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FEB 11 1999 (12)

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 625621

S

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Distribution	TRU Waste Program	N/A
5. Proj./Prog./Dept./Div.:	6. Design Authority/Design Agent/Cog. Engr.:	7. Purchase Order No.:
TRU Project	N/A	N/A
8. Originator Remarks:		9. Equip./Component No.:
This EDT is to release the documentation for the TRU Project to Engineering Files for retention and retrieval purposes		N/A
		10. System/Bldg./Facility:
		N/A
		12. Major Assm. Dwg. No.:
		N/A
11. Receiver Remarks: 11A. Design Baseline Document? ○ Yes ◉ No		13. Permit/Permit Application No.:
		N/A
		14. Required Response Date:
		N/A

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	HNF-2605	N/A	0	HANFORD SITE TRANSURANIC SAMPLING PLAN	Q	2	1	

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D OR N/A (See WHC-CM-3-5, Sec. 12.7)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION
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(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
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		Env.									

18.	19.	20.	21. DOE APPROVAL (if required)
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Signature of EDT Originator Date	Authorized Representative for Receiving Organization Date	Design Authority/ Cognizant Manager Date	○ Approved ○ Approved w/comments ○ Disapproved w/comments

S

HANFORD SITE TRANSURANIC WASTE SAMPLING PLAN

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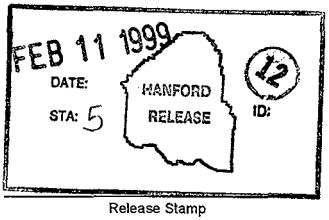
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: 625621 UC: 506
Org Code: 32B00 Charge Code: BC10
B&R Code: EW02J126 Total Pages: 15

Key Words: Sampling Plan, TRU, CAO, WIPP

Abstract: The Hanford Site Transuranic Waste Sampling Plan describes the selection of containers for sampling of homogeneous solids and soil/gravel and for visual examination of transuranic and mixed transuranic (collectively referred to as TRU) waste generated at the U.S. Department of Energy (DOE) Hanford Site.



Release Approval — Date: 2/11/99 — Release Stamp

Approved For Public Release

HANFORD SITE TRANSURANIC WASTE SAMPLING PLAN

HNF-2605
Revision 0

November 4, 1998

Project No. 5065.00.0007

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HANFORD SITE TRANSURANIC WASTE SAMPLING PLAN

HNF-2605 REV 0

Approval Page

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ACRONYMS

ALARA	as low as reasonably achievable
CAO	Carlsbad Area Office
CFR	*Code of Federal Regulations*
CV	coefficient of variation
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
QA	quality assurance
QAPjP	*Hanford Site Transuranic Waste Quality Assurance Project Plan* (Hanford 1998b)
QAPP	*Transuranic Waste Characterization Quality Assurance Program Plan* (DOE 1996a)
QC	quality control
RCRA	Resource Conservation and Recovery Act
SP	*Hanford Site Transuranic Waste Sampling Plan*
SPM	site project manager
SWITS	Solid Waste Information and Tracking System
TRU	transuranic
TRUCON	TRUPACT-II Content Code
TRUPACT-II	Transuranic Package Transporter-II
TWBIR	*Waste Isolation Pilot Plant Transuranic Waste Baseline Inventory Report* (DOE 1995b)
UCL_{90}	90-percent upper confidence limit
WIPP	Waste Isolation Pilot Plant
WIPP WAC	*Waste Acceptance Criteria for the Waste Isolation Pilot Plant* (DOE 1996b)

HANFORD SITE TRANSURANIC WASTE SAMPLING PLAN

1.0 INTRODUCTION

This sampling plan (SP) describes the selection of containers for sampling of homogeneous solids and soil/gravel and for visual examination of transuranic and mixed transuranic (collectively referred to as TRU) waste generated at the U.S. Department of Energy (DOE) Hanford Site. The activities described in this SP will be conducted under the Hanford Site TRU Waste Certification Program. This SP is designed to meet the requirements of the *Transuranic Waste Characterization Quality Assurance Program Plan* (CAO-94-1010) (DOE 1996a) (QAPP), site-specific implementation of which is described in the *Hanford Site Transuranic Waste Characterization Program Quality Assurance Project Plan* (HNF-2599) (Hanford 1998b) (QAPjP).

