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Composite Analysis Monitoring Plan for the E-Area Low-Level Waste Facility and the Z-Area Saltstone Disposal Facility

by

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Rev. 0

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CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS

ACRONYMS

CA	Composite Analysis
CIF	Consolidated Incineration Facility
DAS	Disposal Authorization Statement
DWPF	Defense Waste Processing Facility
ESP	Extended Sludge Processing
ETF	Effluent Treatment Facility
GDNR	Georgia Department of Natural Resources
GSA	General Separations Area
HLW	High-Level Waste
IAW	Intermediate-Activity Waste
ITP	In-Tank Precipitation
LAW	Low-Activity Waste
LLWF	Low-Level Waste Facility
LLW	Low-Level Waste
MWMF	Mixed Waste Management Facility
ORWBG	Old Radioactive Waste Burial Ground
PA	Performance Assessment
RCRA	Resource Conservation and Recovery Act
SCDHEC	South Carolina Department of Health and Environmental Control
SDF	Saltstone Disposal Facility
SPF	Saltstone Processing Facility
SRS	Savannah River Site
SRTC	Savannah River Technology Center
SWD	Solid Waste Division
USDOE	United States Department of Energy
WSRC	Westinghouse Savannah River Company

ABBREVIATIONS

Ci	Curie
g	gram
hr	hour
km	kilometer
L	liter
m	meter
mrem	millirem
n	nano
p	pico
yr	year

1.0 EXECUTIVE SUMMARY

This monitoring plan has been developed to meet the requirements for monitoring low-level waste (LLW) disposal facilities according to the United States Department of Energy (USDOE) Order 435.1 (USDOE 1999) and its associated implementation guidance with regard to actual performance versus projected performance based on the Composite Analysis (CA) for the E-Area Low-Level Waste Facility (LLWF) and the Z-Area Saltstone Disposal Facility (SDF). Section 2.0 provides general facility information, a discussion of the reason for monitoring, information on related documents, and the monitoring approach. The monitoring plan is discussed in Section 3.0. Sections 4.0 and 5.0 provide information on data evaluation and recommendations based on data evaluation, respectively. Section 6.0 describes implementation of the monitoring plan and Section 7.0 identifies references. Attachment 1 is a table summarizing the requirements outlined in the Disposal Authorization Statement (DAS, USDOE 1999b), USDOE Order 435.1, and the associated guidance and a description of the associated section in this monitoring plan in which the required information is provided.

2.0 INTRODUCTION

2.1 Facility Description, Operations, and Types of Waste Disposed

The Savannah River Site has completed a CA to estimate the effects on future members of the public of radioactivity that may remain after USDOE operations cease. In particular, the CA examined the potential interactions of current radioactive waste disposal operations with residuals from past, present, and future operations in the General Separations Area (GSA). The results of the CA are projected concentrations and doses in the groundwater and surface waters in and around the GSA.

The GSA comprises approximately 30 km^2 of the central Savannah River Site (SRS) and encompasses major processing and waste management areas that will contain residual radioactivity after USDOE operations at SRS cease. The areas are E Area, F Area, H Area, S Area, and Z Area. A brief description of each area follows.

E Area

E Area consists of several waste disposal facilities for radioactive solid waste at SRS. The original facility, 643-E, is a 310,000 m^2 area used from 1952 through 1972. The 643-7E facility is a 480,000 m^2 area contiguous to the original facility that received waste from 1969 through 1995. Within the 643-7E facility, an area of 230,000 m^2 has been closed under the Resource Conservation and Recovery Act (RCRA). Beginning in 1994, disposal operations moved to the E-Area LLWF. This facility consists of several disposal units: Low-Activity Waste (LAW) Vaults, Intermediate-Activity Waste (IAW) Vaults, Very Low Activity Waste Trenches, and Naval Reactor Components Disposal Area. The IAW vaults include cells specially designed for the disposal of tritiated waste.

Waste management operations at SRS have always distinguished among low activity, intermediate activity, and alpha contaminated wastes. At SRS, the determination of low activity and intermediate activity wastes is made based on a radiation rate of 200 mrem/hr.

Until 1965, alpha-bearing waste was buried in plastic bags and cardboard boxes in earthen trenches separate from those for other types of waste. Between 1965 and 1974 alpha-bearing waste was segregated into two categories. Waste containing less than 0.1 Ci per package was

buried unencapsulated in separate trenches. Waste containing greater than 0.1 Ci per package was buried in concrete containers. If waste would not fit into prefabricated containers, it was encapsulated in concrete. Since 1974, alpha-bearing waste containing greater than 10 nCi/g has been stored on pads.

