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QUALITY ASSURANCE PROJECT PLAN FOR FACILITY
EFFLUENT MONITORING PLAN ACTIVITIES

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ABSTRACT

This Quality Assurance Project Plan addresses the quality assurance requirements for the Facility Effluent Monitoring Plans of the overall site-wide environmental monitoring plan. 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 individual Facility Effluent Monitoring Plans. This document is intended to be a basic road map to the Facility Effluent Monitoring Plan documents (i.e., the guidance document for preparing Facility Effluent Monitoring Plans, Facility Effluent Monitoring Plan determinations, management plan, and Facility Effluent Monitoring Plans).

U.S. Department of Energy Order 5400.1, General Environmental Protection Program (DOE 1988a) and DOE/RL-89-18, U.S. Department of Energy-Richland Operations Office Environmental Protection Implementation Plan (DOE-RL 1989), requires U.S. Department of Energy sites to prepare a Facility Effluent Monitoring Plan by November 9, 1991. To accomplish this task, the Westinghouse Hanford Company's Environmental Assurance function has prepared a Facility Effluent Monitoring Plan guidance document (WHC-EP-0438, A Guide for Preparing Hanford Site Facility Effluent Monitoring Plans [WHC 1991]) to be used by the Hanford Site contractors in preparing the Facility Effluent Monitoring Plan determinations and subsequent Facility Effluent Monitoring

Plans. The general Facility Effluent Monitoring Plan requirements identified in the guidance document are further defined in this Quality Assurance Project Plan.

This Quality Assurance Project Plan is prepared 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 1989a). 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 1989a).

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 6.0, "Document Control," and quality instruction 6.1, "Quality Assurance Document Control," from WHC-CM-4-2 (WHC 1989a).

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LIST OF TERMS

CERCLA	<i>Comprehensive Environmental Response, Compensation and Liability Act of 1980</i>
CFR	Code of Federal Regulations
CQL	contractual quantitation limit
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy-Richland Operations Office
EA	Environmental Assurance
ECN	Engineering Change Notice
Ecology	Washington State Department of Ecology
EDE	effective dose equivalent
EII	Environmental Investigations Instruction
EMP	Environmental Monitoring Plan
EP	Environmental Protection
EPA	U.S. Environmental Protection Agency
ER&I	Environmental Review and Integration
FEMP	Facility Effluent Monitoring Plan
NESHAP	"National Emission Standards for Hazardous Air Pollutants"
OSM	Office of Sample Management
PNL	Pacific Northwest Laboratory
PISCES	Plant Instrumentation Surveillance, Calibration, and Evaluation System
QA	quality assurance
QAMS	Quality Assurance Methods
QAPP	Quality Assurance Project Plan
QC	quality control
QI	quality instruction
QR	quality requirement
QUEST	Quality, Environment, and Safety Trending
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RWP	radiation work permits
Westinghouse Hanford	Westinghouse Hanford Company

QUALITY ASSURANCE PROJECT PLAN FOR FACILITY EFFLUENT MONITORING PLAN ACTIVITIES

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Order 5400.1, *General Environmental Protection Program* (DOE 1988a), requires 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 will contain the following elements:

- A conceptual plan addressing effluent monitoring and environmental surveillance
- Separate facility-specific EMPs
- Two distinct environmental surveillance plans describing the Westinghouse Hanford Company (Westinghouse Hanford) near-field and the Pacific Northwest Laboratory (PNL) site-wide environmental surveillance activities.

This Quality Assurance Project Plan (QAPP) addresses the quality assurance (QA) implementation of the second of these three elements of the overall site-wide EMP, the facility effluent monitoring plans (FEMP). Every major Westinghouse Hanford facility shall prepare a FEMP determination in accordance with *A Guide for Preparing Hanford Site Facility Effluent Monitoring Plans* (Guide), WHC-EP-0438 (WHC 1991). Results of this determination will dictate whether an actual FEMP is needed. To meet the overall EMP requirements of DOE Order 5400.1 (DOE 1988a), all operational FEMPs are to be completed by November 9, 1991. In addition, new or modified facilities requiring FEMPs must have the documents completed before startup. Elements of the Quality Assurance (QA) Program (NQA-1 [ANSI/ASME 1986] and U.S. Environmental Protection Agency [EPA] *Interim Guidelines and Specifications for Preparation of Quality Assurance Project Plans* QAM-005/80 [EPA 1983]) and "Quality Assurance Methods," Title 40, Code of Federal Regulations Part 60, U.S. Environmental Protection Agency, Washington, D.C. [EPA 1990] are contained throughout the body of the individual FEMP. Section 12.0 in each individual FEMP references this QAPP for the general requirements of the QA program. Facility-specific QA requirements are also included in this section if applicable.

In accordance with the requirement of U.S. Department of Energy-Richland Operations Office (DOE-RL) 89-18, *United States Department of Energy-Richland Operations Office Environmental Protection Implementation Plan* (DOE/RL 1989a), the Westinghouse Hanford Environmental Assurance (EA) function has prepared a

FEMP guidance document to be used by the four Hanford Site contractors (Westinghouse Hanford, PNL, Kaiser Engineers Hanford, and Hanford Environmental Health Foundation) in preparing the FEMP determinations and FEMPs. This guidance document, *A Guide for Preparing Hanford Site Facility Effluent Monitoring Plans*, WHC-EP-0438 (WHC 1991), was originally distributed to the managers of all Hanford Site facilities that may require written FEMPs on September 14, 1990. Many issues and concerns identified during the FEMP determinations were incorporated into the guidance document to ensure that consistency is maintained for the Hanford Site during FEMP preparations.

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 1989a), 5400.4 (DOE 1989b), 5400.5 (DOE 1990), 5480.1 (DOE 1982a), 5480.11 (DOE 1988b), and 5484.1 (DOE 1981)
- Ensure that effluent monitoring systems provide an adequate means of determining releases to the environs to assess the impact of protection to the public and the environment
- Ensure that facility operations are in compliance with other applicable federal, state, and local emission standards and requirements.

Briefly summarized, the FEMPs require the characterization of radioactive and nonradioactive gaseous and liquid effluents from all Westinghouse Hanford facilities or sites and the detection of statistically significant concentrations of specified contaminants in these effluents. In addition, assessment of compliance with the new U.S. Environmental Protection Agency (EPA) "National Emission Standards for Hazardous Air Pollutants" (NESHAP) [40 Code of Federal Regulations (CFR) 61, Subpart H] (EPA 1989a) for radioactive airborne effluents shall be included in the FEMP determinations and subsequent FEMPs. Facility-specific procedures shall be referenced in the FEMPs to demonstrate compliance.

2.2 MONITORING ACTIVITIES DESCRIPTION

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

The QAPP is prepared 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 CFR 60, Appendix B, Method 114 (EPA 1989a). It describes the means selected to implement the overall QA program requirements defined by the *Quality Assurance Manual*, WHC-CM-4-2 (WHC 1989a). The implementing procedures, plans, and instructions are appropriate for the control of effluent monitoring plans requiring compliance with DOE, EPA, state, and local requirements. The QAPP contains a matrix of procedural resources from facility or site manuals used in the FEMPs to support this QAPP. This QAPP shall be reviewed and updated as required by changes made in the FEMPs. Distribution and revision control of this plan shall be in compliance with quality requirement (QR) 6.0, "Document Control," and quality instruction (QI) 6.1, "Quality Assurance Document Control," from WHC-CM-4-2 (WHC 1989a). The QAPP distribution shall routinely include all review/approval personnel indicated on the title page of the document and all other individuals designated by EA. Plans and procedures referenced in the QAPP 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 QAPP and select the necessary procedural controls from the generic requirements of this plan that are specifically applicable to individual effluent sampling and monitoring activities. At a minimum, the FEMP should address the items below. For some facilities such as the 340 Waste Handling Facility, analyses are performed by an outside laboratory such as PNL. The following requirements for procedures would be under the control and authority of the contracting laboratory and would not necessarily be reviewed by Westinghouse Hanford on a continual basis. The laboratory Quality Assurance/Quality Control function would be responsible for this action.

- Definition of analytes of interest and specific objectives for data quality: Based on the Hanford Site list provided in Table A-1, 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.
- Definition of specific procedural controls: Based on the comprehensive list provided in Table B-1, individual FEMPs define specific procedural controls that apply to the individual facilities.

- Definition 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.
- Definition of data assessment procedures: Procedures for assessment of data by appropriate organizations [Office of Sample Management (OSM), Environmental Protection (EP), QA, etc.] should be referenced in the FEMP for each facility, to include comprehensive discussions of any statistical methodologies and formulae that may be applied to the data. The guidance provided by the *RCRA Groundwater Monitoring Technical Enforcement Guidance Document* (EPA 1986a) and *Statistical Analyses of Groundwater Monitoring Data at RCRA Facilities, Interim Final Guidance* (EPA 1989b) should be considered, as appropriate.
- Definition of facility-specific performance or system audit requirements: Performance or system audit requirements over and above scheduled audits performed by appropriate organizations (i.e., facility QA, Compliance Verification, and Environmental QA) shall be defined.

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3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

3.1 PROJECT MANAGEMENT

The Environmental Assurance function of Westinghouse Hanford has the primary responsibility for specifying the requirements for effluent monitoring and providing guidance in the preparation of FEMPs. An organizational chart is included as Figure 3-1. Responsibilities of key personnel are described below.

- **Environmental Assurance/Environmental Protection**--The EP group within EA has the responsibility to oversee and verify the environmental radioactivity and chemical emission monitoring program at Westinghouse Hanford facilities and associated active and inactive waste sites as required to assure compliance to environmental regulations.

