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SAFELY DELIVERING THE DEPARTMENT OF ENERGY'S VISION
FOR THE EAST TENNESSEE TECHNOLOGY PARK MISSION

Waste Acceptance Criteria Attainment Team Project Execution Plan Environmental Management Waste Management Facility Oak Ridge Reservation, Oak Ridge, Tennessee

This document is approved for public release per review by:

Peter Kortman — 12/22/15
UCOR Classification & Information Control Office — Date

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UCOR-4024/R4

Waste Acceptance Criteria Attainment Team Project Execution Plan Environmental Management Waste Management Facility Oak Ridge Reservation, Oak Ridge, Tennessee

Date Issued—January 2016

Prepared for the
U.S. Department of Energy
Office of Environmental Management

URS | CH2M Oak Ridge LLC
Safely Delivering the Department of Energy's Vision
for the East Tennessee Technology Park Mission
under contract DE-SC-0004645

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APPROVALS

Waste Acceptance Criteria Attainment Team Project Execution Plan Environmental Management Waste Management Facility Oak Ridge Reservation, Oak Ridge, Tennessee	UCOR-4024/R4 January 2016

USQD Review Determination	☐ USQD ☒ UCD ☐ CAT X ☐ Exempt (Select Criteria 1-3 below.) USQD/UCD/CAT X No.: UCD-YT-EMWMF-0480
Exemption Criteria	☐ (1) Non-Intent Change ☐ (2) DOE-Approved Document ☐ (3) Chief Accounting Officer, Internal Audit, Labor Relations, General Counsel, Outreach & Public Affairs, or Project Controls Services OR ☐ (4) Document identified in USQD-MS-CX-REPORTS-1074
USQD Preparer:	Name: [signature] Date: 1/28/2016
Exhibit L Mandatory Contractor Document	☒ No (No PCCB Reviewer Signature Required) ☐ Yes (Requires review by the Proforma Change Control Board.)
PCCB Reviewer:	Name: Date:

Prepared by: [signature] 1-28-16

James "Guy" Hopper
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Date

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REVISION LOG		
Revision Number	Description of Changes	Pages Affected
4	Added reference NCSD –ET-K27-0162 and updated HAD-YT-EMWMF-0020 reference.	Multiple
3	Updated NCSD-ET-K25-0161 and HAD-YT-EMWMF-0020 reference revisions.	Pages 40, A-15, and A-23
2	Added one reference to nuclear criticality safety determinations to be consistent with HAD-YT-EMWMF-0020, R12. Revised language to reflect current roles and responsibilities.	Multiple
1	Incorporated new language regarding Waste Handling Plan requirements	Sect. 3.2.2
	Added clarification concerning Class C waste determinations	Sect. 3.3
	Global changes made to Appendix A and new waste profile format	Appendix A
	Added two references to nuclear criticality safety determinations to be consistent with HAD-YT-EMWMF-0020, R11. Added clarifications to Chap. 4 description in Appendix A.	Multiple
0	Initial issue of document.	All

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ACRONYMS

ADP	anomaly detection plan
ASA	auditable safety analysis
BCP	baseline change process
BJC	Bechtel Jacobs Company LLC
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CM	configuration management
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DQA	data quality assessment
DQO	data quality objective
EMWMF	Environmental Management Waste Management Facility
EPA	U.S. Environmental Protection Agency
ES&H	Environment Safety, and Health
FFA	Federal Facility Agreement
FS	feasibility study
HAD	Hazard Analysis Document
K_d	soil-to-liquid partition factor
LDR	land disposal restriction
MCA	Monte Carlo Analysis
NCSD	Nuclear Criticality Safety Determination
NT	North Tributary
OREIS	Oak Ridge Environmental Information System
ORR	Oak Ridge Reservation
PEP	Project Execution Plan
QA	quality assurance
RA	response action
RCRA	Resource Conservation and Recovery Act of 1976
ROD	record of decision
RTSC	Readiness to Ship Checklist
SAP	sampling and analysis plan
SOF	sum of fractions
SRC	site-related contaminant
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environment and Conservation
TSCA	Toxic Substances Control Act of 1976
UCL	upper confidence limit
UCL_{90}	90% upper confidence limit
UCL_{95}	95% upper confidence limit
UCOR	URS | CH2M Oak Ridge LLC
VWSF	volume-weighted sum of fractions
WAC	waste acceptance criteria
WACFACS	Waste Acceptance Criteria Forecasting Analysis Capability System
WGF	Waste Generation Forecast
WHP	waste handling plan
WL ID	Waste Lot ID
WPXL	waste-disposal proxy lot

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EXECUTIVE SUMMARY

On-site disposal is the selected remedy for the comprehensive management of waste generated from environmental restoration activities on the Oak Ridge Reservation in Oak Ridge, Tennessee. Radiological and chemical releases from wastes disposed in the Environmental Management Waste Management Facility (EMWMF) and the potential risks to the public from such releases are mitigated by the disposal cell design. Wastes that will be accepted for placement must meet four waste acceptance criteria (WAC):

- Administrative WAC are derived from applicable or relevant and appropriate requirements in the record of decision (DOE/OR/01-1791&D3, *Record of Decision for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste, Oak Ridge, Tennessee*) and from other agreements between the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency, and the Tennessee Department of Environment and Conservation.
- Analytic WAC are derived from the approved risk assessment model in the remedial investigation/ feasibility study (FS) (DOE/OR/02-1637&D2, *Remedial Investigation/Feasibility Study for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste*) and FS addendum (DOE/OR/02-1637&D2/A1, *Addendum to Remedial Investigation/Feasibility Study for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste*) for EMWMF.
- Auditable safety analysis (ASA)-derived WAC are derived from the facility authorization basis documentation for EMWMF in effect at the time of the approval of the creation of the WAC. Since that time, the facility has modified its safety basis documentation and has replaced the ASA with a Hazard Analysis Document (HAD), codified in the *Hazard Analysis Document for the Environmental Management Waste Management Facility*, HAD-YT-EMWMF-0020. The HAD uses the original ASA-derived WAC sum of fractions to manage wastes, so for consistency, the requirements to fulfill this WAC remain unchanged. Some requirements from the HAD have safety basis implications for EMWMF Operations. Where hard requirements from the HAD are incorporated into this Project Execution Plan (PEP), such that a protected assumption is potentially affected by changes, these requirements are noted by the insertion of a "<HAD>" symbol.
- Physical WAC are derived from operational constraints needed to properly and efficiently manage waste placement activities at EMWMF.

The primary unit of waste to be considered for WAC attainment is the "waste lot." Each Response Action (RA) Project (or any waste generator) defines one or more waste streams that comprise a waste lot; for example, a waste lot may consist of 100% soil, 100% debris, or some combination thereof. Each waste lot is necessarily constrained by availability and quality of characterization information, the waste origin, and RA Project scheduling requirements.

DOE is accountable for EMWMF WAC compliance. DOE and the other Federal Facility Agreement of 1992 parties have delegated the responsibility to make WAC attainment decisions for wastes designated for disposal at EMWMF to the Environmental Management prime contractor, i.e., URS | CH2M Oak Ridge LLC. The WAC Attainment Team is responsible for determining if the waste lots can be accepted for disposal. The WAC Attainment Team can make one of four decisions: the waste lot is accepted for disposal, it is recommended for approval, it is rejected for disposal, or a previously accepted waste lot is suspended from further disposal. The WAC Attainment Team will identify specific conditions placed upon approved or suspended waste lots, or recommend to projects with rejected waste lots how the waste lot could be altered in order to become acceptable (e.g., segregating out hot spots for separate

disposition). Finally, the WAC Attainment Team could also identify required additional data in order to make a final decision.

The *Attainment Plan for Risk/Toxicity-Based WAC at the ORR, Oak Ridge, Tennessee* (DOE/OR/01-1909&D3) provides the EMMWF WAC that RA Projects must meet in order for any RA Project waste lot to be accepted at EMWMF. This PEP describes how the WAC Attainment Team ensures that RA Projects' waste lots meet the prescribed EMWMF WAC.

1. INTRODUCTION

1.1 PROJECT DESCRIPTION

On-site disposal is the selected remedy in the record of decision (ROD) for the comprehensive management of waste generated from environmental restoration activities on the Oak Ridge Reservation (ORR) in Oak Ridge, Tennessee, under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). The *Record of Decision for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste, Oak Ridge, Tennessee* (DOE/OR/01-1791&D3) documents the remedy selected, an engineered disposal facility in East Bear Creek Valley on the ORR for the consolidation of contaminated waste. This facility, the Environmental Management Waste Management Facility (EMWMF), will accept only wastes that meet the waste acceptance criteria (WAC) set forth in the *Attainment Plan for Risk/Toxicity-Based Waste Acceptance Criteria at the Oak Ridge Reservation, Oak Ridge, Tennessee*, (DOE/OR/01-1909&D3), hereafter referred to as the *WAC Attainment Plan*. Such wastes will contain low-level radioactive substances, Resource Conservation and Recovery Act of 1976 (RCRA) hazardous substances, Toxic Substances Control Act of 1976 (TSCA)-regulated constituents, asbestos-containing materials, and combinations of these contaminants.

EMWMF has a nominal footprint of between 22 and 44 acres and is situated between North Tributary (NT)-3 and NT-5 north of Bear Creek. EMWMF consists of a planned 13-ft-thick multi-component cover and a constructed 13-ft-thick liner consisting of a leachate collection/detection system, a 3-ft compacted clay foundation layer, and a 10-ft geological buffer. Radiological and chemical releases from wastes disposed at EMWMF and the potential risks to the public from such releases are mitigated by the disposal cell design. Wastes that are generated from Response Action (RA) Projects are candidates for disposal at EMWMF. RA Projects include remedial action projects or decontamination and decommissioning (D&D) projects.

Wastes that will be accepted for placement are limited by a set of WAC, which are divided into four categories:

- Administrative
- Analytic
- Auditable safety analysis (ASA)-derived
- Physical

Administrative WAC are derived from applicable or relevant and appropriate requirements in the ROD and from other agreements between U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and Tennessee Department of Environment and Conservation (TDEC). In order for wastes to be disposed at EMWMF, all administrative WAC must be met, or appropriate waivers must be obtained in the form of regulator-approved CERCLA documentation. The Administrative WAC are presented in Sect. 5.1 of the *WAC Attainment Plan*.

Analytic WAC are derived from the approved risk assessment model in the remedial investigation/ feasibility study (FS) (DOE/OR/02-1637&D2, *Remedial Investigation/Feasibility Study for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste*) and FS addendum (DOE/OR/02-1637&D2/A1, *Addendum to Remedial Investigation/Feasibility Study for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste*) for EMWMF. In these documents, concentration-based "analytic" WAC were established assuming a resident farmer receptor (i.e., WAC

receptor). This farmer is assumed to use groundwater from a well between the facility and Bear Creek for domestic needs and surface water from Bear Creek for agricultural purposes. The Analytical WAC are presented in Sect. 5.2 of the *WAC Attainment Plan*.

As part of the development of the DOE Facility safety-authorization basis for EMWMF, an ASA and supporting Hazard Categorization were produced that included operational limitations on the releasable inventory of radionuclides that could exist within the facility at any one time. Consistent with the methodology used to develop the facility safety-authorization basis, ASA-derived WAC were derived for the various radionuclides that potentially could be accepted at EMWMF. Subsequently, the ASA was replaced with a Hazard Analysis Document (HAD) and is codified in the *Hazard Analysis Document for the Environmental Management Waste Management Facility*, HAD-YT-EMWMF-0020. The safety authorization basis developed in the HAD is similar to that used in the ASA and includes the use of the same calculated ASA-derived sum of fractions (SOF). Therefore, in order to provide a clear link between the WAC attainment plan nomenclature and the profiles being developed, this WAC category name remains "ASA-Derived WAC," even though the ASA has been replaced with a HAD. The ASA-derived WAC are presented in Sect. 5.3 of the *WAC Attainment Plan*. Some requirements from the HAD have safety basis implications for EMWMF Operations. Where hard requirements from the HAD are incorporated into this Project Execution Plan (PEP), such that a protected assumption is potentially affected by changes, these requirements are noted by the insertion of a "<HAD>" symbol.

Physical WAC are derived from operational constraints needed to properly and efficiently manage waste placement activities at EMWMF. Variances to physical WAC requirements can be requested by RA Projects and obtained through negotiations between the RA Project and EMWMF Operations. Written physical WAC variances are developed from these negotiations on a waste lot basis. The Physical WAC are presented in Sect. 5.4 of the *WAC Attainment Plan*.

RA Projects and generators are required to develop and properly implement waste anomaly detection plans (ADPs) for each waste lot. Once generators produce approved waste lot profiles and are authorized to dispose of the wastes at EMWMF, it is imperative that the wastes delivered to EMWMF be consistent with the characterization parameters within those approved profiles, including compliance with the WAC or conditions contained in an approved variance. ADPs shall be included in the waste lot profile and shall be summarized in a checklist format. Waste generators shall certify each shipment meets the waste profile and ADP requirements. The WAC Attainment Team shall include these checklists as an attachment to waste lot approval letters. The ADP guidelines are presented in Appendix A.

Revision 4 incorporates the latest revisions of NCSD-ET-K27-0163, *K-27 Demolition*, and HAD-YT-EMWMF-0020.

2. PROJECT SCOPE AND PURPOSE

2.1 PROJECT SCOPE

The primary scope of the WAC Attainment Team is to:

- Incorporate project waste volume estimates maintained in the URS | CH2M Oak Ridge LLC (UCOR) Waste Generation Forecast (WGF) System into WAC Attainment Team analytical tools.
- Communicate WAC Attainment Team and the 1992 Federal Facility Agreement (FFA) (DOE/OR-1014, *Federal Facility Agreement for the Oak Ridge Reservation*) parties' expectations and requirements for WAC attainment.
- Remain independent of RA Projects for the purpose of making final decisions regarding waste lot acceptability, but also remain helpful to the RA Projects in understanding the WAC requirements.
- Confirm that the waste lots proposed for disposal at EMWMF plan to either meet all physical WAC or have negotiated variances with EMWMF Operations.
- Ensure projects have used the data quality objective (DQO) process to assess/evaluate data.
- Verify that the waste lots proposed for disposal at EMWMF meet the administrative, ASA-derived, and analytic WAC.
- Assess/calculate waste lot SOFs and EMWMF volume-weighted sums of fractions (VWSFs), and verify that the waste lots meet the analytic WAC DQOs.
- Ensure waste profiles submitted by RA Projects provide sufficient information to assess WAC compliance.
- Interface with EMWMF Operations concerning waste volumes placed at EMWMF.
- Develop analytic WAC for site-related contaminants (SRCs).

In addition to its primary scope activities, the WAC Attainment Team will determine if additional data is required to make a decision for waste lot disposal at EMWMF, or the WAC Attainment Team may recommend that waste lots may be altered (e.g., segregate hot spots for separate disposition).

The WAC Attainment Team shall use the *WAC Attainment Plan* as the primary reference to guide its decisions. The WAC Attainment Team will also rely on the ROD as a primary reference.

2.2 PURPOSE

The purpose of this document, the *WAC Attainment Team PEP*, is to define the manner in which the WAC Attainment Team will ensure that CERCLA waste generated by various projects meets the criteria set forth in the aforementioned *WAC Attainment Plan* for acceptance for disposal at EMWMF.

The WAC Attainment Team is responsible for three primary activities:

- Approving, recommending for approval, suspending, or rejecting waste lots for disposal.
- Developing new, or modifying existing, analytic WAC, when necessary.
- Maintaining Waste Acceptance Criteria Forecasting Analysis Capability System (WACFACS).

In addition to its primary activities, the WAC Attainment Team is responsible for communicating existing WAC and providing consultation and interpretation with regard to the EMWMF WAC. Additional details concerning roles and responsibilities of the WAC Attainment Team are located in Chap. 4, "Roles and Responsibilities," and an interface matrix is presented in Appendix E. The overall project execution strategy of the WAC Attainment Team in approving, recommending for approval, suspending, or rejecting waste lots for disposal at EMWMF is to ensure waste lot profile information is complete, comprehensive, compliant, and technically defensible. This strategy will be executed using tools and systems specifically developed to meet the WAC Attainment Team scope and purpose.

The WAC Attainment Team PEP is organized as follows:

- Chapter 1 provides the project description.
- Chapter 2 provides the scope and purpose of the WAC Attainment Team PEP.
- Chapter 3 describes the strategy that will be executed to achieve the scope and purpose.
- Chapter 4 provides the roles and responsibilities of the WAC Attainment Team and those who interface with the team.
- Chapter 5 provides the type of records that will be maintained during the WAC attainment process.
- Chapter 6 provides quality assurance (QA) requirements.
- Chapter 7 provides the references used to develop this PEP, which can serve as additional guidance when making decisions concerning the required criteria for acceptance at EMWMF.

3. PROJECT EXECUTION STRATEGY

This chapter defines how the WAC Attainment Team will execute the scope and purpose listed in Chap. 2 using various tools and information specifically described in Sect. 3.4. Fundamental to the decision-making process specific to each criterion is an understanding of the DQO process described in Sect. 3.1.

The generic WAC attainment process is depicted in Fig. 1.

3.1 EVALUATION OF DATA USING DQO PROCESS

For each of the EMWMF decisions in Fig. 1, specific DQO decisions have been negotiated and agreed to by the FFA parties. DQO decisions are illustrated in Fig. 2. The WAC Attainment Team will apply these DQO decisions to determine whether individual waste lots can be accepted as proposed or whether additional information or waste lot modifications will be required for acceptance.

The DQO decisions address the following:

- DQO Decision 1: Does the waste lot data meet the form and format required by the WAC Attainment Team?
- DQO Decision 2: Is the existing waste lot characterization data sufficient to assess the waste lot SOFs?
- DQO Decision 3: Using a graded approach for the effects of SOF uncertainties on the VWSFs, can the waste stream be disposed at EMWMF?

Using the DQO Decisions, the EMWMF WAC Attainment Team can utilize waste lot data to do the following:

- Accurately assess waste lot SOFs and the EMWMF VWSFs.
- Examine significant parameters of future EMWMF waste streams with those of EMWMF-disposed waste to forecast the VWSFs at various times in the future.
- Perform sensitivity analysis to identify critical future waste streams impacting the VWSFs.

The DQO process is used to develop performance and acceptance criteria (or DQOs) that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions (EPA/240/B-06/001, *Guidance on Systematic Planning using the Data Quality Objectives Process*). The DQO process has been successfully used for many projects at the ORR. The WAC Attainment Team will use the outcome of the DQO process implemented for EMWMF WAC attainment as outlined in Appendix E of the *WAC Attainment Plan* to accomplish its goals.

In addition to the WAC Attainment DQOs, projects will typically hold either formal or informal meetings with their regulators to determine data adequacy for WAC attainment and other project purposes. In instances where such meetings are held, members of the WAC Attainment Team may be asked to attend to facilitate discussions concerning EMWMF data needs and to ascertain the adequacy of existing project data and any plans to obtain additional samples. All formal decisions made between projects and regulators concerning a waste profile and its characterization objectives must be documented and incorporated into the waste profile.

Sampling needs for projects/waste lots are codified in sampling plans, FFA party-approved waste handling plans (WHPs), or other approved documents. The RA Project waste lot profile shall include a summary-level comparison of what samples were actually collected versus the agreed-upon sampling requirements as prescribed in the WHP. Should any sampling deficiencies have occurred, these must be presented to the respective project's core team to obtain concurrence and verify that no corrective actions are needed as a result of these sampling deficiencies. Sufficient correspondence between the project and the regulators concerning waste lot characterization requirements (e.g., core team approval documentation, meeting minutes, concurrence forms) must be incorporated into the waste profile so that an independent reviewer can understand the sampling logic and data presented in the profile.

3.2 WASTE LOT ASSESSMENT

The primary unit of waste to be considered for WAC attainment is the waste lot. A waste lot can be all or some of the waste of a particular waste stream removed from a CERCLA site, from an entire waste stream down to a single truckload of waste, a set of drums of waste, or even a single drum of waste. Refer to Chap. 5 of the *WAC Attainment Plan* for additional details on waste lots.

The WAC Attainment Team is responsible for ensuring waste lots from each project meet the EMWMF WAC requirements. The WAC Attainment Team will request each project to provide a waste profile for each waste lot. These waste profiles will address the requirements listed in Appendix A, "Waste Profile Generic Instructions." All criteria must be fulfilled before a waste lot is approved. The WAC Attainment Team will use the checklist in Appendix B, "Waste Lot Assessment Checklist," to confirm all WAC requirements have been met by the RA Project waste profiles. The Generic instructions and the checklist serve to facilitate communication between the WAC Attainment Team and generators. The criteria in these documents address the administrative, analytic, ASA-derived, and physical WAC provided in the *WAC Attainment Plan*, and ensure that DQO Decision 1, Form and Format Compliance, is met.

The WAC Attainment Team decisions include approving or recommending for approval the waste lot for disposal, recommending to projects that the waste lot be altered (e.g., by segregating out hot spots for separate disposition, or dividing a proposed waste lot into multiple, separate lots), requiring additional data in order to make a decision, suspending waste lots, or rejecting the waste lot. This decision logic is depicted in Fig. 3.

3.2.1 WAC Attainment Team Interface with RA Projects

The WAC Attainment Team encourages communication with the RA Projects early in the WAC attainment process. Appendix A, "Waste Profile Generic Instructions," has been developed by the WAC Attainment Team, and is available to RA Projects whenever those projects identify the EMWMF as a viable waste disposal option for their wastes. Also, RA Projects may submit draft WACFACS input sheets (see Sect. 3.4 for further details) to enable early assessment of analytic WAC data needs, as well as to allow a proper calculation of the 3-year VWSF calculations, including the RA Project's potential contributions to this key parameter. The WAC Attainment Team will remain independent of the RA Projects or other entities preparing profiles and will provide technical assistance to the RA Projects to communicate requirements set forth in the *WAC Attainment Plan*. The WAC Attainment Team will also communicate its expectations for how the RA Projects demonstrate these requirements have been met in their waste profiles. While demonstration of WAC attainment is the responsibility of the RA Project, the WAC Attainment Team will be accountable for calculating the SOF and VWSF results.

The overall EMWMF WAC Attainment Team waste approval process is shown in Fig. 4 and will generally follow a pattern whereby the projects submit waste profile information to the WAC Attainment

Team for initial assessment, followed by closure of any remaining open issues. If no remaining open issues (to include data gaps) exist, approval can be granted on the basis that all WAC requirements are met. If data gaps exist, additional data must be gathered prior to the WAC Attainment Team evaluation of a waste lot profile for final approval.

It is the RA Project's responsibility to ensure wastes are properly screened for anomalies as the wastes are generated and that effective oversight of these activities remains vigilant throughout the project. Potential waste anomalies must be segregated, evaluated, and characterized for compliant disposition, including disposal at EMWMF or an off-site disposal facility. In such circumstances, the WAC Attainment Team could be involved in these determinations.

The waste profiles constitute the basis upon which waste lot shipments are approved for disposal. Any waste potentially outside of the parameters of the approved waste lot profile is a potential anomaly that must be confirmed to be within the profile's parameters, or if not, be segregated for separate review for disposal (either in a new waste lot, by revising the existing waste lot, or at another disposal facility).

The systems and waste generation practices referenced in the approved waste profiles form the basis for waste lot approval decisions; therefore, any proposed changes to waste delivery methods, waste generation methods, or waste screening methods must be reviewed by the WAC Attainment Team to determine whether any bases for approving the waste lot may have been impacted.

Waste lot profiles shall include ADPs to facilitate the screening of wastes for anomalies. These plans shall be implemented by qualified project personnel who have read and understand the waste lot profile and the *WAC Attainment Plan*. Anomaly detection includes a one- or two-page waste anomaly checklist that will be included as part of the waste ADP. Both the ADP and the anomaly checklist will be specific to each waste lot and will be used to train project field personnel on the types of wastes or field conditions that may indicate potential waste anomalies are present. When specific quantitative screening criteria is deemed necessary during waste-generation activities (such as radiological dose rate measurements, non-destructive assay measurements, or chemical instrumentation), these data acquisition methods and performance criteria will be finalized during the DQO process. The project must ensure that any required screening criteria is documented in the WHP and implemented in the ADP.

