

**ATTACHMENT B4**

**TRU MIXED WASTE CHARACTERIZATION USING  
ACCEPTABLE KNOWLEDGE**

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## ATTACHMENT B4

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#### TABLE OF CONTENTS

List of Figures .....	<a href="#">B4-ii</a>
B4-1 <u>Introduction</u> .....	<a href="#">B4-1</a>
B4-2 <u>Acceptable Knowledge Documentation</u> .....	<a href="#">B4-1</a>
B4-2a <u>Required TRU Mixed Waste Management Program Information</u> .....	<a href="#">B4-2</a>
B4-2b <u>Required TRU Mixed Waste Stream Information</u> .....	<a href="#">B4-3</a>
B4-2c <u>Supplemental Acceptable Knowledge Information</u> .....	<a href="#">B4-4</a>
B4-3 <u>Acceptable Knowledge Training, Procedures and Other Requirements</u> .....	<a href="#">B4-6</a>
B4-3a <u>Qualifications and Training Requirements</u> .....	<a href="#">B4-6</a>
B4-3b <u>Acceptable Knowledge Assembly, Compilation, and Confirmation Procedures and         Required Administrative Controls</u> .....	<a href="#">B4-6</a>
B4-3c <u>Criteria for Assembling an Acceptable Knowledge Record and Delineating the         Waste Stream</u> .....	<a href="#">B4-8</a>
B4-3d <u>Requirements for Confirmation of Acceptable Knowledge Information</u> .....	<a href="#">B4-9</a>
B4-3e <u>Acceptable Knowledge Data Quality Requirements</u> .....	<a href="#">B4-12</a>
B4-3f <u>Audits of Acceptable Knowledge</u> .....	<a href="#">B4-13</a>
B4-4 <u>Additional Final Confirmation of Acceptable Knowledge at the WIPP Facility</u> .....	<a href="#">B4-15</a>

## List of Figures

<b>Figure</b>	<b>Title</b>
B4-1	Compilation of Acceptable Knowledge Documentation
B4-2	Confirmation of Acceptable Knowledge
B4-3	Acceptable Knowledge Auditing

## ATTACHMENT B4 TRU MIXED WASTE CHARACTERIZATION USING ACCEPTABLE KNOWLEDGE

### 1 B4-1 Introduction

2 The Resource Conservation and Recovery Act (**RCRA**) regulations codified in 40 CFR Parts  
3 260 through 265, 268, and 270, and the New Mexico Hazardous Waste Management  
4 Regulations in Title 20 New Mexico Administrative Code, Chapter 4, Part 1, (20.4.1 NMAC)  
5 Subparts I through VI, Subpart VIII, and Subpart IX, authorize the use of acceptable knowledge  
6 (**AK**) in appropriate circumstances by waste generators, or treatment, storage, or disposal  
7 facilities to characterize hazardous waste. Acceptable knowledge is described in *Waste*  
8 *Analysis: EPA Guidance Manual for Facilities That Generate, Treat, Store and Dispose of*  
9 *Hazardous Waste* (EPA, 1994). Acceptable knowledge, as an alternative to sampling and  
10 analysis, can be used to meet all or part of the waste characterization requirements under the  
11 RCRA (EPA, 1994).

12 Acceptable knowledge includes a number of techniques used to characterize transuranic (**TRU**)  
13 mixed waste, such as process knowledge, records of analysis acquired prior to RCRA, and  
14 other supplemental sampling and analysis data (EPA, 1994). Radiography and/or visual  
15 examination, headspace gas sampling and analysis, and homogeneous waste sampling and  
16 analysis (specified in Permit Attachment B1) are used to acquire supplemental sampling and  
17 analysis data to meet the requirements of the Waste Analysis Plan (**WAP**) specified in Permit  
18 Attachment B. Acceptable knowledge is used in TRU mixed waste characterization activities in  
19 three ways:

- 20 • To delineate TRU mixed waste streams
- 21 ~~• To establish drum age criteria scenarios and waste packaging configurations~~
- 22 • To assess if TRU mixed heterogeneous debris wastes exhibit a toxicity  
23 characteristic (20.4.1.200 NMAC, incorporating 40 CFR §261.24)
- 24 • To assess if TRU mixed wastes are listed (20.4.1.200 NMAC, incorporating 40  
25 CFR §261.31)

26 Sampling and analysis shall be performed to confirm acceptable knowledge and to update and  
27 modify initial AK assessments. Sampling and analysis includes radiography, visual examination,  
28 headspace gas, and homogeneous waste sampling and analysis. TRU mixed waste streams  
29 shall undergo applicable provisions of the acceptable knowledge process prior to management,  
30 storage, or disposal by the Permittees at WIPP.