The E-Area LLWF currently consists of one LAW vault, one IAW vault, one set of Very Low Activity Waste Trenches, and one Naval Reactor Component disposal area. The radiation rate of 200 mrem/hr is used to determine whether waste goes to the LAW or IAW vaults. Material placed in Very Low Activity Waste Trenches for disposal consists of job control waste, soil, debris, rubble, and wood. The allowable inventory in Very Low Activity Waste Trenches is set by Waste Acceptance Criteria (WSRC 1999) determined in part by a Performance Assessment (PA, WSRC 2000).

F Area

F Area contains a number of facilities for the processing, handling, treatment and storage of radioactive material. The major facilities within F Area are the Separations Canyon, the Naval Fuels Facility, the F-Area High-Level Waste (HLW) Tank Farm, and the Process Control Laboratory.

The F-Area Canyon is used to separate ^{239}Pu from irradiated target elements. Before being placed in standby mode, the Naval Fuels Facility was used to produce fuel material for nuclear Naval propulsion. The F-Area Tank Farm is used to store high level liquid waste generated from operations in the F-Area Canyon until it can be removed and transferred to H Area for further processing. The process control laboratory in F Area is used primarily to verify the operations of the SRS separations processes through chemical and radiochemical analyses.

H Area

H Area contains a number of facilities for the processing, handling, treatment and storage of radioactive material. Major facilities within H Area are the Separations Canyon, the Tritium Facility, the H-Area HLW Tank Farm, the Extended Sludge Processing (ESP) Facility, the Consolidated Incineration Facility (CIF), the Effluent Treatment Facility (ETF), and In-Tank Precipitation facility (ITP).

The H-Area Canyon is used to chemically separate enriched uranium, ^{237}Np and ^{238}Pu from irradiated fuel and target assemblies.

Liquid HLW, containing mostly fission products from the extraction processes, is stored in the H-Area Tank Farm.

Insoluble sludge solids in the HLW from storage tanks in both F-Area and H-Area Tank Farms are slurried for removal and subsequent processing and storage in the ESP Facility until the sludge slurry can be transferred to S Area for further treatment.

Soluble salts in the HLW from storage tanks in both F-and H-Area Tank Farms are dissolved in water for subsequent treatment in the ITP facility. In the ITP, the salt solution is treated to generate a HLW precipitate slurry and decontaminated salt solution. The HLW slurry is stored until it can be transferred for further treatment. The salt solution is transferred to Z Area for treatment and disposal as LLW saltstone.

The tritium facilities extract tritium from lithium-aluminum target assemblies. These facilities also recover and recycle tritium that has previously been deployed to the field.

The CIF consists of a rotary kiln incinerator, which thermally treats hazardous, radioactive, and mixed wastes.

The ETF treats dilute liquid waste from the processing facilities and storm water runoff. The resulting concentrate is sent to Z Area for treatment and disposal as LLW saltstone, and the treated water is released to Fourmile Branch.

The flow of material and general processing are similar in F and H Areas. Residual contamination will remain in the canyon buildings, the HLW Tanks, the Sand Filters, and the Seepage Basins for each area.

S Area

S Area is the site of the Defense Waste Processing Facility (DWPF). This is a vitrification plant that converts liquid high level radioactive waste streams from ESP and ITP to a glass waste form. Canisters of glass are stored in S Area until they can be shipped to the Federal Repository for HLW.

Z Area

The Saltstone Processing Facility (SPF) and the SDF are located in Z Area. Decontaminated salt solutions from the ETF and the ITP are blended with cement, fly ash, and blast furnace slag to produce saltstone grout. The saltstone grout is then pumped to concrete vaults in the SDF for disposal, where it solidifies into a stable monolith.

This Monitoring Plan describes the process by which samples will be taken of the appropriate media at the proper locations and analyzed for the constituents of interest from the facilities identified as significant in the CA.

2.2 Reason for Monitoring

Per the requirements in the DAS issued for the E-Area LLWF and the SDF (see Attachment 1), a monitoring plan shall be written, approved, and implemented within 1 year of issuance of the DAS (9/28/00) and updated at least every 5 years. This monitoring plan includes annual data review and evaluation as discussed in Section 5.0. Following this annual data review and evaluation, any modifications to this monitoring plan that may be applicable will be noted and the plan updated as necessary.