The WAC Attainment Team approval letter for the waste lot will include the anomaly detection checklist. As part of the ADP, a waste certification statement is to be provided with each shipment delivered to EMWMF, and this waste certification statement will be signed by a qualified project person.

Once the WAC Attainment Team approves a waste lot, the project must submit a Readiness to Ship Checklist (RTSC) that is administered by EMWMF Operations. The RTSC requirements can be found in *Technical Information for Delivery of Waste to the Environmental Management Waste Management Facility*, 23900-SC-BC008U-A001. Once the RTSC is approved by EMWMF Operations, authorization to ship is granted to the generating project.

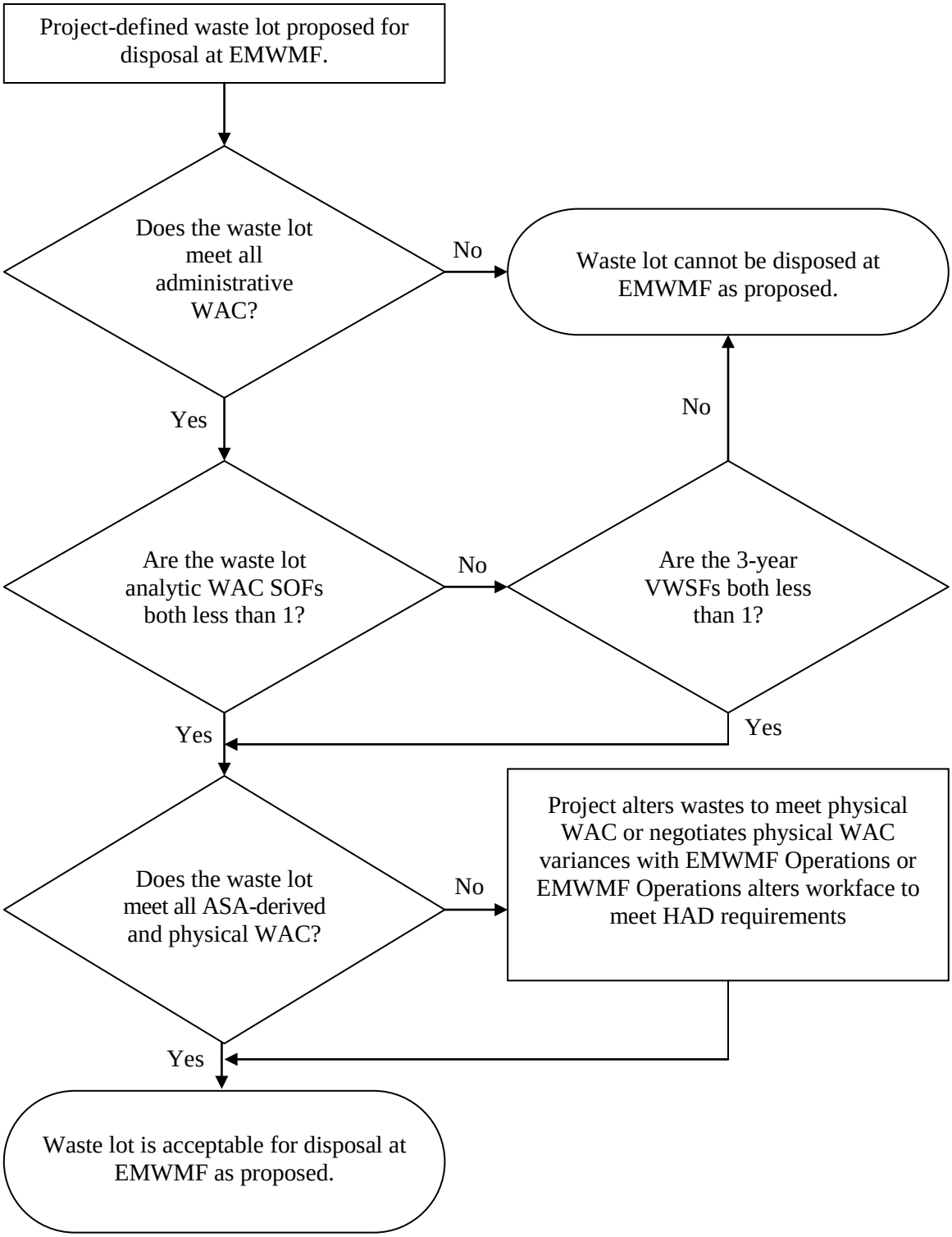
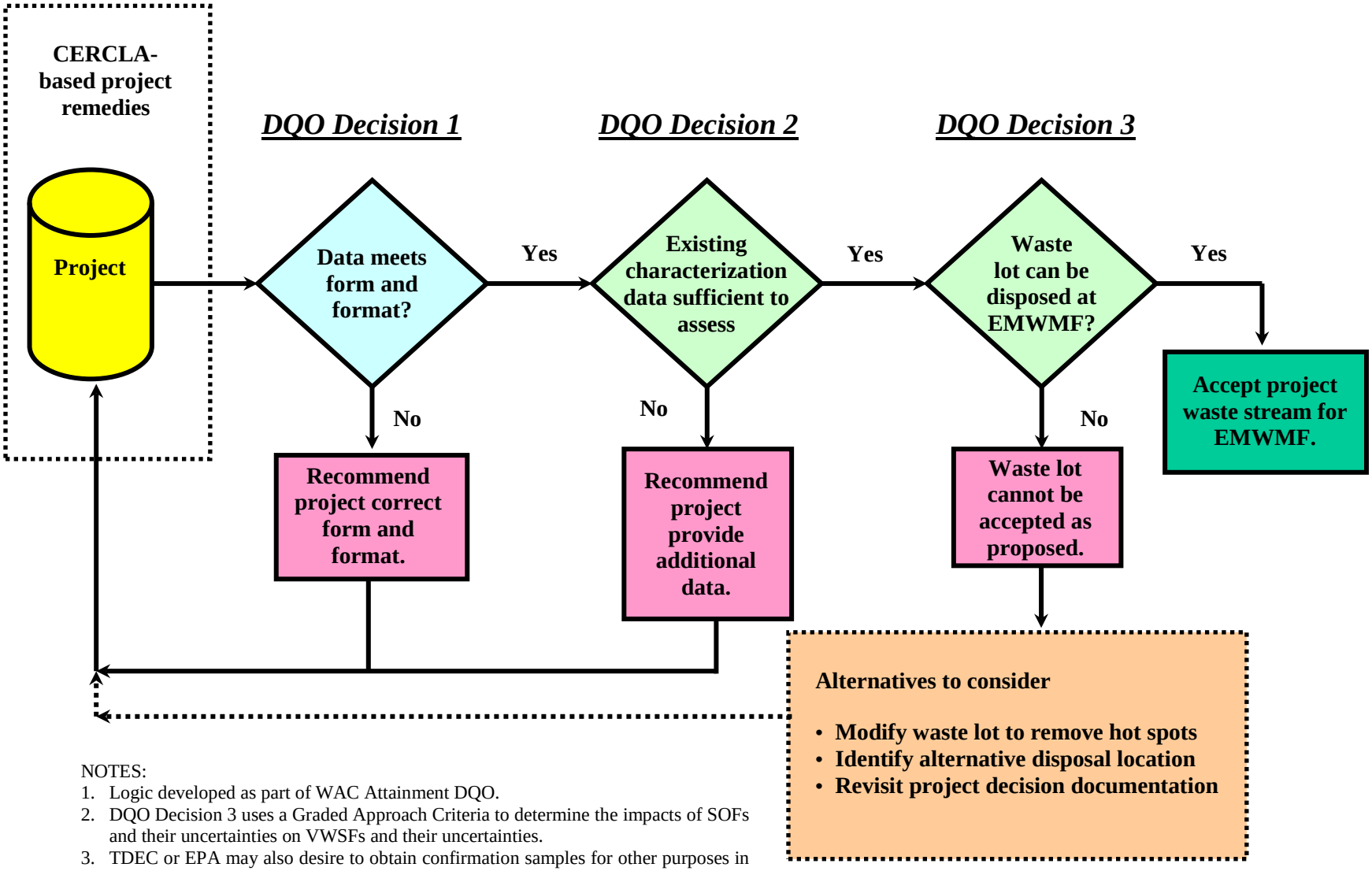


Fig. 1. Generic waste attainment process.



NOTES:
1. Logic developed as part of WAC Attainment DQO.
2. DQO Decision 3 uses a Graded Approach Criteria to determine the impacts of SOFs and their uncertainties on VWSFs and their uncertainties.
3. TDEC or EPA may also desire to obtain confirmation samples for other purposes in DQO Decision 3.

Fig. 2. WAC DQO decisions.

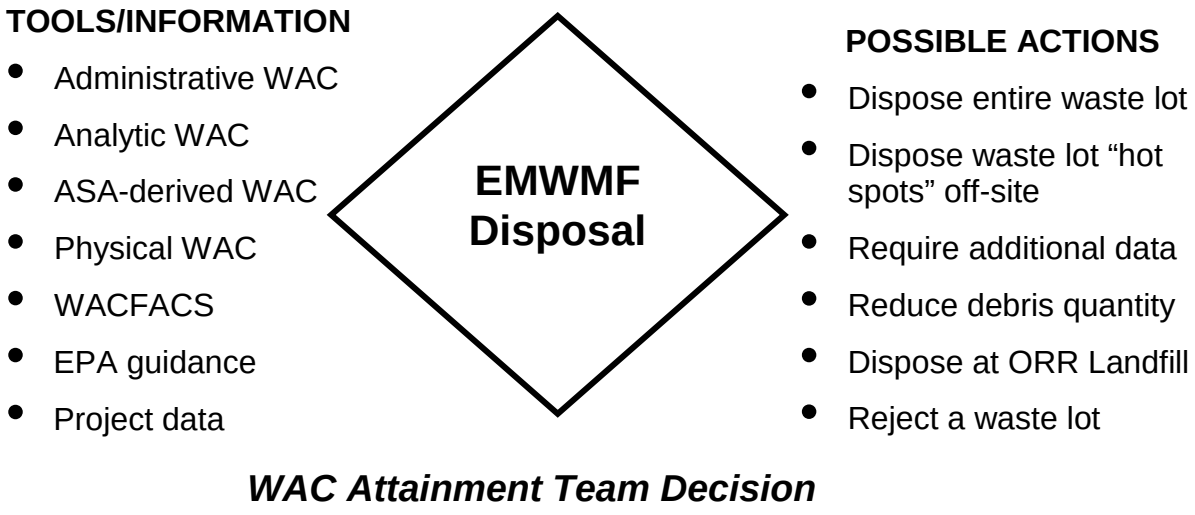


Fig. 3. WAC Attainment Team decision logic.

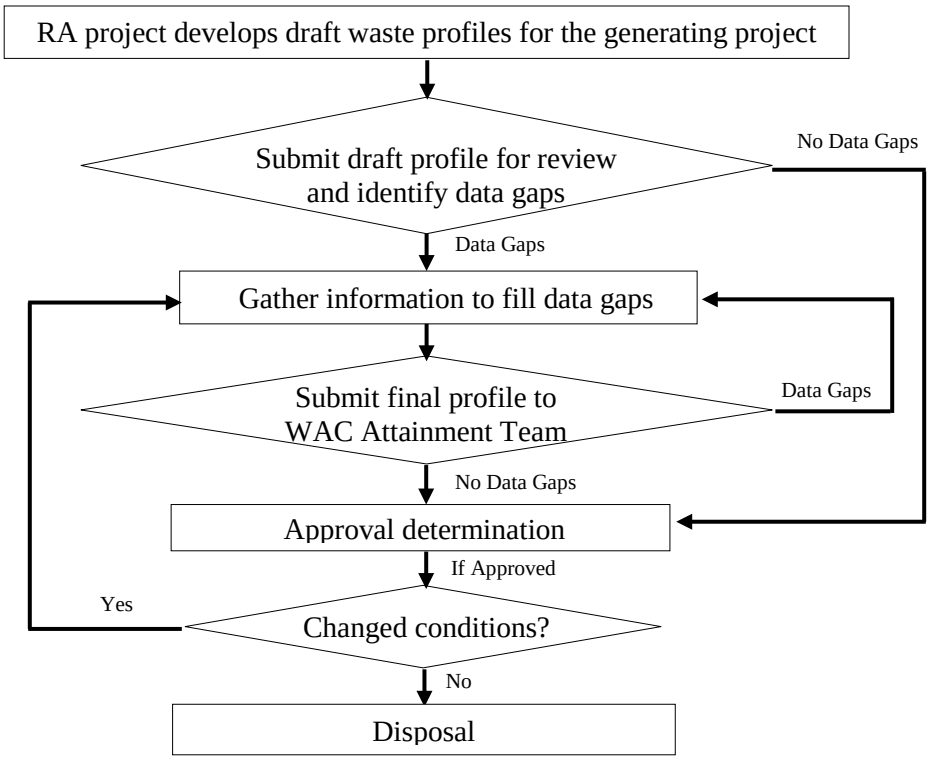


Fig. 4. EMWMF WAC Attainment Team waste approval process.

3.2.2 Data Collection and Analysis

Proper WAC attainment requires the RA Project to: (1) collect appropriate data in accordance with approved sampling and analysis plans (SAPs), (2) analyze the data in a consistent and rigorous manner, and (3) formulate plans to mitigate any data insufficiencies. A flow diagram of the overall data evaluation process is presented in Fig. 5. Steps 1 through 4 relate to the RA Project's collection of data and evaluation of the data to determine which WAC constituents are SRCs. Steps 5 and 6 relate to analysis of the data performed by the RA Projects to produce the inputs required by WACFACS. WACFACS is a Monte Carlo statistical analysis program that is the principal analytical tool used by the WAC Attainment Team to support DQO decisions and calculate the expected value and its uncertainty of the SOFs and volumes for the waste lots and of the VWSF for EMWMF. Steps 7 and 8 relate to the identification of data gaps and their mitigation, either prior to RAs, during RAs, or both.

Appendix C of the *WAC Attainment Plan* provides key guidance for data collection, data analysis, and formulation of sampling plans necessary for proper data quality assessment (DQA). RA Projects should apply (1) the EPA DQO process (EPA/240/B-06/001) to define sampling requirements, (2) EPA-approved sample design and data collection guidance (EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection*) and software approaches (e.g., *Visual Sample Plan* [PNNL] and *Spatial Analysis and Decision Assistance* [SADA, latest revision]), and (3) the EPA DQA process (EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide* and EPA/240B-06/003, *Data Quality Assessment: Statistical Tools for Practitioners*) and software approaches (e.g., *ProUCL Version 4.00.05 User Guide* and *ProUCL Version 5.0.00 Technical Guide* [EPA/600/R-07/038 and 041], *JMP Statistical Discovery Software* [SAS], and *QND-PERT Beta UCL-95: Upper 95th Confidence Interval Calculations for a PERT Beta PDF* [Redus and Associates]).

Appendix E of the *WAC Attainment Plan* details the development of the DQOs to be used to assess compliance with the EMWMF WAC using the data collected.

Information generated from these processes is also delineated in approved WHPs, or other equivalent documentation as approved by the FFA parties. WHPs are developed independently from waste profiles. It should be noted that EMWMF waste profiles cannot be formally approved or shipped unless the applicable WHP has been approved by FFA parties. In some unique cases, the WAC Attainment Team may issue a "Recommend for Approval" letter for EMWMF waste profiles in advance of an approved WHP. These conditions are evaluated on a case-by-case basis and require DOE authorization.

These plans may be referenced in waste profiles as part of their CERCLA and other documentation. Waste profiles must provide sufficient information to independently evaluate any results generated and conclusions drawn regarding compliance with WAC Attainment requirements. WHP sampling requirements should be viewed as necessary characterization requirements. Should data gaps be discovered, either as a result of unexpected sample results or incomplete DQOs within the WHP (e.g., due to discovering new process knowledge), additional data will be required to meet the EMWMF DQOs.

Additional useful guidance for properly characterizing wastes for chemical and radioactive content can be found in the following documents:

- UCOR-4188, *URS | CH2M Oak Ridge LLC Waste Characterization Plan, Oak Ridge, Tennessee*
- UCOR-4189, *URS | CH2M Oak Ridge LLC Quality Assurance Plan for Environmental Characterization and Monitoring, Oak Ridge, Tennessee*
- DIR-UCOR-2010, *Characterization and Waste Profile Administration for Environmental Management Waste Management Facility Waste*
- PROC-ES-1000, *Process for Obtaining Characterization and Analytical Support*
- PROC-TR-4551, *Radiological Characterization of Surface Contaminated Objects*

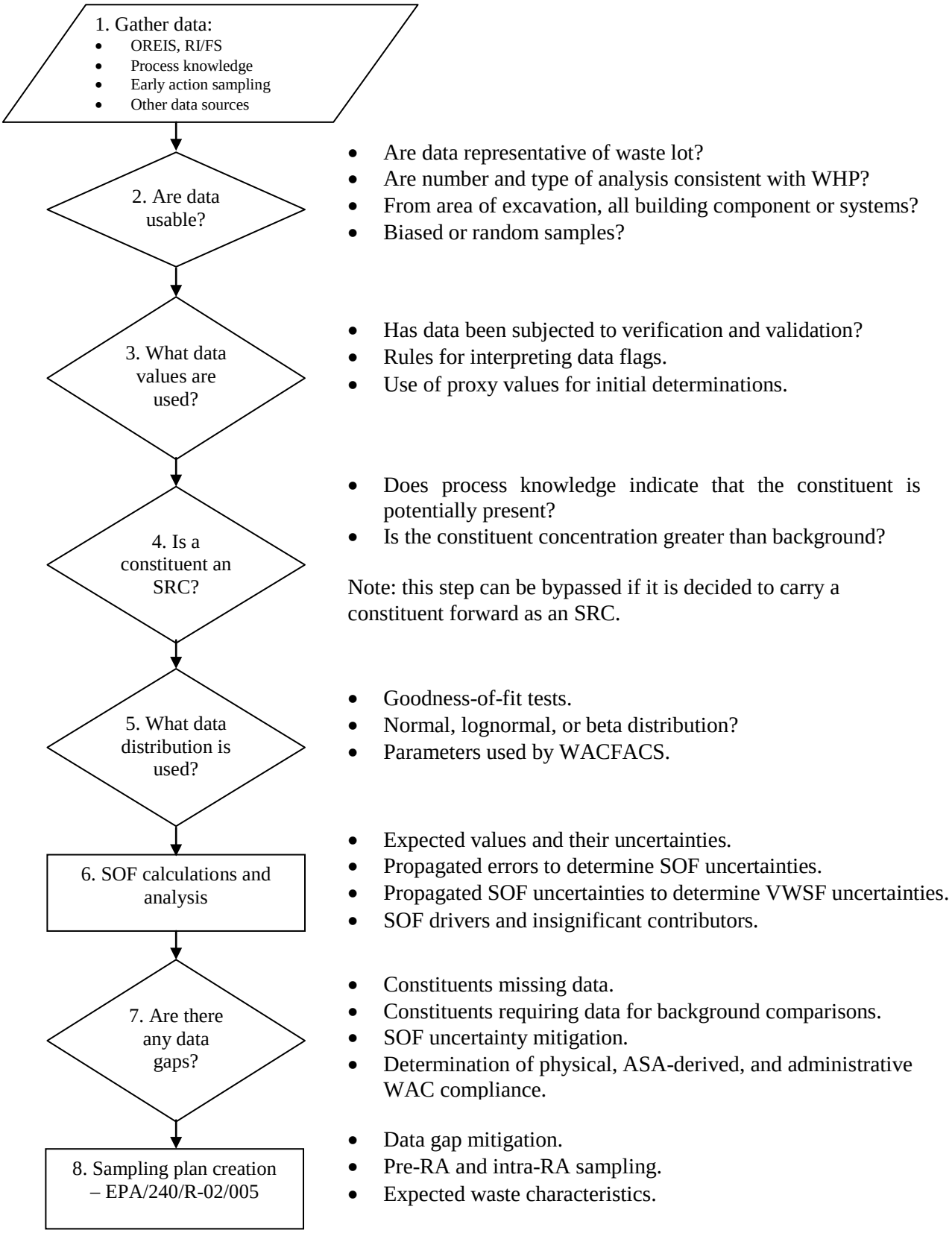


Fig. 5. Overall data evaluation flowchart.

OREIS = Oak Ridge Environmental Information System
RI = remedial investigation

3.2.3 Identification of RA Project SRCs

An SRC is a chemical or radionuclide constituent of concern that has a WAC limit and is present in a waste lot in concentrations that are above background levels. Some SRCs are used to evaluate analytic WAC compliance. Other SRCs are those associated with RCRA and TSCA land disposal restriction (LDR) compliance or safety basis requirements. SRCs are also used to assess whether special waste handling provisions are warranted to maintain the EMWMF operating basis.

To determine whether a waste constituent is an SRC, data for the constituent must be available and representative of the wastes to be disposed. The sources of these data can be analytical data from past CERCLA investigations, which are typically found in Oak Ridge Environmental Information System (OREIS), or from other investigations, such as sampling done to support removal actions or remedial designs. Data can also be anecdotal, such as from process knowledge associated with a facility or site, or from established relationships of contaminants.

RA Projects are strongly encouraged to involve project Environment, Safety and Health (ES&H) and other support personnel to aid them in determining SRCs. Project radiological support should be consulted when developing process knowledge and anecdotal evidence arguments for radionuclides, project industrial hygienists should be consulted when developing similar arguments for chemical contaminants, and project environmental compliance personnel should be consulted for RCRA- or TSCA-compliance determinations. Department of Transportation specialists are also critical inputs to sampling requirements for SRCs in order to make defensible and complaint shipping determinations. Also, since materials of construction are often issues for waste lots (especially D&D waste lots), project engineers can often assist in efforts to bound concentrations of various elements within construction materials.

The WAC Attainment Team will base decisions concerning SRCs largely on analytical data; however, process knowledge, as provided by the project team, and comparisons to background concentrations or detection rates are also important. In general, any constituent with a significant detection is to be considered an SRC. Section C.2.4 of the *WAC Attainment Plan* provides additional information concerning SRC determinations.

Occasionally, SRCs may be identified in CERCLA wastes that are not on the list of contaminants for which analytic WAC have been calculated. Also, projects may, from time to time, desire to take waste-lot-specific measurements of soil-to-liquid partition factors (K_d) to assess the waste's actual leaching potential relative to the assumed, conservative K_d values used to develop the final analytic WAC. In such cases, new or waste-lot-specific analytic WAC must be developed to ensure that the waste being placed at EMWMF will not pose a risk to the public beyond that allowed in the ROD and articulated in the *WAC Attainment Plan*. It is the project's responsibility to review its SRCs against the list of radionuclides and chemicals for which analytic WAC have been approved. Table A.1 is maintained by the WAC Attainment Team, provides an up-to-date listing of all approved WAC, and is available on the UCOR Intranet and UCOR external home page. If a radionuclide or chemical SRC for a waste lot does not have an analytic WAC, then it is the project's responsibility to contact the WAC Attainment Team and request a new analytic WAC be developed. Since FFA parties must approve all revised or new analytic WAC, advanced notification is advised if schedule delays are to be avoided.

In such cases, analytic WAC will be calculated by the WAC Attainment Team using the prescribed process of the *WAC Attainment Plan*. In general, the same codes and procedures that were used to develop the WAC given in the ROD (DOE/OR/01-1791&D3), and consistent with Appendix E of DOE/OR/02-1637&D2 and in Chap. 2 of DOE/OR/02-1637&D2/A1, will be used. However, other codes and procedures could be used if they are equivalent and are approved by the FFA parties. Following the process described in detail in

Appendix B of the *WAC Attainment Plan* will ensure that any WAC developed for new contaminants and waste-lot-specific WAC will have the same basis as the WAC given in Appendix A of the *WAC Attainment Plan.*

3.3 WASTE LOT DECISIONS

Waste lot decisions will be based upon assessments of the data provided by the RA Projects in the waste lot profiles against the WAC for EMWMF. These assessments will be summarized using the "Waste Lot Assessment Checklist" in Appendix B. Projects are strongly encouraged to assess their own proposed profiles against this checklist prior to submitting profiles to the WAC Attainment Team for review.