### 31 B4-2 Acceptable Knowledge Documentation

32 The Permittees shall obtain from each Department of Energy (**DOE**) TRU mixed waste  
33 generator/storage site (**site**) a logical sequence of acceptable knowledge information that  
34 progresses from general facility information (TRU Mixed Waste Management Program

1 Information) to more detailed waste-specific information (TRU Mixed Waste Stream  
2 Information). Traceability of acceptable knowledge information for a select drum in the audited  
3 Waste Summary Category Group(s) will be examined during the Permittees' audit of a site  
4 (Section B4-3f). The consistent presentation of acceptable knowledge documentation among  
5 sites in auditable records<sup>1</sup> will allow Waste Isolation Pilot Plant (**WIPP**) personnel to verify the  
6 completeness and adequacy of acceptable knowledge for TRU mixed waste characterization  
7 during the audit process. The Permittees shall implement the acceptable knowledge process as  
8 specified in this Permit to characterize TRU mixed wastes. NMED may independently validate  
9 the implementation of and compliance with applicable provisions of the WAP at each  
10 generator/storage site by participation in the Permittees' Audit and Surveillance Program  
11 (Permit Attachment B6). The Permittees shall provide NMED with current audit schedules and  
12 notify NMED in writing no later than thirty (30) calendar days prior to each audit. NMED may  
13 choose to accompany the Permittees on any audit of the WAP implementation.  
14

15 The following sections include the information the Permittees will require for each site to  
16 characterize TRU mixed waste using acceptable knowledge. Because waste generating  
17 processes are site-specific, sites shall, as necessary, supplement the required acceptable  
18 knowledge records with additional information (see Section B4-2c, Supplemental Acceptable  
19 Knowledge Information). If the required information is not available for a particular waste,  
20 supplemental information shall be obtained and the waste will not be accepted for  
21 management, storage, or disposal at the WIPP facility as a retrievably stored waste (i.e., the  
22 waste will be characterized as specified in Permit Attachment B, Section B-3d(1)).

#### 23 B4-2a Required TRU Mixed Waste Management Program Information

24 TRU mixed waste management program information shall clearly define waste categorization  
25 schemes and terminology, provide a breakdown of the types and quantities of TRU mixed  
26 waste that are generated and stored at the site, and describe how waste is tracked and  
27 managed at the site, including historical and current operations. Information related to TRU  
28 mixed waste certification procedures and the types of documentation (e.g., waste profile forms)  
29 used to summarize acceptable knowledge shall also be provided. The following information  
30 shall be included as part of the acceptable knowledge written record:

- 31 • Map of the site with the areas and facilities involved in TRU mixed waste  
32 generation, treatment, and storage identified
- 33 • Facility mission description as related to TRU mixed waste generation and  
34 management (e.g., nuclear weapons research may involve metallurgy,  
35 radiochemistry, and nuclear physics operations that result in specific waste  
36 streams)
- 37 • Description of the operations that generate TRU mixed waste at the site (e.g.,  
38 plutonium recovery, weapons design, or weapons fabrication)

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<sup>1</sup>"Auditable records" mean those records which allow the Permittees to conduct a systematic assessment, analysis, and evaluation of the Permittees compliance with the WAP and this Permit.

- 1 • Waste identification or categorization schemes used at the facility (e.g., item  
2 description codes, content codes)
- 3
- 4 • Types and quantities of TRU mixed waste generated, including historical  
5 generation through future projections
- 6 • Correlation of waste streams generated from the same building and process, as  
7 appropriate (e.g., sludge, combustibles, metals, and glass)
- 8 • Waste certification procedures for retrievably stored and newly generated wastes  
9 to be sent to the WIPP facility

#### 10 B4-2b Required TRU Mixed Waste Stream Information

11 The Permittees may use acceptable knowledge to delineate site-specific waste streams. For  
12 each TRU mixed waste stream, the Permittees shall require sites to compile all process  
13 information and data that support the acceptable knowledge used to characterize that waste  
14 stream. The type and quantity of supporting documentation will vary by waste stream,  
15 depending on the process generating the waste and site-specific requirements imposed by the  
16 Permittees. At a minimum, the waste process information shall include the following written  
17 information:

- 18 • Area(s) and/or building(s) from which the waste stream was or is generated
- 19
- 20 • Waste stream volume and time period of generation (e.g., 100 standard waste  
21 boxes of retrievable stored waste generated from June 1977 through December  
22 1977)
- 23 • Waste generating process described for each building (e.g., batch waste stream  
24 generated during decommissioning operations of glove boxes)
- 25 • Process flow diagrams (e.g., a diagram illustrating glove boxes from a specific  
26 building to a size reduction facility to a container storage area). In the case of  
27 research/development, analytical laboratory waste, or other similar processes  
28 where process flow diagrams cannot be created, a description of the waste  
29 generating processes, rather than a formal process flow diagram, may be  
30 included if this modification is justified and the justification is placed in the  
31 auditable record
- 32 • Material inputs or other information that identifies the chemical content of the  
33 waste stream and the physical waste form (e.g., glove box materials and  
34 chemicals handled during glove box operations, ~~if available AK information to  
35 select the appropriate Drum Age Criteria from Tables B1-5 through B1-10,  
36 including but not limited to sampling scenario, packaging configurations, filter  
37 diffusivity, and liner lid opening diameter, as~~ applicable)

38 The acceptable knowledge written record shall include a summary that identifies all sources of  
39 waste characterization information used to delineate the waste stream. The basis and rationale

1 for delineating each waste stream, based on the parameters of interest, shall be clearly  
2 summarized and traceable to referenced documents. Assumptions made in delineating each  
3 waste stream also shall be identified and justified. If discrepancies exist between required  
4 information, then sites shall apply all hazardous waste codes indicated by the information to the  
5 subject waste stream unless the sites choose to justify an alternative assignment and document  
6 the justification in the auditable record. The Permittees shall obtain from each site, at a  
7 minimum, procedures that comply with the following acceptable knowledge requirements:

- 8 • Procedures for identifying and assigning the physical waste form of the waste
- 9 • Procedures for delineating waste streams and assigning Waste Matrix Codes
- 10 • Procedures for resolving inconsistencies in acceptable knowledge  
11 documentation
- 12 • Procedures for confirming acceptable knowledge information through headspace  
13 gas sampling and analysis, visual examination and/or radiography, and  
14 homogeneous waste sampling and analysis
- 15 • Procedures describing management controls used to ensure prohibited items  
16 (specified in the WAP, Permit Attachment B) are documented and managed
- 17 • Procedures to ensure radiography and visual examination include a list of  
18 prohibited items that the operator shall verify are not present in each container of  
19 waste (e.g., liquids exceeding TSDF-WAC limits, corrosives, ignitables,  
20 reactives, and incompatible wastes)
- 21 • Procedures to document how changes to Waste Matrix Codes, waste stream  
22 assignment, and associated EPA hazardous waste numbers based on material  
23 composition are documented for any waste
- 24 • Procedures for newly generated waste shall describe how acceptable knowledge  
25 is confirmed using visual examination

#### 26 B4-2c Supplemental Acceptable Knowledge Information

27 The generator/storage sites shall obtain supplemental acceptable knowledge information. The  
28 amount and type of supplemental information is site-specific and cannot be mandated, but sites  
29 shall collect information as appropriate to support required information. Adequacy of  
30 supplemental information shall be assessed by the Permittees during audits (Section B4-3f).  
31 Sites will use this information to compile the acceptable knowledge written record.  
32 Supplemental acceptable knowledge documentation that may be used (if available) in addition  
33 to the required information specified above include, but are not limited to, the following  
34 information:

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

- 1 • Standard operating procedures that may include a list of raw materials or  
2 reagents, a description of the process or experiment generating the waste, and a  
3 description of wastes generated and how the wastes are managed at the point of  
4 generation
- 5 • Preliminary and final safety analysis reports and technical safety requirements
- 6 • Waste packaging logs
- 7 • Test plans or research project reports that describe reagents and other raw  
8 materials used in experiments
- 9 • Site databases (e.g., chemical inventory database for Superfund Amendments  
10 and Reauthorization Act Title III requirements)
- 11 • Information from site personnel (e.g., documented interviews)
- 12 • Standard industry documents (e.g., vendor information)
- 13 • Analytical data relevant to the waste stream, including results from fingerprint  
14 analyses, spot checks, or routine verification sampling. This may also include  
15 new information acquired apart from the confirmatory process which  
16 supplements required information (e.g., visual examination not performed in  
17 compliance with the WAP)
- 18 • Material Safety Data Sheets, product labels, or other product package  
19 information
- 20 • Sampling and analysis data from comparable or surrogate waste streams (e.g.,  
21 equivalent nonradioactive materials)
- 22 • Laboratory notebooks that detail the research processes and raw materials used  
23 in an experiment

24 All specific, relevant supplemental acceptable knowledge documentation assembled and used  
25 in the acceptable knowledge process, whether it supports or contradicts any required  
26 acceptable knowledge documentation, shall be identified and an explanation provided for its  
27 use (e.g., identification of a toxicity characteristic). Supplemental documentation may be used  
28 to further document the rationale for the hazardous characterization results. The collection and  
29 use of supplemental information shall be assessed by the Permittees during site audits to  
30 ensure that hazardous waste characterization is supported, as necessary, by supplemental  
31 information. Similar to required information, if discrepancies exist between supplemental  
32 information and the required information, then sites shall apply all hazardous waste codes  
33 indicated by the supplemental information to the subject waste stream unless the sites choose  
34 to justify an alternative assignment and document the justification in the auditable record.

1 B4-3 Acceptable Knowledge Training, Procedures and Other Requirements

2 The Permittees shall require consistency among sites in using acceptable knowledge  
3 information to characterize TRU mixed waste by the use of the following three phase process:  
4 1) compiling the required and supplemental acceptable knowledge documentation in an  
5 auditable record, 2) confirming and updating acceptable knowledge information using  
6 radiography and/or visual examination, headspace-gas sampling and analysis, and  
7 homogeneous waste sampling and analysis, and 3) auditing acceptable knowledge records.  
8 This section specifies qualification and training requirements, describes each phase of the  
9 process, specifies the procedures that the Permittees shall require all sites to develop to  
10 implement the requirements for using acceptable knowledge, and specifies data quality  
11 requirements for acceptable knowledge.

12 B4-3a Qualifications and Training Requirements

13 Site personnel responsible for compiling acceptable knowledge, assessing acceptable  
14 knowledge, and resolving discrepancies associated with acceptable knowledge shall be  
15 qualified and trained in the following areas at a minimum:

- 16 • WIPP WAP in Permit Attachment B and the Treatment, Storage and Disposal  
17 Facility Waste Acceptance Criteria (**TSDF-WAC**) specified in this permit
- 18 • State and Federal RCRA regulations associated with solid and hazardous waste  
19 characterization
- 20 • Discrepancy resolution and reporting processes
- 21 • Site-specific procedures associated with waste characterization using acceptable  
22 knowledge

23 B4-3b Acceptable Knowledge Assembly, Compilation, and Confirmation Procedures and  
24 Required Administrative Controls

25 The Permittees shall obtain from sites acceptable knowledge procedures which require  
26 consistent application of the acceptable knowledge process and requirements. Site-specific  
27 acceptable knowledge procedures shall address the following:

- 28 • Sites shall prepare and implement a written procedure outlining the specific  
29 methodology used to assemble acceptable knowledge records, including the  
30 origin of the documentation, how it will be used, and any limitations associated  
31 with the information (e.g., identify the purpose and scope of a study that included  
32 limited sampling and analysis data).
- 33 • Sites shall develop and implement a written procedure to compile the required  
34 acceptable knowledge record.