The EP group acts as the technical liaison between the facilities and regulators on issues pertaining to the effluent monitoring program and provides guidance for implementing that program. The EP group also provides technical support for effluent sampling and analysis. The EP group prepares annual emissions reports to DOE and the appropriate regulatory agencies. The EP group has the responsibility for assigning the unique electronic data processing codes and identification numbers for each sample point at each facility. The EP group maintains permanent records of effluent releases of radioactivity in the effluents discharged from each Westinghouse Hanford facility.

- **Facility Effluent Monitoring Plan Coordinator.** The FEMP program coordinator for EA coordinates technical activities associated with the effluent monitoring program. The coordinator is responsible for the overall effluent monitoring program (planning, organizing, scheduling, and ensuring quality reviews) are performed. This coordinator will be an assigned representative in the EP group. The coordinator provides technical guidance to individual facility cognizant engineers, facility sampling and analysis task leaders, and designated FEMP authors.
- **Facility Cognizant Engineer(s)**--At the direction of the facility manager, facility cognizant engineers should be assigned to individual monitoring programs to provide technical guidance, assist in planning, staffing, scheduling, and coordinating facility-specific FEMP activities. Specific technical responsibilities include coordination and documentation of sampling and monitoring activities pertaining to the FEMPs and serving as the designated liaison between EA and Health Physics.
- **Facility Sampling and Analysis Task Leader**--The facility sampling and analysis task leader is responsible for coordinating all sampling and analysis activities. Responsibilities include advising and assisting cognizant engineers and analytical laboratories with

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

developing and maintaining facility-specific sampling programs, staffing, controlling the budget, maintaining updated facility-specific sampling schedules, authorizing changes to the sampling and analysis program, and keeping management informed of potential impacts on the status of sampling and analysis activities, including those activities requiring elevated management attention. This individual typically is appointed by the manager of facility effluents and as a technician works side by side with the cognizant engineer.

3.2 SUPPORTING ORGANIZATIONS

Routine technical support to EA will be provided through several Westinghouse Hanford organizations as described below.

- **Environmental Quality Assurance.** Environmental QA provides quality engineering support related to procurement control, document approval, surveillance, and auditing needs.
- **Environmental Review and Integration.** The Environmental Review and Integration (ER&I) group within EA has the responsibility to plan, direct, and execute the near-field environmental surveillance program for all media except groundwater and ensure that the requirements of this program are implemented. In addition, this group acts as the primary interfacing organization for environmental adverse condition statements, tracking environmental surveillance corrective actions, and generating status reports in the Quality, Environment, and Safety Trending (QUEST) system.
- **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. In most cases, Health Physics is the organization that collects the airborne samples for the facility. Operations personnel typically collect the liquid samples in each facility.
- **Office of Sample Management.** At the direction of the EA manager and/or facility manager, the OSM provides data validation services primarily in the area of evaluation and selection of hazardous or *Resource Conservation and Recovery Act of 1976 (RCRA)* analytical laboratory services.
- **Regulatory Analyses.** These personnel provide guidance in interpretation of all regulations and interface with the regulatory agencies pertaining to such matters.
- **Facility Compliance.** These personnel provide guidance to the facilities on interpretation of the regulations specifically for the facility-related operations.

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

<u>Task</u>		<u>Organization</u>						
		EA	EP	QA	FO	OSM	LABS	HP
1	Provide Criteria, Limits, and Guidelines		A					
2	Prepare FEMPs and FEMP Determinations		R	R	A	R		
3	Prepare Facility-Specific Implementing Procedures		R	R	A	R		
4	Take Effluent Samples		S		A			A
5	Prepare Spiked Samples					A		
6	Ship Samples				A			
7	Track Samples				R	A		
8	Prepare Analytical Laboratory SOW and Procedure for Offsite Laboratories		R	R	R	A		
9	Analyze Samples					R	A	
10	Audit Laboratory QA/QC			A		A		
11	Prepare Data Validation Procedures					A		
12	Receive Laboratory Test Reports and Transmit to Facility					A		
13	Review and Validate Data	* See Individual FEMP						

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

Task		Organization						
	EA	EP	QA	FO	OSM	LABS	HP	
14	Conduct Final Technical Review Of Validation Reports and Supporting Analytical Data Packages		*See Individual FEMP					
15		Compare Test Results To Operating Limits		S		A		
16		Prepare Environmental Release Reports, NESHAP and NPDES Reports, etc.		A		R		
17		Programmatic Audits and Surveillances	A			A		
Legend	A: Action R: Review and Approve S: Surveillance NPDES: National Pollution Discharge Elimination System		EA: Environmental Assurance EP: Environmental Protection FEMP: Facility Effluent Monitoring Plan		FO: Facility Operations OSM: Office of Sample Management HP: Health Physics			
			QA: Quality Assurance (to include Environmental Quality Assurance) NESHAP: "National Emission Standards for Hazardous Air Pollutants"					
	*Note: The review and validation process varies from facility to facility and is specifically described in each FEMP.							

Figure 3-2 summarizes the organizational responsibilities.

3.3 ANALYTICAL LABORATORIES

Analytical samples will be transported to an approved Westinghouse Hanford participant contractor or subcontractor laboratory for radiological and/or chemical analysis. For participant contractors or subcontractors, applicable quality requirements of this QAPP shall be invoked as part of the approved applicable work order or procurement document. Laboratories are to submit their analytical methods and internal QAPP for Westinghouse Hanford review and approval before use. At the direction of EA, Westinghouse Hanford OSM, or the facility operator, the services of alternative analytical chemistry laboratories may be procured for split (performance audit) sample analysis. Participant contractor or subcontractor laboratories will be subject to a source surveillance with Environmental QA participation, in compliance with QI 7.3, "Source Surveillance and Inspection" (WHC 1989b). Subsequent surveillance for systems audit purposes shall be in compliance with QI 10.4, "Surveillance."1989b).

3.4 OTHER SUPPORT CONTRACTORS

Procurement of the services of other subcontractors to support any or all of the activities addressed by this QAPP may be initiated at the direction of EA. Such services shall be in compliance with standard Westinghouse Hanford procurement procedures requirements. All work shall be performed in compliance with Westinghouse Hanford-approved QA plans and/or procedures, subject to the controls of QI 7.3, "Source Surveillance and Inspection" (WHC 1989b).

4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENTS

The QA objectives for measurements generally applicable to FEMPs under the purview of this QAPP 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 the purposes of all facility effluent monitoring at the Hanford Site
- Defining appropriate input parameters (i.e., meteorological data) required for EPA-approved and Hanford Site-specific dose modeling used in FEMP determinations
- Defining data representativeness, completeness, and comparability in terms applicable to the FEMPs at the Hanford Site.

Detailed discussions of the analytes of interest and analytical methods are provided in Table A-1. Specific data quality needs for individual investigations that are over and above the minimum requirements established herein 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 B-1. A matrix comparison of the QA requirements contained in ASME NQA-1 and EPA QAMS is contained in Table C-1, which shows the applicable Westinghouse Hanford requirements (manuals or procedures).

4.1 ANALYTES OF INTEREST AND ANALYTICAL METHOD SELECTION

Table A-1 identifies potential analytes of interest based on input from the individual FEMPs and corresponding analytical reference methods for effluent sampling and monitoring at the Hanford Site. The list of analytes is developed from the compounds identified in 40 CFR 264, Appendix IX (EPA 1988a), and requirements specified in the NESHAPs (40 CFR 61, Subpart H) (EPA 1989a) with the addition of those Hanford-specific parameters required by the RCRA Part B permit applications for the individual solid waste management units, and 40 CFR 302, *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA), requirements under the purview of this QAPP. Analytical methods are selected from those provided in *Test Methods for Evaluating Solid Waste*, SW-846 (EPA 1986b), as suggested by 40 CFR 264, Appendix IX, for those analytes for which SW-846 methods exist. Remaining analytes specify reference methods selected from appropriate EPA guidance documents (see notes (a), (e), (f), (g), (h), and (i) of Table A-1). Where options have been suggested or implied, the more reliable methods have been selected.

The 222-S Laboratory typically only performs radiological analyses and analyses on nonradioactive constituents in liquid effluents. The purely hazardous or RCRA-type sampling analyses are coordinated by the OSM whereby an offsite contracted laboratory performs these analyses. The offsite laboratories are required to meet the contractual requirements established by Westinghouse Hanford.

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 this version of the QAPP, these parameters are presented as target values that must be adjusted and/or confirmed and accepted by Westinghouse Hanford and the proposed laboratory before final approval of associated subcontracts or work orders. These target values have been developed from the practical quantitation limits suggested by 40 CFR 264, Appendix IX (EPA 1988a), and CERCLA-reportable quantities. The CERCLA-reportable quantities are historically achievable values based on those negotiated and approved in previous analytical subcontracts for similar analyses at the Hanford Site, or are proposed on the basis of the performance level that can routinely be expected for the methods indicated. These target values must be confirmed and/or adjusted to mutually satisfactory values and be approved by Westinghouse Hanford and the proposed analytical laboratory during subcontractor or work order negotiation. Once the values are established as contractual requirements, Table A-1 and this section of this QAPP should be revised accordingly. There is no approved procedure to perform this action. The primary responsibility of the FEMP Coordinator is to ensure that the QAPP and associated FEMP documentation are updated.

