Characterization Approaches Proposed for RH-TRU Wastes

INTRODUCTION

The characterization program proposed by the DOE for RH-TRU wastes is a modified version of what is already approved for CH TRU wastes. The proposed characterization program is a Performance-Based Measurement System (PBMS) approach that focuses on ensuring that sufficient data is collected to meet characterization objectives. The approach allows flexibility in applying the allowable methods to collect the necessary information. This is in contrast to the CH waste characterization approach which requires, for most characterization activities, that a specific method be used to collect data from 100% of the waste.

In order to minimize potentially-large RH-TRU waste characterization costs and also to minimize worker radiation exposure to highly-radioactive RH-TRU waste containers canisters, changes to the characterization approach are necessary. Procedures that rely on AK, which in turn relies largely on process knowledge, are proposed for quantifying and tracking the important RH-TRU waste components. Proposed tracking of the waste components is based on waste stream information. When AK does not provide the necessary waste component information, sampling programs or direct measurement characterization methods (radiography, radioassay, and/or VE) will be used as appropriate. The DOE's approach allows sites to tailor their programs to lower worker exposure, while ensuring that necessary information is collected to meet characterization objectives for safely managing and disposing of the waste.

RH-TRU wastes may contain both radioactive and non-radioactive chemical components. To comply with RCRA requirements, chemical components must be identified. Three chemical constituents have a potential impact on the long-term performance of the repository. These are: 1) the amount of free water; 2) the amount of corrodible metals; and 3) the amount of cellulosics, plastics, and rubber.

The challenges for safely characterizing RH-TRU mixed wastes are substantially greater than for CH TRU wastes. The RH-TRU mixed wastes have the same physical characteristics as the CH TRU wastes (i.e., debris, homogeneous solids, and soils/gravel). However, the distinguishing difference between the two wastes is the radioactivity of relatively short-lived beta and gamma emitters (including the fission and activation products, that can have a surface dose rate of up to 5,000 times more than the largest allowable CH rate) are characteristic of RH-TRU mixed wastes. The higher external dose rates of the RH wastes necessitate additional

precautions be taken in waste management procedures. Whereas CH wastes are stored in unshielded buildings, moved using operators and forklifts, and inspected by physically viewing its condition, RH-TRU mixed wastes are typically stored in heavily shielded vaults or hot cells and managed by indirect management of the waste containers. The proposed RH-TRU mixed waste operations incorporate specially-designed equipment and shielded containers and storage areas to unload, move and store the wastes. The process is intended to minimize operator/technician exposure to the penetrating radiation associated with RH-TRU mixed wastes. The indirect interaction includes inspecting the waste using remote cameras and using specially-designed equipment and shielded containers to move the waste.

Since the volume of RH wastes to be disposed at the WIPP is less than 5% of the total CH wastes, the decision was made to place the RH waste containers in horizontal holes pre-drilled in the walls of the underground rooms where the CH wastes containers are to be stacked. Thus the RH wastes must be placed prior to stacking the CH wastes on the repository floor.

RH CHARACTERIZATION

The proposed RH characterization program (WAP) incorporates a characterization approach that relies on both AK and testing of the waste. The waste characterization proposal is based on EPA guidance published by the EPA's Office of Solid Waste and Emergency Response for a Performance-Based Measurement System (PBMS). The implementing plan (EPA 1994) outlines guiding principles for such a system and states:

"PBMS conveys what needs to be accomplished, but not prescriptively how to do it. Under a performance-based approach, EPA would specify questions to be answered by monitoring, the decisions to be supported by the data, the level of uncertainty acceptable for making the decisions, and the documentation to be generated to support the PBMS approach in the monitoring program."

The EPA further clarified the PBMS approach by stating:

"Regulatory methods are written so that they may be used as quantitative trace analytical methods to demonstrate that a waste does not contain constituents that require it to be managed as a hazardous waste. If particular RCRA applications do

not require this rigor, looser analytical criteria may be applied, provided that they satisfy the data quality requirements for the particular application. Since data quality needs are project-specific in the RCRA Program, in order to successfully perform analyses it is necessary to address data quality issues prior to initiating any analyses. Good science indicates that, at a minimum, the following questions should be asked before beginning any analyses:

1. What is the purpose of this analysis? (Why are we doing this analysis?)
2. How (for what action) is the data generated from this analysis to be used?
3. What are the data quality needs for this project, i.e. how good does the data have to be to be useful for its intended purpose (including regulatory drivers, target analytes, matrices, concentration levels, statistical confidence levels, etc.)?

