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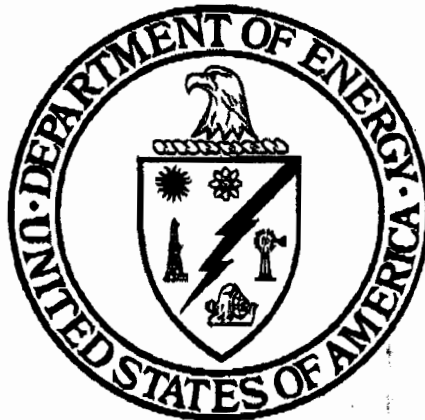
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**Carlsbad Area Office**

**Interim Guidance on Ensuring That  
Waste Qualifies for Disposal at the  
Waste Isolation Pilot Plant**



**Carlsbad, New Mexico**

**February 13, 1997**

**Carlsbad Area Office**  
**Interim Guidance on Ensuring That Waste Qualifies**  
**for Disposal at the Waste Isolation Pilot Plant**

This interim guidance has been prepared to assist the transuranic (TRU) waste sites in establishing and demonstrating that only TRU waste generated by atomic energy defense activities is certified for disposal at the Waste Isolation Pilot Plant (WIPP). Low-level waste, high-level waste, and spent nuclear fuel are not acceptable for disposal at the WIPP. The bases for this interim guidance are legislative requirements; the U.S. Department of Energy (DOE) General Counsel's interpretation of defense waste as it applies to the WIPP (Nordhaus, 1996; Cowan, 1996); the TRU Waste Decision Tree, which has been reviewed by the DOE General Counsel; and the interim change to the Quality Assurance Program Plan (QAPP) (DOE, 1996a) that addresses acceptable knowledge.

The Waste Isolation Pilot Plant Land Withdrawal Act (LWA) (U.S. Congress, 1992), as amended, includes a number of requirements and restrictions on the wastes that can be disposed of at the WIPP. These "statutory requirements" are distinct from the "technical requirements" that are contained in the Resource Conservation and Recovery Act (RCRA) or the final disposal regulations set forth in 40 CFR Part 191. Many of the statutory requirements focus on aspects of the waste's history, e.g., the process by which the waste was generated, the DOE's use of the material generated by that process, whether or not DOE has determined that the waste need not be disposed of in the WIPP, and whether or not the U.S. Nuclear Regulatory Commission has approved disposal in accordance with 10 CFR Part 61.<sup>1</sup> Accordingly, the DOE must rely primarily on historical information about a waste to determine whether it complies with a number of the statutory requirements imposed by the LWA, as amended.

Under the LWA, as amended, waste must meet several conditions if it is to be disposed of at the WIPP; some conditions address measurable physical characteristics of the waste, others address its origin. Provisions that address measurable physical characteristics are as follows:

The term "transuranic waste" means waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years. [Land Withdrawal Act, as amended, § 2(18)]

No transuranic waste received at WIPP may have a surface dose rate in excess of 1,000 rems per hour. [Land Withdrawal Act, as amended, §7(a)(1)(A)]

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<sup>1</sup> The waste must not be "(B) waste that the Secretary has determined, with the concurrence of the Administrator, does not need the degree of isolation required by the disposal regulations; or (C) waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with part 61 of title 10, Code of Federal Regulations." *Land Withdrawal Act, as amended, § 2(18)*.

No more than 5 percent by volume of the remote handled transuranic waste received at WIPP may have a surface dose rate in excess of 100 rems per hour. [Land Withdrawal Act, as amended, §7(a)(1)(B)] [CAO will ensure compliance.]

Remote handled transuranic waste received at WIPP shall not exceed 23 curies per liter maximum activity level (average over the volume of the canister). [Land Withdrawal Act, as amended, §7(a)(2)(A)]

To determine whether a particular TRU waste complies with the measurable physical characteristic conditions, the radiological characteristics of the waste must be measured and verified. The necessary programs, systems, and processes for making and reporting these measurements have already been established by the DOE (DOE, 1996b).