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 1989a) require radionuclide emissions from each DOE site to 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 1989a). Input parameters are obtained from historical, PNL sitewide environmental surveillance reports, and Hanford Site meteorological data. The results of the dose models are included in the FEMP determinations. (They are not included in Table A-1.) At the effluent points where the dose limits (0.1 mrem/yr EPA, Westinghouse Hanford administrative control values) are exceeded, monitoring shall be performed in accordance with the procedures identified in Table B-1.

4.4 REPRESENTATIVENESS, COMPLETENESS, AND COMPARABILITY

Goals for data representativeness are addressed qualitatively by the specification of sampling locations and intervals within the applicable FEMP. Completeness objectives for all FEMPs shall require that the contractually or procedurally established requirements for precision and accuracy be met for at least 90% of the requested determinations for each facility on an annual basis for each laboratory conducting analyses. In other words, precision and accuracy for all the data within a facility shall be at least 90% effective, accurate, and precise overall. 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 EP, OSM, or QA, as appropriate. Approved analytical procedures shall require the use of the reporting techniques and units consistent with the EPA reference methods listed in Table A-1 to facilitate the comparability of data sets in terms of precision and accuracy.

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5.0 SAMPLING PROCEDURES

5.1 SAMPLING PROCEDURES

Sampling activities and equipment and sample material and containers will be subjected to field screening (i.e., radiological survey and quality control check of transporting documentation) for radioactivity in compliance with the requirements of governing radiation work permits (RWP) to ensure that samples are transported only to laboratories that are appropriately equipped and licensed for receiving radioactive materials and performing mixed waste analyses. All effluent sampling performed 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 (i.e., gallons, cubic feet).

5.2 OTHER SUPPORTING PROCEDURES

Except for the analytical chemistry procedures specified in Table A-1, procedures to be used to directly support FEMP activities are presented in Table B-1, cross referenced to their source documents and the types of activities they will typically support. Any additions or modifications to procedures listed here shall be addressed in the text of individual FEMPs.

5.3 PROCEDURE APPROVALS AND CONTROL

5.3.1 Westinghouse Hanford Procedures

The Westinghouse Hanford procedures that may be used to support the sampling and monitoring activities specifically defined by individual FEMPs are referenced in Table B-1. Latest approved versions of all referenced procedures shall apply in all cases. Selected procedures include Environmental Investigations Instructions (EII) from WHC-CM-7-7, *Environmental Investigations and Site Characterization Manual* (WHC '989c) or equivalent and QR and QI from WHC-CM-4-2, *Quality Assurance Manual* (WHC 1989a), and plant operating manuals. Procedure approval, revision, and distribution control requirements applicable to EII are addressed in EII 1.2, "Preparation and Revision of Environmental Investigation Instructions" (WHC 1989b); requirements applicable to QI and QR are addressed in QR 5.0, "Instructions, Procedures, and Drawings;" QI 5.1, "Preparation of Quality Assurance Documents;" QR 6.0, "Document Control;" and QI 6.1, "Quality Assurance Document Control" (WHC 1989a). All procedures are available for regulatory review on request at the direction of EA. Other Westinghouse Hanford procedures that will apply may be facility specific and are defined in the individual FEMPs.

5.3.2 Participant Contractor/Subcontractor Procedures

As noted in Section 2.4, participant contractor and/or subcontractor services may be procured with the concurrence of the EA manager. Such

procurements shall be subject to the applicable requirements of QR 4.0, "Procurement Document Control;" QI 4.1, "Procurement Document Control;" QI 4.2, "External Services Control;" QR 7.0, "Control of Purchased Items and Services;" QI 7.1, "Procurement Planning and Control;" and/or QI 7.2, "Supplier Evaluation" (WHC 1989a). Whenever such services require procedural controls, requirements for use of Westinghouse Hanford procedures, or submittal of contractor procedures for Westinghouse Hanford review and approval before use, 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. All analytical laboratory plans and procedures shall be reviewed and approved by QA and the OSM. All participant contractor or subcontractor procedures, plans, and/or manuals should be retained as project quality records in compliance with EII 1.6, "Records Management" (WHC 1989b) or equivalent Westinghouse Hanford- approved procedure; QR 17.0, "Quality Assurance Records;" and QI 17.1, "Quality Assurance Records Control" (WHC 1989a). All such documents should be made available for regulatory review on request, at the direction of EA.

5.4 PROCEDURE ADDITIONS AND CHANGES

Additional procedures, EII, or changes to existing procedures and EIIs found necessary as a consequence of individual FEMP requirements shall be developed in accordance with "Management Regulations and Procedures" (MRP) 2.16, WHC-CM-1-3 (WHC 1989b); QR 5.0 and 6.0, WHC-CM-4-2 (WHC 1989c); and EII 1.2, "Preparation and Revision of Environmental Investigations Instructions" (WHC 1989d). Should deviations from established procedures or EIIs be required to accommodate unforeseen field situations, they may be authorized in accordance with the requirements of EII 1.4, "Deviation from Environmental Investigations Instructions" (WHC 1989d) or equivalent procedure. Documentation, review, and disposition of instruction change authorization forms are defined within EII 1.4. Other types of document change requests shall be completed as Engineering Change Notices (ECN). 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 for FEMP activities. By definition a record sample is a representative sample collected in a sampling system for laboratory analysis used as a basis for reporting the amount and contaminant(s) released to the environment to the DOE, facility operation and safety.

All record sampling schedules are approved by Environmental Protection. 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 EP in accordance with the *Environmental Compliance Manual* (WHC 1988a).

6.0 SAMPLE CUSTODY

All samples obtained during the FEMP activities shall be controlled as required by EII 5.1, "Chain of Custody" (WHC 1989b), or an equivalent approved facility chain-of-custody procedure. The EII 5.1 requirements or equivalent facility procedure apply as soon as sample material is introduced to the sample container within which it will be preserved, sealed, labeled, and transported to the analytical laboratory. Laboratory chain-of-custody procedures shall be reviewed and approved by OSM or by Westinghouse Hanford procurement control procedures, as noted in Section 4.1. These procedures shall ensure the 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 initiated for returned residual samples as required by the approved procedures applicable within the participating laboratory. Those facilities that do not have chain-of-custody procedures in place shall prepare a procedure equivalent to the EII 5.1 (WHC 1989d). 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 1989a), and EII 1.6, "Records Management" (WHC 1989d), *Records Management System*, WHC-CM-3-5 (WHC 1988c), or equivalent Westinghouse Hanford-approved procedure.

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7.0 CALIBRATION PROCEDURES

Calibration of all Westinghouse Hanford 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 Measuring and Test Equipment;" QI 12.1, "Acquisition and Calibration of Portable Measuring and Test Equipment;" and QI 12.2, "Measuring and Test Equipment Calibration by User" (WHC 1989a). Routine operational checks for Westinghouse Hanford field equipment shall be as defined in EII 3.1, "User Calibration of Health and Safety Equipment;" EII 3.2, "Health and Safety Monitoring Instruments" (WHC 1989b), or other applicable facility-specific internal procedure; similar information shall be provided within Westinghouse Hanford-approved participant contractor or subcontractor procedures. The sampling and monitoring equipment used in this activity is controlled by the Plant Instrumentation Surveillance, Calibration, and Evaluation System (PISCES) or another Westinghouse Hanford-approved system. Calibration and maintenance are the controlling factors in this system.

Calibration procedures can be made available on request under the direction of the EA manager.

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8.0 ANALYTICAL PROCEDURES

Analytical methods or procedures based on the reference methods identified in Table 8-1 and Section 3.0 shall be selected or developed and approved before use, in compliance with appropriate Westinghouse Hanford procedure, work order, and/or procurement control requirements (Section 4.2). The following table summarizes the analytical procedures used for the Westinghouse Hanford Company facility laboratories. Procedures from other offsite laboratories (i.e., PNL, HEHF, Oak Ridge, etc.) performing analyses on environmental samples are not provided in this section.

Table 8-1. Analytical Procedures for the FEMP Activities.

Procedure Number	Title	Facility
Procedure numbers will be provided when available	7 Day Holding of Specific Samples to Allow Short-Lived Radionuclides to Decay, Silver Zeolite Cartridges, Counting Air Samples, Reducing/Computerizing Data, Operation of the Gamma Products Alpha/beta counting systems Located in the 222-S Counting Room, Determination of pH Direct Measurement, Separation of Pu and Am by Ion Exchange, Compositing and preparation of Liquid Effluent samples for analysis, Preparation of quarterly filter Composites for gamma analysis, Carbon 14 by distillation, and liquid scintillation counting, Determination of ^{129}I waste tank sample, Determination ^{99}Tc by solvent extraction and liquid scintillation counting, AEA using the ND600, Operation of the Beckman 255801 Liquid Scintillation Counter, Alpha energy analysis using the Canberra Jupiter Systems, Analysis of air samples, Low-level alpha and beta in water samples	222-S Laboratory
	Detection Levels for Radioisotope Counting Air Filter Analyses by Tennelec AEA	PFP
	AEA of PUREX Main Stack Air Filter, PUREX Plutonium solution isotopic system-sample counting and analysis, PUREX visual test, Compositing of PUREX samples, Fast analysis for Sr 89, 90 in Small Volume Samples, Total Alpha/Total Beta Mounting Procedure, Preparation of 125-ml Sample Mounts for Low-Level Gamma Energy Analysis, Fast Analysis for $^{89/90}\text{Sr}$ in Small Volume Samples, Routine Sample Analysis with ICP Emissions Spectrometer, Determination of Uranium by Scintrex UA-3 Laser Fluorometer.	PUREX

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9.0 MONITORING AND REPORTING CRITERIA

The effluent monitoring program encompasses all gaseous and liquid radioactive and nonradioactive effluent analyses performed for the Westinghouse Hanford facilities requiring a FEMP. The DOE orders, federal and state regulations criteria as specified in the FEMP guidance document are contained in the Westinghouse Hanford *Environmental Compliance Manual* (WHC 1988a).