CHARACTERIZATION METHODS

The characterization methods in the proposed RH WAP are AK, radiography, and VE; site specific methods are selected to ensure quality control. The RH WAP requires that AK be used in making hazardous waste determinations. Under the proposed approach, AK may also be used to determine the physical form of the waste and the absence of prohibited items. Hazardous waste determinations made using AK may be supplemented with applicable information obtained through radiography and/or VE if the AK information alone is insufficient for applying hazardous waste numbers. Testing is required to confirm the characterization that is done using AK as the sole characterization technique; this confirmation utilizes radiography and/or VE. The assignment of hazardous waste numbers by using AK does not have to be confirmed. Due to differences in site-specific AK information and the intense radiation associated with RH-TRU wastes, the process used for confirming the AK must also be site-specific. Each site is to provide confirmation on a representative sample of the waste stream.

The characterization methods in the proposed program for compliance with 40 CFR 94 requirements are AK, radioassay, radiography, and radiological survey. In this program AK is used to identify the physical form of the waste (summary category group), to quantify the important waste components (metals, cellulosics, plastics, rubber, free water)—and where feasible—to quantify the total radioactivity of waste

streams. AK may be supplemented with applicable information obtained through radioassay or radiography if the AK information alone is insufficient to meet characterization objectives.

AK refers to applying knowledge of the wastes based on the materials or processes used to generate the wastes. AK includes documented attributes of waste streams, such as chemical, physical, and radiological properties. This may include process knowledge, which relies on the generators' knowledge of the material properties associated with the waste-generating processes; the fate of those materials during and subsequent to the processes; and associated administrative controls. Process knowledge commonly includes detailed information on the waste obtained from existing waste analysis data; review of waste-generating processes; or detailed information relative to the properties of the wastes that are known due to site-specific and/or process-specific factors (e.g., material accountability and tracking systems or waste management databases may supply information on wasted isotopic composition and/or quantity of radionuclides, among other waste attributes).

Waste characterization using AK involves the compilation and evaluation of information concerning waste-generating processes or activities at a site. AK information may include previous testing data; waste generating procedures; chemical inputs to the processes; time period that the processes took place; the facilities involved; types of waste generated; and past sampling, analytical data, and hazardous waste determinations made to satisfy host state requirements. AK information may contain reference materials; process flow diagrams; personnel interviews; analytical results; hazardous waste determinations under RCRA; and packaging logs and videotapes. AK information may also include administrative controls as a basis for the absence of prohibited items in the waste.

AK is used in program activities to characterize RH-TRU wastes to the extent practicable as determined on a site-by-site basis depending upon the types of wastes being characterized and the types of data required. Hence, AK balances requirements for providing definitive characterization data of waste streams where sampling and analysis are not feasible or necessary (e.g., waste streams for which it is difficult to obtain a representative sample because of physical form and/or heterogeneous composition—including metals, glass, combustibles).

Radiography may be used for determining physical form; the absence of prohibited items; and quantifying non-radioactive waste components. Additionally,

radiography may be used on a limited basis to supplement AK in assuring that appropriate EPA hazardous waste numbers are assigned. Radiography is a nondestructive qualitative and semi-quantitative technique that involves X-ray scanning of waste containers to identify and verify container contents. When radiography data is required, representative selections of containers will be used for these measurements. However, due to the intense radiation and lead shielding associated with RH-TRU wastes, it may not be possible to image all of the waste containers using a site's radiography equipment. Therefore, those sub-populations selected according to the operational constraints associated with the radiography operations (including image quality and operator safety) may be used. To reduce waste characterization worker exposure, the RH WAP does not propose a replicate scan, as is required for radiography of CH TRU wastes. A replicate scan requires removing the container from the radiography system and then replacing it at a later time, resulting in additional exposure. Using VE as a quality control check on radiography also is not proposed in order to reduce waste characterization worker exposure.

