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Los Alamos National Laboratory Response to Notice of Deficiency - Technical Adequacy Review of LANL RCRA Waste Analysis Plan, Rev. 0.0, EPA ID No. NM0890010515-1

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Los Alamos National Laboratory
July 12, 1996

Introduction

The following information is the Los Alamos National Laboratory's (LANL) response to the Notice of Deficiency (NOD) issued by the Hazardous and Radioactive Materials Bureau of the New Mexico Environment Department (NMED) on May 24, 1996, and received by the Los Alamos Area Office of the Department of Energy (DOE) on May 29, 1996. The NOD requests additional information supplementing the LANL Resource Conservation and Recovery Act (RCRA) Transuranic (TRU) Mixed Waste Analysis Plan (WAP), submitted to NMED on March 31, 1995. The document consists of answers to the eight information comments or requests contained in the NOD, and includes supplementary attachments and a revised WAP incorporating new text as suggested by the information requested. The responses to comments below contain explanatory discussions as necessary and new text to be added to the WAP. The new text incorporated into the attached revised WAP is highlighted in "bold/strikeout" format.

Discussion of Comments

1. Section 1.2, Description of TRU Mixed Waste Management Units, p.18 *- Several storage units are incorrectly identified as operating under interim status (container storage areas at the RANT facility at TA-54 West, storage unit at TA-55-185). Revise the WAP to classify these units as either permitted or pending a permit.*

The regulatory status of the referenced mixed waste storage areas had not been formally determined in March, 1995 when the TRU mixed WAP was submitted. Per NMED's determination of interim status applicability and LANL's current permit applications or modification requests, the phrase "pending a permit" may be used to describe these units. Therefore, the following language has been added to the WAP at Section 1.2.

> "TRU mixed waste storage units operating under 20 NMAC 4.1, Subpart VI, Section 265, facility standards and addressed in this WAP include:
>
> - Storage Domes 48, 153, 224, and 283 at TA-54, Area G
> - The Drum Prep Facility and Storage Shed 8 at TA-54, Area G
> - Container storage areas (CSA) in Rooms 9010, 9020, and 9030 of Wing 9 at TA-3-29
> - Storage units at TA-50-1 (Room 59) and TA-50-37 (Rooms 115, 117, and 118)
> - CSAs at TA-50-69 and TA-50-114
> - Storage units at TA-55, Building 4
>
> Information on these units is available in LANL's "RCRA Part A Permit Application for Mixed Waste" (LANL, January 25, 1991).
>
> "TRU mixed waste storage units pending a permit and addressed in this WAP include:
>
> - CSAs at the Radioassay and Nondestructive Testing Facility at TA-54 West.
> - Storage units at TA-55, Buildings 4 and 185.
> - Storage units at TA-50-1, Rooms 35, 36, and 38/38A

Information on these units is available in LANL's "RCRA Part A Permit Application for Mixed Waste, Revision 2.0" (LANL, 1994) and "Proposed Hazardous Waste Facility Permit Modification, Technical Area 50, Building 1; Rooms 35, 36, and 38/38A Container Storage Areas, Building 69; Indoor and Outdoor Container Storage Areas, Technical Area 54 West, Building 38; High Bay, Low Bay, Loading Dock, and Outdoor Container Storage Areas, December 22, 1995," (LANL, 1995)."

2. Section 3.2, Acceptable Knowledge, p. 24+ *- Although much attention is given to defining, justifying, and providing examples of acceptable knowledge, several statements concerning the implementation of "an acceptable knowledge certification program" (p. 22, second paragraph; p. 35, Section 5.2) are unsupported by necessary details describing exactly how acceptable knowledge data will be certified. Revise the WAP by providing detailed information about the acceptable knowledge certification program. LANL may wish to incorporate some of the material found in Appendix C9, "TRU Waste Characterization Using Acceptable Knowledge", of the WIPP RCRA Part B Permit Application, Revision 6 (April 1996).*

The WAP states that the acceptable knowledge certification program will be used for waste characterization of future generated TRU mixed waste. Therefore, the description of the program requested has been added to Section 5.2 "Verification of Future TRU Mixed Waste." The following reference has been added to the statement at page 22 to move the discussion to the appropriate section:

> "Future homogeneous TRU mixed waste will be characterized through the use of LANL's WPF and the acceptable knowledge certification program described in Section 5.2 of this WAP."

The current DOE strategy for TRU mixed waste is to characterize, certify, and package the waste to meet the Waste Acceptance Criteria (WAC) of the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. DOE is in the process of developing guidelines for the use of acceptable knowledge procedures for TRU waste characterization and certification. LANL will use these procedures with some modifications for verification of TRU mixed waste characterization for the purpose of storage on-site. This will avoid duplication of effort in TRU mixed waste characterization activities and provide consistency between DOE sites. As discussed with NMED representatives, the modifications currently anticipated involve the degree and timing of container examination rather than substantive differences in methods.

For example, the WIPP WAP (revision 6) currently states that all waste containers are sampled and analyzed for volatile organic compounds in the headspace gas. The LANL TRU mixed waste WAP requires sampling from a statistically selected subset of containers for each waste stream. LANL's priority is to meet the necessary conditions to retrieve waste for placement into inspectable storage in the near future and to perform further characterization activities for ultimate disposal or treatment of the waste in a later timeframe and under more efficient or safer conditions.

Many of the conditions of the DOE documents will be incorporated in LANL site specific procedures, which although being developed, cannot be finalized until approval of WIPP related issues by NMED. The WIPP documents currently represent the best source of information for these procedures. As suggested in NOD Comment #2, material contained in Appendix C9 "TRU

Waste Characterization Using Acceptable Knowledge," of the WIPP RCRA Part B Permit Application, Revision 6 (April 1996) has been incorporated on a general basis. Therefore, the following language has been added to the TRU mixed WAP:

> Section 5.2: "Future homogeneous TRU mixed waste streams will be characterized using LANL's WPF, Transuranic Waste Storage Record, and Transuranic Waste Certification Plan for WIPP (TWCP). The TWCP includes an acceptable knowledge certification program as described in the WIPP Waste Acceptance Criteria (DOE, 1991) and WIPP QAPP (DOE, 1994) and developed by LANL site specific documents and procedures. LANL procedures consistent with the WIPP WAP, (DOE, 1996), Appendix C9, "TRU Waste Characterization Using Acceptable Knowledge" will be used to implement acceptable knowledge certification as part of the LANL TRU waste certification program for WIPP. The acceptable knowledge certification program will include the following elements:
>
> - A description of the waste certification program.
> - Written procedures outlining the specific methodology used to assemble acceptable knowledge records including document origins, guidelines for the use of documents or information, auditable record guidelines, and potential limitations associated with the information.
> - Procedures to evaluate acceptable knowledge information and to resolve discrepancies in documentation.
> - Guidelines for the identification of RCRA hazardous constituents and assignment of appropriate EPA hazardous waste numbers to each waste stream.
> - Procedures to ensure that unacceptable wastes are identified, documented, and segregated.
> - Procedures to verify or confirm acceptable knowledge. Acceptable knowledge for TRU mixed waste is confirmed using nondestructive techniques and sampling and analysis as described by this WAP.
> - A cross reference to the applicable waste summary category group (i.e.,S3000, S4000, and S5000) to verify the required confirmation data has been evaluated and the proper EPA hazardous waste numbers have been assigned.
> - Administrative control procedures that identify organizational responsibility for compliance, oversight procedures, on-the-job control procedure training, stop-work procedures, nonconformance process and corrective action procedures."

A potential concern related to this approach is that the incorporation of WIPP related document references may result in inconsistencies with this WAP as NMED and DOE revise the base references. In addition, as previously discussed, LANL's waste characterization activities for storage do not necessitate the scope of WIPP disposal requirements. Therefore, the following language is suggested for the introductory section of the WAP:

> "This WAP references documents addressing TRU mixed waste characterization procedures to be utilized after the waste is stored at LANL. These procedures were developed primarily to meet off-site waste acceptance criteria. LANL's use of these procedures is designed to allow appropriate waste characterization information obtained for storage to serve as a basis for or to supplement future characterization needs without a

duplication of effort. These documents are referenced for informational purposes only, as they constitute requirements established for another facility's operating permit conditions. Because these referenced documents are subject to change as new information is provided, developed, or approved, and because LANL is not subject to their requirements in LANL's operating permit for storage but rather utilizes them as waste management guidelines, this WAP will not be modified as ongoing changes to the referenced documents occur."

3. Section 3.3.1, Real-Time Radiography (RTR), p. 28+ *- The description of RTR is unacceptably brief, and assumes the reader has prior knowledge of the technique. Revise this section of the WAP to include additional detail on the equipment used and the procedures followed; how the operators are qualified; how RTR verifies the absence of free liquids, physical form, waste classification, and waste form: how the results are documented, and provide an example of the RTR data form used to document the waste matrix parameter code. Also, provide the reference for a complete description of the procedure (Procedure 310.1, TRU Waste Characterization Sampling and Analysis Methods Manual, DOE/WIPP-91-043, April 1996).*

The following language has been added to Section 3.3.1 describing real-time radiography:

"A radiography system routinely consists of an X-ray producing device, an imaging system, an enclosure for radiation protection, a waste container handling system, an audio/video recording system, and an operator control and data acquisition station. Operating parameters such as the intensity of the X-ray can be varied for optimum viewing of the interior of the waste container. The imaging system typically utilizes an image intensifier, television camera, and remotely located television screen. Instrument configurations will vary depending on manufacturer and site usage.

"During operation of the system, the waste container is scanned while the operator views and permanently records the image from the television screen on audio/videotape. The radiography data form is also used to document the matrix parameter category and other information about the containerized waste as required by the WIPP QAPP (DOE, 1994).

"The radiography image produced is examined for evidence of liquid materials by jogging the container or repetitively moving the container handling system and searching for evidence of wave motion in addition to observing the container contents for suspect waste items. The container contents are also observed for items that confirm the waste classification of the container. Conditions that may limit or interfere with this determination are noted.

"Operator training and experience are important considerations for assuring the quality of the radiography data. Only properly trained personnel are allowed to operate radiography equipment. Standardized training requirements for radiography operators are based upon existing industry standard training requirements. (An example is ASNT-TC-1A). Radiography operators receive formal and on-the-job training in project requirements, system operations and standards, safe operating practices, application techniques, specific waste generating practices, packaging configurations, parameter estimation and identification of prohibited items. Operators must be trained and tested before they are qualified for RTR operation, and must requalify at least every two years. LANL operating

and training requirements for RTR analysis of TRU mixed waste are based on "Procedure 310.1 Physical Waste Form Characterization Using Radiography, TRU Waste Characterization Sampling and Analysis Methods Manual," (DOE, 1996)."

An example of the RTR data form, "Radiography Data Form,"is provided as Attachment 1. The form is used as part of LANL's RTR procedure.

4. Section 3.3.2, Visual Examination, p. 29 *- Insufficient details are provided on visual examination procedures. Revise this section of the WAP to include additional details on how the results of a visual examination are documented (provide example forms), and how the staff is trained. Provide a complete description of the statistical approach for selecting containers for visual examination, rather than simply mentioning the hypergeometric distribution. Much of this information is provided in the NOD Response Schedule (which is* <u>*not*</u> *part of the waste analysis plan), and should be reproduced here. Also, provide the reference for a complete description of the procedure (Procedure 310.2, TRU Waste Characterization Sampling and Analysis Methods Manual, DOE/WIPP-91-043, April 1996).*

The following language has been added to Section 3.3.2 describing visual examination procedures:

> "The contents of each container undergoing visual examination will be recorded on audio/videotape and a description of the observed items must be provided on a visual examination data form. Visual examination procedure operators receive formal and on-the-job training in project requirements, safe operating practices, specific waste generating practices, packaging configurations, waste parameter estimation and identification of prohibited items. Operators must be trained and qualify for visual examination procedures and must requalify at least every two years. LANL operating and training requirements for visual examination of TRU mixed waste are based on Procedure 310.2 "Physical Waste Form Characterization Using Visual Examination, TRU Waste Characterization Sampling and Analysis Methods Manual,' (DOE, 1996).
>
> "The hypergeometric distribution is a statistical means of estimating the probability of determining the true number of miscertified containers in the overall population of waste drums by selecting a number of drums for visual examination using a previously determined or observed miscertification rate and a set confidence factor. The basis for the determination of the number of appropriate containers to be visually examined and a description of the hypergeometric distribution used is available in the WIPP QAPP (DOE, 1994). The following table is an example of how the number of TRU mixed waste containers to be randomly selected for visual examination will be determined. The selection process will be updated as necessary to maintain consistency with revisions of the WIPP QAPP (DOE, 1994).

Number of Waste Containers Requiring Visual Examination

Annual Number of Waste Containers Undergoing Characterization	Number of Waste Containers Requiring Visual Examination					
50	NA	22	NA	22	NA	29
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	54
500	15	26	26	36	45	63
Percent of Waste Containers Miscertified to WIPP WAC by Radiography in Previous Year	1%	2%	3%	4%	5%	6%

NA = not applicable

(Source : Table 5.1, WIPP QAPP,(DOE, 1994)

An example of the visual examination data form, "Transuranic Waste Certification Program Visual Examination Record", is provided as Attachment 2. The form is used as part of LANL's visual examination procedure.

5. Section 3.3.3, Headspace Gas Sampling and Analysis, p. 29+ *- The statement is made that the "drum headspace will be sampled when filters are inserted into unvented drums... a statistically selected subset of these drums will be sampled for selected VOCs..." This implies all waste codes will be subject to headspace gas analysis, yet the NOD Response Schedule emphasizes only heterogeneous waste will undergo headspace gas analysis. Revise the WAP to clarify this apparent discrepancy.*

The discussion of headspace gas sampling and analysis in the March, 1995 TRU mixed WAP submittal predates subsequent plans for the process. The waste sampling method developed for future WIPP waste certification stipulates that headspace gas sampling for VOCs requires a temperature equalization procedure. This restricts the ability to efficiently retrieve and process waste containers due to the extra time required for VOC sample equilibration when the drums are vented and sampled for flammable gases. Current LANL policy is to minimize duplication of information and effort required for on-site RCRA storage compliance and WIPP waste certification. Therefore, the selected drums will be headspace sampled for VOCs in accordance with the WIPP procedure after being placed in storage. The following language revises the WAP section to specify heterogeneous waste containers and to clarify the existing WAP language:

> "The drum headspace (i.e., the space directly under the drum lid) of all previously unvented drums will be sampled for flammable gases when filters are inserted. A statistically selected subset of heterogeneous waste drums will be sampled for selected VOCs in order to assure ..."

6. Section 3.3.5 Statistical Approach for Headspace Gas and Solid Waste Sampling, p. 33 - *The "predetermined level of confidence" associated with determining whether a waste stream exhibits a hazardous characteristic is mentioned but is not provided. Again, more detail is provided in the schedule than in the waste analysis plan. Revise the WAP to provide sufficient detail about deciding whether a waste stream is hazardous for a RCRA constituent.*

In order to provide the requested detail, Section 3.3.5 has been modified by incorporating text from Attachment C of the Response Schedule submitted with the TRU Mixed WAP, March 31, 1995. These sentences have been added to the first paragraph:

-The phrase "heterogeneous legacy waste" has been added to the first sentence to better define the applicable waste streams.

-"The methods used to segregate drums into waste streams and lots for sampling within waste streams are detailed in the LANL TRU Waste Characterization Sampling Plan, a site specific document required by the WIPP QAPP (DOE, 1994)." has been added as further sampling procedure detail.

-The phrase "using the method described in the WIPP QAPP (DOE, 1994), Section 5.3.1. A minimum of 5 containers per waste stream are sampled." has been added for more sampling detail.

-Two sentences have been deleted as no longer correct: "For waste streams consisting of ten drums or more, ten drums are selected at random for sampling. For waste streams consisting of ten drums or less, each drum is sampled."

-"90 percent upper one-sided" and "(UCL_{90})" has been added to the sentence "The analytical results from the initial round of sampling are used to calculate upper and lower confidence limits for the mean concentrations of RCRA-regulated constituents." The phrase "and lower" has been deleted from the same sentence as incorrect.

-The sentence "Drums are sampled to a maximum of all the drums in the waste stream or 40 drums, whichever is smaller." has been replaced with "The specific method for calculating the number of drums for additional sampling is found in the WIPP QAPP (DOE, 1994), Section 5.3.1"

The second paragraph sentence "Confidence limits for the mean concentration will be used in comparisons to RCRA regulatory limits so that a predetermined level of confidence can be associated with the decision on whether a waste stream is hazardous for a RCRA characteristic." has been deleted. The use of the 90 percent upper confidence limit specification in the first paragraph renders this sentence redundant.

7. Section 5.2, Verification of Future TRU Mixed Waste, p. 35-36 - *A verification sampling and analysis frequency of "at least 1 in 100 waste streams per year" is proposed, assuming use of the LANL Waste Profile Form and an acceptable knowledge certification program. As mentioned in comment #2, the acceptable knowledge certification program must be fully described. Also, the use of the term "waste streams" in the above context is unclear. Generally,*

waste analysis verification occurs at least annually for <u>each</u> waste stream to ensure the process for generating the waste has not changed. In fact, this condition is presently required in the LANL Hazardous Waste Facility Permit Attachment A, Section A.5.2. Revise the TRU mixed WAP to incorporate the conditions imposed in Section A.5.2 of the current WAP.

As discussed in the response to NOD comment #2, present DOE policy regarding the future disposition of TRU mixed waste requires the development of site-specific TRU mixed waste management procedures consistent with WIPP waste acceptance criteria. Section 5.2 of the TRU mixed WAP has been revised largely by using elements of the acceptable knowledge certification program described in Appendix C9 of the WIPP WAP as suggested in NOD comment #2. Therefore, the one percent verification process originally proposed as consistent with the existing hazardous waste facility permit has been deleted. Acceptable knowledge for TRU mixed waste characterization will be confirmed using the nondestructive techniques and supplementary sampling and analysis described in Section 3.3 of the WAP.

The annual verification described in Attachment A, Section A.5.2 of the LANL Hazardous Waste Facility Permit applies to all LANL routinely generated hazardous waste streams as stated. However, in order to properly apply the phrase "annually analyzed," one should refer to the definition of "analysis" found in Module I of the hazardous waste facility permit. The definition states that "The term 'analysis' includes physical analysis, chemical analysis and knowledge of process determinations" (Module I, Section H.3.e). LANL currently re-evaluates, on an annual basis, the analytical and process knowledge-derived waste characterization information and the records supporting the WPF for all unchanged waste streams as required by 20 NMAC 4.1, Subpart V, 264.13(b)(4). This re-evaluation is discussed in Section 3.1 of the TRU mixed WAP.

8. Section 6.3, Procedures to Ensure Compliance with LDR Requirements, p. 36-37 *- The statement at the top of page 37 is unclear. By saying "If it is known whether or not the waste meet applicable LDR standards," the WAP provides a conflicting "either/or" choice for conducting sampling and analysis. Revise the WAP to clearly state the situation(s) when sampling and analysis to certify LDR compliance are unnecessary.*

Section 6.3 has been modified as follows:

> "In accordance with LDR requirements, TRU mixed waste to be shipped off site must be evaluated to determine whether it meets the applicable LDR treatment standards in 20 NMAC 4.1, Subpart VIII, Part 268, Subpart D, revised November 1, 1995, unless waste will be transported to a permitted waste management facility operating in conformance with a no-migration determination. This evaluation will be accomplished by using acceptable knowledge of the waste or sampling and analysis.
>
> "Each waste for which a treatment standard has been established will be evaluated for the applicable LDR parameters in 20 NMAC 4.1, Subpart VIII, Part 268, Subpart D, revised November 1, 1995. Acceptable knowledge will be used to evaluate LDR applicability for wastes with treatment standards expressed as specific technologies in 20 NMAC 4.1, Subpart VIII, 268.42, and for hazardous debris treated to meet the alternative debris treatment standards in 20 NMAC 4.1, Subpart VIII, 268.45. Wastes with constituent concentration-based treatment standards or waste extract concentration-based treatment

standards will be evaluated using acceptable knowledge supplemented by sampling and analysis if acceptable knowledge alone is not sufficient to determine LDR treatment standards in 20 NMAC 4.1, Subpart VIII, 268.40.

"Sampling and analysis will be conducted in accordance with 20 NMAC 4.1, Subpart VIII, Part 268, revised November 1, 1995, only to certify that the waste meets LDR treatment standards. All analytical results completed in support of LDR requirements will be retained within the facility operating record. LDR determinations will be documented on LANL's Land Disposal Restrictions Notification Form (Figure A.2-2)."

9. Section 7.0, List of References, page 38 *- The title for DOE 1994a (CAO-94-1005, Revision 0, June 1994) is incorrect. Revise the list to refer to "Waste Isolation Pilot Plant Transuranic Baseline Inventory Report."*

The reference has been revised. In addition, the following references have been added to the list to incorporate new documentation as discussed in the previous comments:

Los Alamos National Laboratory, 1995, "Proposed Hazardous Waste Facility Permit Modification, Technical Area 50, Building 1; Rooms 35, 36, and 38/38A Container Storage Areas, Building 69; Indoor and Outdoor Container Storage Areas, Technical Area 54 West, Building 38; High Bay, Low Bay, Loading Dock, and Outdoor Container Storage Areas, December 22, 1995."

U.S. Department of Energy (DOE), 1996, "Waste Isolation Pilot Plant, RCRA Part B Permit Application, Waste Analysis Plan." April, 1996.

U.S. Department of Energy (DOE), 1996, "TRU Waste Characterization Sampling and Analysis Methods Manual," DOE/WIPP-91-043, April, 1996.

Attachment 1

Real Time Radiography Data Form

17.5 Attachment E, *Radiography Data Form*

Radiography Data Form

Container Number:_____ Date:_____

TRU Data Base Information

TRUCON Code_____	Item Description Code_____	Waste Matrix Code_____

Operator RTR Information

Visual Examination Performed	☐Yes	☐No
Waste Matrix Code Agrees with RTR	☐Yes	☐No
Waste Matrix Code Changes_____		
Waste Container Liner	☐Yes	☐No

Estimated Waste Inventory:

Packaging Material Description (includes number of layers):

Estimated Weight of Applicable Waste Material Parameter(s) (kg):

Iron-based Metals/Alloys _____	Plastics (waste materials) _____
Aluminum-based Metals/Alloys _____	Organic Matrix _____
Other Metals _____	Inorganic Matrix _____
Other Inorganic Materials _____	Soils _____
Cellulosics _____	Steel (packaging materials) _____
Rubber _____	Plastics (packaging materials) _____

RTR Record Information

Audio/Video Tape ID Number_____ Backup No. 1 Tape ID_____
Backup No. 2 Tape ID_____

QC Replicate ☐Yes ☐No

(If Yes) Comparison Results Description:

Operator	Signature	Date
Technical Reviewer	Signature	Date

CONTROLLED COPY

Attachment 2

Visual Examination Data Form

TWCP Visual Examination Record

Is this a new campaign (waste containers with the same matrix parameter category, waste material paramaters, and EPA codes)?

☐Yes ☐No (If yes, ensure that the WCG is decontaminated and surveyed for radioactive contamination.)

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Section 1 - Container Information

Container Identification No.	Gas Sample Batch No.
New Container Identification No.	Is a rigid liner present? ☐ Yes ☐ No
Video Tape No.	If yes, is the rigid liner vented? ☐ Yes ☐ No
Visual Batch No. Radiography Batch No.	Number of Inner Liner(s) and Closure Method(s)[a]:

Section 2 - Waste Item Information (List additional items on Section 2 Continuation Page)

Item No.	No. of Layers	Breached? (yes/no)	Headspace Gas Sampled?	Matrix Parameter Category	Waste Material Parameter	Weight	Closure Method[a]	Description
Overall Matrix Parameter Category for Container:					Sum of Weights:			

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☐ Check here if continuation pages are attached.

[a]Acceptable closure methods: Twist-and-tape or fold-and-tape (the use of wire or plastic ties is allowable); or heat-seal closure with a vented bag.

TWCP Visual Examination Record (Continued)

Container Identification No. _____

Section 2 - Waste Item Information (Continuation Page)								
Item No.	No. of Layers	Breached? (yes/no)	Headspace Gas Sampled?	Matrix Parameter Category	Waste Material Parameter	Weight	Closure Method*	Description
Overall Matrix Parameter Category for Container					Sum of Weights:			

*Acceptable closure methods: Twist-and-tape or fold-and-tape (the use of wire or plastic ties is allowable); or heat-seal closure with a vented bag.

[] Check here if additional continuation pages are attached.

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TWCP Visual Examination Record (Continued)

Container Identification No. _____

Section 3 - Waste Item Conditions (Continuation Page)								
Item No.	Free Liquids? (Yes/No)	Estimated Liquid Volume	pH of Liquid (if > 50 mL)	Explosives? (Yes/No)	Pressurized or Sealed Containers? (Yes/No)	Pyrophorics? (Yes/No)	NCR Issued? (Yes/No)	Comments

☐ Check here if additional continuation pages are attached.

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TWCP Visual Examination Record (Continued)

Section 3 - Waste Item Conditions (List additional items on Section 3 Continuation Page)								
Item No.	Free Liquids? (Yes/No)	Estimated Liquid Volume	pH of Liquid (if > 50 mL)	Explosives? (Yes/No)	Pressurized or Sealed Containers? (Yes/No)	Pyrophorics? (Yes/No)	NCR Issued? (Yes/No)	Comments

Section 4: Waste Container Examination

Liquids present? ☐ Yes ☐ No If yes: Estimated Volume: ___(mL) If ≥ 50 mL, pH: _____ Location of Liquid:

Internal corrosion present? ☐ Yes ☐ No

☐ Check here if continuation pages are attached.

Visual examination personnel:

Print Name _____ Signature _____ Date _____

Visual examination expert:

Print Name _____ Signature _____ Date _____

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WASTE ANALYSIS PLAN INCLUDING REVISED TEXT

("Bold/Strikeout" Format)

WASTE ANALYSIS PLAN

PERMIT ATTACHMENT A.2
NM0890010515-1

WASTE ANALYSIS PLAN FOR TRANSURANIC MIXED WASTE

LIST OF DEFINITIONS

Acceptable knowledge - Broadly defined to include process knowledge, waste analysis data, and/or facility records of analysis.

Existing (or currently generated) transuranic (TRU) mixed waste - TRU mixed waste streams that have been characterized using Los Alamos National Laboratory (LANL)'s Waste Profile Form (WPF) (the WPF has been used since May 1991).

Future TRU mixed waste - TRU mixed waste streams that will be characterized through the use of both LANL's WPF and a radioactive and mixed waste certification program.

RCRA **Hazardous waste** - The criteria for establishing a waste as a hazardous waste are provided in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart II, revised November 1, 1995. A waste is considered hazardous if it meets the definition of a solid waste described in 20 NMAC 4.1, Subpart II, Part 261.2, revised November 1, 1995; is not exempted from regulation; and exhibits one or more of the characteristics described in 20 NMAC 4.1, Subpart II, Part 261, Subpart C, revised November 1, 1995, or is listed in 20 NMAC 4.1, Subpart II, Part 261, Subpart D, revised November 1, 1995.

Heterogeneous waste - Waste that is of dissimilar or diverse composition.

Homogeneous waste - Waste that is of uniform composition.

Item Description Code - A waste identification system used at most U.S. Department of Energy (DOE) facilities that generate TRU and TRU mixed waste based on the chemical and physical form of the waste. This system was first used at LANL in July 1984.

Legacy TRU mixed waste - TRU mixed waste streams generated before the LANL WPF was implemented (i.e., prior to May 1991).

Mixed waste - Waste that has both a hazardous waste component (see definition) and a radioactive waste component.

Process knowledge - Described in 20 NMAC 4.1, Subpart V, 264.13(a)(2), revised November 1, 1995, as data developed under Subpart II and existing published or documented data on a specific hazardous waste or hazardous waste generated from similar processes.

Radioactive Solid Waste Disposal Code - A waste identification system used exclusively at LANL to categorize TRU and TRU mixed waste forms generated by various on-site facilities.

Retrievably stored waste - Waste that was generated and placed in storage in covered pads and shafts before the implementation of LANL's TRU waste certification program. Waste stored after implementation of LANL's TRU waste certification program is stored in areas that can be more easily accessed.

LIST OF DEFINITIONS
(Continued)

Solid physical form waste - Any waste stream in a solid physical form. In this document, use of the generic term "solid physical form waste" has no additional regulatory meaning.

Solid waste - Any waste stream that meets the definition of a "solid waste" as specified in 20 NMAC 4.1, Subpart II, 261.2, revised November 1, 1995.

TRU mixed waste - Waste that has both a hazardous waste component and a TRU waste component (see definition).

