Quality Assurance Project Plan for Facility Effluent Monitoring Plan Activities

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**QUALITY ASSURANCE PROJECT PLAN FOR FACILITY
EFFLUENT MONITORING PLAN ACTIVITIES**

ABSTRACT

This Quality Assurance Project Plan addresses the quality assurance requirements for the activities associated with the Facility Effluent Monitoring Plans, which are part of the overall Hanford Site Environmental Protection Plan (DOE/Quality [RL 93-97] [DOE-RL 1993]). This plan specifically applies to the sampling and analysis activities and continuous monitoring performed for all Facility Effluent Monitoring Plan activities conducted by Westinghouse Hanford Company. It is generic in approach and will be implemented in conjunction with the specific requirements of the individual Facility Effluent Monitoring Plans.

U.S. Department of Energy Order 5400.1, General Environmental Protection Program (DOE 1988a) and DOE/RL-93-97, U.S. Department of Energy-Richland Operations Office Environmental Protection Plan (DOE-RL 1993), requires U.S. Department of Energy sites to prepare and update Facility Effluent Monitoring Plans by November 9 of each year. To accomplish this task, Westinghouse Hanford Company has prepared a Facility Effluent Monitoring Plan guidance document (WHC-EP-0438-01, A Guide for Preparing Hanford Site Facility Effluent Monitoring Plans [WHC 1992a]) to be used by Hanford Site contractors in preparing Facility Effluent Monitoring Plan determinations and subsequent Facility Effluent Monitoring Plans.

DOE Order 5700.6C, Quality Assurance (DOE 1991), DOE Order 5400.1 (DOE 1988a), and this Quality Assurance Project Plan address the appropriate requirements of DOE orders in compliance with the guidance of Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80 (EPA 1983), and Quality Assurance Methods, 40 Code of Federal Regulations 61, Appendix B, Method 114 (EPA 1992b). The means selected to implement the overall Quality Assurance program requirements are defined by the Westinghouse Hanford Company's Quality Assurance Manual, WHC-CM-4-2 (WHC 1993d).

The implementing procedures, plans, and instructions are appropriate for the control of effluent monitoring plans requiring compliance with U.S. Department of Energy, U.S. Environmental Protection Agency, State, and local requirements. This Quality Assurance Project Plan contains a matrix of organizational responsibilities, procedural resources from facility or site manuals used in the Facility Effluent Monitoring Plans, and a list of the analytes of interest and analytical methods for each facility preparing a Facility Effluent Monitoring Plan.

Distribution and revision control of this plan will be in compliance with Quality Requirement 5.0, "Instructions Procedures," and 6.0, "Document Control" from WHC-CM-4-2 (WHC 1993d).

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LIST OF TERMS

AEA	Alpha Energy Analysis
CAS	Commercial Analytical Services
CBRCS	Component-Based Recall Calibration System
CERCLA	<i>Comprehensive Environmental Response, Compensation and Liability Act of 1980</i>
CFR	Code of Federal Regulations
CQL	Contractual Quantitation Limit
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy-Richland Operations Office
DOE-HQ	U.S. Department of Energy-Headquarters
ECN	Engineering Change Notice
Ecology	Washington State Department of Ecology
EDE	Effective Dose Equivalent
EES	Environmental Engineering Studies
EIS	Environmental Restoration Program
EM	Effluent Monitoring
EMP	Environmental Monitoring Plan
EPA	U.S. Environmental Protection Agency
ES	Environmental Services
FEMP	Facility Effluent Monitoring Plan
LES	Liquid Effluent Study
NESHAP	<i>National Emission Standards for Hazardous Air Pollutants</i>
NPDES	National Pollution Discharge Elimination System
PPF	Plutonium-Finishing Plant
PEIS	Programmatic Environmental Impact Statement
PNL	Pacific Northwest Laboratory
PUREX	Plutonium-Uranium Extraction (Facility at Hanford Site)
POC	Point-of-Contact
QA	Quality Assurance
QAMS	Quality Assurance Methods
QAPJP	Quality Assurance Project Plan
QC	Quality Control
QI	Quality Instruction
QR	Quality Requirement
RL	U.S. Department of Energy Richland, Operations Office
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
ROD	Record of Decision
RWP	Radiation Work Permit
SAP	Sampling Analysis Plan
SNF	Spent Nuclear Fuel
SNFP	Spent Nuclear Fuel Plan
TQO	Technical and Quality Oversight
WHC	Westinghouse Hanford Company

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QUALITY ASSURANCE PROJECT PLAN FOR FACILITY EFFLUENT MONITORING PLAN ACTIVITIES

1.0 INTRODUCTION

U.S. Department of Energy (DOE) Order 5400.1, *General Environmental Protection Program* (DOE 1988a), required DOE sites to prepare an Environmental Monitoring Plan (EMP) by November 9, 1991.

According to the guidance provided in DOE Order 5400.1 (DOE 1988a), each DOE site, facility, or activity that uses, generates, releases, or manages significant quantities of hazardous materials shall provide a written EMP. This EMP must identify and discuss two major activities: (1) effluent monitoring, and (2) environmental surveillance.

At the Hanford Site, the site-wide EMP (DOE/RL 93-97 [DOE-RL 1993]) contains the following elements:

- A conceptual plan addressing effluent monitoring and environmental surveillance
- A listing of contractor facility effluent monitoring plans (FEMP)
- Two distinct operational EMPs describing Westinghouse Hanford Company (WHC) near-facility and Pacific Northwest Laboratory (PNL) site-wide environmental surveillance activities.

To address the second item above and to fulfill the requirements of the United States Department of Energy-Richland Operations Office *Environmental Protection Implementation Plan*, DOE/RL 89-18 (DOE-RL 1989), the WHC Effluent Monitoring (EM) function has prepared a FEMP guidance document (WHC 1992a) to be used by the Hanford Site contractors in preparing FEMP determinations and FEMPs.

Every major WHC-managed facility prepared a FEMP determination (which dictates where FEMPs are actually needed) in accordance with the guidance document, and FEMPs have been prepared and issued where required. New or modified facilities requiring FEMPs must have a FEMP determination and/or a FEMP completed before startup.

This Quality Assurance Project Plan (QAPjP) addresses quality assurance (QA) implementation of WHC FEMPs. Section 12.0 of each individual FEMP addresses facility-specific QA requirements and refers to this QAPjP for the general QA requirements.

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2.0 PROJECT DESCRIPTION

2.1 GENERAL OBJECTIVES

The general objectives of the FEMP are as follows:

- Ensure compliance with DOE Orders 5400.1 (DOE 1988a), 5400.3 (DOE 1989b), 5400.4 (DOE 1989a), 5400.5 (DOE 1990), 5480.1 (DOE 1982), 5480.1 (DOE 1988b), 5484.1 (DOE 1981), and 5700.6C (DOE 1991)
- Ensure that facility effluent monitoring systems provide an adequate means of determining releases to the environs to assess the impact of these releases on the public and the environment
- Ensure that facility operations are in compliance with applicable Federal, State, and local emission standards and requirements.

Briefly summarized, FEMPs require characterization of radioactive and nonradioactive gaseous and liquid effluents from all WHC facilities or sites, and detection of statistically significant concentrations of specified contaminants in these effluents. In addition, assessment of compliance with the U.S. Environmental Protection Agency (EPA) "National Emission Standards for Hazardous Air Pollutants" (NESHAP) (40 Code of Federal Regulations [CFR] 61, Subpart H) (EPA 1992a) for radioactive airborne effluents shall be included in FEMP determinations and subsequent FEMPs. Facility-specific procedures shall be referenced in the FEMPs to demonstrate compliance. The QAPjP for the FEMPs shall address the QA requirements in DOE Order 5700.6C (DOE 1991).