The VE is a characterization technique of the proposed RH WAP that may be used for determining physical form and absence of prohibited items, and may be used on a limited basis to supplement AK to ensure that appropriate EPA hazardous waste numbers are assigned. The proposed RH WAP does not make any distinction between newly-generated and retrievably-stored waste for characterization (unlike the CH WAP); therefore, the RH WAP proposes to use VE as a characterization technique for any container. The proposed RH WAP requires that either a videotape (or equivalent) be made of all VE characterizations, or that dual operator signatures be documented in lieu of a tape. Use of existing videotape records (or equivalent) is permitted as it eliminates additional exposure of the waste characterization worker, while ensuring quality control.

Similar to the requirements for radiography in the proposed RH WAP, VE is not required on every container. VE on every container would result in additional exposure to the waste characterization worker and may not be needed to meet quality control supported by VE. Due to the intense radiation associated with RH-TRU waste, it may not be possible to open all of the RH-TRU waste containers for VE due to operational constraints (e.g., hot cell limitations on maximum dose rate). Therefore, subpopulations based on the VE operational constraints may be used. If VE data are being used to meet quality control, containers examined must be representatively selected. Detailed information regarding selection of a

representative container must be included in the site-specific implementation procedures. Because VE operations can produce data that are similar in type and quality to radiography, the procedures parallel those for radiography in the proposed RH WAP.

In addition to the characterization techniques required by the RH WAP, the characterization program for RH waste includes AK and radioassay techniques for determining the radionuclide content of the waste. Radioassay is a term used to define measurement methods for determining the radionuclide content of wastes, and includes both nondestructive assays (NDA) and destructive assays (i.e., radiochemistry). The isotopic composition of RH-TRU wastes is usually determined from documented AK and, in some cases, from measurements taken on the product material during processing at each site. The isotopic composition of the waste need not be determined by direct analysis or measurement of the waste unless AK is not available.

The NDA techniques allow an item to be assayed without altering its physical or chemical form. NDA techniques can be classified as active or passive. Passive NDA is based on the observation of spontaneously-emitted radiations created through radioactive decay of the isotopes of interest or their radioactive daughters. Most active NDA is based on the observation of gamma or neutron radiation that is emitted from a target isotope when that isotope undergoes a transformation resulting from an interaction with stimulating radiation provided by an appropriate, external source.

In the destructive assay technique, a representative sample is collected from the waste and physically and/or chemically processed for subsequent analysis by standard radioactivity counting methods. Radiochemical analyses are to demonstrate that sampling methods and analytical equipment used can produce results with sufficient precision and accuracy to meet disposal requirements.

Dose rate measurements can provide estimates of the radionuclides present in the waste. Measurements are taken of the containerized waste and correlated to a known isotopic inventory to provide estimated curie contents of the container. This process requires knowledge of the isotopic ratios for the waste stream. The isotopic ratios can be determined by AK or by measurement of a sample of the waste. The sample can be a smear taken on the waste or an aliquot of the waste subjected to radiochemistry.

Radiochemistry is a destructive assay technique in which a representative sample is collected from the waste and physically and/or chemically processed for subsequent analysis by standard radioactivity counting methods. Radiochemistry is most commonly used to analyze the radionuclide content of homogeneous waste forms resulting from liquids such as process sludge or other sludge waste forms. (DOE 2001 b)

COMPARISON OF THE RH WAP AND CH WAP

The RH-TRU wastes are currently prohibited at the WIPP because it has not yet been demonstrated that RH-TRU waste could be characterized in the same manner as CH TRU waste. The DOE submits that RH-TRU waste should not be characterized using the same criteria as those used for CH TRU waste; thus, there are differences between the RH WAP and CH WAP. The major differences, which reflect the Performance-based measurement system (PBMS) approach in the RH WAP, are summarized in Tables 2 through 5. In general, the proposed RH WAP requires AK, radiography, and/or VE as characterization methods for RH-TRU waste. The CH WAP requirements for each of the proposed methods has been maintained except where the specific requirement conflicts with the PBMS approach, or could lead to unnecessary additional waste characterization worker exposure. The CH WAP requires sampling and analysis to confirm AK and the application of some characterization techniques on every container. The proposed RH WAP does not require confirmatory testing, sampling, or analysis and allows for representative selection of containers for radiography and VE; thus workers are not unnecessarily exposed to the additional penetrating radiation associated withconducting confirmatory activities.

Any RH-TRU waste container that has not been characterized by AK—supplemented as necessary by radiography and/or VE—is prohibited at the WIPP facility.

