EPA'S PRELIMINARY DECISION ON DOE'S REMOTE-HANDLED WASTE CHARACTERIZATION PROGRAM IMPLEMENTATION PLAN

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ABSTRACT

This paper describes the U.S. Environmental Protection Agency's (EPA or we) preliminary decision concerning approval of the Department of Energy's (DOE) proposed waste characterization (WC) program implementation plan (WCPIP) for characterizing remote-handled (RH) transuranic (TRU) waste. EPA regulates the disposal of TRU waste at the Waste Isolation Pilot Plant (WIPP) repository in Carlsbad, New Mexico. In our WIPP Certification Decision of 1998, we stated that RH TRU waste sites may not dispose of their waste at WIPP until they demonstrate to EPA that such waste can be adequately characterized and can meet the regulatory limits for TRU waste emplaced at the WIPP. Our regulations also require that EPA evaluate site-specific WC activities leading to site WC (process/program) approvals.

The paper briefly presents DOE's rationale for (a) proposing an RH waste stream-specific characterization program different than that for contact-handled waste; and (b) providing flexibility to sites to develop WC approaches that comport with the general requirement that the processes must meet Data Quality Objectives, but could use any of the processes identified in the WCPIP, as well as procedures that may be different than those contained in the DOE's WCPIP subject to prior approval by DOE and EPA. Additional information that RH sites must provide to EPA for approval prior to characterizing their RH waste destined for disposal in the WIPP repository is also presented. In addition, the paper will discuss the public comments we received related to our preliminary decision on the DOE's WCPIP.

INTRODUCTION

On December 19, 2003, the U.S. Environmental Protection Agency (EPA or we) issued our preliminary decision to approve the TRU W~~w~~aste Characterization Program implementation plan (WCPIP). Our letter stated that the RH TRU Waste Characterization Plan and the WCPIP provides an adequate framework for conducting RH waste characterization while giving RH sites the flexibility to develop site-specific programs for characterizing RH waste. This paper discusses those elements of the DOE's RH program EPA found acceptable and additional information EPA would require from RH sites seeking our approval of their WC program before the RH sites can ship waste for disposal at the Waste Isolation Pilot Plant (WIPP).

The WCPIP is the primary document governing DOE's proposed characterization program for RH-TRU wastes intended for disposal at the WIPP. The WCPIP was developed by DOE and refined through extensive discussion between the EPA and the Carlsbad Field Office (CBFO) of the DOE over a period of approximately eighteen months. EPA received the first formal Notification of Planned Change to the EPA Part 194 Certification of the Waste Isolation Pilot Plant ("RH Submission") from the DOE in June of 2002. EPA reviewed this document for technical completeness and adequacy, and we provided

comments. DOE submitted Revision 0d to EPA in October ~~of~~ 2003, and it is this latest revision upon which EPA based its preliminary approval of DOE's program for characterizing RH waste.

EPA'S APPROACH FOR EVALUATING DOE's ~~THE~~ RH PROPOSAL

EPA's evaluation began by assessing the differences between the RH proposal and the well-established contact-handled (CH) WC program already implemented at multiple DOE waste generator sites for WIPP waste. We determined key information necessary for the proposed RH characterization scheme to comply with EPA's WIPP waste characterization requirements (40 CFR 194.24) and requested additional information from DOE to explain and justify the identified differences. Based on the Department's stated concerns regarding worker exposure and other programmatic considerations, the RH proposal did not mandate measurement of radiological contents or visual examination (VE) of all RH containers destined for WIPP as has historically been done under the CH program. Instead, DOE's RH proposal relies more heavily on the collection of acceptable knowledge (AK) data for RH waste, with potential qualification of these data under any of the four methodologies specified in EPA's quality assurance requirements (40 CFR 194.22(b)): confirmatory testing, peer review, or demonstration of equivalent QA programs.

In its proposal, DOE followed the Data Quality Objective (DQO) Evaluation Process contained in EPA Guidance EPA QA/G-4 (1) to derive DQOs that the RH characterization program must achieve. Using this process, DOE identified the following DQOs for the WIPP with respect to management of RH waste:

- Defense Waste Determination
- DQOs for Radioactive Properties- TRU Waste Determination, RH Waste Determination, and Activity Determination
- DQOs for Physical and Chemical Properties- Residual Liquids and Physical Form

The proposal identified RH waste characterization method-specific Quality Assurance Objectives (QAOs). Condition 2 of EPA's WIPP Certification Decision requires that the TRU waste characterization data comply with the quality assurance elements of data accuracy, precision, representativeness, completeness, and comparability (40 CFR 194.22)

The DOE proposal identified several characterization methods with specific QAOs that sites may use to meet the DQOs. AK is a methodology common to each DQO, although the DOE proposal allows sites to ~~may~~ use any of the characterization methods described in the WCPIP to achieve individual DQOs. DOE requires the collection of AK for each waste stream. If AK is used to meet a DQO, it must be qualified by Peer Review, Corroborating Data, Confirmatory Data, and/or equivalent QA program demonstration. EPA's rule indicates that combinations of these AK qualification methods may be required to adequately qualify the AK record. For example, a combination of equivalent QA program demonstration and confirmatory testing could be required to adequately qualify the information for use in the characterization program. The following flow chart presents the AK characterization process proposed by DOE and addressed by EPA's preliminary approval.