The criteria for effluent sampling, monitoring, and reporting are identified in the *Environmental Compliance Manual*, WHC-CM-7-5 (WHC 1988a). The requirements for sampling and monitoring radioactive gaseous effluents are contained in Part D, "Radioactive Airborne Releases," and the results are to be reported annually by EP. Nonradioactive airborne effluent sampling, monitoring, requirements are described in Part C, "Nonradioactive Airborne Effluents," and must also be reported annually. At this time EP only reports annually the nonradioactive air emissions (i.e., NO_x emissions, etc.) that are registered with the federal and state agencies.

Monitoring and reporting criteria are also in place for liquid effluent streams. Radioactive liquid effluent monitoring requirements are identified in Part F, "Radioactive Liquid," and are to be reported annually. Those radioactive 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 1988a) and 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. Nonradioactive liquid effluent requirements are identified in Part E, "Nonradioactive Liquid Discharges."

Environmental Protection is the organization that 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 a Westinghouse Hanford-approved internal procedure. This procedure can be made available on request.

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10.0 DATA REDUCTION, VALIDATION, AND REPORTING

10.1 DATA REDUCTION AND DATA PACKAGE PREPARATION

Analytical 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. Data reporting requirements and data package content shall comply with the appropriate requirements of Section 1.4 and 1.5 of *Test Methods for Evaluating Solid Waste*, SW-846 (EPA 1986b), as modified by the proposed rule changes included in the *Federal Register*, Volume 54, No. 13 (EPA 1989c). These requirements shall be defined in work order or procurement documentation, subject to Westinghouse Hanford review and approval as noted in Section 4.2. Data packages shall be prepared in legible, reproducible format; any changes must be made as single-line corrections in black, nonsoluble ink, and must be initialed and dated. All laboratory data packages should include those items described below as a minimum.

- Sample receipt and tracking documentation, including identification of the organization and individuals performing the analysis, the names and signatures of the responsible analysts, sample holding times, references to applicable chain of custody procedures, and the dates of sample receipt, extraction, and analysis.
- Instrument calibration documentation, submitted monthly, including equipment type and model, with continuing calibration data for the time period in which the analysis was performed (PISCES, etc.).
- Internal quality control (QC) data, submitted monthly for the methods used, including matrix spike/matrix spike duplicate data, recovery percentages, precision data, laboratory blank data, and identification of any nonconformances that may have affected the laboratory's measurement system during the time period in which the analysis was performed.
- The analytical results or data deliverables, including reduced data, reduction formulas or algorithms, and identification of data outliers or deficiencies.

Other supporting information, such as initial calibration data, reconstructed ion chromatographs, spectrograms, traffic reports, and raw data, need not be included in the submittal of individual data packages unless specifically requested by the applicable FEMP or by EA. All sample data shall be retained by the analytical laboratory and made available for systems or program audits at the request of Westinghouse Hanford, EPA, DOE-RL, or Washington State Department of Ecology (Ecology) representatives. Such data shall be retained by the analytical laboratory through the duration of the authorization work order or period of their contractual statement of work, at which point it shall be turned over to Westinghouse Hanford for archiving.

The completed data package shall be reviewed and approved by the analytical laboratory's QA manager before submittal for validation. The requirements of this section shall be included in procurement documentation or work orders, as appropriate, in compliance with the standard Westinghouse Hanford procurement control procedures referenced in Section 4.2.

It is apparent that the 222-S Laboratory does not currently prepare data packages for air samples and liquid composite analysis as required by EPA protocols. This analysis is not being performed because meeting this requirement would delay analysis reporting a minimum of 6 mo per package. The laboratory will begin satisfying this requirement in the near future.

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 analysis, 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 Westinghouse Hanford-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 weekly and are 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 Westinghouse Hanford-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 EA for radioactive effluents and validated by the OSM for hazardous or nonradioactive effluents or as specified in the individual FEMPs. Alternative sources shall be used as directed by EP or as specifically required by an individual FEMP. Regardless of the source of validation services, validation requirements shall be defined within Westinghouse Hanford-approved data validation procedures, which at a minimum shall require the following QC checks.

For organic analyses, validation reports shall be prepared documenting QC checks of the following areas as recommended in *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses* (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
- Field 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.

For inorganic analyses, validation reports shall be prepared documenting QC checks of the following areas, as recommended in *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses* (EPA 1988d):

- 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 quality control 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. The precision of radionuclide analytical results shall be reported as a range, a variance, a standard deviation, a standard error, and/or a confidence interval. 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, it 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 EA 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 1988a) 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 1989d).

11.0 INTERNAL QUALITY CONTROL

In general, analytical samples shall be subject to in-process quality control measures in both the field and laboratory. Unless superseded by specific directions provided in the individual FEMP, the following minimum field quality control requirements apply to large-volume routine liquid-effluent sampling. These requirements are adapted from *Test Methods for Evaluating Solid Waste*, SW-846 (EPA 1986b), as modified by the proposed rule changes included in the *Federal Register*, Volume 54, No. 13 (EPA 1989c). In cases where a one-time single analysis is performed, these requirements may be limited in scope.

- **Field duplicate samples.** For each shift of sampling activity on a liquid or gaseous medium for like constituents or properties in an individual sampling task, at least 5% of the total collected samples shall be duplicated, or one duplicate shall be collected for every 20 samples, whichever is greater. Duplicate samples shall be retrieved from the same sampling location using the same equipment and sampling technique, and shall be placed into two identically prepared and preserved containers. Field duplicates shall be analyzed independently as an indication of gross errors in sampling techniques.
- **Split samples.** At EA or OSM direction, field or field duplicate samples may be split in the field and sent to an alternative laboratory as a performance audit of the primary laboratory. Sampling frequency shall meet the minimum scheduled requirements for performance audits (EPA 1983).
- **Blind samples.** Blind reference samples may be introduced into any sampling round as a performance audit of the primary laboratory. Blind sample type and frequency shall meet the minimum scheduled EP requirements for performance audits (EPA 1983).
- **Field blanks.** Field blanks consist of pure deionized distilled water transferred into a sample container at the site and preserved with the reagent specified for the analytes of interest. Field blanks are used as a check on reagent and environmental contamination, and shall be collected at the same frequency as field duplicate samples.
- **Equipment blanks.** Equipment blanks consist of pure deionized distilled water washed through decontaminated sampling equipment and placed in containers identical to those used for actual field samples. Equipment blanks are used to verify the adequacy of sampling equipment decontamination procedures, and shall be collected at the same frequency as field duplicate samples.
- **Trip blanks.** Trip blanks consist of pure deionized distilled water added to one clean sample container, accompanying each batch of containers shipped to the sampling activity. Trip blanks shall be returned unopened to the laboratory, and are prepared as a check on possible contamination originating from container preparation

methods, shipment, handling, storage, or site conditions. Requirements for trip blank preparation shall be included in procurement documents of work orders to the sample container supplier and/or preparer in compliance with standard Westinghouse Hanford procurement procedures. For routine gaseous effluent analytical sampling, supporting blanks/controls (i.e., filter media) should be taken in the same manner as for liquid samples during operating periods. Frequency should be increased during operations. At least 10 samples should be taken to establish trends and perform statistical analyses.

The internal QC checks performed by analytical laboratories shall meet the minimum requirements described below.

- **Matrix and matrix spike duplicate samples.** Matrix spike and matrix spike duplicate samples require the addition of a known quantity of a representative analyte of interest to the sample as a measure of recovery percentage. The spike and spike duplicate shall be created from replicates of a field sample. Replicate samples are separate aliquots removed from the same sample container in the laboratory. Spike compound selection, quantities, and concentrations shall be described in the laboratory analytical procedures. One sample shall be spiked per analytical batch or per 20 samples, whichever is greater. In other words, a spiked sample should be available for every batch of samples analyzed (<20 samples) or at least 1 spiked sample for every 20 samples.
- **Quality control reference samples.** A QC reference sample shall be prepared from an independent standard at a concentration other than that used for calibration, but within the calibration range. Reference samples are required as an independent check on analytical technique and methodology, and shall be run with every analytical batch or every 20 samples, whichever is greater.

Other requirements specific to laboratory analytical equipment calibration are included in Section 6.0. The minimum requirements of this section shall be invoked in procurement documents or work orders in compliance with standard Westinghouse Hanford procedures as noted in Section 5.3.2. The statement of work should be reviewed by OSM and the laboratory to ensure that the laboratory is capable of performing the work.

12.0 PERFORMANCE AND SYSTEM AUDITS

As noted in Section 2.4 and Table C-1, 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, audits may be of the following two types:

- Performance audits, in which quantitative data are independently obtained for comparison with data routinely obtained by the measurement system
- 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.

At a minimum, performance audit requirements shall be met for each laboratory (onsite or offsite) providing support to FEMP sampling and monitoring activities by an annual analysis of at least one blind or one split sample for each analytical method identified in Table A-1 that is included in that laboratory's contract or work order. Blind samples shall not be identified as such to the investigated laboratory, and may be made from traceable standards or from routine samples spiked with a known concentration of a known compound. Split samples shall be analyzed by an independent laboratory in compliance with approved methods based on the same reference standards as are invoked for the primary laboratory. Analytical procedures shall be approved by Westinghouse Hanford before being used as described in Section 4.2 of this QAPP.