Data Quality Objectives		
RH WAP Requirement	**Difference from CH WAP**	**Justification**
Determine the physical form of the waste at the Summary Category Group level • S3000: Homogeneous Solids • S4000: Soil Gravel • S5000: Debris	Only the Summary Category Group is necessary for RH-TRU waste	Evaluation of the repository modeling indicates that the amount of waste in the individual material parameter categories does not affect repository integrity. (See Appendix 1)
Determine the absence of prohibited items • Liquids (Permit Module II, Section II.C.3.a • Pyrophoric materials (Permit Module II, Section II.C.3.b) • Incompatible waste (Module II, Section II.C.3.d) • Explosives and compressed gases (Permit Module II, Section II.C.3.e) • PCBs with concentrations greater-than-or-equal-to 50 ppm (Module II, Section II.C.3.f)	None	N/A
Determine the listed and characteristic hazardous constituents in the waste • Determine if a waste is listed as specified in 20.4.1.200 NMAC (incorporating 40 CFR §261.31 and 33); assign the appropriate US EPA hazardous waste number(s); and ensure that the US EPA hazardous waste number(s) are listed in Permit Attachment O. • Determine if a waste exhibits the toxicity characteristic as specified in 20.4.1.200 NMAC (incorporating 40 CFR §261.24); assign the appropriate US EPA hazardous waste number(s); and ensure that the US EPA hazardous waste number(s) are listed in Permit Attachment 0.	None	N/A

Table 2. (cont'd)

Data Quality Objectives		
RH WAP Requirement	**Difference from CH WAP**	**Justification**
Identification of Appendix VIII constituents	Not required for RH-TRU waste	Identifying the presence of additional Appendix VIII constituents that do not overlap with the hazardous constituents identified for a characteristic or listing does not affect the integrity of the repository and is not necessary to store or dispose of the waste at WIPP.

Table 3. Differences between Proposed RH-TRU Mixed Waste Characterization Acceptable Knowledge Method and the CH TRU Mixed Waste Characterization Acceptable Knowledge Method.

Acceptable Knowledge		
RH Requirement	**Difference from CH**	**Justification**
Administrative controls for prohibited items Sites may rely on administrative controls to ensure absence of prohibited items. Sites must implement a procedure(s) which addresses the following elements associated with administrative controls: • Organization(s) responsible for compliance with administrative controls. • A description of the administrative controls used by the site to ensure that prohibited items are documented and managed in accordance with site-specific certification plans. • The oversight actions, and frequency of actions, to verify compliance with administrative controls. • On-the-job training specific to administrative control procedures. • A statement that personnel may stop work if noncompliance with administrative controls is identified. • The nonconformance and corrective action process	None	N/A
List of information necessary The Permittees shall obtain from each Department of Energy (DOE) RH-TRU waste generator/storage site (site), AK information for meeting the required DQOs in Section R-1c.	The RH WAP requires that only information necessary to meet the applicable DQO(s) be collected and maintained, rather than requiring a prescriptive list of information for all AK.	Based on the PBMS approach, only the data related to the intended purpose need be collected.

Table 3. (cont'd)

Acceptable Knowledge		
RH Requirement	**Difference from CH**	**Justification**
AK auditing The AK process and waste stream documentation must be evaluated through assessments by quality assurance organizations. Audit checklists for AK shall be used to review applicable elements based on the DQOs that are being met using AK data.	Only the information required by the site procedure, which specifies the information necessary to meet the intended DQO(s), will be subject to audit.	Based on the PBMS approach, only the data related to the intended purpose need be collected or evaluated. Each site will establish the requirements that are necessary to meet the intended DQO(s) in their procedure.
AK required for determining listed constituents AK is required to identify toxicity characteristic and listed U.S. EPA hazardous waste numbers pursuant to 20.4.1.200 NMAC (incorporating 40 CFR §§ 261.24,261.31 and 261.33). As allowed by 20.4.1.500 NMAC (incorporating 40 CFR 264.13(a)(2)), the assignment of U.S. EPA hazardous waste numbers in compliance with the generator host-state requirements is considered AK for this RH WAP.	None	N/A
Hazardous waste numbers must be applied conservatively If different sources of information indicate different hazardous wastes are present, then sites shall include all sources of information in its records and conservatively assign all appropriate U.S. EPA hazardous waste numbers.	None	N/A
Use of hazardous waste determinations made in accordance with host-state requirements as AK As allowed by 20.4.1.500 NMAC (incorporating 40 CFR 264.13(a)(2)), the assignment of U.S. EPA hazardous waste numbers in compliance with the generator host-state requirements is considered AK for this RH WAP.	This information is used as AK for CH TRU waste, but was not specifically called out in the CH WAP.	Hazardous waste determinations must be conducted in accordance with the minimum requirements of RCRA, regardless of the state in which they are made. 40 CFR 264.13(a)2 allows for the use of data developed under 40CFR Part 261, which is the process that is used to establish the hazardous waste determination in the host state.