Monitoring to be performed as part of this monitoring plan is intended to meet the requirements of USDOE Order 435.1 and its associated implementation manual and guide (USDOE 1999a). These documents require disposal facilities to monitor for compliance with the conditions of the DAS. In particular, the following must be addressed:

- The site-specific PA and CA shall be used to determine the media, locations, radionuclides, and other substances to be monitored.

- The environmental monitoring program shall be designed to include measuring and evaluating releases, migration of radionuclides, disposal unit subsidence, and changes in disposal facility and disposal site parameters which may affect long-term performance.

- The environmental monitoring programs shall be capable of detecting changing trends in performance to allow application of any necessary corrective action prior to exceeding the PA performance objectives (USDOE 1999a).

Separate monitoring plans have been written for each facility to monitor for compliance with the performance objectives from the individual facility PAs (WSRC 2000b; WSRC 2000d). This plan proposes monitoring to evaluate actual performance versus projected performance based on the CA for the E-Area LLWF and the Z-Area SDF.

2.3 Related Documents

The *Disposal Authorization Statement for the Department of Energy Savannah River Site E-Area Vaults and Saltstone Disposal Facilities* (USDOE 1999b) was issued on September 28, 1999. This document specifies the provisions and conditions for waste disposal at these facilities. Among these conditions is the requirement to develop a monitoring plan to demonstrate compliance with the performance objectives.

The performance evaluations for the facilities are documented in the *Radiological Performance Assessment for the E-Area Low-Level Waste Facility*, Revision 1 (WSRC 2000), and in the *Radiological Performance Assessment for the Z-Area Saltstone Disposal Facility*, Rev. 0 (WSRC 1992) and the *Addendum to the Radiological Performance Assessment for the Z-Area Saltstone Disposal Facility at the Savannah River Site*, Revision 0 (WSRC 1998). The results of these assessments are identified in the respective PAs and also included in the DAS.

The *E-Area Monitoring Program for the E-Area Low-Level Radioactive Waste Facility*, Rev. 11 (WSRC 2000b) and the *Performance Assessment Monitoring Plan for the Z-Area Saltstone Disposal Facility* (WSRC 2000d) have been developed to comply with the requirement to evaluate monitoring data versus the respective PAs for these facilities. These plans focus on facility-specific monitoring and do not address their composite affects.

The *Composite Analysis E-Area Vaults and Saltstone Disposal Facilities*, Rev. 0 (WSRC 1997a) complements the PA by addressing impacts associated with sources of radioactive material that may interact with both the SDF and the E-Area Low-Level Waste Facility (EALLWF).

The *Addendum to the Composite Analysis for the E-Area Vaults and Saltstone Disposal Facilities*, Revision 0 (WSRC 1999a) provides additional information in support of the CA.

The *Maintenance Program for the E-Area Low-Level Waste Facility and Saltstone Performance Assessments and the Composite Analysis*, Draft, April 6, 2000 (WSRC 2000c) describes the maintenance program implemented to confirm the continued adequacy of the PA/CA and to increase confidence in the results of the PA/CA. The preparation and execution of this plan complies with the complex-wide strategy for maintenance of USDOE PAs and CAs as reflected in USDOE Order 435.1. The PA/CA maintenance program will evaluate the *Environmental Monitoring Program* annually to identify any information that may indicate the need for additional monitoring to be included in this monitoring plan. The PA/CA maintenance program also includes a test and research component that will be reviewed annually to identify any new results that indicate that additional monitoring and/or facility inspections are necessary. This

monitoring plan will be amended to incorporate applicable information identified through the PA/CA maintenance program as needed.

Because changes to any of these documents may affect the implementation of the others, annual review of the most current revision of each of these documents will be performed as part of this monitoring plan to ensure consistency.

2.4 Monitoring Plan Approach

This monitoring plan uses existing monitoring currently performed via other monitoring programs whenever possible. It is not the intent of this plan to duplicate efforts undertaken elsewhere and/or to fulfill other requirements. Existing programs have been reviewed and are referenced as appropriate. Currently, all monitoring proposed in this monitoring plan is performed under existing programs/permits. No new or additional monitoring is proposed.

3.0 MONITORING PLAN

SRS looks for, identifies, and quantifies its released contaminants through implementation of the *Environmental Monitoring Plan* (WSRC 2000a) and Environmental Monitoring Program. This program's main parts are effluent monitoring and environmental surveillance. In the program, samples of air, water, and other media are collected and analyzed to determine the presence of contaminants from site operations. Results are used to show effects on natural resources and human health and also to show compliance with regulations.