The actual WAC Attainment Team decision for approval, recommendation for approval, suspension, or rejection of a waste lot will be communicated using Appendix C, "EMWMF WAC Attainment Team Waste Lot Decision Form" (the Form). The Form will be disseminated to the RA Projects, the EMWMF Project, DOE, and regulators once an evaluation is complete. The Form will clearly identify the RA Project name, WACFACS identification number, volume, and other information provided by the project. The WAC Attainment Team will then indicate whether the waste lot is "approved," "recommended for approval," "suspended," or "rejected." If "approved" or "recommended for approval," the Form may contain conditions for approval (e.g., "approved based upon project plans to segregate hot spots in accordance with the project Waste Management Plan"). If "suspended," the Form will delineate the reason for suspension and the steps that are necessary to take to lift the suspension. If "rejected," the Form may indicate any required additional information necessary for approval of the waste lot or observations regarding the potential for some of the proposed wastes to be acceptable as a separate waste lot. The Form consists of three main fields:

- Decision Summary
- Key Assumptions
- Conditions of Approval

Appendix C details the content typical of each field on the Form. The WAC Attainment Team Manager, or designee, will sign the cover letter transmitting each Form after consultation with the WAC Attainment Team. In instances where DOE determines that FFA party concurrence with a waste lot approval decision is desirable, the WAC Attainment Team will first issue a "Recommended for Approval" decision to DOE. Upon receipt of FFA party concurrence, the WAC Attainment Team will issue a subsequent "Approved" decision to the waste lot requester.

Waste classification in the state of Tennessee is applied on a container-by-container basis. In instances where Class C waste is expected to be generated, profiles will be required to discuss which portions of the waste lot are expected to be Class C waste, and ADPs will be required to discuss the specific methods that will be used to ensure no individual containers are greater than Class C wastes.

3.3.1 Assessing Waste Lot Compliance with Analytic WAC

Once the list of SRCs has been determined, the next step is to analyze the data to determine the representative expected concentrations and their uncertainties to make the determination of whether wastes are acceptable for disposal at EMWMF and whether additional analytical data are needed to confirm this initial assessment, better estimate the expected concentrations in the wastes, or both. The distributions of the data populations must be determined and descriptive statistical parameters calculated for use in WACFACS. Figure 6 diagrams the overall data distribution analysis process.

The following lists the specifics of WACFACS:

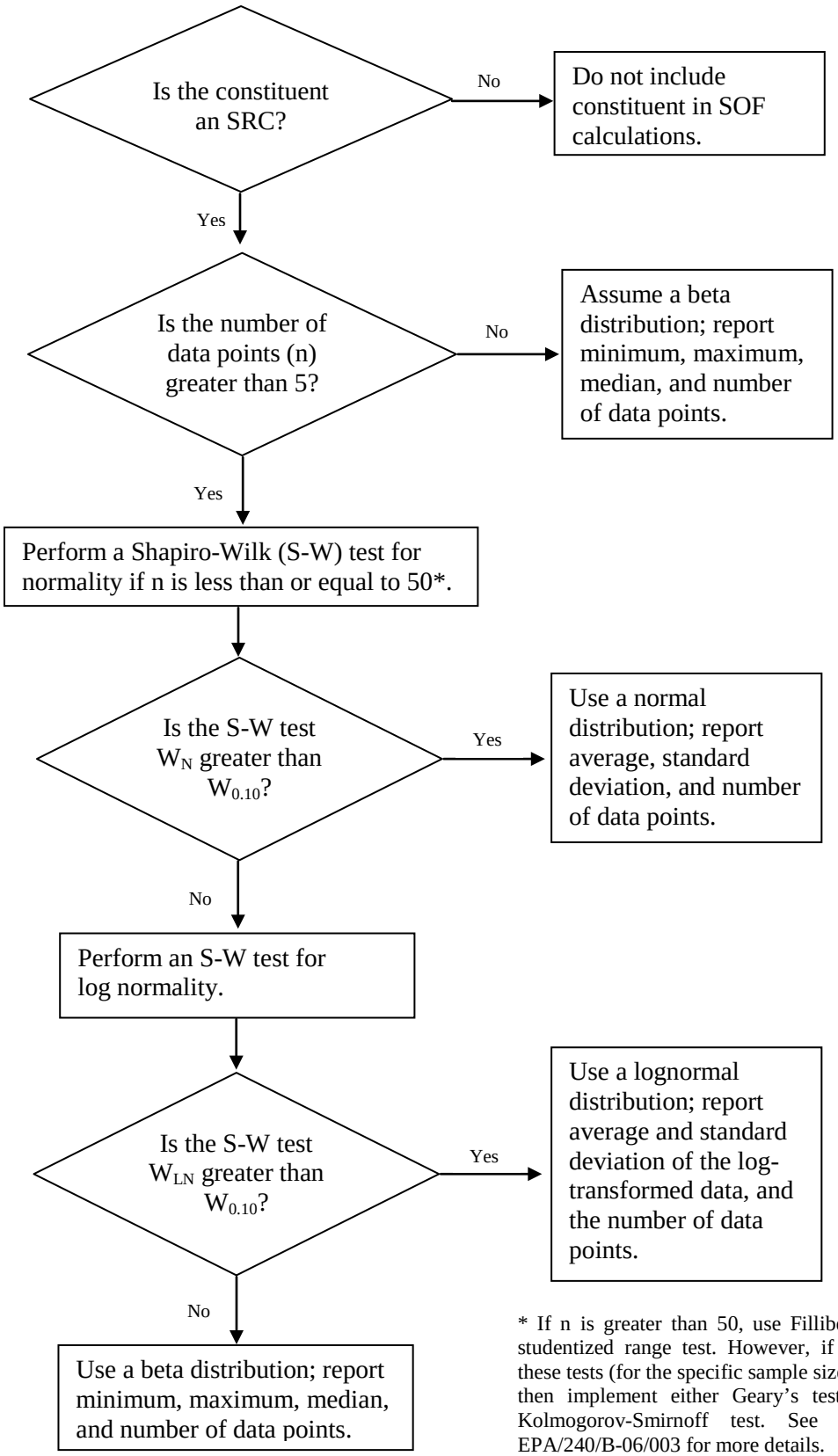
- WACFACS inputs are generated by RA Projects using historical and current databases, e.g., OREIS and the WGF Project volume databases, as supplemented by RA Project input.
- WACFACS is used to address specific key issues and decisions based upon WAC attainment DQO requirements. WACFACS follows EPA policy to use Monte Carlo Analysis (MCA) probabilistic techniques with environmental data.
- WACFACS outputs include the SOF and VWSF at EMWMF. In order to manage uncertainty, WACFACS combines the inputs and their uncertainties to propagate the uncertainties through the SOF and VWSF calculations.

For any specific waste lot evaluated by the WAC Attainment Team, the primary parameters of interest are the expected volume, the expected SOF, the expected VWSF, and their associated uncertainties. These parameters are calculated by WACFACS using RA Project inputs. Appendix D of the *WAC Attainment Plan* provides an in-depth discussion of the bases for WACFACS, its architecture, and its concept of operations. Details of these parameters and WACFACS output are given in Chap. 4 of the *Implementation Plan and User's Guide for the Waste Acceptance Criteria Forecasting and Analysis Capability System (WACFACS) Version 1.0* (BJC/OR-1089).

Using these parameters, WACFACS first calculates RA Project SOFs and their uncertainties. Then WACFACS uses these SOFs and uncertainties to calculate the VWSF and its uncertainty. Under the EMWMF ROD, the carcinogenic VWSF at closure must be at or below 1.0 within a prescribed confidence limit to demonstrate that remedial action objectives are met.

SOFs are calculated for all SRCs with analytic WAC limits and, conversely, constituents that are not SRCs are excluded from SOF calculations. As stated previously, generators must screen all waste lot SRCs against the current Table A.1, Analytic WAC Limits, published on the UCOR webpage to determine which SRCs have analytic WAC limits. In cases where a waste lot contains SRCs not already listed in the revised Table A.1, the generator must notify the WAC Attainment Team in order to obtain a new analytic WAC prior to the approval of the waste lot. It should be noted that new analytic WAC require the approval of DOE, EPA, and TDEC, and have typically taken a month or more to obtain. Projects are therefore cautioned to screen their SRCs against the revised Table A.1 early in the process of creating their waste lot profile.

Once the SOFs and their uncertainties are calculated, it is possible to determine which contaminants are significantly affecting the waste lot's SOFs and their uncertainties. In general, any contaminant with a concentration greater than 1% of an analytic WAC limit and that contributes greater than 1% of the final expected or upper confidence limit (UCL) SOF can be considered a significant contributor to the SOF calculations.



* If n is greater than 50, use Filliben's statistic or the studentized range test. However, if critical values for these tests (for the specific sample size) are not available, then implement either Geary's test or the Lilliefors Kolmogorov-Smirnoff test. See the guidance in EPA/240/B-06/003 for more details.

Fig. 6. Data distribution analysis.

The VWSF is calculated to account for the fact that not all waste lots will contain the same volume of waste. The VWSF is the sum of all the SOFs for each waste lot placed, or anticipated to be placed, in the disposal cell, with each individual lot's SOF multiplied by the volume of the waste in that lot and then divided by the total projected volume of waste for the EMWMF. The *WAC Attainment Plan* specifies that waste lot decisions be based upon 3-year VWSFs. Therefore, the WAC Attainment Team will calculate the VWSFs using three sets of information:

1. The actual volumes of in-cell material and their concentrations, plus any suitable fill material necessary for operational purposes
2. The waste volumes from the WGF projected for the current fiscal year and the following 2 years
3. The volumes and concentrations of any waste lots under consideration for disposal

Other time periods of interest can be used to calculate VWSFs, but the use of such numbers is limited to planning purposes only.

The 90% UCL (UCL_{90}) is the measure of merit selected by the FFA parties for the VWSF. The UCL_{90} is the value for which 90% of the time the expected VWSF is less than 1 or, equivalently, 10% of the time the expected SOF is greater than 1. Using the MCA approach, WACFACS employs simulation software (*@RISK, Risk Analysis Add-In for Microsoft Excel*, Palisade). A Bayesian updating approach is applied in estimation of the SOF and the VWSF, and the techniques identified in the *JMP Statistical Discovery Software* (SAS) and the "Bayesian Approach for Data Fusion in Waste Characterization" (Redus, K.S.) are applicable.

If the UCL_{90} of the VWSF for waste volumes projected over the 3-year period is less than 1, the waste to be placed in the cell meets the criteria and the WAC Attainment Team is authorized to approve a waste lot. In cases where the VWSF marginally exceeds 1 using in-cell VWSFs, the waste lot SOFs, and the 3-year forecasted VWSF, it may still be desirable to dispose of that waste lot as proposed. In such cases, the WAC Attainment Team will propose a variance to DOE and, if DOE concurs, will seek a variance with the FFA managers. The waste lot will be accepted as proposed, only if the FFA managers concur.

If an analysis of the output of the VWSF calculations from WACFACS indicates the uncertainty of a waste lot's SOF significantly contributes to the UCL_{90} VWSF, the significant SOF contributors will be examined to determine whether additional samples are needed to mitigate the uncertainty in their expected concentrations. The decision to obtain additional samples for this purpose will utilize a graded approach under which the cost and risk of obtaining the data is balanced against the desire to minimize the difference between the expected mean VWSF and its UCL_{90}. Alternatively, all or some of the waste in the proposed waste lot could be segregated for off-site disposal.

To declare analytic WAC SOF calculations complete, the underlying data in the controlled data set must be complete and verified to be accurate in its determinations of waste lot expected concentrations to make accurate predictions of the VWSFs. Any additional data required to meet these goals are considered a data gap.

Because one of the significant fundamental parameters upon which the VWSF calculations are based is the volume projections, it is important that the volumes input into WACFACS be the most recent and accurate predictions possible and that actual disposed volumes are within the expected range used for the waste lot approval. WACFACS input volumes should be drawn from the latest WGF data; if the project has produced more accurate volume estimates during the development of the waste profile, then the WGF should be updated to reflect these revisions prior to the submission of the final WACFACS input sheet.

Once a waste lot is approved, it is still possible for actual field conditions to be significantly different from those assumed during the planning stages. Therefore, waste lot approvals will include the expected range of volumes to be disposed under that waste lot, expressed as the 5% lower confidence limit, the expected volume, and the 95% upper confidence limit (UCL_{95}) of that volume range. If the actual volumes to be disposed at EMWMF change significantly and exceed the UCL_{95}, the RA Project must revisit the WHP, and the VWSF must be recalculated to determine the impact on the VWSF. If not, the RA Project will be re-authorized to dispose the higher volumes. If, however, the volume estimate changes adversely impact the VWSF, then appropriate mitigation measures must be taken (for example, the RA Project may have to disposition the additional wastes elsewhere).

Appendix D.2 of the *WAC Attainment Plan* provides detailed discussion of the input requirements into WACFACS, and Appendix D.3 of the *WAC Attainment Plan* provides discussion for computing the outputs (SOF, VWSF, and UCL_{90}, and K_d) of WACFACS. Given the complex nature of these statistical tests, and given the importance of correctly characterizing project wastes, RA Projects are strongly encouraged to employ the services of one or more individuals familiar with statistics and waste characterization practices (e.g., individuals familiar with data interpretation for CERCLA risk assessments, waste management personnel, statisticians).

3.3.2 Assessing Waste Lot Compliance with Administrative WAC

Administrative WAC are derived from regulatory agreements. Therefore, the sole means of obtaining a variance to an administrative WAC is to obtain a formal exemption within the CERCLA documentation for the project (e.g., an exemption from RCRA LDR within a ROD is an acceptable means of complying with the requirement to meet RCRA LDRs).

Many administrative WAC can only be physically verified once the wastes are generated (e.g., the prohibitions against free liquids). In such cases, WAC Attainment Team verification activities are limited to ensuring the remedial action plans, waste management plans, or other RA Project documentation contain statements attesting that these requirements will be met during the generation of wastes, and if necessary, the ADPs contain provisions to ensure compliance.

However, one administrative WAC is verified directly by the WAC Attainment Team—the assurance that the average uranium concentrations in the cell are less than or equal to 714 pCi/g or 1030 parts per million (ppm), whichever is more restrictive. Because this WAC relates to the average concentrations within the entire cell within the same 3-year period used for analytic WAC compliance, it is possible for individual waste lots to exceed these levels and still comply. However, because this WAC does not include any credit for treatment or reduced leachability without the express consent of the FFA parties, it is necessary to closely manage these concentrations to ensure any short-term exceedance will be returned to acceptable levels prior to closure.

Another administrative WAC warranting a more detailed discussion is the requirement that wastes remain sub-critical during all phases of waste disposal. EMWMF has generated a Nuclear Criticality Safety Determination (NCSD) (NCSD-YT-EMWMF-0012, *Nuclear Criticality Safety Determination EMWMF Operations*) covering all EMWMF Operations, including disposal of wastes. Although the *WAC Attainment Plan* does include some default benchmarks below which criticality safety is assumed, the NCSD includes additional requirements deemed necessary to ensure compliance with DOE Orders. Details related to the implementation of the requirements of NCSD-YT-EMWMF-0050 (*Nuclear Criticality Safety Determination, Burial of Process Equipment and Building Debris at the EMWMF*) are given in Appendix A.

One other aspect of administrative WAC compliance is compliance with RCRA and TSCA LDRs. Though RA Projects are responsible for certifying that wastes meet LDRs, the WAC Attainment Team will independently verify that each waste lot meets LDRs. For this verification assessment, the WAC will review and examine the analytical results and other waste profile documentation provided by the project teams.

In cases where LDR compliance cannot be assessed using process knowledge and anecdotal evidence alone, each RA Project will provide the following documentation, consistent with EPA LDR guidance, to the WAC Attainment Team so that an independent assessment can be performed:

- Tabulated analytical results (total concentrations, toxicity characteristic leaching procedure [TCLP] results, derived TCLP concentrations using any "rule of 20" proxy values, polychlorinated biphenyls [PCB] concentrations)
- Description of process/process knowledge – stating why waste is not a characteristic or listed waste
- Treatment methods, if required, used to treat each waste lot
- RCRA and TSCA compliance data for treated hazardous/PCB waste

Profiles for waste lots containing listed or characteristic waste must demonstrate how LDRs will be met, including evaluations of waste lot data against underlying hazardous constituents.

If project CERCLA decision documentation specifies that no listed waste codes apply to an RA, then referencing the statements made in the CERCLA decision documentation may be sufficient evidence, provided site conditions have not changed or compiled process knowledge does not indicate listed waste issues. If CERCLA decision documentation does not specify listed waste determinations, then the profile must include an analysis of building activities and chemicals used that could potentially invoke listed waste codes, and must specify whether listed waste could be generated within the planned activities for that waste lot. In either case, RCRA/TSCA determinations must be performed by appropriate personnel (e.g., Environmental Compliance personnel assigned to support the generating project) and the individual who performed these analyses for the waste lot must sign profiles containing such analyses.

Evaluations of most RCRA characteristics are relatively straightforward. However, evaluations of waste lots against the TCLP criteria do involve further discussion.

- The WAC Attainment Team will review total concentrations and TCLP data, if available. If TCLP data indicate concentrations for hazardous substances to be below RCRA characteristic limits using EPA guidance for the evaluation of RCRA data, then the waste lot will be considered to meet the WAC.
- If TCLP data are not available, the WAC Attainment Team will request the project team to apply the 20-times rule to solids (divide total concentrations of each constituent by 20, reflecting a 20 to 1 weight ratio of extraction fluid to solid sample portion) and submit tabulated results to the WAC Attainment Team. If theoretical concentrations are less than the RCRA characteristic limits, then the waste is deemed acceptable for disposal at EMWMF.
- If theoretical concentrations of the constituents are greater than LDR limits, the WAC Attainment Team will require the project team to acquire TCLP data or request the project to consider disposal at another location.

In cases where wastes require treatment in order to meet LDRs, it must be demonstrated that an approved treatment methodology has or will be completed prior to disposal of the affected wastes. If an outside

vendor is to perform the activity, then the credentials of that vendor to perform the treatment must be presented, along with a description of the selected technology. In cases where the treatment will be self-performed, an approved waste treatment plan must be referenced and summarized. Such treatment plans must be approved by both Environmental Compliance and Engineering personnel, and may also require Legal approval if there are any questions regarding the selected remedy or specific methodology meeting RCRA LDRs. After successful treatment, the profile must include clear evidence that the selected treatment standard has been met. For visual determinations (i.e., alternative treatment standards for hazardous debris), a compliance verification checklist shall be provided with signatures. For LDR treatment activities that must meet a numerical standard, the profile shall include a summary table and associated analytical data that demonstrates all LDR numerical standards have been met, including underlying hazardous constituents.

Additional useful guidance in making RCRA and TSCA compliance determinations is given in UCOR-4188.

If insufficient information exists to assess compliance with any administrative WAC, then this WAC cannot be verified. It is anticipated that such a situation may arise during reviews of preliminary RA Project information. Should such a data gap exist in any final waste profiles (i.e., profiles submitted for formal approval), that waste lot would be rejected as not meeting the WAC. In all cases, any missing data necessary to verify compliance with administrative WAC will be noted to the RA Projects as a data gap.

3.3.3 Assessing Waste Lot Compliance with ASA-Derived WAC

For ASA-derived WAC compliance, the RA Projects must use UCL_{95} concentrations of radionuclides to calculate the associated SOF. This will allow a very conservative assessment of compliance with the ASA that forms the radiological basis of this WAC limit. In cases where measured concentrations are not available for all radionuclides known or suspected to be present at an RA site, it is acceptable for RA Projects to subtract the concentrations of measured or inferred radionuclides (e.g., daughters in secular equilibrium) from gross alpha and gross beta concentrations. The remainder of each can then be divided by the most restrictive unmeasured alpha or beta-emitting radionuclide that is suspected to be present in the waste lot. These fractions are then summed with the fractions of measured or inferred radionuclides to calculate the ASA-derived SOF.

If it is not possible to follow this procedure and sufficient process knowledge and anecdotal evidence does not exist to state that all unmeasured radionuclides are less than 1% of their ASA-derived WAC, this WAC cannot be verified. In such cases, the necessary information will be noted as a data gap.

In addition to the calculation of this SOF, RA Projects are to report the UCL_{95} concentrations of any chemicals in their wastes that have 40 *Code of Federal Regulations* 302.4 reportable quantities. EMWMF Operations will manage the allowable open operating face of the cell and the allowable volumes of waste that can be staged using these concentrations and the ASA-derived SOF. Maximum concentrations of chemicals may be reported in lieu of UCL_{95} concentrations for chemicals.

Since it is possible for release calculations to credit certain containerized wastes and solid waste forms, any contaminant present in such wastes should be noted as such. If an extreme concentration is present in a solid form (e.g., very high lead concentrations in solid brass), but is also present to a lesser degree in dispersible wastes (e.g., also present in lesser concentrations in associated soils), then this information should also be noted. In such cases, separate tables may be needed to present the ASA-derived SOF for both non-dispersible and dispersible waste forms.

It should be noted that ASA-derived SOF greater than 0.05 in dispersible waste forms will result in a need to decrease the allowable operating cell face. In such cases, the generators must coordinate with EMWMF Operations in order to ensure adequate preparation is made to receive these wastes. In accordance with the HAD, uncontainerized dispersible waste lots shall not exceed an ASA-derived WAC SOF of 1.0. <HAD>

3.3.4 Assessing Waste Lot Compliance with Physical WAC

The physical WAC are the only requirements that the WAC Attainment Team does not verify compliance. These WAC were developed by EMWMF Operations and are tied either to operational considerations or to the ability of EMWMF Operations to guarantee the long-term stability of the cell cover. If desired, RA Projects can negotiate variances to these WAC or request clarification from EMWMF Operations (e.g., if it is desired to dispose of an oversized or overweight item intact). In all cases, EMWMF Operations is responsible for verifying compliance with the physical WAC. Therefore, the WAC Attainment Team is responsible to confirm RA Projects' plan either to meet the physical WAC, or have negotiated variances with EMWMF Operations.

Occasionally there is need to implement a physical WAC variance after the approval of a waste lot. These agreements are worked out between the generator project and EMWMF Operations, and formal physical WAC variances are then produced. Because physical WAC variances do not directly involve the WAC Attainment Team, in cases where physical WAC variances are negotiated after profile approval, a formal approval of an updated profile is not required prior to shipment. Such agreements that take place after profile approval are maintained between the RA Project and EMWMF Operations.

3.3.5 Elimination of Data Gaps

The WAC Attainment Team will request additional sampling or data collection if data gaps are recognized. Typically, this would occur during the review of preliminary waste profiles, but may occur in the review of a final waste profile if aspects of WAC compliance are determined to not be sufficiently fulfilled by the RA Projects. Appendix C of the *WAC Attainment Pla*n provides guidelines for developing a SAP should additional analytical data be necessary. Such sampling plans will clearly identify any data gaps that are noted during preliminary waste profile assessments and the means of obtaining the data necessary to fill those data gaps.

Occasionally, projects determine that it would be desirable to revise information within an approved waste profile. Such instances can include the desire to add an additional waste type (personal protective equipment, secondary waste, etc.) to those already defined under the waste lot, or discovering that the waste volumes require revision. In such cases, the profile documentation must be revised to reflect the desired changed condition(s).

The WAC Attainment Team will then determine whether the requested revision will result in a significant change to any of the assessed WAC. If not, the WAC Attainment Team will communicate to the requesting project that the proposed changes are accepted. If the change could potentially affect any aspect of EMWMF Operations, the WAC Attainment Team will also communicate the change to the EMWMF Operations. In cases where the proposed change could substantially affect any of the assessed WAC, the WAC Attainment Team will either formally re-approve the revised waste lot, or inform the RA Project that the proposed change is rejected. In cases where a proposed change is rejected, the RA Projects may continue to either comply with the conditions of the approved waste profile, or seek alternate disposal alternatives.

3.4 MAINTENANCE OF TOOLS AND SYSTEMS

A primary tool used by the WAC Attainment Team is WACFACS. This program allows a Monte Carlo simulation of RA Project SOFs and the EMWMF VWSFs. As such, it is designed to enable compliance with the analytic WAC. Though the data it uses and the outputs it produces can be adapted to provide useful information for other purposes, its principal function of analytic WAC compliance must remain under strict configuration management (CM) and control.