TRUPACT-II Content (TRUCON) Code - A waste identification system developed by DOE to provide a consistent waste description for all TRU and TRU mixed waste generated throughout all of DOE's facilities. These codes are intended to assist DOE in establishing the characteristics of TRU and TRU mixed waste to be certified for transportation to the Waste Isolation Pilot Plant.

TRU waste - Waste defined in DOE Order 5820.2A, "Radioactive Waste Management" (DOE, 1988), as follows: "Without regard to source or form, waste that is contaminated with alpha-emitting transuranic radionuclides with half-lives greater than 20 years and concentrations greater than 100 nanocuries per gram at the time of assay and has atomic numbers greater than 92. Heads of Field Elements can determine that other alpha contaminated waste, peculiar to a specific site, must be managed as TRU waste."

LIST OF REGULATORY REFERENCES AND CORRESPONDING WASTE ANALYSIS PLAN LOCATION

Regulatory Reference 20 NMAC 4.1[a], Subparts V, VIII, and IX	Description of Requirement	Location in the Waste Analysis Plan
264.13(a)(1)	Analysis information adequate to meet 20 NMAC 4.1, Subparts V and VIII, Parts 264 and 268, revised November 1, 1995, storage requirements	A.2.2 and A.2.3
264.13(a)(2)	Waste analysis data	A.2.3.2
264.13(a)(3)	Repeat analysis	A.2.3.1, A.2.5, and A.2.5.2
264.13(a)(4)	Inspection and analysis after each movement of hazardous waste received from off-site	Not applicable (NA)
264.13(b)	Written waste analysis plan	Entire plan
264.13(b)(1)	Parameters and rationale for selection	A.2.2.1 and A.2.2.2 and Table A.2-3
264.13(b)(2)	Test methods	A.2.3, A.2.3.3, A.2.3.3.1, A.2.3.3.2, A.2.3.3.3, A.2.4, and Tables A.2-3 and A.2-4
264.13(b)(3)	Representative sample collection method	A.2.3.3, A.2.3.3.3, A.2.3.3.4, and A.2.3.3.5
264.13(b)(4)	Frequency for review or repeat of initial analysis	A.2.3.1, A.2.5.1, and A.2.5.2
264.13(b)(5)	Waste analysis information to be provided to off-site facilities	A.2.3.1, A.2.3.2, and Figure A.2-1
264.13(b)(6)	Additional waste analysis requirements	A.2.6
264.13(b)(7)	Surface impoundments exempted under 20 NMAC 4.1, Subpart VIII, 268.4(a), revised November 1, 1995	NA

Refer to footnotes at end of table.

Attachment A.2
Page 4 of 58

LIST OF REGULATORY REFERENCES AND CORRESPONDING WASTE ANALYSIS PLAN LOCATION (Continued)

Regulatory Reference 20 NMAC 4.1[a], Subparts V, VIII, and IX	Description of Requirement	Location in the Waste Analysis Plan
264.13(c)	Inspection and analysis procedures for off-site facilities	NA
264.13(c)(1)	Procedures for identification of each movement of waste at off-site facilities	NA
264.13(c)(2)	Sampling method for the waste to be identified at off-site facilities	NA
264.13(c)(3)	For off-site landfills: procedures to determine whether a biodegradable sorbent has been added to containers	NA
268.7(a)	Determination of whether waste is restricted from land disposal	A.2.6.3
268.7(b)	Testing requirements for treatment facilities	NA
268.7(b)(1)	Testing of treatment residues or extract of waste with concentration-based treatment standards specified in 20 NMAC 4.1, Subpart VIII, 268.41, revised November 1, 1995	A.2.6.3
268.7(b)(2)	Testing of treatment residues pursuant to 20 NMAC 4.1, Subpart VIII, 268.32, revised November 1, 1995	NA
268.7(b)(3)	Testing of treatment residues of waste with concentration-based treatment standards specified in 20 NMAC 4.1, Subpart VIII, 268.43, revised November 1, 1995	A.2.6.3
268.7(b)(4)	Notice requirements	A.2.6.3 and Figure A.2-2
268.7(b)(5)	Certification of compliance with 20 NMAC 4.1, Subpart VIII, Part 268, revised November 1, 1995	A.2.6.3

Refer to footnotes at end of table.

Attachment A.2
Page 5 of 58

LIST OF REGULATORY REFERENCES AND CORRESPONDING WASTE ANALYSIS PLAN LOCATION (Continued)

268.7(b)(6)	Notice and certification requirements for treatment facilities that ship treatment residues to a different treatment, storage, or disposal (TSD) facility	NA
268.7(b)(7)	Notice requirement for recycling facilities using materials in a manner constituting disposal	NA
268.7(c)(1)	Recordkeeping requirements for land disposal facilities	NA
268.7(c)(2)	Testing requirements for land disposal facilities	NA
268.7(d)(1)	Notification requirements for excluded debris (i.e., pursuant to 20 NMAC 4.1, Subpart II, 261.3, revised November 1, 1995)	NA
268.7(d)(2)	Updated notification requirements for debris	NA
268.7(d)(3)	Documentation and certification requirements for debris excluded under 20 NMAC 4.1, Subpart II, 261.3(e)(1), revised November 1, 1995	NA
270.14(b)(2)	Chemical and physical analyses	A.2.2.1, A.2.3, A.2.3.1, A.2.3.2, A.2.3.3, A.2.3.3.1, A.2.3.3.2, A.2.3.3.3, Figure A.2-1, and Tables A.2-3 and A.2-4

[a] New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), revised November 1, 1995, which adopts, with a few limited exceptions, Title 40 of the Code of Federal Regulations (40 CFR), Parts 260–266, Part 268, and Part 270 (1994). 20 NMAC 4.1, Subparts V, VIII, and IX, revised November 1, 1995, contain regulations equivalent to 40 CFR Parts 264, 268, and 270, respectively.

ATTACHMENT A.2
WASTE ANALYSIS PLAN FOR TRANSURANIC MIXED WASTE

This waste analysis plan (WAP) presents information on the chemical and physical nature of transuranic (TRU) mixed waste generated and general TRU mixed waste characterization methods used at Los Alamos National Laboratory (LANL). The waste analysis information contained within this WAP is specific to storage requirements only. Waste analysis plans specific to treatment requirements will be developed and submitted as needed. Waste analysis requirements are specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart IX, 270.14(b)(2), revised November 1, 1995; in 20 NMAC 4.1, Subpart V, 264.13, "General Waste Analysis," revised November 1, 1995; and in 20 NMAC 4.1, Subpart VIII, 268.7, "Waste Analysis and Recordkeeping," revised November 1, 1995. The content of this WAP generally follows the guidance provided in "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes - A Guidance Manual" (U.S. Environmental Protection Agency [EPA], 1994).

Mixed waste contains both a hazardous waste component and a radioactive waste component. This WAP addresses only *TRU mixed waste*, which is defined in the List of Definitions of this WAP.

For waste characterization purposes, TRU mixed waste at LANL has been subdivided into three groups based on the timeframe for generation of the waste: *legacy, existing (or currently generated)*, and *future*. These three groups are defined in the List of Definitions.

This WAP references documents addressing TRU mixed waste characterization procedures to be utilized after the waste is stored at LANL. These procedures were developed primarily to meet off-site waste acceptance criteria. LANL's use of these procedures is designed to allow appropriate waste characterization information obtained for storage to serve as a basis for or to supplement future characterization needs without a duplication of effort. These documents are referenced for informational purposes only, as they constitute requirements established for another facility's operating permit conditions. Because these references are subject to change as new information is provided, developed, or approved, and because LANL is not subject to their requirements in LANL's operating permit for storage but rather utilizes them as waste management guidelines, this WAP will not be modified as ongoing changes to the referenced documents occur.

This TRU mixed waste WAP is organized as follows. Section A.2.1 includes a facility description, information on TRU mixed waste-generating processes and activities, identification of TRU mixed waste managed, and a description of TRU mixed waste management units. Section A.2.2 presents waste parameters, including the criteria and rationale for selection. Section A.2.3 provides TRU mixed waste characterization procedures. Section A.2.4 presents laboratory selection and analytical methods. Section A.2.5 provides waste verification requirements. Section A.2.6 addresses special procedural requirements (e.g., for ignitable, reactive, and incompatible waste and for compliance with land disposal restriction [LDR] requirements). Differences in requirements for the characterization of legacy, existing, and future TRU mixed waste are described in the applicable sections of this WAP.

A.2.1 FACILITY DESCRIPTION

LANL is located in Los Alamos County in north-central New Mexico. It is approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe. LANL, which is divided into 49 technical areas (TA), and the associated residential and commercial areas of Los Alamos County are situated on the Pajarito Plateau. The principal missions of LANL include the research, design, development, and analysis of weapons components for the nation's nuclear arsenal; supporting research programs; energy research and environmental missions; and environmental management programs. LANL is owned by the U.S. Department of Energy (DOE) and is operated jointly by DOE and the University of California, DOE's management and operating contractor.

A.2.1.1 Facility Waste-Generating Processes, Activities, and Identification of TRU Mixed Wastes Managed

TRU mixed waste is generated at LANL primarily from research and development activities, processing and recovery operations, and decontamination and decommissioning projects. Additional information on waste-generating processes is provided in Sections A.2.1.1.1 through A.2.1.1.3.

In addition to grouping TRU mixed waste based on the time of generation (i.e., legacy, existing, and future), TRU mixed waste streams at LANL will be divided into three broad categories referred to as *matrix parameter codes*, which are used to define waste characterization groupings for the Federal Facilities Compliance Act requirements. The matrix parameter codes are based upon the physical and chemical forms of the waste. The matrix parameter codes that are applicable to LANL's TRU mixed waste are:

- Matrix Parameter Code S3000 - homogeneous solids
- Matrix Parameter Code S4000 - soil/gravel
- Matrix Parameter Code S5000 - debris wastes.

Matrix parameter code descriptions are provided in "DOE Waste Treatability Group Guidance" (DOE, 1995). Sampling and analytical procedures, discussed in Sections A.2.3 and A.2.4, are based on the physical characteristics of these broad categories.

Matrix parameter codes have been applied to TRU mixed waste streams at LANL as the most general categorization scheme to distinguish waste types at this time. Additional waste identification systems have been used for supplementary purposes as part of waste management operations for TRU mixed waste generated at LANL. Table A.2-1 cross references the matrix parameter codes with these waste identification systems. The waste identification system used for a particular waste container depends largely upon the date of placement into storage. The additional waste identification systems, listed in order of the most general system to the most specific, are as follows:

- Item Description Codes (IDC) - IDCs, first used at LANL in July 1984, generally consist of a three-digit number. These codes represent the most general descriptions of TRU and TRU mixed waste and are used at most of DOE's facilities that generate TRU and TRU mixed waste. They were developed as a waste identification system, based on the chemical and physical form

of the waste, to promote consistency throughout DOE for wastes intended for transportation to the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico. IDCs for TRU mixed waste at LANL are provided in Section A.2.1.1.1.

- TRUPACT-II Content (TRUCON) Codes - TRUCON codes, first used at LANL in October 1992, were developed by DOE to provide a consistent waste description for all TRU and TRU mixed waste generated throughout all of DOE's facilities. The TRUCON codes are intended to assist DOE in establishing the characteristics of TRU and TRU mixed waste to be certified for transportation to the WIPP. LANL TRUCON codes consist of a three-digit number preceded by the letters "LA" and followed by a letter that further defines the waste type and source. TRUCON codes for TRU mixed waste at LANL are provided in Section A.2.1.1.2.

- Radioactive Solid Waste Disposal (RSWD) Codes - RSWD codes, first used at LANL in January 1971, are two-digit codes preceded by the letter "A". These codes are used exclusively at LANL and categorize TRU and TRU mixed waste forms generated by the various on-site facilities. RSWD codes for TRU mixed waste are provided in Section A.2.1.1.3.

Tables A.2-1 and A.2-2 are organized in this hierarchical fashion, from the most general waste stream categorization scheme to the most specific waste stream identification system. As shown in Table A.2-1, the matrix parameter codes are the most general categorization scheme for TRU mixed waste. Each matrix parameter code includes specific IDCs, and each IDC in turn may include a number of TRUCON and RSWD codes. Each IDC, TRUCON code, and RSWD code in LANL's TRU mixed waste inventory is described in Sections A.2.1.1.1, A.2.1.1.2, and A.2.1.1.3, respectively. The basis for hazardous waste classification for each IDC, TRUCON code, and RSWD code is provided in Table A.2-2. Because the IDCs, TRUCON codes, and RSWD codes were not developed to provide hazardous waste characterization information, potential EPA Hazardous Waste Numbers (as referenced by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995) and potential hazardous constituents shown in Table A.2-2 have been identified through records reviews and interviews with generators for much of LANL's legacy TRU mixed waste. A conservative approach has been used to identify potential hazardous constituents for legacy and existing TRU mixed waste streams. Waste characterization, as discussed in Section A.2.3, will be used to confirm hazardous constituents present in individual waste streams. The development of detailed information for legacy TRU mixed waste is an ongoing process at LANL. The potential EPA Hazardous Waste Numbers and hazardous constituents shown in Table A.2-2 are the result of the most recent iteration of this process and may be updated upon further evaluation.

A.2.1.1.1 <u>LANL IDCs</u>

This section provides brief descriptions of the TRU mixed waste streams at LANL that have been assigned IDCs. The descriptions of the IDC wastes were developed from Attachments 1 through 4 and Attachment 6 to the "Los Alamos TRU Waste Certification Plan" (LANL, 1991). The EPA Hazardous Waste Numbers (as referenced by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995) that potentially apply to these IDC wastes are listed in Table A.2-2.

IDC 001

IDC 001 waste is comprised of several types of metal scrap and incidental combustibles. This waste is generated at various TAs throughout LANL and is size reduced at the Waste Characterization, Reduction, and Repackaging Facility (WCRRF) at TA-50-69. The waste consists mostly of metals or metal equipment, either whole or sectioned, and lesser amounts of combustible components. In addition, it contains small volumes of combustibles generated during decommissioning, sectioning, and packaging. The waste forms primarily include gloveboxes, process equipment, and ductwork from decommissioning operations. Gloveboxes may include gloves, wiring, plastic, glass windows, plastic wrapping, and lead shielding.

IDC 002

IDC 002 waste is concreted (cemented) aqueous waste, which consists of caustic sludge stabilized with Portland cement to form a noncorrosive solid monolith. The sludge is a residue from the treatment of blended acidic and caustic aqueous liquid radioactive waste with calcium hydroxide, ferric sulfate, and a flocculation aid. This treatment produces a thin sludge (approximately 25 percent solids) that is always alkaline and is compatible with Portland cement. Portland cement is commonly used to solidify caustic waste streams. Final cemented waste monoliths are produced by tumbling 55-gallon steel drums containing empirically determined quantities of sludge, Portland cement, vermiculite, and sodium silicate.

IDC 003

IDC 003 waste is stabilized aqueous waste. It consists of dewatered sludge generated by the vacuum filtration of solids from a pretreated aqueous waste slurry. These solids are first trapped on the surfaces of the filter media (diatomaceous earth). The filter medium with the entrapped filtrate is then placed in drums with dry concrete absorbent.

IDC 004

Combustible waste (e.g., paper, rags, plastic, rubber) comprises IDC 004, including plastic-based and cellulose-based waste generated at TA-55-4. Plastic-based waste includes, but may not be limited to, tape, polyethylene, and vinyl; gloves; plastic vials; polystyrene; Tygon™ tubing; polyvinyl chloride plastic; Teflon™ products; plexiglass; and dry box gloves (unleaded Neoprene base). Cellulose-based waste includes, but may not be limited to, rags, wood, paper, cardboard, laboratory coats and coveralls, booties and cotton gloves, and similar miscellaneous materials. IDC 004 waste may also contain a small fraction of noncombustible solids (e.g., scrap metals, metal lids).

IDC 005 and Subgroups

IDC 005 waste consists of the following subgroups:

IDC 005

Discarded high-efficiency particulate air (HEPA) filters are identified as IDC 005 waste. This waste is generated at TA-55-4.

IDC 005(LG)

IDC 005(LG) waste consists of glass waste and includes, but may not be limited to, discarded labware, windows, and bottles. A small fraction of combustible waste, such as plastics (mainly packaging), may also be present in this waste stream.

IDC 005(LM)

Metal waste (e.g., motors, pumps, tools, and process equipment) comprises IDC 005(LM) waste. A small fraction of combustible waste, such as plastics (mainly packaging), may also be present in this waste stream.

IDC 005(P1)

IDC 005(P1) waste is leaded rubber waste and metal waste. This waste stream also includes lead-lined glovebox gloves discarded along with metal waste, such as motors and tools.

IDC 005(P2G)

IDC 005(P2G) waste is graphite solid waste that consists of discarded graphite mold and furnace equipment generated during plutonium casting and other operations conducted in Room 327 at TA-55-4.

IDC 005(P2S)

IDC 005(P2S) waste consists of used salts from pyrochemical processes such as electrorefining, molten salt extraction, salt stripping, fluoride reduction, and direct oxide reduction. These processes occur at TA-55-4. A small fraction of combustible waste, such as plastics (mainly packaging), may also be present in this waste stream.

IDC 006

Solidified inorganic and organic process solids comprise IDC 006 waste. This waste consists of process leached solids, ash, filter cakes, salts, metal oxides, fines, or evaporator bottoms stabilized in Portland or gypsum cement, depending on the pH of the original waste stream. These waste streams are generated at TA-55-4.

A.2.1.1.2 LANL TRUCON Codes

This section provides a brief description of the TRUCON-coded TRU mixed waste streams at LANL. All existing (i.e., currently generated) TRU mixed waste at LANL is assigned a TRUCON code. The

descriptions of the TRUCON-coded wastes were extracted from "TRUPACT-II Content Codes (TRUCON)," DOE/WIPP 89-004, Rev. 8 (DOE, 1994); and "Detailed Operating Procedure for the Review and Disposition of the TRU Waste Storage Record," Attachment B (LANL, 1994). These TRUCON codes are from the most recent iteration and are periodically updated. The EPA Hazardous Waste Numbers, as referenced by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995, that potentially apply to these TRUCON-coded wastes are listed in Table A.2-2.

TRUCON Code LA 111A

TRUCON code LA 111A waste consists of concreted (cemented) aqueous waste. This waste is similar to the waste previously identified as IDC 002. The waste originates as aqueous effluent from plutonium processing at TA-55-4 that is then treated in Room 60 of the Radioactive Liquid Waste Treatment Facility (RLWTF) at TA-50-1. As described for IDC 002, the resultant sludge is mixed with Portland cement, vermiculite, and sodium silicate and then packaged as TRUCON code LA 111A.

TRUCON Code LA 211A

TRUCON code LA 211A waste consists of retrievably stored (see List of Definitions), concreted (cemented) aqueous waste. This waste originates as aqueous effluent from plutonium processing at TA-55-4 that is then treated in Room 60 of the RLWTF at TA-50-1. As described for IDC 002, the resultant sludge is mixed with Portland cement, vermiculite, and sodium silicate.

TRUCON Code LA 111B

TRUCON code LA 111B waste consists of stabilized aqueous waste (dewatered sludge) that is similar to the waste identified as IDC 003. The waste consists of solids from vacuum filtration of a pretreated aqueous waste slurry at TA-50-1. These solids, which originated in the plutonium-processing facility at TA-55-4, are trapped on the surfaces of filter media (diatomaceous earth). The filter medium with the entrapped filtrate is placed in drums with dry Portland cement as an absorbent.

TRUCON Code LA 211B

TRUCON code LA 211B waste consists of retrievably stored, stabilized aqueous waste (dewatered sludge) that is similar to the waste identified as IDC 003. The waste consists of solids from vacuum filtration of a pretreated aqueous waste slurry at TA-50-1. These solids, which originated in the plutonium-processing facility at TA-55-4, are trapped on the surfaces of filter media (diatomaceous earth). The filter medium with the entrapped filtrate is placed in drums with dry Portland cement as an absorbent.

TRUCON Code LA 114A

TRUCON code LA 114A waste consists of solidified inorganic process solids. This waste is similar to the waste previously identified as IDC 006. The waste is generated at TA-55-4 as a result of plutonium-processing operations. Solidified process solids include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, salts, metal oxides, and fines. These process solids are immobilized in gypsum cement to form a noncorrosive solid matrix. Gypsum cement has been used to solidify acidic waste streams. The resultant waste is packaged as TRUCON code LA 114A.

TRUCON Code LA 115A

Graphite waste generated from plutonium-processing activities at TA-55-4 is packaged as TRUCON code LA 115A waste. TRUCON code LA 115A is similar to the waste identified as IDC 005(P2G). The waste consists of discarded graphite mold and furnace equipment from plutonium-casting operations. A small fraction of combustible waste, such as plastic (mainly packaging), also comprises this waste type. The graphite waste is first placed in tin or stainless steel cans and then placed in 55-gallon drums or standard waste boxes (SWB).

TRUCON Code LA 116A

TRUCON code LA 116A waste is comprised of combustible waste generated at TA-55-4. TRUCON code LA 116A is similar to the waste identified as IDC 004. The combustible solids consist primarily of paper, rags, plastic, and rubber. A small fraction of noncombustible solids, such as scrap metals, may also be contained in this waste form. The wastes are containerized in 55-gallon drums or SWBs.

TRUCON Code LA 116B

TRUCON code LA 116B waste is comprised of combustible debris waste generated at TA-55. TRUCON code LA 116B is similar to the waste identified as IDC 004. This combustible debris waste consists primarily of room trash generated during plutonium-processing activities.

TRUCON Code LA 116C

TRUCON code LA 116C waste is comprised of combustible debris waste generated at TA-55. TRUCON code LA 116C is similar to the waste identified as IDC 004. This combustible debris waste consists primarily of glovebox trash generated during plutonium-processing activities.

TRUCON Code LA 116D

TRUCON code LA 116D waste is comprised of all other combustible waste generated at TA-3 and not included in LA 116E. TRUCON code LA 116D is similar to the waste previously identified as IDC 004.

TRUCON Code LA 116E

TRUCON code LA 116E waste is comprised of combustible waste generated at TA-3. TRUCON code LA 116E is similar to the waste previously identified as IDC 004. This combustible solid waste may consist of paper, rags, plastic, and rubber.

TRUCON Code LA 117A

TRUCON code LA 117A waste is comprised of noncombustible waste generated at TA-55. TRUCON code LA 117A is similar to the waste previously identified as IDC 005(LM). This metal waste may consist of motors, pumps, tools, and process equipment and may contain some small fraction of combustible waste, such as plastics (mainly packaging). This waste is packaged in SWBs.

TRUCON Code LA 117B

TRUCON code LA 117B waste is comprised of noncombustible waste generated at TA-55. TRUCON code LA 117B consists of the metal waste described in TRUCON code LA 117A. The difference between this waste and LA 117A is that LA 117B is packaged in a maximum of four layers of plastic bagging contained within 55-gallon drums.

TRUCON Code LA 117C

TRUCON code LA 117C waste is comprised of metal waste as described in TRUCON code LA 117A. This waste stream is generated at TA-3.

TRUCON Code LA 117D

TRUCON code LA 117D waste is comprised of metal waste as described in TRUCON code LA 117A. This waste stream is generated at TA-55. The waste may also contain glass in the form of discarded laboratory glassware, windows, and bottles, with a small fraction of combustibles (e.g., plastics mainly from packaging). The waste is packaged in a maximum of four layers of plastic bagging contained within 55-gallon drums.

TRUCON Code LA 117E

TRUCON code LA 117E waste is comprised of metal waste from plutonium-processing activities at TA-55. TRUCON code LA 117E is similar to IDC 005(LM). This waste may consist of motors, pumps, tools, and process equipment and may contain some small fraction of combustible waste, such as plastic (mainly from packaging). The waste is packaged in a maximum of four layers of plastic bagging contained within 55-gallon drums.

TRUCON Code LA 117F

TRUCON code LA 117F waste is comprised of noncombustible waste and is similar to IDC 005(LM). This waste is generated from plutonium-processing activities at TA-3.

TRUCON Code LA 117G

TRUCON code LA 117G waste is comprised of all other noncombustible waste generated at TA-3. TRUCON code LA 117G is similar to IDC 005(LM).

TRUCON Code LA 118A

TRUCON code LA 118A waste consists of TRU glass waste generated from plutonium-processing activities at TA-55-4. TRUCON code LA 118A is similar to the waste identified as IDC 005(LG). This glass waste consists of discarded laboratory glassware, windows, and bottles. A small fraction of combustible waste, such as plastic (mainly packaging), may also comprise this waste type. The waste is packaged in tin or stainless steel cans and contained in 55-gallon drums or SWBs.

TRUCON Code LA 119A

TRUCON code LA 119A waste consists of discarded HEPA filters from TA-55-4. TRUCON code LA 119A is similar to the waste identified as IDC 005.

TRUCON Code LA 123A

Leaded rubber and metal waste generated at TA-55-4 is packaged as TRUCON code LA 123A waste, which is similar to the waste identified as IDC 005(P1). This waste type consists of lead-lined glovebox gloves discarded along with metal waste, such as discarded metals, motors, and tools. The waste is placed in 55-gallon drums or SWBs.

TRUCON Code LA 123B

TRUCON code LA 123B waste consists only of leaded gloves from TA-55-4. The waste is similar to the waste identified previously as IDC 005(P1).

TRUCON Code LA 124A

TRUCON code LA 124A waste consists of TRU waste salts generated from plutonium-processing activities at TA-55-4. TRUCON code LA 124A is similar to the waste identified as IDC 005(P2S). The salt waste consists of used salts from pyrochemical processes, such as electrorefining, molten salt extraction, salt stripping, fluoride reduction, and direct oxide reduction. A small fraction of combustible waste, such as plastics (mainly packaging), may also be contained in this waste.

TRUCON Code LA 125A

TRUCON code LA 125A waste contains metal equipment, either whole or sectioned, along with its combustible components. This waste also consists of a small volume of combustibles generated during decommissioning, sectioning, and packaging. TRUCON code LA 125A is similar to IDC 001 and is generated at TA-50.

TRUCON Code LA 126A

TRUCON code LA 126A waste consists of solidified organic process solids. This waste is similar to the waste previously identified as IDC 006. The waste is generated at TA-55-4 as a result of plutonium-processing operations. Solidified process solids include process residue from evaporator bottoms and other discardable solutions, process leached solids, ash, filter cakes, salts, metal oxides, and fines. These process solids are immobilized in gypsum cement to form a noncorrosive solid matrix. The resultant waste is packaged as TRUCON code LA 126A.

A.2.1.1.3 LANL RSWD Codes

This section provides a brief description of the RSWD-coded waste at LANL and the processes that generated the waste. The descriptions of the RSWD-coded waste were extracted primarily from the DOE/LANL "Response to the Notice of Deficiency Issued by the New Mexico Environment Department for the Part B Permit Application for Technical Area 54, Area G Storage Pads and Domes" (DOE, 1994). Additional information was obtained through queries of LANL's Chemical Science and Technology (CST) Division waste management database. The EPA Hazardous Waste Numbers (as referenced by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995) that potentially apply to these RSWD codes are listed in Table A.2-2.

LANL RSWD Code A10

RSWD code A10 waste consists of graphite solids generated from plutonium-processing operations, specifically, casting conducted in Room 327 at TA-55-4.

LANL RSWD Code A14

RSWD code A14 waste consists of combustible material generated during decontamination activities at TA-3, TA-21, TA-50, and TA-55. Decontamination waste may include cellulosics, plastic, or cloth generated during plutonium processing.

LANL RSWD Code A15

RSWD code A15 waste consists mainly of combustible solids collected from plutonium-processing operations and related activities at TA-3, TA-21, TA-50, and TA-55-4. Waste at TA-55-4 is collected in the waste management room (Room 432) for packaging, documentation, and radionuclide assay. The waste includes cellulosics, such as wood scraps, paper, and rags.

LANL RSWD Code A16

RSWD code A16 waste consists of plastic (mainly packaging) generated at TA-3, TA-21, TA-50, and TA-55. This waste is generated from plutonium-processing and related activities.

LANL RSWD Code A17

RSWD code A17 waste consists of rubber materials generated during plutonium-processing and related activities. This waste is generated at TA-3, TA-21, TA-50, and TA-55.

LANL RSWD Code A18

Nonsegregated paper, plastic, and rubber comprises RSWD code A18 waste. This waste is generated at TA-3, TA-21, TA-50, and TA-55 during plutonium-processing and related activities.

LANL RSWD Code A19

RSWD code A19 waste consists of a combination of noncombustible material, such as scrap metal, and trash generated at TA-3, TA-21, TA-50, and TA-55. Plutonium-processing and related activities generate this waste.