System audits shall be performed by the appropriate organization (i.e., QA, EQA, Environmental Compliance Verification) at least annually; system audit requirements shall be implemented through the use of procedure QI 10.4, "Surveillance" (WHC 1989d). 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 EA, QA, DOE-RL, EPA, or Ecology.

Any discrepancies observed during the evaluation of performance audit results or during system audit surveillance activities that cannot be immediately corrected to the satisfaction of the investigator shall be documented on a surveillance report and resolved in compliance with procedure QI 10.4, "Surveillance" (WHC 1989b). In addition, at the direction of the QA officer, all aspects of test activities may also be evaluated as part of the Westinghouse Hanford site-wide QA audits conducted in compliance with QR 18.0, "Audits;" QI 18.1, "Audit Programming and Scheduling;" and QI 18.2, "Planning, Performing, Reporting, and Follow-up of Quality Audits," by auditors qualified in compliance with QI 2.5, "Qualification of Quality Assurance Program Audit Personnel" (WHC 1989d).

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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 [e.g., EII 3.1, "User Calibration of Health and Safety Measuring and Test Equipment," EII 3.2, "Health and Safety Monitoring Instruments" (WHC 1989c), or another procedure as listed in Appendix B 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 Westinghouse Hanford review and approval as noted in Sections 3.3 and 4.2. When samples are analyzed using methods based on the standards defined in Table A-1, the requirements for preventive maintenance of laboratory analytical equipment that are defined by the appropriate reference method shall apply.

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14.0 DATA ASSESSMENT PROCEDURES

Data from effluent sampling and monitoring shall be assessed as required by the applicable FEMP and appropriate statistical evaluation techniques that may be referenced therein. Analytical data shall first be compiled by the laboratory and validated by Westinghouse Hanford in compliance with Westinghouse Hanford-approved procedures meeting 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 QI 10.4, "Surveillance," 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, "Trending/Trend Analysis;" QI 16.2, "Corrective Action Reporting" (WHC 1989b); and WHC-CM-7-4, *Operational Environmental Monitoring* (WHC 1988b). Primary responsibilities for nonconformance resolution and corrective action are assigned to EA and QA. Environmental Assurance's responsibilities for corrective action followup and resolution are contained in WHC-CM-7-4 (WHC 1988b). Other measurement systems, procedures, or plan corrections that may be required as a result of routine review processes shall be resolved as required by governing procedures or shall be referred to EA for resolution. Copies of all surveillance, nonconformance, audit, and corrective action documentation shall be maintained on completion or closure. The project QA records location shall be specified by the facility. The facility shall issue a temporary records storage procedure (over 90 d of records) as required by WHC-CM-3-5 (WHC 1988c).

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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 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. Audits are considered to be 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. A blind sample refers to 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. Comparability is an expression of the relative confidence with which one data set may be compared to another.

Completeness. Completeness is 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.

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

Effective Dose Equivalent (H_e or EDE). The summation of the products of the dose equivalent received by specified tissues of the body and a tissue-specific weighting factor. This sum is a risk-equivalent value and can be used to estimate the health-effects risk of the exposed individual. The tissue-specific weighting factor represents the fraction of the total health risk resulting from uniform whole-body radiation that would be contributed by that 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; it 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. The 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. Environmental monitoring is the 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. The 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. Equipment blanks consist of 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.

Field Blanks. Field blanks consist of pure, deionized, distilled water, transferred to a sample container at the site and preserved with the reagent specified for the analytes of interest. They are used to check for possible contamination originating with the reagent or the sampling environment and are normally collected as frequently as field duplicate samples.

Field Duplicate Sample. Field duplicate samples are samples retrieved from the same sampling location using the same equipment and sampling technique as the original sample. They are placed in separate identically prepared and preserved containers, and analyzed independently. Field duplicate samples are generally used to verify the repeatability or reproducibility of analytical data and are normally analyzed with each analytical batch or every 20 samples, whichever is greater.

Matrix Spike Samples. Matrix spike samples are a type of laboratory-quality control sample; they are prepared by splitting a sample received from the field into two homogenous aliquots (i.e., replicate samples), and adding a known quantity of a representative analyte of interest to one aliquot to calculate percent of recovery. One of the aliquots is designated as the matrix spike, the other as the matrix spike duplicate.

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. Precision is 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 QA refers to the total integrated quality planning, QC, quality assessment, and corrective action activities that collectively assure that data from monitoring and analysis meets all end user requirements and/or the intended end use of the data.

Quality Assurance Project Plan. The QAPP is an orderly assembly of management policies, project objectives, methods, and procedures that defines 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 the amount and contaminant(s) released to the environment to the DOE, facility operations, and safety.

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

Validation. Validation refers to 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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Table A-1. Analytes of Interest and Analytical Methods for Gaseous and Liquid Effluent Sampling at the Hanford Site (Westinghouse Hanford Facilities). (9 sheets)

Analytical Category	Analyte of Interest	Standard EPA Reference Method	Analytical Method ^d	Contractual Quantitation Limit ^c	Facility
Volatile Organics (organic Carbon: gas chromatograph/ mass spectrometry)	1,1,1-Trichloro-methane	8240 ^a	b	5 µG/L	242-A Evaporator
	2-Hexanone	8240 ^a	b	50 µG/L	B Plant, PUREX, UO ₃ , Tank Farms
	Acetone	8240 ^a	b	100 µG/L	PUREX, UO ₃ , B Plant, PFP, Tank Farms, 222-S Laboratory, 340 Waste Handling, T Plant, Powerhouses
	Acetic acid	8240 ^a	b	100 µG/L	T Plant
	1,3,5-Trimethylbenzene	8240 ^a	b	5 µG/L	242-A Evaporator, PFP
	Alkyl, hydroxy-methyl benzene	8240 ^a	b	5 µG/L	242-A Evaporator, PFP
	c3-Alkylbenzene	8240 ^a	b	5 µG/L	242-A Evaporator, PFP
	Ammonium molybdate	8240 ^a	b	5 µG/L	340 Waste Handling
	Benzene	8240 ^a	b	5 µG/L	PFP, Tank Farms, Powerhouses
	2,4 Dimethyl 1-Decane	8240 ^a	b	5 µG/L	B Plant
	2-Ethyl-hexyl phthalate	8240 ^a	b	5 µG/L	B Plant
	Hexa decanoic acid	8240 ^a	b	5 µG/L	B Plant, 242-A Evaporator
	Octacosane	8240 ^a	b	5 µG/L	B Plant
	Dichloromethane	8240 ^a	b	5 µG/L	B Plant
	Acetophenone	8240 ^a	b	5 µG/L	B Plant
	Trichloromethane	8240 ^a	b	5 µG/L	B Plant, 340 Waste Handling
	Butanedioic acid	8240 ^a	b	5 µG/L	242-A Evaporator
	Caproic acid	8240 ^a	b	5 µG/L	242-A Evaporator
	Methyl-N-propylketone	8240 ^a	b	5 µG/L	242-A Evaporator
	Nitric acid	8240 ^a	b	5 µG/L	340 Waste Handling, T Plant
	Sulfuric acid	8240 ^a	b	5 µ/L	340 Waste Handling

Table A-1. Analytes of Interest and Analytical Methods for Gaseous and Liquid Effluent Sampling at the Hanford Site (Westinghouse Hanford Facilities). (9 sheets)

Analytical Category	Analyte of Interest	Standard EPA Reference Method	Analytical Method ^d	Contractual Quantitation Limit ^c	Facility
Volatile Organics (organic Carbon: gas chromatograph/mass spectrometry) (contd.)	Carbon tetrachloride	8240 ^a	b	5 µG/L	PFP, 340 Waste Handling, Tank Farms
	Heptadecanoic acid	8240 ^a	b	5 µG/L	242-A Evaporator
	Phosphoric acid	8240 ^a	b	5 µG/L	T Plant
	Heptanedioic acid	8240 ^a	b	5 µG/L	242-A Evaporator
	Hexanoic acid	8240 ^a	b	5 µG/L	242-A Evaporator
	Hexadecane	8240 ^a	b	5 µG/L	242-A Evaporator
	2-Butanone	8240 ^a	b	10 µG/L	B Plant
	2-Pentanone	8240 ^a	b	5 µG/L	242-A Evaporator
	Benzaldehyde	8240 ^a	b	5 µG/L	242-A Evaporator
	Butraldehyde	8240 ^a	b	5 µG/L	242-A Evaporator
	2-Chloromethyl-hydroxymethyl-benzene	8240 ^a	b	5 µG/L	242-A Evaporator, 222-S Laboratory, PFP
	2-Chloromethyl-o-xylene	8240 ^a	b	5 µG/L	242-A Evaporator, PUREX, UO ₃ , PFP, 222-S Laboratory
	Boric acid	8240 ^a	b	5 µG/L	340 Waste Handling
	Citric acid	8240 ^a	b	5 µG/L	242-A Evaporator, 340 Waste Handling
	3,5-Dimethyl-pyridine	8240 ^a	b	5 µG/L	242-A Evaporator
Semi-Volatile Organics	Dimethyl-nitrosamine	8240 ^a	b	5 µG/L	242-A Evaporator
	Dimethyl-toluidine	8240 ^a	b	5 µG/L	242-A Evaporator, PFP
	Dioctyl-phthalate	8240 ^a	b	5 µG/L	242-A Evaporator, B-Plant
	Dodecane	8240 ^a	b	5 µG/L	242-A Evaporator
	Dodecanoic acid	8240 ^a	b	5 µG/L	242-A Evaporator
	Ethanedioic acid	8240 ^a	b	5 µG/L	242-A Evaporator
	Chloroform	8240 ^a	b	5 µG/L	PFP, PUREX, UO ₃ , Tank Farms
	Ethyl, 2-methyl-hydroxymethylbenzene	8240 ^a	b	5 µG/L	242-A Evaporator, PFP, 222-S Laboratory