3.4.1 WACFACS Tools

A graphical portrayal of the relation of the inputs, the outputs, the constraints, and the WACFACS process to meet the key decisions for WAC Attainment is presented in Fig.7. This graphical portrayal is called a "systems diagram" and will be used by the WAC Attainment Team as a tool to guide its activities and decision-making. The elements of the four components of the systems diagram are provided in Sect. D.1.3 of the *WAC Attainment Plan*.

Each of the elements of WACFACS requires maintenance and a measure of configuration control.

3.4.2 WACFACS Configuration Management

CM is the process of maintaining the integrity of systems and products as they evolve from specifications, through design, development, installation, and production. CM applies to all information technology hardware, drawings, documentation, computer programs, tools, and processes used on projects. For the purposes of WAC Attainment, WACFACS is the primary tool of interest. Chapter 5 of the *Implementation Plan and User's Guide for the Waste Acceptance Criteria Forecasting and Analysis Capability System (WACFACS)* provides a detailed description of CM and configuration control requirements. The requirements establish consistency among design requirements, physical configuration, and documentation throughout the operational lifecycle of WACFACS.

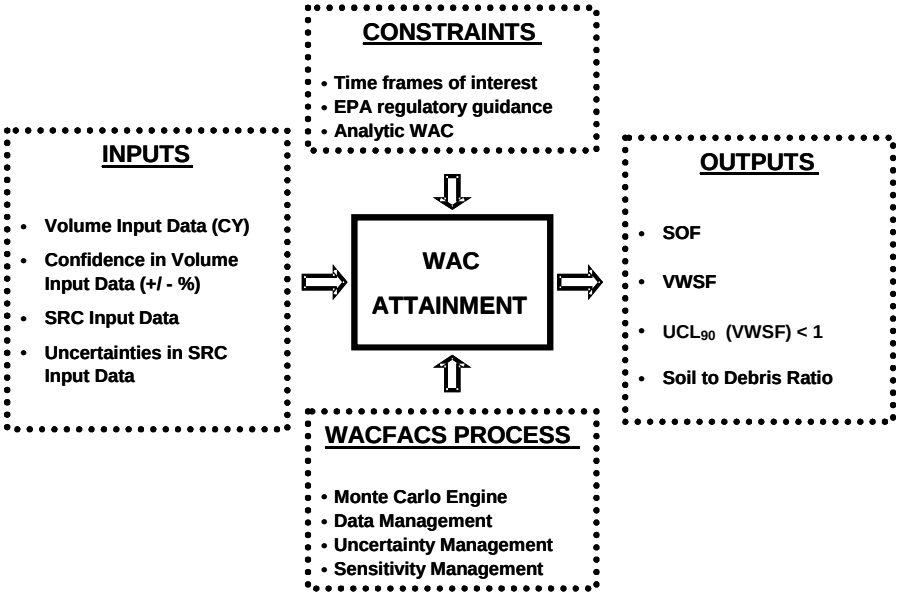


Fig. 7. WACFACS system diagram.

Critical items relevant to WAC attainment that is maintained under strict CM are:

- Waste lot identification—each waste lot established by RA Projects will be provided a unique identifier in WACFACS, known as the Waste Lot ID (WL ID). Should a waste lot be subsequently split, a new WL ID will be given to the separated waste lot. If waste lots are rejected and eventually dispositioned at a facility other than EMWMF, the WL ID will be reserved and will not be used for any subsequent waste lots. The WAC Attainment Team assigns an RA Project-level WL ID for each RA Project, e.g., the project-level WL ID for the K-25/K-27 Buildings D&D Project is 6.0. It is the responsibility of the RA subprojects to communicate to the WAC Attainment Team a list of waste lots within the RA Project-level WL ID. Appendix D, "Nomenclature for WACFACS," provides a sample listing of the waste streams considered for EMWMF disposal, as of the first quarter of fiscal year 2003, and their relevant nomenclature. This listing is intended only to illustrate the waste lot numbering process. Updated listings will be maintained within the WACFACS database.
- WGF data will be uploaded into WACFACS on a quarterly basis. The WGF has its own CM system that is maintained separately from WACFACS and is the subject of other documentation. WACFACS will take advantage of real-time updates provided through baseline change proposals. Each quarter, WACFACS will upload revised WGF volume data, including all changes provided through baseline change proposals up until the time of upload.
- SRC data provided directly by the projects from the completion of sampling, process knowledge analyses, etc., may be entered into WACFACS at any time. When waste volume estimates change in either quantity or type, the RA Projects will be reminded to also change the WGF volumes using the baseline change process (BCP) procedures. However, WACFACS is the decision tool for the WAC Attainment Team to decide whether waste lots comply with the analytic WAC. Therefore, if a project indicates that volumes will be changed within the WGF, but that the BCP simply has not been processed at the time of requiring a WACFACS determination, the WAC Attainment Team may use the project inputs in lieu of WGF data. In such cases, the WAC Attainment Team member assigned the primary responsibility for DQA will notify the WAC Attainment Team member assigned the primary responsibility for Waste Volume Management of the discrepancy. The WAC Attainment Team member assigned the primary responsibility for Waste Volume Management will be responsible for ensuring the BCP is submitted to, and processed by, the WGF to bring the two volumes back into agreement.
- At the time of the quarterly WGF upload, all volume changes from the existing WACFACS data will be noted. RA Projects with volume changes will be requested to verify which estimate, WGF or WACFACS, is more accurate. If the RA Projects indicate that the WGF volumes are in error, it is the RA Project's responsibility to complete a BCP to correct the WGF.
- Once waste is disposed at EMWMF, the EMWMF Operations is required to track actual weights and volumes of each waste lot transported to EMWMF. EMWMF Operations is also required to obtain quarterly surveys of the total volume of airspace utilized to-date within the cell. The conversion of measured tonnage at the EMWMF scales to "as-disposed volumes" is accomplished by the use of density factors supplied to EMWMF Operations by the WAC Attainment Team. On a quarterly basis, WACFACS will attain the calculated volumes of waste disposed at EMWMF by waste lot. Since suitable fill material will be needed from time-to-time to meet various EMWMF Operations' needs, the tracking of total disposed volumes of waste lots and suitable fill in EMWMF are necessary inputs into WACFACS for the total disposed volume to-date in the VWSF calculation. The sum of these calculated volumes of waste and fill will then be compared to the quarterly survey results to determine whether the two measurements are generally in agreement. If not, the survey results will be verified, and if found to be correct, the assumed densities for waste lots will require revision.

- In rare cases, two or more approved waste lots from a single RA Project must be shipped in a single conveyance as commingled waste. In these instances, the RA Project must specify the strategy for commingling waste lots within the associated WHP (or other primary FFA document) for that RA Project. Individual waste lots will still be required to be approved on their own merits, even if they are to be commingled with other waste lots during shipment to EMWMF. The WHP authorizing commingled waste shipments must detail the strategy that will be used to assemble the data, including the ASA-derived SOF and associated chemical data, from each approved waste lot into a single waste-disposal proxy lot (WPXL) under which the commingled wastes will be shipped. The WHP must also specify how the as-disposed volumes of wastes for the WPXL will be subsequently assigned within WACFACS to each individual waste lot within the commingled shipments. Because the methodology used within a WHP to assemble a commingled waste WPXL affects how the WAC Attainment Team updates WACFACS, the WAC Attainment Team must be integrated into the formulation of all commingled waste WPXL strategies and must approve the final strategy that is selected for the WHP.

The WAC Attainment Team can report the 3-year VWSF for waste-disposal approval purposes, the VWSF of the actual in-cell volumes for informational purposes, or the VWSF for volumes over any time period up to the full Life Cycle Baseline for planning purposes. Each of these can be updated on a quarterly basis, but because other time periods are limited to only informational purposes, only the aspects of the calculation for the 3-year VWSF require full CM.

3.4.3 Systems Analysis

A basic tenet of the WAC acceptance process is the use of systems analysis. The influence diagram depicted in Fig. 8 provides a systems view of waste disposition from “cradle-to-grave.” Figure 9 provides a specific illustration of the WAC Attainment Team approval process.

On the front-end, the WAC Attainment Team will engage the projects from the point of data assessment through the calculation of waste lot SOF. If approved for disposal at EMWMF, each RA Project will undergo a readiness evaluation prior to generating wastes. This evaluation will ensure that all logistics, systems, and information necessary for the successful disposal of the wastes are in place and understood.

On the back-end, the WAC Attainment Team will work with RA Projects on closeout activities and EMWMF Operations on actual disposition data in order to assure WACFACS information is kept current as discussed in CM terms.

3.5 CONTINGENCY PLANS

Although it is not foreseen that waste could be rejected for disposal at EMWMF due to improper evaluation by WACFACS or the WAC Attainment Team, it is possible that otherwise acceptable waste lots not be physically disposed at EMWMF due to circumstances germane to EMWMF Operations. Examples include: (1) weather conditions that make it unsafe for off-loading, (2) EMWMF operational circumstances, (3) vehicle inability to obtain a Waste Receipt Form, and (4) waste shipments not arriving at the scheduled time. For each of these circumstances, the transport vehicle may have to be returned to its site of origin or routed to an EMWMF staging area at the discretion of EMWMF Operations. In cases where wastes are returned to the generators, the RA Project and EMWMF Operations would coordinate for rescheduling the waste shipment for unloading. The RA Project would be responsible for providing the adequate staging area for the waste, if staging at EMWMF is not available. However, it should be noted that the WAC Attainment Team is not required to be directly involved in waste transfer activities.

Because waste lots with potentially significant variability will have anomaly detection processes included in their waste generation planning, it is expected that waste received at EMWMF will fit the description of their waste profiles. However, it is possible that upon receipt or placement of wastes on the active disposal face, potentially anomalous wastes could be discovered. Therefore, EMWMF Operations is responsible for examining the wastes during the receipt and disposal process, and to be alert for wastes that exhibit unusual characteristics. Examples include, but are not limited to, the presence of intact drums or containers in waste lots that are expected to be delivering bulk wastes or the visual identification of a significant amount of free liquids, unbreached cylinders, or strong volatile organic vapor smells from wastes that are not expected to have such contaminants.

In cases where potentially anomalous wastes are discovered, EMWMF Operations will take appropriate action to isolate the wastes. If the wastes have not been placed, the delivery conveyance will be moved to an area where it can be controlled and is out of the way of other operations. If the wastes have been placed, disposal operations will temporarily cease while the potentially anomalous waste is investigated. If needed or desired, EMWMF Operations will contact the generator and the WAC Attainment Team Manager to get a determination as to whether the wastes actually meet the profile or whether there is a potentially significant waste anomaly that has been discovered.

If the wastes are in a conveyance, the RA Project will be instructed to take the appropriate measures to return the conveyance to the RA site while the potential anomaly is investigated, unless doing so would present a threat to human health or the environment. If the wastes are already placed on the active disposal face and are an obvious and unacceptable anomaly, then the RA Project will be instructed to remove the wastes from the active waste face, unless doing so would present a threat to human health or the environment. If it is unknown whether the wastes are acceptable or not, then EMWMF can close the active operating face and open a new operating face while the investigation of the potential anomaly is conducted. The RA Project is responsible for obtaining whatever data is determined necessary to characterize the potential anomaly. If the potential anomaly is later found to fit the waste profile or is obviously within the bounds expected for that profile, then waste operations will continue without further restriction. If the potential anomaly is found to be unacceptable for any reason, the RA Project will be responsible for removing the anomaly and finding a disposition alternative, unless doing so would present a threat to human health or the environment. In cases where removing anomalous waste would present a threat to human health or the environment, a cost/benefit analysis (including the potential benefits and impacts to the environment, safety, and health to remove the anomalous waste) will be performed to help determine whether wastes should be removed or managed within EMWMF.

It is also possible that one or more assigned team members would be unavailable due to unforeseen circumstances (e.g., illness, change of employment). In such cases, it is the responsibility of the WAC Attainment Team Manager to work with appropriate UCOR Management to identify qualified replacements. Subcontractor support personnel can also be utilized to assist filling these needs while replacements are found and trained.

Finally, it is possible that the key WAC attainment tool, WACFACS, may become damaged or corrupted. In order to guard against this possibility, at least one backup version of the software and its data will be made and periodically updated. This backup will be stored in a physically separate location from the original software version and database.

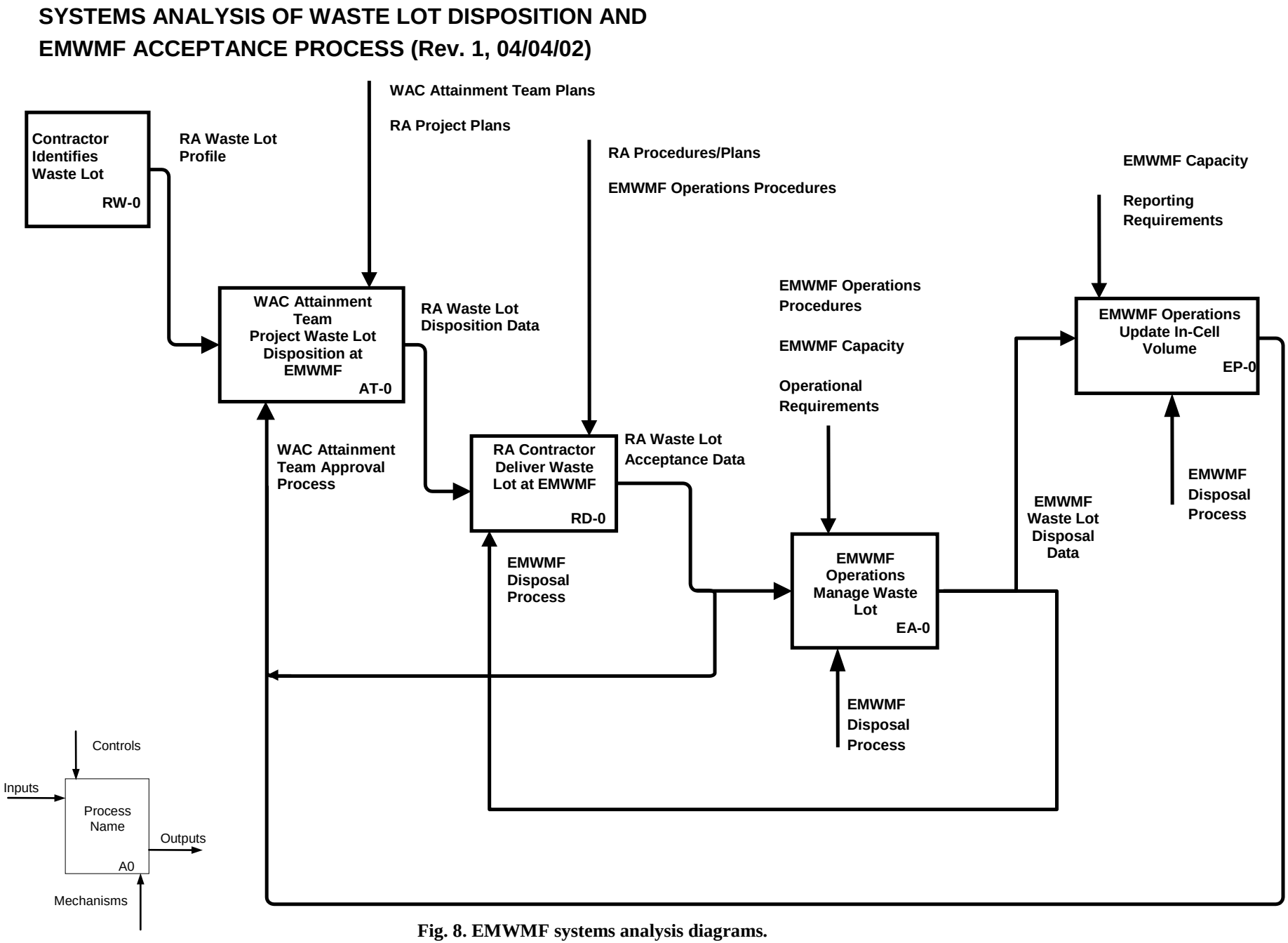


Fig. 8. EMWMF systems analysis diagrams.

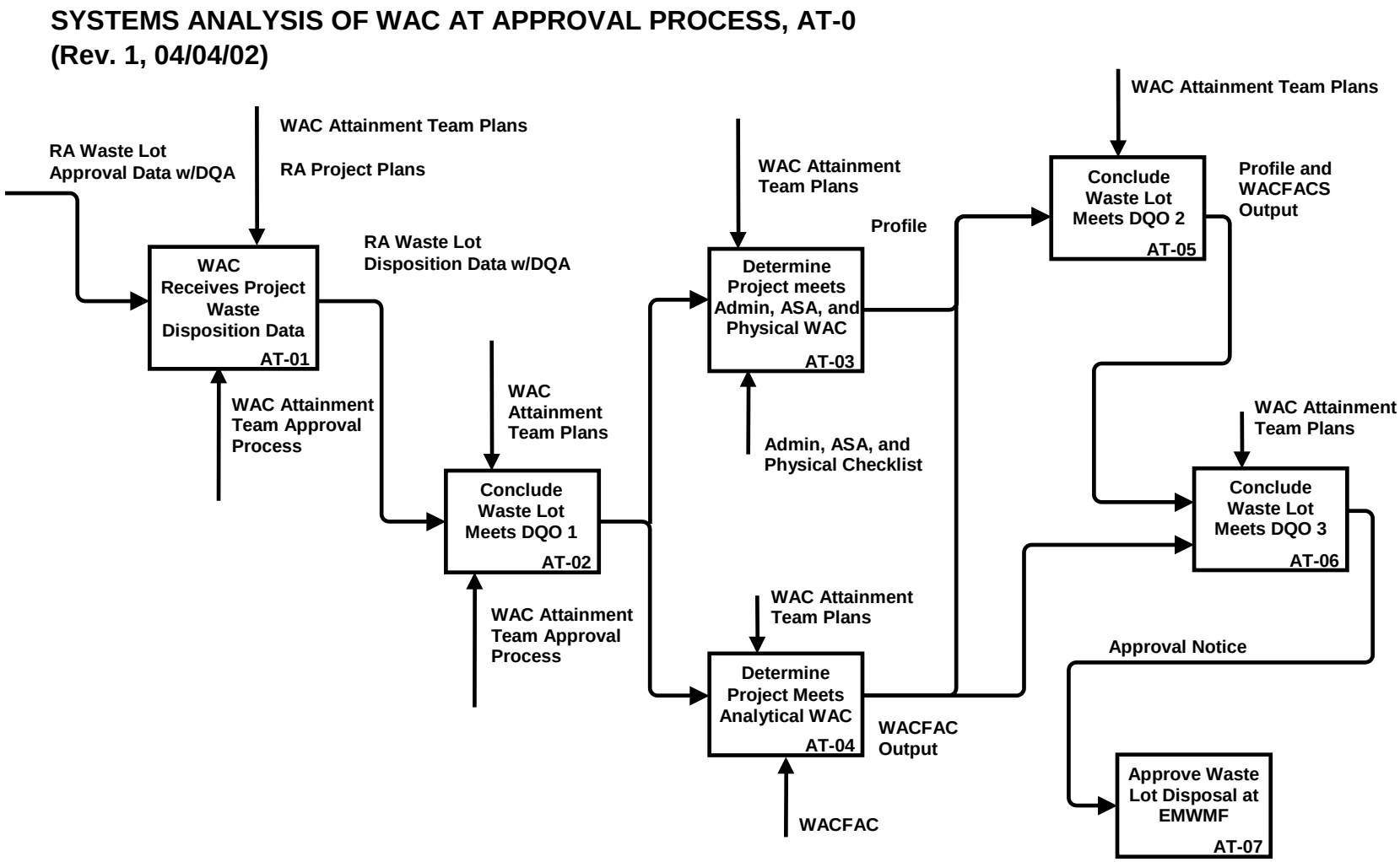


Fig. 9. EMWMF WAC Attainment Team approval process (AT-0).

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4. ROLES AND RESPONSIBILITIES

Several different entities must be integrated for the waste approval and disposal process to function properly. The sections that follow provide a summary of the roles and responsibilities for each organization. Appendix E presents a "N^2" diagram of key UCOR, UCOR subcontractor, DOE, and regulator roles and responsibilities. Most notably, EPA and TDEC oversee RAs and EMWMF Operations, including WAC Attainment Team decisions to authorize waste lots for disposal.

4.1 DOE

Generally, DOE is accountable for WAC compliance. DOE has delegated the responsibility to make WAC attainment decisions to its prime contractor, UCOR, which DOE oversees and audits.

4.2 UCOR

Within UCOR, there are several entities with WAC attainment responsibilities:

- RA Projects oversee removal actions
- Waste Disposition oversees EMWMF Operations
- The EMWMF WAC Attainment Team approves waste lots for disposal at EMWMF
- Planning and Controls provides strategic planning interfaces across all projects

4.3 RA PROJECTS

RA Projects are responsible for:

- Complying with all WAC for wastes disposed at EMWMF
- Certifying wastes meet all applicable administrative WAC or that appropriate waivers from administrative WAC have been obtained through their CERCLA documentation
- Certifying that all reported analytic WAC parameters are correct
- Certifying that the parameters used to demonstrate compliance with the ASA-derived WAC concentrations are correct
- Identifying any waste anomalies using qualified project personnel implementing waste ADPs
- Certifying that each waste shipment conforms to the description in its associated waste lot profile
- Identifying when volumes planned to be shipped to EMWMF are likely to be significantly different from the volumes provided to the WAC Attainment Team in the approved waste profile. (Note: "significantly different volumes" are those that are greater than the UCL_{95} of the volume range calculated by WACFACS using RA Project inputs)
- Maintaining record copies of the waste lot profiles and associated supporting documents as determined necessary by RA Project QA/quality control personnel

4.4 EMWMF OPERATIONS

EMWMF Operations are responsible for:

- Certifying that all remaining physical WAC have been met
- Verifying that the wastes are from an approved waste lot and that all required RA Project certifications have been made
- Employing the use of a database to track total volumes disposed for each waste lot, disposal locations, and to track the total volume of suitable fill used
- Quarterly surveys
- Exporting data to WACFACS to quantify the volumes of waste lots disposed and suitable fill used at EMWMF

4.5 WAC ATTAINMENT TEAM

The WAC Attainment Team is the prime contractor entity responsible for approving or rejecting waste lots for disposal at EMWMF. The decisions will be based upon a comprehensive and independent review of waste profiles produced by the RA Projects for each waste lot in accordance with the "Waste Profile Generic Instructions" in Appendix A. One of the purposes of the waste profile reviews is to enforce the consistent execution of the waste profile requirements in Appendix A in order to ensure that all profiles meet an appropriate level of rigor and contain defensible data upon which to base decisions. Once a waste lot is approved, the RA Project disposing wastes under that waste lot will undergo a readiness evaluation prior to generating wastes. This evaluation will ensure that all logistics, systems, and information necessary for the successful disposal of the wastes are in place and understood.

The WAC Attainment Team is also responsible for maintaining record copies of its official communication, such as approval/recommendation of approval/rejection letters issued for each waste lot. Also, WAC Attainment Team reading files will be maintained to demonstrate the independence of waste profile decisions, and to provide additional background information relevant to those decisions.

4.6 WAC ATTAINMENT TEAM ORGANIZATION

The WAC Attainment Team is made up of a variety of personnel bringing key skills to the team geared toward fulfilling the key WAC DQO decisions necessary for compliance with the *WAC Attainment Plan.* Figure 10 depicts the key skill areas for WAC Attainment Team Members. Not all skill areas will require a full-time team member, and one individual may provide expertise in more than one skill area. In general, the number and mix of permanent team personnel will be at the discretion of the WAC Attainment Team Manager and will be based upon the number and type of projects seeking disposal approval at any given time. Additional team members may be added on a temporary or permanent basis as the workload or decision complexity dictates.