LANL RSWD Code A24

RSWD code A24 waste is comprised of cemented/immobilized residues and/or powders. This waste stream is generated at TA-55-4 and may consist of process leached solids, ash, filter cake, metal oxides, and fines from plutonium-processing operations. The waste has been immobilized in gypsum cement.

LANL RSWD Code A25

Plutonium operations generate numerous waste items that may require plutonium recovery, such as filter media, plastics, used equipment, personal protective equipment, and paper products that are removed from process gloveboxes or radiation control areas. These items are processed by various methods, such as acid leaching, to recover the residual plutonium. In this plutonium-recovery process, waste streams consisting of leached materials, such as solution residues, solids, ash, filter cake residues, salts, and metal oxides, were generated at TA-21 and TA-50 and are currently generated at TA-55. This waste constitutes the A25 waste stream. The residual material is mixed with gypsum cement in steel drums. Some batches of gypsum-cemented waste have been found to release a minimal amount of free liquid as a result of dewatering after the cement has set. There is some likelihood of hydrogen gas generation from the radiolysis of water contained within the cement matrix.

LANL RSWD Code A26

After the items containing recoverable levels of plutonium have been processed (as described for LANL RSWD Code A25) and the waste materials that no longer contain recoverable amounts of plutonium have been segregated (RSWD code A25 waste), the remaining leachate that still contains recoverable levels of plutonium is processed in ion-exchange units. The ion-exchange units segregate the plutonium and generate a stripped leachate. This stripped leachate is then collected, along with plutonium-oxalate solutions and process waters, and distilled in an evaporator. The evaporator distillate is then sent to TA-50 for further treatment. The A26 waste stream consists of the evaporator bottom solutions that result from the evaporation process. This waste stream is generated at TA-55 and is stabilized in a cement matrix at TA-55-4, Room 401.

LANL RSWD Code A27

This waste stream consists of any solid crystallized residues from the evaporator process solution described above for RSWD code A26. The residues may include iron-, aluminum-, calcium-, magnesium-, ammonium-, potassium-, and sodium-nitrate salts. Some particles have been immobilized by cementation to meet minimum particulate size criteria for storage. Most salts were placed in containers without immobilization.

LANL RSWD Code A28

RSWD code A28 waste consists of discarded chloride salts used in pyrochemical operations, such as electrorefining, molten salt extraction, salt stripping, and oxide reduction associated with plutonium-recovery operations at TA-55. In molten form, the chlorides are used as a solvent in the preparation and purification of plutonium metal. Prior to 1987, the discarded salts contained calcium metal. No liquids or hydrocarbons are present in this waste stream.

LANL RSWD Code A29

RSWD code A29 waste is a hydroxide cake generated from waste salt. This waste is generated at TA-55 during plutonium-processing operations.

LANL RSWD Code A30

RSWD Code A30 waste consists of large, discarded, property-numbered (PN) equipment, such as gloveboxes and ancillary equipment (e.g., support structures, feed lines, ventilation equipment) from TA-3, TA-21, TA-39, TA-49, TA-50, and TA-55. These large metallic items from decontamination and decommissioning operations are size reduced at the WCRRF at TA-50-69 by cutting with a plasma arc torch. Many of the gloveboxes included in this waste stream are lined with sheets of lead. This waste may contain very small quantities of contained liquids in piping and possibly precipitation that entered containment crates prior to placement in their present storage configuration.

LANL RSWD Code A31

RSWD Code A31 waste consists of smaller discarded parts and non-PN equipment associated with the generation of RSWD code A30, such as faucets, piping, wiring, plastic wrapping, and plastic or glass windows. No liquids or hydrocarbons are associated with this waste stream.

LANL RSWD Code A36

The RSWD code A36 waste consists of noncombustible building debris. The building debris was generated during decommissioning activities at TA-3, TA-21, TA-39, TA-49, TA-50-69, and TA-55.

LANL RSWD Code A40

RSWD code A40 waste consists of combustible hot cell waste generated during plutonium-processing and related activities. This waste is generated at TA-3, TA-21, TA-50, and TA-55.

LANL RSWD Code A46

RSWD code A46 waste consists of reaction process crucibles and oxide residues immobilized in gypsum cement. This waste is generated at TA-55.

LANL RSWD Code A47

Slag and porcelain waste generated at TA-3 and TA-55 comprise RSWD code A47 waste. This waste is generated as a result of plutonium-processing activities.

LANL RSWD Code A50

RSWD code A50 waste consists of metal crucibles, scrap, and dies. This waste is generated during plutonium-processing activities at TA-3 and TA-55.

LANL RSWD Code A52

RSWD code A52 waste consists of metal waste from TA-55-4. The metal waste is comprised of motors, pumps, tools, and process equipment.

LANL RSWD Code A55

Discarded HEPA filters comprise RSWD code A55 waste. This waste is generated at TA-55-4.

LANL RSWD Code A60

RSWD code A60 waste consists of other combustibles generated at TA-3, TA-21, TA-50, and TA-55. This waste is generated as a result of plutonium-processing and related activities.

LANL RSWD Code A61

RSWD code A61 waste consists of miscellaneous noncombustible trash associated with plutonium-processing operations, such as ceramics, scrap metal, and glass. The scrap metal includes discarded motors, pumps, tools, and process equipment and materials from fabricated items disassembled for evaluation. Rubber gloves containing lead oxide may be included in this waste stream.

LANL RSWD Code A75

Most of the waste included in RSWD code A75 was generated before 1982 at TA-50-1 and TA-55-4. This waste stream consists of the distillate from the evaporator process discussed for RSWD code A26 and depleted plutonium solutions from caustic-recovery processes at TA-55-4. This wastewater was collected and chemically treated at TA-50-1 with lime and ferric sulfate to encapsulate the nuclear material in an iron hydroxide matrix. It was then dewatered by vacuum filtration. Cement was added to the top of the resulting sludge to capture any liquid that separated from the sludge. This waste stream was significantly reduced in 1982 by redirecting TA-50-1 influent with high TRU content into a pretreatment unit in Room 60 (see description below for RSWD code A76). However, even though this influent is now redirected into the pretreatment unit, the supernatant resulting from the current pretreatment operations enters the main plant treatment operations in Room 116; thus, A75 waste continues to be generated.

LANL RSWD Code A76

RSWD Code A76 waste consists of cement paste created by stabilizing pretreatment sludge generated at TA-50-1, Room 60. This sludge results from pretreatment of TA-55 influent before it enters the main

treatment plant operations in TA-50-1, Room 116. The pretreatment sludge was generated after 1982 and stabilized with Portland cement. Halogenated organic solvents used in TA-55 processes may have been introduced to the influent generating this sludge. There is currently no evidence that this waste stream contains free liquids and no materials exist in this waste stream that would cause generation of hydrogen gas.

LANL RSWD Code A80

RSWD code A80 waste consists of irradiation sources plated on planchets. This waste is generated at TA-3 and TA-55.

LANL RSWD Code A90

RSWD code A90 waste consists of radioactively-contaminated soil generated during decontamination activities and/or accidental spills at TA-1, TA-3, TA-21, and TA-50.

LANL RSWD Code A95

RSWD code A95 waste consists of glass waste generated from plutonium-processing and related activities at TA-3, TA-21, TA-42, and TA-55. This waste stream may contain discarded labware, windows, and/or bottles and contains a small fraction of combustibles such as plastic.

A.2.1.2 Description of TRU Mixed Waste Management Units

The permitted TRU mixed waste storage units at LANL that are addressed in this WAP include:

- TA-54-226 and Storage Pads 2 and 4 at TA-54, Area G.
- TA-54-229, TA-54-230, TA-54-231, and TA-54-232 at TA-54, Area G.

Information on the units at TA-54, Area G, is available in LANL's "RCRA Part B Permit Application: Technical Area 54, Area G, Pads 1, 2, and 4; Storage Domes A-D; Chemical Plating Waste Treatment Skid and Treated Liquid Storage Tanks, Technical Area 63, Hazardous Waste Treatment Facility" (LANL, 1993), submitted to the New Mexico Environment Department in September 1993.

TRU mixed waste storage units operating under **20 NMAC 4.1, Subpart VI, Section 265**~~interim status~~ facility standards and addressed in this WAP include:

- Storage Domes 48, 153, 224, and 283 at TA-54, Area G
- The Drum Prep Facility and Storage Shed 8 at TA-54, Area G
- Container storage areas (CSA) in Rooms 9010, 9020, and 9030 of Wing 9 at TA-3-29
- Storage units at TA-50-1 (Room~~s 35, 36, 38/38A, and~~ 59) and TA-50-37 (Rooms 115, 117, and 118)

- CSAs at TA-50-69 and TA-50-114
- ~~CSAs at the Radioassay and Nondestructive Testing Facility at TA-54 West.~~
- Storage units at TA-55, Building 4

Information on these units is available in LANL's "RCRA Part A Permit Application for Mixed Waste" (LANL, January 25, 1991).

TRU mixed waste storage units pending a permit and addressed in this WAP include:

- **CSAs at the Radioassay and Nondestructive Testing Facility at TA-54 West.**
- **Storage units at TA-55, Buildings 4 and 185.**
- **Storage units at TA-50-1, Rooms 35, 36, and 38/38A.**

Information on these units is available in LANL's "RCRA Part A Permit Application for Mixed Waste, Revision 2.0" (LANL, 1994) **and "Proposed Hazardous Waste Facility Permit Modification, Technical Area 50, Building 1; Rooms 35, 36, and 38/38A Container Storage Areas, Building 69; Indoor and Outdoor Container Storage Areas, Technical Area 54 West, Building 38; High Bay, Low Bay, Loading Dock, and Outdoor Container Storage Areas, December 22, 1995.""**

A.2.2 WASTE ANALYSIS PARAMETERS

A detailed chemical and physical characterization will be performed for TRU mixed waste management purposes, as required by 20 NMAC 4.1, revised November 1, 1995. Waste analysis parameters will be selected to ensure that this characterization will contain all the information necessary to properly treat, store, or dispose of waste in accordance with general facility standards and LDR requirements.

A.2.2.1 Proposed Analytical Parameters and Characterization Methods

Proposed analytical parameters and characterization methods for TRU mixed waste at LANL are summarized in Table A.2-3. Some or all of these parameters will be used to determine the regulatory status of LANL TRU mixed waste and are as follows:

- Physical waste form characterization through real-time radiography (RTR) and visual examination to verify the absence of free liquids

- Headspace gas sampling to determine the presence of volatile organic compounds (VOC) in container headspace

- Hazardous constituent sampling to determine the presence and concentrations of:

  - RCRA-regulated metals
  - RCRA-regulated VOCs

- RCRA-regulated semivolatile organic compounds (SVOC)[1]

A.2.2.2 Criteria and Rationale for Parameter Selection

Waste analysis parameters selected to characterize TRU mixed waste are in conformance with 20 NMAC 4.1, revised November 1, 1995, and incorporate characterization procedures from the WIPP "TRU Waste Characterization Quality Assurance Program Plan" (QAPP) (DOE, 1994) requirements, which are based on knowledge of raw materials and physical/chemical processes of waste-generating activities and may be supported by analytical results. The analytical parameters selected to confirm knowledge-based waste characterization, as well as the rationale for the selected parameters, are identified in Table A.2-3.

A.2.3 CHARACTERIZATION OF TRU MIXED WASTE

The characterization of TRU mixed waste managed at LANL can be divided into general approaches based on when the waste was generated and the differences involved in sampling the waste. Generally, the distinction is made between legacy, existing, and future TRU mixed waste to define the quality of information available on the waste and the subsequent need for additional sampling and analysis. A secondary distinction between heterogeneous and homogeneous waste, as reflected in the matrix parameter codes, is made to determine the availability or appropriateness of sampling procedures.

As provided in the List of Definitions, *legacy* TRU mixed waste is waste generated before the LANL Waste Profile Form (WPF) was implemented in May 1991 (see Section A.2.3.1). Legacy TRU mixed waste has been characterized with qualitative assessments to evaluate the presence or absence of hazardous constituents. These assessments include examining past records and databases, conducting interviews with waste generators, and observing and evaluating similar waste-generating processes. *Existing (or currently generated)* TRU mixed waste (i.e., waste generated since May 1991) is characterized using LANL's WPF. *Future* TRU mixed waste will be characterized using both LANL's WPF and a certification program (see Section A.2.3.2).

The TRU mixed waste types described include homogeneous solids, soils/gravel, and debris wastes. As discussed in Section A.2.1.1, these types are categorized by *matrix parameter codes* based on the physical and chemical form of the waste. Waste streams in the homogeneous solids (Matrix Parameter Code S3000) or soils/gravel (Matrix Parameter Code S4000) categories may contain RCRA-regulated VOCs, SVOCs, and metals[2] (see Table A.2-4). These homogeneous waste streams will be sampled and analyzed for the toxicity characteristic (TC) contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995. Analysis for total concentration of TC contaminants may be performed on

[1]Use of the terms, "RCRA-regulated metals," "RCRA-regulated VOCs," "RCRA-regulated SVOCs," "RCRA F-listed and/or K-listed waste," "RCRA P-listed and U-listed waste," "RCRA-regulated hazardous constituents," and "RCRA characteristic" refers to hazardous wastes or hazardous constituents as defined in 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995.

[2]Refer to Footnote 1.

samples in a screening step. If total concentrations are used in the waste characterization process, analytical data will be compared to the TC regulatory levels expressed as total values. These total values will be considered the regulatory threshold limit (RTL) values for the determination of whether a particular waste exhibits a TC. RTL values are obtained by calculating the weight/weight concentration (in the solid) of a TC contaminant that would give the regulatory weight/volume concentration in the toxicity characteristic leaching procedure extract.

Debris waste streams (Matrix Parameter Code S5000) consist of heterogeneous materials. As such, it is difficult to obtain representative samples, and the waste type is best characterized through examination of the original materials from which the waste was generated. Therefore, debris waste may be characterized for the presence of hazardous constituents (i.e., VOCs, SVOCs, and metals) using acceptable knowledge. Additionally, headspace gas sampling, RTR, or visual examination will be conducted on a statistically selected population of waste streams to substantiate this characterization.

The matrix parameter codes (see Table A.2-1) will be used as preliminary guidance for establishing sampling and analytical procedures. Specific sampling and analytical requirements will then be determined for each waste stream. Initial predictions of hazardous constituents present in each waste stream will be based on process knowledge, with waste sampling and analysis performed as necessary to obtain qualitative and quantitative data for hazardous constituents (i.e., VOCs, SVOCs, and metals). Table A.2-3 summarizes characterization methods by matrix parameter code. Sampling and analytical methods for specific hazardous constituents are presented in Table A.2-4. The following discussion presents the approach to characterization that will be used for each of these waste groups, integrating the time of generation and the physical form of the waste.

Characterization of legacy TRU mixed waste is primarily based on process knowledge, which is suitable for safe storage of these waste streams. Further characterization of homogeneous legacy waste may be accomplished through statistically based sampling and analysis, headspace gas sampling, RTR, and visual examination. Heterogeneous legacy waste will be characterized using process knowledge, headspace gas sampling, RTR, and visual examination. These approaches for homogeneous and heterogeneous legacy waste are discussed in Section A.2.3.3.

Existing TRU mixed waste is currently characterized using process knowledge, which is provided by individual waste generators on LANL's WPF. (For a detailed description of the WPF, refer to Section A.2.3.1 and to LANL's Administrative Requirement 10-9, "Waste Profile Form.") Additional characterization of existing TRU mixed waste will occur after the construction of planned facilities and implementation of sampling and analytical capabilities at LANL. For this additional characterization of homogeneous existing waste, LANL will use statistically based sampling and analysis, headspace gas analysis, RTR, and visual examination. Heterogeneous existing waste will be characterized using process knowledge, headspace gas sampling, RTR, and visual examination.

Future homogeneous TRU mixed waste will be characterized through the use of LANL's WPF and **the acceptable knowledge certification program described in Section A.2.5.2 of this WAP.**~~a radioactive and mixed waste certification program to be implemented.~~ Sampling and analysis will be conducted for characterization only when required to fully document and/or verify the waste stream. Documented and

auditable acceptable knowledge will be used to determine whether or not the waste stream is hazardous, as defined by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995. If available information regarding acceptable knowledge is insufficient for waste characterization, additional information will be obtained using the sampling procedures identified in Section A.2.3.3. Heterogeneous waste will be characterized using acceptable knowledge, which may be supported by some waste analysis data.

For future TRU mixed waste, knowledge of the waste-generating process will be strictly controlled by a quality assurance (QA)/quality control (QC) program that addresses management of specific waste streams. This approach will provide a rigid definition for the acceptable knowledge applicable to specific waste streams. For example, the QA/QC program may include procedures for controlling chemical inputs to the waste-generating process as well as procedures for confirming the types of waste placed in different waste containers. These measures will provide knowledge of the types and concentrations of chemical constituents in individual waste streams.

A.2.3.1 Waste Profiling System

In an effort to maintain detailed and accurate waste characterization information, LANL's CST Division utilizes a generator waste-profiling program for existing (i.e., currently generated) waste at LANL. The waste-profiling effort requires each waste generator to provide a detailed written description of the waste on a standardized WPF, Form 1346 (Figure A.2-1). The waste description can be based on generator process knowledge, the use of appropriate Material Safety Data Sheets (MSDS), results of a chemical/physical analysis of the specific waste, and/or any additional information for acceptable knowledge. By completing the WPF, waste generators supply information that allows for the proper management of TRU mixed waste. Specific information that is requested on the WPF includes:

- Point of generation
- Method of characterization
- Waste categories
- Waste description
- Waste origination
- Classification of radioactivity
- Presence of toxic metals and an estimate of concentration
- Presence of organic compounds and an estimate of concentration
- Identification of hazardous constituents
- Identification of hazardous characteristics
- Identification of the radiological characteristics of the waste.

A correctly completed WPF contains sufficient information to allow CST to classify the waste type, class, category, source, matrix, and matrix type (Figure A.2-1). Ultimately, the waste profile is used by CST Division to determine the proper procedures for managing the waste.

All waste generators must certify, based on their knowledge of the waste, that the information on the WPF is complete and accurate. Knowingly providing false information can result in administrative action by

LANL and/or be subject to potential significant civil or criminal penalties, as stipulated by the waste generator's certification statement.

The WPF must be completed prior to any waste treatment, storage, or disposal. Waste generators must provide new profiles when a process change results in a change in waste composition or when a new waste is generated; otherwise, waste stream profiles are reevaluated annually. This annual reevaluation complies with the characterization frequency requirement of 20 NMAC 4.1, Subpart V, 264.13(b)(4), revised November 1, 1995.

A.2.3.2 Acceptable Knowledge

Acceptable knowledge is used to characterize TRU mixed waste forms at LANL. The physical nature of some TRU mixed waste forms (e.g., debris) makes the collection of representative samples difficult. This difficulty arises from several factors, some of which include: waste streams that contain disparate elements; disparate elements may need to be segregated into similar forms; large objects cannot be made to fill standard size sample containers; and laboratories may not have the capability to sample large objects (EPA, 1992). Health and safety risks to personnel from exposure to radioactive material also preclude extensive sampling and analysis of certain TRU mixed waste forms. For generation of future TRU mixed waste, LANL will implement a radioactive and mixed waste certification program to support acceptable knowledge used for waste characterization.

According to EPA guidance, *acceptable knowledge* is broadly defined to include process knowledge, waste analysis data, and/or facility records of analysis (EPA, 1994). *Process knowledge* is described in 20 NMAC 4.1, Subpart V, 264.13(a)(2), revised November 1, 1995, as data developed under 20 NMAC 4.1, Subpart II, revised November 1, 1995, and existing published or documented data on a specific hazardous waste or hazardous waste generated from similar processes. *Waste analysis data* include concentration(s) of regulated hazardous constituents and/or results of tests for hazardous characteristics. These data are used to determine if wastes are regulated and to determine their LDR status. *Facility records of analysis* performed before the effective date of hazardous waste regulations will be used with caution. These analytical results must be accurate and applicable to the specified waste and should be supplemented with other existing information (e.g., published data). EPA guidance suggests that acceptable knowledge may be appropriate for wastes meeting the following descriptions:

- Wastes containing hazardous constituents from specific processes that are well documented, such as RCRA F-listed and/or K-listed waste[3] code descriptions.

- Wastes consisting of discarded unused commercial chemical products, reagents, or chemicals containing known physical and chemical constituents. Several of these fall into the RCRA P-listed and U-listed waste[4] code descriptions.

[3]Refer to Footnote 1.

[4]Refer to Footnote 1.

- Waste (e.g., radioactive mixed waste) containing levels of radioactivity such that health and safety risks to personnel do not justify sampling and analysis due to quantified and documented radiological concerns.

- Wastes containing heterogeneous materials, where the physical nature of the waste does not lend itself to taking a representative sample (e.g., laboratory trash and construction debris with surface contamination) (EPA, 1994).

At LANL, waste generators will obtain, assemble, and prepare the acceptable knowledge documentation available for each waste stream in a separate auditable file or maintain a waste stream reference file that identifies the acceptable knowledge documents and their locations. The acceptable knowledge documentation must be explicitly relevant and traceable to a waste type and must not be merely a list of information sources for a particular operation and/or waste. There are many sources of applicable documentation at LANL that may be used to substantiate acceptable knowledge for a specific waste stream. This documentation includes the following:

- Process design documents (e.g., Title II Design).

- Final safety analysis reports (SAR), unreviewed safety question determinations (USQD), and technical safety requirements (TSR).

- Standard operating procedures and detailed operating procedures that list the raw materials or reagents, describe the process/experiment that uses the materials, and describe how the waste streams are generated and handled.

- Waste packaging logs completed when controlled wastes are placed in containers (e.g., trash can packaging for controlled wastes).

- Test plans or research project reports that describe the reagents and other raw materials used in an experiment.

- Laboratory notebooks, process logs, and run sheets that detail the research processes and raw materials used in an experiment.

- Site databases (e.g., chemical inventory database for Superfund Amendments and Reauthorization Act Title III requirements).

- Documented site personnel interview information.

- Standard industry practice documents (e.g., vendor information).

- Previous analytical data relevant to the waste stream, such as fingerprint analysis, spot-check procedures, or routine waste verification sampling and analysis data.

- Available studies that contain analytical data can be used to identify the constituents of a specific "similar" process waste stream and to determine the regulatory status of the waste stream for common industrial or LANL processes. Such reports on a similar process should have a clear and documented connection to the waste stream being characterized.

- MSDSs, product labels, and other product package information.

- Documented visual inspections that can be used to identify or confirm the physical characteristics and packaging of a waste.

Sampling surrogate wastes (e.g., equivalent nonradioactive or low-level radioactive materials) may also be a means of obtaining acceptable knowledge for characterizing TRU mixed wastes. For example, data from the analysis of nonradioactive leaded-glove waste may be used to evaluate the characteristics of similar radioactive leaded-glove waste. In some cases, a low-level mixed waste stream may be chemically equivalent to a TRU mixed waste stream. Because data for a low-level mixed waste stream may be more readily attainable, it may be useful for characterizing the TRU mixed waste stream. Sampling nonradioactive inputs or outputs from processes may also provide data that are useful for characterizing a similar TRU mixed waste stream.

Acceptable knowledge confirmed with RTR and visual examination is a reasonable approach to characterizing debris waste. Obtaining a representative sample of debris waste (Matrix Parameter Code 5000), as required by 20 NMAC 4.1, Subpart V, 264.13(b)(3), revised November 1, 1995, is difficult, because many types of waste may be present in a single waste stream or even in a single waste container. For legacy and existing heterogeneous waste, the type of waste segregation that would enable the development of a sampling strategy to obtain representative samples has not always occurred. Problems also arise in collecting representative samples from irregularly shaped and indurated waste items. Debris wastes are expected to exhibit highly variable concentrations of hazardous constituents, even for segregated materials. This may potentially diminish the reliability of sampling and analytical data.

The acceptable knowledge approach to characterizing TRU mixed debris waste is supported by EPA guidance for the situations described in the previous paragraph (EPA, 1994). A conservative approach is used to determine if a waste is regulated hazardous waste. Process inputs (e.g., chemicals) are identified, and if the waste stream generated may contain hazardous constituents derived from process inputs, the waste is managed as a regulated hazardous/mixed waste. This type of process knowledge will be used to characterize TRU mixed debris waste. For example, metals present in debris waste are often associated with specific materials (e.g., lead in leaded-gloves, or lead shielding). Knowledge of the materials and operations that generated specific waste streams in the debris category is used to determine if these types of items are present in the waste and if the waste stream contains RCRA-regulated metals[5].

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[5]Refer to Footnote 1.

A.2.3.3 Sampling and Analysis for TRU Mixed Waste

This section discusses proposed sampling procedures and frequency of sampling applicable to TRU mixed wastes. The approach described for characterizing TRU mixed waste streams is based on radiological, physical/chemical, and hazardous properties of the waste. The sampling and analysis strategies presented here will be used to evaluate whether TRU mixed waste exhibits the characteristic of toxicity, as described in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995. The proposed methods do not apply directly to determinations of whether a waste exhibits other characteristics (i.e., ignitability, corrosivity, or reactivity) or is listed in 20 NMAC 4.1, Subpart II, Part 261, Subpart D, revised November 1, 1995. Determinations of whether a TRU mixed waste exhibits these characteristics or is listed will be made by applying acceptable knowledge, as described in Section A.2.3.2. Techniques typically used to obtain the physical and chemical data necessary for TRU mixed waste characterization include the following: RTR, visual examination, headspace gas sampling and analysis, and homogeneous solid waste sampling and analysis (e.g., for VOCs, SVOCs, and metals). For the purpose of TRU mixed waste characterization, LANL utilizes RTR, visual examination, and headspace gas sampling as confirmational sampling and analysis procedures for process knowledge. These procedures, coupled with documented, auditable process knowledge, will result in accurate, defensible waste characterization of TRU mixed waste. Specific waste sampling methods, equipment, and sample-handling procedures are described below.

To confirm whether existing TRU mixed waste is hazardous (as defined by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995), available process knowledge will first be used to segregate the waste containers into waste streams and to assign each waste stream to a matrix parameter code. Once the waste streams have been defined and assigned to the matrix parameter codes, this information will be verified by a multistep process (Section A.2.5). RTR will be used for TRU mixed waste to confirm the matrix parameter code and to verify compliance with the waste form requirements of the "Waste Acceptance Criteria for the Waste Isolation Pilot Plant" (DOE, 1991). A statistically selected number of containers (as described in Section A.2.3.3.2) will be visually examined to confirm RTR results. Drums retrieved from Storage Pads 1, 2, and 4 will be selected on a statistical basis (as described in Section A.2.3.3.5) for headspace gas sampling during drum-venting operations.

A.2.3.3.1 Real-Time Radiography

RTR is a nondestructive, qualitative, and semiquantitative assay technique that involves x-ray scanning of waste containers to identify and verify, using appropriate equipment and qualified operators, the physical form(s) of waste container contents. RTR will be used to verify the absence of free liquids and that the physical form requirements of the WIPP waste acceptance criteria (DOE, 1991) are met. At the same time, RTR will verify the waste classification (i.e., matrix parameter code) and waste form determined using acceptable knowledge. All TRU mixed waste containers will be analyzed by RTR, and the results for each waste container will be documented. The audio/video tapes produced during the waste container scan will be maintained for a minimum of three years. In addition, an RTR data form will be used to document the waste matrix parameter code.

A radiography system routinely consists of an X-ray producing device, an imaging system, an enclosure for radiation protection, a waste container handling system, an audio/video recording system, and an operator control and data acquisition station. Operating parameters such as the intensity of the X-ray can be varied for optimum viewing of the interior of the waste container. The imaging system typically utilizes an image intensifier, television camera, and remotely located television screen. Instrument configurations will vary depending on manufacturer and site usage.

During operation of the system, the waste container is scanned while the operator views and permanently records the image from the television screen on audio/videotape. The radiography data form is also used to document the matrix parameter category and other information about the containerized waste as required by the WIPP QAPP (DOE, 1994).

The radiography image produced is examined for evidence of liquid materials by jogging the container or repetitively moving the container handling system and searching for evidence of wave motion in addition to observing the container contents for suspect waste items. The container contents are also observed for items that confirm the waste classification of the container. Conditions that may limit or interfere with this determination are noted.

Operator training and experience are important considerations for assuring the quality of the radiography data. Only properly trained personnel are allowed to operate radiography equipment. Standardized training requirements for radiography operators are based upon existing industry standard training requirements. (An example is ASNT-TC-1A). Radiography operators receive formal and on-the-job training in project requirements, system operations and standards, safe operating practices, application techniques, specific waste generating practices, packaging configurations, parameter estimation and identification of prohibited items. Operators must be trained and tested before they are qualified for RTR operation, and must requalify at least every two years. LANL operating and training requirements for RTR analysis of TRU mixed waste are based on "Procedure 310.1, Physical Waste Form Characterization Using Radiography, TRU Waste Characterization Sampling and Analysis Methods Manual," (DOE, 1996).