2.2 MONITORING ACTIVITIES DESCRIPTION

The specific effluent monitoring activities performed by WHC are defined by applicable FEMPs as required in DOE Order 5400.1 (DOE 1988a) and generally fall into one or both of the categories described below.

- **Sampling of facility effluent streams:** This category includes all routine environmental liquid and gaseous sampling collection, radiological analysis, and chemical analysis, together with data validation and data analysis associated with facility effluent streams. In-process sampling is not included in the FEMP because it is not considered an effluent by definition. Also, *Resource Conservation and Recovery Act of 1976* (RCRA) protocol liquid effluent sampling, associated with the liquid effluent study (LES), is not included in the FEMP. However, sample results obtained for this study, because they are controlled by the strict QA requirements from the *Test Method for Evaluating Solid Waste*, SW-846-1 (EPA 1992c) as suggested by 40 CFR 246, Appendix IX complement the routine environmental monitoring program. The LES program also provides an analysis of the nonrad constituents in the waste streams that are not covered by any routine environmental monitoring sampling programs. A QA program plan, WHC-EP-0536-1,

Quality Assurance Program Plan for Radionuclide Airborne Emissions Monitoring (WHC 1993e), has been prepared to define the QA requirements of 40 CFR 61, Appendix B, Method 114, and Subpart H(EPA 1992b).

- **Monitoring and recording of facility effluent streams:** This category includes establishing appropriate alarm/diversion set points, documenting process upsets or out-of-compliance conditions, and maintaining a record of maintenance calibrations and operability test results on the effluent monitors (i.e., continuous monitors).

2.3 APPLICABILITY TO WESTINGHOUSE HANFORD COMPANY QUALITY ASSURANCE PROGRAM

This QAPjP applies specifically to the sampling and analysis activities and continuous monitoring performed for all FEMP activities conducted by WHC. This QAPjP is generic in approach and shall be implemented in conjunction with the specific requirements of individual FEMPs.

The QAPjP is prepared in compliance with *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, QAMS-005/80 (EPA 1983), and "Quality Assurance Methods," 40 CFR 61, Appendix B, Method 114 (EPA 1992b). It describes the means selected to implement the appropriate QA program requirements found in the *Quality Assurance Manual*, WHC-CM-4-2 (WHC 1993d). The QAPjP contains a matrix of procedural resources from facility or site manuals used in the FEMPs. This QAPjP shall be reviewed and updated as required by changes made in the FEMP activities. Distribution and revision control of this plan shall be in compliance with quality requirement (QR) 5.0, "Instructions Procedures," and 6.0 "Document Control" from WHC-CM-4-2 (WHC 1993d). The QAPjP distribution shall routinely include all review and approval personnel indicated on the title page of the document and all other individuals designated by WHC's Environmental Services function. Plans and procedures referenced in the QAPjP are available for regulatory review on request.

2.4 MINIMUM QUALITY ASSURANCE REQUIREMENTS FOR FACILITY EFFLUENT MONITORING PLANS

The FEMP prepared for each individual facility should consider the requirements of this QAPjP and select the necessary procedural controls from the generic requirements of this plan that are specifically applicable to individual effluent sampling and monitoring activities. All applicable DOE Order 5700.6C (DOE 1991) requirements shall be included within this QAPjP or addressed in Section 12.0 of the FEMPs. At a minimum, the FEMP should address the items below:

- **Establishment of analytes of interest and specific objectives for data quality.** These items are defined in the following documents:

Internal memo 88420-93-135b, dated December 21, 1993, from Effluent and Emission Monitoring, *Analytical Requirements for FY-94 Liquid Effluent and Air Emission Samples*, (Diediker 1993).

PNL-MA-597, *Analytical Chemistry Laboratory Manual* (PNL 1991a)

K-Basin Process Standard # D-403 (WHC 1991a)

Battelle Memorial Institute Pacific Northwest Laboratory
Contract No. 163587-A-M1 (PNL 1993)

FFTF Operations Operating Procedure
SN-23.13-3, Operation of Process Sewer (WHC 1994a)

WHC-SD-LO45H-PLN-001, Rev 0, "300 Area Process Sewer Sampling
Analysis Plan" (WHC 1993a)

Statement of Work for Services Provided by Pacific Northwest
Laboratory's Analytical Chemistry Laboratory for the 340 Facility
(Perry 1993)

Internal memo 9359235; dated November 15, 1992, from FFTF Regulatory
Compliance, Letter of Instruction--Work Order ED4232 (Seamens 1993)

PNA-MA-70. Quality Assurance (QA) Program (PNL 1991b)

MSC-033, Analytical Chemistry Laboratory (ALC) QA Plan (PNL 1991c)

The FEMPS should define the analytical parameters and reference methods applicable to specific sampling. If modifications to contractually established detection limits, precision, and accuracy values are required, they should be specifically noted in the text of the FEMP.

- Establishment of specific procedural controls. Based on the comprehensive list provided in Table A-1, individual FEMPs should define specific procedural controls that apply to the individual facilities.
- Establishment of unique procedural additions, optional methodologies, modifications, and controls. Where optional and/or alternative methodologies are included in procedures, the options most appropriate for particular facilities are to be specified in the FEMP. Additional procedures or special-case procedural modifications should be defined and appended or included by reference as appropriate.
- Establishment of facility-specific performance or system audit requirements. Performance or system audit requirements over and above scheduled audits performed by appropriate organizations (i.e., QA and Environmental Compliance Assurance) shall be defined.

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3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

3.1 PROJECT MANAGEMENT

WHC's Environmental Services function has the primary responsibility to verify that the responsible line organization has specified the requirements for effluent monitoring. The ES function also has the responsibility to provide guidance in FEMP preparation. An organizational chart is included as Figure 3-1. Responsibilities of key personnel are described below.

- **Environmental Services/Effluent Monitoring.** The EM group within ES has the responsibility to oversee and verify the environmental radioactivity and chemical emission monitoring program at WHC facilities as required to ensure compliance to environmental regulations.

The EM group acts as the technical liaison between the facilities' management and the Regulatory Analysis group on issues pertaining to the effluent monitoring program, and provides guidance for implementing that program. The EM group also provides technical support for effluent sampling and analysis, and prepares annual emissions reports to DOE and the appropriate regulatory agencies. The EM group is responsible for assigning the unique electronic data processing codes and identification numbers for each sample point at each facility. The EM group maintains permanent records of radioactive effluent releases discharged from each WHC facility. The EM QA requirements for compiling and reporting radioactive airborne emissions data are contained in the *Quality Assurance Project Plan for Radioactive Airborne Emissions Data Compilation and Reporting*, WHC-EP-0528-1 (WHC 1994b). EM uses the environmental release summary database to contain radioactive emissions data used for annual reports.

- **Facility Effluent Monitoring Plan Coordinator.** The FEMP program coordinator for ES coordinates technical activities for the effluent monitoring program. The coordinator is responsible to ensure that all effluent monitoring program elements (planning, organizing, scheduling, and ensuring quality reviews) are performed. This coordinator is an assigned representative in the EM group, and provides technical guidance to individual facility cognizant engineers, facility sampling and analysis task leaders, and designated FEMP authors.
- **Environmental Compliance Officer(s).** The Environmental Compliance Officer (ECO) is an individual designated to be the facility or department point-of-contact for (POC) environmental issues. The ECO is to provide support to the facility or department manager to ensure compliance with the applicable environmental compliance requirements as identified in WHC-CM-7-5 (WHC 1993b), environmental permits, the Hanford Federal Facility Agreement and Consent Order and other compliance orders. Ensure that the facility or department

Figure 3-1. Project Organizational Chart for FEMP Activities.

manager is aware of the facility's environmental compliance status and the facility's environmental compliance activities. Understand and be able to explain the facility's or department's environmental compliance status with all applicable environmental requirements. Advise the facility or department manager of new environmental requirements and policies, the associated impacts and recommended implementation mechanisms to ensure compliance.