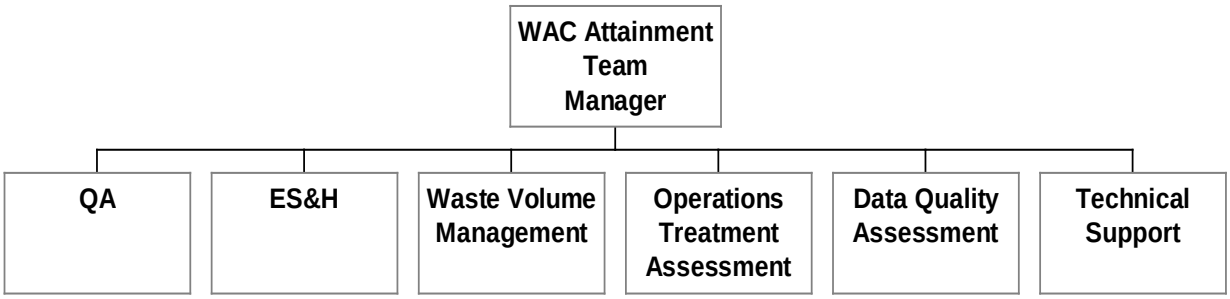

Fig. 10. WAC Attainment Team organization.

All WAC Attainment Team members are primarily responsible for reviewing waste lot profiles and for assessing the provided information relative to WAC requirements. The following text details additional responsibilities of each primary team member for each of the six skill areas. Team members assigned secondary responsibilities in a skill area will support the personnel assigned the primary functions of that area.

WAC Attainment Team Manager

- Coordinate the review of waste lot profiles submitted for EMWMF disposal and either approve the request, recommend it for approval, reject it, or request that it be modified.
- Periodically review all approved waste lots to determine whether any approvals should be suspended due to changed conditions or the suspension or completion of the RA activities associated with the profile.
- Ensure processes and tools are implemented to ascertain requirements of the *WAC Attainment Plan*.
- Communicate to internal Prime Contractor and to the FFA parties the status of VWSFs and the status of waste lots fulfilling the DQO decisions set forth in the *WAC Attainment Plan*.
- Initiate technical analyses to ensure the EMWMF WAC meets the EMWMF ROD requirements.
- Periodically review and, if necessary, revise this PEP.

Quality Assurance

- Provide WAC Attainment Team technical assistance to RA Projects on expectations for the portions of RA Project QA plans that relate to WAC compliance, most significantly waste lot profile ADPs.
- Assist WAC Attainment Team members in determining appropriate documentation needs for evaluations performed and decisions made.
- Serve as the primary interface with any independent Performance/QA Group or external audits of WAC Attainment Team functions.
- Produce corrective action plans for any findings and track action items to closure.
- Confirm adequate WAC Attainment Team records are being generated to document decisions.

Environment, Safety and Health

- Provide technical assistance to RA Projects on WAC Attainment Team expectations for RA Project subcontractor compliance with the ASA-derived WAC SOF and for the provision of chemical concentration data required for EMWMF ASA compliance.

- Serve as the initial interface between RA Projects and the operations subcontractor in identifying ES&H data needs for the disposal of RA wastes.
- Assess the reasonableness of radiological characterization data.
- Assess compliance with ES&H-related physical WAC.

Waste Volume Management

- Provide technical assistance to RA Projects on WAC Attainment Team expectations for RA Projects to input their volume and schedule data to the WGF.
- Obtain WGF data for WAC Attainment Team purposes.
- Assess continuity between WGF volume data and WACFACS volume data, and notify projects of any discrepancies noted.
- Resolve any conflicts between waste volume forecasts provided by generators to the WAC Attainment Team and waste volume forecasts in the WGF.

Operations Treatment Assessment

- Serve as the principal WAC Attainment Team point of contact for readiness evaluations for RA Projects disposing wastes at EMWMF.
- Provide technical assistance to RA Projects on WAC Attainment Team expectations for RA Projects that require treatment to meet LDRs or desire treatment to petition for a waste-lot-specific analytic WAC increase.
- Provide technical assistance to RA Projects regarding acceptable packaging requirements, and serve as the WAC Attainment Team interface between RA Projects and EMWMF Operations for such questions.
- Assess RA Project assertions that wastes meet all applicable RCRA or TSCA LDRs.
- Assess the effectiveness of treatment technologies to justify waste-lot-specific analytic WAC.
- Assess the reasonableness of chemical characterization data.

DQA

- Provide technical guidance to RA Projects regarding WAC Attainment Team expectations for the statistical treatment of data.
- Confirm that the statistics used by RA Projects to describe contaminant concentration values and uncertainties are appropriate and meet the DQA objectives and requirements in Appendix C of the *WAC Attainment Plan*.
- Assess whether statistical evidence exists to warrant proposed waste lots being split into multiple, smaller waste lots.
- If a waste lot must be rejected as proposed due to analytic WAC compliance, assess whether statistical evidence exists for possible hot spots that could be segregated from the bulk of the wastes such that, if removed, could make the remainder acceptable.
- Perform WACFACS calculations to determine waste lot analytic WAC SOFs and EMWMF VWSFs.

Technical Support

- Perform the necessary calculations for any new analytic WAC, and assure that the models and assumptions used are in compliance with the *WAC Attainment Plan*.
- Provide technical assistance to RA Projects on WAC Attainment Team expectations for RA Projects that wish to use measurements of their waste's K_d in order to petition for a waste-lot-specific WAC increase.
- Assess proposals for waste-lot-specific WAC based upon measured K_d (leachability) data.
- Assist in waste treatment determinations for WAC increases.
- Evaluate volume and weight data provided by EMWMF Operations and develop more accurate measurements of tons/cubic yards for wastes shipped to the EMWMF.

In addition to the responsibilities of each primary team member for each of the six skill areas, the WAC Attainment Team Manager may also designate one or more members of the Team to perform field assessments of RA Projects' compliance with any conditions placed upon the approval of their waste profiles.

4.7 TRAINING

UCOR personnel involved in EMWMF WAC attainment activities shall be trained commensurate with their roles and responsibilities. Personnel shall be provided with continuing education and training to ensure that job proficiency is maintained. Specific required reading assignments will be made by the WAC Attainment Team Manager for each WAC Attainment Team member. Position descriptions are available for team members having primary responsibility for the key skill areas. Additional training is prescribed for WAC Attainment Team members assigned field assessment responsibilities. Training in the following subject matter areas is also directly relevant to WAC Attainment Team processes:

- ES&H (e.g., Integrated Safety Management System, ASA-derived WAC)
- Environmental regulations (e.g., RCRA, CERCLA)
- Sampling and analyses, DQO, DQA
- Statistical and systems analyses

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5. RECORD KEEPING

Several records will support the WAC attainment process. UCOR will maintain records pertaining to the WAC attainment process in the project files. Likewise, EMWMF Operations will maintain records pertaining to waste acceptance and operations in accordance with their procedures. The records may have other uses as well, but their presence in the operating facility files will be necessary to document the process. The proper filing of record copies of WAC attainment documentation is the responsibility of the organization generating the original documents. For example, proper storage of the record copies of the waste profiles and any associated transmittals of supporting documentation is the responsibility of the projects generating the profiles, but the filing of the record copies of the approval documentation is the responsibility of the WAC Attainment Team. WAC Attainment Team record copies will be placed in the Environmental Management and Enrichment Facilities Document Management Center.

Records documenting the attainment of the WAC will revolve around the waste lot. The waste lot is the primary indicator by which waste can be identified in the database. The waste lot designator for each project is maintained in the WACFACS database.

Shipments from waste lots will be tracked cradle-to-grave. Each shipment will have a separate record from the time it is generated (usually when it is removed from its original location at the CERCLA site) to its placement at EMWMF. If waste lots are mixed during disposal at EMWMF (for example, if contaminated soil is used as fill material for debris waste), that mixing will appear implicitly in the operating facility records because both waste lots will be shown to have been disposed in the same location.

Waste shipment records will contain, at a minimum, the following information:

- The waste lot from which the shipment came and a sequential numbering of each shipment
- The volume of the waste being shipped in the conveyance
- The average and UCL_{95} SRC concentrations assigned to the waste lot
- The ASA-derived and WAC SOFs for the waste lot
- Date and time the wastes left the CERCLA site

Once EMWMF Operations receives the waste shipment, additional information will be added to the waste shipment documentation, including, but not limited to, the following:

- Date and time the wastes were received at EMWMF
- Confirmation that the waste lot number is on the list of WAC Attainment Team-approved waste lots
- Confirmation that physical and other WAC requirements were met
- Identification of where the shipment was placed at EMWMF

The permanent waste lot record will include, but is not limited to, the following:

- Waste lot profile certified by generator, in accordance with the annotated outline (Appendix A)
- Waste Lot Assessment Checklist (Appendix B)
- EMWMF WAC Attainment Team Waste Lot Decision Form (Appendix C)
- Hardcopy of relevant WACFACS SOF and VWSF information
- Transportation-related materials (e.g., Bill of Lading, manifest)
- Waivers allowing waste not meeting specific WAC to be disposed at EMWMF
- Information required as set forth in EMWMF Operations procedures

RA Projects are responsible for maintaining their own records, with regard to the waste lot, and the activity from which the waste lot was generated. Consistent with RCRA and EPA's Off-Site Rule, generators are responsible for demonstrating compliance with receiving treatment, storage, and/or disposal facility WAC. Specific to EMWMF, no treatment and/or storage capabilities will be provided specifically by the EMWMF Project. Attainment of WAC specific to treatment and storage activities/facilities before EMWMF disposition are the sole responsibility of generating projects.

Certification and justification of LDR attainment for listed or characteristic hazardous wastes are required to be kept by the RA Projects. Copies of the same are also necessary to be provided to the WAC Attainment Team to demonstrate EMWMF administrative WAC are met. All other evidence to attainment to administrative WAC is also required to be documented and maintained by generating projects.

Since attainment of physical and ASA WAC is largely between the generating project and EMWMF Operations, if any documentation of physical and ASA WAC attainment is necessary beyond that included within EMWMF profiles, then such documentation is to be maintained by the projects and EMWMF Operations.

6. QUALITY ASSURANCE

RA Project QA plans will establish and provide specific QA procedures and associated documentation requirements for all project-specific aspects of the WAC attainment process, including the following:

- Waste characterization bases, including process knowledge, existing analytical data, and the results of any sampling and analysis performed
- TCLP testing and other required testing and treatment for LDR compliance, if required
- Field observation logs documenting waste generation activities, including actions taken to identify potential anomalies and address any anomalies found
- Process validation assessments and reviews
- Process changes and corrective action plans for identified deficiencies

The quality of waste-approval decisions is also guaranteed by adherence to the *WAC Attainment Plan* and the use of regulator-approved guidance documents that support WAC attainment. A complete listing of the references used to develop this WAC Attainment Team PEP is given in Chap. 7.

In addition, UCOR will prepare auditable records of its QA activities. Such UCOR QA activities will include project oversight observations and auditing of waste-generation activities, the WAC Attainment Team's independent approval of waste lots for disposal, and any UCOR Performance/QA Group independent internal audits of UCOR and subcontractor activities. Whenever DOE or regulatory agency oversight observations are submitted, either as less formal day-to-day interactions or as more formal audits, these observations will be formally tracked to closure.

A critical element in the functionality and success of the WAC Attainment Team is the WACFACS system. QA for WACFACS is discussed in detail in Chap. 6 of the *Implementation Plan and User's Guide for the Waste Acceptance Criteria Forecasting and Analysis Capability System (WACFACS).*

Additional useful guidance can be found in UCOR-4188 and UCOR-4189.

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APPENDIX A.
WASTE PROFILE GENERIC INSTRUCTIONS

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WASTE PROFILE GENERIC INSTRUCTIONS

The goal of assembling a waste lot profile is to create sufficient stand-alone information to successfully demonstrate compliance with all Environmental Management Waste Management Facility (EMWMF) Waste Acceptance Criteria (WAC).

Waste profile and supporting characterization documents are to be viewed as technical basis documents. As such, they are expected to contain a detailed description of the data and logic applied to develop the profile or characterization. Ideally, the documents should include the following:

- Clear descriptions of the logic leading to the final conclusions
- Detailed list and discussion of all assumptions
- Explanations and justification for decisions made related to information selected or rejected
- Detailed explanation of how process knowledge (PK) and anecdotal evidence was used
- References and/or copies of PK documentation
- Key calculations or examples of calculations that were used
- Analytical data used in the characterizations
- Input data and assumptions used for any necessary computer modeling
- Documents supporting the validity of the above information

When supporting documentation is too voluminous for it to be practically included as a part of the profile, the profile should provide summaries of the information and its sources should be clearly referenced.

Profiles should be written so that a technical professional (not necessarily an expert in the field) would be able to follow the logic, reproduce key calculations, and reach the same conclusions as the document's authors. If that goal is not achieved, then the characterizations cannot readily be shown to be technically defensible.

The following annotated outline shall be followed when creating waste profiles to request approval to dispose of waste lots at EMWMF. The annotated outline is broken into two major parts. The first part consists of summary-level information, with references to key documentation for each of the EMWMF WAC. The second part consists of more detailed information within various appendices.

All waste generation projects shall follow the structure and the order of the EMWMF Waste Lot Profile outline. Table NN identifies the elements of an EMWMF Waste Lot Profile Outline. The waste-generating project shall follow the waste profile instructions contained in the next section, as well as the instructions in the new waste profile annotated outline posted on the Intranet and external home page. When a project has supplemental material that is relevant and germane to the EMWMF Waste Lot Profile or is associated with a profile revision, but cannot reasonably be included in an existing appendix or does not meet the requirement of an existing appendix, the material shall be included as a separate appendix (or appendices) following Appendix K.

Table NN. EMWMF Waste Profile Outline
Title Page, table of contents, list of acronyms, and signature page
Chapter 1 Introduction
Section 1.1 Generator Project/Facility
Section 1.2 Waste Lot Name/WL ID
Section 1.3 Estimated Volume
Section 1.4 Waste Generation
Section 1.5 Waste Composition
Chapter 2 Administrative WAC Compliance
Section 2.1 Waste Lot CERCLA Action
Section 2.2. Prohibited Waste Types
Section 2.2.1 Approved Waste Categories
Section 2.3 Prohibition of Free Liquids
Section 2.4 RCRA Land Disposal Restrictions
Section 2.4.1 Characteristics of Ignitability
Section 2.4.2 Characteristics of Corrosivity
Section 2.4.3 Characteristics of Reactivity
Section 2.4.4 Characteristics of Toxicity
Section 2.4.5 Universal Waste
Section 2.4.6 Materials of Construction/Mass Balance Calculation
Section 2.5 TSCA LDRs
Section 2.6 Infectious Wastes Prohibition
Section 2.7 Pyrophoric Materials Prohibition
Section 2.8 Exclusion of Wastes Capable of Detonation or Explosive Decomposition
Section 2.9 Toxic Gases, Vapors, or Fumes Prohibition
Section 2.10 Structural Stability Determination
Section 2.11 Void Space Requirements
Section 2.12 Container Void Space Requirements
Section 2.13 Average Total Uranium Limits
Section 2.14 Criticality Safety Evaluation
Section 2.15 TDEC Class C Waste Limitation
Chapter 3 Analytic WAC Compliance
Section 3.1 Carcinogenic WAC Site-Related Contaminants and SOF
Section 3.2 HI WAC Site-Related Contaminants and SOF
Section 3.3 Carcinogenic WAC 3-Year VWSF Compliance
Section 3.4 HI WAC 3-Year VWSF Compliance
Chapter 4 ASA-Derived WAC Compliance
Chapter 5 Physical WAC Compliance
Section 5.1 Container Requirements
Section 5.2 Size Requirements
Section 5.3 Weight Requirements
Section 5.4 Concrete Debris Requirements
Section 5.5 Steel Plate Requirements
Section 5.6 Pipe Requirements
Section 5.7 Asbestos and Beryllium Dust Containing Waste Requirements
Section 5.8 Miscellaneous Debris Requirements

Table NN. EMWMF Waste Profile Outline
Section 5.9 Containerized Compactable Waste **Section 5.10 Rebar Requirements** **Section 5.11 Noncrushable Container Requirements** **Section 5.12 Container Liner Requirements** **Section 5.13 Dose Rate Requirements** **Chapter 6 REFERENCES** **Appendix A WASTE LOT ANOMALY DETECTION PLAN** **Appendix B PROCESS KNOWLEDGE AND ANECDOTAL EVIDENCE SUMMARY** **Appendix C CONTROLLED DATA SET TRANSMITTAL TO WAC ATTAINMENT TEAM** **Appendix D ENVIRONMENTAL COMPLIANCE ASSESSMENT – Listed Waste Determination** **Appendix E CALCULATION/MEASUREMENT METHODS** **Appendix F DATA QUALITY OBJECTIVES CHECKLIST** **Appendix G DATA QUALITY ASSESSMENT** **Appendix H RESERVED** **Appendix I RESERVED** **Appendix J CERCLA DOCUMENTATION** **Appendix K EMWMF NUCLEAR CRITICALITY COMPLIANCE DOCUMENTATION** **Other Appendices as Required by the RA Project**

EMWMF Waste Profile Generic Instructions

Title Page and Signature Page

The title page shall contain a unique document number under which the record copy of the profile will be maintained. A signature page for the principal author(s) and relevant project personnel to declare that the information presented in the profile is true and accurate to the best of their knowledge is to be included, along with any formatting pages. At a minimum, these signatures must include the profile author(s), a project representative familiar with the wastes being profiled, and the project Environmental Compliance representative that reviewed and approved the Resource Conservation and Recovery Act of 1976 (RCRA) and the Toxic Substances Control Act of 1976 (TSCA) waste determinations.

Note that the Waste Lot Assessment Checklist used by the WAC Attainment Team as an aid for evaluating waste profile information against WAC requirements is provided as Appendix B of the *EMWMF Project Execution Plan*. This checklist and its evaluation criteria should be used by project personnel that are tasked to certify that the information included in the profile is accurate and complete to the best of their knowledge during their review of the profile prior to submitting it to the WAC Attainment Team.

The title page shall include a classification review of the entire contents, including all attachments and data. All reasonable efforts shall be made to create profiles that are available for unrestricted use by the public. If that goal is not achievable, profiles may be submitted as Official Uses Only (OUO) documents. If profiles are classified as OUO, the Anomaly Detection Checklist within Attachment A of the profile shall be reviewed separately and written in such a manner as to allow it to be released for public use. If it becomes necessary to write a profile that contains classified information, the WAC Attainment Team shall be contacted for additional guidance and requirements (e.g., it may be necessary to write two versions of such profiles, one classified and the other OUO).

Chapter 1 Introduction

This section identifies the waste generating project, the waste lot name and number under consideration in the profile, and any general information necessary to understand the physical, chemical, and radiological characteristics of the waste lot to be offered for disposal. This section may refer to detailed process knowledge statements and anecdotal evidence presented in Appendix B that will be used to comply with the WAC. Section 1.2 is an important section for profile revisions and detailing all pertinent sections that have been revised. Section 1.3 shall provide the estimated “as generated” waste lot volume. This volume should be used consistently through the profile, including calculations and associated appendices. A brief history of the project and a detailed description of the waste to be generated shall be given in Sect. 1.4. If a waste stream is to be divided into multiple waste lots, it may also be useful to highlight how the waste stream is to be subdivided and note which wastes are included and excluded from the waste lot under consideration. Section 1.5 requires a waste composition summary that will be used to calculate a waste lot density factor, as well as feed the Waste Transportation Management System for the waste load forecast and the radio frequency identification system.

Chapter 2 Administrative WAC Compliance

All administrative WAC must be met either by directly fulfilling the WAC requirements, or by having the *Federal Facility Agreement for the Oak Ridge Reservation* (FFA) (DOE/OR-1014) parties for the Response Action (RA) Project grant exemptions from the WAC in the project Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) documentation.

Section 2.1 Waste Lot CERCLA Action

The Action Memorandum or Record of Decision authorizing the CERCLA action that the wastes are or were generated under should be referenced. Copies of the applicable CERCLA document cover pages and approval pages should be included in Appendix J. If any of the CERCLA documents are not approved by FFA parties, then please state within this section. In cases where the waste lot is not explicitly stated in the title of the CERCLA document, appropriate excerpts of the document that demonstrate the waste lot is included in the CERCLA action shall also be provided.

Section 2.2 Prohibited Waste Types

A checkbox (Yes or NO) is provided to demonstrate that transuranic (TRU), high-level radioactive waste (HLW), spent nuclear fuel (SNF), and 11e(2) byproduct materials are not included in the waste lot. For TRU waste determinations, a table is provided to list all TRU nuclides present as site-related contaminants (SRCs) and includes the associated maximum concentrations (nCi/g). The sum of these concentrations shall be presented to demonstrate the waste lot is not TRU waste. A separate checkbox is available to check if the waste lot does not include TRU constituents as SRCs or the total TRU concentration is known to be below 0.1 nCi/g.

If the RA could potentially generate TRU, HLW, SNF, or 11e(2) wastes, this fact shall be noted. In such cases, the plans for how these waste types will be segregated from the waste lot shall be summarized, and references shall be made to the specific section(s) of Appendix A that detail how wastes will be properly segregated.

In Sect. 2.2.1, a list of approved waste categories has been provided as checkboxes. These include low-level radioactive waste (LLW), RCRA waste, TSCA waste, or mixtures of these approved waste streams.

Section 2.3 Prohibition of Free Liquids

A selection of checkboxes has been provided to demonstrate compliance with the prohibition of free liquids. If exclusively LLW, the profile shall state that wastes sent will have less than 1% free liquids by volume, and check the methods below that will be used to confirm compliance with this WAC. If RCRA, TSCA, or mixed wastes are being generated, then the profile should state that wastes sent will have no free liquids, and check the methods below that will be used to confirm compliance with this WAC. Check all that apply by waste class. If some other method is used then provide in the space provided.

Section 2.4 RCRA Land Disposal Restrictions

This section addresses the RCRA classification of the wastes in the lot to be considered. A listed waste determination must be performed and documented in Appendix D that is consistent with PK. The listed waste determination shall describe how any listed waste codes may be associated with the wastes, or the basis for declaring that the wastes are not listed. EMWMF does not currently accept listed waste or listed waste that has been treated to meet land disposal restrictions (LDRs).

Sections 2.4.1 through 2.4.4: Ignitability, Corrosivity, Reactivity, and Toxicity Characteristic Subsections

Separate subsections have been devoted to discussing the basis upon which each RCRA characteristic can be declared as fulfilled (ignitability, corrosivity, reactivity, and toxicity). The typical basis for certifying that the wastes do, or do not, exhibit any RCRA characteristics has been provided as a checkbox. If other means are used, these bases shall be described in the space marked “Other.”

In Sect. 2.4.4, provide a brief discussion of how the waste lot was characterized for RCRA characteristic compliance. For example, describe the media that was sampled, the analytical methods that were performed, and the type of contaminants that may have been eliminated based on PK (e.g., pesticides). In addition, describe how the data were evaluated and discuss any confirmatory toxicity characteristic leaching procedure (TCLP) that was necessary to meet the 40 *Code of Federal Regulations* (*CFR*) 261.24 limits.

A series of statements with checkboxes are provided to describe the regulatory approach of meeting RCRA characteristic limits. If the wastes require treatment to meet LDRs, then the purpose of the treatment should be given and the basis for declaring the treatment to be adequate shall be summarized and the more detailed information that is included in the appendices shall be referenced. In addition, details on how the wastes will meet any applicable Underlying Hazardous Constituents shall be discussed. References to documents containing additional supporting documentation shall be given.

For RCRA toxicity, tabulated results shall be included in the provided table (RCRA Characteristic Summary Table) following the guidance below the table. If TCLP proxy values are derived from total concentrations using the "rule of 20," then the totals results shall be summarized and equivalent TCLP results in mg/L given. In the last column of the provided table, all constituents must be below the regulatory limit unless some form of treatment is being performed. Sample results shall be consistent with data included in Appendix C and the data quality assessment (DQA).

Section 2.4.5 Universal Waste

This section is devoted to universal waste that may be present in the waste lot. If not present, simply check the "No" box. If universal wastes are present, explain how these waste items will be managed (e.g., removed prior to demolition, included in mass balance calculations).

Section 2.4.6 Materials of Construction or Mass Balance

If any materials of construction or mass balance calculations are performed, reference these approved calculation packages in this section and attach the calculation package to Appendix E.