- 1           •       Sites shall develop and implement a written procedure that ensures  
2                    unacceptable wastes (e.g., reactive, ignitable, corrosive) are identified and  
3                    segregated from TRU mixed waste populations sent to WIPP.
- 4           •       Sites shall prepare and implement a written procedure to evaluate acceptable  
5                    knowledge and resolve discrepancies. If different sources of information indicate  
6                    different hazardous wastes are present, then sites shall include all sources of  
7                    information in its records and conservatively assign all potential hazardous waste  
8                    codes unless the sites choose to justify an alternative assignment and document  
9                    the justification in the auditable record. The assignment of hazardous waste  
10                   codes shall be tracked in the auditable record to all required documentation.
- 11          •       Sites shall prepare and implement a written procedure to identify hazardous  
12                    wastes and assign the appropriate hazardous waste codes to each waste  
13                    stream. The following are minimum baseline requirements/standards that site-  
14                    specific procedures shall include to ensure comparable and consistent  
15                    characterization of hazardous waste:
- 16               -       Compile all of the required information in an auditable record.
- 17               -       Review the required information to determine if the waste is listed under  
18                    20.4.1.200 NMAC (incorporating 40 CFR §261), Subpart D. Assign all  
19                    listed hazardous waste codes unless the sites choose to justify an  
20                    alternative assignment and document the justification in the auditable  
21                    record.
- 22               -       Review the required information to determine if the waste may contain  
23                    hazardous constituents included in the toxicity characteristics specified in  
24                    20.4.1.200 NMAC (incorporating 40 CFR §261), Subpart C. If a toxicity  
25                    characteristic contaminant is identified and is not included as a listed  
26                    waste, assign the toxicity characteristic code unless data are available  
27                    that demonstrate that the concentration of the constituent in the waste is  
28                    less than the toxicity characteristic regulatory level. When data are not  
29                    available, the toxicity characteristic hazardous waste code for the  
30                    identified hazardous constituent shall be applied to the mixed waste  
31                    stream.
- 32               For newly generated wastes, procedures shall be developed and implemented to  
33                    characterize hazardous waste using acceptable knowledge prior to packaging  
34                    the waste.
- 35          •       Sites shall develop and implement a written procedure for the confirmation of  
36                    acceptable knowledge in accordance with Section B4-3(d).
- 37          •       Sites shall prepare and implement a written procedure that provides a cross  
38                    reference to the applicable waste summary category group (i.e., S3000, S4000,  
39                    and S5000) to verify all of the required confirmation data has been evaluated  
40                    and the proper hazardous waste codes have been assigned.

- 1           •       Sites shall ensure that results of other audits of the TRU mixed waste  
2                    characterization programs at the site are available in the records.

3       Furthermore, the Permittees shall require the sites to implement procedure(s) which specify the  
4       administrative controls used by the site to ensure that prohibited items are documented and  
5       managed in accordance with site-specific certification plans. The following minimum elements  
6       shall be addressed in site-specific documentation associated with administrative controls:

- 7           •       Identify the organization(s) responsible for compliance with administrative  
8                    controls.
- 9           •       Identify the oversight procedures and frequency of actions to verify compliance  
10                   with administrative controls.
- 11          •       Develop on-the-job training specific to administrative control procedures.
- 12          •       Ensure that personnel may stop work if noncompliance with administrative  
13                   controls is identified.
- 14          •       Develop a nonconformance process that complies with the requirements in  
15                   Section B3 of the WAP to document and establish corrective actions.
- 16          •       As part of the corrective action process, assess the potential time frame of the  
17                   noncompliance, the potentially affected waste population(s), and the  
18                   reassessment and recertification of those wastes.

19       B4-3c Criteria for Assembling an Acceptable Knowledge Record and Delineating the Waste  
20       Stream

21       Figure B4-1 provides an overview of the process for assembling acceptable knowledge  
22       documentation into an auditable record. The first step is to assemble all of the required  
23       acceptable knowledge information and any supplemental information regarding the materials  
24       and processes that generate a specific waste stream. The Permittees shall require the sites to  
25       implement procedures which comply with the following criteria to establish acceptable  
26       knowledge records:

- 27          •       Acceptable knowledge information shall be compiled in an auditable record,  
28                   including a road map for all applicable information.
- 29          •       The overview of the facility and TRU mixed waste management operations in the  
30                   context of the facility's mission shall be correlated to specific waste stream  
31                   information.
- 32          •       Correlations between waste streams, with regard to time of generation, waste  
33                   generating processes, and site-specific facilities shall be clearly described. For  
34                   newly generated wastes, the rate and quantity of waste to be generated shall be  
35                   defined.

- A reference list shall be provided that identifies documents, databases, Quality Assurance protocols, and other sources of information that support the acceptable knowledge information.

Container inventories for TRU mixed waste currently in retrievable storage shall be delineated into waste streams by correlating the container identification to all of the required acceptable knowledge information and any supplemental acceptable knowledge information.

#### B4-3d Requirements for Confirmation of Acceptable Knowledge Information

Acceptable knowledge includes information regarding the physical form of the waste, the base materials composing the waste, and the process that generates the waste. Waste characterization (i.e., radiography or visual examination, headspace-gas sampling and analysis, and homogeneous waste sampling and analysis) will be used to confirm acceptable knowledge information. Figure B4-2 illustrates the process the Permittees shall require sites to use to confirm acceptable knowledge.