3.2 SUPPORTING ORGANIZATIONS

Routine technical support to ES will be provided through several WHC organizations as described below.

- **Quality Assurance.** QA provides quality engineering support related to procurement control, document approval, surveillance, and auditing needs.
- **Environmental Engineering Studies.** The Environmental Engineering Studies (EES) group within ES has the responsibility to plan, direct, and execute the near-facility operational environmental monitoring program for all media except groundwater, and to ensure that the requirements of this program are implemented. In addition, this group acts as the primary interfacing organization for environmental adverse condition statements and for tracking operational environmental monitoring and compliance assessment inspections. The EES QA requirements for the Operational Environmental Monitoring Program are contained in WHC-EP-0538, *Operational Environmental Monitoring Program Quality Assurance Project Plan* (WHC 1992c).
- **Procurement.** The procurement organization obtains services and/or contracts in accordance with purchase requisitions, purchase orders, drawings, contracts, specifications, or instructions used to define requirements for a purchase.
- **Health Physics/Operations Personnel.** These personnel provide sampling and monitoring support as defined in the FEMPs. Usually, Health Physics is the organization that collects the airborne samples for the facility. Operations personnel typically collect the liquid samples in each facility.
- **Environmental Policy.** These personnel provide guidance in interpretation of all regulations and interface with the regulatory agencies pertaining to such matters.

Table 3-1 summarizes the organizational responsibilities.

Table 3-1. Organizational Responsibilities Matrix for Effluent Sampling and Monitoring Program. (2 sheets)

Task		EM	QA	FO	TQO	LABS	HP
1	Prepare FEMPs and FEMP Determinations	R	R	A			
2	Prepare FEMPS Revisions	R		A			
2	Prepare Facility-Specific Implementing Procedures	R	R	A			
3	Take Effluent Samples	V		A			A
4	Prepare Spiked Samples					A	
5	Ship Samples			A			
6	Track Samples			R		A	
7	Review/Approve Procedure for Offsite Laboratories	R		A			
8	Review/Approve Services Provided by 222-S Laboratory.	A	R	R			
9	Analyze Samples					A	
10	Audit Laboratory QA/QC		A				
11	Receive Laboratory Test Reports and Transmit to Facility	A					
12	Review and Validate Data	A			A		
13	Conduct Final Technical Review Of Validation Reports and Supporting Analytical Data Packages	R			A		
14	Compare Test Results To Operating Limits	V		A			

Table 3-1. Organizational Responsibilities Matrix for Effluent Sampling and Monitoring Program. (2 sheets)

Task		EM	QA	FO	TQO	LABS	HP
15	Prepare Environmental Release Reports, NESHAP and NPDES Reports, etc.	A		R			
16	Programmatic Audits and Surveillances		A				

Legend:

- A = Action
- ECA = Environmental Compliance Assurance
- EM = Emission Monitoring
- FEMP = Facility Effluent Monitoring Plan
- FO = Facility Operations
- HP = Health Physics
- NESHAP = National Emission Standards for Hazardous Air Pollutants
- NPDES = National Pollution Discharge Elimination System
- QA = Quality Assurance
- QC = Quality Control
- R = Review and Approve
- SOW = Statement of Work
- TQO = Technical and Quality Oversight
- V = Validation and/or Verification

*NOTE: The review and validation process varies from facility to facility and is specifically described in each FEMP.

3.3 ANALYTICAL LABORATORIES

Analytical samples will be transported to an approved WHC participant contractor or subcontractor laboratory for radiological and/or chemical analysis. For participant contractors or subcontractors, applicable Quality Requirements of this QAPjP shall be invoked as part of the approved applicable work order or procurement document. Off-site laboratories are to submit their analytical methods and internal QA program plan for WHC review and approval before use.

The 222-S Laboratory on the Hanford Site has one program plan and one project plan to address applicable Quality Requirements related to sample analysis. These plans are as follows:

- WHC-SD-CP-QAPP-003-1A, *Quality Assurance Program Plan for Laboratory Analysis and Process Testing* (WHC 1994c)
- WHC-SD-CP-QAPP-002, *Quality Assurance Project Plan for the Chemical Analysis of Highly Radioactive Mixed Waste Samples in Support of Environmental Activities on the Hanford Site* (WHC 1993f).

3.4 OTHER SUPPORT CONTRACTORS

Procurement of the services of other subcontractors (PNL, IT) to support any or all of the activities addressed by this QAPJP may be initiated at the direction of ES and PNL. Such services shall be in compliance with standard WHC procurement procedures requirements. All work shall be reviewed for compliance with WHC-approved QA plans and/or procedures.

4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENTS

The QA objectives for measurements generally applicable to FEMPs under the purview of this QAPJP primarily are related to the following:

- Defining appropriate methods for sampling and chemical analysis for required analytes of interest
- Defining quantitation limits and values for analytical precision and accuracy appropriate for all facility effluent monitoring at the Hanford Site
- Defining data representativeness, completeness, and comparability in terms applicable to Hanford Site FEMPs.

Detailed discussions of the analytes of interest are provided in Internal Memo 88420-93-135b titled: "Analytical Requirements for FY-94 Liquid Effluent and Air Emission Samples" (Diediker 1993) for 200 Area facilities and in the statements of work, sample analysis plans, or facility-specific procedures for the 100, 300, and 400 Areas. The detailed discussion of the analytical methods is found in Table 8-1 of this document, Table 5-1 of WHC-EP-0528 and the statements of work or sample analysis plans, or facility-specific procedures for the 100, 300, and 400 Areas (see Section 2-4). For individual investigations that are over and above the minimum requirements established herein, specific data quality needs shall be addressed within individual FEMPs. Other measurement considerations, accuracy requirements, units, and data recording and reporting protocols for instruments supporting effluent monitoring and other types of field facility effluent monitoring investigations shall be specified in the applicable procedures discussed herein and listed in Table A-1.

4.1 ANALYTES OF INTEREST AND ANALYTICAL METHOD SELECTION

The Internal Memo 88420-93-135b titled: "Analytical Requirements for FY-94 Liquid Effluent and Air Emission Samples" (Diediker 1993) and *Services Provided by the 222-S Laboratory for Regulatory Support*, WHC-EP-0689 (Thomas 1993) identify the analytes of interest based on input from the individual FEMPs and the corresponding analytical reference methods for effluent sampling and monitoring at the 200 Area facilities. The statements of work or sample analysis plans or facility-specific procedures written for the 100, 300, and 400 Areas identify the analytes of interest and the corresponding analytical reference methods (see Section 2-4).

4.2 CONTRACTUAL QUANTITATION LIMITS AND RANGES FOR ANALYTICAL PRECISION AND ACCURACY

The performance of the analytical laboratory or laboratories providing support to effluent sampling and monitoring shall be subject to EPA-established method- and analyte-specific quantitation limits and ranges for precision and accuracy (EPA 1972, EPA 1977) in accordance with the approved statement of work.

4.3 DOSE MODELING INPUT PARAMETERS

Dose limits to the public from airborne effluents dictate airborne effluent monitoring requirements. The EPA radioactive airborne criteria (NESHAPs, 40 CFR 61) (EPA 1992a) require that radionuclide emissions from each DOE site do not cause any individual (maximally exposed member of the public) to receive a dose greater than 10 mrem/yr effective dose equivalent (EDE).