Sites would determine the best method of meeting DQOs and will present the overall characterization process in their Site Certification Plans requiring EPA approval prior to implementation. This approval would ensure that EPA is fully aware of and approves the selected pathway(s). The RH sites would collect AK information that allows determination of the waste stream and identification of specific drums within that waste stream. DOE defines waste stream as "consisting of waste material generated from a single process or activity, or waste with similar physical, chemical, and radiological properties." DOE mandates the acquisition of container-specific data; i.e., the acquisition of manifests or other identifiers specific to each container to ensure that the most detailed information for that container is available and is

used to assist with waste stream assignments. RH sites would then assess available DQO information. If the AK record is inadequate to address certain DQOs, "additional information" (including possibly measurement data) shall be obtained. EPA requires the provision of all documents associated with measurement collection (i.e., sampling plans, etc) when this is performed. (See below for documentation that EPA requires which is unique to the RH program when compared with the current CH program.) If confirmatory testing or any other measurement or modeling is performed, EPA expects all Testing Plans, Sampling Plans, or other documents be provided to EPA prior to implementation for review and approval. Similarly, EPA requires provision of the Peer Review Plan prior to implementation, and EPA shall attend Peer Reviews performed to support the RH program. For demonstration of an equivalent QA program, a QA performance document (QAPD) crosswalk will be prepared and EPA expects this crosswalk to be provided to EPA for review and approval. DOE has not sought the use of corroborating data, and EPA does not approve its use at this time. Following performance of these AK qualification elements, DOE shall revise the AK Summary and prepare a Characterization Reconciliation Report, the later of which reconciles all data acquired and presents the results of the total characterization process in a single report. Following acquisition of requisite AK information, RH sites would prepare an AK Summary for each waste stream, much like what is currently performed under the CH program. However, DOE and EPA may approve RH wastes on a waste stream basis, not on a Summary Waste Category Group basis as is normally completed under the CH program. A draft AK summary report shall be provided to EPA for review and approval.

EPA has the option to observe all measurement activities as they are being performed. This activity could occur prior to the EPA approval inspection performed under 40 CFR Part 194.8, or simultaneously with this inspection depending upon the specific circumstances of data acquisition. Once all of the requisite plans have been submitted to EPA, approval acquired, and other necessary pre-inspection activities performed, EPA shall perform a 194.8 inspection of the site-specific RH programs. Note that EPA's new rule allows flexibility with regard to tiering of data and approval scope/limitations, and since DOE expects to approve RH on a waste stream basis, EPA may also do so (4). The new rule would give EPA latitude to examine certain waste characterization elements even after site approval.

COMPARISION OF RH AND CH TRU WASTE CHARACTERIZATION PROGRAM REQUIREMENTS

The proposed RH WC process differs from the fundamental elements of the CH WC program. The emphasis has been changed from using AK data to define the waste stream and not as the sole characterization method, radiological measurement and nondestructive examination via radiography or visual evaluation of each TRU waste containers, and data validation/verification and data transfer to first assessing available information under the AK program, followed by determination of the appropriate characterization method to meet DQOs, which could include qualification of AK information by confirmatory testing, peer review, or QA equivalency determination. EPA, however, has emphasized and continues to emphasize that 40 CFR Part 194.24 explicitly states that " …The system of controls shall include, but not be limited to "measurement; sampling; chain of custody records; record keeping systems; waste loading schemes used; and other documentation." Therefore, regardless of the process sought, EPA expects measurements to be included in the characterization process, as required by this portion of the rule.

Key components of the modified R~~C~~H characterization process are discussed below:

General Considerations

The following are general differences between the RH and CH TRU waste programs:

- 100% radioassay/NDE is required under the CH program but is not mandated under the RH program, although this could become necessary to meet DQOs.

- AK is a base component of the CH program, but is not a stand-alone characterization process; AK could be stand-alone under the RH program, assuming appropriate qualification occurs.

- The CH program differentiates between retrievably-stored CH and newly-generated waste. The RH program makes no distinctions along these lines, instead differentiating between packaged and to-be-packaged waste.

- RH programs must clearly demonstrate compliance with QAOs for representativeness, completeness, and comprehensiveness in quantifying waste components. CH programs perform 100% direct radioassay and radiography/VE, so waste component data generated in CH programs implicitly meets these three QAOs.

- Some of DOE's proposed methods for radioassay of RH waste include reliance upon waste modeling using shielding and burnup codes. These are activities that have not typically been used in the CH program, which relies more on direct measurement.