Table A-1. Analytes of Interest and Analytical Methods for Gaseous and Liquid Effluent Sampling at the Hanford Site (Westinghouse Hanford Facilities). (9 sheets)

Analytical Category	Analyte of Interest	Standard EPA Reference Method	Analytical Method ^d	Contractual Quantitation Limit ^c n	Facility
Semi-Volatile Organics (contd.)	Ethylbenz-aldehyde	8240 ^a	b	5 µG/L	242-A Evaporator, PFP
	Ethylxylene	8240 ^a	b	5 µG/L	242-A Evaporator, PFP, PUREX, UO ₃
	Hydrogen peroxide	8240 ^a	b	5 µG/L	340 Waste Handling
	Heptadecane	8240 ^a	b	5 µG/L	242-A Evaporator
	Hydroxyacetic acid	8240 ^a	b	5 µG/L	242-A Evaporator
	Chloromethyl, 2-hydroxymethyl benzoic acid	8240 ^a	b	5 µG/L	242-A Evaporator, 222-S Laboratory
	M-methoxyme-thanamine	8240 ^a	b	5 µG/L	242-A Evaporator
	Methylbenzaldehyde	8240 ^a	b	5 µG/L	242-A Evaporator, PFP, PUREX, UO ₃
	Methyl nitrate	8240 ^a	b	5 µG/L	242-A Evaporator, PUREX
	Methyl isobutyl ketone	8240 ^a	b	5 µG/L	242-A Evaporator, PUREX
	Methyl vinyl ketone	8240 ^a	b	5 µG/L	242-A Evaporator
	2-methylbenzoic acid	8240 ^a	b	5 µG/L	242-A Evaporator, PFP, PUREX, UO ₃ , 222-S Laboratory
	2-methyl, hydroxymethyl benzene	8240 ^a	b	5 µG/L	242-A Evaporator, PFP, PUREX, UO ₃ , 222-S Laboratory
	Methyl-toluidine	8240 ^a	b	5 µG/L	242-A Evaporator, PFP, PUREX, UO ₃ , 222-S Laboratory
	Methyl-ethyl ketone	8240 ^a	b	5 µG/L	Tank Farms
	Nitrotri-acetic acid	8240 ^a	b	5 µG/L	242-A Evaporator
	Nitromethane	8240 ^a	b	5 µG/L	242-A Evaporator
	Octadecanoic acid	8240 ^a	b	5 µG/L	242-A Evaporator
	Pentadecane	8240 ^a	b	5 µG/L	242-A Evaporator
	Pentadecanoic acid	8240 ^a	b	5 µG/L	242-A Evaporator
	Pentanedioic acid	8240 ^a	b	5 µG/L	242-A Evaporator
	2-propenal	8240 ^a	b	5 µG/L	242-A Evaporator

Table A-1. Analytes of Interest and Analytical Methods for Gaseous and Liquid Effluent Sampling at the Hanford Site (Westinghouse Hanford Facilities). (9 sheets)

Analytical Category	Analyte of Interest	Standard EPA Reference Method	Analytical Method ^a	Contractual Quantitation Limit ^c	Facility
Semi-Volatile Organics (contd.)	Propylbenzene	8240 ^a	b	5 µG/L	242-A Evaporator, PFP, PUREX, UO ₃ , 222-S Laboratory
	Tetradecane	8240 ^a	b	5 µG/L	242-A Evaporator
	Tetrahydrofuran	8240 ^a	b	5 µG/L	242-A Evaporator
	Tributyl phosphate	8240 ^a	b	5 µG/L	242-A Evaporator, PFP, PUREX, UO ₃ , 222-S Laboratory, Tank Farms
	Toluene	8240 ^a /8250	b	5 µG/L	N Reactor, 340 Waste Handling, Tank Farms, Powerhouses
	Tri-n-butyl-(diol) phosphate	8240 ^a	b	5 µG/L	242-A Evaporator
Alcohols	Undecane	8240 ^a	b	5 µG/L	242-A Evaporator
	Xylene	8240 ^a	b	5 µG/L	340 Waste Handling, Tank Farms, Powerhouses
	1-butanol	8240 ^a	b	5 µG/L	242-A Evaporator, PUREX, UO ₃ , 222-S Laboratory, B-Plant, N Reactor, 340 Waste Handling
	Benzyl alcohol	8240 ^a	b	5 µG/L	242-A Evaporator
	2-butoxy-ethanol	8240 ^a	b	5 µG/L	242-A Evaporator, PUREX, UO ₃ , 222-S Laboratory, B-Plant
	Butoxy-glycol/diglycol	8240 ^a	b	5 µG/L	242-A Evaporator
	Butoxytri-ethylene glycol	8240 ^a	b	5 µG/L	242-A Evaporator
	Ethanol	8240 ^a	b	5 µG/L	242-A Evaporator, PUREX, UO ₃
	2-ethyl-1-hexanol	8240 ^a	b	5 µG/L	B Plant
	Methanol	8240 ^a	b	5 µG/L	T Plant
	Hexoxy-diglycol	8240 ^a	b	5 µG/L	242-A Evaporator
	Methoxy-triglycol	8240 ^a	b	5 µG/L	242-A Evaporator
	Isopropanol methanol	8240 ^a	b	5 µG/L	340 Waste Handling

Table A-1. Analytes of Interest and Analytical Methods for Gaseous and Liquid Effluent Sampling at the Hanford Site (Westinghouse Hanford Facilities). (9 sheets)

Analytical Category	Analyte of Interest	Standard EPA Reference Method	Analytical Method ^d	Contractual Quantitation Limit ^c	Facility
Inorganics	Ammonia	6010	b	5 µg/L	242-A Evaporator, B-Plant, N Reactor, Powerhouses
	Ammonium	6010	b	5 µg/L	242-A Evaporator
	Ammonium Hydroxide	6010	b	5 µg/L	T Plant
	Ammonium Citrate	6010	b	5 µg/L	T Plant
	Boron	6010	b	10 µg/L	242-A Evaporator, B-Plant
	Molybdenum	6010	b	10 µg/L	242-A Evaporator
	Phosphorus	6010	b	10 µg/L	242-A Evaporator
	Silicon	6010	b	10 µg/L	242-A Evaporator, B-Plant
	Strontium	6010	b	20 µg/L	242-A Evaporator
	Tungsten	6010	b	10 µg/L	242-A Evaporator
	Mercury	7470/7741			PFP, B Plant, PUREX, UO ₃ , N Reactor, Tank Farms, 340 Waste Handling, Powerhouses
	Arsenic	7060	b	10 µg/L	B Plant, N Reactor, Powerhouses
	Barium	6010	b	20 µg/L	B Plant, PUREX, PFP, UO ₃ , N Reactor, 340 Waste Handling, Tank Farms, Powerhouses
	Beryllium	6010	b	3 µg/L	PUREX, UO ₃ , PFP, Tank Farms
	Cadmium	6010	b	40 µg/L	PUREX, UO ₃ , B Plant, PFP, N Reactor, Tank Farms, 340 Waste Handling, Powerhouses
	Chromium	6010	b	70 µg/L	B Plant, PUREX, UO ₃ , PFP, N Reactor, Tank Farms, 340 Waste Handling, Powerhouses
	Copper	6010	b	60 µg/L	B Plant, PFP, N Reactor, Tank Farms, Powerhouses
	Lead	7420/7421	b	10 µg/L	PUREX, UO ₃ , B Plant, 222-S Laboratory, N Reactor, 340 Waste Handling, Powerhouses
	Nickel	6010	b	50 µg/L	B Plant, PFP, N Reactor, Tank Farms, Powerhouses

Table A-1. Analytes of Interest and Analytical Methods for Gaseous and Liquid Effluent Sampling at the Hanford Site (Westinghouse Hanford Facilities). (9 sheets)

Analytical Category	Analyte of Interest	Standard EPA Reference Method	Analytical Method ^d	Contractual Quantitation Limit ^c	Facility
Inorganics (contd.)	Selenium	774C	b	20 µG/L	B Plant, PUREX, UO ₃
	Aluminum	6010	b	45 µG/L	PFP, Tank Farms, 340 Waste Handling
	Silver	6010	b	70 µG/L	B Plant, PFP, N Reactor, 340 Waste Handling, Tank Farms, Powerhouses
	Vanadium	6010	b	80 µG/L	PFP, N Reactor, Tank Farms
	Cobalt	6010	b	70 µG/L	PFP, N Reactor, Tank Farms
	Manganese	6010	b	10 µG/L	242-A Evaporator
	Antimony	6010	b	10 µG/L	N Reactor, Tank Farms
	Zinc	6010	b	20 µG/L	PFP, B Plant, N Reactor, 340 Waste Handling, T Plant, Tank Farms, Powerhouses
	Calcium	7140	b	10 µG/L	B Plant, PUREX, UO ₃ , Powerhouses
	Iron	7380	b	30 µG/L	B Plant, PUREX, UO ₃ , Tank Farms, Powerhouses
	Magnesium	7450	b	1 µG/L	B Plant, PUREX, UO ₃ , Powerhouses
	Potassium	7610	b	10 µG/L	B Plant, PUREX, UO ₃ , Powerhouses
	Potassium Permanganate	7610	b	10 µG/L	T Plant
	Sodium	7770	b	2 µG/L	B Plant, PUREX, UO ₃ , 340 Waste Handling, T Plant, Tank Farms, Powerhouses
	Sodium Hydroxide	7770	b	2 µG/L	Tank Farms
	Fluoride	340.2 ^e	b	.01 mg/L	B Plant, PUREX, UO ₃ , PFP, 222-S Laboratory, Tank Farms, Powerhouses
	Chloride	325.3 ^e	b	1 mg/L	PUREX, UO ₃ , B Plant, PFP, 222-S Laboratory, T-Plant, Tank Farms, 242-A Evaporator, N Reactor, KE/KW Basins, 340 Waste handling, 282/284 Powerhouses
	Sulfate	375.1 ^e	b	10 mg/L	B Plant, PUREX, UO ₃ , Tank Farms, 242-A Evaporator
Ions/Anions					