Provisions that address the origin of the wastes are:

The term WIPP means the Waste Isolation Pilot Plant project authorized under Section 213 of the Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980 (Public Law 96-164; 93 Stat.1259,1265) to demonstrate the safe disposal of radioactive waste materials generated by atomic energy defense activities. [Land Withdrawal Act, as amended, § 2(19)] *[emphasis added]*

The Secretary shall not transport high-level radioactive waste or spent nuclear fuel to WIPP or emplace or dispose of such waste or fuel at WIPP. [Land Withdrawal Act, as amended, §12] *[emphasis added]*

Further,

...the Waste Isolation Pilot Plant is authorized...[for] the express purpose of providing research and development facilities to demonstrate the safe disposal of radioactive wastes resulting from the defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission. [Title II, Section 213(a) of the Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980 (Public Law 96-164)] *[emphasis added.]*

To determine whether a particular TRU waste stream was generated by atomic energy defense activities and that it is neither high-level waste nor spent nuclear fuel will require documentation on the history of the waste. Once this determination is made, the waste may be designated for disposal at the WIPP. DOE can verify compliance with these conditions only through the use of historical information about the processes that generated a particular waste stream. Such historical information, termed "acceptable knowledge," can be used to support determinations that waste meets these conditions and can be designated for disposal at the WIPP if it is compiled and managed in accordance with Section 4.0 of the QAPP (DOE, 1996a).

### **Acceptable Knowledge**

Acceptable knowledge documentation will consist primarily of qualitative information regarding the process generating the waste, including management, procedural, and

quality-control records. In addition, material inputs to the waste-generating process and the time period during which the waste was generated are important elements.

The most reliable form of acceptable knowledge documentation consists of relevant information from published documents and controlled databases. Other acceptable forms of support include unpublished data, internal procedures, and notes such as log books. Correspondence such as memoranda and letters, telephone logs, and interviews are considered the least defensible forms. Additional examples of supplemental acceptable knowledge documentation are identified in Section 4.3.3 of the QAPP (DOE, 1996a).

The acceptable knowledge documentation will become part of the record that supports the Waste Stream Profile Form (WSPF). The Waste Acceptance Criteria (WAC) (DOE, 1996b) contains this form. The documentation maintained with the WSPF must be sufficient to allow an independent, technically qualified individual to arrive at the same conclusion: that it is TRU waste generated by atomic energy defense activities. The form requires the Site Project Manager to *certify* whether the waste stream is:

Defense TRU Waste:  Yes  No  
Spent Nuclear Fuel:  Yes  No  
High-Level Waste:  Yes  No

Procedures used to evaluate the supporting documentation are required to be developed and approved. The collection and use of acceptable knowledge to document waste-stream-eligibility determinations applies to both retrievably stored and newly generated waste streams. The attached annotated version of Section 4.2.1 from the QAPP (DOE, 1996a) (Attachment 1) provides information on assembling acceptable knowledge to document specific waste streams as TRU waste generated during defense activities. Sufficient knowledge and information must be documented and maintained in an auditable (QA) record to justify the determination. These records shall be retained according to procedures outlined in the QAPP (DOE, 1996a).

### **Interim Guidance on Ensuring That Waste Streams Planned for Disposal at the WIPP Meet the Definition of TRU Waste**

Section 12 of the LWA, as amended, allows TRU waste to be emplaced at the WIPP, but not high-level waste (HLW) or spent nuclear fuel (SNF). Further, Section 2(20)(A) of the LWA, as amended, excludes high-level radioactive waste from its definition of TRU waste. As TRU wastes can contain approximately the same radionuclides as SNF and HLW, radiological assays alone are insufficient for distinguishing TRU waste from HLW and SNF. Therefore, it is necessary to bring acceptable knowledge to this decision.

The TRU waste sites must have a method to distinguish TRU waste from high-level waste and spent nuclear fuel. Attachment 2 identifies and describes in a decision tree format a process that incorporates the existing regulatory and statutory restrictions for determining whether waste contains HLW/SNF.

Waste streams that are determined to be SNF or HLW are ineligible for disposal at WIPP. Before waste stream classification and during characterization, acceptable knowledge documentation must be evaluated, along with the results of analytical examinations such as real-time radiography. Information that shows a waste stream to be either SNF or HLW must result in the waste being declared ineligible for disposal at the WIPP. If a waste stream formerly identified as defense TRU waste must be reclassified, the Carlsbad Area Office (CAO) must be contacted. The CAO will assist in coordinating the reclassification with the groups responsible for that waste.