The QAPjP defines the quality assurance (QA) requirements and protocols for TRU waste characterization activities at the Hanford Site. In addition, the QAPjP identifies responsible organizations, describes required program activities, outlines sampling and analysis strategies, and identifies procedures for characterization activities. The QAPjP identifies specific requirements for TRU waste sampling plans. Table 1-1 presents these requirements and indicates sections in this SP where these requirements are addressed.

2.0 SCOPE

This SP describes the processes to select containers for sampling and visual examination and to define waste streams. These characterization activities are required for the performance assessment of the Waste Isolation Pilot Plant (WIPP) (40 *Code of Federal Regulations* [CFR] Parts 191 and 194) in accordance with hazardous waste permit application requirements set forth in the Resource Conservation and Recovery Act (RCRA) (40 CFR Part 270) and Title 20 of the New Mexico Administrative Code, Chapter 4, Part 1 (NMAC 4.1).

TRU wastes are typically classified on the basis of their generation either before (i.e., retrievably stored) or after (i.e., newly generated) implementation of the QA and quality control (QC) requirements specified in the QAPjP approved by the U.S. DOE Carlsbad Area Office (CAO). For the Hanford Site TRU Program, all TRU waste, with the exception of selected repackaged debris waste, will be characterized in accordance with the QAPjP requirements for retrievably stored waste. Debris wastes that are repackaged may be characterized in accordance with the requirements for newly generated waste. This SP, and the discussions herein, are applicable to all TRU wastes at the Hanford Site and reflect this approach.

3.0 WASTE STREAMS

The past mission of the Hanford Site was primarily dedicated to the production of plutonium for national defense and management of the wastes generated by chemical processing operations. In recent years, the production mission of the site has ended and the mission is now one of environmental management and cleanup of site facilities. The TRU wastes to which this sampling plan applies were generated as a consequence of the original site production mission during cleanup of various facilities throughout the Hanford Site.

Table 1-1. Sampling Plan Requirements Matrix.

Requirement	Section Location
Name of Site to which Sampling Plan applies	1.0
Waste to which Sampling Plan applies (i.e., retrievably stored and newly generated TRU waste)	2.0
Specific facilities or waste-generating processes addressed	3.0, Appendix A
Characterization activities to which Sampling Plan applies (i.e., selection of containers for RCRA characterization and visual examination)	2.0, 4.1, 4.2
Issues, operational constraints, or as low as reasonably achievable (ALARA) concerns related to container selection and retrieval	4.0
Identification and summary description of waste streams to be sampled, including a citation of the basis used for identification and description	3.0, Appendix A
Correlation to applicable *Waste Isolation Pilot Plant Transuranic Waste Baseline Inventory Report* (CAO-95-1121) (DOE 1995b) (TWBIR) streams	3.0, Appendix A
Description or citation of procedures for obtaining data for preliminary estimates of mean, variance, and coefficient of variation (CV), as described in QAPP Section 5.4.1	4.1
Identification of preliminary sample data (if available), justification for its use for a particular waste stream, and preliminary estimates (or citations of documents containing the preliminary estimates)	4.1
Description or citation of a procedure for selecting CV and documenting calculation of number of containers to sample	4.1
An indication that the number of containers sampled will be compared to the number of containers calculated from the CV for the sampling episode to determine whether additional sampling is required	4.1
Description or citation of procedure used for random selection of containers and sampling locations	4.1, 4.2
Description or citation of procedures for determining miscertification rate, determining number of containers to be selected, and randomly selecting containers for visual examination, as described in QAPP Section 5.4.2	4.2
Description or citation of procedures for interfacing with operations personnel regarding retrieval of selected containers	4.1
Newly generated waste characterization strategies	2.0
Documentation of random container selection	4.0

To delineate waste streams to be sampled according to this SP, wastes will be organized by the waste generating source (i.e., facility and/or process), dates of waste generation, physical content and waste form, chemical and radiological content of the waste, and TRUPACT-II Content Code (TRUCON), based on acceptable knowledge at the Hanford Site. These waste streams will include waste streams defined in the *Transuranic Waste Baseline Inventory Report* (DOE/CAO-95-1121) (DOE 1995b) (TWBIR).

Waste streams will be selected initially on the basis of information available in the Hanford Site Solid Waste Information and Tracking System (SWITS). The SWITS will be used to identify waste streams that are composed of wastes having the same parameters (e.g., waste source and type, waste form and content, U.S. Environmental Protection Agency [EPA] hazardous waste numbers), and identified as belonging to the same matrix parameter summary category (DOE 1995a). These waste streams are correlated to the TWBIR waste streams using the TWBIR identification number. Appendix A lists the initial waste stream identified for characterization. The waste stream may be further delineated as acceptable knowledge is compiled and evaluated. The site project manager (SPM) (or designee) will identify additional waste streams and maintain a list of containers to be characterized each year according to this SP. Required sampling of waste streams for RCRA characterization and visual examination is described in Section 4.0.