To demonstrate compliance with the dose limit requirements using analytical techniques, evaluations of potential doses to individuals shall be evaluated using approved EPA computer codes or models as specified in the NESHAPs, 40 CFR 61 (EPA 1992a). Input parameters are obtained from historical data, PNL sitewide environmental surveillance reports, and Hanford Site meteorological data. The results of the dose models are included in the FEMP determinations and annual Air Emissions Report to EPA for each calendar year. (They are not included in Table A-1.) At the effluent points where the dose limits (0.1 mrem/yr EPA, WHC administrative control values) could be exceeded, monitoring shall be performed in accordance with the procedures identified in Table A-1 and the FEMPs.

4.4 REPRESENTATIVENESS, COMPLETENESS, AND COMPARABILITY

Data representativeness, completeness, and comparability are addressed qualitatively within the applicable FEMP. Concerted efforts are made to ensure that samples collected are representative of the condition being analyzed. For completeness of chemical analyses, the goal is to produce useable analytical data for a minimum of 90 percent of the analyses requested on all samples submitted to the 222-S Laboratory or other subcontractor laboratory. The laboratory's actual performance is evaluated against the 90-percent objective, and failure to meet this criterion shall be documented in data summary reports and shall be considered in the validation process. Corrective action measures using specified procedures shall be initiated by the EM, CAS, TQO, or QA, as appropriate. To facilitate the comparability of data sets in terms of precision and accuracy, approved analytical procedures shall require the use of reporting techniques and units consistent with the EPA reference methods and WHC-SD-CP-QAPP-003-1A, *Quality Assurance Program Plan for Laboratory Analyses and Process Testing* (WHC 1994c).

The 222-S Laboratory participates in the EPA intercomparison program in which blind samples are provided by the EPA and analyzed by the laboratory.

5.0 SAMPLING PROCEDURES

5.1 SAMPLING PROCEDURES

To ensure that samples are transported only to laboratories that are appropriately equipped and licensed for receiving radioactive materials and performing mixed waste analyses, sampling activities and equipment and sample material and containers will be subjected to field screening (radiological survey and quality control [QC] check of transporting documentation) for radioactivity in compliance with the requirements of governing radiation work permits (RWP). All effluent sampling in support of the FEMPs will be performed in a manner that provides representative measurements of the volume and concentration of airborne and liquid pollutants released to the environment, as well as the total volume released (gallons, cubic feet).

5.2 OTHER SUPPORTING PROCEDURES

Except for the analytical chemistry procedures specified in Table 8-1, Internal Memo 88420-93-135b (Diediker 1993) and statements of work written for the 100, 300, and 400 Areas, procedures that directly support FEMP activities are presented in Table A-1. These procedures are cross referenced to their source documents and the types of activities they will support. Any additions or modifications to procedures listed here shall be addressed in the individual FEMPs.

5.3 PROCEDURE APPROVALS AND CONTROL

5.3.1 Westinghouse Hanford Company Procedures

The WHC procedures that may be used to support the sampling and monitoring activities specifically defined by individual FEMPs are referenced in Table A-1. Latest approved versions of all referenced procedures shall apply in all cases. Selected procedures include QR and QI from WHC-CM-4-2, *Quality Assurance Manual* (WHC 1993d), and plant operating manuals. Procedure approval, revision, and distribution control requirements applicable to QI and QR are addressed in QR 5.0, "Instructions Procedures" and 6.0, "Document Control" (WHC 1993d). All procedures are available for regulatory review on request at the direction of ES. Other applicable WHC procedures may be facility specific and are defined in the individual FEMPs.

5.3.2 Participant Contractor/Subcontractor Procedures

All procedures used by participant contractor/subcontractor shall be reviewed and approved. Such requirements shall be included in the procurement document or work order. In addition to submitting analytical procedures, analytical laboratories shall be required to submit the current version of their internal QA program plans to be reviewed and approved. All participant contractor or subcontractor procedures, QA plans, and/or manuals should be retained as project quality records in compliance with WHC-approved procedure QR 17.0,

"Quality Assurance Records" and QI 17.1, "Quality Assurance Records Control" (WHC 1993d). All such documents should be made available for regulatory review on request, at the direction of ES.

5.4 PROCEDURE ADDITIONS AND CHANGES

Additional procedures, or changes to existing procedures found necessary as a consequence of individual FEMP requirements, shall be developed in accordance with *Management Requirements and Procedures*, WHC-CM-1-3, 2.16 (WHC 1994f) and WHC-CM-4-2, QRs 5.0 and 6.0 (WHC 1993d). Should deviations from established procedures be required to accommodate unforeseen field situations, they may be authorized in accordance with the requirements of an appropriate facility-specific procedure. Documentation, review, and disposition of instruction change authorization forms shall be defined within the facilities' plant administrative procedures. Other types of document change requests shall be completed as Engineering Change Notices (ECN) in accordance with EP 2.2 "Engineering Document Change Control," WHC-CM-6-1, *Standard Engineering Practices* (WHC 1993g). Should facility-specific procedural changes or deviations be necessary, they shall be performed according to the facility-specific internal procedures.

5.5 SAMPLING SCHEDULE

Record sampling should be the sampling method for FEMP activities. By definition, a record sample is a representative sample collected in an air and liquid sampling system for laboratory analysis. Record samples are used as a basis for reporting to DOE, facility operation, and safety the amounts of contaminants released to the environment.

All record sampling schedules are approved by EM. Any changes to the radioactive gaseous effluent record sampling schedule or the liquid effluent record sampling schedule, including temporary or one-time deviations, shall be preapproved by EM in accordance with the *Environmental Compliance Manual* WHC-CM-7-5 (WHC 1993b).

6.0 SAMPLE CUSTODY

All samples obtained during FEMP activities shall be controlled as required by an approved facility sample control procedure for air samples, such as the *Health Physics Procedures Manual*, WHC-IP-0718 (WHC 1993c) or facility-created chain-of-custody procedures for handling liquid effluent monitoring samples. The facility procedure applies as soon as sample is introduced to the sample container in which it will be preserved, sealed, labeled, and transported to the analytical laboratory. Laboratory chain-of-custody procedures shall be established. These procedures shall ensure maintenance of sample integrity and identification from receipt through completion of the analytical process. Requirements for returning residual sample materials after analysis is complete shall be defined in the procurement documentation or work orders to subcontractor or participant contractor laboratories. Chain-of-custody forms shall be signed out for returned original samples as required by the approved procedures applicable within the participating laboratory. Analyses results shall be traceable to original samples through unique sample numbers or identification codes. All analyses results shall be controlled as permanent project quality records, as required by QR 17.0, "Quality Assurance Records" (WHC 1993d), and *Document Control and Records Management*, WHC-CM-3-5 (WHC 1994d), or equivalent WHC-approved procedure.

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7.0 CALIBRATION PROCEDURES

Calibration and maintenance are the controlling factors in this system. Calibration of all WHC measuring and test equipment, whether in the existing inventory or purchased for effluent sampling and monitoring, shall be controlled as required by QR 12.0, "Control of Instrument". Routine operational checks for WHC field equipment shall be as defined in applicable facility-specific internal procedures; similar information shall be provided within WHC-approved participant contractor or subcontractor procedures. The sampling and monitoring equipment used in this activity is controlled by the Component-Based Recall Calibration System (CBRCS) or another WHC-approved system.

Calibration procedures/requirements for offsite laboratories are addressed in the procurement or statement of work documents. Calibration procedures can be made available on request at the direction of the ES manager.

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8.0 ANALYTICAL PROCEDURES

Analytical methods or procedures based on the reference methods for radioactive airborne emissions are identified in WHC-EP-0528-1 (WHC 1994b) Table 5-1. While analytical methods or procedures for liquid effluents are identified in Table 8-1 below shall be selected or developed and approved before use, in compliance with appropriate WHC procedure, work order, and/or procurement control requirements (Section 4.2). The following table summarizes the analytical procedures used for the WHC facility laboratories. Procedures from other offsite laboratories performing analyses on environmental samples are not provided in this section.

