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Quality Assurance

Abstract

The Paducah Site maintains a Quality Assurance/Quality Control (QA/QC) Program to verify the integrity of data generated within the Environmental Monitoring Program. Monitoring and sampling organizations at Paducah select sampling methods, instruments, locations, schedules, and other sampling and monitoring criteria based on applicable guidelines from various established authorities.

Introduction

The Paducah Site maintains a QA/QC Program to verify the integrity of data generated within the Environmental Monitoring Program. Each aspect of the monitoring program, from sample collection to data reporting, must address quality requirements and assessment standards. Requirements and guidelines for the QA/QC Program at the Paducah Site are established by DOE Order 414.1, *Quality Assurance*; state and federal regulations; and documentation from the EPA, the American National Standards Institute, the American Society of Mechanical Engineers, the American Society of Testing and Materials (ASTM), and the American Society for Quality Control. The QA/QC Program specifies organizational and programmatic elements to control equipment, design, documents, data, nonconformances, and records. Emphasis is placed on planning, implementing, and assessing activities. Program requirements are specified in project and subcontract documents to ensure that requirements are included in project-specific QA plans and other planning documents.

The *Environmental Services Subcontract Quality Assurance and Data Management Plan (EQADMP)* defines the relationship of each element of the Environmental Monitoring Program to key quality and data management requirements. Training requirements, sample custody, procedures, instrument calibration and maintenance, and data review are a few of the subjects discussed in the EQADMP. In 2004, a variety of functions were performed for the Environmental Monitoring Program, such as conducting surveillances, reporting problems, reviewing data, reviewing procedures, and revising the EQADMP.

Field Sampling Quality Control

Data Quality Objectives and Sample Planning

From the point of conception of any sampling program, data quality objectives (DQOs) play an important role. The number of samples, location of sampling sites, sampling methods, sampling schedules, and coordination of sampling and analytical resources to meet critical completion

times are part of the DQO process and are documented in the *Paducah Site Environmental Monitoring Plan* (BJC 2003a).

Each sampling location and sample collected is assigned a unique identification number. Each segment of the sequence is used to designate information concerning the location from which a sample is collected. In order to progress from planning to implementing the DQOs, an analytical statement of work (SOW) for the analytical laboratory is generated from a system within the Paducah Integrated Data System. From this system, the Project Environmental Measurements System (PEMS), an electronic database used for managing and streamlining field-generated and laboratory-generated data, is populated with sample identification numbers, sampling locations, sampling methods, analytical parameters, analytical methods, and sample container and preservative requirements. This information is used to produce sample bottle labels and chain-of-custody forms for each sampling event.

Field Measurements

Field measurements for the groundwater and surface-water monitoring program are collected in the field and include water level measurements, pH, conductivity, flow rate, turbidity, temperature, dissolved oxygen, total residual chlorine, and barometric pressure. Environmental conditions, such as ambient temperature and weather, are also recorded. Field measurements are collected and either downloaded electronically, recorded on appropriate field forms, or recorded in logbooks, and input into PEMS.

Sampling Procedures

Samples are collected using media-specific procedures, which are written according to EPA-approved sampling methods. Sample media consist of surface water, groundwater, sediment, and biota, such as fish and deer. Sample information recorded during a sampling event consists of the following: sample identification number, station (or location), date collected, time collected, person who performed the sampling, etc. This information is documented in a logbook and on a chain-of-custody form and sample container label, and then input directly into PEMS on a weekly or other appropriate basis. Chain-of-custody forms are maintained from the point of sampling, and the samples are properly

protected until they are placed in the custody of an analytical laboratory.

Field Quality Control Samples

The QC program for both groundwater and environmental monitoring activities specifies a minimum target rate of 5 percent, or one per 20 environmental samples, for field QC samples. Table 10.1 shows the types of field QC samples collected and analyzed. Analytical results of field QC samples are evaluated to determine if the sampling event had any effect on the sample results.

Analytical Laboratory Quality Control

Analytical Procedures

When available and appropriate for the sample matrix, EPA-approved SW-846 methods are used for sample analysis. When SW-846 methods are not available, other nationally recognized methods, such as those developed by DOE and ASTM, are used. Analytical methods are identified in an analytical SOW. Using guidance from EPA, laboratories document the steps in handling, analysis, and approval of results. Chain-of-custody procedures are followed until a sample is analyzed.

Laboratory Quality Control Samples

Laboratory QC samples are prepared and analyzed as required by the analytical methods used. Typical laboratory QC samples are identified in Table 10.1. If acceptance criteria are not met for the QC samples, then appropriate action, as denoted by the analytical method, is taken or the analytical data are appropriately qualified.