### **Interim Guidance on Ensuring That Waste Streams Planned for Disposal at the WIPP Meet the Definition of Defense Waste**

As stated in the laws cited above, only wastes generated by atomic energy defense activities may be disposed of at the WIPP. The DOE General Counsel has provided an interpretation of what constitutes atomic energy defense activities (Nordhaus, 1996; Cowan, 1996):

A TRU waste is eligible for disposal at WIPP if it has been generated in whole or part by one or more of the activities listed in section 10101(3) of the Nuclear Waste Policy Act of 1982:

The term "atomic energy defense activity" means any activity of the Secretary [of the Department of Energy] performed in whole or in part in carrying out any of the following functions:

- (A) naval reactors development;
- (B) weapons activities, including defense inertial confinement fusion;
- (C) verification and control technology;
- (D) defense nuclear materials production;
- (E) defense nuclear waste and materials by-products management;
- (F) defense nuclear materials security and safeguards and security investigations; and
- (G) defense research and development.

Acceptable knowledge must be brought to this determination because it cannot be determined by sampling and analysis of any physical or chemical property whether a TRU waste was generated by one of these activities.

TRU waste resulting from defense activities should be segregated, where feasible, and only the defense waste portion shipped to the WIPP (Nordhaus, 1996; footnote 5, page 6). For newly generated waste, segregation should be accomplished through the establishment of site procedures and waste management practices. For example, the storage areas and handling processes should ensure that drums are properly marked and documented. In addition, the defense TRU waste and other TRU waste storage areas should be clearly marked, e.g., by a rope barrier and/or signs. Some of DOE's sites have historically performed both defense and other atomic energy activities and have stored their TRU waste together. Stored wastes that are commingled will be separated by waste stream at the time of container characterization and certification; thus, segregation of currently stored commingled wastes is not required.

**Summary**

If sufficient information is not available showing that waste is defense TRU, the waste will not be accepted for disposal at the WIPP facility. The required information may be included in the acceptable knowledge record as a list of references annotated to show the specific locations within those references where the required information can be found. In accordance with the interim change to the QAPP (DOE 1996a), the acceptable knowledge program used must have documented procedures, use trained personnel, and be auditable. The program will be audited as part of the certification process. An independent, technically qualified individual must be able to arrive at the same conclusion with the information maintained in the record. When the Site Project Manager certifies the waste at the waste stream level and when payload waste containers are certified for delivery to WIPP, it is understood that he/she is certifying that the waste is a defense TRU waste in accordance with the interim guidance presented.

Questions concerning this interim guidance should be directed to the CAO Waste Certification Manager.

**References**

Cowan, S. P. Memorandum dated October 17, 1996 entitled "Implementation Guidance Concerning 'Atomic Energy Defense Activities' as Used in the Waste Isolation Pilot Plant Land Withdrawal Act" (unpublished).

DOE, 1996a. *Transuranic Waste Characterization Quality Assurance Program Plan*, CAO-94-1010, interim change November 15, 1996. Carlsbad, NM, Carlsbad Area Office, U.S. Department of Energy.

DOE, 1996b. *Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, WIPP-DOE-069, revision 5, Change Notice No. 1, December 1995. Carlsbad, NM, Waste Isolation Pilot Plant, U.S. Department of Energy.

Nordhaus, R. P. Memorandum to Al Alm and George Dials dated September 9, 1996 (unpublished). In this memorandum the General Counsel provides an interpretation of defense waste.

U.S. Congress, 1992. *Waste Isolation Pilot Plant Land Withdrawal Act*. Public Law 102-579, 106 Stat. 4777, October 1992. 102nd Congress, Washington, D.C. WPO 39015.

**Attachment 1**

**Assembling Acceptable Knowledge Documentation**

**[NOTE: The information shown in brackets is provided as interim guidance and does not constitute a requirement or a change to the QAPP]**



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#### 4.2.1 Assembling Acceptable Knowledge Documentation

Figure 4-1 provides an overview of the process for assembling acceptable knowledge documentation. Sites must ensure the following criteria are met in establishing acceptable knowledge records:

- Acceptable knowledge information must be compiled in an auditable record, including a road map for all applicable information.
- The overview of the facility and TRU waste management operations in the context of the facility's mission must be correlated to specific waste stream information. [The facility mission should be used to make a determination of whether waste streams emanating from the facility are: a) defense waste streams; b) nondefense waste streams; or c) both defense and nondefense waste streams. The facility mission should also determine if the waste stream(s) are withdrawn from a nuclear reactor or are products from the first cycle separation.]
- Correlations between waste streams, with regard to the time of generation, waste generating processes, and site-specific facilities must be clearly described. [Correlations should be used to make a final determination of whether waste streams are defense or nondefense or both, for which a determination from the facility mission could not be made. See above.]
- A reference list must be provided that identifies documents, databases, quality assurance protocols, and other sources of information that support the acceptable knowledge information.