Table 8-1. Analytical Procedures for FEMP Activities.

Procedure Number*	Title
LA-613-111	Determination of ^{147}Pm in Effluent Water Samples by Solvent Extraction and Liquid Scintillation Counting
LA-925-008	Uranium by Laser Induced Kinetic Phosphorescence.
LA-220-103	^{90}Sr , ^{89}Sr , ^{90}Sr and/or $^{89/90}\text{SR}$ from Leachated of Soil, Vegetation, Air Filters and Other Solid Samples
LA-548-121	^{60}Co Preparation of Sample Mounts for Gamma Energy Analysis
LA-943-123	$\text{Pu}^{239/240}$, ^{241}Am , Separation of Plutonium and Americium by Ion Exchange
LA-378-101	^{129}I by Liquid - Liquid Extraction and Gamma Energy Samples
LA-220-104	Strontium- $^{89/90}\text{Sr}$ and/or ^{89}Sr and ^{90}Sr in Water by Carbonate Precipitation.
LA-218-111	Tritium Analysis by Liquid Scintillation Counting.
LA-348-104	^{14}C in Small Volume Samples by Persulfate Oxidation and Liquid-Scintillation Counting.
LA-212-102	Determination of PH Direct Measurement
LA-508-162	Gamma Energy Analysis- the Genie System
LA-508-052	Gamma Energy Analysis on the Canberra Jupiter System
LA-438-111	Determination of ^{99}Tc by Solvent Extraction and Liquid Scintillation Counting for Effluents

Table 8-1. Analytical Procedures for FEMP Activities.

Procedure Number*	Title
LA-505-241	Inductively Coupled Plasma-atomic Emission Spectrometer <ICP-AES> Operations and Analysis
LA-508-121	Operation of the Beckman 255801 Liquid Scintillation Counter
LA-508-051	AEA using the Canberra Jupiter Systems
LA-508-101	Low-Level Alpha and Beta in Water Samples
LA-519-251	PUREX Visual Test
LA-549-201	Compositing of PUREX Samples
LA-506-302	Total Alpha/Total Beta Mounting Procedure
LA-548-224	Preparation of 125-ml Sample Mounts for Low-Level Gamma Energy Analysis
LA-505-241	Routine Sample Analysis with ICP Emissions Spectrometer
LA-925-206	Determination of Uranium by Scintrex UA-3 Laser Fluorometer

Legend: PUREX = Plutonium Uranium Extraction (Facility)

*Or approved alternative procedure

9.0 MONITORING AND REPORTING CRITERIA

The effluent monitoring program encompasses all gaseous and liquid radioactive and nonradioactive effluent analyses performed for the WHC facilities requiring a FEMP.

The requirements for sampling and monitoring radioactive and nonradioactive gaseous effluents are contained in Section 2.0, "Air Quality," of WHC-CM-7-5 (WHC 1993b) and the results are to be reported annually by ES. At this time, ES only reports annually the nonradioactive air emissions (NO_x , SO_2 emissions) that are registered with federal and state agencies.

Monitoring and reporting criteria are also in place for liquid effluent streams. Radioactive and nonradioactive liquid effluent monitoring requirements are identified in Section 8.0, "Water Quality" of WHC-CM-7-5 (WHC 1993b), and are to be reported annually. Those radioactive and nonradioactive streams that have a significant potential to become a dangerous waste must also be monitored and/or sampled in accordance with WHC-CM-7-5 (WHC 1993b), DOE Order 5400.1 (DOE 1988a) and DOE Order 5400.5 (DOE 1990) to ensure that no dangerous waste streams are released to the ground.

The EM organization manages and prepares the annual reports on radioactive effluent emissions from each Westinghouse Hanford facility. This report is prepared according to the guidelines/desk instructions set forth in Westinghouse Hanford-approved internal procedure WHC-IP-1066 (WHC 1994f). The QA requirements for the air emissions reporting are contained in the *Quality Assurance Project Plan for Radioactive Airborne Emission Data Compilation and Reporting*, WHC-EP-0528-1 (WHC 1994b).

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10.0 DATA REDUCTION, VALIDATION, AND REPORTING

10.1 DATA REDUCTION AND DATA PACKAGE PREPARATION

The liquid and gaseous effluent monitoring record samples sent to the 222-S Laboratory shall be handled according to methods identified in WHC-SD-QAPP-003-1A, *Quality Assurance Program Plan for Laboratory Analysis and Process Testing* (WHC 1994c). The laboratories shall be responsible for preparing both a report summarizing the analysis results and a detailed data package including information necessary to perform data validation to the extent indicated by the minimum requirements.

10.1.1 Gaseous Effluent Release Determinations

Record sample gaseous effluent analytical data may include gross alpha and beta analyses, carbon-14 and tritium analyses, volatile isotope analyses, and specific radionuclide and nonradionuclide analyses as determined by the FEMP. Each analysis is treated separately. Sample results are received from a Westinghouse Hanford-approved laboratory and included in the calculation of average concentration and total activity and summation for a calendar quarter. In addition, stack flow data obtained from the facility cognizant engineers are also included in the calculation. Calculations for annual reporting are performed in accordance with WHC approved internal procedures.

10.1.2 Liquid Effluent Release Determinations

Record sample liquid effluent sampling data may include gross alpha and beta analyses and specific radionuclide and nonradionuclide analyses as determined by the FEMP. Proportioned liquid samples are collected on a daily shift or weekly basis and composited monthly for analysis. Sample results are received from a Westinghouse Hanford-approved laboratory from all streams for a single month and included in the annual report. Calculations of average concentration and total activity are derived from flow data and stream volumes provided by the facility cognizant engineers, as well as from the sample results from the laboratory, and are performed according to WHC approved internal procedures. For some storage facilities, such as the 340 Waste Handling Facility, batch samples collected for less than 90-day radioactive low-level waste are the record samples identifying the inventory at risk.

10.2 VALIDATION

Completed data packages shall be verified by ES for radioactive effluents and validated by TQOC and/or the contracted laboratory. Alternative sources shall be used as directed by EM. Regardless of the source of validation services, validation requirements shall be defined by the project needs.

When requested, validation reports for organic analysis shall be prepared documenting QC checks in any combination of the following areas, as recommended in *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analysis* (EPA 1988c):

- Data summary narrative
- Sample holding times
- Gas chromatograph/mass spectrometer tuning and mass calibration requirements
- Continuing calibration requirements
- Method blank sample requirements
- Surrogate recovery requirements
- Matrix spike/matrix spike duplicate requirements
- Internal standards performance requirements
- Target compound identification requirements
- Target compound quantitation requirements and reported detection limits
- Any tentatively identified compounds, library search, assessment, and quantitation requirements
- Overall data assessment requirements.

When requested, validation reports for inorganic analysis shall be prepared documenting QC checks in any combination of the following areas, as recommended in *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analysis* (EPA 1988b):

- Data summary narrative
- Sample holding times
- Continuing calibration requirements
- Method blank sample requirements
- Inductively coupled plasma interference check sample requirements
- Laboratory control sample requirements
- Duplicate sample analysis
- Matrix spike sample requirements
- Atomic absorption QC requirements

- Overall data assessment requirements
- Sample result verification.

Validation procedures for radionuclides and other types of analyses shall include requirements for QC checks with similar levels of detail.

The level of confidence in the data resulting from the radiological analyses shall be estimated by analyzing blanks and spiked pseudosamples (EPA-designated environmental measurement laboratory program) and by comparing the resulting concentration estimates to the known concentrations in those samples. Precision is calculated as standard deviation divided by the mean value and the level of precision that is required is determined by this project. The level of precision required for this project is minimum of 90% usable analytical data as identified in WHC-EP-0689, "Services Provided by the 222-S Laboratory for Regulatory Support" (Thomas 1993) or what is stipulated in the statement of work for other laboratories. When selecting the data to be considered, outliers shall be excluded from the data only after investigation confirms that an error has been made in the sample collection, preparation, measurement, or data analysis process. As new data are received, they shall be compared to earlier data.

