006b). Radiological packages are verified and validated using both BNL and DOE guidance documents (BNL 2006, DOE 1977).

4.9 Data Quality Assessment

EPA defines data quality assessment as “the scientific and statistical evaluation of data to determine if data obtained from environmental data operations are of the right type, quality, and quantity to support their intended use” (EPA 1996). The respective SME reviews each set of data provided by a contract analytical laboratory after data validation and then compares the results to historical results, duplicate samples, and control samples. The quality system diagram on the following page details the three stage process: planning, implementation, and assessment. The planning stage can be divided into the DQO process, the sampling design, and the QA plans associated with the program. The implementation stage entails the actual collection of samples and analysis in accordance with the SOPs and quality control guidelines. The final stage is data quality assessment, and includes data verification and validation, and review of the decision-making process to ensure that effluents, emissions, and receptor data are adequate to assess impacts to the health of the BNL environment. The outcome of the quality process is defensible products and decisions.

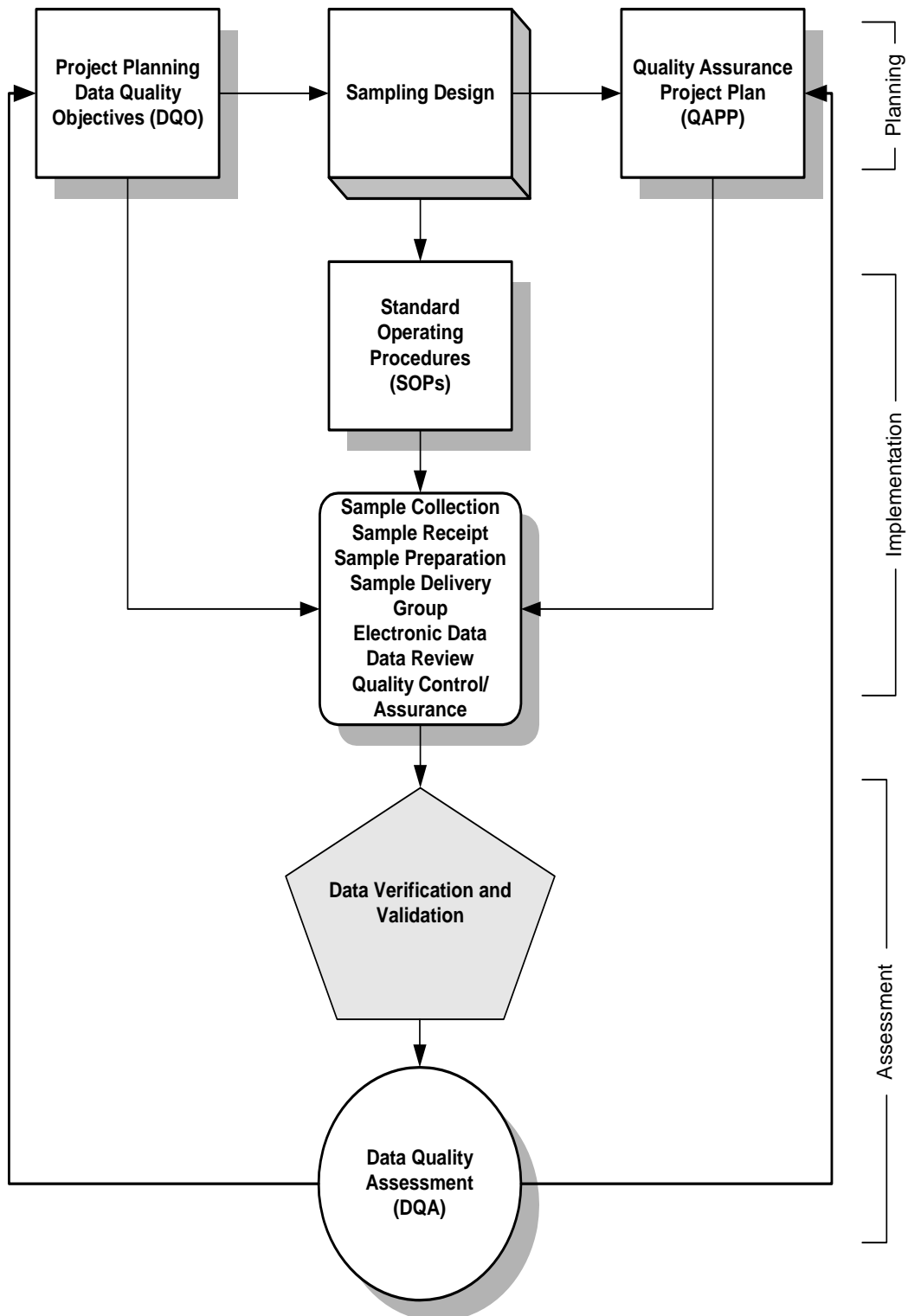


Figure 4-1. Data Quality Flowchart

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