Section 2.5 TSCA LDRs

A series of statements are provided in checkboxes regarding the TSCA classification of the wastes in the lot to be considered. If the wastes are classified as TSCA wastes, the type of TSCA waste should be declared (e.g., polychlorinated biphenyl [PCB] remediation waste, PCB bulk waste). If only a subset of the wastes are classified as being regulated by TSCA, the reasoning for combining those wastes with the non-TSCA wastes should be given, along with any available details regarding which wastes are regulated and which are non-regulated. Any available sample results (in mg/kg) should be summarized for the PCB source (e.g., oils, PCB paint). Any other basis for TSCA classification (e.g., swipe results or PK arguments) shall also be discussed. If the wastes require treatment to meet LDRs, then the basis for testing the treated wastes and declaring the treatment to be adequate shall be given.

Section 2.6 Infectious Wastes Prohibition

The typical definitive statement that is used to eliminate infectious wastes from the waste lot is provided in a checkbox. If the waste lot could potentially generate infectious wastes, this fact should be noted and the plans for how these wastes will be segregated from the waste lot should be summarized, and a reference to the relevant section(s) of the Anomaly Detection Plan (ADP) that details how this requirement will be met shall be provided.

Section 2.7 Pyrophoric Materials Prohibition

The typical definitive statement that is used to eliminate pyrophoric materials from the waste lot is provided in a checkbox. If the waste lot could potentially generate wastes with pyrophoric materials, this fact should be noted and the plans for how these wastes will be segregated from the waste lot should be summarized, and a reference to the relevant section(s) of the ADP that details how this requirement will be met shall be provided.

Section 2.8 Exclusion of Wastes Capable of Detonation or Explosive Decomposition

The typical definitive statement that is used to eliminate concerns associated with wastes capable of detonation or explosive decomposition at normal pressures and temperatures, or of explosive reaction with water, from the waste lot is provided in a checkbox. If the waste lot could potentially generate wastes capable of detonation or explosive decomposition, this fact should be noted and the plans for how these wastes will be segregated from the waste lot should be summarized, and a reference to the relevant section(s) of the ADP that details how this requirement will be met shall be provided.

Section 2.9 Toxic Gases, Vapors, or Fumes Prohibition

The typical definitive statements that are used to eliminate concerns associated with wastes containing, or capable of generating, toxic gases, vapors, or fumes from the waste lot has been provided in checkboxes. If the waste lot could potentially generate such wastes, this fact should be noted and the plans for how these wastes will be segregated from the waste lot should be summarized, and a reference to the relevant section(s) of the ADP that details how this requirement will be met shall be provided. Check all boxes that apply to the waste lot.

Section 2.10 Structural Stability Determination

The typical definitive statement that is used to confirm that the final waste form will meet structural stability requirements at the point of generation or using normal EMWMF Operations equipment is provided in checkbox. If the waste offered for disposal requires special handling to achieve stability or special packaging that provides stability after disposal, describe the agreements reached with EMWMF Operations to achieve structural stability.

Section 2.11 Void Space Requirements

The typical definitive statements that are used to confirm that the final waste form will meet void-space requirements at the point of generation, using normal EMWMF Operations equipment or special packaging, are provided in checkboxes. In addition, an option to provide void-space calculations to verify that the final waste form meet void-space requirements is also provided. Lastly, if the waste offered for disposal requires special handling and/or placement to achieve void-space requirements after disposal, reference the physical WAC (PWAC) variance approved by EMWMF Operations. Check all boxes that apply to the waste lot.

Section 2.12 Container Void Space Requirements

Note that containerized compactable waste, by its nature, contains significant internal voids, and that for such wastes, compliance with this WAC will likely require some form of compaction. If such wastes must be disposed in non-compactable containers, consultation with EMWMF Operations will be required. The typical definitive statements that are used to confirm that the final waste form will meet container void-space requirements at the point of generation or through special handling by EMWMF are provided in

checkboxes. If containers are used, provide reference to void-space calculation packages or PWAC variance, whichever is applicable. Check all boxes that apply to the waste lot.

Section 2.13 Average Total Uranium Limits

The average uranium (U) concentration of the waste lot shall be provided in both total pCi/g and total parts per million (ppm) in the provided table. If either of the total uranium WAC is exceeded, written approval by the WAC Attainment Team shall be obtained that confirms the waste lot can be tolerated within the context of the overall average uranium concentrations in EMWMF. Calculations that convert pCi/g to ppm (or vice versa) must be provided in Appendix E.

Section 2.14 Criticality Safety Evaluation <HAD>

The administrative WAC states, "Waste packages shall be limited so that they will remain subcritical during all phases of waste cell operations, including active waste disposal operations and inactive, post-closure periods." Since the potential for an inadvertent criticality must be precluded during post-closure periods when container degradation may occur and fissile materials may migrate to the bottom of the cell, the nature of the process is the only argument that may be used to establish that an inadvertent criticality cannot occur.

The URS | CH2M Oak Ridge LLC Nuclear Criticality Safety (NCS) Program provides analysis of fissile material operations and establishment of limits for fissile material to be shipped to EMWMF. This ensures that this administrative WAC requirement is met. To maintain the nature of process status, these analyses must not rely upon any operational controls after receipt of the material. Nature of process means that the form of material is inherently safe or that facility or process equipment is designed such that the formation of a critical mass for a particular form of fissile material cannot be achieved. All waste streams designated for emplacement into EMWMF containing fissile isotopes must meet one of the following requirements.

- Compliance with the requirements of the EMWMF Material Screen presented in the *Nuclear Criticality Safety Determination EMWMF Operations*, NCSD-YT-EMWMF-0012
- Compliance with operations at EMWMF as evaluated in *Nuclear Criticality Safety Determination, Burial of Process Equipment and Building Debris at the EMWMF*, NCSD-YT-EMWMF-0050
- Compliance with the requirements for mass and concentration for K-25 and K-27 building process equipment as described in Sect. 4.2.1 of the *Burial of K-25 and K-27 Process Equipment and Building Debris at the EMWMF*, NCSE-ET-K25-1600, as discussed further below
- Completion of a new analysis in compliance with the NCS Program and consistent with the facility categorization of less than Category 3 and nature of process

Documentation of the methodology used to demonstrate compliance with NCS requirements shall be included in Appendix K of the profile. Additional explanation of the requirements to demonstrate nuclear safety compliance for Bldgs. K-25 and K-27 building process equipment is provided in the following.

K-25 and K-27 Building Process Equipment Mass and Concentration for Disposal in EMWMF

These criteria may only be applied to K-25/K-27 process equipment. Process equipment refers to all systems and components in the K-25 and K-27 Buildings, irrespective of whether it was used primarily for process gas or not. Within this section, a "package" is any container or truck with waste material or piece of equipment that meets the volume requirements of the specified drums, boxes, or equipment.

Uranium with enrichment less than 0.90 wt% does not need to be considered in the determination of fissionable mass or concentration.

The satisfaction of this waste volume requirement is not necessary by measurement when using the side-dump or general waste hauling trucks/trailers. The side-dump trucks have at least a 7.8 m^3 (275 ft^3) carrying capacity per tub, and other general waste-hauling trucks/trailers have a much larger carrying capacity. In comparison, for example, a nominal B-25 box capacity is only 2.7 m^3 (96 ft^3) and was modeled within the Nuclear Criticality Safety Evaluation (NCSE) at the reduced dimensions of 0.9 m (3 ft) × 0.9 m (3 ft) × 1.4 m (4.5 ft), equivalent to a much smaller 1.15 m^3 (40.5 ft^3). Lightly loading the waste transport vehicles with less than 1.15 m^3 (40.5 ft^3) of waste is impractical, since this significantly increases the number of shipments. Furthermore, the bulldozer action of spreading the dumped bulk waste at EMWMF will mix the waste with soil, increasing the net volume, as well as potentially increasing the separation between waste shipment loads. Therefore, the waste-hauling capacity of the trucks may be credited as fulfilling this waste volume requirement and direct measurement is not required.

These are the different avenues for meeting the nuclear criticality requirements.

- Material with uranium enrichment < 0.90 wt%—no further requirements
- Individual items/components/systems:
  - Use the individual item table—satisfy the requirements in the following sections: *Mass Limits for K-25/K-27 Building Process Equipment Waste*, subsection titled "Mass Limits for Individual Equipment Items;" *Concentration Limits for K-25/K-27 Building Process Equipment Waste Packages/Containers/Trucks*; and *Void Filler Material Restrictions*
  - Package in a container—satisfy the requirements in the following sections: *Mass Limits for K-25/K-27 Building Process Equipment Waste*, subsection titled "Mass Limits for Containers;" *Concentration Limits for K-25/K-27 Building Process Equipment Waste Packages/Containers/Trucks*; and *Void Filler Material Restrictions*
  - Bulk load on a truck—satisfy the requirements in the following sections: *Mass Limits for K-25/K-27 Building Process Equipment Waste*, subsection titled "Mass Limits for Trucks;" *Concentration Limits for K-25/K-27 Building Process Equipment Waste Packages/Containers/Trucks*; and *Void Filler Material Restrictions*
- For all items remaining for building demolition—satisfy the requirements in the following sections: *Mass Limits for K-25/K-27 Building Process Equipment Waste*, subsection titled "Mass Limits for Items/Components/Systems Under the Systematic Characterization Approach;" *Concentration Limits for K-25/K-27 Building Process Equipment Waste Packages/Containers/Trucks*; and *Void Filler Material Restrictions*

Note that concentration and void-filler restrictions are the same, no matter which approach is used for mass limits. These options and the specific requirements are discussed further in the following sections.

Mass Limits for K-25/K-27 Building Process Equipment Waste

The mass limits for waste material from the K-25 and K-27 Buildings demolition that has a uranium enrichment > 0.90 wt% are met by the applying one of the following options.

Mass Limits for Individual Equipment Items

Major process gas equipment and monoliths that are expected to be transported to EMWMF as separate entities have specific NCS U-235 mass limits and all will be measured prior to disposal. The mass limits

for these items are presented in Table A.1. From a nuclear criticality perspective, there is no transport conveyance mass limit when all items in the conveyance meet these requirements. However, there are non-NCS required mass limits for the conveyance, as discussed in Sect. 2.5.1.2 of the Hazard Analysis Document (HAD) (*Hazard Analysis Document for the Environmental Management Waste Management Facility*, HAD-YT-EMWMF-0020).

Alternatively, all of these items, except Size 1, 2, 3, or 4 converters; Size 12 or larger compressors with or without the base plate; Size 38, 92, 96, or 112 compressor volutes; and monoliths, may be disposed of in containers, as part of a load on a truck, or as part of the building demolition. When that occurs, the mass limits must comply with those provided in the following subsections: “Mass Limits for Containers,” “Mass Limits for Trucks,” or “Mass Limits for Items/Components/Systems under the Systematic Characterization Approach.”

Table A.1. Mass limits for individual items*

An unlimited number and any combination of these items may be loaded per conveyance up to the permitted limits for the Haul Road

*Uranium with enrichment less than 0.90 wt% need not be considered in the determination of fissionable mass.

Equipment, parts, piping, or containers (nominal sizes)	Mass limit per item (including uncertainty)
Size 1, 2, 3, or 4 converters**	350 g U-235
Size 12 or larger compressors that include at least the base-plate and the back-plate**	350 g U-235
Size 12 or larger compressor volute (casing) only**	90 g U-235
Size 38, 92, 96, or 112 compressor volute (casing) only**	300 g U-235
Process Gas Piping: 3-inch ≤ diameter < 4-inch • G-17 valve shall be attached to enough piping to provide at least 26 inches of length that includes the valve base and piping length	7 g U-235/ft*** • 40 g ^{235}U
Process Gas Piping: 4-inch ≤ diameter < 6-inch • G-17 valve shall be attached to enough piping to provide at least 26 inches of length that includes the valve base and piping length	10 g U-235/ft*** • 50 g U-235
Process Gas Piping, 6-inch ≤ diameter < 10-inch • G-17 valve attached to any length of this size piping	14 g U-235/ft*** • 50 g U-235
Process Gas Piping, Size 10-inch or larger • G-17 valve attached to any length of this size piping	22 g U-235/ft*** • 75 g U-235
G-17 valves, < Size 6-inch (no attached piping necessary)	16 g U-235
G-17 valve, 6-inch ≤ Size < 10-inch: (no attached piping necessary)	50 g U-235
G-17 valve, Size 10-inch or larger: (no attached piping necessary)	75 g U-235
4.0-inch outer diameter or greater: • Used Cold Traps • Non-Seal Exhaust system Chemical Traps	10 g U-235/ft***
Intercell/Intersectional Coolers from K-25 Area 306 and Area 312	80 g U-235
Intercell/Intersectional Coolers, except those in K-25 Area 306 and Area 312	200 g U-235
Monoliths (large concrete blocks encasing process gas equipment)**	350 g U-235

**Items may not be disposed of under the systematic characterization approach nuclear criticality safety determination (NCSD).
*** Linear U-235 density, The U-235 mass from any attached valve may be included if the pipe linear mass density limit is not exceeded when the U-235 mass associated with the valve is included.

Mass Limits for Containers

Individual process equipment items, either with or without assigned mass values, may be disposed of in a container. Mass limits for the various container types are provided in Table A.2.

Table A.2. Mass limits for containers or large process equipment components*
An unlimited number/combination of these items/components/systems may be loaded per conveyance up to the limits for the Haul Road

Nominal sizes	Normal case quantity (including uncertainty)
55-gal drums, 85-gal drums, 110-gal drums	200 g U-235
B-12-size boxes (nominal 2 ft × 4 ft × 6 ft) up to B-25 size boxes	200 g U-235
A process equipment component or a container (e.g., B-25 box) that is a nominal 4 ft × 4 ft × 6 ft or greater in volume or dimensions	350 g U-235
A container (e.g., Sealand) that is a nominal 8 ft × 8 ft × 20 ft or greater in volume or dimensions, with the fissile material shown to be uniformly distributed in the form of contamination	700 g U-235

*Uranium with enrichment less than 0.90 wt% need not be considered in the determination of fissionable mass.

Mass Limits for Trucks

If fissile-bearing items/components/systems do not meet the requirements of Table A.1 or A.2 and are not addressed in a systematic characterization NCSD, they may be bulk-loaded (unpackaged in any form) onto a truck, but they shall meet the truck U-235 mass limits shown below in Table A.3.

Table A.3. Mass limits for waste material bulk loaded on a conveyance

Waste truck unit	U-235 Mass limit* including uncertainty (g U-235)
Truck with a waste-hauling capacity of at least 275 ft^3	350
Each tub of a side-dump truck	350
Truck that has a nominal waste hauling capacity of 8 ft × 8 ft × 20 ft or greater in volume or dimensions, with the fissile material shown to be uniformly distributed in the form of contamination	700

*Uranium with enrichment less than 0.90 wt% need not be considered in the determination of fissionable mass.

Mass Limits for Items/Components/Systems Under the Systematic Characterization Approach

Table A.4 provides examples of the items/components/systems that are expected to become part of the demolished building rubble and hence will most likely not be transported to EMWMF as separate entities. It is not expected that a large fraction of the individual constituents in this category will be directly measured for U-235 mass by non-destructive assay methods prior to demolition, but may be qualified for burial per a systematic characterization approach. An item/component/system is approved for EMWMF burial if the systematic characterization approach documented in an NCSD that establishes criticality incredibility for building demolition is shown to be bound by the analysis in NCSE-ET-K25-1600.

NCSDs will be developed for various sections of the building as demolition activities are planned. The following NCSDs are approved for use:

- NCSD-ET-K25-0129, *K-25 West Wing Demolition*
- NCSD-ET-K25-0154, *K-25 Northeast Bridge Demolition*
- NCSD-ET-K25-0156, *K-25 East Wing (non Tc-99 Area) Demolition*
- NCSD-ET-K25-0158, *K-25 North End Demolition*
- NCSD-ET-K27-0163, *K-27 Demolition*

Table A.4. Items/components/systems for qualification per a systematic characterization approach
An unlimited number/combination of these items/components/systems may be loaded per conveyance up to the limits for the Haul Road

Nominal sizes
Product withdrawal piping, 1-inch ≤ diameter < 2-inch (includes attached valves)
Product withdrawal piping, 2-inch ≤ diameter < 3-inch (includes attached valves)
Non-product withdrawal piping, 1-inch ≤ diameter < 2-inch (includes attached valves)
Non-product withdrawal piping, 2-inch ≤ diameter < 3-inch (includes attached valves)
½-inch copper line-recorder tubing
$^{1}/_{8}$-inch ≤ diameter < 1-inch non-copper tubing
Line recorder station manifold cabinet
Line recorder spectrometer carts
DBM/PBM box clusters (A cluster is defined as the combined boxes attached to the same DPM/PBM rack associated with a stage, or the combined boxes in the same cabinet. The intra-connected tubes are included in this definition.)
Oil separators and oil misters
Cold traps
Seal exhaust system and non-seal exhaust system chemical traps
Vacuum pumps (Beach-Russ) and seal exhaust pumps
Cell panel boards
Lube oil tanks or coolant tanks

DBM = differential blind multiplier
PBM = partial blind multiplier

Concentration Limits for K-25/K-27 Building Process Equipment Waste Packages/Containers/Trucks

The concentration limits below shall be met:

1. All waste shipments shall have an average fissionable mass concentration that does not exceed 0.002 g U-235/g of waste material. The average fissionable mass concentration shall be computed as:

   Average concentration = (total container U-235 mass)/(mass of waste material)

The mass of a box or drum shall not be included in the determination of the mass of waste material.

The concentration limit does not have to be demonstrated if the waste shipment consists only of:

- Size 1, 2, 3, or 4 converters, and/or
- Size 12 or larger compressors that include at least the base-plate

Converters weigh over 1000 pounds and the base-plate for the smallest compressor, the Size 12, weighs an estimated 842 pounds. Because only 386 pounds of waste is necessary to meet the concentration limit for the 350 gram U-235 limit, the concentration is substantially below the limit, making it unnecessary to otherwise determine that the criterion is being met.

2. When applying these concentrations, the determination of fissile mass shall include uncertainty.

Void-Filler Material Restrictions

The following restrictions are placed on void-filler materials used for any K-25 and K-27 Building fissile item/component/system or fissile container bound for EMWMF burial.

- Sand shall not be used as void-filler material, except for Size 1, 2, 3, or 4 converters.
- Alumina or aluminum shall not be used as void-filler material, except for trap material still held in traps.

Section 2.15 TDEC Class C Waste Limitation

The Tennessee Department of Environment and Conservation (TDEC) waste classification that is based on comparisons of activities of short-lived and long-lived radionuclides against set limits shall be stated, along with the resultant overall TDEC waste classification (see Table A.3 of the *WAC Attainment Plan* for these limits). Supporting calculation tables are provided in this section and the 95% upper confidence limit (UCL_{95}) shall be incorporated for each radionuclide present in the waste lot. If no short- or long-lived radionuclides are present in the waste lot, then the appropriate checkbox shall be used. Once all tables are completed, check the appropriate waste classification box (e.g., Class A, B, or C) following the instructions in the *WAC Attainment Plan*.

Projects are admonished that the Tennessee waste classification is applied on a container-by-container basis. In instances where Class C waste is expected to be generated, profiles are required to discuss which portions of the waste lot are expected to be Class C waste, and the ADP in Appendix A is required to discuss the specific methods that will be used to ensure no individual containers are greater than Class C wastes.

Chapter 3 Analytic WAC Compliance

Analytic WAC compliance will be based upon the project's completion of the WAC Forecasting Analysis Capability System (WACFACS) data input sheets, and the WACFACS output of waste lot carcinogenic and hazard index (HI) sum of fractions (SOF) and the EMWMF carcinogenic and HI volume-weighted sum of fractions. The summary statistics for the waste lot and the WACFACS output summary shall be included in this section of the waste profile. Ensure that all data are consistent with the controlled data set (CDS) for the waste lot. Include all SRCs, both analytic WAC and auditable safety analysis (ASA) WAC SRCs, in the summary statistics.

A brief discussion of the characterization approach shall be provided, along with confirmation that the waste lot was characterized in accordance with the approved waste handling plan(s) (WHP) and associated sampling and analysis plan(s) (SAP). If there were any deviations to the WHP during characterization, then these need to be communicated to and agreed upon by the appropriate FFA Core Team. These agreements shall be in writing (e.g., Concurrence Form) and must have approval by all three FFA parties. Attach these agreements in Appendix J.

The specifics of the DQA of project data shall be presented in Appendix G. Note that the generator must perform a screening of SRCs against the revised Table A.1 analytic WAC limits published on the web to ensure formal analytic WAC limits have been set for all waste lot SRCs. If contaminants are identified that are not on the revised Table A.1, the generator must contact the WAC Attainment Team in order to determine if a new analytic WAC must be approved for the identified SRCs prior to the approval of the waste lot.

A statistical summary shall be provided in this section describing the number and type of samples that were used for waste lot characterization. This summary should be consistent with the number of samples presented in WACFACS for each class of SRCs (e.g., radionuclides, metals, semi-volatile organic compounds). Any in-depth characterization discussions, along with data summaries, should be provided in Appendix G, "Data Quality Assessment."

The format for the statistical summary information is presented in Table A.5. All data elements in the table are directly obtained during DQA. Data may be presented in scientific or in decimal notation. If the data is normally distributed, the Std Dev (standard deviation) is required. If the data follows a lognormal (LN) distribution, LN Mean (the arithmetic average of natural logarithms of the raw data) and LN Std Dev (the standard deviation of the natural logarithms of the raw data) are required. E(X) denotes the expected value for the SRC under the probability distribution function (PDF), and UCL_{95} denotes the upper 95% confidence limit for E(X) for the SRC under the PDF. Both parameters are calculated from U.S. Environmental Protection Agency (EPA) *ProUCL User Guide* and *ProUCL Technical Guide* (EPA/600/R-07-038 and EPA/600/R-07-041) or *QND - PERT BETA UCL-95: Upper 95th Confidence Interval Calculations for a PERT Beta PDF,* Version 1.0 (Redus and Associates, LLC).

Table A.5. Format for statistical summary information

SRC	Units	N	Detects	Minimum	Median	Maximum	Arithmetic Mean	Std Dev	PDF	LN Mean	LN Std Dev	E(X)	UCL-95
Am-241	pCi/g	47	26	3.90E-02	1.13E-01	2.07E-01	1.20E-01	4.60E-02	N			1.20E-01	1.30E-01
U-238	pCi/g	47	31	7.40E-02	2.18E-01	3.11E+00	3.90E-01		B			6.80E-01	1.58E+00
Lead	mg/kg	47	46	2.70E-01	1.20E+01	4.70E+03	1.48E+02		LN	2.416	2.169	1.18E+02	4.00E+02

Once the characterization approach and the summary statistics are provided, the remainder of Chap. 3 (Sects. 3.1 through 3.4), including the WACFACS Output Sheet, will be completed by the WAC Attainment Team and provided to the waste-generating project to incorporate into the final profile.

Chapter 4 ASA-Derived WAC Compliance

This section will identify all SRC radionuclides with ASA-derived WAC concentrations known or suspected to be present in the waste lot. For radionuclides present in concentrations greater than 1% of their WAC, UCL_{95} will be provided.

If justified, PK and anecdotal evidence for bounding maximum concentrations may be used in lieu of analytical data. In such cases, the bases for doing so shall be summarized, with details provided in Appendix B.

When measurements of gross alpha and gross beta concentrations have been performed and radionuclides with ASA-derived WAC are known or suspected to be present, then the sum total of all alpha-emitting radionuclides (including daughter products in equilibrium) may be subtracted from the gross measurements. The resultant difference is then divided by the most restrictive ASA-derived limit for the known or suspected alpha- or beta-emitting radionuclides without data. The sum of all UCL_{95} concentrations (or maximums) divided by their WAC is then reported.

In cases where ASA-derived SOF exceeds 0.05, an evaluation is made to determine what portion of contamination is bound within non-dispersible waste forms. If so, two separate tables developing the ASA-derived SOF for dispersible and non-dispersible waste forms are warranted. It should be noted that ASA-derived SOF greater than 0.05 in dispersible waste forms may result in a need to decrease the allowable operating cell face. In such cases, the generators must coordinate with EMWMF Operations in order to ensure adequate preparation is made to receive these wastes. In accordance with the HAD, uncontainerized dispersible waste lots shall not exceed an ASA-derived WAC SOF of 1.0. Once the radiological ASA-derived SOF is calculated, check the appropriate checkbox in the waste profile and provide necessary supporting documentation, as required.