4.0 CHARACTERIZATION STRATEGY

Characterization of TRU waste streams will be accomplished through testing, sampling and analysis, and acceptable knowledge documentation. Testing includes nondestructive assay, nondestructive examination, and visual examination (the latter as a quality control check on nondestructive examination). Types of sampling and analysis to be performed include headspace gas of all waste containers and solid sampling for randomly selected containers in accordance with the sampling strategy described in Section 4.1. Acceptable knowledge for this purpose will be compiled and verified in accordance with the procedure *Acceptable Knowledge Documentation Management* (WMH-400, Section 7.1.9).

Each waste stream is assigned a particular matrix parameter category in accordance with *DOE Treatability Group Guidance* (DOE/LLW-217) (DOE 1995a). This identifies the waste streams as belonging to one of the following matrix parameter summary categories: homogeneous solids (S3000 series), soils/gravel (S4000 series), and debris waste (S5000 series). These are described as follows:

- Homogeneous solids wastes (summary category S3000) are solid waste materials that may include residual or absorbed liquids, but that exclude soil/gravel, and are not considered debris. These wastes are at least 50 percent by volume homogeneous solids.

- Soil/gravel wastes (summary category S4000) are those wastes estimated to be at least 50 percent by volume soil, including sand and silt or rock and gravel.

- Debris wastes (summary category S5000) are those wastes that are at least 50 percent by volume heterogeneous waste materials or waste materials whose physical form does not lend themselves to sampling and analysis. No size limitations are made for debris wastes.

Waste streams that are classified as homogeneous solids (S3000) or soil/gravel (S4000) will be randomly selected, sampled, and analyzed to determine whether the waste stream exhibits a RCRA toxicity characteristic and to update previously assigned spent solvent EPA hazardous waste numbers. Debris waste streams (S5000) are not intrusively sampled for RCRA characterization. Waste containers from all matrix parameter summary categories are randomly selected for visual examination. Random container selection is documented in accordance with the procedure *Sampling*

Design and Data Analysis for RCRA Characterization and Visual Examination of Retrievably Stored Transuranic Waste (WMH-400, Section 7.14).

Waste containers that may impose operational constraints (e.g., health and safety concerns, ALARA issues, containers with questionable integrity) during retrieval or characterization operations will be segregated from other waste containers. As necessary containers will be overpacked and transferred to a facility equipped or designed to handle such situations.

4.1 RCRA Characterization

The sampling strategy for RCRA characterization of S3000 and S4000 matrix parameter summary categories includes the use of preliminary sample statistics from waste streams. Because preliminary sampling data are generally not available, the minimum number of containers (five - based on established statistical practices) will be randomly selected and sampled initially, and the appropriate statistics (e.g., mean, standard deviation, CV) calculated from the analytical results for RCRA-regulated constituents. To accomplish preliminary sampling, inventories of retrievably stored waste streams will be randomly sorted and the first five containers in each sort will be selected for sampling. Where fewer than five containers of retrievably stored waste exist, multiple samples will be randomly collected from the containers, as necessary, to ensure that a minimum of five samples are obtained to characterize the waste stream. The sampling strategy and corresponding data reduction are performed in accordance with the procedure *Sampling Design and Data Analysis for RCRA Characterization and Visual Examination of Retrievably Stored Transuranic Waste* (WMH-400, Section 7.1.4).

The preliminary sample statistics will then be used to statistically determine the number of containers from the waste stream to randomly select and sample. A method that ensures equal probability of selection and sample location will be employed. The QAPjP cites procedures for sample management, documentation, chain-of-custody, analysis, and other activities.

Following sampling and analysis, the adequacy of the number of samples collected will be evaluated by comparing the observed CV with that from the preliminary parameter estimates. The process for determining the number of containers to sample, randomly selecting containers and sampling locations, arranging for sampling and analysis, and evaluating results is described in *Sampling Design and Data Analysis for RCRA Characterization and Visual Examination of Retrievably Stored Transuranic Waste* (WMH-400, Section 7.1.4) and *Transuranic Waste Characterization Data Quality Objectives Reconciliation and Reporting* (WMH-400, Section 7.1.1).