Table A-1. Analytes of Interest and Analytical Methods for Gaseous and Liquid Effluent Sampling at the Hanford Site (Westinghouse Hanford Facilities). (9 sheets)

Analytical Category	Analyte of Interest	Standard EPA Reference Method	Analytical Method ^d	Contractual Quantitation Limit ^c	Facility
Ions/Anions (contd.)	Nitrate	352.1 ^e	b	.1 mg/L	B Plant, PFP, PUREX, UO ₃ , Tank Farms, 242-A Evaporator, 340 Waste Handling
	Nitrite	354.1 ^e	b	.01 mg/L	PFP, 340 Waste Handling, T Plant, Tank Farms, 242-A Evaporator
	Phosphate	f	b	f	B Plant, 242-A Evaporator
	Cyanide (total)	335.2 ^e	b	.002 mg/L	B Plant
	pH/Total Dissolved Solids (TDS)	9045 ^a	b	N/A	All Facilities
	Total Organic Carbon (TOC)	9060 ^a	b	1 mg/L	All Facilities
	Total Organic Halides (TOX)	9020	b	5 mg/L	PUREX, UO ₃ , B Plant, N Reactor, Powerhouses
	Conductivity	9050	b	N/A	All Facilities
	Alkalinity	310.1 ^e	b	10 mg/L	All Facilities
	Phenols (total)	420.1 ^e	b	5 mg/L	All Facilities
				Water $\mu\text{Ci/ml}$	
Radionuclides				Air $\mu\text{Ci/ml}$	
	Gross Alpha ^m	9310 ^a	b	3 E-8	All Facilities
	Gross Beta ^l	9310 ^a	b	1 E-6	All Facilities
	Uranium (238, 239, 240)	00-07 ^h	b	5 E-7	B Plant, PUREX, UO ₃ , 242-A Evaporator, 313/333 Fuel Fab, 222-S Laboratory, 340 Waste Handling, Tank Farms
	Uranium 233, 234	00-07 ^h	b	5 E-7	242-A Evaporator
	Uranium 235	00-07 ^h	b	6 E-7	242-A Evaporator
	Plutonium (238, 239, 240) ^j	00-07 ^g	b	3 E-8	B Plant, PUREX, UO ₃ , PFP, 242-A evaporator, Tank Farms, Laundry, 222-S Laboratory, TRUSAF, N Reactor, 340 Waste Handling, T Plant
	Plutonium 241	00-7 ^g	b	2 E-6	242-A Evaporator

Table A-1. Analytes of Interest and Analytical Methods for Gaseous and Liquid Effluent Sampling at the Hanford Site (Westinghouse Hanford Facilities). (9 sheets)

Analytical Category	Analyte of Interest	Standard EPA Reference Method	Analytical Method	Contractual Quantitation Limit ^c n		Facility
Radionuclides (contd.)	Americium 241, 243	AM-01 ^g	b	3 E-8	2 E-14	B Plant, PUREX, UO ₃ , PFP, Laundry, T Plant, Tank Farms
	Strontium 89/90	SR-05 ^h	b	1 E-6	9 E-12	B Plant, PUREX, UO ₃ , PFP, 222-S Laboratory, 242-A Evaporator, Tank Farms, N Reactor, KE/KW Basins, Laundry, T Plant, 340 Waste Handling
	Tritium	707 ^j	b	2 E-3	1 E-7	PUREX, UO ₃ , 340 waste handling, FTF, N Reactor, KE/KW Basins, 222-S Laboratory, Tank Farms, 242-A Evaporator, N Reactor
	Technetium 99	EC-186 ^k	b	1 E-4	2 E-9	PUREX, UO ₃ , Laundry, 340 Waste Handling, Tank Farms
	Cesium 137		b	3 E-6	4 E-10	B Plant, PUREX, UO ₃ , 340 Waste Handling, FTF, N Reactor, KE/KW Basins, 222-S Laboratory, Tank Farms, 242-A Evaporator
	Cesium 134	NA ^o	b	2 E-6	2 E-10	242-A Evaporator
	Cesium 135	NA ^o	b	2 E-5	3 E-9	242-A Evaporator
	Iodine 129	NA ^o	b	5 E-7	7 E-11	242-A Evaporator, PUREX, UO ₃ , Laundry, Tank Farms
	Cerium	NA ^o	b	1 E-3	3 E-7	242-A Evaporator, PUREX, UO ₃ , B Plant, Tank Farms
	Carbon 14	NA ^o	b	7 E-5	6 E-9	242-A Evaporator, Tank Farms
	Ruthenium 103	NA ^o	b	5 E-5	2 E-9	242-A Evaporator, PUREX, UO ₃ , Tank Farms
	Ruthenium 106	NA ^o	b	6 E-6	3 E-11	242-A Evaporator, PUREX, UO ₃ , Tank Farms
	Selenium	NA ^o	b	2 E-5	1 E-9	242-A Evaporator
	Cobalt 60/58	NA ^o	b	5 E-6	8 E-11	B Plant, PUREX, UO ₃ , N Reactor, KE/KW Basins, Laundry
	Zirconium 93/95	NA ^o	b	9 E-5	4 E-11	242-A Evaporator, 313/333 Fuel Fab, N Reactor, 340 Waste Handling, Tank Farms
	Tin 124, 125, 126	NA ^o	b	9 E-5	3 E-8	242-A Evaporator, Tank Farms

Table A-1. Analytes of Interest and Analytical Methods for Gaseous and Liquid Effluent Sampling at the Hanford Site (Westinghouse Hanford Facilities). (9 sheets)

Analytical Category	Analyte of Interest	Standard EPA Reference Method	Analytical Method ^a	Contractual Quantitation Limit ^c	Facility
Radionuclides (contd.)	Nickel 63	NA ^o	b	3 E-4 4 E-9	242-A Evaporator, Tank Farms
	Neptunium 237	00-07 ^d	b	3 E-8	Tank Farms
	Thorium 230	00-07 ^h	b	5 E-7	Tank Farms
	Samarium 151	NA ^o	b	4 E-4	242-A Evaporator, N Reactor, Tank Farms
	Iron 59	NA ^o	b	2 E-5	N Reactor
	Lead 212/210	NA ^o	b	3 E-6	PUREX, Laundry
	Argon	NA ^o	b	---	FFTF
	Anitmony 113	NA ^o	b	5 E-5	242-A Evaporator
	Promethium 147	NA ^o	b	2 E-3	242-A Evaporator
	Europium 154, 155	NA ^o	b	2 E-5 1 E-4	242-A Evaporator
				5 E-11 7 E-10	

^aStandard EPA methods are from Test Methods for Evaluating Solid Waste (SW846) (EPA 1986).

^bAnalytical methods shall be Westinghouse Hanford or Westinghouse-approved participant contractor or subcontractor procedures based on the reference methods cited in column 3 of the table. All procedure reviews and approvals shall be in compliance with applicable Westinghouse Hanford procedure control or procurement procedures as noted in Section 4.2. Once laboratory methods are approved, this table shall be updated to provide contractual method references as applicable.

^cValues for quantitation limits, are to be considered only as target values for initial procurement negotiations with the analytical laboratory. This table shall be updated to reflect negotiated contractual values as specified in final procurement documents or work orders. Analysis shall be performed by an approved WHC, participant contractor, or subcontractor laboratory.

^dStandard methods are from Methods for Chemical Analysis of Water and Waste (EPA 1979).

^eNo reference method available; quantitation limits shall be proposed in the analytical method and reviewed and approved by Westinghouse Hanford prior to use.

^fStandard methods are from Prescribed Procedures for the Measurement of Radioactivity in Drinking Water (EPA 1982).

^gStandard Methods are from Eastern Environmental Radiation Facility Radiochemistry Procedures Manual (EPA 1984).

^hPu-241 is calculated from Pu-239; the cognizant facility personnel provides Environmental Protection with the isotopic weight percent of plutonium 239, 240, and 241 produced: Activity ratio is: [(weight percent Pu-241)(103.2)]/[(weight percent Pu-239)(0.0614)]+[(weight percent Pu-240)(0.227)] where specific activities are: Pu-239 = 0.0614 Ci/g
Pu-240 = 0.227 Ci/g
Pu-241 = 103.2 Ci/g

Therefore, the quarterly concentration of Pu-241 is [(quarterly concentration of Pu-239/240 μ Ci/ml)(activity ratio)]

^jStandard method is from Standard Methods for the Examination of Water and Wastewater (APHA 1985).