Acceptable knowledge characterization results shall be confirmed for both retrievably stored and newly generated waste. All retrievably stored waste shall be characterized using radiography or visual examination to confirm the Waste Matrix Code and waste stream and certify compliance with the WAP (Permit Attachment B). If a site must repackage its retrievably stored waste, then visual examination of the waste during repackaging using the VE technique or VE in lieu of radiography shall be used to confirm acceptable knowledge information rather than radiography.

For newly generated wastes, sites shall have written procedures to document the confirmation of acceptable knowledge information with visual examination prior to or during waste packaging. The following minimum requirements shall be addressed in site-specific procedures:

- scope (i.e., waste streams) and purpose;
- responsible organization(s);
- administrative process controls;
- material inputs to process;
- process controls and range of operation that affect final hazardous waste characterization;
- rate and quantity of the hazardous waste generated;
- list of applicable operating procedures relevant to the hazardous waste characterization;
- process knowledge verification sampling (i.e., headspace-gas sampling and/or homogeneous waste annual sampling); and

- 1 • reporting and records management.

2 The Permittees shall require sites to establish procedures for reevaluating acceptable  
3 knowledge if radiography or visual examination results in the assignment of a different Waste  
4 Matrix Code [e.g., Plastic/Rubber (S5310) versus Paper/Cloth (S5330)]. Site procedures shall  
5 describe how the waste is reassigned, acceptable knowledge reevaluated, and appropriate  
6 hazardous waste codes assigned. If a waste must be assigned to a different Waste Matrix  
7 Code based on radiography or visual examination, the following minimum steps shall be taken  
8 to reevaluate acceptable knowledge:

- 9 • Review existing information based on the container identification number and  
10 document all differences in hazardous waste code assignments
- 11 • If differences exist in the hazardous waste codes that were assigned, reassess  
12 and document all required acceptable knowledge information (Section B4-3b)  
13 associated with the new designation
- 14 • Reassess and document all sampling and analytical data associated with the  
15 waste
- 16 • Verify and document that the reassigned Waste Matrix Code was generated  
17 within the specified time period, area and buildings, waste generating process,  
18 and that the process material inputs are consistent with the waste material  
19 parameters identified during radiography or visual examination
- 20 • Record all changes to acceptable knowledge records
- 21 • If discrepancies exist in the acceptable knowledge information for the reassigned  
22 Waste Matrix Code, document the segregation of this container, and define the  
23 actions necessary to fully characterize the waste

24 Potential toxicity characteristics for base materials that compose TRU mixed heterogeneous  
25 debris (S5000) waste may be determined without destructive sampling and analysis via  
26 acceptable knowledge. Sites will assign a Waste Matrix Code and waste stream to each  
27 container of waste using acceptable knowledge. In lieu of confirmatory sampling and analytical  
28 or other data to the contrary (including headspace gas and total/TCLP analysis of solids/soils),  
29 sites shall assign the toxicity characteristic hazardous waste codes based on the presence of  
30 the constituent identified by acceptable knowledge, regardless of the quantity or concentration.  
31 Radiography or visual examination shall be used to confirm the Waste Matrix Code and waste  
32 stream identified using acceptable knowledge. If the waste stream designation is so detailed  
33 that the specific components cannot be differentiated by radiography (e.g., a waste stream  
34 based on a specific type of plastic), this waste stream confirmation need not be performed and  
35 this omission shall be explained in the auditable record. Procedures shall describe how  
36 discrepancies in the Waste Matrix Code are recorded and additions to hazardous waste codes  
37 based on material composition are documented, as necessary (Section B4-3b).

1 Headspace-gas sampling and analysis shall be conducted on all TRU mixed waste or randomly  
2 selected containers from waste streams that meet the conditions for reduced headspace gas  
3 sampling listed in Permit Attachment B, Section B-3a(1), to be sent to the WIPP facility.  
4 Headspace-gas data will be used to confirm the presence or absence of volatile organic  
5 compounds (**VOCs**) identified using acceptable knowledge.

6  
7 The Permittees shall require sites to use acceptable knowledge to identify spent solvents  
8 associated with each TRU mixed waste stream or waste stream lot. Headspace-gas data will  
9 then be used to confirm acceptable knowledge concerning the presence or absence of F-listed  
10 solvents and concentration of applicable toxicity characteristic solvents. Sites shall confirm the  
11 assignment of F-listed hazardous waste codes (20.4.1.200 NMAC, incorporating 40 CFR  
12 §261.31) by evaluating the average concentrations of each VOC detected in container  
13 headspace gas for each waste stream or waste stream lot using the upper 90 percent  
14 confidence limit (**UCL<sub>90</sub>**). The **UCL<sub>90</sub>** for the mean concentration shall be compared to the  
15 program required quantitation limit (**PRQL**) for the constituent. If the **UCL<sub>90</sub>** for the mean  
16 concentration exceeds the **PRQL**, sites shall reevaluate their acceptable knowledge information  
17 and determine the potential source of the constituent. Sites shall provide documentation to  
18 support any determination that F-listed organic constituents are associated with packaging  
19 materials, radiolysis, or other uses not consistent with solvent use. If the source of the detected  
20 F-listed solvents can not be identified, the appropriate spent solvent hazardous waste code will  
21 be conservatively applied to the waste stream. In the case of applicable toxicity characteristic  
22 VOCs and non-toxic F003 constituents, generator/storage sites may assess whether the head  
23 space gas concentration would render the waste non-hazardous for those characteristics and  
24 change the initial acceptable knowledge determination accordingly.