Independent Quality Control

The Paducah Site is required by DOE and EPA to participate in independent QC programs. The site also participates in voluntary independent programs to improve analytical QC. These programs generate data that are readily recognizable as objective measures that allow participating laboratories and government agencies a periodic review of their performance. Results that exceed acceptable limits are investigated and documented according to formal procedures. Although participation in certain programs is mandatory, the degree of participation is voluntary, so that each laboratory can select parameters of particular interest to that facility. These programs are

Table 10.1 Types of QC samples

Field QC Samples	Laboratory QC Samples
Field blanks ^a	Laboratory duplicates
Field duplicates	Reagent blanks
Trip blanks ^a	Matrix spikes ^b
Equipment rinseates	Matrix spike duplicates
	Surrogates
	Performance evaluations
	Laboratory control samples

- a Blanks – samples of deionized water used to assess potential contamination from a source other than the media being sampled.
- b Spikes – samples that have been mixed with a known quantity of a chemical to measure instrument effectiveness during the analysis process.

conducted by EPA, DOE, and commercial laboratories. The laboratories supporting the Paducah DOE KPDES program participate in a Discharge Monitoring Report QA Study conducted annually by EPA. The laboratories currently utilized all received acceptable results during 2004.

Laboratory Audits/Sample Management Office

Laboratory audits are performed periodically by the BJC Oak Ridge Sample Management Office (SMO) to ensure that the laboratory is in compliance with regulations, procedures, and the contract between the laboratory and the SMO. Findings are documented and addressed by the audited laboratory through corrective actions.

Data Management

Project Environmental Management System

The data generated from sampling events are stored in PEMS, a consolidated site data system for tracking and managing data. The system is used to manage field-generated data; import laboratory-generated data; input data qualifiers identified during the data review process; and transfer data to the Paducah OREIS for reporting. PEMS uses a

variety of references and code lists to ensure consistency and standardization of the data.

Paducah OREIS

Paducah OREIS is the database used to consolidate data generated by the EM Program. Data consolidation consists of the activities necessary to prepare the evaluated data for the users. The PEMS files containing the assessed data are transferred from PEMS to Paducah OREIS for future use. The data manager is responsible for notifying the project team and other data users of the available data. Data used in reports distributed to external agencies (e.g., the quarterly landfill reports, the ASER, and the biological monitoring program reports) are obtained from Paducah OREIS and have been through the data review process.

Electronic Data Deliverables

A “results only” Electronic Data Deliverable (EDD) is requested for all samples analyzed by each laboratory. The results and qualifier information from the EDD are checked in addition to the format of all fields provided. Discrepancies are immediately reported to the laboratory so corrections can be made or new EDDs can be issued. Approximately 10 percent of the EDDs is randomly checked to verify that the laboratory continues to provide adequate EDDs.

Data Packages

A “forms only” Level III data package is requested from the laboratory when data validation is to be performed on a specific sampling event or media. All data packages received from the fixed-base laboratory are tracked, reviewed, and maintained in a secure environment. The following information is tracked: sample delivery group number, date received, number of samples, sample analyses, receipt of any EDD, and comments. The contents of the data package and the chain-of-custody forms are compared and discrepancies identified. Discrepancies are immediately reported to the laboratory and data validators. All data packages are forwarded to the PGDP Environmental Management and Enrichment Facilities Document Management Center for permanent storage.

Laboratory Contractual Screening

Laboratory contractual screening is the process of evaluating a set of data against the requirements specified in the analytical SOW to ensure that all requested information is received. The contractual screening includes, but is not limited to, the chain-of-custody form, number of samples, analytes requested, total number of analyses, method used, QC samples analyzed, EDDs, units, holding times, and reporting limits achieved. The contractual screening is conducted electronically upon receipt of data from the analytical laboratory. Any exception to the SOW is identified and documented.

Data Verification, Validation, and Assessment

Data verification is the process for comparing a data set against a set standard or contractual requirement. Verification is performed electronically, manually, or by a combination of both. Data verification includes contractual screening and other criteria specific to the data. Data are flagged as necessary. Verification qualifiers are stored in PEMS and transferred with the data to Paducah OREIS.

Data validation is the process performed by a qualified individual for a data set, independent from sampling, laboratory, project management, or other decision-making personnel. Data validation evaluates the laboratory adherence to analytical method requirements. Validation qualifiers are stored in PEMS and transferred with the data to Paducah

OREIS. Data from routine sampling events are validated programmatically at a frequency of 5 percent of the total data packages. Each of the selected data packages, which make up 5 percent of the total number of data packages, is validated 100 percent.

Data assessment is the process for assuring that the type, quality, and quantity of data are appropriate for their intended use. It allows for the determination that a decision (or estimate) can be made with the desired level of confidence, given the quality of the data set. Data assessment follows data verification and data validation (if applicable) and must be performed at a rate of 100 percent to ensure data are useable. The data assessment is conducted by trained technical personnel in conjunction with other project team members. Assessment qualifiers are stored in PEMS and transferred with the data to Paducah OREIS. Data are made available for reporting from Paducah OREIS upon completion of the data assessment, and associated documentation is filed with the project files.

The EPA and KDOW require, as part of their QA program, a laboratory QA study. Each laboratory performing analyses to demonstrate KPDES permit compliance are required to participate. Two laboratories and one sampling organization participated in the study in 2004. Final results for the Discharge Monitoring Report QA Study Number 24 were “acceptable.” These results were provided to KDOW and EPA as required.