Sites must address the following elements in their procedures for the use of acceptable knowledge:

- Sites must prepare a written procedure outlining the specific methodology used to assemble acceptable knowledge records, including the origin of the documentation, how it will be used, and any limitations associated with the information (e.g., identify the purpose and scope of a study that included limited sampling and analysis data). [The procedure must require that acceptable knowledge records will also be used to make defense waste determinations.]
- To compile the required acceptable knowledge record, sites must assemble and evaluate available documentation in the following priority: a) relevant information from published documents and controlled databases, b) unpublished data, c) internal procedures and notes, such as log books, and d) correspondence, such as memoranda, letters, telephone logs, and interviews.
- Sites must identify the physical form of the waste and assign the appropriate matrix parameter category to each waste stream.
- Sites must identify the waste material parameters and radionuclides present in each waste stream.
- Sites must identify hazardous wastes and assign the appropriate EPA hazardous waste numbers to each waste stream.
- Sites must describe the procedures that are used to ensure unacceptable wastes are identified and segregated and waste is certified for shipment to the WIPP facility. [This note applies to spent nuclear fuel, high-level waste, and waste that is other than defense.]
- Sites must describe the management controls used to ensure nonconforming items are documented and managed.
- Sites must ensure radiography and visual examination procedures include a list of nonconforming items that the operator must verify are not present in each container of waste (i.e., corrosives, ignitables, reactives, incompatible waste).

[NOTE: The information shown in brackets is provided as interim guidance and does not constitute a requirement or a change to the QAPP.]