A.2.3.3.2 Visual Examination

Waste contents of select TRU mixed waste containers will be visually examined to confirm the RTR results. This visual examination will also verify aspects of acceptable knowledge amenable to visual confirmation. For example, the visual examination will verify the physical characteristics of the waste and the associated matrix parameter code (i.e., Matrix Parameter Code S3000, S4000, or S5000). In addition, the visual examination will verify the presence of certain hazardous constituents, such as lead in lead bricks or lead-lined gloves. These types of visual confirmations will either verify or refute the overall acceptable knowledge used to characterize the waste stream.

The contents of each container undergoing visual examination will be recorded on audio/videotape and a description of the observed items must be provided on a visual examination data form. Visual examination procedure operators receive formal and on-the-job training in project requirements, safe operating practices, specific waste generating practices, packaging configurations, waste parameter

estimation and identification of prohibited items. Operators must be trained and qualify for visual examination procedures and must requalify at least every two years. LANL operating and training requirements for visual examination of TRU mixed waste are based on "Procedure 310.2, Physical Waste Form Characterization Using Visual Examination, TRU Waste Characterization Sampling and Analysis Methods Manual," (DOE, 1996).

The hypergeometric distribution is a statistical means of estimating the probability of determining the true number of miscertified containers in the overall population of waste drums by selecting a number of drums for visual examination using a previously determined or observed miscertification rate and a set confidence factor. The basis for the determination of the number of appropriate containers to be visually examined and a description of the hyergeometric distribution used is available in the WIPP TRU Waste Characterization Plan. The following table is an example of how the number of TRU mixed waste containers to be randomly selected for visual examination will be determined. The selection process will be updated as necessary to maintain consistency with revisions of the QAPP (DOE/CAO 94-1010).

Number of Waste Containers Requiring Visual Examination

Annual Number of Waste Containers Undergoing Characterization	Number of Waste Containers Requiring Visual Examination					
50	NA	22	NA	22	NA	29
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	54
500	15	26	26	36	45	63
Percent of Waste Containers Miscertified to WIPP WAC by Radiography in Previous Year	1%	2%	3%	4%	5%	6%

NA = not applicable

(Source : Table 5.1, WIPP QAPP,(DOE, 1994)

~~The number of containers to be visually examined will be determined based on the drum population and on the historical miscertification percentage. The method for selecting containers to be examined visually is based upon a statistical approach for quantifying the proportion of waste containers miscertified by the RTR process. Because the sampling effort will be to estimate a proportion in a finite population, the hypergeometric distribution is used to determine the number of containers to be visually examined.~~ For the first year of container examination, LANL will use the 2 percent miscertification rate observed at the Idaho

National Engineering Laboratory (INEL). In subsequent years, LANL will use the miscertification rate observed at LANL in the previous year(s) to determine the appropriate number of containers for visual examination.~~ Visual examinations will be documented and the staff making the examination will be trained regarding what to look for and how to record observations.~~

A.2.3.3.3 Headspace Gas Sampling and Analysis

Headspace gas sampling and analysis is a qualitative screening technique used to confirm the presence of regulated hazardous constituents. TRU mixed waste characterization includes sampling and analysis of headspace gas from up to three areas within drums of waste as follows:

(1) The drum headspace (i.e., directly under the drum lid)
(2) The 55-gallon polyethylene bag headspace
(3) The innermost layers of confinement headspace.

The drum headspace (i.e., the space directly under the drum lid) **of all previously unvented drums** will be sampled **for flammable gases** when filters are inserted.~~ into unvented drums. All previously unvented drums will be sampled for flammable gases, and a~~**A** statistically selected subset of **heterogeneous waste**~~these~~ drums will be sampled for selected VOCs in order to assure that health and safety criteria for safe storage of these drums are met. The statistical basis for selection of drums to be sampled is described in Section A.2.3.3.5. Headspace gas sampling and analysis also serves to confirm the presence of regulated hazardous constituents. Headspace gas sampling will not be relied upon to prove the absence of a hazardous constituent in a waste.

The precision, accuracy, and representativeness of these headspace gas samples will be evaluated for adherence to the program's QA objectives through analysis of field QC samples and adherence to QC practices.

In order to meet the proposed characterization requirements in the WIPP QAPP (DOE, 1994), the headspace of previously vented drums in retrievable storage will be sampled and analyzed as the drums are characterized for shipment to WIPP. The sampling of vented drums may include samples from inner layers of confinement (55-gallon polyethylene bag headspace and innermost layers of confinement headspace) for a statistically selected subset of drums undergoing visual examination.

Analytical methods for the determination of VOCs in the headspace of TRU mixed waste containers must meet technical performance criteria, be consistent with regulatory guidance, and be compatible with the operational constraints associated with the analysis of actinide-contaminated materials. Methods for the collection of headspace gases are based on "Test Methods for Evaluating Solid Waste" (SW-846) (EPA, 1992) and on the "Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air" (EPA, 1988). DOE has modified the EPA methods to accommodate the characteristics of TRU mixed waste headspace gas samples. These methods include SA 010 and SA 011 (DOE, 1994).

A.2.3.3.4 Solid Waste Sampling and Analysis

The following describes the proposed methods for collecting samples of homogeneous TRU mixed waste classified as homogeneous solids or soils. Sampling protocol is based on sampling methods similar to those approved by EPA for solid waste and soil sampling in SW-846 (EPA, 1992); in "Standard Practice for Thin-Walled Tube Sampling of Soils" (American Society for Testing and Materials [ASTM], 1983); and in "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds" (ASTM, 1991). These methods are designed to ensure that representative waste samples are consistently collected and transferred to the responsible laboratory in a manner that maintains sample integrity. The statistical basis for sampling is described in Section A.2.3.3.5.

The TRU mixed waste classified as homogeneous solids or soils is packaged in either 55-gallon drums or in smaller containers within 55-gallon drums. Drums may contain TRU mixed waste within a 55-gallon polyethylene bag or may consist of up to 20 or more small containers within a 55-gallon polyethylene bag. For drums selected for sampling that contain multiple small containers, one of the small containers will be randomly selected for sampling. Waste parameters for which homogeneous solids and soils may be analyzed are listed in Table A.2-3.

To accomplish sampling of these wastes, the techniques described below have been developed for sample and subsample collection. The sampling techniques are designed to obtain a representative sample from the container (e.g., 55-gallon drum, 1-gallon polyethylene bottle) and the subsampling techniques are designed to obtain a representative subsample from the sample. Subsampling is conducted to provide laboratories the minimum amount of required sample, thus minimizing the quantity of investigation-derived waste.

The methods used to collect samples of TRU mixed waste classified as homogeneous solids and soils from 55-gallon drums and smaller containers must be such that the samples are representative of the waste from which they were taken. For 55-gallon drums containing homogeneous solids and soils, a sample must be collected as a core that is representative of the waste along the entire depth of the waste in the drum.

Sample Core Collection

Coring tools must be used to collect cores of homogeneous solids and soils from 55-gallon drums and smaller containers in a manner that minimizes disturbance to the core. A rotational coring tool (i.e., a tool that is rotated longitudinally), similar to a drill bit, must be used to cut, lift the waste cuttings, and collect a core sample from containers of waste. For homogeneous solids and soils that are relatively soft, nonrotational coring tools may be used in lieu of a rotational coring tool.

Rotational coring tools (i.e., lightweight augers) and nonrotational coring tools (i.e., thin-walled samplers) have each been tested for their ability to collect a vertical core of simulated solidified waste contained in 55-gallon drums and 1-gallon polyethylene bottles, as described in "Idaho National Engineering Laboratory Simulated Solidified Transuranic Waste Sampling Program" (EG&G, 1994). The rotational coring tool used at the INEL has demonstrated core recoveries greater than 75 percent for soft simulated wastes and greater than 94 percent for hard simulated waste. The sampling tool has been designed to minimize the transfer of frictional heat to the core, thereby minimizing potential loss of VOCs (DOE, 1994). The nonrotational coring tool has demonstrated core recoveries greater than 88 percent for soft simulated wastes. LANL will use coring tools similar to those developed at the INEL.

Subsample Collection

To obtain representative subsamples, subsampling of the sample core is required. Subsampling must be conducted as soon as possible after sample core collection to minimize the loss of VOCs. If a substantial delay (e.g., several minutes) is expected between sample core collection and subsampling, the sample core must remain in the sleeve and the sleeve must be capped at each end. Subsamples for VOCs must be collected prior to extruding the sample core from the sleeve. The sampling location must be randomly selected along the long axis of the sleeve and access to the waste must be gained by making a perpendicular cut through the sleeve and the waste it contains.

A.2.3.3.5 Statistical Approach for Headspace Gas and Solid Waste Sampling

A statistical approach will be used to select **heterogeneous legacy waste** containers for headspace gas sampling. The same approach will be used for solid waste sampling and analysis of legacy and existing homogeneous solids and soil waste streams. This approach relies on the premise that the waste containers have been separated into waste streams on the basis of process knowledge and, thus, represent populations that contain similar waste. Drums are first segregated into waste streams based on existing characterization information. **The methods used to segregate drums into waste streams and lots for sampling within waste streams are detailed in the LANL TRU Waste Characterization Sampling Plan, a site specific document required by the WIPP QAPP (DOE, 1994).** An initial number of drums is selected from each waste stream for sampling and analysis **using the method described in the WIPP QAPP DOE, 1994), Section 5.3.1. A minimum of five containers per waste stream are sampled.** ~~For waste streams consisting of ten drums or more, ten drums are selected at random for sampling. For waste streams consisting of ten drums or less, each drum is sampled.~~ For waste streams with less than three drums, a total of three samples is taken. The analytical results from the initial round of sampling are used to calculate **upper 90 percent** ~~upper and lower~~ **one-sided** confidence limits (**UCL_{90}**) for the mean concentrations of regulated hazardous constituents. Those limits are compared to the RTLs for the constituents. If a hazardous waste determination cannot be made based on the results from the initial round of sampling, an additional number of drums is selected. The number of additional drums for the second round of sampling depends on the variance of the analytical results from the first round. ~~Drums are sampled to a maximum of all of the drums in the waste stream or 40 drums, whichever is smaller.~~ **The specific method for calculating the number of drums for additional sampling is found in the WIPP QAPP (DOE, 1994), Section 5.3.1.**

The objective is to classify specific waste streams as hazardous or nonhazardous by determining the average, or mean, and associated variance of the concentration of regulated hazardous constituents in the waste stream. ~~Confidence limits for the mean concentration will be used in comparisons to regulatory levels, as described in 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995, so that a predetermined degree of confidence can be associated with the decision on whether a waste stream is hazardous for a RCRA characteristic[6].~~ Waste containers within each waste stream and sample locations

[6]Refer to Footnote 1.

within each container will be randomly selected to ensure that the analytical results provide an unbiased estimate of the true mean contaminant concentration for each waste stream.

A.2.3.4 Sample Handling, Preservation, and Storage

Table A.2-5 presents SW-846 requirements regarding sample containers, preservation techniques, and holding times associated with sample collection. Adherence to these requirements will occur to ensure that sampling and analysis meet quality objectives for data.

A.2.4 ANALYTICAL LABORATORY SELECTION AND ANALYTICAL METHODS

Analytical laboratories at LANL and/or approved subcontractor laboratories will perform all of the detailed qualitative and quantitative chemical analyses specified in Table A.2-4 of this WAP. These laboratories must have:

- The capability of handling radioactive material/waste
- A documented comprehensive QA/QC program
- Technical analytical expertise
- A document control/records management plan
- The capability to perform data reduction, validation, and reporting.

The selection and development of analytical testing methods for LANL TRU mixed waste streams were based on the following considerations:

- The physical form of the waste
- Analytes of interest
- Required detection limits (e.g., regulatory thresholds)
- Information requirements (e.g., verify compliance with LDR treatment standards, waste classification).

Collectively, these factors contributed to the selection of the analytical methods specified in Table A.2-4. Qualified analytical laboratories at LANL and/or approved subcontractor laboratories that meet the above criteria will analyze TRU mixed waste samples for RCRA-regulated hazardous constituents (VOCs, SVOCs, and metals) and characteristics[7] according to SW-846 or documented and approved equivalent methods.

[7]Refer to Footnote 1.

A.2.5 VERIFICATION ANALYSIS FOR TRU MIXED WASTE

Analysis may be performed to verify the accuracy of the initial waste characterization, to verify that applicable treatment standards have been met, when there is a change in a waste-generating process, when the generator requests a review, or when analytical results indicate a change in a waste stream. Verification analysis for TRU mixed waste will be conducted at LANL's or an approved subcontractor's laboratory facilities. All verification analyses will be conducted in conformance with appropriate EPA-approved methods. The type of verification analysis that will be performed to obtain waste characterization information depends upon the matrix parameter code of the waste stream and whether the waste is existing or future TRU mixed waste. Verification analysis methodologies for these different types of waste are presented below.

A.2.5.1 Verification of Existing TRU Mixed Waste

Characterization for existing homogeneous TRU mixed waste streams (Matrix Parameter Codes S3000 and S4000) will not require verification, because the statistical basis for initial characterization provides statistical confidence in determining whether a waste is hazardous as defined by 20 NMAC 4.1, revised November 1, 1995. Process knowledge documentation applicable to existing heterogeneous TRU mixed waste streams (Matrix Parameter Code S5000) will be qualitatively verified by RTR of waste containers (see Section A.2.3.3.1), visual examination of the contents of select waste containers (see Section A.2.3.3.2), and headspace gas sampling while venting (see Section A.2.3.3.3).

A.2.5.2 Verification of Future TRU Mixed Waste

Future homogeneous TRU mixed waste streams will be characterized using LANL's WPF, Transuranic Waste Storage Record, and Transuranic Waste Certification Plan for WIPP (TWCP). The TWCP includes an acceptable knowledge certification program as described in the WIPP Waste Acceptance Criteria (DOE, 1991) and WIPP QAPP (DOE, 1994) and developed by LANL site specific documents and procedures. LANL procedures consistent with the WIPP WAP, (DOE, 1996), Appendix C9, "TRU Waste Characterization Using Acceptable Knowledge" will be used to implement acceptable knowledge as part of the LANL TRU waste certification program for WIPP. The acceptable knowledge certification program will include the following elements:

- **A description of the waste certification program.**
- **Written procedures outlining the specific methodology used to assemble acceptable knowledge records including document origins, guidelines for the use of documents or information, auditable record guidelines, and potential limitations associated with the information.**
- **Procedures to evaluate acceptable knowledge information and to resolve discrepancies in documentation.**
- **Guidelines for the identification of RCRA hazardous constituents and assignment of appropriate EPA hazardous waste numbers to each waste stream.**

- **Procedures to ensure that unacceptable wastes are identified, documented, and segregated.**
- **Procedures to verify or confirm acceptable knowledge. Acceptable knowledge for TRU mixed waste is confirmed using nondestructive techniques and sampling and analysis as described by this WAP.**
- **A cross reference to the applicable waste summary category group (i.e.,S3000, S4000, and S5000) to verify the required confirmation data has been evaluated and the proper EPA hazardous waste numbers have been assigned.**
- **Administrative control procedures that identify organization responsibility for compliance, oversight procedures, on-the-job control procedure training, stop-work procedures, nonconformance process and corrective action procedures."**

~~Future homogeneous TRU mixed waste streams that have been characterized using LANL's WPF and a radioactive and mixed waste certification program will undergo verification sampling and analysis at a frequency of at least 1 in 100 waste streams per year. This verification will be used to support waste characterization information provided on the WPF, as well as the radioactive and mixed waste certification program, for the waste stream. Analytical results that show regulated constituents present at concentrations outside the ranges documented on the WPF are cause for rejection of the WPF and will require investigation and recharacterization of the waste stream. The recharacterization will include sampling and analysis sufficient to establish the range of regulated constituents potentially present in the waste stream.~~

~~Future heterogeneous TRU mixed waste streams will undergo qualitative verification of acceptable knowledge through RTR, visual examination, and headspace gas sampling, as described in Section A.2.5.1. Both homogeneous and heterogeneous waste streams will undergo qualitative verification through review of documentation supporting waste characterization as part of a radioactive and mixed waste certification program.~~

A.2.6 SPECIAL PROCEDURAL REQUIREMENTS

Additional waste management requirements specific to ignitable, reactive, and incompatible wastes, as well as compliance with LDR, are described below.

A.2.6.1 Procedures for Ignitable and Reactive Wastes

When ignitable or reactive waste streams are stored at LANL, specific waste management procedures for ignitable and reactive waste will be followed pursuant to 20 NMAC 4.1, Subpart V, 264.17, revised November 1, 1995. At a minimum, ignitable and reactive wastes will be separated during storage.

A.2.6.2 Procedures for Incompatible Wastes

Pursuant to 20 NMAC 4.1 Subpart V, 264.17, revised November 1, 1995, specific waste management procedures for incompatible wastes are described as follows. Incompatible wastes are kept separated during storage. Waste containers holding potentially incompatible free liquids will be stored on self-

containment pallets to maintain separation. Because incompatible wastes are and will be separated and potentially incompatible free liquids will be stored on self-containment pallets, any potential for release and reaction with other wastes or materials is and will be minimized.

A.2.6.3 Procedures to Ensure Compliance with LDR Requirements

In accordance with LDR requirements, **TRU mixed** waste to be shipped off site **must be evaluated**~~may need to be analyzed~~ to determine whether it meets the applicable LDR treatment standards in 20 NMAC 4.1, Subpart VIII, Part 268, Subpart D, revised November 1, 1995,~~. If (1) it is known whether the wastes meet applicable LDR treatment standards based on acceptable knowledge or (2)~~**unless** waste will be transported to a permitted waste management facility operating in conformance with a no-migration determination. **This evaluation will be accomplished by using acceptable knowledge of the waste or sampling and analysis.**

Each waste for which a treatment standard has been established will be evaluated for the applicable LDR parameters in 20 NMAC 4.1, Subpart VIII, Part 268, Subpart D, revised November 1, 1995. Acceptable knowledge will be used to evaluate LDR applicability for wastes with treatment standards expressed as specific technologies in 20 NMAC 4.1, Subpart VIII, 268.42, and for hazardous debris treated to meet the alternative debris treatment standards in 20 NMAC 4.1, Subpart VIII, 268.45. Wastes with constituent concentration-based treatment standards or waste extract concentration-based treatment standards will be evaluated using acceptable knowledge supplemented by sampling and analysis if acceptable knowledge alone is not sufficient to determine LDR treatment standards in 20 NMAC 4.1, Subpart VIII, 268.40.
~~, then sampling and analysis to certify LDR compliance is not necessary for affected waste.~~

Sampling and analysis will be conducted in accordance with 20 NMAC 4.1, Subpart VIII, Part 268, revised November 1, 1995, only to certify that the waste meets LDR treatment standards. ~~Each waste for which a treatment standard has been established will be evaluated for the applicable parameters in 20 NMAC 4.1, Subpart VIII, Part 268, Subpart D, revised November 1, 1995.~~ All analytical results completed in support of LDR requirements will be retained within the facility operating record. LDR determinations will be documented on LANL's Land Disposal Restrictions Notification Form (Figure A.2-2).

7.0 LIST OF REFERENCES

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Data provided in Tables A.2-1 and A.2-2 are provided for informational purposes and are subject to change as new information is obtained. The Waste Profile Form and the Land Disposal Restrictions Notification Form are also subject to change as Los Alamos National Laboratory procedures are revised and/or amended.

TABLE A.2-1
CROSS REFERENCE OF MATRIX PARAMETER CODES AND WASTE IDENTIFICATION CODES

Matrix Parameter[a] Code/ Description	Item Description Codes (IDCs)	Matrix Category (Waste Description)	TRUPACT-II Content and Radioactive Solid Waste Disposal Codes	Waste Descriptions
S3000-Homogeneous Solids	002	Stabilized aqueous waste	LA 111A/211A	Concreted/cemented aqueous waste
			A76	Cement paste
	003	Stabilized aqueous waste	LA 111B/211B	Dewatered sludge
			A75	Chemical treatment sludge
	005(P2S)	Waste salts	LA 124A	Transuranic (TRU) waste salts
			A27	Nitrated solid crystallized residues
			A28	Chloride salts
			A29	Hydroxide cake
	006	Solidified inorganic process solids	LA 114A	Solidified inorganic process solids
			A24	Cemented/immobilized residues/powders
			A26	Evaporator bottoms/salts
	006	Solidified organic process solids	LA 126A	Solidified organic process solids
			A24	Cemented/immobilized residues/powders
			A25	Leached process residues
			A26	Evaporator bottoms/salts
			A29	Hydroxide cake
			A46	Reaction process crucibles and oxide residues
S4000-Soils	None	Contaminated soil	A90	Contaminated soil
S5000-Debris Wastes	001	Mixed metal scrap and incidental	LA 125A	Incidental combustibles and mixed metal scrap

efer to footnotes at end of table.

TABLE A.2-1
CROSS REFERENCE OF MATRIX PARAMETER CODES AND WASTE IDENTIFICATION CODES
(continued)

Matrix Parameter[a] Code/ Description	Item Description Codes (IDCs)	Matrix Category (Waste Description)	TRUPACT-II Content and Radioactive Solid Waste Disposal Codes	Waste Descriptions
		combustibles	A30	Property-numbered (PN) equipment
			A31	Non-PN equipment
			A36	Noncombustible building debris
			A55	Filter media
	004	Combustible waste	LA 116A-E	Combustible waste
			A14	Combustible decontamination waste
			A15	Cellulosics (e.g., paper, wood)
			A16	Plastics
			A17	Rubber materials
			A18	Combined paper/plastics/rubber
			A19	Combined noncombustible trash
			A40	Combustible hot cell waste
			A60	Other combustibles
	005	High-efficiency particulate air (HEPA) filters	LA 119A	HEPA filters
			A55	Filter media
	005(LG)	Glass waste	LA 118A	TRU glass waste
			A47	Slag and porcelain
			A95	Glass waste
S5000-Debris Wastes (Continued)	005(LM)	Metal waste	LA 117A-G	TRU noncombustible/ metal waste
			A50	Metal crucibles, scrap, dies

[a]Refer to footnotes at end of table.

TABLE A.2-1
CROSS REFERENCE OF MATRIX PARAMETER CODES AND WASTE IDENTIFICATION CODES
(continued)

		A52	Scrap metal
		A61	Other noncombustibles
		A80	Irradiation sources
005(P1)	Leaded-rubber and metal waste	LA 123A-B	TRU leaded-rubber and TRU metal waste
		A61	Other noncombustibles
005(P2G)	Graphite waste	LA 115A	TRU graphite waste
		A10	Graphite solids

[a] Information in this column was extracted from the U.S. Department of Energy (DOE), 1995, "TRU Waste Characterization Quality Assurance Program Plan," *CAO-94-1010*, Rev. 0, Carlsbad Area Office, Carlsbad, New Mexico.

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]

:T-II ıt)N) ;	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
A	Metal equipment from decommissioning (e.g., gloveboxes, process equipment, ductwork); small volumes of combustibles from decommissioning in TA-3, TA-21, TA-39, TA-49, and TA-55, and sectioning, and packaging in TA-50-69.	A30 - Property-numbered (PN) equipment A31 - Non-PN Equipment A36 - Non-combustible building debris A55 - Filter media	Knowledge[d]	D006 D008	Cadmium Lead	1.0 5.0
A A	Effluent from plutonium (Pu) processing operations in TA-21 and TA-55, treated in TA-50-1 to produce the resulting concreted monolith	A76 - Cement paste	Knowledge	D004 D006 D007 D008 D009 None None	Arsenic Cadmium Chromium Lead Mercury Barium hydroxide Beryllium hydroxide	5.0 1.0 5.0 5.0 0.2 None None
B B	Sludge from Pu processing in TA-55 is chemically treated and mixed with dry concrete in TA-50-1	A75 - Chemical treatment sludge	Knowledge	D004 D006 D007 D008 D009 D010 D011 D019 D021 D022 F002	Arsenic Cadmium Chromium Lead Mercury Selenium Silver Carbon tetrachloride Chlorobenzene Chloroform Spent halogenated	5.0 1.0 5.0 5.0 0.2 1.0 5.0 0.5 100.0 6.0 Not

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

:T-II ıt)N) ı	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
					solvents	Applicable (NA)
				F004	Spent nonhalogenated	NA
				F005	solvents	
					Acetone	
				None	Barium chloride	None
				None	Barium hydroxide	None
				None	Beryllium	None
				None	Beryllium hydroxide	None
				None	Di-n-octyl-phthalate	None
				None	Ethanol	None
				None	Methanol	None
				None	Methylene chloride	None
				None	n-Butyl alcohol	None
				None	Nickel	None
				None	Thallium	None
				None	Toluene	None
				None	Xylene	None
				None		None
A	Combustible solids	A14 - Combustible decontamination waste	Knowledge/	D002	Hydrofluoric acid	NA
B	(e.g., paper, rags,	A15 - Cellulosics	Testing[e]	D004	Arsenic	5.0
C	plastic, rubber) and a	A16 - Plastics		D006	Cadmium	1.0
D	small fraction of non-	A17 - Rubber materials		D008	Lead	5.0
E	combustibles (e.g.,	A18 - Combined paper/plastics/rubber		D009	Mercury	0.2
	metal scrap) generated	A19 - Combined noncombustible trash		D019	Carbon tetrachloride	0.5
	from Pu processing and	A40 - Combustible hot cell waste		D022	Chloroform	6.0
	operations in TA-3, TA-	A60 - Other combustibles		D028	Dichloroethane	0.5
	21, TA-50, and TA-55			D040	Trichloroethylene	0.5
				F002	1,1,1-Trichloroethane	NA
				F003	Acetone	NA
				F005	Toluene	NA

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

:T-II ıt ıN) ɜ	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
				None None None None None None	Barium chloride Beryllium Beryllium hydroxide Bromobenzene Nickel Tributyl phosphate	None None None None None None
A	HEPA filters from exhaust air systems in Pu processing in TA-55	A55 - Filter media	Knowledge	None	None	None
A	Glass waste (e.g., discarded labware, windows, bottles) with a small fraction of combustibles (e.g., plastics) generated from Pu processing in TA-3, TA-21, TA-42, and TA-55	A47 - Slag and porcelain A95 - Glass waste	Knowledge/Testi ng	D002 D008 D009 D019 None None	Hydrofluoric acid Lead Mercury Carbon tetrachloride Barium chloride Barium hydroxide	NA 5.0 0.2 0.5 None None
A B C D E F G	Metal waste (e.g., motors, pumps, tools, process equipment) with a small fraction of combustible waste (e.g., plastics) generated from Pu processing in TA-3 and TA-55	A50 - Metal crucibles, scrap, dies A52 - Scrap metal A61 - Other noncombustibles A80 - Irradiation sources	Knowledge/ Testing	D002 D008 D019 None None	Hydrofluoric acid Lead Carbon tetrachloride Barium chloride Beryllium	NA 5.0 0.5 None None
A	Lead-lined glovebox gloves and metal waste	A61 - Other noncombustibles	Knowledge/Testi	D002 D004	Hydrofluoric acid Arsenic	NA 5.0

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

:T-II nt)N) s	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
B	(e.g., motors, tools, discarded metals) generated from Pu processing in TA-55		ng	D006 D008 D009 D019 None None None	Cadmium Lead Mercury Carbon tetrachloride Beryllium hydroxide Bromobenzene Nickel	1.0 5.0 0.2 0.5 None None None
A	Discarded graphite molds, furnace equipment, and a small fraction of combustible waste generated from Pu processing in TA-55	A10 - Graphite solids	Knowledge	D004 D006 D008 None None	Arsenic Cadmium Lead Beryllium Nickel	5.0 1.0 5.0 None None
A	Used chloride salts from pyrochemical processes (e.g., electrorefining, molten salt extraction, salt stripping, fluoride reduction, direct oxide reduction) and a small fraction of combustible waste (e.g., plastic) generated from Pu processing in TA-55	A27 - Nitrated solid crystallized residues A28 - Chloride salts A29 - Hydroxide cake	Knowledge/ Testing	D004 D006 D008 D009 None None	Arsenic Cadmium Lead Mercury Beryllium hydroxide Nickel	5.0 1.0 5.0 0.2 None None
A	Process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, salts, metal	A24 - Cemented/immobilized residues/powders A26 - Evaporator bottoms/salts	Knowledge	D002 D004 D006 D007 D008	Hydrofluoric acid Arsenic Cadmium Chromium Lead	NA 5.0 1.0 5.0 5.0

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

:T-II ıt)N) ;	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
	oxides, and fines generated as a result of Pu processing at TA-55-4			D009	Mercury	0.2
A	Solidified process residue from evaporator bottoms and other discardable solutions, processed leached solids, ash, filter cake, salts, metal oxide, fines, etc., that are immobilized in gypsum cement, generated from processing operations in TA-55.	A24 - Cemented/immobilized residues/powders A25 - Leached process residues A26 - Evaporator bottoms/salts A29 - Hydroxide cake A46 - Reaction process crucibles and oxide residues	Knowledge	D002 D004 D006 D007 D008 D009 D019 D021 D022 D028 D040 F002 None None None None None None None None None	Hydrofluoric acid Arsenic Cadmium Chromium Lead Mercury Carbon tetrachloride Chlorobenzene Chloroform Dichloroethane Trichloroethylene 1,1,1-Trichloroethane Acetone Beryllium Bromobenzene Ethanol Methanol Methylene Chloride n-Butyl Alcohol Toluene Xylene	NA 5.0 1.0 5.0 5.0 0.2 0.5 100.0 6.0 0.5 0.5 NA None None None None None None None None None
	Possibly generated by decontamination activities and/or accidental spills in TA-1, TA-3, TA-21, and	A90 - Contaminated soil	Knowledge	Unknown	Unknown	Unknown

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

TA-50

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

ı Los Alamos National Laboratory, 1994, "Draft Transuranic Waste Stream Hazardous Material Characterization Study," Rev. 0, an
'erenced in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), revised November 1, 1995) shown in
(Rev. 2.0), September 1994, which reports the EPA Hazardous Waste Numbers in LANL's waste management database.