25 Hazardous wastes associated with S3000 and S4000 waste streams will be verified based on  
26 the results of the total/TCLP analysis of a representative homogeneous waste sample. If  
27 discrepancies between the results obtained from homogeneous waste sampling and analysis  
28 and headspace-gas sampling and analysis exist (i.e., a VOC is detected in the solidified waste  
29 but not in the headspace), the most conservative results will be used to verify acceptable  
30 knowledge and assign hazardous waste codes, as applicable. As with headspace gas, if the  
31 total/TCLP results indicate that the concentration of a characteristic waste or non-toxic  
32 constituent of an F003 waste is below regulatory levels, the hazardous waste code assigned  
33 initially by acceptable knowledge may be changed as part of the confirmatory process.  
34 Otherwise, if an F-listed waste constituent is detected, the appropriate hazardous waste code  
35 shall be applied.

36 If the confirmatory process determines that the source of the F-listed constituent is a spent  
37 solvent used in the process or is determined to be the result of mixing a listed waste with a solid  
38 waste during waste packaging, or applicable toxicity characteristic or non-toxic F003 wastes are  
39 present in excess of regulatory levels, then the site will either: 1) assign the applicable listed  
40 hazardous waste code to the entire waste stream, or 2) segregate the drums containing  
41 detectable concentrations of the solvent into a separate waste stream and assign applicable  
42 hazardous waste codes. Each site shall document, justify, and consistently delineate waste  
43 streams and assign hazardous waste codes based on site-specific permit requirements and  
44 other state-enforced agreements.

1 To determine the mean concentration of solvent VOCs, all headspace-gas data and  
2 homogeneous waste data for a waste stream or waste stream lot (i.e., the portion of the waste  
3 stream that is characterized as a unit) will be used, including data qualified with a 'J' flag (i.e.,  
4 less than the PRQL but greater than the method detection limit [**MDL**]) or qualified with a 'U'  
5 flag (i.e., undetected). For data qualified with a 'U' flag, sites shall use one-half the MDL in  
6 calculating the mean concentration. Because listed wastes are not defined based on  
7 concentration, sites may not remove hazardous waste codes assigned using acceptable  
8 knowledge if hazardous constituents are not detected in the headspace gas or solids/soil  
9 analysis.

10 TRU mixed headspace gases and homogeneous waste matrices may contain one or two  
11 constituents (e.g., carbon tetrachloride and 1,1,1-trichloroethane) at concentrations that are  
12 orders of magnitude higher than the other target analytes. In these cases, samples shall be  
13 diluted to remain within the instrument calibration range for the elevated constituents. Sample  
14 dilution results in elevated MDLs for the constituents with elevated concentrations. Only the  
15 concentrations of detected constituents will be used to calculate the mean for the purpose of  
16 assigning F-listed hazardous waste codes. Because the presence or absence of F-listed  
17 solvents can not be confirmed based on the artificially high MDLs that are caused by sample  
18 dilution, data flagged as 'U' and showing an elevated MDL will not be used in calculating the  
19 mean concentration.

#### 20 21 B4-3e Acceptable Knowledge Data Quality Requirements

22 The data quality objectives for sampling and analysis techniques are provided in Permit  
23 Attachment B3. Analytical results will be used to confirm the characterization of wastes based  
24 on acceptable knowledge. To ensure that the acceptable knowledge process is consistently  
25 applied, the Permittees shall require sites to comply with the following data quality requirements  
26 for acceptable knowledge documentation:

- 27 • Precision - Precision is the agreement among a set of replicate measurements  
28 without assumption of the knowledge of a true value. The qualitative  
29 determinations, such as compiling and assessing acceptable knowledge  
30 documentation, do not lend themselves to statistical evaluations of precision.  
31 Therefore, precision requirements are not established for acceptable knowledge.
- 32 • Accuracy - Accuracy is the degree of agreement between an observed sample  
33 result and the true value. The percentage of waste containers which require  
34 reassignment to a new Waste Matrix Code and/or designation of different  
35 hazardous waste codes based on the reevaluation of acceptable knowledge or  
36 on obtaining sampling and analysis data will be reported as a measure of  
37 acceptable knowledge accuracy.
- 38 • Completeness - Completeness is an assessment of the number of waste  
39 streams or number of samples collected to the number of samples determined to  
40 be useable through the data validation process. The acceptable knowledge  
41 record shall contain 100 percent of the information specified in Section B4-2. The  
42 useability of the acceptable knowledge information will be assessed for  
43 completeness during audits.

- 1           •       Comparability - Data are considered comparable when one set of data can be  
2                    compared to another set of data. Comparability is ensured through sites meeting  
3                    the training requirements and complying with the minimum standards outlined for  
4                    procedures that are used to implement the acceptable knowledge process. All  
5                    sites shall assign hazardous waste codes in accordance with Section B4.3b and  
6                    provide this information regarding its waste to other sites who store or generate  
7                    a similar waste stream.
  
- 8           •       Representativeness - Representativeness expresses the degree to which sample  
9                    data accurately and precisely represent characteristics of a population.  
10                   Representativeness is a qualitative parameter that will be satisfied by ensuring  
11                   that the process of obtaining, evaluating, and documenting acceptable  
12                   knowledge information is performed in accordance with the minimum standards  
13                   established in Section B4-3b. Sites also shall assess and document the  
14                   limitations of the acceptable knowledge information used to assign hazardous  
15                   waste codes (e.g., purpose and scope of information, date of publication, type  
16                   and extent to which waste parameters are addressed and limitations of  
17                   information in identifying hazardous wastes).