In addition, any chemicals with reportable quantities in 40 *CFR* 302.4 that are present in the waste lot must be identified. For these chemicals, the UCL_{95} concentrations are then reported. A table of typical chemicals observed in waste lots is provided in the annotated profile template. This table shall be modified to include only the chemical SRCs in the waste lot.

It is important to note that credit may be possible for waste packaging for dispersible waste forms. If the generator determines that it is desirable to containerize such wastes to comply with the HAD conditions, the profile should note this fact. EMWMF Operations should be consulted to determine appropriate waste packaging alternatives.

Chapter 5 Physical WAC Compliance

PWAC are verified by EMWMF Operations at the time of disposal. However, for each WAC, plans and/or agreements with EMWMF Operations must be in place to meet the requirements. Negotiated agreements with EMWMF Operations in the form of a PWAC variance shall be referenced in the appropriate section below. All variances that are negotiated after profile approval are maintained between the waste-generating project and EMWMF Operations.

Section 5.1 Container Requirements

Checkboxes are provided to signify the container requirements in the WAC are met, or if not, reference the PWAC variance with EMWMF Operations. If no containers will be used, check “not applicable.”

Section 5.2 Size Requirements

Checkboxes are provided to signify the size requirements in the WAC are met, or if not, reference the PWAC variance with EMWMF Operations.

Section 5.3 Weight Requirements

Checkboxes are provided to signify the weight requirements of single debris waste forms in the WAC are met, or if not, reference the PWAC variance with EMWMF Operations.

Section 5.4 Concrete Debris Requirements

Checkboxes are provided to signify the concrete debris waste requirements in the WAC are met, or if not, reference the PWAC variance with EMWMF Operations. If no concrete debris is included in the waste lot, check “not applicable.”

Section 5.5 Steel Plate Requirements

Checkboxes are provided to signify the steel plate debris requirements in the WAC are met, or if not, reference the PWAC variance with EMWMF Operations. If no steel plates are included in the waste lot, check “not applicable.”

Section 5.6 Pipe Requirements

Checkboxes are provided to signify the pipe debris requirements in the WAC are met, or if not, reference the PWAC variance with EMWMF Operations. If no pipe debris is included in the waste lot, check “not applicable.”

Section 5.7 Asbestos and Beryllium Dust-Containing Waste Requirements

Checkboxes are provided to signify the asbestos and beryllium dust waste requirements in the WAC are met, or if not, reference the PWAC variance with EMWMF Operations. If no asbestos or beryllium dust waste is included in the waste lot, check “not applicable.”

Section 5.8 Miscellaneous Debris Requirements

Checkboxes are provided to signify the miscellaneous debris requirements in the WAC are met, or if not, reference the PWAC variance with EMWMF Operations. If no miscellaneous debris is included in the waste lot, check “not applicable.”

Section 5.9 Containerized Compactable Waste

Checkboxes are provided to signify the containerized compactable waste requirements in the WAC are met, or if not, reference the PWAC variance with EMWMF Operations. If no containerized compactable waste is included in the waste lot, check “not applicable.”

Section 5.10 Rebar Requirements

Checkboxes are provided to signify the rebar debris requirements in the WAC are met, or if not, reference the PWAC variance with EMWMF Operations. If no rebar waste is included in the waste lot, check "not applicable."

Section 5.11 Noncrushable Container Requirements

Checkboxes are provided to signify the noncrushable container requirements in the WAC are met, or if not, reference the PWAC variance with EMWMF Operations. If no noncrushable containers are included in the waste lot, check "not applicable."

Section 5.12 Container Liner Requirements

Checkboxes are provided to signify the container liner requirements in the WAC are met, or if not, reference the PWAC variance with EMWMF Operations.

Section 5.13 Dose Rate Requirements

Checkboxes are provided to signify the dose rate requirements in the WAC are met, or if not, reference the PWAC variance with EMWMF Operations.

Chapter 6 References

Provide references to documents used in the development of this profile. Referenced CERCLA documents that have been listed in Sect. 2.1 do not have to be listed again in this section. Reference documents that have been listed in Appendix B do not have to be listed again in this section.

Appendices—See EMWMF Waste Profile Annotated Outline for specific instructions for all appendices.

A summary of each Appendix is provided as follows:

Appendix A Waste Lot Anomaly Detection Plan

This appendix shall provide a comprehensive overview of the formalized waste ADPs that shall be implemented during the implementation of the waste lot. If other plans exist (e.g., project waste management plans or other project plans) that discuss anomaly detection, then the details of the requirements within these plans for activities that will be undertaken to confirm anomalous wastes are absent shall be included within this ADP.

Appendix B Process Knowledge and Anecdotal Evidence Summary

Since the main text portion of the waste profile is intended to contain summary-level information, this appendix is used for detailed developments of relevant PK and anecdotal evidence that is used to support characterizing wastes in the profile. If PK is used to designate proxy values for contaminants within the profile, the bases for doing so must be clearly discussed and defended; those values should then be used in appendix C for any calculations performed for those contaminants.

Appendix C Controlled Data Set Transmittal to WAC Attainment Team (Details are contained in Appendix E of this document)

The purpose of Appendix C is to provide a copy of the transmittal document of the CDS to the WAC Attainment Team. In most cases, if not all, this is an e-mail from the RA Project to the WAC Attainment Team that identifies the CDS is provided to the WAC Attainment Team as an attachment. The CDS is an electronic file. The RA Project shall transmit the CDS in an unprotected Microsoft Excel format.

Appendix D Environmental Compliance Assessment – Listed Waste Determination

The purpose of Appendix D is to provide clear and succinct documentation that all aspects of the RCRA and TSCA compliance have been reviewed and approved by the RA Project's Environmental Compliance Organization.

Appendix E Calculation/Measurement Methods

The purpose of Appendix E is to provide a detailed explanation of all calculation methods in order to demonstrate:

- A clear description of the logic leading to the final conclusions
- A detailed list and discussion of all assumptions
- Explanations and justification for decisions made related to information selected or rejected
- Key calculations or examples of calculations that were used
- Input data and assumptions used for any necessary computer modeling

Typical calculations include, but are not limited to, data transformations, mass balance determinations, RCRA determinations, dpm/100cm2 to pCi/g, etc. Calculations and spreadsheets that are generated to support waste management decisions shall be peer-reviewed for independent verification of the results. Calculations that are performed to support regulatory compliance shall be reviewed and approved by project Environmental Compliance staff, and if necessary, Legal concurrence.

Appendix F Data Quality Objectives Checklist

The purpose of Appendix F is to present the data quality objectives (DQOs) (EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide*) used for (1) the collection of the data contained in the CDS as transmitted to the WAC Attainment Team in Appendix C, (2) the data and the decisions reached by Environmental Compliance in Appendix D, (3) the development of the sampling approach presented in Appendix E, and (4) the basis for the DQA presented in Appendix G. The title page of the documents presenting the DQOs that were used shall be inserted into this section for reference. If DQOs have not been prepared, the RA Project shall use the following template and fill in the areas in brackets indicated as [text].

Appendix G: Data Quality Assessment (Details are contained in Appendix E of this document)

The purpose of Appendix G is to present the DQA performed to (1) confirm RA project DQO, as described in Appendix F, are met, (2) characterize the RA Project waste based upon the SAP and data collection efforts as described in Appendix E, (3) provide a clear cross-walk to any calculations/measurement methods or models used to develop or transform the data, as presented in Appendix E, and carry forward any contaminant concentrations based upon PK, as presented in Appendix B. The goal of this appendix is to provide a clear description of the DQA approach used, including a detailed list and discussion of all assumptions, and explanations and justification for decisions made related to information selected or rejected.

Appendix H Reserved

Appendix I Reserved

Appendix J CERCLA Documentation

The purpose of Appendix J is to present the cover pages and any relevant information from CERCLA documentation associated with the profile. Copies of the entire CERCLA documents are not needed or desired.

Appendix K EMWMF Nuclear Criticality Compliance Documentation

The purpose of Appendix K is to present the approved EMWMF Nuclear Criticality Check Sheet associated with the profile, or other approved evidence that the wastes meet the NCS compliance requirements.

REFERENCES

DOE/OR-1014. *Federal Facility Agreement for the Oak Ridge Reservation*, 1992, EPA–Region 4, DOE, and TDEC, Washington, D.C.

EPA/240/B-06/002. *Data Quality Assessment: A Reviewer's Guide (QA/G-9R)*, 2006, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC. URL: http://www.epa.gov/sites/production/files/2015-08/documents/g9r-final.pdf. Last accessed December 2015).

EPA/600/R-07/038. *ProUCL Version 4.00.05 User Guide*, 2010, U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC. URL: http://www.epa.gov/sites/production/files/2015-03/documents/proucl_v4.00.05_user.pdf. Last accessed December 2015.

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HAD-YT-EMWMF-0020/R13. *Hazard Analysis Document for the Environmental Management Waste Management Facility*, 2015, URS | CH2M Oak Ridge LLC, Oak Ridge, TN.

NCSD-ET-K25-0129. *K-25 West Wing Demolition*, 2008, Bechtel Jacobs Company LLC, Oak Ridge, TN.

NCSD-ET-K25-0154. *K-25 Northeast Bridge Demolition*, 2011, Bechtel Jacobs Company LLC, Oak Ridge, TN.

NCSD-ET-K25-0156/R2. *K-25 East Wing (non Tc-99 Area) Demolition*, 2012, URS | CH2M Oak Ridge LLC, Oak Ridge, TN.

NCSD-ET-K25-0158/R1. *Nuclear Criticality Safety Determination K-25 North End Demolition*, 2012, URS | CH2M Oak Ridge LLC, Oak Ridge, TN.

NCSD-ET-K27-0163. *Nuclear Criticality Safety Determination, K-27 Demolition*, 2013, URS | CH2M Oak Ridge LLC, Oak Ridge, TN.

NCSD-YT-EMWMF-0012/R2. *Nuclear Criticality Safety Determination EMWMF Operations*, 2005, Bechtel Jacobs Company LLC, Oak Ridge, TN.

NCSD-YT-EMWMF-0050/R1. *Nuclear Criticality Safety Determination, Burial of Process Equipment and Building Debris at the EMWMF*, 2006, Bechtel Jacobs Company LLC, Oak Ridge, TN.

NCSE-ET-K25-1600/R1. *Burial of K-25 and K-27 Process Equipment and Building Debris at the EMWMF*, 2009, Bechtel Jacobs Company LLC, Oak Ridge, TN.

Redus and Associates, LLC. *QND - PERT BETA UCL-95: Upper 95th Confidence Interval Calculations for a PERT Beta PDF*, latest revision, Redus and Associates LLC, Oak Ridge, TN.

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APPENDIX B.
WASTE LOT ASSESSMENT CHECKLIST

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WASTE LOT ASSESSMENT CHECKLIST

(Project and Waste Lot Name and WACFACS Identification Number)			
	Requirement	**Fulfilled?**	**Comment**
Administrative WAC	CERCLA Action	(yes/no)	(signed ROD or AM name and document number)
	No TRU, HLW, SNF, or 11e(2)	(yes/no)	(summary of evidence for certifications)
	No free liquids [1]	(yes/no)	(summary of evidence for meeting requirement)
	RCRA LDRs	(yes/no)	(summary of evidence for meeting the requirement for no listed or characteristic wastes, or summary of approved treatment plans exist to meet LDR standards)
	TSCA LDRs	(yes/no)	(summary of evidence for meeting the requirement for no TSCA-prohibited wastes are included, or summary of approved treatment plans to meet TSCA waste restriction standards)
	No infectious wastes	(yes/no)	(summary of evidence for meeting the requirement)
	No pyrophoric materials	(yes/no)	(summary of evidence for meeting the requirement)
	Not capable of detonation	(yes/no)	(summary of evidence for meeting the requirement)
	No toxic gases, vapors, or fumes	(yes/no)	(summary of evidence for meeting the requirement)
	Structural stability	(yes/no)	(summary of evidence for meeting the requirement, either at the RA or negotiated with EMWMF Operations for fulfillment at the cell)
	Void space issues addressed	(yes/no)	(summary of evidence for meeting the requirement, either at the RA or negotiated with EMWMF Operations for fulfillment at the cell)
	Container requirements	(yes/no)	(summary of evidence for meeting the requirement, either at the RA or negotiated with EMWMF Operations for fulfillment at the cell)
	Average total U limit addressed	(yes/no)	(expected value of total uranium ppm and pCi/g)
	Criticality safety evaluation	(yes/no)	(document name and number containing methodology to be used to ensure requirement is met, and if necessary letter of agreement between the RA and operations subcontractors to any proposed operational restrictions)
	TDEC Class C waste or less	(yes/no)	(document name and number containing the most restrictive classification)
Analytic WAC	Carcinogenic WAC SRCs Identified	(yes/no)	(all constituents with analytic WAC limits have either been carried forward into SOF calculations, have been shown to be background with 95% confidence and 80% power, or have been shown to be absent using process knowledge, anecdotal evidence, and/or analytic data demonstrating an appropriate rate of non-detection)
	HI WAC SRCs identified	(yes/no)	(all constituents with analytic WAC limits have either been carried forward into SOF calculations, have been shown to be background with 95% confidence and 80% power, or have been shown to be absent using process knowledge, anecdotal evidence, and/or analytic data demonstrating an appropriate rate of non-detection per Appendix C)
	Carcinogenic WAC 3-year UCL_{90} VWSF≤1	(yes/no)	(1: DQA performed in accordance with Appendix C to determine distribution and appropriate statistical descriptors, 2: SOF and its uncertainties calculated by WACFACS, and 3: VWSF and its uncertainty calculated by WACFACS)
	HI WAC 3-year UCL_{90} VWSF≤1	(yes/no)	(1: DQA performed in accordance with Appendix C to determine distribution and appropriate statistical descriptors, 2: SOF and its uncertainties calculated by WACFACS, and 3: VWSF and its uncertainty calculated by WACFACS)

[1] < 1% free liquids for LLW.

(Project and Waste Lot Name and WACFACS Identification Number)			
Requirement		**Fulfilled?**	**Comment**
ASA-Derived WAC		(yes/no)	(results of ASA SOF calculations here, including the radiological ASA-derived SOF, and whether all radioactive and chemical contaminants are presented with their relevant descriptive statistics)
Physical WAC	Container requirements	(yes/no)	(indicate that profile either commits to meeting this WAC, or that an approved variance has been included in the profile)
	Size requirements	(yes/no)	(indicate that profile either commits to meeting this WAC, or that an approved variance has been included in the profile)
	Weight requirements	(yes/no)	(indicate that profile either commits to meeting this WAC, or that an approved variance has been included in the profile)
	Concrete debris requirements	(yes/no)	(indicate that profile either commits to meeting this WAC, or that an approved variance has been included in the profile)
	Steel plate requirements	(yes/no)	(indicate that profile either commits to meeting this WAC, or that an approved variance has been included in the profile)
	Pipe requirements	(yes/no)	(indicate that profile either commits to meeting this WAC, or that an approved variance has been included in the profile)
	Asbestos and beryllium requirements	(yes/no)	(indicate that profile either commits to meeting this WAC, or that an approved variance has been included in the profile)
	Miscellaneous debris requirements	(yes/no)	(indicate that profile either commits to meeting this WAC, or that an approved variance has been included in the profile)
	Containerized compactable waste	(yes/no)	(indicate that profile either commits to meeting this WAC, or that an approved variance has been included in the profile)
	Rebar requirements	(yes/no)	(indicate that profile either commits to meeting this WAC, or that an approved variance has been included in the profile)
	Noncrushable container requirements	(yes/no)	(indicate that profile either commits to meeting this WAC, or that an approved variance has been included in the profile)
	Container liner requirements	(yes/no)	(indicate that profile either commits to meeting this WAC, or that an approved variance has been included in the profile)
	Dose rate requirements	(yes/no)	(indicate that profile either commits to meeting this WAC, or that an approved variance has been included in the profile)
CERCLA and Other Documentation			(full references for all approved CERCLA and other relevant documentation that were deemed necessary to demonstrate attainment of WAC requirements)

APPENDIX C.
EMWMF WAC ATTAINMENT TEAM
WASTE LOT DECISION FORM

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EMWMF WAC ATTAINMENT TEAM
WASTE LOT DECISION FORM

Project Name:_____
WBS Number:_____
Waste Lot WACFACS ID Number:_____
Project Contact:_____Phone Number: _____
Estimated Volume: _____
ASA-Derived WAC SOF:_____

This waste lot is
APPROVED
(or)
RECOMMENDED FOR APPROVAL
(or)
SUSPENDED
(or)
REJECTED

for disposal in the EMWMF.

Decision Summary:

Include in this section a brief description of the project and the specific waste lot being considered, including a physical description of the expected wastes and other key facts such as whether the wastes are LLW, RCRA, or TSCA. State definitively whether lot is or is not approved for disposal at EMWMF.

Key Assumptions:

List any assumptions used in approving or rejecting the waste lot that were important to the outcome of that decision. For example, if waste treatment is required to meet RCRA or TSCA land disposal restrictions, this section should specify the parameters treated and any performance standards that must be met. Another example would be the exclusion of suspected barrels of yellowcake from the waste lot when calculating the SOFs, or the existence of significant hot spots in a rejected waste lot such that the exclusion of those hot spots could significantly alter the decision outcome.

Conditions of Approval or Recommendation for Approval/Reasons for Rejection/Conditions of Lifting Suspension:

List any conditions of approval placed upon the waste lot (if appropriate), which will often be derived from any key assumptions made. For example, if LDR treatment standards are required, state the measurement to be taken and the minimum acceptable results. Or, if barrels of yellowcake were excluded from the SOF calculations, then a condition of approval would be that all barrels of yellowcake are segregated from wastes delivered to EMWMF under this waste lot. If it is determined that a waste lot is acceptable for disposal (i.e., the 3-year VWSFs are less than 1), but it is still desirable to obtain additional samples during the RA to further mitigate SOF uncertainties, specify here the number of additional samples required and any conditions placed upon their collection (e.g., random, 1 composite every 25 trucks, full or limited suite of analytes).

If a waste lot is being suspended, list the actions that must be undertaken to lift the suspension. Examples include a review of the waste lot profile against any updated requirements for form and format, a walkdown of project sites to identify changed conditions, etc.

If a waste lot is being rejected, note the specific reasons for rejecting the waste lot, and identify any possible remedies that may lead to all or some of the wastes being capable of being accepted under a revised profile (e.g., the removal of small volumes of high-activity wastes from the proposed waste lot).

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APPENDIX D.
NOMENCLATURE FOR WACFACS

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NOMENCLATURE FOR WACFACS

compiled 12/02/02

Project Control Code (PMCP)	WBS	RA Project Name	Waste Lot ID (WL ID)
MD	01.03.04.02	BCV Boneyard/Burnyard	1.0
CD	01.02.01.01	MV Closure Hydrologic Isolation	2.0
GB	01.01.08.04	K-1070-A Contaminated Burial Ground	3.0
GZ	01.01.11.03	Powerhouse Area RA	4.0
GO	01.01.06.01	K-25/K-27 Buildings D&D	6.0
OC	01.01.14.01	K29/K31/K33 Equipment Removal	8.0
CH	01.02.02.03	MV Closure HF and Small Facilities D&D	10.0
UA	01.01.09.01	ETTP Main Plant Area Facilities D&D	14.0
AN	01.03.07.01	Atomic City Auto Parts	24.0
QF	01.01.02.05	ETTP Legacy LLW Disposition	30.0
VU	01.01.01.01	ETTP RA S&M	31.0
A2	01.01.01.02	ETTP K-25/K-27 D&D S&M	32.0
VM	01.01.01.03	ETTP Other Non-Defense Facilities S&M	33.0
VO	01.01.01.04	ETTP Defense Facilities S&M	34.0
UK	01.01.01.05	ETTP Long Term S&M	35.0
VC	01.01.01.06	ETTP Water Quality Program	36.0
VG	01.01.01.07	ETTP Fire Protection & Emergency Mgmt.	37.0
VH	01.01.01.08	ETTP CROET Furnished Services	38.0
VJ	01.01.01.09	ETTP Environmental, Safety & Health	39.0
VW	01.01.01.10	ETTP Real Property Management	40.0
HA	01.01.01.11	ETTP Power Operations & Maintenance	41.0
VI	01.01.01.12	ETTP Security	42.0
EK	01.01.01.13	Filter Test Facility Operations	43.0
A6	01.01.01.14	ETTP Property/Materials Management & Disposition	44.0
VP	01.01.01.15	ETTP DOE Safeguards and Security	45.0
QF	01.01.02.05	ETTP Legacy LLW Disposition	46.0
UU	01.01.03.01	Reindustrialization Support	47.0
QX	01.01.03.02	Facilities & Materials Reuse Support	48.0
YY	01.01.03.03	ED-1 Transfer	49.0
GF	01.01.05.01	ETTP Zone 1 Soils Record of Decision	50.0
VD	01.01.05.02	ETTP Zone 2 Soils Record of Decision	51.0
GK	01.01.05.03	ETTP NFI / Delist Sites	52.0
GN	01.01.05.04	ETTP Groundwater Record of Decision	53.0
A5	01.01.05.05	ETTP Facilities D&D Action Memorandum	54.0
GM	01.01.06.02	K-25 Area RA	55.0
UJ	01.01.07.01	K-1064 Peninsula D&D	56.0
UG	01.01.07.02	K-1064 Peninsula Area RA	57.0
A7	01.01.08.01	K31/K33 Area D&D	58.0
A8	01.01.08.02	K31/K33 RA	59.0
HI	01.01.08.03	K-901 Area RA	60.0
HN	01.01.09.02	Main Plant Area RA	61.0
GU	01.01.10.01	Poplar Creek Facilities D&D	62.0
GQ	01.01.10.02	Poplar Creek Area RA	63.0
HG	01.01.11.01	ETTP Powerhouse Facilities D&D	64.0
GW	01.01.11.02	K-770 Scrap	65.0
A9	01.01.12.01	ETTP Balance of Site Facilities D&D - Lab Group	66.0
B2	01.01.12.02	ETTP Balance of Site D&D - K25 Support Facs	67.0
C8	01.01.12.03	ETTP Balance of Site D&D - Utilities Group	68.0
GA	01.01.12.04	K-1070 C/D G Pit and Concrete Pad	69.0
UB	01.01.12.05	Balance of Site RA	70.0
HX	01.01.12.06	K-1070 C/D Burial Ground	71.0
UC	01.01.13.01	Centrifuge Facilities Equipment Removal	72.0
B8	01.01.13.02	Centrifuge Facilities D&D	73.0
EX	01.01.13.03	TSCA Incinerator D&D	74.0