Much of the onsite monitoring is done by the Environmental Protection Department's Environmental Monitoring Section and by the Savannah River Technology Center (SRTC). Groups outside of SRS also monitor the site. These include the South Carolina Department of Health and Environmental Control (SCDHEC) and the Georgia Department of Natural Resources (GDNR).

The essential parts of the SRS Environmental Monitoring Program are summarized below. Following this, the portions that are relevant to the Composite Analysis Monitoring Program are described.

Effluent Monitoring

Effluent monitoring is the collection of samples at the point where materials are released from the facilities and their subsequent analysis. Two types of effluent monitoring are performed at SRS. Radiological effluent monitoring looks for radioactive elements that are released from the facilities. More than 4,400 radiological samples were collected and analyzed during 1996. Nonradiological effluent monitoring looks for nonradioactive materials that are released from the facility.

Environmental Surveillance

Environmental surveillance covers more than 31,000 square miles and extends up to 100 miles from the site. With results of this surveillance, scientists attempt to measure contaminants that may have spread into the environment. Like effluent monitoring, environmental surveillance can be both radiological and nonradiological.

Radiological Releases

Contaminants released from the site can travel through the environment, potentially causing exposure to the offsite public. Routes that contaminants may follow through the environment are called pathways. Airborne release pathways include (1) inhalation and (2) the consumption of locally produced foods and milk; liquid release pathways include the consumption of (1) fish, (2) shellfish from downriver where the Savannah River is met by Atlantic Ocean tides, and (3) Savannah River water. Monitoring groundwater migration from contaminated areas on site is important in determining liquid releases.

Radiological Surveillance

Routine surveillance is performed on the atmosphere (air and rainwater), surface water (site streams and the Savannah River), drinking water, food products (terrestrial and aquatic), wildlife, soil, sediment vegetation, and groundwater. Monitoring of gamma radiation in the environment is conducted on site, at the site boundary, and in surrounding communities.

Table 3-1 summarizes the monitoring that will be implemented to evaluate the projected composite performance of the facilities. A more detailed discussion of each of the items in this table is presented in the subsections following the table.

Table 3-1 Summary Monitoring Table

Pathway	Media	Radionuclide	Sampling Frequency	Monitoring Location	Sampling Method	Analytical Method	Minimum Detectable Activity/Method Detection Limit
Groundwater Pathway	Groundwater	Gross alpha Nonvolatile beta Tritium	Twice per year	• ORWBG: BGO-46D, 47D, 48D, 49D and 50D • MWMF: all BGX_D wells • H Tank Farm: HAA-2 and HTF-17 • F Tank Farm: FSL-3D and 6D	As designated in the groundwater protection management program (WSRC 1996)	As designated in the groundwater protection management program (WSRC 1996)	As designated in the groundwater protection management program (WSRC 1996)
Groundwater Pathway	Surface Water	Gross alpha Nonvolatile beta Tritium	Once every two weeks	• Upper Three Runs: U3R-1A, U3R-4 • Fourmile Branch: FM-1C, FM-6	As designated in the groundwater protection management program (WSRC 1996)	As designated in the groundwater protection management program (WSRC 1996)	As designated in the groundwater protection management program (WSRC 1996)

3.1 Pathways, Relevant Features, and Media to be Monitored

This section provides a brief discussion and justification of the exposure pathways and relevant features to be monitored along with the appropriate media to be sampled to evaluate actual versus projected performance with regard to the CA and/or to identify early indications of possible releases.

The CA indicated that the only significant migration pathway is groundwater that discharges to surface water streams. The only potential exposure pathway for the public is through exposure to surface water. Therefore, monitoring of groundwater will be performed in close proximity to the facilities identified in the CA as primary contributors of contaminant flux to the groundwater. Monitoring of the surface water in Upper Three Runs and Fourmile Branch will be performed to evaluate the projections in the CA for the composite effects of all facilities considered.

Based on projected contaminant flux to the water table in Chapter 4 of the CA, the Old Radioactive Waste Burial Ground (ORWBG), Mixed Waste Management Facility (MWMF), and the H-Area Tank Farms are the facilities that are likely to contribute measurable contaminant concentrations in the near term. Groundwater monitoring data from these facilities will be evaluated to monitor actual versus projected contaminant flux to the groundwater.