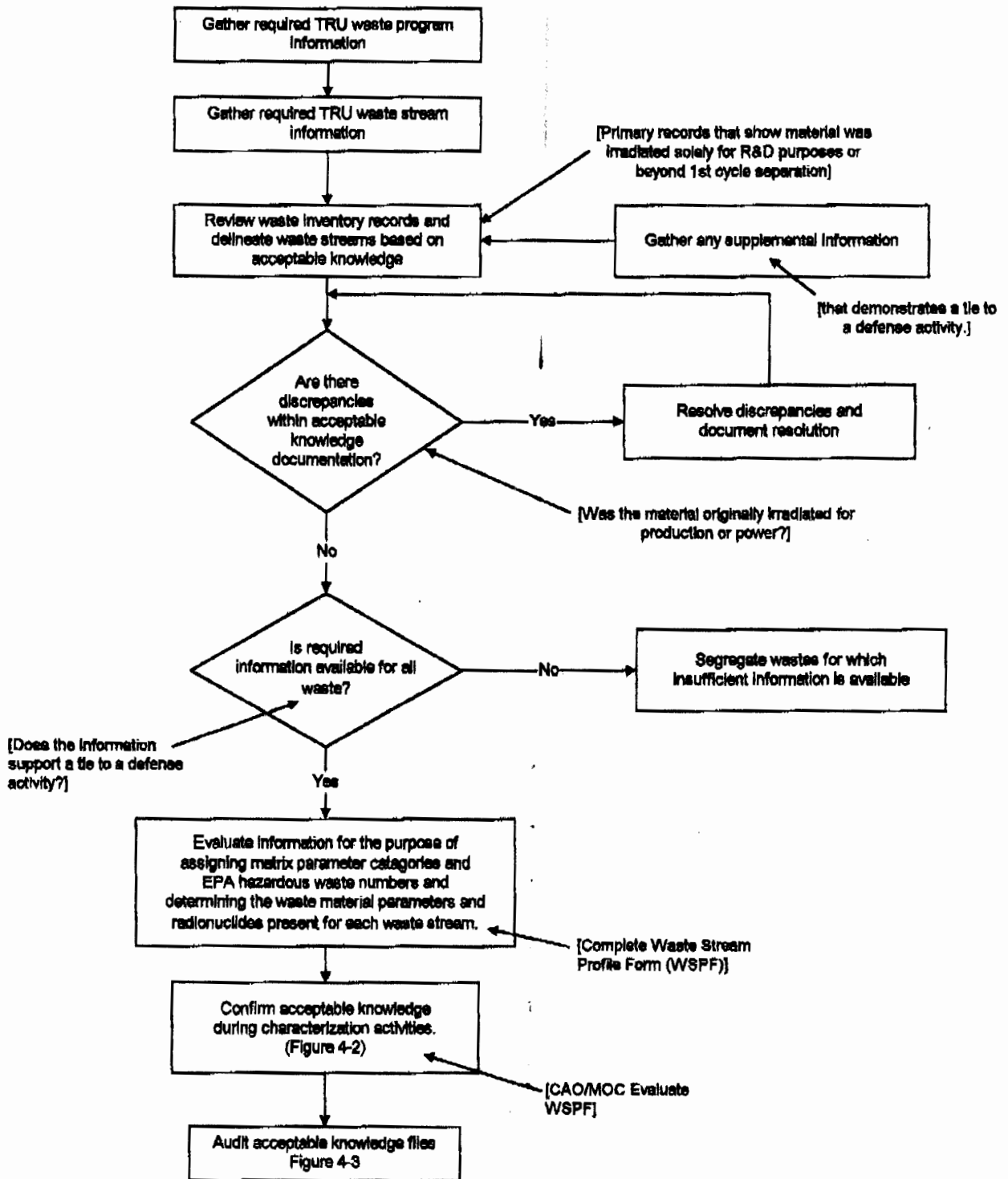


FIGURE 4.1  
Compilation of Acceptable Knowledge Documentation

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- Sites must develop and implement a procedure(s) for the confirmation of acceptable knowledge in accordance with Section 4.4.3.
- Sites must provide a cross reference to the applicable matrix parameter summary category (i.e., S3000, S4000, and S5000) to verify all of the required confirmation data has been evaluated and the proper EPA hazardous waste numbers have been assigned.
- Sites must describe how acceptable knowledge information is evaluated and any discrepancies in documentation are resolved.
- For debris waste streams, sites must describe how changes to matrix parameter categories, waste stream assignment, and any associated EPA hazardous waste numbers based on material composition are documented, as necessary.
- For newly generated waste streams, sites must describe how acceptable knowledge information is confirmed using visual examination prior to or during waste packaging.
- For all waste streams, sites must describe how acceptable knowledge information is re-evaluated if radiography or visual examination results in the reassignment of a different matrix parameter category (e.g., Plastic/Rubber (S5310) versus Paper/Cloth (S5330)).
- For all waste streams, sites must describe how waste is reassigned to a different waste stream and appropriate EPA hazardous waste numbers assigned. [Waste that has SNF or HLW must be segregated and assigned to a separate waste stream.]

The following minimum requirements must be addressed in site-specific procedures for newly generated waste: 1) scope (i.e., waste streams) and purpose; 2) responsible organization(s); 3) management controls; 4) material inputs to process; 5) process controls and range of operation that affect final matrix parameter category, waste material parameter, radionuclide, and hazardous waste determinations; 6) rate and quantity of the waste generated; 7) list of applicable operating procedures relevant to the waste determinations; 8) nonconformance reporting; 9) acceptable knowledge confirmation sampling (i.e., headspace gas sampling and/or solidified waste annual sample); and 10) reporting and records management.

Sites must develop adequate documentation to demonstrate consistency in assigning matrix parameter categories, assigning EPA hazardous waste numbers, and determining waste material parameters and radionuclides to defend the use of acceptable knowledge in making these determinations to independent auditors. The process for assembling and using acceptable knowledge includes the following steps:

- Compile all of the required information, including any acceptable knowledge information regarding the materials and processes that generate a specific waste stream, in an auditable record.
- Review the required information to determine the appropriate matrix parameter category.

[NOTE: The information shown in brackets is provided as interim guidance and does not constitute a requirement or a change to the QAPP.]

- Review the required information to determine the waste material parameters and radionuclides present.
- Review the required information to determine if the waste is listed under 40 CFR Part 261, Subpart D. Assign all listed EPA hazardous waste numbers.