' if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or gre
d November 1, 1995.
the basis for hazardous waste designation.
'aste classification, indicates that sampling and analysis has been performed, but either (1) the documentation is not available or (2)

TABLE A.2-3
PARAMETERS, CHARACTERIZATION METHODS, AND RATIONALE FOR TRANSURANIC MIXED WASTE

Matrix Parameter[a] Code/Description	Waste Description	Analytical Parameters[b]	Characterization Methods	Rationale
S3000—Homogeneous Solids	– Solidified aqueous waste (e.g., concreted/cemented aqueous waste) – Solidified aqueous waste (e.g., dewatered sludge and chemical treatment sludge) – Solidified inorganic/organic process solids – Waste salts	– Free liquids in waste matrix – Physical form of the waste	– Visual examination – Real-time radiography (RTR) – Acceptable knowledge[c]	– Verify physical waste form – No free liquids allowed
		– Resource Conservation and Recovery Act (RCRA)–regulated metals[d] (see Table A.2-4)	– Sample and analyze statistically selected number of drums in waste stream. (see Table A.2-4)	– Determine toxicity characteristic – Determine concentration of metals
		–Volatile organic compounds (VOC) in container headspace gas	– Gas chromatography/ mass spectrometry – Fourier transform infrared spectrometry – Gas chromatography/ Flame ionization detector	– Qualitative screening to confirm the presence of VOCs
		–VOCs and semivolatile organic compounds (SVOC) (see Table A.2-4)	– Sample and analyze statistically selected number of drums in waste stream. (see Table A.2-4)	– Determine toxicity characteristic – Determine concentration of organics
S4000—Soils	–Contaminated soil			
S5000—Debris Waste	–Mixed metal scrap and incidental combustibles –Combustible waste –Graphite waste –Metal waste –Glass waste –Leaded-rubber and metal waste –High-efficiency particulate air filters	–Free liquids –Physical form of the waste	– Visual examination – RTR – Acceptable knowledge	– Verify physical waste form – No free liquids allowed
		– RCRA-regulated metals[d] (see Table A.2-4)	– Acceptable knowledge	– Determine compliance with land disposal restriction (LDR) treatment standards, if applicable
		– VOCs in container headspace gas	– Gas chromatography/ mass spectrometry – Fourier transform infrared spectrometry	– Qualitative screening to confirm the presence of VOCs

r to footnotes at end of table.

TABLE A.2-3
PARAMETERS, CHARACTERIZATION METHODS, AND RATIONALE FOR TRANSURANIC MIXED WASTE
(continued)

			– Gas chromatography/ Flame ionization detector	
		– VOCs and SVOCs (see Table A.2-4)	– Acceptable knowledge	– Determine compliance with LDR treatment standards, if applicable

[a] Information in this column was extracted from the U.S. Department of Energy (DOE), 1995, "TRU Waste Characterization Quality Assurance Program Plan," *CAO-94-1010*, Rev. 0, Carlsbad Area Office, Carlsbad, New Mexico.

[b] U.S. Department of Energy (DOE), 1992, "RCRA Part B Permit Application for the Waste Isolation Pilot Plant," *DOE/WIPP 91-005*, Rev. 2, U.S. Department of Energy, Carlsbad, New Mexico.

[c] According to U.S. Environmental Protection Agency (EPA), 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes - A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C., acceptable knowledge is broadly defined as process knowledge, waste analysis data (e.g., sampling and analysis), and/or facility records of analysis performed.

[d] Use of the term "RCRA-regulated metals" refers to hazardous waste as defined in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261.24, revised November 1, 1995.

TABLE A.2-4
SUMMARY OF WASTE CHARACTERIZATION TECHNIQUES FOR TRANSURANIC MIXED WASTE

Parameter[a]	Method Numbers	Test Methods	Rationale
Physical Waste Form		Waste inspection procedures Real-time radiography Visual examination Process knowledge	Identify and verify waste container contents
Volatile Organic Compounds (VOC) in waste matrix and container headspace gas: Acetone n-Butyl alcohol Carbon tetrachloride Chlorobenzene Chloroform Dichloroethane Formaldehyde Methanol Methylene chloride Spent halogenated solvents Spent nonhalogenated solvents [illegible] chloroethylene Toluene 1,1,1-Trichloroethane Trichloroethylene Xylenes	ASTM Method D4547-91[b] U.S. EPA/540/4-91/001[c] SW-846 (1311, 8240B, 8260A)[d], or equivalent methods[e]	Total and/or toxicity characteristic leaching procedure (TCLP) VOC analysis by gas chromatography/ mass spectrometry (GC/MS) Fourier transform infrared spectrometry Flame ionization detector Process knowledge for debris wastes	Determine total and/or TCLP VOC concentrations in samples of homogeneous solids and soils
Semivolatile Organic Compounds (SVOC) in waste: Cresols Ortho-dichlorobenzene 1,4-Dichlorobenzene 2,4-Dinitrotoluene Hexachloroethane Nitrobenzene Pyridine	SW-846 (1311, 8250A, 8270B)[d], or equivalent methods	Total and/or TCLP SVOC analysis by GC/MS Process knowledge for debris waste	Determine total and/or TCLP SVOC concentrations in samples of homogeneous solids and soils
Metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Nickel Selenium Silver Thallium	SW-846 (3051, 1311, 6010A, 6020, 7060A, 7061A)[d] (3051, 1311, 6010A, 6020, 7080A, 7081)[d] (3051, 1311, 6010A, 6020, 7130, 7131A)[d] (3051, 1311, 6010A, 6020, 7190, 7191)[d] (3051, 1311, 6010A, 6020, 7420, 7421)[d] (1311, 7470A, 7471A)[d] (3051, 1311, 6010A, 6020, 7520)[d] (3051, 1311, 6010A, 6020, 7740, 7741A, 7742)[d] (3051, 1311, 6010A, 6020, 7760A, 7761)[d] (3051, 1311, 6010A, 6020, 7840, 7841)[d], or equivalent methods	Total and/or TCLP metals analysis Inductively coupled plasma Atomic absorption spectroscopy Cold vapor atomic absorption spectroscopy Process knowledge for	Determine total and/or TCLP metals concentrations in samples of solid process residues and soils

[illegible] r to footnotes at end of table.

TABLE A.2-4
SUMMARY OF WASTE CHARACTERIZATION TECHNIQUES FOR TRANSURANIC MIXED WASTE
(continued)

		debris wastes	

[a] Information in this column was extracted from the U.S. Department of Energy (DOE), 1992, "RCRA Part B Permit Application for the Waste Isolation Pilot Plant," *DOE/WIPP 91-005*, Rev. 2, U.S. Department of Energy, Carlsbad, New Mexico.

[b] American Society for Testing and Materials (ASTM), 1991, "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds," *ASTM D4547-91*, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials.

[c] U.S. Environmental Protection Agency (EPA), 1991, "Soil Sampling and Analysis for Volatile Organic Compounds," *EPA/540/4-91/001*, Office of Research and Development, U.S. Environmental Protection Agency.

[d] U.S. Environmental Protection Agency (EPA), 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, Third Edition, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

[e] Equivalent methods, subject to EPA approval, may be substituted.

FIGURE A.2-1

WASTE PROFILE FORM

FIGURE A.2-2

LAND DISPOSAL RESTRICTIONS NOTIFICATION FORM

WASTE ANALYSIS PLAN INCLUDING REVISED TEXT

("Clean Text" Format)

WASTE ANALYSIS PLAN

PERMIT ATTACHMENT A.2
NM0890010515-1

WASTE ANALYSIS PLAN FOR TRANSURANIC MIXED WASTE

LIST OF DEFINITIONS

Acceptable knowledge - Broadly defined to include process knowledge, waste analysis data, and/or facility records of analysis.

Existing (or currently generated) transuranic (TRU) mixed waste - TRU mixed waste streams that have been characterized using Los Alamos National Laboratory (LANL)'s Waste Profile Form (WPF) (the WPF has been used since May 1991).

Future TRU mixed waste - TRU mixed waste streams that will be characterized through the use of both LANL's WPF and a radioactive and mixed waste certification program.

Hazardous waste - The criteria for establishing a waste as a hazardous waste are provided in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart II, revised November 1, 1995. A waste is considered hazardous if it meets the definition of a solid waste described in 20 NMAC 4.1, Subpart II, Part 261.2, revised November 1, 1995; is not exempted from regulation; and exhibits one or more of the characteristics described in 20 NMAC 4.1, Subpart II, Part 261, Subpart C, revised November 1, 1995, or is listed in 20 NMAC 4.1, Subpart II, Part 261, Subpart D, revised November 1, 1995.

Heterogeneous waste - Waste that is of dissimilar or diverse composition.

Homogeneous waste - Waste that is of uniform composition.

Item Description Code - A waste identification system used at most U.S. Department of Energy (DOE) facilities that generate TRU and TRU mixed waste based on the chemical and physical form of the waste. This system was first used at LANL in July 1984.

Legacy TRU mixed waste - TRU mixed waste streams generated before the LANL WPF was implemented (i.e., prior to May 1991).

Mixed waste - Waste that has both a hazardous waste component (see definition) and a radioactive waste component.

Process knowledge - Described in 20 NMAC 4.1, Subpart V, 264.13(a)(2), revised November 1, 1995, as data developed under Subpart II and existing published or documented data on a specific hazardous waste or hazardous waste generated from similar processes.

Radioactive Solid Waste Disposal Code - A waste identification system used exclusively at LANL to categorize TRU and TRU mixed waste forms generated by various on-site facilities.

Retrievably stored waste - Waste that was generated and placed in storage in covered pads and shafts before the implementation of LANL's TRU waste certification program. Waste stored after implementation of LANL's TRU waste certification program is stored in areas that can be more easily accessed.

LIST OF DEFINITIONS
(Continued)

Solid physical form waste - Any waste stream in a solid physical form. In this document, use of the generic term "solid physical form waste" has no additional regulatory meaning.

Solid waste - Any waste stream that meets the definition of a "solid waste" as specified in 20 NMAC 4.1, Subpart II, 261.2, revised November 1, 1995.

TRU mixed waste - Waste that has both a hazardous waste component and a TRU waste component (see definition).

TRUPACT-II Content (TRUCON) Code - A waste identification system developed by DOE to provide a consistent waste description for all TRU and TRU mixed waste generated throughout all of DOE's facilities. These codes are intended to assist DOE in establishing the characteristics of TRU and TRU mixed waste to be certified for transportation to the Waste Isolation Pilot Plant.

TRU waste - Waste defined in DOE Order 5820.2A, "Radioactive Waste Management" (DOE, 1988), as follows: "Without regard to source or form, waste that is contaminated with alpha-emitting transuranic radionuclides with half-lives greater than 20 years and concentrations greater than 100 nanocuries per gram at the time of assay and has atomic numbers greater than 92. Heads of Field Elements can determine that other alpha contaminated waste, peculiar to a specific site, must be managed as TRU waste."

LIST OF REGULATORY REFERENCES AND CORRESPONDING WASTE ANALYSIS PLAN LOCATION

Regulatory Reference 20 NMAC 4.1[a], Subparts V, VIII, and IX	Description of Requirement	Location in the Waste Analysis Plan
264.13(a)(1)	Analysis information adequate to meet 20 NMAC 4.1, Subparts V and VIII, Parts 264 and 268, revised November 1, 1995, storage requirements	A.2.2 and A.2.3
264.13(a)(2)	Waste analysis data	A.2.3.2
264.13(a)(3)	Repeat analysis	A.2.3.1, A.2.5, and A.2.5.2
264.13(a)(4)	Inspection and analysis after each movement of hazardous waste received from off-site	Not applicable (NA)
264.13(b)	Written waste analysis plan	Entire plan
264.13(b)(1)	Parameters and rationale for selection	A.2.2.1 and A.2.2.2 and Table A.2-3
264.13(b)(2)	Test methods	A.2.3, A.2.3.3, A.2.3.3.1, A.2.3.3.2, A.2.3.3.3, A.2.4, and Tables A.2-3 and A.2-4
264.13(b)(3)	Representative sample collection method	A.2.3.3, A.2.3.3.3, A.2.3.3.4, and A.2.3.3.5
264.13(b)(4)	Frequency for review or repeat of initial analysis	A.2.3.1, A.2.5.1, and A.2.5.2
264.13(b)(5)	Waste analysis information to be provided to off-site facilities	A.2.3.1, A.2.3.2, and Figure A.2-1
264.13(b)(6)	Additional waste analysis requirements	A.2.6
264.13(b)(7)	Surface impoundments exempted under 20 NMAC 4.1, Subpart VIII, 268.4(a), revised November 1, 1995	NA

Refer to footnotes at end of table.

Attachment A.2
Page 4 of 58

LIST OF REGULATORY REFERENCES AND CORRESPONDING WASTE ANALYSIS PLAN LOCATION (Continued)

Regulatory Reference 20 NMAC 4.1[a], Subparts V, VIII, and IX	Description of Requirement	Location in the Waste Analysis Plan
264.13(c)	Inspection and analysis procedures for off-site facilities	NA
264.13(c)(1)	Procedures for identification of each movement of waste at off-site facilities	NA
264.13(c)(2)	Sampling method for the waste to be identified at off-site facilities	NA
264.13(c)(3)	For off-site landfills: procedures to determine whether a biodegradable sorbent has been added to containers	NA
268.7(a)	Determination of whether waste is restricted from land disposal	A.2.6.3
268.7(b)	Testing requirements for treatment facilities	NA
268.7(b)(1)	Testing of treatment residues or extract of waste with concentration-based treatment standards specified in 20 NMAC 4.1, Subpart VIII, 268.41, revised November 1, 1995	A.2.6.3
268.7(b)(2)	Testing of treatment residues pursuant to 20 NMAC 4.1, Subpart VIII, 268.32, revised November 1, 1995	NA
268.7(b)(3)	Testing of treatment residues of waste with concentration-based treatment standards specified in 20 NMAC 4.1, Subpart VIII, 268.43, revised November 1, 1995	A.2.6.3
268.7(b)(4)	Notice requirements	A.2.6.3 and Figure A.2-2
268.7(b)(5)	Certification of compliance with 20 NMAC 4.1, Subpart VIII, Part 268, revised November 1, 1995	A.2.6.3

Refer to footnotes at end of table.

Attachment A.2
Page 5 of 58

LIST OF REGULATORY REFERENCES AND CORRESPONDING WASTE ANALYSIS PLAN LOCATION (Continued)

268.7(b)(6)	Notice and certification requirements for treatment facilities that ship treatment residues to a different treatment, storage, or disposal (TSD) facility	NA
268.7(b)(7)	Notice requirement for recycling facilities using materials in a manner constituting disposal	NA
268.7(c)(1)	Recordkeeping requirements for land disposal facilities	NA
268.7(c)(2)	Testing requirements for land disposal facilities	NA
268.7(d)(1)	Notification requirements for excluded debris (i.e., pursuant to 20 NMAC 4.1, Subpart II, 261.3, revised November 1, 1995)	NA
268.7(d)(2)	Updated notification requirements for debris	NA
268.7(d)(3)	Documentation and certification requirements for debris excluded under 20 NMAC 4.1, Subpart II, 261.3(e)(1), revised November 1, 1995	NA
270.14(b)(2)	Chemical and physical analyses	A.2.2.1, A.2.3, A.2.3.1, A.2.3.2, A.2.3.3, A.2.3.3.1, A.2.3.3.2, A.2.3.3.3, Figure A.2-1, and Tables A.2-3 and A.2-4

[a] New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), revised November 1, 1995, which adopts, with a few limited exceptions, Title 40 of the Code of Federal Regulations (40 CFR), Parts 260–266, Part 268, and Part 270 (1994). 20 NMAC 4.1, Subparts V, VIII, and IX, revised November 1, 1995, contain regulations equivalent to 40 CFR Parts 264, 268, and 270, respectively.

ATTACHMENT A.2
WASTE ANALYSIS PLAN FOR TRANSURANIC MIXED WASTE

This waste analysis plan (WAP) presents information on the chemical and physical nature of transuranic (TRU) mixed waste generated and general TRU mixed waste characterization methods used at Los Alamos National Laboratory (LANL). The waste analysis information contained within this WAP is specific to storage requirements only. Waste analysis plans specific to treatment requirements will be developed and submitted as needed. Waste analysis requirements are specified in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), Subpart IX, 270.14(b)(2), revised November 1, 1995; in 20 NMAC 4.1, Subpart V, 264.13, "General Waste Analysis," revised November 1, 1995; and in 20 NMAC 4.1, Subpart VIII, 268.7, "Waste Analysis and Recordkeeping," revised November 1, 1995. The content of this WAP generally follows the guidance provided in "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes - A Guidance Manual" (U.S. Environmental Protection Agency [EPA], 1994).

Mixed waste contains both a hazardous waste component and a radioactive waste component. This WAP addresses only *TRU mixed waste*, which is defined in the List of Definitions of this WAP.

For waste characterization purposes, TRU mixed waste at LANL has been subdivided into three groups based on the timeframe for generation of the waste: *legacy, existing (or currently generated)*, and *future*. These three groups are defined in the List of Definitions.

This WAP references documents addressing TRU mixed waste characterization procedures to be utilized after the waste is stored at LANL. These procedures were developed primarily to meet off-site waste acceptance criteria. LANL's use of these procedures is designed to allow appropriate waste characterization information obtained for storage to serve as a basis for or to supplement future characterization needs without a duplication of effort. These documents are referenced for informational purposes only, as they constitute requirements established for another facility's operating permit conditions. Because these references are subject to change as new information is provided, developed, or approved, and because LANL is not subject to their requirements in LANL's operating permit for storage but rather utilizes them as waste management guidelines, this WAP will not be modified as ongoing changes to the referenced documents occur.

This TRU mixed waste WAP is organized as follows. Section A.2.1 includes a facility description, information on TRU mixed waste-generating processes and activities, identification of TRU mixed waste managed, and a description of TRU mixed waste management units. Section A.2.2 presents waste parameters, including the criteria and rationale for selection. Section A.2.3 provides TRU mixed waste characterization procedures. Section A.2.4 presents laboratory selection and analytical methods. Section A.2.5 provides waste verification requirements. Section A.2.6 addresses special procedural requirements (e.g., for ignitable, reactive, and incompatible waste and for compliance with land disposal restriction [LDR] requirements). Differences in requirements for the characterization of legacy, existing, and future TRU mixed waste are described in the applicable sections of this WAP.

A.2.1 FACILITY DESCRIPTION

LANL is located in Los Alamos County in north-central New Mexico. It is approximately 60 miles north-northeast of Albuquerque and 25 miles northwest of Santa Fe. LANL, which is divided into 49 technical areas (TA), and the associated residential and commercial areas of Los Alamos County are situated on the Pajarito Plateau. The principal missions of LANL include the research, design, development, and analysis of weapons components for the nation's nuclear arsenal; supporting research programs; energy research and environmental missions; and environmental management programs. LANL is owned by the U.S. Department of Energy (DOE) and is operated jointly by DOE and the University of California, DOE's management and operating contractor.

A.2.1.1 Facility Waste-Generating Processes, Activities, and Identification of TRU Mixed Wastes Managed

TRU mixed waste is generated at LANL primarily from research and development activities, processing and recovery operations, and decontamination and decommissioning projects. Additional information on waste-generating processes is provided in Sections A.2.1.1.1 through A.2.1.1.3.

In addition to grouping TRU mixed waste based on the time of generation (i.e., legacy, existing, and future), TRU mixed waste streams at LANL will be divided into three broad categories referred to as *matrix parameter codes*, which are used to define waste characterization groupings for the Federal Facilities Compliance Act requirements. The matrix parameter codes are based upon the physical and chemical forms of the waste. The matrix parameter codes that are applicable to LANL's TRU mixed waste are:

- Matrix Parameter Code S3000 - homogeneous solids
- Matrix Parameter Code S4000 - soil/gravel
- Matrix Parameter Code S5000 - debris wastes.

Matrix parameter code descriptions are provided in "DOE Waste Treatability Group Guidance" (DOE, 1995). Sampling and analytical procedures, discussed in Sections A.2.3 and A.2.4, are based on the physical characteristics of these broad categories.

Matrix parameter codes have been applied to TRU mixed waste streams at LANL as the most general categorization scheme to distinguish waste types at this time. Additional waste identification systems have been used for supplementary purposes as part of waste management operations for TRU mixed waste generated at LANL. Table A.2-1 cross references the matrix parameter codes with these waste identification systems. The waste identification system used for a particular waste container depends largely upon the date of placement into storage. The additional waste identification systems, listed in order of the most general system to the most specific, are as follows:

- Item Description Codes (IDC) - IDCs, first used at LANL in July 1984, generally consist of a three-digit number. These codes represent the most general descriptions of TRU and TRU mixed waste and are used at most of DOE's facilities that generate TRU and TRU mixed waste. They were developed as a waste identification system, based on the chemical and physical form

of the waste, to promote consistency throughout DOE for wastes intended for transportation to the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico. IDCs for TRU mixed waste at LANL are provided in Section A.2.1.1.1.

- TRUPACT-II Content (TRUCON) Codes - TRUCON codes, first used at LANL in October 1992, were developed by DOE to provide a consistent waste description for all TRU and TRU mixed waste generated throughout all of DOE's facilities. The TRUCON codes are intended to assist DOE in establishing the characteristics of TRU and TRU mixed waste to be certified for transportation to the WIPP. LANL TRUCON codes consist of a three-digit number preceded by the letters "LA" and followed by a letter that further defines the waste type and source. TRUCON codes for TRU mixed waste at LANL are provided in Section A.2.1.1.2.

- Radioactive Solid Waste Disposal (RSWD) Codes - RSWD codes, first used at LANL in January 1971, are two-digit codes preceded by the letter "A". These codes are used exclusively at LANL and categorize TRU and TRU mixed waste forms generated by the various on-site facilities. RSWD codes for TRU mixed waste are provided in Section A.2.1.1.3.

Tables A.2-1 and A.2-2 are organized in this hierarchical fashion, from the most general waste stream categorization scheme to the most specific waste stream identification system. As shown in Table A.2-1, the matrix parameter codes are the most general categorization scheme for TRU mixed waste. Each matrix parameter code includes specific IDCs, and each IDC in turn may include a number of TRUCON and RSWD codes. Each IDC, TRUCON code, and RSWD code in LANL's TRU mixed waste inventory is described in Sections A.2.1.1.1, A.2.1.1.2, and A.2.1.1.3, respectively. The basis for hazardous waste classification for each IDC, TRUCON code, and RSWD code is provided in Table A.2-2. Because the IDCs, TRUCON codes, and RSWD codes were not developed to provide hazardous waste characterization information, potential EPA Hazardous Waste Numbers (as referenced by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995) and potential hazardous constituents shown in Table A.2-2 have been identified through records reviews and interviews with generators for much of LANL's legacy TRU mixed waste. A conservative approach has been used to identify potential hazardous constituents for legacy and existing TRU mixed waste streams. Waste characterization, as discussed in Section A.2.3, will be used to confirm hazardous constituents present in individual waste streams. The development of detailed information for legacy TRU mixed waste is an ongoing process at LANL. The potential EPA Hazardous Waste Numbers and hazardous constituents shown in Table A.2-2 are the result of the most recent iteration of this process and may be updated upon further evaluation.

A.2.1.1.1 <u>LANL IDCs</u>

This section provides brief descriptions of the TRU mixed waste streams at LANL that have been assigned IDCs. The descriptions of the IDC wastes were developed from Attachments 1 through 4 and Attachment 6 to the "Los Alamos TRU Waste Certification Plan" (LANL, 1991). The EPA Hazardous Waste Numbers (as referenced by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995) that potentially apply to these IDC wastes are listed in Table A.2-2.

IDC 001

IDC 001 waste is comprised of several types of metal scrap and incidental combustibles. This waste is generated at various TAs throughout LANL and is size reduced at the Waste Characterization, Reduction, and Repackaging Facility (WCRRF) at TA-50-69. The waste consists mostly of metals or metal equipment, either whole or sectioned, and lesser amounts of combustible components. In addition, it contains small volumes of combustibles generated during decommissioning, sectioning, and packaging. The waste forms primarily include gloveboxes, process equipment, and ductwork from decommissioning operations. Gloveboxes may include gloves, wiring, plastic, glass windows, plastic wrapping, and lead shielding.

IDC 002

IDC 002 waste is concreted (cemented) aqueous waste, which consists of caustic sludge stabilized with Portland cement to form a noncorrosive solid monolith. The sludge is a residue from the treatment of blended acidic and caustic aqueous liquid radioactive waste with calcium hydroxide, ferric sulfate, and a flocculation aid. This treatment produces a thin sludge (approximately 25 percent solids) that is always alkaline and is compatible with Portland cement. Portland cement is commonly used to solidify caustic waste streams. Final cemented waste monoliths are produced by tumbling 55-gallon steel drums containing empirically determined quantities of sludge, Portland cement, vermiculite, and sodium silicate.

IDC 003

IDC 003 waste is stabilized aqueous waste. It consists of dewatered sludge generated by the vacuum filtration of solids from a pretreated aqueous waste slurry. These solids are first trapped on the surfaces of the filter media (diatomaceous earth). The filter medium with the entrapped filtrate is then placed in drums with dry concrete absorbent.

IDC 004

Combustible waste (e.g., paper, rags, plastic, rubber) comprises IDC 004, including plastic-based and cellulose-based waste generated at TA-55-4. Plastic-based waste includes, but may not be limited to, tape, polyethylene, and vinyl; gloves; plastic vials; polystyrene; Tygon™ tubing; polyvinyl chloride plastic; Teflon™ products; plexiglass; and dry box gloves (unleaded Neoprene base). Cellulose-based waste includes, but may not be limited to, rags, wood, paper, cardboard, laboratory coats and coveralls, booties and cotton gloves, and similar miscellaneous materials. IDC 004 waste may also contain a small fraction of noncombustible solids (e.g., scrap metals, metal lids).

IDC 005 and Subgroups

IDC 005 waste consists of the following subgroups:

IDC 005

Discarded high-efficiency particulate air (HEPA) filters are identified as IDC 005 waste. This waste is generated at TA-55-4.

IDC 005(LG)

IDC 005(LG) waste consists of glass waste and includes, but may not be limited to, discarded labware, windows, and bottles. A small fraction of combustible waste, such as plastics (mainly packaging), may also be present in this waste stream.

IDC 005(LM)

Metal waste (e.g., motors, pumps, tools, and process equipment) comprises IDC 005(LM) waste. A small fraction of combustible waste, such as plastics (mainly packaging), may also be present in this waste stream.

IDC 005(P1)

IDC 005(P1) waste is leaded rubber waste and metal waste. This waste stream also includes lead-lined glovebox gloves discarded along with metal waste, such as motors and tools.

IDC 005(P2G)

IDC 005(P2G) waste is graphite solid waste that consists of discarded graphite mold and furnace equipment generated during plutonium casting and other operations conducted in Room 327 at TA-55-4.

IDC 005(P2S)

IDC 005(P2S) waste consists of used salts from pyrochemical processes such as electrorefining, molten salt extraction, salt stripping, fluoride reduction, and direct oxide reduction. These processes occur at TA-55-4. A small fraction of combustible waste, such as plastics (mainly packaging), may also be present in this waste stream.

IDC 006

Solidified inorganic and organic process solids comprise IDC 006 waste. This waste consists of process leached solids, ash, filter cakes, salts, metal oxides, fines, or evaporator bottoms stabilized in Portland or gypsum cement, depending on the pH of the original waste stream. These waste streams are generated at TA-55-4.