10.3 FINAL REVIEW AND RECORDS MANAGEMENT CONSIDERATIONS

Validation reports and supporting analytical data packages will have a final technical review by ES before submittal to DOE and Ecology or inclusion in reports or technical memoranda. Validation reports, data packages, and review comments shall be retained as permanent project quality records at locations specified by the facility in accordance with WHC-CM-7-5 (WHC 1993b) and shall be defined in procurement documentation or work orders, as specified in the individual FEMPs. Records management practices shall comply with QR 17.0, "Quality Assurance Records" (WHC 1993d).

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11.0 INTERNAL QUALITY CONTROL

In general, analytical samples shall be subject to in-process QC measures in both the field facility and laboratory. Analytical samples both gaseous and liquid effluent will be subject to the QC protocol as discussed in these WHC documents:

- WHC-SD-CP-QAPP-002, *Quality Assurance Project Plan for the Chemical Analysis of Highly Radioactive Mixed Waste Samples in Support of Environmental Activities on the Hanford Site* (WHC 1993b)
- WHC-SD-CP-QAPP-003-1A, *Quality Assurance Program Plan for Laboratory Analysis and Process Testing* (WHC-1994c)
- WHC-EP-0689, *Services Provided by the 222-S Laboratory for Regulatory Support* (Thomas 1993)
- WHC-IP-1066, *Effluent Monitoring Program* (WHC-1994e)
- WHC-EP-0528-1, *Quality Assurance Project Plan for Radioactive Airborne Emissions Data Compilation and Reporting* (WHC-1994b)

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12.0 SYSTEM AUDITS

As noted in Section 2.4, audits shall be performed to verify the quality of operation of one or more elements of the total measurement system. In the sense intended by QAMS-005/80 (EPA 1983), system audits, involving a qualitative onsite evaluation of laboratories (or other organizational elements of the measurement system) for compliance with established QA program and procedure requirements. This also includes audits of individual facility sampling programs against those requirements in the FEMP.

System audits shall be performed by the appropriate organization (e.g., QA, Environmental Compliance Assurance) at least annually. Additional performance or system audits shall be performed if specifically required by individual FEMPs, as a consequence of corrective action requirements, or if requested by ES, QA, DOE-RL, EPA, or Ecology.

Any discrepancies that are observed during system audit surveillance activities and which cannot be immediately corrected to the satisfaction of the investigator, shall be documented.

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13.0 PREVENTIVE MAINTENANCE

Measurement and testing equipment used in the field and laboratory that directly affect the quality of the analytical data shall be subject to preventive maintenance measures that ensure minimization of measurement system downtime and ability to perform reliable measurements. Field equipment maintenance instructions shall be as defined by the approved procedures governing equipment use as listed in Appendix A or the individual FEMP. Laboratories shall be responsible for performing or managing the maintenance of their analytical equipment; maintenance requirements, spare parts lists, and instructions shall be included in individual methods or in laboratory QA plans, subject to WHC review and approval as noted in Sections 3.3.

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14.0 DATA ASSESSMENT PROCEDURES

Data from effluent sampling and monitoring shall be assessed as required according to procedures listed in the appropriate statistical evaluation techniques that may be referenced herein. Analytical data shall be compiled by the laboratory and validated by WHC in compliance with WHC-approved procedures, meeting the minimum requirements of Section 10.0.

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15.0 CORRECTIVE ACTION

Corrective action requests required as a result of surveillance or audit activity shall be documented and dispositioned as required by: QR 15.0, "Control of Nonconforming Items;" QI 15.1, "Nonconforming Item Reporting;" QI 15.2, "Nonconformance Report Processing;" QR 16.0, "Corrective Action;" QI 16.1, "Trend Analysis;" QI 16.2, "Corrective Action Request" (WHC 1993d); and WHC-CM-7-6, *Environmental Compliance Verification Program Manual* (WHC 1992b).

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16.0 QUALITY ASSURANCE REPORTS

As stated in Sections 10.0 and 13.0, FEMP activities shall be regularly assessed by surveillance and auditing processes. Surveillance, nonconformance, audit, and corrective action documentation shall be considered QA records and shall be documented and dispositioned as stated in Section 15.0. Records management requirements applicable to subcontractors or participant contractors shall be defined in applicable procurement documents or work orders as noted in Section 4.2.

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17.0 HUMAN FACTORS

17.1 EFFECTS OF HUMAN FACTORS

Human factors affect the following activities associated with Hanford Site EM programs.

- Calibration of sampling and monitoring equipment
- Sample collection
- Transportation of samples to the analytical laboratories
- Proper storage and handling of samples in the laboratories
- Standardized testing of reagents used in the analysis performed on the samples received in the laboratory
- Proper training of laboratory staff to perform the analytical procedures
- Calibration of all equipment used in analysis of the samples
- Tracking of the samples through the laboratory
- Performance of the requested analytical procedures on the samples
- Entering laboratory results into an electronic database
- Maintaining quality of sample data in the database
- Performance of audits and compliance assessments.

17.2 EFFECTS OF HUMAN FACTORS MINIMIZED BY PROCEDURES AND QUALITY ASSURANCE PLANS

The effects of human factors on these activities are minimized by adherence to procedures such as those for:

- Sampling and Monitoring
- Equipment Calibration
- Chain-of-Custody
- Sample Handling
- Sample Analysis
- Data Handling
- Data Quality Assurance.

The effects of human factors on activities associated with EM are also minimized by adherence to documents such as:

- Quality Assurance Program Plan for Radioactive Airborne Emissions Monitoring, WHC-EP-0536-1 (WHC 1993e)
- Quality Assurance Project Plans WHC-SD-WM-QAPP-011, Rev. 3 (WHC 1992), WHC-EP-0528-1 (WHC 1994b)

18.0 GLOSSARY

Accuracy. Accuracy may be interpreted as the measure of bias in a system. Sampling accuracy is normally assessed by evaluating matrix spiked samples and reference samples.

Audit. Systematic checks to verify the quality of operation of one or more elements of the total measurement system. In this sense, audits may be of two types: (1) performance audits, in which quantitative data are independently obtained for comparison with data routinely obtained in a measurement system; or (2) system audits, involving a qualitative onsite evaluation of laboratories or other organizational elements of the measurement system for compliance with established QA program and procedure requirements. For effluent monitoring at the Hanford Site, performance audit requirements are fulfilled by periodic submittal of blind samples to the primary laboratory, or the analysis of split samples by an independent laboratory. System audit requirements are implemented through the use of standard surveillance procedures.

Blind Sample. Any type of sample routed to the primary laboratory for purposes of auditing performance relative to a particular sample matrix and analytical method. Blind samples are not specifically identified as such to the laboratory; they may be made from traceable standards, or may consist of sample material spiked with a known concentration of a known compound. See audit.

Comparability. An expression of the relative confidence with which one data set may be compared to another.

Completeness. A qualitative parameter expressing the percentage of measurements judged to be valid.

Contractual Quantitation Limit. The contractual quantitation limit (CQL) represents the lowest level of quantitation agreed on by the analytical laboratory and formally established in applicable contracts or work orders that the laboratory attests can be reliably achieved within contractually (or work order) established limits of precision and accuracy under routine laboratory operating conditions. The CQL is based on analytical experience and the data needs of individual projects; it represents the minimum acceptable standard against which analytical data will be judged.