The procedure *Transuranic Waste Repackaging, Visual Examination, and Sampling* (WMH-400, Section 7.1.3), describes organizational responsibilities and interfaces and details the steps for requesting retrieval of selected waste containers for sampling and examination. The SPM (or designee) will maintain a list of drums selected for sampling each year.

4.2 Visual Examination

TRU waste containers from all matrix parameter summary categories will be randomly selected for visual examination annually in accordance with *Sampling Design and Data Analysis for RCRA Characterization and Visual Examination of Retrievably Stored Transuranic Waste* (WMH-400, Section 7.1.4). The population from which these containers are selected is that portion of the container inventory that has undergone or will undergo radiography in the examination year. This population may be restricted by certification activities that remove containers from the TRU waste program. In this case replacement containers will be randomly selected to fulfill the visual examination requirements. The eligible population, along with the expected miscertification rate, will be used to determine the number of containers to examine each year. Miscertified containers are those that radiography (i.e., nondestructive examination) indicate can be certified, however, subsequent visual exam determines that the container cannot be certified as meeting the WAC requirements for

prohibited items.

During the first year of Program activities, a miscertification rate of two percent will be assumed based on historical evidence from the Idaho National Engineering and Environmental Laboratory. In succeeding years, the miscertification rate will be determined each year based on the results of certification activities over the preceding 12 months. The following assumptions are used to determine the number of containers for visual examination:

- Waste containers are randomly selected and examined to ensure that a representative sample of waste containers is obtained.
- Only waste containers certified for compliance with WIPP WAC and TRAMPAC will be selected.
- There is a definable finite population of waste containers for which the proportion miscertified is to be estimated.
- The certification process is uniform for all waste containers and is unbiased regardless of the waste stream.
- The radiography system is functioning property and is operated by qualified personnel.

Table 4-1 identifies the number of containers requiring visual examination for specific populations of containers having undergone radiography and at various miscertification rates. Table 4-1 may be used conservatively to determine the number of containers to visually examine for rates less than six percent and populations of 500 or fewer containers (e.g., 24 containers may be randomly selected from a total population of 90 if the miscertification rate is assumed to be two percent). Alternatively (e.g., larger populations, higher miscertification rates), the number may be calculated using the information in Section 5.4.2 and Appendix A of the QAPP. Random selection of containers using these approaches ensures that the certification program is 80-percent confident that if the actual miscertification rate is the same as the percent in the column identified in Table 4-1, and if the specified number of waste containers is examined, the 90-percent upper confidence limit (UCL_{90}) of the miscertification percentage will be less than or equal to 14 percent. The first year of operation has 900 drums planned for radiography with 26 of those drums requiring visual examination.

Table 4-1. Number of Containers for Visual Examination.

Annual Number of Waste Containers Undergoing Radiography	Number of Waste Containers Requiring Visual Examination Based on Percent of Waste Containers Miscertified to WIPP WAC by RTR in Previous Years					
100	15	24	24	33	33	41
200	15	26	26	35	44	52
300	15	26	26	35	44	53
400	15	26	26	36	45	62
500	16	26	26	36	45	63
Percent of waste containers miscertified[a]	1%	2%	3%	4%	5%	6%

[a] Miscertified by radiography in previous years based on *Waste Acceptance Criteria for the Waste Isolation Pilot Plant* (DOE 1996b) (WIPP WAC).

Provided that all visual examination requirements are accomplished in association with solid waste sampling operations, waste containers selected for visual examination may be replaced on a one-to-one basis by those undergoing solid waste sampling from the same waste stream or waste stream lot. In this case, visual examination may be performed at the time of solid sampling. If the number of containers from a waste stream or waste stream lot that is undergoing solid sampling is greater than the number to be visually examined, replacements will be randomly selected from the group undergoing solid sampling.

To determine whether a container is miscertified, the results of each visual examination are compared to the radiography results. A container is considered to be miscertified by radiography if, based on radiography acceptance criteria, radiography does not identify a nonconforming condition or prohibited item that is subsequently identified by visual examination. The waste is repackaged if a prohibited item is found during visual examination. Visual examination of the waste may be performed during repackaging, and the SPM can use these results (rather than radiography) to confirm acceptable knowledge. A container is not considered to be miscertified by radiography if either of the following conditions are met:

- A nonconforming condition is identified by radiography, but is found to meet the appropriate WIPP WAC upon subsequent visual examination (e.g., radiography identifies a container as nonconforming based on the presence of residual liquids in the container, but visual examination determines that the amount of liquid meets the WIPP WAC for residual liquids).