**Attachment 2**

**Method for Distinguishing TRU from HLW and SNF,  
and CH-TRU from RH-TRU**

**Attachment 2****Method for Distinguishing TRU from HLW and SNF and CH-TRU from RH-TRU**

The following is a process to distinguish TRU waste from HLW and SNF, as well as CH-TRU from RH-TRU; it incorporates the existing regulatory and statutory restrictions. The steps for this process follow and are keyed to the accompanying "decision tree" diagrams.

**A**

The first decision point is whether the last source of the material has been a nuclear reactor following irradiation. If so, the material may be fuel and additional criteria need to be applied. If not, the material may be waste from a first-cycle extraction system.

**B**

The second decision point is whether the material is waste from the first-cycle extraction system. If so, it is HLW according to 10 CFR 60.2. If not, it may be TRU waste.

**C**

The third decision point is whether the material is actually fuel. If the material is fuel, additional criteria are applied. If the material in question is not nuclear reactor fuel, it may be TRU waste.

**D**

The fourth decision point is whether test specimens of fissionable materials were irradiated only for R&D purposes and not to produce power. Material irradiated solely for R&D purposes may be TRU waste, whereas other test specimens of fissionable materials are HLW/SNF.

In a memorandum dated March 1, 1995 to Charles Hansen of the DOE Richland Operations Office, Jill Lytle clarified this point (Lytle, 1995). Fuel used to power research reactors is not to be managed as RH-TRU, but test capsules (or specimens) of developmental reactor fuel that are irradiated to determine the characteristics of the fuel sample are to be so managed. The letter gives direct guidance on the issue.

"Irradiated fuel materials that should be managed as RH-TRU waste should exhibit the following characteristics:

- Have been irradiated for research and development purposes only. (Note: This should not be interpreted to imply that fuel used to 'power' test reactors may be classified as RH-TRU, but rather be classified and managed as spent nuclear fuel.) [and]
- Include irradiated fuel test residues, test materials, and/or any resultant fragments upon which tests were performed and resultant waste generated from experiments and/or examinations, such as polishing residue, cutting fluids, adsorbents, metal fines. These may also include irradiated fuel pin fragments and dispersed particulate that cannot be readily retrieved and packaged with the fuel assemblies and intact pins. [and]

- Be acceptable for final disposal at the Waste Isolation Pilot Plant, or appropriately addressed as part of a national program.

Irradiated fuel materials that should not [emphasis added] be managed as RH-TRU waste include:

- Irradiated fuel still managed as material.
- Irradiated fuel which was utilized for power or plutonium production.
- Irradiated fuel accepted by the DOE for final disposal at a DOE deep geological repository (e.g. Yucca Mountain Project Office or similar facility)."

#### **E**

The fifth decision point is whether the constituent elements of the fuel have been separated by reprocessing. The Nuclear Waste Policy Act definition of SNF has two criteria: 1) fuel withdrawn from a nuclear reactor; and 2) the constituent elements of the fuel have not been separated. Waste from the reprocessing of nuclear fuel is HLW.

#### **F**

The sixth decision point is whether the wastes are test specimens of developmental reactor fuel irradiated solely for R&D purposes (fueled experiments) and destructively examined to determine fuel sample characteristics (Lytle, 1995). If so, the material may be TRU waste.

#### **G**

The seventh decision point is whether the waste meets the criteria in section 2 (18) of the LWA, as amended. If so, the waste is TRU waste. The term "transuranic waste" means waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years. Note that this determination is made for each payload container (as required by the WAC), whereas all previous decision points are on a waste-stream basis.

#### **H**

The eighth decision point is whether the TRU waste container has a surface dose rate greater than 200 mrem/hr. CH-TRU is TRU waste with a surface dose rate less than or equal to 200 mrem/hr (LWA). RH-TRU is TRU waste with a surface dose rate greater than 200 mrem/hr (LWA and DOE Order 5820.2A). As in G, this determination is made for each payload container as required by the WAC.