Relevant features that may affect contaminant migration from the facilities are addressed in the facility-specific monitoring plans (e.g., subsidence or other facility parameters) and, therefore, are not included in this monitoring plan.

Table 3-2 summarizes the pathways to be monitored and the media that will be sampled.

Table 3-2

Pathway	Media
Groundwater Pathway	Groundwater
Groundwater Pathway	Surface Water

3.2 Radionuclides and Other Substances to be Monitored

The CA identified tritium as the only radionuclide expected to occur in SRS streams in the near term. Tritium will be monitored. In addition, gross alpha and nonvolatile beta will be monitored to verify the CA prediction that no other radionuclides should be present. No nonradioactive substances are relevant for CA monitoring.

Table 3-3 identifies the radionuclides to be monitored per this monitoring plan.

Table 3-3

Pathway	Media	Radionuclide
Groundwater Pathway	Groundwater	Gross alpha Nonvolatile beta Tritium
Groundwater Pathway	Surface Water	Gross alpha Nonvolatile beta Tritium

3.3 Monitoring Locations

The point of assessment used in the CA is the water at the mouth of Upper Three Runs just prior its confluence with the Savannah River. An existing Upper Three Runs mid-stream sampling station that is downstream of the last contributing source will be used. A sample from such a location would have the same mass of contaminant dissolved in somewhat less water than a sample taken at the actual point of assessment, and would thus be a somewhat higher estimate of stream-mouth concentration. A sampling station upstream of all production facilities will be used to determine background concentrations.

Due to the presence of the groundwater divide located generally beneath the ORWBG, groundwater also flows toward Fourmile Branch. Existing sampling stations both upstream and downstream of the contributing facilities will be used. This is necessary to attempt to isolate the radionuclide contributions from only the facilities included in the CA. Additional sources of radionuclides contribute to the total concentrations in Fourmile Branch.

Because the ORWBG, MWMF, and the F- and H-Area Tank Farms are the facilities that are likely to contribute measurable contaminant concentrations in the near term, appropriate groundwater monitoring wells downgradient from each facility will be monitored.

Table 3-4 summarizes the appropriate monitoring locations.

Table 3-4

Pathway	Media	Radionuclide	Monitoring Location
Groundwater Pathway	Groundwater	Gross alpha Nonvolatile beta Tritium	• ORWBG: BGO-46D, 47D, 48D, 49D and 50D • MWMF: all BGX_D wells • H Tank Farm: HAA-2 and HTF-17 • F Tank Farm: FSL-3D and 6D
Groundwater Pathway	Surface Water	Gross alpha Nonvolatile beta Tritium	• Upper Three Runs: U3R-1A, U3R-4 • Fourmile Branch: FM-1C, FM-6

3.4 Sampling Frequencies and Methods

Samples will be collected from Upper Three Runs and Fourmile Branch biweekly using a Time Proportional Automatic Composite Sampler. Groundwater sampling performed twice per year is appropriate to detect the presence of waste constituents migrating from the facilities. These sampling frequencies will provide sufficient data to evaluate trends.

Sampling will be performed according to the appropriate approved methods identified in the *Groundwater Protection Management Program* (WSRC 1996).

Table 3-5 summarizes the sampling frequencies and methods that are appropriate.

Table 3-5

Pathway	Media	Radionuclide	Monitoring Location	Sampling Frequency	Sampling Method
Groundwater Pathway	Groundwater	Gross alpha Nonvolatile beta Tritium	• ORWBG: BGO-46D, 47D, 48D, 49D and 50D • MWMF: all BGX_D wells • H Tank Farm: HAA-2 and HTF-17 • F Tank Farm: FSL-3D and 6D	Twice per year	As designated in the groundwater protection management program (WSRC 1996)
Groundwater Pathway	Surface Water	Gross alpha Nonvolatile beta Tritium	• Upper Three Runs; U3R-1A, U3R-4 • Fourmile Branch: FM-1C, FM-6	Once every two weeks	As designated in the groundwater protection management program (WSRC 1996)

3.5 Analytical Methods and Required Minimum Detectable Activities/Method Detection Limits

The analytical methods and required minimum detectable activities or method detection limits specified for use in the *SRS Groundwater Protection Management Program* (WSRC 1996) and *Westinghouse Savannah River Company Environmental Monitoring Section Plans and Procedures Manual 3Q1, Environmental Monitoring Plan* (WSRC 2000a) are appropriate to use in this monitoring plan. The sampling methods follow documented WSRC procedures that ensure integrity of the sample and consistency between samples collected at various times, to minimize the possibility of external contamination of the sample, and to ensure sample integrity during shipping. The minimum detectable activities or method detection limits specified for use in the groundwater protection management and environmental monitoring programs are also appropriate for use in this monitoring plan. These limits are sufficiently below the CA predictions to provide early warning of very low levels of contamination migrating from the facility, allowing time for confirmation sampling and/or implementation of corrective measures, as necessary.