Minimum Detectable Concentration. The smallest concentration of radioactive material in a sample that will yield a net count (above system background) that will be detected with a 95 percent confidence level.

$$DL = \{[(4.6)(S_b)] + (2.72/T)\} / [(E)(V)(2.22 \text{ E+06})(Y)(e^{-(k)(dt)})]$$

where:

DL = The detection limit as defined above (μCi per unit mass or volume)

S_b = The standard deviation of the background counting rate (counts per minute)

T = The sample count time in minutes

E = The counting efficiency (counts per disintegration)

V = The sample size (in units of mass or volume)

$2.22 \text{ E}+06$ = Number of disintegrations per minute per microcurie

Y = The fractional radiochemical yield (when applicable)

e = The base of natural logs (approximately 2.718)

k = The radioactive decay constant for the particular radionuclide

dt = The elapsed time between sample collection (or end of sample collection period) and the time of counting.

Deviation. A planned departure from established criteria that may be required as a result of unforeseen field situations or to correct ambiguities in procedures that may arise in practical applications.

Effective Dose Equivalent (H_E or EDE). An EDE is defined to be the summation of the products of the dose equivalent received by specified tissues of the body and a tissue-specific weighting factor. The sum is a risk-equivalent value that can be used to estimate the health-effects risk of exposed individuals. The tissue-specific weighting factor represents the fraction of the total health risk resulting from uniform whole-body radiation that would be contributed by the particular tissue. The EDE includes the committed EDE from internal deposition of radionuclides and the EDE caused by penetrating radiation from sources external to the body. The EDE is expressed in units of rem (or sievert).

Effluent. Any treated or untreated air emission or liquid discharge at a DOE site or from a DOE facility. The term includes onsite discharge to the atmosphere, lagoons, ponds, cribs, injection wells, French drains, or ditches. The term does not include solid wastes stored or removed for disposal or wastes contained in retention basins or tanks before treatment and/or disposal.

Effluent Monitoring. Collection and analysis of samples or measurements of liquid and gaseous effluents for the purpose of characterizing and quantifying contaminants, assessing radiation exposures of members of the public, providing a means to control effluents at or near the point of discharge, and demonstrating compliance with applicable standards and permit requirements.

Emission. See Effluent.

Environmental Monitoring. Collection and analysis of samples or direct measurements (i.e., continuous monitoring) of environmental media. Environmental monitoring consists of two major activities: effluent monitoring and environmental surveillance.

Environmental Surveillance. Collection and analysis of samples or direct measurements of air, water, soil, foodstuff, biota, and other media from DOE sites and their environs for the purpose of determining compliance with applicable standards and permit requirements, assessing radiation exposures of members of the public and assessing the effects, if any, on the local environment.

Equipment Blanks. Pure deionized, distilled water washed through decontaminated sampling or testing equipment and placed in containers identical to those used for actual field samples. They are used to verify the adequacy of sampling equipment decontamination procedures and are normally collected as frequently as field duplicate samples.

Nonconformance. A nonconformance is a deficiency in characteristic, documentation, or procedure that renders the quality of material, equipment, services, or activities unacceptable or indeterminate. When the deficiency is minor, does not effect a permanent or significant change in quality if it is not corrected, and can be brought into conformance with immediate corrective action, it shall not be categorized as a nonconformance. However, if the nature of the condition is such that it cannot be immediately and satisfactorily corrected, it shall be documented in compliance with approved procedures and brought to the attention of management for disposition and appropriate corrective action.

Precision. A measure of the repeatability or reproducibility of specific measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. Precision is normally expressed in terms of standard deviation, but may also be expressed as the coefficient of variation (i.e., relative standard deviation) and range (i.e., maximum value minus minimum value). Precision is assessed by means of duplicate/replicate sample analysis.

Proportional Sampling or Monitoring. For continuous airborne effluents, the ratio of the sample flowrate (e.g., the flow through the filter) to the discharge flowrate is constant within acceptable limits. For continuous liquid effluents, the ratio of the sample volume to the discharge volume is constant. For batch releases, the ratio of the sample volume to batch volume is constant from batch to batch. (This applies only to the final volumetric composition of the record sample as analyzed by the laboratory.)

Quality Assurance. The total integrated quality planning, QC, quality assessment, and corrective action activities that collectively ensure that data from monitoring and analysis meet all end user requirements and/or the intended end use of the data.

Quality Assurance Project Plan. An orderly assembly of management policies, project objectives, methods, and procedures that define how data of known quality will be produced for a particular project, investigation, or monitoring program.

Quality Control. For the purposes of effluent monitoring, QC refers to the routine application of procedures and defined methods to the performance of sampling, measurement, and analytical processes.

Record Sample. A representative sample collected in a sampling system for laboratory analysis used as a basis for reporting to the DOE, facility operations, and safety the amounts of contaminants released to the environment.

Reference Samples. A type of laboratory QC sample prepared from an independent, traceable standard at a concentration other than that used for analytical equipment calibration, but within the calibration range. Reference samples are required for every analytical batch or every 20 samples, whichever is greater.

Replicate Sample. Replicate samples are two or more aliquots removed from the same sample container in the laboratory and analyzed independently.

Representativeness. May be interpreted as the degree to which data accurately and precisely represent a characteristic of a population parameter, variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter that is most concerned with the proper design of a sampling program.

Sample. A physical specimen of air, water, or particles filtered from air.

Sampling Schedule. A description of routine sampling necessary to support the effluent monitoring program. Sampling schedules specify the effluent, location, size, type, and frequency of samples to be collected.

Sampling System. Instrumentation and equipment that remove a part of a liquid or airborne waste stream for subsequent quantitative determination of a stream parameter. The sampling system generally employs such devices as filters, other sample collection media, or effluent traps of some kind. A continuous sampling system removes a part of the stream continuously except during sample change, maintenance, repair, or other necessary outages. A grab sampling system instantaneously removes a part of the stream or removes a part of the stream over a period of time.

Split Sample. A split sample is produced by homogenizing a field sample and separating the sample material into two equal aliquots. Field split samples are usually routed to separate laboratories for independent analysis, generally to audit the performance of the primary laboratory relative to a particular sample matrix and analytical method. In the laboratory, samples are generally split to create matrix spike samples.

Trip Blanks. A type of field QC sample consisting of pure, deionized, distilled water in a clean, sealed sample container. Trip blanks accompany each batch of containers shipped to the sampling site and are returned unopened to the laboratory. They are used to identify any possible contamination originating from container preparation methods, shipment, handling, storage, or site conditions.

Validation. A systematic process of reviewing a body of data against a set of criteria to ensure that the data are acceptable for their intended use. Validation methods may include review of verification activities (i.e., QC program), editing, screening, cross checking, historical trending, and technical review.

Verification. Verification refers to the process of determining whether procedures, processes, data, or documentation conform to specified requirements. Verification activities may include inspections, audits, surveillances, or technical review.