Table 3. (cont'd)

Acceptable Knowledge		
RH Requirement	**Difference from CH**	**Justification**
Use of AK information from similar waste streams • If sites can demonstrate correlations and similarities between the CH and RH-TRU waste operations, characterization information for the CH TRU waste stream may be used to determine the physical form, U.S. EPA hazardous waste number(s), and absence of prohibited items for the RH-TRU waste stream. • If sites can demonstrate correlations and similarities between the RH- TRU waste operations at other sites, characterization information for that RH-TRU waste may be used to determine the physical form, U.S. EPA hazardous waste number(s), and absence of prohibited items for their RH-TRU waste stream.	None	N/A
Training Site personnel responsible for compiling AK, assessing AK, and resolving discrepancies associated with AK shall be qualified and trained in the following areas at a minimum: • RH WAP and the RH TSDF-WAC • State and Federal RCRA regulations associated with solid and hazardous waste characterization • The nonconformance and corrective action process • Site-specific procedures associated with waste characterization using AK	None	N/A

Table 3. (cont'd)

Acceptable Knowledge		
RH Requirement	**Difference from CH**	**Justification**
QAO: Precision The qualitative determinations, such as compiling and assessing AK documentation, do not lend themselves to statistical evaluations of precision. Therefore, precision requirements are not established for AK. However, the acceptable knowledge information is subject to audits as specified in Permit Attachment R3.	None	N/A
QAO: Accuracy The qualitative determinations, such as compiling and assessing AK documentation, do not lend themselves to statistical evaluations of accuracy. Therefore, accuracy requirements are not established for AK. However, AK must be confirmed if it is used as the sole characterization technique to meet a DQO. In addition, the AK process is subject to audits as specified in Permit Attachment R1.	Testing data are required to confirm AK if it is used as the sole characterization technique and the audit process will be used to ensure that the information was accurately collected.	Newly collected data under the WAP should not require additional confirmation. Only information brought into the program through the AK process requires confirmation and only if it is the only information used to meet one or more of the DQOs.
QAO: Completeness The AK record shall contain sufficient information to meet the DQO(s) in Section R-2 that are being supported using AK data or supplemental information must be collected. If additional AK information is part of the identified supplemental information, the additional AK information must be collected and documented to ensure AK completeness.	Only the information that is relevant to the intended DQO(s) must be 100% complete based on the site procedure.	Based on the performance-based approach, only the data related to the intended purpose need be collected.
QAO: Comparability Comparability is ensured through sites meeting the training requirements and minimum standards outlined in this RH WAP. Sites shall ensure appropriate U.S. EPA hazardous waste numbers are assigned in accordance with Permit Attachment R3 and ensure information regarding its waste is available to other sites.	None	N/A
QAO: Representativeness Representativeness will be satisfied by ensuring that the process of obtaining, evaluating, and documenting AK information is performed in accordance with the requirements established in Permit Attachment R3.	None	N/A

Table 3. (cont'd)

Acceptable Knowledge		
RH Requirement	**Difference from CH**	**Justification**
AK Confirmation If AK is used as the sole characterization method to meet a DQO, an AK confirmation program must be developed and implemented by the generator/storage site.	AK must only be confirmed if it is not supported by new testing to meet the DQO. Confirmation must be conducted on a representative sample rather than 100%.	If new testing is conducted, the results of that testing are used in addition to the AK information to meet the DQO providing an implicit confirmation of the AK information used. If no new testing is needed to meet the DQO, the AK information requires explicit confirmation with new testing data. Representative sampling meets the regulatory requirements for sampling.

Table 4. Differences between Proposed RH-TRU Mixed Waste Characterization Radiography Method and the CH TRU Mixed Waste Characterization Radiography Method.