3.6 Reporting

Groundwater and surface water monitoring data used in this monitoring plan have been collected and reported under other existing established SRS programs. These other reports and electronic

databases will be reviewed annually and the relevant data extracted for evaluation as described in Section 4.0. The results of the CA monitoring program will be reported in the annual review conducted through the PA/CA maintenance program.

4.0 DATA EVALUATION

4.1 Data Evaluation vs. Action Levels

The action levels selected for this plan represent 25% of the peak stream concentrations for Upper Three Runs and Fourmile Branch and 25% of the peak groundwater concentration beneath each facility of interest as calculated in the CA.

The stream concentrations were calculated using the peak doses from Chapter 5 of the CA, the dose conversion factors, and a consumption rate of 730 L/yr.

The groundwater concentrations were calculated using the peak fluxes for the facilities of interest from Chapter 4 and dividing the flux by the annual infiltration through the facility, length times width times infiltration rate.

Table 4-1

Monitoring Location	Radionuclide	Action Level (pCi/L)
ORWBG: BGO-46D, 47D, 48D, 49D and 50D	Gross alpha	$4.21\times10^{+2}$
	Nonvolatile beta	$2.21\times10^{+3}$
	Tritium	$7.11\times10^{+7}$
MWMF: all BGX_D wells	Gross alpha	$7.56\times10^{+2}$
	Nonvolatile beta	$1.63\times10^{+3}$
	Tritium	$7.53\times10^{+7}$
H Tank Farm: HAA-2 and HTF-17	Gross alpha	$2.84\times10^{+4}$
	Nonvolatile beta	3.28×10^{-1}
Upper Three Runs: U3R-1A, U3R-4	Gross alpha	9.68×10^{-3}
	Nonvolatile beta	$2.94\times10^{+2}$
	Tritium	$3.26\times10^{+2}$
Fourmile Branch: FM-1C, FM-6	Gross alpha	8.34×10^{-2}
	Nonvolatile beta	$2.12\times10^{+3}$
	Tritium	$1.74\times10^{+3}$

4.2 Data Evaluation vs. Composite Analysis Results

Data collected as described in this monitoring plan will be evaluated using the projections presented in the CA to determine if actual results are in line with projected results.

4.3 Reporting

Results and recommendations from data evaluation will be reported and distributed in the annual review conducted through the PA/CA maintenance program.

5.0 RECOMMENDATIONS BASED ON DATA EVALUATION

Following data evaluation, the related documents discussed in Section 2.3 will be reviewed to determine if the documents and/or programs/procedures discussed in those documents need to be modified. The test and research component of the PA/CA maintenance program will be an integral part of this review. This program provides a mechanism to implement additional tests and/or research that may be needed to enhance or modify the SDF, the E-Area LLWF, or these facilities' supporting monitoring regimes.

5.1 Additional/Verification Sampling Needed

Additional sampling to verify results will be evaluated on a case-by-case basis.

5.2 Modifications to Monitoring Program

If data evaluation identifies the need for additional monitoring, the relevant programs under which that monitoring is performed will be modified to include the required additions (e.g., the groundwater protection management program). Confirmatory sampling may be performed either under other programs or implemented directly through this monitoring plan as necessary based on the timeframe in which the additional data are required. Any modifications to these supporting programs that are needed based on data evaluated under this monitoring plan will be documented through revisions to this plan and in the PA/CA maintenance program.

5.3 Modifications to Composite Analysis

If data evaluation indicates that projected results from the CA are not consistent with actual results, modification of the CA may be warranted. However, additional confirmatory sampling, special analyses, and tests and/or research may first be implemented through the PA/CA maintenance program to specifically identify modifications needed for the CA.

5.4 Modifications to Disposal Facility

Following any additional confirmatory sampling and tests and/or research based on data evaluation, any modifications to the closure or remediation plans for a facility will be implemented through the relevant functional group.