18       Each site shall address quality control by tracking its performance with regard to the use of  
19       acceptable knowledge by: 1) assessing the frequency of inconsistencies among information,  
20       and 2) documenting the results of acceptable knowledge confirmation through radiography or  
21       visual examination, headspace-gas analyses, and homogeneous waste analyses. In addition,  
22       the acceptable knowledge process and waste stream documentation shall be evaluated through  
23       internal assessments by quality assurance organizations and assessments by auditors or  
24       observers external to the organization (i.e., DOE/Carlsbad Area Office (**CAO**), NMED, EPA).

#### 25       B4-3f Audits of Acceptable Knowledge

26       The Permittees will conduct an initial audit of each site prior to certifying the site for shipment of  
27       TRU mixed waste to the WIPP facility. This initial audit will establish an approved baseline that  
28       will be reassessed annually by the Permittees. These audits will verify compliance with the  
29       requirements specified in the WAP (Permit Attachment B). The audits will be used to verify  
30       compliance with the compilation, application, and interpretation requirements of acceptable  
31       knowledge information specified in this Permit at all sites, and to evaluate the completeness  
32       and defensibility of site-specific acceptable knowledge documentation related to hazardous  
33       waste characterization. Permit Attachment B6 gives a description of the overall audit program  
34       and a required checklist. Figure B4-3 includes the primary steps associated with the audit  
35       process of acceptable knowledge.

36       Site-specific audit plans will be prepared by the Permittees and provided to NMED, and will  
37       identify the scope of the audit, requirements to be assessed, participating personnel, activities  
38       to be audited, organizations to be notified, applicable documents, and schedule. Audits will be  
39       performed in accordance with written procedures and site-specific checklists that will be  
40       developed by the Permittees prior to the audit and provided to NMED. The site-specific audit  
41       checklists will include items associated with the compilation and evaluation of the required  
42       acceptable knowledge information as specified in the checklist required by Permit Attachment  
43       B6.

1 Audit checklists shall include Table B6-3 in Permit Attachment B6, and will include but not be  
2 limited to the following elements for review during the audit:

- 3 • Documentation of the process used to compile, evaluate, and record acceptable  
4 knowledge is available and implemented;
- 5 • Personnel qualifications and training are documented;
- 6 • All of the required acceptable knowledge documentation specified in Section B4-  
7 2 has been compiled in an auditable record;
- 8 • All of the required procedures specified in B4-3 have been developed and  
9 implemented, including but not limited to:
  - 11 - A procedure exists for assigning hazardous waste codes to waste  
12 streams in accordance with Section B4-3;
  - 13 - A procedure exists for resolving discrepancies in acceptable knowledge  
14 documentation in accordance with Section B4-3;
  - 15 - A procedure exists for confirming acceptable knowledge information  
16 through: a) radiography or visual examination, b) headspace gas  
17 sampling and analysis, and c) homogeneous waste sampling and  
18 analysis in accordance with Section B4-3; and
- 19 • Results of other audits of the TRU mixed waste characterization programs at the  
20 site are available in site records.

21 Members of the audit team will be knowledgeable regarding the required acceptable knowledge  
22 information, RCRA regulations and EPA guidance regarding the use of acceptable knowledge  
23 for waste characterization, RCRA hazardous waste characterization, and the WAP  
24 requirements (Permit Attachment B). Audit team members will be independent of all TRU mixed  
25 waste management operations at the site being audited.

26 Auditors will evaluate acceptable knowledge documentation for at least one waste stream from  
27 the Summary Category Group(s) being audited, and will audit acceptable knowledge traceability  
28 for at least one container from the audited Summary Category Group(s). For these waste  
29 streams, auditors will review all procedures and associated processes developed by the site for  
30 documenting the process of compiling acceptable knowledge documentation; correlating  
31 information to specific waste inventories; assigning hazardous waste codes; and identifying,  
32 resolving, and documenting discrepancies in acceptable knowledge records. The adequacy of  
33 acceptable knowledge procedures and processes will be assessed and any deficiencies in  
34 procedures documented in the audit report.

35 Auditors will review the acceptable knowledge documentation for selected waste streams for  
36 logic, completeness, and defensibility. The criteria that will be used by auditors to evaluate the  
37 logic and defensibility of the acceptable knowledge documentation include completeness and  
38 traceability of the information, consistency of application of information, clarity of presentation,

1 degree of compliance with this Permit Attachment with regard to acceptable knowledge  
2 confirmation data, nonconformance procedures, and oversight procedures. Auditors will  
3 evaluate compliance with written site procedures for developing the acceptable knowledge  
4 record. A completeness review will evaluate the availability of all required TRU mixed waste  
5 management program information and TRU mixed waste stream information (Section B4-2).  
6 Records will be reviewed for correlation to specific waste streams and the basis for  
7 characterizing hazardous waste. Auditors will verify that sites include all required information  
8 and conservatively include all potential hazardous waste codes indicated by the acceptable  
9 knowledge records. All deficiencies in the acceptable knowledge documentation will be included  
10 in the audit report.

11 Auditors will verify and document that sites use administrative controls and follow written  
12 procedures to characterize hazardous waste for newly-generated and retrievably stored wastes.  
13 Auditors will review procedures used by the sites to confirm acceptable knowledge information  
14 using radiography or visual examination, headspace gas sampling and analysis, and  
15 homogeneous waste sampling and analysis. Procedures to document changes in acceptable  
16 knowledge documentation and changes to hazardous waste code assignments to specific  
17 waste streams also will be evaluated for compliance with the WAP (Permit Attachment B).