Radiography		
RH Requirement	**Difference from CH**	**Justification**
Material parameter category weight estimation	Not required for RH-TRU waste	Evaluation of the repository modeling indicates that the integrity of the repository is not affected by conservatively bounding the material parameters in RH waste.
Requirement to use other characterization technique if contents cannot be resolved due to interference If a site operates a radiography system that is not capable of X-ray penetration or image quality sufficient to provide information to meet the DQOs, then another suitable waste characterization technique must be used (i.e., AK or VE).	None	N/A
Complete Data Form A radiography data form is also used to document the physical form(s) of the waste and the overall summary category group, the absence of prohibited items and, to a limited extent, hazardous constituents that can be correlated to physical indicators, depending on the DQOs that are being met using radiography data.	None	N/A
Videotape Operation To perform radiography, the operator scans waste container while viewing a video image. A videotape recording (or equivalent) is made of the waste container scan.	None	N/A
Independent Observation Independent observations of the video output of the radiography process shall be performed under uniform conditions and procedures.	None	N/A

Radiography		
RH Requirement	**Difference from CH**	**Justification**
Replicate scan	Not required for RH-TRU waste	Independent observations of radiography are used to meet the accuracy QAO; therefore, any additional worker exposure associated with performing a replicate scan is not necessary.
Contents Test drum is required to contain items common to the waste streams to be generated/stored at the generator/storage site.	None	N/A
Formal and On-the-job Training Although the site-specific training programs will vary to some degree, the Permittees shall require each site's program to contain the following required elements based on the DQOs that are being met using data from radiography: Formal Training 1. Project Requirements 2. State and Federal Regulations 3. Basic Principles of Radiography 4. Radiographic Image Quality 5. Radiographic Scanning Techniques 6. Application Techniques 7. Radiography of Waste Forms 8. Standards, Codes and Procedures for Radiography 9. Site-specific instruction	Training curriculum and drum are only required to contain items that are relevant to the DQO that is being met with radiography data.	Training that is not relevant to the intended purpose of radiography is unnecessary.

Table 4. (cont'd)

Radiography		
RH Requirement	**Difference from CH**	**Justification**
On-the-Job Training 1. System Operation 2. Identification of Summary Category Groups (only required if radiography data are used to support determining the physical waste form) 3. Identification of Prohibited Items (only required if radiography data are used to support determining the absence of prohibited items) 4. Identification of Physical Indicator Parameters Used for Assigning U.S. EPA Hazardous Waste Numbers (only required if radiography data are used as a supplement to AK for ensuring appropriate U.S. EPA hazardous waste numbers are assigned)		
QAO: Precision The precision of the radiography image is verified prior to use of the system through viewing and being able to distinguish an image test pattern.	No change to image test pattern requirement. Relative percent difference (RPD) calculated for CH TRU waste material parameter weights not required.	Material parameter weights are not necessary to ensure the integrity of the repository and are not measured.
QAO: Accuracy An independent observation will be conducted by comparing the contents of a radiography data form to the videotape (or equivalent) of the associated radiography scan by a qualified independent reviewer at the frequency of one per testing batch or once per day, whichever is less frequent.	Use independent observation of radiography rather than VE to ensure accuracy.	Independent observations provide assurance that accuracy is maintained without additional worker exposure during visual examination.
QAO: Completeness A videotape (or equivalent) of the radiography examination and an associated complete data form will be obtained for all waste containers subject to radiography.	None	N/A
QAO: Comparability The comparability of radiography data from different sites shall be enhanced by using standardized radiography operator qualifications that comply with this RH WAP.	None	N/A
QAO: Representativeness Representativeness for waste selected for radiography will be ensured through random container selection.	RH WAP requires radiography of representative waste container selected randomly from the population. There is no CH QAO for representativeness due to the requirement to do 100% radiography	Additional worker exposure from performing 100% radiography is not necessary if a representative waste container is selected.

Table 5. Differences between Proposed RH-TRU Mixed Waste Characterization Visual Examination Method and the CH TRU Mixed Waste Characterization Visual Examination Method.