6.0 IMPLEMENTATION

As discussed previously, monitoring data will be evaluated annually as outlined in the PA/CA maintenance program schedule. Data evaluation will be performed jointly by the SRTC and Solid Waste Division (SWD) personnel with the relevant expertise necessary to evaluate data from the various media and to compare those data with projections in the CA. An estimate of the resources required to implement this plan is also included in the PA/CA maintenance program.

7.0 REFERENCES

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ATTACHMENT 1
DOE Order 435.1 Monitoring Plan Requirements Table (Generic - Non-facility Specific)

Summarized Requirement and Source	Source Citation	Requirement Applicable? (Yes/No)	Monitoring Plan Section Discussing Requirement	Comments
NOTE: Items shown in like fonts generally represent identical requirements. Grey shaded items stand alone.				
DAS				
Monitoring Plan shall be written, approved, and implemented within 1 year of issuance of DAS (9/28/00)	Page 3, Paragraph 4	Yes	2.0 Introduction	No comment
Plan updated at least every 5 years	Page 3, Paragraph 4	Yes	2.0 Introduction	
Plan shall include monitoring frequencies and protocols for existing data collection and any new data collection to monitor continued performance of the disposal facility.	Page 3, Paragraph 4	Yes	3.0 Monitoring Plan 5.0 Recommendations Based on Data Evaluation	No comment
Compare data collected with PA results and develop corrective action, if necessary	Page 3, Paragraph 4	Yes	4.0 Data Evaluation 4.2 Data Evaluation vs. Performance Assessment and Composite Analysis Result 5.0 Recommendations Based on Data Evaluation	No comment
435.1 Manual - Chapter I				
Ensure monitoring is conducted for compliance with conditions of DAS	Chapter I, Page I-11, I.F.(16)	Yes	4.0 Data Evaluation 4.2 Data Evaluation vs. Performance Assessment and Composite Analysis Result	No comment
435.1 Manual - Chapter IV				
1 At a minimum, sample or monitor temperature, pressure (for closed systems) radioactivity in ventilation exhaust and liquid effluent streams, and flammable or explosive mixtures of gases. Include verification that passive and active control systems have not failed.	Chapter IV, Page IV-15, R.(1)	No	N/A	This requirement is from the "all facilities" section of the Manual and is deemed to not apply to the monitoring plans

Summarized Requirement and Source	Source Citation	Requirement Applicable? (Yes/No)	Monitoring Plan Section Discussing Requirement	Comments
3(a) Use PA/CA to determine the media, locations, radionuclides, and other substances to be monitored	Chapter IV, Page IV-16, R.(3).(a)	Yes	3.0 Monitoring Plan 3.1 Pathways, Relevant Features, and Media to be Monitored 3.2 Radionuclides and Other Substances to be Monitored 3.3 Monitoring Locations	No comment
3(b) Environmental monitoring program will measure and evaluate releases, migration of radionuclides, disposal unit subsidence, changes in disposal facility and disposal facility site parameters that may affect long-term performance	Chapter IV, Page IV-16, R.(3).(b)	Yes	3.0 Monitoring Plan 3.1 Pathways, Relevant Features, and Media to be Monitored 3.2 Radionuclides and Other Substances to be Monitored 3.3 Monitoring Locations 4.0 Data Evaluation 4.1 Data Evaluation vs. Action Levels 4.2 Data Evaluation vs. Performance Assessment and Composite Analysis Result	No comment
3(c) Environmental monitoring program must be capable of detecting changing trends in performance to allow implementation of any required corrective actions prior to exceeding performance objectives in Chapter IV (same as DAS/PA)	Chapter IV, Page IV-16, R.(3).(c)	Yes	4.0 Data Evaluation 5.0 Recommendations Based on Data Evaluation	No comment
435.1 Guidance - Chapter I				
Ensure that disposal facilities are monitored for compliance with conditions of the DAS	Chapter I, Page I-171, I.2.F.(16)	Yes	4.0 Data Evaluation 4.2 Data Evaluation vs. Performance Assessment and Composite Analysis Results	No comment