Project Control Code (PMCP)	WBS	RA Project Name	Waste Lot ID (WL ID)
B9	01.01.13.04	Central Neutralization Facility D&D	75.0
C3	01.01.13.05	Centrifuge Facilities RA	76.0
VL	01.01.14.02	K29/K31/K33 BJC Support to DOE	77.0
C4	01.01.14.03	D&D of Facilities and Utility Systems	78.0
C5	01.01.14.04	Facilities Planned for Reind - Remedial Actions	79.0
CF	01.02.01.02	MV Closure Soils and Sediments	80.0
CG	01.02.01.03	TRU Trenches & Tanks Remediation	81.0
CE	01.02.01.04	ISV-Trenches 5 & 7	82.0
CM	01.02.02.02	Spent Nuclear Fuel Disposition	83.0
KE	01.02.03.01	RA Projects Stored Waste Disposition	84.0
DG	01.02.03.04	ORNL Remedial Action TRU Waste	85.0
CN	01.02.04.01	MV Closure RAR	86.0
KF	01.03.01.01	ORNL Main Plant Surface Impoundments	87.0
KR	01.03.01.02	BV Groundwater Action	88.0
CI	01.03.01.03	MSRE Remedial Action	89.0
HT	01.03.01.04	BV Corehole 8 Plume Source	90.0
CP	01.03.01.05	MSRE Conversion	91.0
KT	01.03.02.01	BV Groundwater Action	92.0
KS	01.03.02.02	BV Inactive Tanks & Pipelines	93.0
K6	01.03.02.03	BV Burial Grounds	94.0
KW	01.03.02.04	ORNL Soils & Sediments	95.0
K2	01.03.02.05	ORNL FPR/Boundary Sites ROD	96.0
K8	01.03.02.06	Bethel Valley Groundwater ROD	97.0
K9	01.03.02.07	Melton Valley Final ROD	98.0
CJ	01.03.02.08	ORNL Small Facilities D&D	99.0
CK	01.03.02.09	MV Homogeneous Reactor Experiment D&D	100.0
KV	01.03.02.10	Molten Salt Reactor Experiment D&D	101.0
KJ	01.03.02.11	BV Isotopes Facilities (Building 3026 C&D)	102.0
KZ	01.03.02.12	BV Isotope Area Facilities D&D	103.0
KK	01.03.02.13	BV Chemical Development Lab Facilities D&D	104.0
K4	01.03.02.14	BV Reactor Area Facilities D&D	105.0
KI	01.03.02.15	BV Tank Area Facilities D&D	106.0
KU	01.03.02.16	ORNL Non-HF Well P&A	107.0
KM	01.03.03.01	ORNL Routine S&M	108.0
KL	01.03.03.02	ORNL Non-Routine S&M	109.0
KN	01.03.03.03	ORNL Long-Term S&M	110.0
KC	01.03.03.04	ORNL Water Quality Program	111.0
MM	01.03.04.01	UEFPC Bldg. 9201-2 Water Treatment System	112.0
AG	01.03.04.03	UEFPC East End VOC Plume	113.0
MN	01.03.04.04	UEFPC Soils ROD	114.0
MA	01.03.05.01	BCV ROD - Phase 1 (Stream Restoration)	115.0
MU	01.03.05.02	BCV ROD - Phase 2	116.0
AA	01.03.05.03	UEFPC ROD - Phase 1	117.0
C7	01.03.05.04	UEFPC Surface Water ROD	118.0
AR	01.03.05.05	UEFPC Groundwater ROD	119.0
AB	01.03.05.06	Chestnut Ridge ROD and RA	120.0
AC	01.03.05.07	ORR Integrated Footprint Reduction	121.0
NE	01.03.05.08	Clinch River/Poplar Creek Surface Water ROD	122.0
NR	01.03.05.09	BCV White Wing Scrap Yard ROD	123.0
NS	01.03.05.10	BCV Groundwater ROD	124.0
MC	01.03.05.11	BCV S-3 Ponds	125.0
NM	01.03.05.12	UEFPC West End Mercury Area Horiz Wells	126.0
ME	01.03.05.13	BCV Burial Grounds	127.0
MF	01.03.05.14	BCV White Wing Scrap Yard Remediation	128.0
AL	01.03.05.16	UEFPC Soils Remediation	129.0
AS	01.03.05.17	UEFPC Sediments - Streambed & Lake Reality	130.0
AI	01.03.05.18	UEFPC West End Mercury Area Remediation	131.0
MP	01.03.05.19	BCV DARA/SSF	132.0
NK	01.03.05.20	UEFPC Soils 81-10 Area Remediation	133.0
NL	01.03.05.21	UEFPC In-Situ Remediation - Alpha 2	134.0

Project Control Code (PMCP)	WBS	RA Project Name	Waste Lot ID (WL ID)
NT	01.03.05.22	Y-12 Salvage Yard - Scrap Removal	135.0
NC	01.03.05.23	Alpha-4 -D&D	136.0
NU	01.03.05.24	Transition Facility D&D	137.0
NN	01.03.05.25	Y-12 EM Facilities D&D	138.0
AK	01.03.06.01	Y-12 RA/Long Term S&M	139.0
NB	01.03.06.02	Y-12 D&D S&M	140.0
YV	01.03.06.03	Y-12 Excess Facilities - Defense	141.0
YW	01.03.06.04	Y-12 Excess Facilities - Non Defense	142.0
AP	01.03.06.05	Water Resources Restoration Program	143.0
MZ	01.03.06.06	Y-12 Water Quality Program	144.0
AZ	01.03.07.02	David Witherspoon, Inc. 901 Site	145.0
MV	01.03.07.03	David Witherspoon, Inc. 1630 Site	146.0
LT	01.03.08.03	EMWMF - Operations	147.0
CS	01.01.04.01	UF6 Cylinder Disposition	148.0
HR	01.03.01.06	Old Hydrofracture Waste	149.0
KG	01.03.01.07	Corehole 8 (FY02 Carryover)	150.0

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APPENDIX E.
DETAILS FOR PROFILE APPENDIX C AND APPENDIX G

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This Appendix provides details for completing Profile Appendix E and Appendix G.

Details for Completing Profile Appendix C, Controlled Data Set to the WAC Attainment Team

The purpose of Appendix C is to provide a copy of the transmittal document of the Controlled Data Set (CDS) to the Waste Acceptance Criteria (WAC) Attainment Team. In most cases, if not all, this is an e-mail from the Response Action (RA) Project to the WAC Attainment Team that identifies the CDS is provided to the WAC Attainment Team as an attachment. The CDS is an electronic file. Included as an attachment to the transmittal document, the RA Project shall transmit the CDS in an unprotected Microsoft Excel format.

The CDS shall include, at a minimum, the following parameters identified by the check mark (✓) and ordered by the Ordering number (1), (2), and (3) in Table E.1, depending on whether the RA Project waste lot is a soil remedial action waste lot or a building decontamination and decommissioning waste lot. Refer to Oak Ridge Environmental Information System (OREIS) (*OREIS User's Guide Information* and *OREIS Data Dictionary Information*) or Project Environmental Measurements System (PEMS) (*PEMS User's Guide*) for identification of parameter codes.

As indicated in the Ordering column of the table below, the data set should be ordered by (1) first by analysis type (radionuclides, metals, volatile organic compounds, semi volatile organic compounds, pesticides, herbicides, and polychlorinated biphenyls), (2) then by analyte, and (3) sorted from the lowest value to the highest value to facilitate a timely review of the data set. All data in the CDS shall include any associated data validation qualifiers. The final CDS shall be dated and shall also be 100% consistent with the data in the profile. It shall also be consistent with the other information presented in Appendix C (e.g., sample maps, sample nomenclature, crosswalks, and tables). In addition, an electronic version of the CDS shall be transmitted separately to the WAC Attainment Team.

Table E.1. RA Project Waste Lot NNN.NN controlled data set requirements

Ordering	Parameter	Soil Remedial Action	Building D&D
	PROJ_CODE	✓	✓
	SITE STA_NAME	✓	✓
	STA_TYPE	✓	✓
	LOCATION_ID	✓	✓
	PROJ_SAMPLE_ID	✓	✓
	D_COLLECTED	✓	✓
	MED_TYPE	✓	✓
	SMP_TYPE	✓	✓
	SMP_DEVICE_TYPE	✓	✓
	SMP_STRT_LEVEL	✓	
	SMP_END_LEVEL	✓	
	SDG_NUM	✓	✓
	LAB_SMP_ID	✓	✓
	LAB_PROC	✓	✓
	MATRIX	✓	✓
(1)	**LAB_MEAS_ANA_TYPE**	✓	✓
	ANA_METHOD	✓	✓
	LAB_MEAS_PARAMTR	✓	✓
(2)	**LAB_MEAS_CHEMICAL_NAME**	✓	✓
(3)	**LAB_MEAS_RESULTS**	✓	✓
	LAB_MEAS_UNITS	✓	✓
	DETECT_LIMIT	✓	✓

Table E.1. RA Project Waste Lot NNN.NN controlled data set requirements

RAD_ERR	✓	✓
DILU_FAC	✓	✓
LAB_MEAS_VALIDATION	✓	✓
LAB_MEAS_RSLTQUAL	✓	✓
LAB_MEAS_RSLT_PREFIX_QUALIFIER	✓	✓
SPLANE_NORTH	✓	✓
SPLANE_EAST	✓	✓

Details for Completing Profile Appendix G: Data Quality Assessment

The purpose of Profile Appendix G is to present the Data Quality Assessment (DQA) performed to (1) confirm RA Project data quality objectives (DQOs) as described in Appendix F are met, (2) characterize the RA Project waste based upon the sampling and analysis plan and data collection efforts, as described in Appendix E, (3) provide a clear crosswalk to any calculations/measurement methods or models used to develop or transform the data, as presented in Profile Appendix E, and carry forward any contaminant concentrations based upon process knowledge, as presented in Profile Appendix B.

The goal of providing these details is to offer a format that will clearly describe the DQA approach used, including a detailed list and discussion of all assumptions, and explanations and justification for decisions made related to information selected or rejected.

Overview of the Data Quality Assessment

This section of the appendix should provide the general approach for how DQA was performed to include any supplemental methods not included in Appendix E. Generally, the DQA overview identifies all calculations performed to support the data presented in the profile. The calculations are based on sampling and analysis results and calculations identified in Profile Appendix E, "Calculation/Measurement Methods," and include any other statistical computation software outputs, such as best-fit probability distributions, etc.

Appendix C of the *WAC Attainment Plan* (DOE/OR/01-1909&D3) provides key guidance for DQA. RA projects should apply (1) the U.S. Environmental Protection Agency (EPA) DQO process (EPA/240/B-06/001) to define sampling requirements; (2) EPA-approved sample design and data collection guidance (EPA/240/R-02/005) and software approaches, such as *Visual Sampling Plan* (PNNL-19915) and *Spatial Analysis and Decision Assistance* (SADA, latest revision); and (3) the EPA DQA process (EPA/240/B-06/002 and EPA/240/B-06/003) using statistical software calculation results obtained from *ProUCL* (EPA/600/R-07/041, latest revision, and EPA/600/R-07/038, latest revision), SAS (*JMP Statistical Discovery Software*) or SAS (*SAS Statistical Analysis Software,* latest revision), and *QND – PERT BETA UCL-95* (Redus and Associates, LLC).

Results of Data Quality Assessment

The results of the DQA shall be presented in two required formats.

(1) Summary Statistics for All Site-Related Contaminants (SRCs) Table—summary statistics for all SRCs examined as part of the RA Project waste lot, including goodness-of-fit results, as illustrated in two examples in Table E.2, and

(2) Data Summary for Each SRC—a data summary for each SRC examined as part of the RA Project waste lot sorted from maximum to minimum Proxy Value, including summary statistics and goodness-of-fit results as illustrated in Table E.3.

The intent of Table E.2 is to allow a direct comparison to all tables as contained in Profile Sections 2 (Prohibited Waste Types, Resource Conservation and Recovery Act Land Disposal Restrictions, Average Total Uranium Limits, Criticality Safety Evaluation, and Tennessee Department of Environment and Conservation Class C Determination), Section 3 (Analytic WAC Compliance), and Section 4 (Auditable Safety Analysis-Derived WAC Compliance).

The intent of Table E.3 is to allow a more detailed examination of sampling information (sample ID, location, data qualifiers, etc.) used to calculate the summary statistics.

All SRCs, including intrusive sample results, materials of construction calculations, or other isotope or chemical calculations on which DQA is performed shall be included in this appendix. Graphical information may include, but is not limited to, bar charts, normal and lognormal probability plots, or box plots for all or individual waste components in the waste lot.

Table E.2. RA Project Waste Lot NNN.NN summary statistics for all SRCs (two examples)

Example 1

Constituent	Freq. of Detection	Units	Non-detect Detection Limits[a] Min	Non-detect Detection Limits[a] Max	Min[b]	Mean[b]	Median[b]	Max[b]	S.D.[b]	Detected Min	Detected Mean	Detected Max	Detected S.D.	Ln transformed Mean[b]	Ln transformed S.D.[b]	Ln transformed Detected Mean	Ln transformed Detected S.D.	Dist.	E(X)	UCL 90	UCL 95	UTL 95/95	Analytic WAC Carc.	Analytic WAC HI	ASA WAC	E(X) divided by Analytic WAC Carc.	E(X) divided by Analytic WAC HI
All transite samples from K-310-2, K-310-3 and K-311-1																											
Radionuclides																											
Technetium-99	14 / 14	pCi/g	--	--	4.1	35.1	27.1	190	46.8	4.1	35.1	190	46.8	3.06	0.998	3.06	0.998	L	35.2	61.3	76.1	291	172	--	4.2E+07	0.204	--
Uranium-234	8 / 14	pCi/g	3.7	4.5	3.7	6.46	5.11	12.5	2.91	4.88	8.25	12.5	2.66	1.78	0.422	2.06	0.335	B	6.1	8.21	8.9	--	1700	2.8E+07	100,000	0.004	2.2E-07
Uranium-235	0 / 14	%	--	--	0	0	0	0	0	--	--	--	--	--	--	--	--	B	0	0	0	--	--	--	--	NSRC	NSRC
Uranium-235	14 / 14	pCi/g	--	--	0.025	0.204	0.186	0.466	0.15	0.025	0.204	0.466	0.15	-1.93	0.932	-1.93	0.932	N	0.204	0.258	0.275	0.596	1500	9500	100,000	1.4E-04	2.2E-05
Uranium-236	4 / 14	pCi/g	0.035	0.051	0.035	0.047	0.048	0.058	0.006	0.046	0.052	0.058	0.005	-3.07	0.132	-2.97	0.103	N	0.047	0.049	0.049	0.062	1700	280,000	100,000	2.7E-05	1.7E-07
Uranium-238	14 / 14	pCi/g	--	--	0.38	0.991	0.803	2.18	0.55	0.38	0.991	2.18	0.55	-0.153	0.562	-0.153	0.562	N	0.991	1.19	1.25	2.43	1200	1500	100,000	8.3E-04	6.6E-04
																									SOF =	0.209	6.8E-04

[a] The detection limits shown are used as proxy values for non-detect radionuclides.

[b] This summary statistic is calculated using both detects and proxy values for non-detects.

ASA = Auditable Safety Analysis.

Carc. = Carcinogenic.

Dist. = distribution. Distribution flags are defined as:

B = PERT Beta. Data are neither normal nor lognormal based on Shapiro-Wilk ($n \leq 50$) or Lilliefors ($n > 50$) test using 0.10 significance level.

L = lognormal. UCL90 and UCL95 are calculated using Land's statistic, Chebyshev minimum variance unbiased estimator, or nonparametric Chebyshev inequality method.

N = normal. UCL90 and UCL95 are calculated using t statistic.

E(X) = Expected value for the constituent for the probability density function.

HI = Hazard index.

NSRC = Not a site related contaminant (SRC).

pCi/g = picocuries per gram.

S.D. = standard deviation.

UCL90 = upper confidence limit on the mean concentration with 90% confidence.

UCL95 = upper confidence limit on the mean concentration with 95% confidence.

UTL95/95 = upper tolerance limit on individual concentrations with 95% confidence and 95% coverage. A nonparametric UTL95/95 requires at least 59 samples.

WAC = Waste acceptance criteria from Tables A.1 and A.2 in *Containment Plan for Risk/Toxicity-Based Waste Acceptance Criteria at the Oak Ridge Reservation, Oak Ridge, Tennessee* (DOE/OR/01-1909&D3).

-- = Not applicable, not available or insufficient data to calculate the statistic.

Example 2

Chemical Name	Units	N	Detects	Minimum	Median	Maximum	Arithmetic Mean	Std Dev of Result	PDF	LN Mean	LN Std Dev	E(x)	UCL-95
Neptunium-237	pCi/g	23	2	0.0217	0.0551	0.145	0.07	0.04	LN	-2.86	0.53	0.07	0.08
Thorium-234	pCi/g	23	19	0.531	5.38	135	18.80	34.55	LN	1.65	1.63	19.74	65.47
Uranium-235	pCi/g	2	2	0.655	1.1925	1.73	1.19	0.76	PB	NA	NA	1.19	1.53
Plutonium-239/240	pCi/g	23	1	0.0385	0.0879	0.217	0.09	0.04	LN	-2.52	0.42	0.09	0.10
Plutonium-241	pCi/g	23	1	4.6	8.75	24.7	8.96	4.31	LN	2.11	0.40	8.93	10.50
Radium-226	pCi/g	23	9	0.1215	0.471	0.767	0.48	0.19	N	NA	NA	0.48	0.55
Technetium-99	pCi/g	23	23	0.771	5.19	67.5	18.17	23.81	PB	NA	NA	14.84	34.99
Uranium-233/234	pCi/g	23	23	0.106	6.09	101	14.17	23.73	LN	1.48	1.75	20.18	78.21
Uranium-235/236	pCi/g	23	17	0.0744	0.374	6.6	1.03	1.76	LN	-0.95	1.36	0.98	2.35
Uranium-238	pCi/g	23	23	0.209	5.37	140	21.04	38.86	LN	1.59	1.87	28.04	128.67
Arsenic	mg/L	15	15	0.0345	0.245	0.7	0.279	0.211	N	NA	NA	0.279	0.375
Barium	mg/L	15	9	0.0049	0.0275	0.5	0.089	0.133	LN	-0.10	1.14	0.0865	0.2135
Cadmium	mg/L	15	4	0.00095	0.005	0.15	0.0145	0.0375	PB	NA	NA	0.0285	0.072
Chromium	mg/L	15	15	0.305	1.4	7	2.709	2.18	LN	3.59	1.01	3.028	6.41
Lead	mg/L	15	15	0.0065	0.055	0.95	0.1255	0.2415	LN	0.01	1.29	0.117	0.357
Mercury	mg/L	15	1	0.00005	0.00012	0.000375	0.000165	0.000115	PB	NA	NA	0.0001	0.0005
Selenium	mg/L	15	1	0.0125	0.0125	0.8	0.065	0.2035	PB	NA	NA	0.144	0.3675
Silver	mg/L	15	4	0.00245	0.0125	0.17	0.0325	0.055	PB	NA	NA	0.037	0.0875

Table E.3. RA Project Waste Lot NNN.NN data summary for generic SRC (example)

Sort by Proxy Value

Location ID	Sample ID	Result	Result Qualifier	Validation Qualifier	Detection Limit	Detect = 1, ND = 0	Proxy Value	LN Proxy Value
EWPC-TR-E7-11	EWPC-TR-E7-11	190		J	0.879	1	190	5.25
EWPC-TR-W5-08	EWPC-TR-W5-08	52.7		J	0.667	1	52.7	3.96
EWPC-TR-S2-02	EWPC-TR-S2-02	40		J	0.691	1	40	3.69
EWPC-TR-S2-03	EWPC-TR-S2-03	36.1		J	0.715	1	36.1	3.59
EWPC-TR-S2-04	EWPC-TR-S2-04	30.8		J	0.922	1	30.8	3.43
EWPC-TR-E7-10	EWPC-TR-E7-10	30.2		J	0.825	1	30.2	3.41
EWPC-TR-S2-05	EWPC-TR-S2-05	30.2		J	0.719	1	30.2	3.41
EWPC-TR-S1-01	EWPC-TR-S1-01	24		J	0.704	1	24	3.18
EWPC-TR-E6-09	EWPC-TR-E6-09	15.6		J	0.585	1	15.6	2.75
EWPC-TR-W3-06	EWPC-TR-W3-06	13.5		J	0.983	1	13.5	2.6
EWPC-TR-W4-07	EWPC-TR-W4-07	11.7		J	0.565	1	11.7	2.46
EWPC-TR-E7-12	EWPC-TR-E7-12	7.81		J	0.603	1	7.81	2.06
EWPC-TR-E8-13	EWPC-TR-E8-13	5.38		J	0.881	1	5.38	1.68
EWPC-TR-E8-14	EWPC-TR-E8-14	4.1		J	0.913	1	4.1	1.41

Number of Samples	14
Number of Detects	14
Minimum	4.1
Median	27.1
Maximum	190
Arithmetic Average	35.1
Std Dev	46.8
PERT-Beta Expected Value	50.4
LN Mean	3.06
LN Std Dev	0.998
S-W p-value for normality	2.9E-05
S-W p-value for lognormality	0.768

References

DOE/OR/01-1909&D3. *Attainment Plan for Risk/Toxicity-Based Waste Acceptance Criteria at the Oak Ridge Reservation, Oak Ridge, Tennessee*, 2002, Office of Environmental Management, Oak Ridge, TN.

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APPENDIX F.
ROLES AND RESPONSIBILITIES CROSSWALK

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ROLES AND RESPONSIBILITIES CROSSWALK

From: \ To:	RA Project (prime contractor and RA subcontractor)	EMWMF Operations	WAC Attainment Team	Prime contractor Planning and Controls	DOE	TDEC and EPA
RA Project (prime contractor and RA subcontractor)	—	• Propose waste delivery schedule. • Inform if variance from physical WAC needed. • Deliver wastes as scheduled. • Provide proper approval ID. • Inform if there are any delays.	• Coordinate WHP and SAPs preparation • Prepare WL Profile • Provide required documentation for DQO Decisions 1, 2, and 3. • Identify anomalies.	• Provide LCB and WGF updates. • Provide any other requested data.	• Manage and execute RA scope. • Submit any required BCP changes.	• Adhere to all applicable regulations. • Propose any administrative WAC waivers.
EMWMF Operations	• Accept or negotiate waste delivery schedule. • Track approved variances to physical WAC. • Dispose wastes. • Verify physical WAC compliance. • Integrate waste deliveries.	–	• Propose any permanent changes to physical WAC. • Confirm wastes have proper approvals.	• Report possible soil-to-debris ratio challenges. • Report project sequencing challenges.	• Provide interface with DOE. • Provide progress reports to DOE. • Cooperate with audits • Respond to audit findings.	• Copy DOE progress reports to regulators. • Cooperate with audits. • Respond to audit findings.
WAC Attainment Team	• Provide WAC attainment guidelines. • Provide inputs to WHP and SAPs preparation • Approve wastes for disposal.	• Process any requested permanent changes to physical WAC for DOE consideration. • Provide independent oversight of WAC compliance.	—	• Provide WACFACS VWSF results. • Perform VWSF scenario analyses.	• Report when waste lots are approved for disposal. • Maintain auditable VWSF system. • Notify of ASA-derived WAC variances. • Propose new and changed WAC.	• Copy waste lot approval decisions to regulators. • Maintain auditable VWSF. • Copy on ASA-derived WAC variances. • Support new WAC proposals
Prime contractor Planning and Controls	• Provide strategic sequencing of projects. • Examine projects for integration synergies.	• Explore solutions to soil-to-debris ratio and sequencing challenges.	• Analyze WACFACS VWSF results. • Request VWSF scenario analyses.	—	• Propose project-sequencing options to DOE. • Propose VWSF solutions.	• Support DOE solution proposals to regulators.
DOE	• Set RA scope. • Approve BCP changes.	• Audit and oversee disposal operations.	• Audit and oversee WAC attainment decisions. • Consider proposed WAC changes.	• Consider and choose sequencing and VWSF solutions.	—	• Propose sequencing and VWSF solutions. • Propose new WAC and WAC changes.

ROLES AND RESPONSIBILITIES CROSSWALK (cont.)

From: \ To:	RA Project (prime contractor and RA subcontractor)	EMWMF Operations	WAC Attainment Team	Prime contractor Planning and Controls	DOE	TDEC and EPA
TDEC and EPA	• Audit and oversee RA activities. • Approve any administrative WAC waivers.	• Audit and oversee disposal operations.	• Audit and oversee WAC attainment and approval decisions.	*	• Concur with sequencing and VWSF solutions. • Approve new WAC and WAC changes.	—

*No direct interface
ASA = auditable safety analysis
BCP = baseline change proposal
DOE = U.S. Department of Energy
DQO = data quality objective
EMWMF = Environmental Management Waste Management Facility
EPA = U.S. Environmental Protection Agency
ID = identification
LCB = lifecycle baseline
RA = response action
SAPs = Sampling and Analysis Plans
TDEC = Tennessee Department of Environment and Conservation
VWSF = volume-weighted sum of fractions
WAC = waste acceptance criteria
WACFACS = Waste Acceptance Criteria Forecasting Analysis Capability System
WGF = Waste Generation Forecast
WHP = Waste Handling Plan
WL = Waste Lot

EXAMPLE: The RA Project (prime contractor and RA subcontractor) is responsible for preparing Waste Lot Profile; providing required documentation for DQO Decisions 1, 2, and 3; and identifying anomalies. This information is provided to the WAC Attainment Team

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