A.2.1.1.2 LANL TRUCON Codes

This section provides a brief description of the TRUCON-coded TRU mixed waste streams at LANL. All existing (i.e., currently generated) TRU mixed waste at LANL is assigned a TRUCON code. The

descriptions of the TRUCON-coded wastes were extracted from "TRUPACT-II Content Codes (TRUCON)," DOE/WIPP 89-004, Rev. 8 (DOE, 1994); and "Detailed Operating Procedure for the Review and Disposition of the TRU Waste Storage Record," Attachment B (LANL, 1994). These TRUCON codes are from the most recent iteration and are periodically updated. The EPA Hazardous Waste Numbers, as referenced by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995, that potentially apply to these TRUCON-coded wastes are listed in Table A.2-2.

TRUCON Code LA 111A

TRUCON code LA 111A waste consists of concreted (cemented) aqueous waste. This waste is similar to the waste previously identified as IDC 002. The waste originates as aqueous effluent from plutonium processing at TA-55-4 that is then treated in Room 60 of the Radioactive Liquid Waste Treatment Facility (RLWTF) at TA-50-1. As described for IDC 002, the resultant sludge is mixed with Portland cement, vermiculite, and sodium silicate and then packaged as TRUCON code LA 111A.

TRUCON Code LA 211A

TRUCON code LA 211A waste consists of retrievably stored (see List of Definitions), concreted (cemented) aqueous waste. This waste originates as aqueous effluent from plutonium processing at TA-55-4 that is then treated in Room 60 of the RLWTF at TA-50-1. As described for IDC 002, the resultant sludge is mixed with Portland cement, vermiculite, and sodium silicate.

TRUCON Code LA 111B

TRUCON code LA 111B waste consists of stabilized aqueous waste (dewatered sludge) that is similar to the waste identified as IDC 003. The waste consists of solids from vacuum filtration of a pretreated aqueous waste slurry at TA-50-1. These solids, which originated in the plutonium-processing facility at TA-55-4, are trapped on the surfaces of filter media (diatomaceous earth). The filter medium with the entrapped filtrate is placed in drums with dry Portland cement as an absorbent.

TRUCON Code LA 211B

TRUCON code LA 211B waste consists of retrievably stored, stabilized aqueous waste (dewatered sludge) that is similar to the waste identified as IDC 003. The waste consists of solids from vacuum filtration of a pretreated aqueous waste slurry at TA-50-1. These solids, which originated in the plutonium-processing facility at TA-55-4, are trapped on the surfaces of filter media (diatomaceous earth). The filter medium with the entrapped filtrate is placed in drums with dry Portland cement as an absorbent.

TRUCON Code LA 114A

TRUCON code LA 114A waste consists of solidified inorganic process solids. This waste is similar to the waste previously identified as IDC 006. The waste is generated at TA-55-4 as a result of plutonium-processing operations. Solidified process solids include process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, salts, metal oxides, and fines. These process solids are immobilized in gypsum cement to form a noncorrosive solid matrix. Gypsum cement has been used to solidify acidic waste streams. The resultant waste is packaged as TRUCON code LA 114A.

TRUCON Code LA 115A

Graphite waste generated from plutonium-processing activities at TA-55-4 is packaged as TRUCON code LA 115A waste. TRUCON code LA 115A is similar to the waste identified as IDC 005(P2G). The waste consists of discarded graphite mold and furnace equipment from plutonium-casting operations. A small fraction of combustible waste, such as plastic (mainly packaging), also comprises this waste type. The graphite waste is first placed in tin or stainless steel cans and then placed in 55-gallon drums or standard waste boxes (SWB).

TRUCON Code LA 116A

TRUCON code LA 116A waste is comprised of combustible waste generated at TA-55-4. TRUCON code LA 116A is similar to the waste identified as IDC 004. The combustible solids consist primarily of paper, rags, plastic, and rubber. A small fraction of noncombustible solids, such as scrap metals, may also be contained in this waste form. The wastes are containerized in 55-gallon drums or SWBs.

TRUCON Code LA 116B

TRUCON code LA 116B waste is comprised of combustible debris waste generated at TA-55. TRUCON code LA 116B is similar to the waste identified as IDC 004. This combustible debris waste consists primarily of room trash generated during plutonium-processing activities.

TRUCON Code LA 116C

TRUCON code LA 116C waste is comprised of combustible debris waste generated at TA-55. TRUCON code LA 116C is similar to the waste identified as IDC 004. This combustible debris waste consists primarily of glovebox trash generated during plutonium-processing activities.

TRUCON Code LA 116D

TRUCON code LA 116D waste is comprised of all other combustible waste generated at TA-3 and not included in LA 116E. TRUCON code LA 116D is similar to the waste previously identified as IDC 004.

TRUCON Code LA 116E

TRUCON code LA 116E waste is comprised of combustible waste generated at TA-3. TRUCON code LA 116E is similar to the waste previously identified as IDC 004. This combustible solid waste may consist of paper, rags, plastic, and rubber.

TRUCON Code LA 117A

TRUCON code LA 117A waste is comprised of noncombustible waste generated at TA-55. TRUCON code LA 117A is similar to the waste previously identified as IDC 005(LM). This metal waste may consist of motors, pumps, tools, and process equipment and may contain some small fraction of combustible waste, such as plastics (mainly packaging). This waste is packaged in SWBs.

TRUCON Code LA 117B

TRUCON code LA 117B waste is comprised of noncombustible waste generated at TA-55. TRUCON code LA 117B consists of the metal waste described in TRUCON code LA 117A. The difference between this waste and LA 117A is that LA 117B is packaged in a maximum of four layers of plastic bagging contained within 55-gallon drums.

TRUCON Code LA 117C

TRUCON code LA 117C waste is comprised of metal waste as described in TRUCON code LA 117A. This waste stream is generated at TA-3.

TRUCON Code LA 117D

TRUCON code LA 117D waste is comprised of metal waste as described in TRUCON code LA 117A. This waste stream is generated at TA-55. The waste may also contain glass in the form of discarded laboratory glassware, windows, and bottles, with a small fraction of combustibles (e.g., plastics mainly from packaging). The waste is packaged in a maximum of four layers of plastic bagging contained within 55-gallon drums.

TRUCON Code LA 117E

TRUCON code LA 117E waste is comprised of metal waste from plutonium-processing activities at TA-55. TRUCON code LA 117E is similar to IDC 005(LM). This waste may consist of motors, pumps, tools, and process equipment and may contain some small fraction of combustible waste, such as plastic (mainly from packaging). The waste is packaged in a maximum of four layers of plastic bagging contained within 55-gallon drums.

TRUCON Code LA 117F

TRUCON code LA 117F waste is comprised of noncombustible waste and is similar to IDC 005(LM). This waste is generated from plutonium-processing activities at TA-3.

TRUCON Code LA 117G

TRUCON code LA 117G waste is comprised of all other noncombustible waste generated at TA-3. TRUCON code LA 117G is similar to IDC 005(LM).

TRUCON Code LA 118A

TRUCON code LA 118A waste consists of TRU glass waste generated from plutonium-processing activities at TA-55-4. TRUCON code LA 118A is similar to the waste identified as IDC 005(LG). This glass waste consists of discarded laboratory glassware, windows, and bottles. A small fraction of combustible waste, such as plastic (mainly packaging), may also comprise this waste type. The waste is packaged in tin or stainless steel cans and contained in 55-gallon drums or SWBs.

TRUCON Code LA 119A

TRUCON code LA 119A waste consists of discarded HEPA filters from TA-55-4. TRUCON code LA 119A is similar to the waste identified as IDC 005.

TRUCON Code LA 123A

Leaded rubber and metal waste generated at TA-55-4 is packaged as TRUCON code LA 123A waste, which is similar to the waste identified as IDC 005(P1). This waste type consists of lead-lined glovebox gloves discarded along with metal waste, such as discarded metals, motors, and tools. The waste is placed in 55-gallon drums or SWBs.

TRUCON Code LA 123B

TRUCON code LA 123B waste consists only of leaded gloves from TA-55-4. The waste is similar to the waste identified previously as IDC 005(P1).

TRUCON Code LA 124A

TRUCON code LA 124A waste consists of TRU waste salts generated from plutonium-processing activities at TA-55-4. TRUCON code LA 124A is similar to the waste identified as IDC 005(P2S). The salt waste consists of used salts from pyrochemical processes, such as electrorefining, molten salt extraction, salt stripping, fluoride reduction, and direct oxide reduction. A small fraction of combustible waste, such as plastics (mainly packaging), may also be contained in this waste.

TRUCON Code LA 125A

TRUCON code LA 125A waste contains metal equipment, either whole or sectioned, along with its combustible components. This waste also consists of a small volume of combustibles generated during decommissioning, sectioning, and packaging. TRUCON code LA 125A is similar to IDC 001 and is generated at TA-50.

TRUCON Code LA 126A

TRUCON code LA 126A waste consists of solidified organic process solids. This waste is similar to the waste previously identified as IDC 006. The waste is generated at TA-55-4 as a result of plutonium-processing operations. Solidified process solids include process residue from evaporator bottoms and other discardable solutions, process leached solids, ash, filter cakes, salts, metal oxides, and fines. These process solids are immobilized in gypsum cement to form a noncorrosive solid matrix. The resultant waste is packaged as TRUCON code LA 126A.

A.2.1.1.3 LANL RSWD Codes

This section provides a brief description of the RSWD-coded waste at LANL and the processes that generated the waste. The descriptions of the RSWD-coded waste were extracted primarily from the DOE/LANL "Response to the Notice of Deficiency Issued by the New Mexico Environment Department for the Part B Permit Application for Technical Area 54, Area G Storage Pads and Domes" (DOE, 1994). Additional information was obtained through queries of LANL's Chemical Science and Technology (CST) Division waste management database. The EPA Hazardous Waste Numbers (as referenced by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995) that potentially apply to these RSWD codes are listed in Table A.2-2.

LANL RSWD Code A10

RSWD code A10 waste consists of graphite solids generated from plutonium-processing operations, specifically, casting conducted in Room 327 at TA-55-4.

LANL RSWD Code A14

RSWD code A14 waste consists of combustible material generated during decontamination activities at TA-3, TA-21, TA-50, and TA-55. Decontamination waste may include cellulosics, plastic, or cloth generated during plutonium processing.

LANL RSWD Code A15

RSWD code A15 waste consists mainly of combustible solids collected from plutonium-processing operations and related activities at TA-3, TA-21, TA-50, and TA-55-4. Waste at TA-55-4 is collected in the waste management room (Room 432) for packaging, documentation, and radionuclide assay. The waste includes cellulosics, such as wood scraps, paper, and rags.

LANL RSWD Code A16

RSWD code A16 waste consists of plastic (mainly packaging) generated at TA-3, TA-21, TA-50, and TA-55. This waste is generated from plutonium-processing and related activities.

LANL RSWD Code A17

RSWD code A17 waste consists of rubber materials generated during plutonium-processing and related activities. This waste is generated at TA-3, TA-21, TA-50, and TA-55.

LANL RSWD Code A18

Nonsegregated paper, plastic, and rubber comprises RSWD code A18 waste. This waste is generated at TA-3, TA-21, TA-50, and TA-55 during plutonium-processing and related activities.

LANL RSWD Code A19

RSWD code A19 waste consists of a combination of noncombustible material, such as scrap metal, and trash generated at TA-3, TA-21, TA-50, and TA-55. Plutonium-processing and related activities generate this waste.

LANL RSWD Code A24

RSWD code A24 waste is comprised of cemented/immobilized residues and/or powders. This waste stream is generated at TA-55-4 and may consist of process leached solids, ash, filter cake, metal oxides, and fines from plutonium-processing operations. The waste has been immobilized in gypsum cement.

LANL RSWD Code A25

Plutonium operations generate numerous waste items that may require plutonium recovery, such as filter media, plastics, used equipment, personal protective equipment, and paper products that are removed from process gloveboxes or radiation control areas. These items are processed by various methods, such as acid leaching, to recover the residual plutonium. In this plutonium-recovery process, waste streams consisting of leached materials, such as solution residues, solids, ash, filter cake residues, salts, and metal oxides, were generated at TA-21 and TA-50 and are currently generated at TA-55. This waste constitutes the A25 waste stream. The residual material is mixed with gypsum cement in steel drums. Some batches of gypsum-cemented waste have been found to release a minimal amount of free liquid as a result of dewatering after the cement has set. There is some likelihood of hydrogen gas generation from the radiolysis of water contained within the cement matrix.

LANL RSWD Code A26

After the items containing recoverable levels of plutonium have been processed (as described for LANL RSWD Code A25) and the waste materials that no longer contain recoverable amounts of plutonium have been segregated (RSWD code A25 waste), the remaining leachate that still contains recoverable levels of plutonium is processed in ion-exchange units. The ion-exchange units segregate the plutonium and generate a stripped leachate. This stripped leachate is then collected, along with plutonium-oxalate solutions and process waters, and distilled in an evaporator. The evaporator distillate is then sent to TA-50 for further treatment. The A26 waste stream consists of the evaporator bottom solutions that result from the evaporation process. This waste stream is generated at TA-55 and is stabilized in a cement matrix at TA-55-4, Room 401.

LANL RSWD Code A27

This waste stream consists of any solid crystallized residues from the evaporator process solution described above for RSWD code A26. The residues may include iron-, aluminum-, calcium-, magnesium-, ammonium-, potassium-, and sodium-nitrate salts. Some particles have been immobilized by cementation to meet minimum particulate size criteria for storage. Most salts were placed in containers without immobilization.

LANL RSWD Code A28

RSWD code A28 waste consists of discarded chloride salts used in pyrochemical operations, such as electrorefining, molten salt extraction, salt stripping, and oxide reduction associated with plutonium-recovery operations at TA-55. In molten form, the chlorides are used as a solvent in the preparation and purification of plutonium metal. Prior to 1987, the discarded salts contained calcium metal. No liquids or hydrocarbons are present in this waste stream.

LANL RSWD Code A29

RSWD code A29 waste is a hydroxide cake generated from waste salt. This waste is generated at TA-55 during plutonium-processing operations.

LANL RSWD Code A30

RSWD Code A30 waste consists of large, discarded, property-numbered (PN) equipment, such as gloveboxes and ancillary equipment (e.g., support structures, feed lines, ventilation equipment) from TA-3, TA-21, TA-39, TA-49, TA-50, and TA-55. These large metallic items from decontamination and decommissioning operations are size reduced at the WCRRF at TA-50-69 by cutting with a plasma arc torch. Many of the gloveboxes included in this waste stream are lined with sheets of lead. This waste may contain very small quantities of contained liquids in piping and possibly precipitation that entered containment crates prior to placement in their present storage configuration.

LANL RSWD Code A31

RSWD Code A31 waste consists of smaller discarded parts and non-PN equipment associated with the generation of RSWD code A30, such as faucets, piping, wiring, plastic wrapping, and plastic or glass windows. No liquids or hydrocarbons are associated with this waste stream.

LANL RSWD Code A36

The RSWD code A36 waste consists of noncombustible building debris. The building debris was generated during decommissioning activities at TA-3, TA-21, TA-39, TA-49, TA-50-69, and TA-55.

LANL RSWD Code A40

RSWD code A40 waste consists of combustible hot cell waste generated during plutonium-processing and related activities. This waste is generated at TA-3, TA-21, TA-50, and TA-55.

LANL RSWD Code A46

RSWD code A46 waste consists of reaction process crucibles and oxide residues immobilized in gypsum cement. This waste is generated at TA-55.

LANL RSWD Code A47

Slag and porcelain waste generated at TA-3 and TA-55 comprise RSWD code A47 waste. This waste is generated as a result of plutonium-processing activities.

LANL RSWD Code A50

RSWD code A50 waste consists of metal crucibles, scrap, and dies. This waste is generated during plutonium-processing activities at TA-3 and TA-55.

LANL RSWD Code A52

RSWD code A52 waste consists of metal waste from TA-55-4. The metal waste is comprised of motors, pumps, tools, and process equipment.

LANL RSWD Code A55

Discarded HEPA filters comprise RSWD code A55 waste. This waste is generated at TA-55-4.

LANL RSWD Code A60

RSWD code A60 waste consists of other combustibles generated at TA-3, TA-21, TA-50, and TA-55. This waste is generated as a result of plutonium-processing and related activities.

LANL RSWD Code A61

RSWD code A61 waste consists of miscellaneous noncombustible trash associated with plutonium-processing operations, such as ceramics, scrap metal, and glass. The scrap metal includes discarded motors, pumps, tools, and process equipment and materials from fabricated items disassembled for evaluation. Rubber gloves containing lead oxide may be included in this waste stream.

LANL RSWD Code A75

Most of the waste included in RSWD code A75 was generated before 1982 at TA-50-1 and TA-55-4. This waste stream consists of the distillate from the evaporator process discussed for RSWD code A26 and depleted plutonium solutions from caustic-recovery processes at TA-55-4. This wastewater was collected and chemically treated at TA-50-1 with lime and ferric sulfate to encapsulate the nuclear material in an iron hydroxide matrix. It was then dewatered by vacuum filtration. Cement was added to the top of the resulting sludge to capture any liquid that separated from the sludge. This waste stream was significantly reduced in 1982 by redirecting TA-50-1 influent with high TRU content into a pretreatment unit in Room 60 (see description below for RSWD code A76). However, even though this influent is now redirected into the pretreatment unit, the supernatant resulting from the current pretreatment operations enters the main plant treatment operations in Room 116; thus, A75 waste continues to be generated.

LANL RSWD Code A76

RSWD Code A76 waste consists of cement paste created by stabilizing pretreatment sludge generated at TA-50-1, Room 60. This sludge results from pretreatment of TA-55 influent before it enters the main

treatment plant operations in TA-50-1, Room 116. The pretreatment sludge was generated after 1982 and stabilized with Portland cement. Halogenated organic solvents used in TA-55 processes may have been introduced to the influent generating this sludge. There is currently no evidence that this waste stream contains free liquids and no materials exist in this waste stream that would cause generation of hydrogen gas.

LANL RSWD Code A80

RSWD code A80 waste consists of irradiation sources plated on planchets. This waste is generated at TA-3 and TA-55.

LANL RSWD Code A90

RSWD code A90 waste consists of radioactively-contaminated soil generated during decontamination activities and/or accidental spills at TA-1, TA-3, TA-21, and TA-50.

LANL RSWD Code A95

RSWD code A95 waste consists of glass waste generated from plutonium-processing and related activities at TA-3, TA-21, TA-42, and TA-55. This waste stream may contain discarded labware, windows, and/or bottles and contains a small fraction of combustibles such as plastic.

A.2.1.2 Description of TRU Mixed Waste Management Units

The permitted TRU mixed waste storage units at LANL that are addressed in this WAP include:

- TA-54-226 and Storage Pads 2 and 4 at TA-54, Area G.
- TA-54-229, TA-54-230, TA-54-231, and TA-54-232 at TA-54, Area G.

Information on the units at TA-54, Area G, is available in LANL's "RCRA Part B Permit Application: Technical Area 54, Area G, Pads 1, 2, and 4; Storage Domes A-D; Chemical Plating Waste Treatment Skid and Treated Liquid Storage Tanks, Technical Area 63, Hazardous Waste Treatment Facility" (LANL, 1993), submitted to the New Mexico Environment Department in September 1993.

TRU mixed waste storage units operating under 20 NMAC 4.1, Subpart VI, Section 265facility standards and addressed in this WAP include:

- Storage Domes 48, 153, 224, and 283 at TA-54, Area G
- The Drum Prep Facility and Storage Shed 8 at TA-54, Area G
- Container storage areas (CSA) in Rooms 9010, 9020, and 9030 of Wing 9 at TA-3-29
- Storage units at TA-50-1 (Room 59) and TA-50-37 (Rooms 115, 117, and 118)
- CSAs at TA-50-69 and TA-50-114

- Storage units at TA-55, Building 4

Information on these units is available in LANL's "RCRA Part A Permit Application for Mixed Waste" (LANL, January 25, 1991).

TRU mixed waste storage units pending a permit and addressed in this WAP include:

- CSAs at the Radioassay and Nondestructive Testing Facility at TA-54 West.
- Storage units at TA-55, Buildings 4 and 185.
- Storage units at TA-50-1, Rooms 35, 36, and 38/38A.

Information on these units is available in LANL's "RCRA Part A Permit Application for Mixed Waste, Revision 2.0" (LANL, 1994) and "Proposed Hazardous Waste Facility Permit Modification, Technical Area 50, Building 1; Rooms 35, 36, and 38/38A Container Storage Areas, Building 69; Indoor and Outdoor Container Storage Areas, Technical Area 54 West, Building 38; High Bay, Low Bay, Loading Dock, and Outdoor Container Storage Areas, December 22, 1995.""

A.2.2 WASTE ANALYSIS PARAMETERS

A detailed chemical and physical characterization will be performed for TRU mixed waste management purposes, as required by 20 NMAC 4.1, revised November 1, 1995. Waste analysis parameters will be selected to ensure that this characterization will contain all the information necessary to properly treat, store, or dispose of waste in accordance with general facility standards and LDR requirements.

A.2.2.1 Proposed Analytical Parameters and Characterization Methods

Proposed analytical parameters and characterization methods for TRU mixed waste at LANL are summarized in Table A.2-3. Some or all of these parameters will be used to determine the regulatory status of LANL TRU mixed waste and are as follows:

- Physical waste form characterization through real-time radiography (RTR) and visual examination to verify the absence of free liquids

- Headspace gas sampling to determine the presence of volatile organic compounds (VOC) in container headspace

- Hazardous constituent sampling to determine the presence and concentrations of:

  - RCRA-regulated metals
  - RCRA-regulated VOCs
  - RCRA-regulated semivolatile organic compounds (SVOC)[1]

[1]Use of the terms, "RCRA-regulated metals," "RCRA-regulated VOCs," "RCRA-regulated SVOCs," "RCRA F-listed and/or K-listed waste," "RCRA P-listed and U-listed waste," "RCRA-regulated hazardous constituents," and

A.2.2.2 Criteria and Rationale for Parameter Selection

Waste analysis parameters selected to characterize TRU mixed waste are in conformance with 20 NMAC 4.1, revised November 1, 1995, and incorporate characterization procedures from the WIPP "TRU Waste Characterization Quality Assurance Program Plan" (QAPP) (DOE, 1994) requirements, which are based on knowledge of raw materials and physical/chemical processes of waste-generating activities and may be supported by analytical results. The analytical parameters selected to confirm knowledge-based waste characterization, as well as the rationale for the selected parameters, are identified in Table A.2-3.

A.2.3 CHARACTERIZATION OF TRU MIXED WASTE

The characterization of TRU mixed waste managed at LANL can be divided into general approaches based on when the waste was generated and the differences involved in sampling the waste. Generally, the distinction is made between legacy, existing, and future TRU mixed waste to define the quality of information available on the waste and the subsequent need for additional sampling and analysis. A secondary distinction between heterogeneous and homogeneous waste, as reflected in the matrix parameter codes, is made to determine the availability or appropriateness of sampling procedures.

As provided in the List of Definitions, *legacy* TRU mixed waste is waste generated before the LANL Waste Profile Form (WPF) was implemented in May 1991 (see Section A.2.3.1). Legacy TRU mixed waste has been characterized with qualitative assessments to evaluate the presence or absence of hazardous constituents. These assessments include examining past records and databases, conducting interviews with waste generators, and observing and evaluating similar waste-generating processes. *Existing (or currently generated)* TRU mixed waste (i.e., waste generated since May 1991) is characterized using LANL's WPF. *Future* TRU mixed waste will be characterized using both LANL's WPF and a certification program (see Section A.2.3.2).

The TRU mixed waste types described include homogeneous solids, soils/gravel, and debris wastes. As discussed in Section A.2.1.1, these types are categorized by *matrix parameter codes* based on the physical and chemical form of the waste. Waste streams in the homogeneous solids (Matrix Parameter Code S3000) or soils/gravel (Matrix Parameter Code S4000) categories may contain RCRA-regulated VOCs, SVOCs, and metals[2] (see Table A.2-4). These homogeneous waste streams will be sampled and analyzed for the toxicity characteristic (TC) contaminants listed in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995. Analysis for total concentration of TC contaminants may be performed on samples in a screening step. If total concentrations are used in the waste characterization process, analytical data will be compared to the TC regulatory levels expressed as total values. These total values will be considered the regulatory threshold limit (RTL) values for the determination of whether a particular waste exhibits a TC. RTL values are obtained by calculating the weight/weight concentration (in the solid)

"RCRA characteristic" refers to hazardous wastes or hazardous constituents as defined in 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995.

[2]Refer to Footnote 1.

of a TC contaminant that would give the regulatory weight/volume concentration in the toxicity characteristic leaching procedure extract.

Debris waste streams (Matrix Parameter Code S5000) consist of heterogeneous materials. As such, it is difficult to obtain representative samples, and the waste type is best characterized through examination of the original materials from which the waste was generated. Therefore, debris waste may be characterized for the presence of hazardous constituents (i.e., VOCs, SVOCs, and metals) using acceptable knowledge. Additionally, headspace gas sampling, RTR, or visual examination will be conducted on a statistically selected population of waste streams to substantiate this characterization.

The matrix parameter codes (see Table A.2-1) will be used as preliminary guidance for establishing sampling and analytical procedures. Specific sampling and analytical requirements will then be determined for each waste stream. Initial predictions of hazardous constituents present in each waste stream will be based on process knowledge, with waste sampling and analysis performed as necessary to obtain qualitative and quantitative data for hazardous constituents (i.e., VOCs, SVOCs, and metals). Table A.2-3 summarizes characterization methods by matrix parameter code. Sampling and analytical methods for specific hazardous constituents are presented in Table A.2-4. The following discussion presents the approach to characterization that will be used for each of these waste groups, integrating the time of generation and the physical form of the waste.

Characterization of legacy TRU mixed waste is primarily based on process knowledge, which is suitable for safe storage of these waste streams. Further characterization of homogeneous legacy waste may be accomplished through statistically based sampling and analysis, headspace gas sampling, RTR, and visual examination. Heterogeneous legacy waste will be characterized using process knowledge, headspace gas sampling, RTR, and visual examination. These approaches for homogeneous and heterogeneous legacy waste are discussed in Section A.2.3.3.

Existing TRU mixed waste is currently characterized using process knowledge, which is provided by individual waste generators on LANL's WPF. (For a detailed description of the WPF, refer to Section A.2.3.1 and to LANL's Administrative Requirement 10-9, "Waste Profile Form.") Additional characterization of existing TRU mixed waste will occur after the construction of planned facilities and implementation of sampling and analytical capabilities at LANL. For this additional characterization of homogeneous existing waste, LANL will use statistically based sampling and analysis, headspace gas analysis, RTR, and visual examination. Heterogeneous existing waste will be characterized using process knowledge, headspace gas sampling, RTR, and visual examination.

Future homogeneous TRU mixed waste will be characterized through the use of LANL's WPF and the acceptable knowledge certification program described in Section A.2.5.2 of this WAP.. Sampling and analysis will be conducted for characterization only when required to fully document and/or verify the waste stream. Documented and auditable acceptable knowledge will be used to determine whether or not the waste stream is hazardous, as defined by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995. If available information regarding acceptable knowledge is insufficient for waste characterization, additional information will be obtained using the sampling procedures identified in Section A.2.3.3.

Heterogeneous waste will be characterized using acceptable knowledge, which may be supported by some waste analysis data.

For future TRU mixed waste, knowledge of the waste-generating process will be strictly controlled by a quality assurance (QA)/quality control (QC) program that addresses management of specific waste streams. This approach will provide a rigid definition for the acceptable knowledge applicable to specific waste streams. For example, the QA/QC program may include procedures for controlling chemical inputs to the waste-generating process as well as procedures for confirming the types of waste placed in different waste containers. These measures will provide knowledge of the types and concentrations of chemical constituents in individual waste streams.

A.2.3.1 Waste Profiling System

In an effort to maintain detailed and accurate waste characterization information, LANL's CST Division utilizes a generator waste-profiling program for existing (i.e., currently generated) waste at LANL. The waste-profiling effort requires each waste generator to provide a detailed written description of the waste on a standardized WPF, Form 1346 (Figure A.2-1). The waste description can be based on generator process knowledge, the use of appropriate Material Safety Data Sheets (MSDS), results of a chemical/physical analysis of the specific waste, and/or any additional information for acceptable knowledge. By completing the WPF, waste generators supply information that allows for the proper management of TRU mixed waste. Specific information that is requested on the WPF includes:

- Point of generation
- Method of characterization
- Waste categories
- Waste description
- Waste origination
- Classification of radioactivity
- Presence of toxic metals and an estimate of concentration
- Presence of organic compounds and an estimate of concentration
- Identification of hazardous constituents
- Identification of hazardous characteristics
- Identification of the radiological characteristics of the waste.