Summarized Requirement and Source	Source Citation	Requirement Applicable? (Yes/No)	Monitoring Plan Section Discussing Requirement	Comments
Review Safety Analysis to define acceptable operations envelope and technical safety requirements which may include requirements for monitoring.	Chapter I, Page I-172, I.2.F.(16), Paragraph 2	No	N/A	This requirement is from the "all facilities" section of the Manual and is deemed to not apply to the monitoring plans
Monitoring should be used to verify assumptions, reduce uncertainties, and build confidence in the results and conclusions of the PA/CA	Chapter I, Page I-172, I.2.F.(16), Paragraph 4	Yes	4.0 Data Evaluation 4.2 Data Evaluation vs. Performance Assessment and Composite Analysis Results	No comment
435.1 Guidance - Chapter IV.R.(3)				
1 At a minimum, sample or monitor temperature, pressure (for closed systems) radioactivity in ventilation exhaust and liquid effluent streams, and flammable or explosive mixtures of gases. Include verification that passive and active control systems have not failed. Compliance with this requirement is demonstrated if monitoring or sampling for the stated parameters is performed for all facilities with a precision, accuracy, and frequency consistent with timely identification of developing problems and a justification exists in the approved radioactive waste management basis for those specified parameters which are not monitored or sampled.	Chapter IV, Page IV-241, IV.R.(1)	No	N/A	This requirement is from the "all facilities" section of the Manual and is deemed to not apply to the monitoring plans

Summarized Requirement and Source	Source Citation	Requirement Applicable? (Yes/No)	Monitoring Plan Section Discussing Requirement	Comments
The monitoring plan includes a tabular summary of the media to be monitored, the methods to be used, the methods for sample analysis, methods of reporting, frequency of data collection, action levels based on data collected. Sampling procedures clearly defined in monitoring plan.	Chapter IV, Page IV-245, IV.R.(3), Paragraph 5	Yes	3.0 Monitoring Plan	No comment
Schedule for implementing the monitoring plan, estimates of resources required to implement plan. Describe the multi-disciplinary team of skilled professionals representing various components of the monitoring program(Air pathway, groundwater, closure cap, etc.) who will conduct the monitoring program	Chapter IV, Page IV-245, IV.R.(3), Paragraph 6	Yes	6.0 Implementation	No comment
To the extent practicable, incorporate documentation, review and approval, and reporting into the environmental monitoring plan required under USDOE 5400.1	Chapter IV, Page IV-246, IV.R.(3), Paragraph 1	Yes	3.6 Reporting 4.3 Reporting	No comment
(a) The Site-specific PA/CA should be used to determine the media, locations, radionuclides, and other substances to be monitored.	Chapter IV, Page IV-246, IV.R.(3).(a)	Yes	3.0 Monitoring Plan 3.1 Pathways, Relevant Features, and Media to be Monitored 3.2 Radionuclides and Other Substances to be Monitored 3.3 Monitoring Locations	No comment
The PA/CA should provide sufficient information to identify the important migration pathways for the transport of radionuclides, primary mobile radiological and chemical constituents, logical monitoring locations, monitoring parameters, and sampling frequencies.	Chapter IV, Page IV-246, IV.R.(3).(a), Paragraph 6	Yes	3.0 Monitoring Plan	No comment

Summarized Requirement and Source	Source Citation	Requirement Applicable? (Yes/No)	Monitoring Plan Section Discussing Requirement	Comments
(b) the environmental monitoring program must include measuring and evaluating releases, migration of radionuclides, disposal unit subsidence, changes in facility/site parameters that may affect long-term performance.	Chapter IV, Page IV-249, IV.R.(3).(b)	Yes	3.0 Monitoring Plan	No comment
A successful monitoring program begins prior to the facility construction. Pre-operational monitoring should provide site characterization information, sit suitability information, provides a record for public information.	Chapter IV, Page IV-250, IV.R.(3).(b), Paragraphs 2 & 3	Yes	N/A	No comment
Operational monitoring includes effluent monitoring, radionuclide release detection, subsidence detection, evaluation of monitoring data.	Chapter IV, Page IV-251, IV.R.(3).(b), Paragraphs 3 & 4, Page 252, Paragraphs 1, 3, & 4	Yes	3.0 Monitoring Plan 4.0 Data Evaluation	No comment
Monitoring data are reviewed periodically against the action levels in the monitoring plan.	Chapter IV, Page IV-253 , IV.R.(3).(b), Paragraph 3	Yes	4.0 Data Evaluation	No comment
Compliance with this requirement [DOE G 435.1-1 IV.R.(3)] is demonstrated if the environmental monitoring program collects and evaluates sufficient data on effluents, radionuclide releases, and subsidence to provide a sound basis for analyzing the long-term performance of the disposal facility.	Chapter IV, Page IV-253 , IV.R.(3).(b), Paragraph 6	Yes	3.0 Monitoring Plan 4.0 Data Evaluation 5.0 Recommendations Based on Data Evaluation	No comment

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