^kStandard method is from The Environmental Survey Manual, Appendix D (DOE 1987).

^lThe values shown for gross beta activity may be used when it is known that Sr-90 is the most limiting beta emitter present. The most limiting isotope shall be specified in the FEMP for each stream.

^mThe values shown for gross alpha activity may be used when it is known that Pu 239 is the most limiting alpha emitter present. The most limiting isotope shall be specified in the FEMP for each stream.

ⁿPrecision is based on established contractual values. Accuracy is within $\pm$ 25%.

^oNot Available; No reference method available at this time.

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APPENDIX B

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Table B-1. Supporting Procedures for Facility Effluent Monitoring Plan Activities. (5 sheets)

Procedure	Procedure Number	Title	Facility
Chain of custody and Sample packaging and shipping	Procedure numbers will be provided when available	Chain of Custody Procedures, Health Physics Procedures	242-A Evaporator
		Chain of Custody	284E/W Powerhouses
		Sample Chain of Custody	N Reactor KE/KW Basins
		Sample Truck Transport and Accountability at B Plant	B Plant
		Chain of Custody, Environmental Investigations and Site Characterization Manual	340 Waste Handling Facility
		Analytical Chemistry Services Laboratories Operating Instructions Manual	222-S Lab
		To be provided when complete	PFP, PUREX, UO ₂ , TRUSAF, T Plant, Tank Farms, 313/333 Fuel Fab Laundry
		Chain of custody	FFTF
		Sample, Package, and Seal Hazardous Waste Containers, Transport Sample	PFP
Sampling and Monitoring (airborne and liquid)	Procedure numbers will be provided when available	Sampling and Monitoring at the 284E/W Steam and Utilities Facility	284E/W Powerhouses

Table B-1. Supporting Procedures for Facility Effluent Monitoring Plan Activities. (5 sheets)

Procedure	Procedure Number	Title	Facility
Sampling and Monitoring (airborne and liquid) (contd.)	Procedure numbers will be provided when available (contd.)	Operation of Gaseous Effluent Sampling and Monitoring Systems, Air Sampling and Monitoring Instruments, Air Sample Envelopes, Alpha CAM Operational Performance Tests, Eberline Alpha -4, 5 and 5A, Beta CAM Operational Performance Tests, Eberline AMS-3 Gaseous Effluent Sampling and Monitoring System Operability Inspection, Effluent Exhaust CAM Alarm Response, Stack Effluent Release Response, Health Physics Practices Manual	All facilities
		Air Sample Envelopes, Silver Zeolite Monitor Changeout Program at 241AW Tank Farm and the 242-A Evaporator, Health Physics Procedures	Tank Farms, 242-A Evaporator
		291-Z Sump and Z-20 Crib Routine Sample Schedule, Sample Manhole #9 During Pump or Power Failure, Sample 2904-ZA, Perform Drain/Manhole Sampling, Operate 2904-ZB Sampling Facility, Operate/Decontaminate 2904-ZA Alpha Monitor	PFP
		Operate SCD Sampling System, Operate CWL Sampling System, Perform Effluent Sampling and Monitoring Surveillance, Startup and Shutdown Chemical Sewer (CSL) Sample System	PUREX
		Sample UO ₃ Liquid Effluent Stream	UO ₃

Table B-1. Supporting Procedures for Facility Effluent Monitoring Plan Activities. (5 sheets)

Procedure	Procedure Number	Title	Facility
Sampling and Monitoring (airborne and liquid) (contd.)	Procedure numbers will be provided when available (contd.)	Perform Sampling of Chemical Sewer (BCE), Perform 207-B Operations and Sampling (CBC), Perform Sampling of 216-B-59 Basin and Transfer Contents to TK-9-1 or to 207-B (CBC), Perform Sampling of Steam Condensate (BCS), Perform Sampling of Process Condensate (BCP)	B Plant
		Sample Cooling Water from 242-A Evaporator via Receiver Tank RC-2, Sample/Drain 242-A Steam Condensate	242-A Evaporator
		340 Waste Complex Liquid Sampling Procedure	340 Waste Handling
		Liquid Effluent Sample Collection (Auxiliaries and NPDES), Groundwater Sample Collection, Effluent Sample Tracking	N Reactor
		Sample Vault Tanks Radioactive Liquid Waste	340 Waste Handling
Calibration	Procedure numbers will be provided when available	Flow Monitor Calibration	N Reactor

Table B-1. Supporting Procedures for Facility Effluent Monitoring Plan Activities. (5 sheets)

Procedure	Procedure Number	Title	Facility
Calibration (contd.)	Procedure numbers will be provided when available (contd.)	221-B Steam Orifice Blowdown, B Plant CO Monitor Calibration, B Plant Flow Indicator Inspection, Cleaning, and Functional Test, B Plant 18-2 IX Bedload Monitor Calibration, 291-B Turbine Building Calibrations, BCE pH Calibration-2904-EA, 15-Inch and 24-Inch Sewers Calibration at 221-BA/BG, Bailey System Filter and Ribbon Inspection-271-B and 221-B, Functional Test of B Plant Bailey "Network 90" Analog Meter Module AMM02, Functional Test for Victoreen, G-M Area Monitoring System Model 855/856, Breathing Air Analyzer Calibration at 225-B, Radiation Monitor	B Plant
		Yokogawa (YEW) Recorder Model ER106-A, Lear Siegler RN7A/RN7AN Opacity Monitor/Indicator	284E/W Powerhouses
		Columbia Scientific Industries, NOx Monitor Calibration, Interscan NOx Multipoint Continuous Monitoring System (MCMS)	PUREX, UO ₃
		Eberline, PING Monitoring System/PUREX Main Stack Calibration, Liquid Effluent Online Alpha Monitor for PUREX, PUREX Main Stack CPM Beta and Channel Calibration, PUREX Modified Effluent CAM Eberline Alpha-5A for Detection of ²³⁹ Pu, Kurz 142/151 KM Calibration, Kurz Linear Mass Flow Meter Series 505 at PUREX	PUREX

Table B-1. Supporting Procedures for Facility Effluent Monitoring Plan Activities. (5 sheets)

Procedure	Procedure Number	Title	Facility
Calibration (contd.)	Procedure numbers will be provided when available (contd.)	FFTF Environmental Compliance Procedures	FFTF
		Liquid Effluent Online Alpha Monitor for PFP	PFP
		Eberline, RMS II ECI-1 Through ECI-8 Count Rate Meter, Field Calibration of Gamma Radiation Detection Liquid Effluent Systems that Use Victoreen Ratemeters, Foxboro Model 99D-110 Totalizer, Manning Model S-5000 Environmental Stationary Composite Sampler, Rosemount Model 1054 pH Meter Calibration, Fisher and Porter Series 1100GD Flow Meters, Loop Calibration Verification Procedure, Molytek Model 310 and 312 Strip Chart Recorder, Ortec Model 406A Single Channel Analyzer, Ortec Model 485, Model 541, Amplifier and Rate Meter, Ortec Model 773 and 773H Timer/Counter Test Procedure, Tennelec Count Ratemeter Models TC595/TC595M Calibration, Victoreen Model 842 Series Electronic Calibration	All 200 Area facilities

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APPENDIX C

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Table C-1. Quality Assurance Requirements - Comparison of U.S. Environmental Protection Agency and American Society of Mechanical Engineers NQA-1 Requirements (ANSI and ASME 1986).

EPA ^b	NQA-1 ^c																		No EPA Requirements
	1. Organization	2. QA Program	3. QA Program Control	4. Performance Measurement Control	5. Inspection, Monitoring, and Reporting	6. Equipment Control	7. Control of Production Items and Services	8. Identification and Control of Items	9. Control of Resources	10. Inspection	11. Test Control	12. Control of Measuring and Test Equipment	13. Handling, Storage, and Shipping	14. Inspection, Test and Operating Status	15. Control of Manufacturing Items	16. Comparison Analysis	17. QA Records	18. Audit	
1. This Page		CM-4-2																	
2. Table of Contents																			
3. Project Description		CM-4-2																	
4. Project Organization and Responsibilities	CM-1-2 CM-1-3	CM-7-7 CM-7-6																	
5. QA Objectives for Measurement		See Specifics																	
6. Sampling Procedures					CM-7-7 or equivalent procedure			CM-7-7 or equivalent procedure			CM-7-7 or equivalent procedure		CM-7-7 or equivalent procedure						
7. Sample Control																			
8. Calibration Procedures																			
9. Collection Procedures									CM-4-2								CM-7-6 CM-4-2		
10. Analytical Procedures																			
11. Data Reduction, Verification, Reporting																			
12. Internal Quality Control																			
13. Performance and Inspection Audit										CM-7-7 CM-7-6								CM-4-2	
14. Preventive Maintenance																			CM-7-7 or equivalent procedure
15. Data Assessment Procedures																			
16. Comparison Analysis																CM-4-2			
17. Quality Assurance Reports		CM-4-2														CM-4-2 CM-4-2	CM-7-7 CM-4-2		
18. EPA Requirements								CM-1-2 CM-1-3 CM-1-5						CM-7-7	CM-4-2				

NOTE: See Section 4.9 for references.
^aANSI Z39.18-1986 (Environmental Protection Agency, U.S. Environmental Protection Agency, Washington, D.C.).
^bASME NQA-1-1986 (American Society of Mechanical Engineers, New York, New York).
^cANSI Z39.18-1986 (Environmental Protection Agency, U.S. Environmental Protection Agency, Washington, D.C.).
^dHydrogenated standard procedure practices will be followed.

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