18 After the audit is complete, the Permittees will provide the site with preliminary results at a  
19 close-out meeting. The Permittees will prepare a final audit report that includes all observations  
20 and findings identified during the audit. Sites shall respond to all audit findings and identify  
21 corrective actions. Audit results will be included in the final audit report (Permit Attachment B6).  
22 If acceptable knowledge procedures do not exist, the required information is not available, or  
23 corrective actions (i.e., CARs) are identified associated with acceptable knowledge compilation,  
24 acceptable knowledge confirmation, and/or hazardous waste characterization, the Permittees  
25 will not manage, store, or dispose TRU mixed waste for the subject waste summary category.  
26 Management, storage, or disposal of the subject waste summary category at WIPP will not  
27 resume until the Permittees find that all corrective actions have been implemented and the site  
28 complies with all applicable requirements of the WAP.

29 The National TRU Program disseminates information regarding TRU mixed waste  
30 characterization requirements and program status through the WIPP Home Page at  
31 <<http://www.wipp.carlsbad.nm.us/>>. The Permittees will use this web page to disseminate  
32 information regarding TRU mixed waste streams, RCRA compliance, and operational and  
33 programmatic issues, methods development, and waste characterization information, including  
34 the application of acceptable knowledge. The Permittees are provided the required waste  
35 characterization information prior to management, storage, or disposal of that waste at WIPP  
36 and also will conduct audits at least annually. The Permittees will maintain an operating record  
37 for review during regulatory agency audits. NMED may also review any information relevant to  
38 the scope of the audit during site audits. The Permittees will notify NMED regarding any site's  
39 failure to implement corrective actions associated with hazardous waste characterization as  
40 specified in Modules I and II and Permit Attachment B3.

#### 41 B4-4 Additional Final Confirmation of Acceptable Knowledge at the WIPP Facility

42 The Permittees shall require confirmation of acceptable knowledge characterization  
43 designations at the site, as stated in Section B4-3(b). In addition and prior to notifying a site that

1 a waste stream can be managed, stored, or disposed at the WIPP facility, the Permittees will  
2 review the Waste Stream Profile Forms, the WIPP Waste Information System (**WWIS**), and  
3 associated Characterization Information Summary to ensure that radiography or visual  
4 examination, headspace-gas sampling and analysis data, and homogeneous waste sampling  
5 and analysis data confirm hazardous waste characterization made using acceptable knowledge.  
6 The Permittees shall require all sites to provide all of the required data associated with waste  
7 stream characterization, including summary acceptable knowledge information, radiography or  
8 visual examination, headspace gas sampling and analysis, and homogeneous waste sampling  
9 and analysis results. In addition, sites will designate the assigned hazardous waste codes for  
10 the waste stream on the waste profile form. The WWIS and associated Characterization  
11 Information Summary will be evaluated as illustrated in Figure B4-2 and compared to the  
12 hazardous waste codes specified on the waste stream profile form. The Permittees will review  
13 information provided by the sites to ensure that additions to hazardous waste codes are  
14 identified and justified based on data and that hazardous waste codes are included in the Part  
15 A of the WIPP permit application. As part of the reconciliation of data quality objectives (**DQOs**)  
16 (Permit Attachment B3, Section B3-11), sites are required to track and report changes to  
17 hazardous waste characterizations. If data consistently indicates that discrepancies with  
18 acceptable knowledge information were identified at the site level (and were subsequently  
19 reconciled), the Permittees will require sites to reassess the materials and processes that  
20 generate the waste, and resubmit waste stream profile information and implement their  
21 corrective action system. If the Permittees' review of a waste stream profile form and  
22 associated waste characterization data reveal nonconformance with acceptable knowledge  
23 requirements as described in Permit Attachment B3 (i.e. project level nonconformance), the  
24 Permittees shall not manage, store, or dispose of the waste stream until corrective action is  
25 taken as specified in Permit Attachment B3. Repeated nonconformances by a site in  
26 implementing and documenting WAP requirements (Permit Attachment B) will result in the  
27 termination of management, storage, or disposal of the site's waste, waste stream(s), or  
28 summary category group(s), as applicable. Management, storage, or disposal of the subject  
29 waste summary category at WIPP will not resume until the Permittees find that all corrective  
30 actions have been implemented and the site complies with all applicable requirements of the  
31 WAP.

32 Any drum with unresolved discrepancies associated with hazardous waste characterization will  
33 not be managed, stored, or disposed at the WIPP facility until the discrepancies are resolved.  
34 The Permittees shall require the sites to reassess the materials and processes that generate  
35 the waste, and headspace-gas sampling and analysis, radiography or visual examination, and  
36 homogeneous waste sampling and analysis results. All shipments of the subject waste stream  
37 will cease until the corrective action(s), as necessary, have been implemented and the  
38 discrepancy resolved. The Permittees will notify NMED when the certification status of a waste  
39 stream at a site is revoked. Waste characterization and certification authority will not be  
40 reinstated until the site demonstrates all corrective actions have been implemented and the  
41 program is reassessed by the Permittees.

1

## FIGURES

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Figure B4-1  
Compilation of Acceptable Knowledge Documentation

Figure B4-2  
Confirmation of Acceptable Knowledge

Figure B4-3  
Acceptable Knowledge Auditing