Visual Examination		
RH Requirement	**Difference from CH**	**Justification**
Material parameter category weight estimation	Not required for RH-TRU waste	Repository modeling demonstrates that the repository integrity is not affected by conservatively bounding the material parameters in RH-TRU waste.
Complete Data Form The results of VE documented on the data form shall clearly identify the physical form(s) and the overall summary category group, the absence of prohibited items and, to a limited extent, hazardous constituents that can be correlated to physical indicators depending on the DQOs that are being met using VE data.	None	N/A
Videotape Operation The VE shall consist of a qualitative evaluation of the waste container contents, and shall be recorded on videotape (or equivalent) or, if two trained operators perform the VE a videotape (or equivalent) is not required.	None	N/A
Independent Observation Oversight functions (i.e., data validation, Permit Attachment R2) include independent review of VE data forms by a qualified VE operator other than the individual who performed the first examination.	Independent observations are required if a single operator conducts the VE.	Independent observation of the VE is necessary to meet the accuracy QAO if two operators are not used.
Representative Sample	Perform VE on representative waste containers selected randomly from the population.	20.4.1.500 NMAC (incorporating 40 CFR 264.13(a)1) requires that a representative sample be taken; any additional worker exposure associated with additional VE is not necessary if a representative waste container is selected.

Table 5. (cont'd)

Visual Examination		
RH Requirement	**Difference from CH**	**Justification**
Training Curriculum Although site-specific training programs will vary to some degree, the Permittees shall require each site's program to contain the following required elements: Form Training 1. Project Requirements 2. State and Federal Regulations 3. Application Techniques 4. Site-Specific Instruction On-the-Job Training 5. Identification of Summary Category Groups (only required if VE data are used to support determining the physical waste form) 6. Identification of Prohibited Items (only required if VE data are used to support determining the absence of prohibited items) 7. Identification of Physical Indicator Parameters Used for Assigning U.S. EPA Hazardous Waste Numbers (only required if VE data are used as	Requires the training curriculum to cover material that is relevant to the DQO that is being met using visual examination data.	Training that is not relevant to the intended purpose of VE is unnecessary.
Training Drum Contents	Training drum is required to contain items that are relevant to the DQO that is being met with visual examination data.	Training that is not relevant to the intended purpose of VE is unnecessary.

Table 5. (cont'd)

Visual Examination		
RH Requirement	**Difference from CH**	**Justification**
Training Examinations Qualification of VE operators shall, at a minimum, encompass the following requirements: 1. Successfully pass a comprehensive exam based upon training enabling objectives. The comprehensive exam will address the VE training requirements and implementation stipulated in this RH WAP. A minimum score of 80% is required to pass the exam. 2. Demonstrate capability in the presence of the appointed site VE expert.	Successfully passing a comprehensive examination is required.	Passing an examination is required because standardized VE operator qualification is used to meet the comparability QAO.
QAO: Precision Precision - The qualitative determinations, such as identifying the summary category group, made during VE do not lend themselves to statistical evaluation of precision because of the qualitative nature of the inspection. Therefore, precision requirements are not established for VE. However, the VE information is subject to the Permittees' Audit and Surveillance Program.	VE provides qualitative data, so a precision is not established. There is no QAO for VE precision in the CH WAP.	N/A
QAO: Accuracy An independent observation will be performed by comparing the contents of a VE data form to the videotape (or equivalent) of the associated examination at the frequency of one per testing batch on once per day, whichever is less frequent. In the case of VE performed by two operators, dual signatures on the data form will verify accuracy in lieu of the independent observation.	Use independent observation or dual signatures for VE to ensure accuracy. There is no QAO for VE accuracy in the CH WAP.	Independent observations or signatures of both operators performing visual examination provide assurance that accuracy is maintained.

Table 5. (cont'd)

Visual Examination		
RH Requirement	**Difference from CH**	**Justification**
QAO: Completeness A videotape (or equivalent) of the VE and an associated complete data form will be obtained for all waste containers subjected to VE. In the case of VE performed by two operators, dual signatures on the data form will verify completeness.	Videotape of the VE of dual signatures on the data form. Data forms must be fully completed. There is no QAO for VE completeness in the CH WAP.	Fully completed data forms and videotapes or dual signatures provide assurance of completeness.
QAO: Comparability The comparability of VE data from different sites shall be enhanced by using standardized VE operator qualifications that comply with this RH WAP.	Standardized training that meets the WAP is required. There is no QAO for VE comparability in the CH WAP.	Using standardized training requirements ensure that comparability is enhanced.
QAO: Representativeness Representativeness for waste selected for VE will be ensured through random container selection.	Require representative sample taken randomly from the population. There is no QAO for VE representativeness in the CH WAP.	Using a representative sample meets the regulatory requirements.