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APPENDIX A

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APPENDIX A

Table A-1. Supporting Procedures for Facility Effluent Monitoring Plan Activities. (7 sheets)

Procedure	Procedure Number	Title	Facility
Chain-of-Custody, Sample Packaging, and Shipping	WHC-IP-0718	Chain of Custody	242-A Evaporator
	TO-080-060	Health Physics Procedures Manual Chain-of-Custody Process sampler	
	WHC-IP-0568	Chain of Custody	284E/W Powerhouses
	SWU2-A-020	200 Area Steam & Water Utilities Operations Administration Procedures	
	WHC-CM-5-6	B Plant Operations Administration	B Plant
	BO-080-008	Sample Truck Transport and Accountability at B Plant	
	SW-025-006	Package and Transfer of Radioactive Liquid Waste Samples	340 Waste Handling
	Laboratory Procedure Control Book (No Number)	Analytical Chemistry Services Laboratories Operating Instructions Manual	222-S Laboratory
	POP-ZO-102-010	Sample 2904-ZA	PFP
	PO-080-0315	PUREX Sample Chain-of-Custody	PUREX, UO3
	Desk Instruction 91-X-005	Chain of Custody	FFTF
	HRWC-03 HRWC-06 HRWC-07 HRWC-08	Waste Hazardous Waste Mixed Waste Radioactive Waste	KE/KW Basins
	WHC-IP-0718	Health Physics Procedures Manual	All Facilities
	Section ER-04	Effluent Exhaust CAM Alarm Response	
Sampling Monitoring Airborne			

Table A-1. Supporting Procedures for Facility Effluent Monitoring Plan Activities. (7 sheets)

Procedure	Procedure Number	Title	Facility
Sampling Monitoring airborne (continued)	Section 3.1.1	Material Release Surveys	All Facilities
	Section 3.2.1	Radioactive Material Shipment and Receipt Exchange	
	Section 3.3.1	Air Sampling	
	Section 3.3.2	Gaseous Effluent Monitoring System Inspection and Sample Exchange	
	Section 3.3.3	Automated Bar Coding of Air Samples at Hanford (ABCASH)	
	WHC-IP-0718 (Appendix I)		
	Section 4.2	Continuous Air Monitoring	
	Section 5.3	Air Sample Envelopes and Counter Log Sheets	
Sampling Monitoring liquid	WHC-CM-5-8	PFP Administration Manual	PFP
	FSS-Z-080-00003	291-Z Sump and Z-20 Crib Routine Sample Schedule	

Table A-1. Supporting Procedures for Facility Effluent Monitoring Plan Activities. (7 sheets)

Procedure	Procedure Number	Title	Facility
Sampling Monitoring liquid (continued)	POP-ZO-100-011	Sample Manhole #9 During Pump or Power Failure	PFP
	POP-ZO-102-010	Sample 2904-ZA	
	POP-ZO-100-008	Perform Drain/Manhole Sampling	
	POP-ZO-102-010	Operate 2904-ZB Sampling Facility	
	POP-ZO-102-009	Operate/ Decontaminate 2904-ZA Alpha Monitor	
	WHC-CM-5-9	PUREX/UO ₃ Plant Administration Manual	PUREX
	PO-040-050	Perform Effluent Sampling and Monitoring Surveillance	
	PO-080-320	Operate CSL Monitoring, Sampling and Control System	
	WHC-CM-5-9	PUREX/UO ₃ Plant Administration Manual	UO ₃
	UO-080-006	Sample UO ₃ Liquid Effluent	
	SWU2-A-021	Sampling and Monitoring at the 284E/W Steam and Utilities Facility	284E/W Powerhouses
	BO-018-020	Perform Sampling of Chemical Sewer (BCE)	B Plant
	BO-018-040	Perform 207-B Operations and Sampling (CBC)	
	BO-018-041	Perform Sampling of 216-B-59 Basin and Transfer Contents to TK-9-1 or to 207-B (CBC)	
	BO-018-050	Perform Sampling of Steam Condensate (BCS)	
	BO-018-060	Perform Sampling of Process Condensate (BCP)	

Table A-1. Supporting Procedures for Facility Effluent Monitoring Plan Activities. (7 sheets)

Procedure	Procedure Number	Title	Facility
Sampling Monitoring liquid (continued)	TO-630-040	Sample Cooling Water from 242-A Evaporator via Receiver Tank RC-2	242-A Evaporator
	TO-080-060	Chain of Custody Process Sampler	
	SW-080-001	Sample Vault Tanks Radioactive Liquid Waste	340 Waste Handling
	WHC-IP-0718 Section 4.5C (WHC 1993c)	Operation of the 400 Area Effluent Monitoring System	All 400 Area gaseous emission sampling systems
	WHC-IP-0718 Section 4.6C	Operation of Tri-Carb Liquid Scintillation Counter	All Westinghouse Hanford Stacks (100, 200, 300, 400 Areas)
Calibration	2B18002	P.M. 221-B Steam Orifice Blowdown	B Plant
	05-BM-050	B Plant CO Monitor Calibration	
	2B18010	B Plant Flow Indicator Inspection, Cleaning, and Functional Test	
	2B18015	B Plant 18-2 IX Bedford Monitor Calibration	
	2B18019	291-B Turbine Building Calibrations	

Table A-1. Supporting Procedures for Facility Effluent Monitoring Plan Activities. (7 sheets)

Procedure	Procedure Number	Title	Facility
Calibration (continued)	2B18023	Calibration at 221-BA/BG	B Plant
	2B18024	Bailey System Filter and Ribbon Inspection-271-B and 221-B	
	2B18025	Functional Test of B Plant Bailey "Network 90" Analog Meter Module AMM02	
	2B18030/ 05-BM-045	G-M Area Monitoring System Model 855/856	
	PSCP-5-003	Breathing Air Analyzer Calibration at 225-B, Radiation Monitor	
	PSCP-4-188	Yokogawa (YEW) Recorder Model ER106-A	284E/W Powerhouses
	PSCP-4-189	Lear Siegler RN7A/RN7AN Opacity Monitor/Indicator	
	PSCP-7-041 PSCP-4-218	NOx Monitor Calibration Interscan NOx Multipoint Continuous Monitoring System (MCMS)	PUREX, UO ₃
	PSCP-3-087	Eberline PING Monitoring System/PUREX Main Stack Calibration	PUREX
	CSL Work package	Liquid Effluent On-line Alpha Monitor for PUREX	
	PSCP-3-054	PUREX Main Stack CPRM Beta and Channel Calibration	
	PSCP-3-083	PUREX Modified Effluent CAM Eberline Alpha-5A for Detection of ²³⁹ Pu	
	PSCP-1-044	Kurz 142/151 KM Calibration	
	PSCP-1-045	Kurz Linear Mass Flow Meter Series 505 at PUREX	

Table A-1. Supporting Procedures for Facility Effluent Monitoring Plan Activities. (7 sheets)

Procedure	Procedure Number	Title	Facility
Calibration (continued)	Environmental Specifications Administration A-7	FFTF Environmental Compliance Procedures	FFTF
	PSCP-3-082	Liquid Effluent On-line Alpha Monitor for PFP	PFP
	PSCP-3-080	Eberline, RMS II ECI-1 Through ECI-8 Count Rate Meter	All 200 Area Facilities
	PSCP-3-053	Field Calibration of Gamma Radiation Detection Liquid Effluent Systems that Use Victoreen Ratemeters	
	PSCP-4-018 Foxboro Model 99D-110 Totalizer CB1	Manning Model S-5000 Environmental Stationary Composite Sampler	
	PSCP-3-029		
	PSCP-5-012		
	PSCP-1-014		
	PSCP-4-220		
	PSCP-4-181		

Table A-1. Supporting Procedures for Facility Effluent Monitoring Plan Activities. (7 sheets)

Procedure	Procedure Number	Title	Facility
Calibration (continued)	PSCP-3-040	Ortec Model 406A Single Channel Analyzer	All 200 Area Facilities
	PSCP-3-046/065	Ortec Model 485, Model 541, Amplifier and Rate Meter	
	PSCP-3-060	Ortec Model 773 and 773H Timer/Counter Test Procedure	
	PSCP-3-064	Tennelec Count Ratemeter Models TC595/TC595M Calibration	
	PSCP-3-076	Victoreen Model 842 Series Electronic Calibration	

Legend: ABCASH = Automated Bar Coding of Air Samples at Hanford
 FFTF = Fast Flux Test Facility
 MCMS = Multipoint Continuous Monitoring System
 PFP = Plutonium Finishing Plant
 PUREX = Plutonium Uranium Extraction (Facility)

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