A correctly completed WPF contains sufficient information to allow CST to classify the waste type, class, category, source, matrix, and matrix type (Figure A.2-1). Ultimately, the waste profile is used by CST Division to determine the proper procedures for managing the waste.

All waste generators must certify, based on their knowledge of the waste, that the information on the WPF is complete and accurate. Knowingly providing false information can result in administrative action by LANL and/or be subject to potential significant civil or criminal penalties, as stipulated by the waste generator's certification statement.

The WPF must be completed prior to any waste treatment, storage, or disposal. Waste generators must provide new profiles when a process change results in a change in waste composition or when a new waste is generated; otherwise, waste stream profiles are reevaluated annually. This annual reevaluation complies with the characterization frequency requirement of 20 NMAC 4.1, Subpart V, 264.13(b)(4), revised November 1, 1995.

A.2.3.2 Acceptable Knowledge

Acceptable knowledge is used to characterize TRU mixed waste forms at LANL. The physical nature of some TRU mixed waste forms (e.g., debris) makes the collection of representative samples difficult. This difficulty arises from several factors, some of which include: waste streams that contain disparate elements; disparate elements may need to be segregated into similar forms; large objects cannot be made to fill standard size sample containers; and laboratories may not have the capability to sample large objects (EPA, 1992). Health and safety risks to personnel from exposure to radioactive material also preclude extensive sampling and analysis of certain TRU mixed waste forms. For generation of future TRU mixed waste, LANL will implement a radioactive and mixed waste certification program to support acceptable knowledge used for waste characterization.

According to EPA guidance, *acceptable knowledge* is broadly defined to include process knowledge, waste analysis data, and/or facility records of analysis (EPA, 1994). *Process knowledge* is described in 20 NMAC 4.1, Subpart V, 264.13(a)(2), revised November 1, 1995, as data developed under 20 NMAC 4.1, Subpart II, revised November 1, 1995, and existing published or documented data on a specific hazardous waste or hazardous waste generated from similar processes. *Waste analysis data* include concentration(s) of regulated hazardous constituents and/or results of tests for hazardous characteristics. These data are used to determine if wastes are regulated and to determine their LDR status. *Facility records of analysis* performed before the effective date of hazardous waste regulations will be used with caution. These analytical results must be accurate and applicable to the specified waste and should be supplemented with other existing information (e.g., published data). EPA guidance suggests that acceptable knowledge may be appropriate for wastes meeting the following descriptions:

- Wastes containing hazardous constituents from specific processes that are well documented, such as RCRA F-listed and/or K-listed waste[3] code descriptions.

- Wastes consisting of discarded unused commercial chemical products, reagents, or chemicals containing known physical and chemical constituents. Several of these fall into the RCRA P-listed and U-listed waste[4] code descriptions.

[3]Refer to Footnote 1.

[4]Refer to Footnote 1.

- Waste (e.g., radioactive mixed waste) containing levels of radioactivity such that health and safety risks to personnel do not justify sampling and analysis due to quantified and documented radiological concerns.

- Wastes containing heterogeneous materials, where the physical nature of the waste does not lend itself to taking a representative sample (e.g., laboratory trash and construction debris with surface contamination) (EPA, 1994).

At LANL, waste generators will obtain, assemble, and prepare the acceptable knowledge documentation available for each waste stream in a separate auditable file or maintain a waste stream reference file that identifies the acceptable knowledge documents and their locations. The acceptable knowledge documentation must be explicitly relevant and traceable to a waste type and must not be merely a list of information sources for a particular operation and/or waste. There are many sources of applicable documentation at LANL that may be used to substantiate acceptable knowledge for a specific waste stream. This documentation includes the following:

- Process design documents (e.g., Title II Design).

- Final safety analysis reports (SAR), unreviewed safety question determinations (USQD), and technical safety requirements (TSR).

- Standard operating procedures and detailed operating procedures that list the raw materials or reagents, describe the process/experiment that uses the materials, and describe how the waste streams are generated and handled.

- Waste packaging logs completed when controlled wastes are placed in containers (e.g., trash can packaging for controlled wastes).

- Test plans or research project reports that describe the reagents and other raw materials used in an experiment.

- Laboratory notebooks, process logs, and run sheets that detail the research processes and raw materials used in an experiment.

- Site databases (e.g., chemical inventory database for Superfund Amendments and Reauthorization Act Title III requirements).

- Documented site personnel interview information.

- Standard industry practice documents (e.g., vendor information).

- Previous analytical data relevant to the waste stream, such as fingerprint analysis, spot-check procedures, or routine waste verification sampling and analysis data.

- Available studies that contain analytical data can be used to identify the constituents of a specific "similar" process waste stream and to determine the regulatory status of the waste stream for common industrial or LANL processes. Such reports on a similar process should have a clear and documented connection to the waste stream being characterized.

- MSDSs, product labels, and other product package information.

- Documented visual inspections that can be used to identify or confirm the physical characteristics and packaging of a waste.

Sampling surrogate wastes (e.g., equivalent nonradioactive or low-level radioactive materials) may also be a means of obtaining acceptable knowledge for characterizing TRU mixed wastes. For example, data from the analysis of nonradioactive leaded-glove waste may be used to evaluate the characteristics of similar radioactive leaded-glove waste. In some cases, a low-level mixed waste stream may be chemically equivalent to a TRU mixed waste stream. Because data for a low-level mixed waste stream may be more readily attainable, it may be useful for characterizing the TRU mixed waste stream. Sampling nonradioactive inputs or outputs from processes may also provide data that are useful for characterizing a similar TRU mixed waste stream.

Acceptable knowledge confirmed with RTR and visual examination is a reasonable approach to characterizing debris waste. Obtaining a representative sample of debris waste (Matrix Parameter Code 5000), as required by 20 NMAC 4.1, Subpart V, 264.13(b)(3), revised November 1, 1995, is difficult, because many types of waste may be present in a single waste stream or even in a single waste container. For legacy and existing heterogeneous waste, the type of waste segregation that would enable the development of a sampling strategy to obtain representative samples has not always occurred. Problems also arise in collecting representative samples from irregularly shaped and indurated waste items. Debris wastes are expected to exhibit highly variable concentrations of hazardous constituents, even for segregated materials. This may potentially diminish the reliability of sampling and analytical data.

The acceptable knowledge approach to characterizing TRU mixed debris waste is supported by EPA guidance for the situations described in the previous paragraph (EPA, 1994). A conservative approach is used to determine if a waste is regulated hazardous waste. Process inputs (e.g., chemicals) are identified, and if the waste stream generated may contain hazardous constituents derived from process inputs, the waste is managed as a regulated hazardous/mixed waste. This type of process knowledge will be used to characterize TRU mixed debris waste. For example, metals present in debris waste are often associated with specific materials (e.g., lead in leaded-gloves, or lead shielding). Knowledge of the materials and operations that generated specific waste streams in the debris category is used to determine if these types of items are present in the waste and if the waste stream contains RCRA-regulated metals[5].

[5]Refer to Footnote 1.

A.2.3.3 Sampling and Analysis for TRU Mixed Waste

This section discusses proposed sampling procedures and frequency of sampling applicable to TRU mixed wastes. The approach described for characterizing TRU mixed waste streams is based on radiological, physical/chemical, and hazardous properties of the waste. The sampling and analysis strategies presented here will be used to evaluate whether TRU mixed waste exhibits the characteristic of toxicity, as described in 20 NMAC 4.1, Subpart II, 261.24, revised November 1, 1995. The proposed methods do not apply directly to determinations of whether a waste exhibits other characteristics (i.e., ignitability, corrosivity, or reactivity) or is listed in 20 NMAC 4.1, Subpart II, Part 261, Subpart D, revised November 1, 1995. Determinations of whether a TRU mixed waste exhibits these characteristics or is listed will be made by applying acceptable knowledge, as described in Section A.2.3.2. Techniques typically used to obtain the physical and chemical data necessary for TRU mixed waste characterization include the following: RTR, visual examination, headspace gas sampling and analysis, and homogeneous solid waste sampling and analysis (e.g., for VOCs, SVOCs, and metals). For the purpose of TRU mixed waste characterization, LANL utilizes RTR, visual examination, and headspace gas sampling as confirmational sampling and analysis procedures for process knowledge. These procedures, coupled with documented, auditable process knowledge, will result in accurate, defensible waste characterization of TRU mixed waste. Specific waste sampling methods, equipment, and sample-handling procedures are described below.

To confirm whether existing TRU mixed waste is hazardous (as defined by 20 NMAC 4.1, Subpart II, Part 261, revised November 1, 1995), available process knowledge will first be used to segregate the waste containers into waste streams and to assign each waste stream to a matrix parameter code. Once the waste streams have been defined and assigned to the matrix parameter codes, this information will be verified by a multistep process (Section A.2.5). RTR will be used for TRU mixed waste to confirm the matrix parameter code and to verify compliance with the waste form requirements of the "Waste Acceptance Criteria for the Waste Isolation Pilot Plant" (DOE, 1991). A statistically selected number of containers (as described in Section A.2.3.3.2) will be visually examined to confirm RTR results. Drums retrieved from Storage Pads 1, 2, and 4 will be selected on a statistical basis (as described in Section A.2.3.3.5) for headspace gas sampling during drum-venting operations.

A.2.3.3.1 Real-Time Radiography

RTR is a nondestructive, qualitative, and semiquantitative assay technique that involves x-ray scanning of waste containers to identify and verify, using appropriate equipment and qualified operators, the physical form(s) of waste container contents. RTR will be used to verify the absence of free liquids and that the physical form requirements of the WIPP waste acceptance criteria (DOE, 1991) are met. At the same time, RTR will verify the waste classification (i.e., matrix parameter code) and waste form determined using acceptable knowledge. All TRU mixed waste containers will be analyzed by RTR, and the results for each waste container will be documented. The audio/video tapes produced during the waste container scan will be maintained for a minimum of three years. In addition, an RTR data form will be used to document the waste matrix parameter code.

A radiography system routinely consists of an X-ray producing device, an imaging system, an enclosure for radiation protection, a waste container handling system, an audio/video recording system, and an operator control and data acquisition station. Operating parameters such as the intensity of the X-ray can be varied for optimum viewing of the interior of the waste container. The imaging system typically utilizes an image intensifier, television camera, and remotely located television screen. Instrument configurations will vary depending on manufacturer and site usage.

During operation of the system, the waste container is scanned while the operator views and permanently records the image from the television screen on audio/videotape. The radiography data form is also used to document the matrix parameter category and other information about the containerized waste as required by the WIPP QAPP (DOE, 1994).

The radiography image produced is examined for evidence of liquid materials by jogging the container or repetitively moving the container handling system and searching for evidence of wave motion in addition to observing the container contents for suspect waste items. The container contents are also observed for items that confirm the waste classification of the container. Conditions that may limit or interfere with this determination are noted.

Operator training and experience are important considerations for assuring the quality of the radiography data. Only properly trained personnel are allowed to operate radiography equipment. Standardized training requirements for radiography operators are based upon existing industry standard training requirements. (An example is ASNT-TC-1A). Radiography operators receive formal and on-the-job training in project requirements, system operations and standards, safe operating practices, application techniques, specific waste generating practices, packaging configurations, parameter estimation and identification of prohibited items. Operators must be trained and tested before they are qualified for RTR operation, and must requalify at least every two years. LANL operating and training requirements for RTR analysis of TRU mixed waste are based on "Procedure 310.1, Physical Waste Form Characterization Using Radiography, TRU Waste Characterization Sampling and Analysis Methods Manual," (DOE, 1996).

A.2.3.3.2 Visual Examination

Waste contents of select TRU mixed waste containers will be visually examined to confirm the RTR results. This visual examination will also verify aspects of acceptable knowledge amenable to visual confirmation. For example, the visual examination will verify the physical characteristics of the waste and the associated matrix parameter code (i.e., Matrix Parameter Code S3000, S4000, or S5000). In addition, the visual examination will verify the presence of certain hazardous constituents, such as lead in lead bricks or lead-lined gloves. These types of visual confirmations will either verify or refute the overall acceptable knowledge used to characterize the waste stream.

The contents of each container undergoing visual examination will be recorded on audio/videotape and a description of the observed items must be provided on a visual examination data form. Visual examination procedure operators receive formal and on-the-job training in project requirements, safe operating practices, specific waste generating practices, packaging configurations, waste parameter estimation and

identification of prohibited items. Operators must be trained and qualify for visual examination procedures and must requalify at least every two years. LANL operating and training requirements for visual examination of TRU mixed waste are based on "Procedure 310.2, Physical Waste Form Characterization Using Visual Examination, TRU Waste Characterization Sampling and Analysis Methods Manual," (DOE, 1996).

The hypergeometric distribution is a statistical means of estimating the probability of determining the true number of miscertified containers in the overall population of waste drums by selecting a number of drums for visual examination using a previously determined or observed miscertification rate and a set confidence factor. The basis for the determination of the number of appropriate containers to be visually examined and a description of the hyergeometric distribution used is available in the WIPP TRU Waste Characterization Plan. The following table is an example of how the number of TRU mixed waste containers to be randomly selected for visual examination will be determined. The selection process will be updated as necessary to maintain consistency with revisions of the QAPP (DOE/CAO 94-1010).

Number of Waste Containers Requiring Visual Examination

Annual Number of Waste Containers Undergoing Characterization	Number of Waste Containers Requiring Visual Examination					
50	NA	22	NA	22	NA	29
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	54
500	15	26	26	36	45	63
Percent of Waste Containers Miscertified to WIPP WAC by Radiography in Previous Year	1%	2%	3%	4%	5%	6%

NA = not applicable

(Source : Table 5.1, WIPP QAPP,(DOE, 1994)

For the first year of container examination, LANL will use the 2 percent miscertification rate observed at the Idaho National Engineering Laboratory (INEL). In subsequent years, LANL will use the miscertification rate observed at LANL in the previous year(s) to determine the appropriate number of containers for visual examination.

A.2.3.3.3 Headspace Gas Sampling and Analysis

Headspace gas sampling and analysis is a qualitative screening technique used to confirm the presence of regulated hazardous constituents. TRU mixed waste characterization includes sampling and analysis of headspace gas from up to three areas within drums of waste as follows:

(1) The drum headspace (i.e., directly under the drum lid)
(2) The 55-gallon polyethylene bag headspace
(3) The innermost layers of confinement headspace.

The drum headspace (i.e., the space directly under the drum lid) of all previously unvented drums will be sampled for flammable gases when filters are inserted.A statistically selected subset of heterogeneous waste drums will be sampled for selected VOCs in order to assure that health and safety criteria for safe storage of these drums are met. The statistical basis for selection of drums to be sampled is described in Section A.2.3.3.5. Headspace gas sampling and analysis also serves to confirm the presence of regulated hazardous constituents. Headspace gas sampling will not be relied upon to prove the absence of a hazardous constituent in a waste.

The precision, accuracy, and representativeness of these headspace gas samples will be evaluated for adherence to the program's QA objectives through analysis of field QC samples and adherence to QC practices.

In order to meet the proposed characterization requirements in the WIPP QAPP (DOE, 1994), the headspace of previously vented drums in retrievable storage will be sampled and analyzed as the drums are characterized for shipment to WIPP. The sampling of vented drums may include samples from inner layers of confinement (55-gallon polyethylene bag headspace and innermost layers of confinement headspace) for a statistically selected subset of drums undergoing visual examination.

Analytical methods for the determination of VOCs in the headspace of TRU mixed waste containers must meet technical performance criteria, be consistent with regulatory guidance, and be compatible with the operational constraints associated with the analysis of actinide-contaminated materials. Methods for the collection of headspace gases are based on "Test Methods for Evaluating Solid Waste" (SW-846) (EPA, 1992) and on the "Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air" (EPA, 1988). DOE has modified the EPA methods to accommodate the characteristics of TRU mixed waste headspace gas samples. These methods include SA 010 and SA 011 (DOE, 1994).

A.2.3.3.4 Solid Waste Sampling and Analysis

The following describes the proposed methods for collecting samples of homogeneous TRU mixed waste classified as homogeneous solids or soils. Sampling protocol is based on sampling methods similar to those approved by EPA for solid waste and soil sampling in SW-846 (EPA, 1992); in "Standard Practice for Thin-Walled Tube Sampling of Soils" (American Society for Testing and Materials [ASTM], 1983); and in "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds" (ASTM, 1991). These

methods are designed to ensure that representative waste samples are consistently collected and transferred to the responsible laboratory in a manner that maintains sample integrity. The statistical basis for sampling is described in Section A.2.3.3.5.

The TRU mixed waste classified as homogeneous solids or soils is packaged in either 55-gallon drums or in smaller containers within 55-gallon drums. Drums may contain TRU mixed waste within a 55-gallon polyethylene bag or may consist of up to 20 or more small containers within a 55-gallon polyethylene bag. For drums selected for sampling that contain multiple small containers, one of the small containers will be randomly selected for sampling. Waste parameters for which homogeneous solids and soils may be analyzed are listed in Table A.2-3.

To accomplish sampling of these wastes, the techniques described below have been developed for sample and subsample collection. The sampling techniques are designed to obtain a representative sample from the container (e.g., 55-gallon drum, 1-gallon polyethylene bottle) and the subsampling techniques are designed to obtain a representative subsample from the sample. Subsampling is conducted to provide laboratories the minimum amount of required sample, thus minimizing the quantity of investigation-derived waste.

The methods used to collect samples of TRU mixed waste classified as homogeneous solids and soils from 55-gallon drums and smaller containers must be such that the samples are representative of the waste from which they were taken. For 55-gallon drums containing homogeneous solids and soils, a sample must be collected as a core that is representative of the waste along the entire depth of the waste in the drum.

Sample Core Collection

Coring tools must be used to collect cores of homogeneous solids and soils from 55-gallon drums and smaller containers in a manner that minimizes disturbance to the core. A rotational coring tool (i.e., a tool that is rotated longitudinally), similar to a drill bit, must be used to cut, lift the waste cuttings, and collect a core sample from containers of waste. For homogeneous solids and soils that are relatively soft, nonrotational coring tools may be used in lieu of a rotational coring tool.

Rotational coring tools (i.e., lightweight augers) and nonrotational coring tools (i.e., thin-walled samplers) have each been tested for their ability to collect a vertical core of simulated solidified waste contained in 55-gallon drums and 1-gallon polyethylene bottles, as described in "Idaho National Engineering Laboratory Simulated Solidified Transuranic Waste Sampling Program" (EG&G, 1994). The rotational coring tool used at the INEL has demonstrated core recoveries greater than 75 percent for soft simulated wastes and greater than 94 percent for hard simulated waste. The sampling tool has been designed to minimize the transfer of frictional heat to the core, thereby minimizing potential loss of VOCs (DOE, 1994). The nonrotational coring tool has demonstrated core recoveries greater than 88 percent for soft simulated wastes. LANL will use coring tools similar to those developed at the INEL.

Subsample Collection

To obtain representative subsamples, subsampling of the sample core is required. Subsampling must be conducted as soon as possible after sample core collection to minimize the loss of VOCs. If a substantial delay (e.g., several minutes) is expected between sample core collection and subsampling, the sample core must remain in the sleeve and the sleeve must be capped at each end. Subsamples for VOCs must be collected prior to extruding the sample core from the sleeve. The sampling location must be randomly selected along the long axis of the sleeve and access to the waste must be gained by making a perpendicular cut through the sleeve and the waste it contains.

A.2.3.3.5 Statistical Approach for Headspace Gas and Solid Waste Sampling

A statistical approach will be used to select heterogeneous legacy waste containers for headspace gas sampling. The same approach will be used for solid waste sampling and analysis of legacy and existing homogeneous solids and soil waste streams. This approach relies on the premise that the waste containers have been separated into waste streams on the basis of process knowledge and, thus, represent populations that contain similar waste. Drums are first segregated into waste streams based on existing characterization information. The methods used to segregate drums into waste streams and lots for sampling within waste streams are detailed in the LANL TRU Waste Characterization Sampling Plan, a site specific document required by the WIPP QAPP (DOE, 1994). An initial number of drums is selected from each waste stream for sampling and analysis using the method described in the WIPP QAPP DOE, 1994), Section 5.3.1. A minimum of five containers per waste stream are sampled. For waste streams with less than three drums, a total of three samples is taken. The analytical results from the initial round of sampling are used to calculate upper 90 percent one-sided confidence limits (UCL_{90}) for the mean concentrations of regulated hazardous constituents. Those limits are compared to the RTLs for the constituents. If a hazardous waste determination cannot be made based on the results from the initial round of sampling, an additional number of drums is selected. The number of additional drums for the second round of sampling depends on the variance of the analytical results from the first round. The specific method for calculating the number of drums for additional sampling is found in the WIPP QAPP (DOE, 1994), Section 5.3.1.

The objective is to classify specific waste streams as hazardous or nonhazardous by determining the average, or mean, and associated variance of the concentration of regulated hazardous constituents in the waste stream. Waste containers within each waste stream and sample locations within each container will be randomly selected to ensure that the analytical results provide an unbiased estimate of the true mean contaminant concentration for each waste stream.

A.2.3.4 Sample Handling, Preservation, and Storage

Table A.2-5 presents SW-846 requirements regarding sample containers, preservation techniques, and holding times associated with sample collection. Adherence to these requirements will occur to ensure that sampling and analysis meet quality objectives for data.

A.2.4 ANALYTICAL LABORATORY SELECTION AND ANALYTICAL METHODS

Analytical laboratories at LANL and/or approved subcontractor laboratories will perform all of the detailed qualitative and quantitative chemical analyses specified in Table A.2-4 of this WAP. These laboratories must have:

- The capability of handling radioactive material/waste
- A documented comprehensive QA/QC program
- Technical analytical expertise
- A document control/records management plan
- The capability to perform data reduction, validation, and reporting.

The selection and development of analytical testing methods for LANL TRU mixed waste streams were based on the following considerations:

- The physical form of the waste
- Analytes of interest
- Required detection limits (e.g., regulatory thresholds)
- Information requirements (e.g., verify compliance with LDR treatment standards, waste classification).

Collectively, these factors contributed to the selection of the analytical methods specified in Table A.2-4. Qualified analytical laboratories at LANL and/or approved subcontractor laboratories that meet the above criteria will analyze TRU mixed waste samples for RCRA-regulated hazardous constituents (VOCs, SVOCs, and metals) and characteristics[6] according to SW-846 or documented and approved equivalent methods.

A.2.5 VERIFICATION ANALYSIS FOR TRU MIXED WASTE

Analysis may be performed to verify the accuracy of the initial waste characterization, to verify that applicable treatment standards have been met, when there is a change in a waste-generating process, when the generator requests a review, or when analytical results indicate a change in a waste stream. Verification analysis for TRU mixed waste will be conducted at LANL's or an approved subcontractor's laboratory facilities. All verification analyses will be conducted in conformance with appropriate EPA-approved methods. The type of verification analysis that will be performed to obtain waste characterization information depends upon the matrix parameter code of the waste stream and whether the waste is existing or future TRU mixed waste. Verification analysis methodologies for these different types of waste are presented below.

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[6]Refer to Footnote 1.

A.2.5.1 Verification of Existing TRU Mixed Waste

Characterization for existing homogeneous TRU mixed waste streams (Matrix Parameter Codes S3000 and S4000) will not require verification, because the statistical basis for initial characterization provides statistical confidence in determining whether a waste is hazardous as defined by 20 NMAC 4.1, revised November 1, 1995. Process knowledge documentation applicable to existing heterogeneous TRU mixed waste streams (Matrix Parameter Code S5000) will be qualitatively verified by RTR of waste containers (see Section A.2.3.3.1), visual examination of the contents of select waste containers (see Section A.2.3.3.2), and headspace gas sampling while venting (see Section A.2.3.3.3).

A.2.5.2 Verification of Future TRU Mixed Waste

Future homogeneous TRU mixed waste streams will be characterized using LANL's WPF, Transuranic Waste Storage Record, and Transuranic Waste Certification Plan for WIPP (TWCP). The TWCP includes an acceptable knowledge certification program as described in the WIPP Waste Acceptance Criteria (DOE, 1991) and WIPP QAPP (DOE, 1994) and developed by LANL site specific documents and procedures. LANL procedures consistent with the WIPP WAP, (DOE, 1996), Appendix C9, "TRU Waste Characterization Using Acceptable Knowledge" will be used to implement acceptable knowledge as part of the LANL TRU waste certification program for WIPP. The acceptable knowledge certification program will include the following elements:

- A description of the waste certification program.
- Written procedures outlining the specific methodology used to assemble acceptable knowledge records including document origins, guidelines for the use of documents or information, auditable record guidelines, and potential limitations associated with the information.
- Procedures to evaluate acceptable knowledge information and to resolve discrepancies in documentation.
- Guidelines for the identification of RCRA hazardous constituents and assignment of appropriate EPA hazardous waste numbers to each waste stream.
- Procedures to ensure that unacceptable wastes are identified, documented, and segregated.
- Procedures to verify or confirm acceptable knowledge. Acceptable knowledge for TRU mixed waste is confirmed using nondestructive techniques and sampling and analysis as described by this WAP.
- A cross reference to the applicable waste summary category group (i.e.,S3000, S4000, and S5000) to verify the required confirmation data has been evaluated and the proper EPA hazardous waste numbers have been assigned.
- Administrative control procedures that identify organization responsibility for compliance, oversight procedures, on-the-job control procedure training, stop-work procedures, nonconformance process and corrective action procedures."

A.2.6 SPECIAL PROCEDURAL REQUIREMENTS

Additional waste management requirements specific to ignitable, reactive, and incompatible wastes, as well as compliance with LDR, are described below.

A.2.6.1 Procedures for Ignitable and Reactive Wastes

When ignitable or reactive waste streams are stored at LANL, specific waste management procedures for ignitable and reactive waste will be followed pursuant to 20 NMAC 4.1, Subpart V, 264.17, revised November 1, 1995. At a minimum, ignitable and reactive wastes will be separated during storage.

A.2.6.2 Procedures for Incompatible Wastes

Pursuant to 20 NMAC 4.1 Subpart V, 264.17, revised November 1, 1995, specific waste management procedures for incompatible wastes are described as follows. Incompatible wastes are kept separated during storage. Waste containers holding potentially incompatible free liquids will be stored on self-containment pallets to maintain separation. Because incompatible wastes are and will be separated and potentially incompatible free liquids will be stored on self-containment pallets, any potential for release and reaction with other wastes or materials is and will be minimized.

A.2.6.3 Procedures to Ensure Compliance with LDR Requirements

In accordance with LDR requirements, TRU mixed waste to be shipped off site must be evaluated to determine whether it meets the applicable LDR treatment standards in 20 NMAC 4.1, Subpart VIII, Part 268, Subpart D, revised November 1, 1995,unless waste will be transported to a permitted waste management facility operating in conformance with a no-migration determination. This evaluation will be accomplished by using acceptable knowledge of the waste or sampling and analysis.

Each waste for which a treatment standard has been established will be evaluated for the applicable LDR parameters in 20 NMAC 4.1, Subpart VIII, Part 268, Subpart D, revised November 1, 1995. Acceptable knowledge will be used to evaluate LDR applicability for wastes with treatment standards expressed as specific technologies in 20 NMAC 4.1, Subpart VIII, 268.42, and for hazardous debris treated to meet the alternative debris treatment standards in 20 NMAC 4.1, Subpart VIII, 268.45. Wastes with constituent concentration-based treatment standards or waste extract concentration-based treatment standards will be evaluated using acceptable knowledge supplemented by sampling and analysis if acceptable knowledge alone is not sufficient to determine LDR treatment standards in 20 NMAC 4.1, Subpart VIII, 268.40.

Sampling and analysis will be conducted in accordance with 20 NMAC 4.1, Subpart VIII, Part 268, revised November 1, 1995, only to certify that the waste meets LDR treatment standards. All analytical results completed in support of LDR requirements will be retained within the facility operating record. LDR determinations will be documented on LANL's Land Disposal Restrictions Notification Form (Figure A.2-2).

7.0 LIST OF REFERENCES

American Society for Testing and Materials (ASTM), 1991, "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds," ASTM D4547-91, *Annual Book of ASTM Standards*, Philadelphia, Pennsylvania, American Society for Testing and Materials.

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Los Alamos National Laboratory (LANL), 1991, "Los Alamos TRU Waste Certification Plan," Los Alamos National Laboratory, Los Alamos, New Mexico.

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U.S. Environmental Protection Agency (EPA), 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes, A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1992a, "Characterizing Heterogeneous Wastes: Methods and Recommendations," U.S. Environmental Protection Agency, Environmental Systems Monitoring Laboratory, Office of Research and Development, Las Vegas, Nevada.