- A nonconforming condition is noted during visual examination that is not included in the radiography acceptance criteria.

Acceptance criteria used during radiography are found in the procedures *TRU Waste Certification—Operation of the Drum Nondestructive Examination System* (WRP1-OP-0908) and other facility operating procedures, as applicable. The criteria used in evaluating whether the container has been miscertified by radiography include the following:

- Absence of pressurized vessels and compressed gases

- Absence of sealed containers >4 L
- Residual liquids are <2 L in a 55-gal. drum or <8 L in a standard waste box and <1 in. in the bottom of a container

Nonconforming items and conditions noted during the visual examination resulting in a miscertification may be resolved by correcting the nonconforming condition in accordance with *TRU Nonconforming Item Reporting and Control* (WMH-400, Section 1.3.2).

Each fiscal year, the Hanford Site will establish the number of containers that will undergo radiography during the year and randomly select and examine the appropriate number, substituting containers undergoing solid sampling, as appropriate. A container that has been visually examined in previous years is not eligible for future examination. If a container cannot be visually examined in any year, the SPM (or designee) documents and approves the reason. In the event that one or more of the identified containers cannot be visually examined, alternative containers will be identified through random selection. The SPM (or designee) will maintain a list of drums for selection each year. At the conclusion of each year's examinations, the miscertification rate will be updated based on previous visual examination results. The procedure *Sampling Design and Data Analysis for RCRA Characterization and Visual Examination of Retrievably Stored Transuranic Waste* (WMH-400, Section 7.1.4) describes the steps involved in determining the annual miscertification rate and number of containers to examine.

For repackaged wastes, visual examination is allowed to be used in lieu of radiography to confirm applicable WIPP WAC parameters. Waste material parameters and waste material parameter weight estimates will be determined in accordance with the procedures *Transuranic Waste Repackaging, Visual Examination, and Sampling* (WMH-400, Section 7.1.3) and *TRU Waste Certification—TRU Sorting Glovebox Operation* (WRP1-OP-0725), which includes the checklist for visual examination requirements. Miscertifications noted during visual exam will be resolved by correcting the nonconforming condition in accordance with *TRU Nonconforming Item Reporting and Control* (WMH-400, Section 1.3.2).

5.0 REFERENCES

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Hanford, 1998b, *Hanford Site Transuranic Waste Characterization Program Quality Assurance Project Plan*, HNF-2599, Richland, Washington, Waste Management Federal Services of Hanford, Inc.

WMH-400, Section 1.3.2, *TRU Nonconforming Item Reporting and Control.*

WMH-400, Section 7.1.3, *Transuranic Waste Repackaging, Visual Examination, and Sampling.*

WMH-400, Section 7.1.4, *Sampling Design and Data Analysis for RCRA Characterization and Visual Examination of Retrievably Stored Transuranic Waste.*

WMH-400, Section 7.1.9, *Acceptable Knowledge Documentation Management.*

WRP1-TR-0725, *TRU Waste Certification—TRU Sorting Glovebox Operation.*

WRP1-TR-0908, *TRU Waste Certification—Operation of the Drum Nondestructive Examination System.*

APPENDIX A

Hanford Site Contact-Handled Transuranic Waste Streams

Hanford Site Contact-Handled Transuranic Waste Streams

Waste Stream Name	Waste Source	Waste Description	Waste Form	Matrix Parameter Category
Non-Hazardous 234-5Z Heterogeneous Debris	Plutonium Recovery and Processing Facility	Miscellaneous debris waste containing: • Plastic/polyurethane • Cloth/rags/nylon/tape/rope • Paper/cardboard • Rubber • Metals • Wood • Dirt/soil/diatomaceous earth • Anti-corrosive radpad • Absorbent • Other miscellaneous debris	Heterogeneous	S5000

The overall mission of 234-5Z was plutonium finishing involving production of Pu metal (buttons) in the Remote Mechanical C (RMC) lines and Pu component fabrication. The facility also recovered Pu from waste and scrap (e.g., incinerator ash) via dissolution, extraction and other miscellaneous treatment processes. Americium was recovered using ion exchange.

Transmittal No.	ECN-IRM TRANSMITTAL	Date: 02/10/99

ECN/EDT No.	Org Code CACN/COA #	Comments	ID No.
ECN-647072L	74100 102613/AJ60	HID#0022499-RS NICHOLSON	58

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HNF-2605, Hanford Site Transuranic Waste Sampling Plan		ECN No.

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