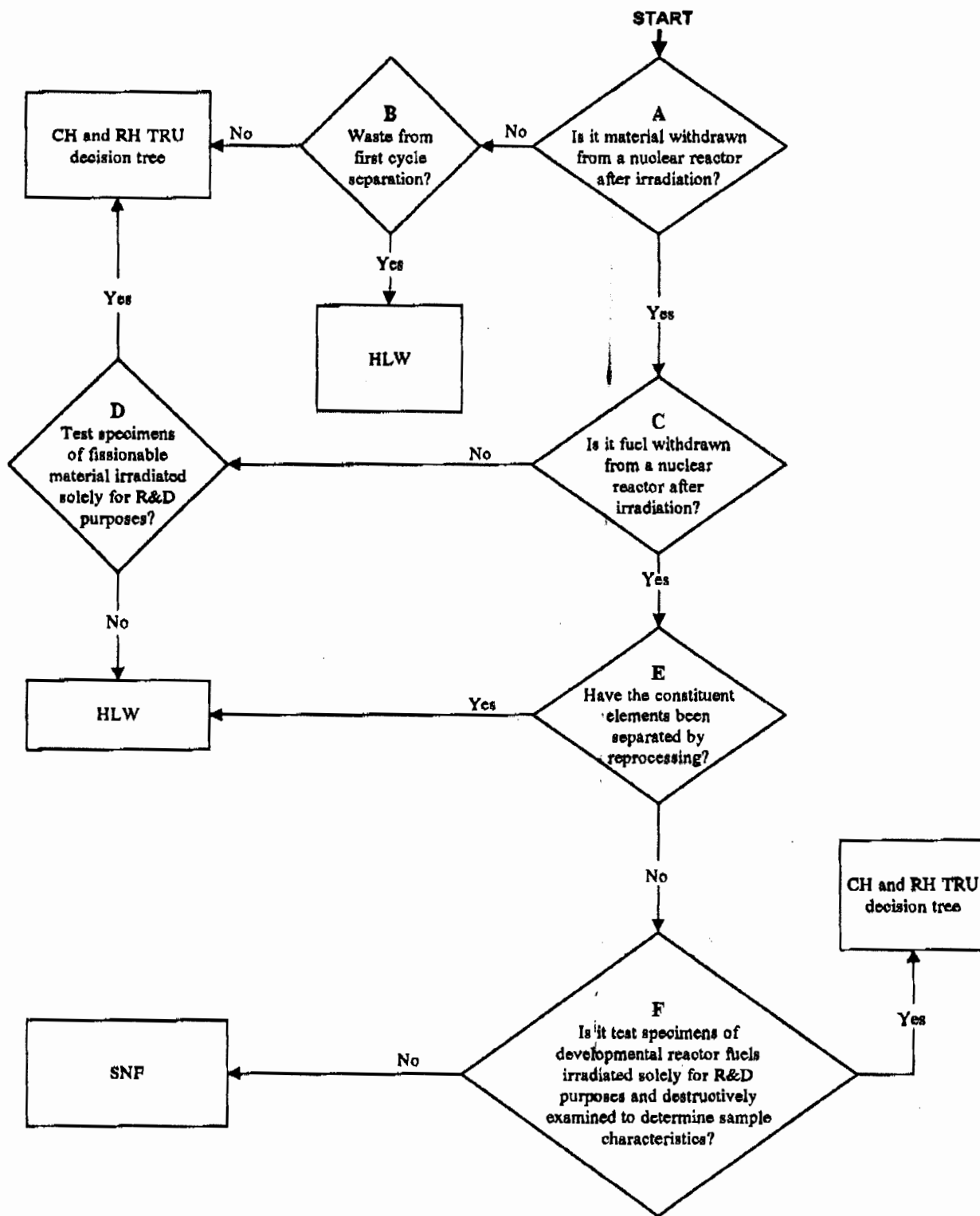
Note: RH-TRU waste destined for WIPP must meet additional criteria. The surface dose rate must be less than 1,000 rems per hour and:

- no more than 5 percent by volume of the RH-TRU received at WIPP may have a surface dose rate in excess of 100 rems per hour;
- RH-TRU received at WIPP shall not exceed 23 curies per liter maximum activity level (averaged over the volume of the canister); and
- the total curies of the RH-TRU received at WIPP shall not exceed 5,100,000 curies.

**Reference**

Lytle, J. E. (signed by Mark Frei). Memorandum to Charles A. Hansen dated March 1, 1995 (unpublished). In this memorandum the Deputy Assistant Secretary for Waste Management requests the Richland Operations Office Assistant Manager for Waste Operations to incorporate attached guidance for classifying material as either spent nuclear fuel or RH-TRU in their waste classification procedures.

### TRU WASTE DECISION TREE





### CH-TRU AND RH-TRU DECISION TREE