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Data provided in Tables A.2-1 and A.2-2 are provided for informational purposes and are subject to change as new information is obtained. The Waste Profile Form and the Land Disposal Restrictions Notification Form are also subject to change as Los Alamos National Laboratory procedures are revised and/or amended.

TABLE A.2-1
CROSS REFERENCE OF MATRIX PARAMETER CODES AND WASTE IDENTIFICATION CODES

Matrix Parameter[a] Code/ Description	Item Description Codes (IDCs)	Matrix Category (Waste Description)	TRUPACT-II Content and Radioactive Solid Waste Disposal Codes	Waste Descriptions
S3000-Homogeneous Solids	002	Stabilized aqueous waste	LA 111A/211A	Concreted/cemented aqueous waste
			A76	Cement paste
	003	Stabilized aqueous waste	LA 111B/211B	Dewatered sludge
			A75	Chemical treatment sludge
	005(P2S)	Waste salts	LA 124A	Transuranic (TRU) waste salts
			A27	Nitrated solid crystallized residues
			A28	Chloride salts
			A29	Hydroxide cake
	006	Solidified inorganic process solids	LA 114A	Solidified inorganic process solids
			A24	Cemented/immobilized residues/powders
			A26	Evaporator bottoms/salts
	006	Solidified organic process solids	LA 126A	Solidified organic process solids
			A24	Cemented/immobilized residues/powders
			A25	Leached process residues
			A26	Evaporator bottoms/salts
			A29	Hydroxide cake
			A46	Reaction process crucibles and oxide residues
S4000-Soils	None	Contaminated soil	A90	Contaminated soil
S5000-Debris Wastes	001	Mixed metal scrap and incidental	LA 125A	Incidental combustibles and mixed metal scrap

Refer to footnotes at end of table.

TABLE A.2-1
CROSS REFERENCE OF MATRIX PARAMETER CODES AND WASTE IDENTIFICATION CODES
(continued)

Matrix Parameter[a] Code/ Description	Item Description Codes (IDCs)	Matrix Category (Waste Description)	TRUPACT-II Content and Radioactive Solid Waste Disposal Codes	Waste Descriptions
		combustibles		
			A30	Property-numbered (PN) equipment
			A31	Non-PN equipment
			A36	Noncombustible building debris
			A55	Filter media
	004	Combustible waste	LA 116A-E	Combustible waste
			A14	Combustible decontamination waste
			A15	Cellulosics (e.g., paper, wood)
			A16	Plastics
			A17	Rubber materials
			A18	Combined paper/plastics/rubber
			A19	Combined noncombustible trash
			A40	Combustible hot cell waste
			A60	Other combustibles
	005	High-efficiency particulate air (HEPA) filters	LA 119A	HEPA filters
			A55	Filter media
	005(LG)	Glass waste	LA 118A	TRU glass waste
			A47	Slag and porcelain
			A95	Glass waste
S5000-Debris Wastes (Continued)	005(LM)	Metal waste	LA 117A-G	TRU noncombustible/ metal waste
			A50	Metal crucibles, scrap, dies

Refer to footnotes at end of table.

TABLE A.2-1
CROSS REFERENCE OF MATRIX PARAMETER CODES AND WASTE IDENTIFICATION CODES
(continued)

		A52	Scrap metal
		A61	Other noncombustibles
		A80	Irradiation sources
005(P1)	Leaded-rubber and metal waste	LA 123A-B	TRU leaded-rubber and TRU metal waste
		A61	Other noncombustibles
005(P2G)	Graphite waste	LA 115A	TRU graphite waste
		A10	Graphite solids

[a] Information in this column was extracted from the U.S. Department of Energy (DOE), 1995, "TRU Waste Characterization Quality Assurance Program Plan," *CAO-94-1010*, Rev. 0, Carlsbad Area Office, Carlsbad, New Mexico.

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]

:T-II ıt ıN) ı	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
A	Metal equipment from decommissioning (e.g., gloveboxes, process equipment, ductwork); small volumes of combustibles from decommissioning in TA-3, TA-21, TA-39, TA-49, and TA-55, and sectioning, and packaging in TA-50-69.	A30 - Property-numbered (PN) equipment A31 - Non-PN Equipment A36 - Non-combustible building debris A55 - Filter media	Knowledge[d]	D006 D008	Cadmium Lead	1.0 5.0
A A	Effluent from plutonium (Pu) processing operations in TA-21 and TA-55, treated in TA-50-1 to produce the resulting concreted monolith	A76 - Cement paste	Knowledge	D004 D006 D007 D008 D009 None None	Arsenic Cadmium Chromium Lead Mercury Barium hydroxide Beryllium hydroxide	5.0 1.0 5.0 5.0 0.2 None None
B B	Sludge from Pu processing in TA-55 is chemically treated and mixed with dry concrete in TA-50-1	A75 - Chemical treatment sludge	Knowledge	D004 D006 D007 D008 D009 D010 D011 D019 D021 D022 F002	Arsenic Cadmium Chromium Lead Mercury Selenium Silver Carbon tetrachloride Chlorobenzene Chloroform Spent halogenated	5.0 1.0 5.0 5.0 0.2 1.0 5.0 0.5 100.0 6.0 Not

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

:T-ll ıt)N) ;	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
					solvents	Applicable (NA)
				F004	Spent nonhalogenated	NA
				F005	solvents	
					Acetone	
				None	Barium chloride	None
				None	Barium hydroxide	None
				None	Beryllium	None
				None	Beryllium hydroxide	None
				None	Di-n-octyl-phthalate	None
				None	Ethanol	None
				None	Methanol	None
				None	Methylene chloride	None
				None	n-Butyl alcohol	None
				None	Nickel	None
				None	Thallium	None
				None	Toluene	None
				None	Xylene	None
				None		None
A	Combustible solids	A14 - Combustible decontamination waste	Knowledge/	D002	Hydrofluoric acid	NA
B	(e.g., paper, rags,	A15 - Cellulosics	Testing[e]	D004	Arsenic	5.0
C	plastic, rubber) and a	A16 - Plastics		D006	Cadmium	1.0
D	small fraction of non-	A17 - Rubber materials		D008	Lead	5.0
E	combustibles (e.g.,	A18 - Combined paper/plastics/rubber		D009	Mercury	0.2
	metal scrap) generated	A19 - Combined noncombustible trash		D019	Carbon tetrachloride	0.5
	from Pu processing and	A40 - Combustible hot cell waste		D022	Chloroform	6.0
	operations in TA-3, TA-	A60 - Other combustibles		D028	Dichloroethane	0.5
	21, TA-50, and TA-55			D040	Trichloroethylene	0.5
				F002	1,1,1-Trichloroethane	NA
				F003	Acetone	NA
				F005	Toluene	NA

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

:T-II ıt)N) ı	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
				None None None None None None	Barium chloride Beryllium Beryllium hydroxide Bromobenzene Nickel Tributyl phosphate	None None None None None None
A	HEPA filters from exhaust air systems in Pu processing in TA-55	A55 - Filter media	Knowledge	None	None	None
A	Glass waste (e.g., discarded labware, windows, bottles) with a small fraction of combustibles (e.g., plastics) generated from Pu processing in TA-3, TA-21, TA-42, and TA-55	A47 - Slag and porcelain A95 - Glass waste	Knowledge/Testi ng	D002 D008 D009 D019 None None	Hydrofluoric acid Lead Mercury Carbon tetrachloride Barium chloride Barium hydroxide	NA 5.0 0.2 0.5 None None
A B C D E F G	Metal waste (e.g., motors, pumps, tools, process equipment) with a small fraction of combustible waste (e.g., plastics) generated from Pu processing in TA-3 and TA-55	A50 - Metal crucibles, scrap, dies A52 - Scrap metal A61 - Other noncombustibles A80 - Irradiation sources	Knowledge/ Testing	D002 D008 D019 None None	Hydrofluoric acid Lead Carbon tetrachloride Barium chloride Beryllium	NA 5.0 0.5 None None
A	Lead-lined glovebox gloves and metal waste	A61 - Other noncombustibles	Knowledge/Testi	D002 D004	Hydrofluoric acid Arsenic	NA 5.0

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

:T-II ıt)N) ɜ	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
B	(e.g., motors, tools, discarded metals) generated from Pu processing in TA-55		ng	D006 D008 D009 D019 None None None	Cadmium Lead Mercury Carbon tetrachloride Beryllium hydroxide Bromobenzene Nickel	1.0 5.0 0.2 0.5 None None None
A	Discarded graphite molds, furnace equipment, and a small fraction of combustible waste generated from Pu processing in TA-55	A10 - Graphite solids	Knowledge	D004 D006 D008 None None	Arsenic Cadmium Lead Beryllium Nickel	5.0 1.0 5.0 None None
A	Used chloride salts from pyrochemical processes (e.g., electrorefining, molten salt extraction, salt stripping, fluoride reduction, direct oxide reduction) and a small fraction of combustible waste (e.g., plastic) generated from Pu processing in TA-55	A27 - Nitrated solid crystallized residues A28 - Chloride salts A29 - Hydroxide cake	Knowledge/ Testing	D004 D006 D008 D009 None None	Arsenic Cadmium Lead Mercury Beryllium hydroxide Nickel	5.0 1.0 5.0 0.2 None None
A	Process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, salts, metal	A24 - Cemented/immobilized residues/powders A26 - Evaporator bottoms/salts	Knowledge	D002 D004 D006 D007 D008	Hydrofluoric acid Arsenic Cadmium Chromium Lead	NA 5.0 1.0 5.0 5.0

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

:T-II ıt)N) ı	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
	oxides, and fines generated as a result of Pu processing at TA-55-4			D009	Mercury	0.2
A	Solidified process residue from evaporator bottoms and other discardable solutions, processed leached solids, ash, filter cake, salts, metal oxide, fines, etc., that are immobilized in gypsum cement, generated from processing operations in TA-55.	A24 - Cemented/immobilized residues/powders A25 - Leached process residues A26 - Evaporator bottoms/salts A29 - Hydroxide cake A46 - Reaction process crucibles and oxide residues	Knowledge	D002 D004 D006 D007 D008 D009 D019 D021 D022 D028 D040 F002 None None None None None None None None None	Hydrofluoric acid Arsenic Cadmium Chromium Lead Mercury Carbon tetrachloride Chlorobenzene Chloroform Dichloroethane Trichloroethylene 1,1,1-Trichloroethane Acetone Beryllium Bromobenzene Ethanol Methanol Methylene Chloride n-Butyl Alcohol Toluene Xylene	NA 5.0 1.0 5.0 5.0 0.2 0.5 100.0 6.0 0.5 0.5 NA None None None None None None None None None
	Possibly generated by decontamination activities and/or accidental spills in TA-1, TA-3, TA-21, and	A90 - Contaminated soil	Knowledge	Unknown	Unknown	Unknown

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

TA-50

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

ı Los Alamos National Laboratory, 1994, "Draft Transuranic Waste Stream Hazardous Material Characterization Study," Rev. 0, an
'erenced in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), revised November 1, 1995) shown in
(Rev. 2.0), September 1994, which reports the EPA Hazardous Waste Numbers in LANL's waste management database.

' if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or gre
d November 1, 1995.
the basis for hazardous waste designation.
'aste classification, indicates that sampling and analysis has been performed, but either (1) the documentation is not available or (2)

TABLE A.2-3
PARAMETERS, CHARACTERIZATION METHODS, AND RATIONALE FOR TRANSURANIC MIXED WASTE

Matrix Parameter[a] Code/Description	Waste Description	Analytical Parameters[b]	Characterization Methods	Rationale
S3000—Homogeneous Solids	– Solidified aqueous waste (e.g., concreted/cemented aqueous waste) – Solidified aqueous waste (e.g., dewatered sludge and chemical treatment sludge) – Solidified inorganic/organic process solids – Waste salts	– Free liquids in waste matrix – Physical form of the waste	– Visual examination – Real-time radiography (RTR) – Acceptable knowledge[c]	– Verify physical waste form – No free liquids allowed
		– Resource Conservation and Recovery Act (RCRA)–regulated metals[d] (see Table A.2-4)	– Sample and analyze statistically selected number of drums in waste stream. (see Table A.2-4)	– Determine toxicity characteristic – Determine concentration of metals
		–Volatile organic compounds (VOC) in container headspace gas	– Gas chromatography/ mass spectrometry – Fourier transform infrared spectrometry – Gas chromatography/ Flame ionization detector	– Qualitative screening to confirm the presence of VOCs
		–VOCs and semivolatile organic compounds (SVOC) (see Table A.2-4)	– Sample and analyze statistically selected number of drums in waste stream. (see Table A.2-4)	– Determine toxicity characteristic – Determine concentration of organics
S4000—Soils	–Contaminated soil			
S5000—Debris Waste	–Mixed metal scrap and incidental combustibles –Combustible waste –Graphite waste –Metal waste –Glass waste –Leaded-rubber and metal waste –High-efficiency particulate air filters	–Free liquids –Physical form of the waste	– Visual examination – RTR – Acceptable knowledge	– Verify physical waste form – No free liquids allowed
		– RCRA-regulated metals[d] (see Table A.2-4)	– Acceptable knowledge	– Determine compliance with land disposal restriction (LDR) treatment standards, if applicable
		– VOCs in container headspace gas	– Gas chromatography/ mass spectrometry – Fourier transform infrared spectrometry	– Qualitative screening to confirm the presence of VOCs

r to footnotes at end of table.

TABLE A.2-3
PARAMETERS, CHARACTERIZATION METHODS, AND RATIONALE FOR TRANSURANIC MIXED WASTE
(continued)

			– Gas chromatography/ Flame ionization detector	
		– VOCs and SVOCs (see Table A.2-4)	– Acceptable knowledge	– Determine compliance with LDR treatment standards, if applicable

[a] Information in this column was extracted from the U.S. Department of Energy (DOE), 1995, "TRU Waste Characterization Quality Assurance Program Plan," *CAO-94-1010*, Rev. 0, Carlsbad Area Office, Carlsbad, New Mexico.

[b] U.S. Department of Energy (DOE), 1992, "RCRA Part B Permit Application for the Waste Isolation Pilot Plant," *DOE/WIPP 91-005*, Rev. 2, U.S. Department of Energy, Carlsbad, New Mexico.

[c] According to U.S. Environmental Protection Agency (EPA), 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes - A Guidance Manual," *OSWER 9938.4-03*, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C., acceptable knowledge is broadly defined as process knowledge, waste analysis data (e.g., sampling and analysis), and/or facility records of analysis performed.

[d] Use of the term "RCRA-regulated metals" refers to hazardous waste as defined in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1, Subpart II, 261.24, revised November 1, 1995.

TABLE A.2-4
SUMMARY OF WASTE CHARACTERIZATION TECHNIQUES FOR TRANSURANIC MIXED WASTE

Parameter[a]	Method Numbers	Test Methods	Rationale
Physical Waste Form		Waste inspection procedures Real-time radiography Visual examination Process knowledge	Identify and verify waste container contents
Volatile Organic Compounds (VOC) in waste matrix and container headspace gas: Acetone n-Butyl alcohol Carbon tetrachloride Chlorobenzene Chloroform Dichloroethane Formaldehyde Methanol Methylene chloride Spent halogenated solvents Spent nonhalogenated solvents [illegible]chloroethylene Toluene 1,1,1-Trichloroethane Trichloroethylene Xylenes	ASTM Method D4547-91[b] U.S. EPA/540/4-91/001[c] SW-846 (1311, 8240B, 8260A)[d], or equivalent methods[e]	Total and/or toxicity characteristic leaching procedure (TCLP) VOC analysis by gas chromatography/ mass spectrometry (GC/MS) Fourier transform infrared spectrometry Flame ionization detector Process knowledge for debris wastes	Determine total and/or TCLP VOC concentrations in samples of homogeneous solids and soils
Semivolatile Organic Compounds (SVOC) in waste: Cresols Ortho-dichlorobenzene 1,4-Dichlorobenzene 2,4-Dinitrotoluene Hexachloroethane Nitrobenzene Pyridine	SW-846 (1311, 8250A, 8270B)[d], or equivalent methods	Total and/or TCLP SVOC analysis by GC/MS Process knowledge for debris waste	Determine total and/or TCLP SVOC concentrations in samples of homogeneous solids and soils
Metals in waste: Arsenic Barium Cadmium Chromium Lead Mercury Nickel Selenium Silver Thallium	SW-846 (3051, 1311, 6010A, 6020, 7060A, 7061A)[d] (3051, 1311, 6010A, 6020, 7080A, 7081)[d] (3051, 1311, 6010A, 6020, 7130, 7131A)[d] (3051, 1311, 6010A, 6020, 7190, 7191)[d] (3051, 1311, 6010A, 6020, 7420, 7421)[d] (1311, 7470A, 7471A)[d] (3051, 1311, 6010A, 6020, 7520)[d] (3051, 1311, 6010A, 6020, 7740, 7741A, 7742)[d] (3051, 1311, 6010A, 6020, 7760A, 7761)[d] (3051, 1311, 6010A, 6020, 7840, 7841)[d], or equivalent methods	Total and/or TCLP metals analysis Inductively coupled plasma Atomic absorption spectroscopy Cold vapor atomic absorption spectroscopy Process knowledge for	Determine total and/or TCLP metals concentrations in samples of solid process residues and soils

[illegible]r to footnotes at end of table.

TABLE A.2-4
SUMMARY OF WASTE CHARACTERIZATION TECHNIQUES FOR TRANSURANIC MIXED WASTE
(continued)

		debris wastes	

[a] Information in this column was extracted from the U.S. Department of Energy (DOE), 1992, "RCRA Part B Permit Application for the Waste Isolation Pilot Plant," *DOE/WIPP 91-005*, Rev. 2, U.S. Department of Energy, Carlsbad, New Mexico.

[b] American Society for Testing and Materials (ASTM), 1991, "Standard Practice for Sampling Waste and Soils for Volatile Organic Compounds," *ASTM D4547-91*, Annual Book of ASTM Standards, Philadelphia, Pennsylvania, American Society for Testing and Materials.

[c] U.S. Environmental Protection Agency (EPA), 1991, "Soil Sampling and Analysis for Volatile Organic Compounds," *EPA/540/4-91/001*, Office of Research and Development, U.S. Environmental Protection Agency.

[d] U.S. Environmental Protection Agency (EPA), 1994, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," *SW-846*, Third Edition, Office of Solid Waste and Emergency Response, U.S. Government Printing Office, Washington, D.C.

[e] Equivalent methods, subject to EPA approval, may be substituted.

FIGURE A.2-1

WASTE PROFILE FORM

FIGURE A.2-2

LAND DISPOSAL RESTRICTIONS NOTIFICATION FORM

TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]

Item Description Codes (IDC)	Waste Description	TRUPACT-II Content (TRUCON) Codes	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
001	Mixed metal scrap and incidental combustibles	LA 125A	Metal equipment from decommissioning (e.g., gloveboxes, process equipment, ductwork); small volumes of combustibles from decommissioning in TA-3, TA-21, TA-39, TA-49, and TA-55, and sectioning, and packaging in TA-50-69.	A30 - Property-numbered (PN) equipment A31 - Non-PN Equipment A36 - Non-combustible building debris A55 - Filter media	Knowledge[d]	D006 D008	Cadmium Lead	1.0 5.0
002	Stabilized aqueous waste	LA 111A LA 211A	Effluent from plutonium (Pu) processing operations in TA-21 and TA-55, treated in TA-50-1 to produce the resulting concreted monolith	A76 - Cement paste	Knowledge	D004 D006 D007 D008 D009 None None	Arsenic Cadmium Chromium Lead Mercury Barium hydroxide Beryllium hydroxide	5.0 1.0 5.0 5.0 0.2 None None

Refer to footnotes at end of table.

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TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

Item Description Codes (IDC)	Waste Description	TRUPACT-II Content (TRUCON) Codes	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
004	Combustible waste	LA 116A LA 116B LA 116C LA 116D LA 116E	Combustible solids (e.g., paper, rags, plastic, rubber) and a small fraction of non-combustibles (e.g., metal scrap) generated from Pu processing and operations in TA-3, TA-21, TA-50, and TA-55	A14 - Combustible decontamination waste A15 - Cellulosics A16 - Plastics A17 - Rubber materials A18 - Combined paper/plastics/rubber A19 - Combined noncombustible trash A40 - Combustible hot cell waste A60 - Other combustibles	Knowledge/ Testing[e]	D002 D004 D006 D008 D009 D019 D022 D028 D040 F002 F003 F005 None None None None None None	Hydrofluoric acid Arsenic Cadmium Lead Mercury Carbon tetrachloride Chloroform Dichloroethane Trichloroethylene 1,1,1-Trichloroethane Acetone Toluene Barium chloride Beryllium Beryllium hydroxide Bromobenzene Nickel Tributyl phosphate	NA 5.0 1.0 5.0 0.2 0.5 6.0 0.5 0.5 NA NA NA None None None None None None
005	High-efficiency particulate air (HEPA) filters	LA 119A	HEPA filters from exhaust air systems in Pu processing in TA-55	A55 - Filter media	Knowledge	None	None	None

Refer to footnotes at end of table.

TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

Item Description Codes (IDC)	Waste Description	TRUPACT-II Content (TRUCON) Codes	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
005(LG)	Glass waste	LA 118A	Glass waste (e.g., discarded labware, windows, bottles) with a small fraction of combustibles (e.g., plastics) generated from Pu processing in TA-3, TA-21, TA-42, and TA-55	A47 - Slag and porcelain A95 - Glass waste	Knowledge/Testing	D002 D008 D009 D019 None None	Hydrofluoric acid Lead Mercury Carbon tetrachloride Barium chloride Barium hydroxide	NA 5.0 0.2 0.5 None None
005(LM)	Metal waste	LA 117A LA 117B LA 117C LA 117D LA 117E LA 117F LA 117G	Metal waste (e.g., motors, pumps, tools, process equipment) with a small fraction of combustible waste (e.g., plastics) generated from Pu processing in TA-3 and TA-55	A50 - Metal crucibles, scrap, dies A52 - Scrap metal A61 - Other noncombustibles A80 - Irradiation sources	Knowledge/ Testing	D002 D008 D019 None None	Hydrofluoric acid Lead Carbon tetrachloride Barium chloride Beryllium	NA 5.0 0.5 None None

Refer to footnotes at end of table.

TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

Item Description Codes (IDC)	Waste Description	TRUPACT-II Content (TRUCON) Codes	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
005(P1)	Leaded-rubber and metal waste	LA 123A LA 123B	Lead-lined glovebox gloves and metal waste (e.g., motors, tools, discarded metals) generated from Pu processing in TA-55	A61 - Other noncombustibles	Knowledge/Testing	D002 D004 D006 D008 D009 D019 None None None	Hydrofluoric acid Arsenic Cadmium Lead Mercury Carbon tetrachloride Beryllium hydroxide Bromobenzene Nickel	NA 5.0 1.0 5.0 0.2 0.5 None None None
005(P2G)	Graphite waste	LA 115A	Discarded graphite molds, furnace equipment, and a small fraction of combustible waste generated from Pu processing in TA-55	A10 - Graphite solids	Knowledge	D004 D006 D008 None None	Arsenic Cadmium Lead Beryllium Nickel	5.0 1.0 5.0 None None
005(P2S)	Waste salts	LA 124A	Used chloride salts from pyrochemical processes (e.g., electrorefining, molten salt extraction, salt stripping, fluoride reduction, direct oxide reduction) and a small fraction of combustible waste (e.g., plastic) generated from Pu processing in TA-55	A27 - Nitrated solid crystallized residues A28 - Chloride salts A29 - Hydroxide cake	Knowledge/ Testing	D004 D006 D008 D009 None None	Arsenic Cadmium Lead Mercury Beryllium hydroxide Nickel	5.0 1.0 5.0 0.2 None None

Refer to footnotes at end of table.

TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

Item Description Codes (IDC)	Waste Description	TRUPACT-II Content (TRUCON) Codes	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
006	Solidified inorganic process solids	LA 114A	Process residue from evaporator bottoms and other discardable solutions, process-leached solids, ash, filter cakes, salts, metal oxides, and fines generated as a result of Pu processing at TA-55-4	A24 - Cemented/immobilized residues/powders A26 - Evaporator bottoms/salts	Knowledge	D002 D004 D006 D007 D008 D009	Hydrofluoric acid Arsenic Cadmium Chromium Lead Mercury	NA 5.0 1.0 5.0 5.0 0.2

Refer to footnotes at end of table.

TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

Item Description Codes (IDC)	Waste Description	TRUPACT-II Content (TRUCON) Codes	Process Generating the Waste/Technical Area (TA)	Radioactive Solid Waste Disposal (RSWD) Codes/Waste Description	Basis for Hazardous Waste Designation (knowledge and/or testing)	Potential EPA[b] Hazardous Waste Numbers	Potential Hazardous Constituents in the Waste	Regulatory Limits[c] (milligrams per liter)
006	Solidified organic process solids	LA 126A	Solidified process residue from evaporator bottoms and other discardable solutions, processed leached solids, ash, filter cake, salts, metal oxide, fines, etc., that are immobilized in gypsum cement, generated from processing operations in TA-55.	A24 - Cemented/immobilized residues/powders A25 - Leached process residues A26 - Evaporator bottoms/salts A29 - Hydroxide cake A46 - Reaction process crucibles and oxide residues	Knowledge	D002 D004 D006 D007 D008 D009 D019 D021 D022 D028 D040 F002 None None None None None None None None None	Hydrofluoric acid Arsenic Cadmium Chromium Lead Mercury Carbon tetrachloride Chlorobenzene Chloroform Dichloroethane Trichloroethylene 1,1,1-Trichloroethane Acetone Beryllium Bromobenzene Ethanol Methanol Methylene Chloride n-Butyl Alcohol Toluene Xylene	NA 5.0 1.0 5.0 5.0 0.2 0.5 100.0 6.0 0.5 0.5 NA None None None None None None None None None
None	Contaminated soil	None	Possibly generated by decontamination activities and/or accidental spills in TA-1, TA-3, TA-21, and TA-50	A90 - Contaminated soil	Knowledge	Unknown	Unknown	Unknown

Refer to footnotes at end of table.

TABLE A.2-2
TRANSURANIC MIXED WASTE CHARACTERIZATION MATRIX[a]
(continued)

[a] This table is based on preliminary information from Los Alamos National Laboratory, 1994, "Draft Transuranic Waste Stream Hazardous Material Characterization Study," Rev. 0, and is subject to change upon further review. Potential EPA Hazardous Waste Numbers (as referenced in the New Mexico Administrative Code, Title 20, Chapter 4, Part 1 (20 NMAC 4.1), revised November 1, 1995) shown in this table may vary from those reported in LANL's Part A Permit Application for Mixed Waste (Rev. 2.0), September 1994, which reports the EPA Hazardous Waste Numbers in LANL's waste management database.

[b] U.S. Environmental Protection Agency.

[c] A solid waste exhibits the characteristic of toxicity if the extract from a representative sample of the waste contains any of the contaminants listed at a concentration equal to or greater than the respective value given in 20 NMAC 4.1, Subpart II, Part 261, Subpart D, revised November 1, 1995.

[d] Knowledge indicates process knowledge used as the basis for hazardous waste designation.

[e] Testing: In reference to the basis for hazardous waste classification, indicates that sampling and analysis has been performed, but either (1) the documentation is not available or (2) the data exist but are not verifiable.

CERTIFICATION

I certify under penalty of law that this document and all attachments* were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

*This refers to the revised Transuranic Waste Analysis Plan and Response to Notice of Deficiency: Technical Adequacy Review of Los Alamos National Laboratory RCRA Waste Analysis Plan, Rev. 0.0, EPA ID No. NM 0890010515-1. These documents revise the Transuranic Mixed Waste Analysis Plan submitted to the New Mexico Environment Department, March 31, 1995. The Transuranic Mixed Waste Analysis Plan is a component of the Proposed Hazardous Waste Facility Permit Modification, Technical Area 54, Area G, Storage Domes 226, 229, 230, 231, and 232 and Storage Pads 2 and 4, January 31, 1996 and the Proposed Hazardous Waste Facility Permit Modification, Technical Area 50, Building 1; Rooms 35, 36, and 38/38A Container Storage Areas, Building 69; Indoor and Outdoor Container Storage Areas, Technical Area 54 West, Building 38; High Bay, Low Bay, Loading Dock, and Outdoor Container Storage Areas, December 22, 1995.

Alexander Gancarz
Division Director for Chemical Science and Technology Division
Los Alamos National Laboratory
Operator

July 12, 1996
Date Signed

Dennis J. Erickson
Division Director for Environment, Safety, and Health Division
Los Alamos National Laboratory
Operator

7/11/96
Date Signed

G. Thomas Todd
Area Manager, Los Alamos Area Office
U.S. Department of Energy
Albuquerque Operations
Owner/Operator

7/12/96
Date Signed