Acceptable Knowledge

The RH and CH AK processes are generally similar in that each requires the collection of AK information, compilation of these data, resolution of discrepancies, and preparation of an AK Summary Report. The RH program most closely resembles the AK program DOE has implemented for its Central Characterization Program (CCP). There are some key differences, however, and major differences include the following:

Mandatory/Supplemental Data
The CH program differentiates between mandatory and supplemental data collection, that that supplemental information, while required, is specifically collected to "check" the mandatory requirements. Under the RH program, DOE has acceptably streamlined these two elements.

Emphasis on DQOs
The CH program focuses on a process that assembled information necessary to support the waste determination, characterization via NDA, etc. This process did not explicitly mention data quality objectives, but the RH program does specifically state attainment of DQOs is a requirement of the AK process. Note also that DOE contends that AK can be used to address most if not all DQOs if the data in the AK record are adequate. EPA believes that 40 CFR Part 194.24 requires collection of measurement data, etc., and this requirement applies both to RH and CH WC, although the mandate for measurement of every container is not necessarily required for RH waste in light of the radiation exposure concerns if adequate alternatives are presented to and approved by EPA.

Collection of Container-Specific Data
The CH program did not mandate the collection of AK information down to the container level. Rather, process information could suffice, as in the case of Rocky Flats, to meet AK requirements. Because AK is not being relied upon as the primary source of WC information, it is mandatory that the data provided by AK be capable of describing the waste on a container basis.

Collection of Additional Data to Augment AK if AK is Lacking
The collection of additional information –i.e., measurement data—to augment inadequate AK has not been required in the CH program because NDA and NDE are performed on every container regardless of the quality of the AK information. The RH AK program states "… Otherwise, the above characterization objectives must be met by collecting additional radionuclide data during the packaging/repackaging activity, if applicable, and using, for example, the dose-to-curie conversion method to meet the radiological DQOs. This additional radionuclide information, if collected by a CBFO- and EPA-approved technique, could be used without further qualification to supplement the characterization process."

Calculation of AK Accuracy
The CH program does not mandate calculation of AK Accuracy; this is now required as part of the RH AK process. The RH AK process states: "This report will identify the percentage of containers that have been assigned to another SCG (Summary Category Group). It will also identify the percentage of containers for which there are significant discrepancies in radionuclide information between the AK record and measured values. What constitutes a significant discrepancy will depend on site- and waste stream-specific considerations. The AK Accuracy Report will be updated annually. If AK accuracy falls below 90%, the site shall document this as a significant condition adverse to quality as defined by the CBFO QAPD."

AK Summary Report Contents—DOE has provided a required outline for the AK Summary which was not included in the CCA for CH AK. EPA does not mandate a specific report format but does require that the fundamental contents identified in the RH AK report outline be included in any RH AK Summary.

Non Destructive Examination

Below are significant differences between the RH and CH NDE programs:

Use of Radiography
The CH program requires 100% radiographic examination (or visual examination) of each container. DOE believes that the nature of RH waste, from a radiological perspective of workers' health and safety, would preclude the use of radiography to examine RH waste in many instances (although DOE did not conclusively rule out the use of radiography).

Use of Visual Examination (VE) technique
The DOE states that approximately 95% of the RH waste is yet to be packaged and committed to perform VE of each of these containers. DOE has the option of using VE under the CH program as a primary characterization methodology but chooses to use it rarely with retrievably-stored waste (it is used for newly generated waste).

Use of VE as a Check of Radiography
The CH program uses VE as a check of RTR based upon site-specific miscertification rates. The RH program will not use VE in this fashion, and therefore, site-specific miscertification rates with respect to RH are no longer a factor.

Visual Examination Data Collection
The DOE shall assume that all debris waste are plastic, and shall report this as such in the waste tracking system – WIPP Waste Information System (WWIS). Therefore, DOE has not proposed the collection of any quantitative data with respect to cellulosics, plastics, and rubber, the assumption being that presuming all debris waste is plastic is conservative from a performance assessment (PA) perspective.

10-10-All for Already Packaged Waste
The DOE has proposed a "staged" examination process for already-packaged waste that is not used in the CH program. Specifically, DOE shall examine via NDE containers in already packaged waste to see whether the waste comports with the waste stream description, etc. as derived through AK. If the first ten percent (randomly selected) does not verify these data, an additional 10 percent will be selected. If this ten percent is still problematic, then DOE is required to re-examine all of the containers. DOE may use previously-generated RTR tapes or other data to perform this analysis.

Radiological Characterization

The RH program for radiological characterization described in the WCPIP allows radioassay using NDA as is done in CH programs. The RH program also permits additional methods for generating the radioisotope content of the waste containers. These additional methods include radiochemical analysis and the Dose-to-Curie (DTC) method.

Non-Destructive Assay
The only significant change from the CH to the RH characterization programs using NDA is the fact that RH NDA systems do not have to participate in a Performance Demonstration Program.

Dose-to-Curie Method (DTC)
The DTC method uses a profile of the waste to relate a dose rate measurement performed on the outside of the container to the activities of all isotopes of interest in the waste. This profile is developed using AK information, modeling, radiochemical analysis, NDA, or some combination of these. These activities would be performed in accordance with EPA QA requirements. EPA approval of the DTC method for isotopic profile development is necessary.

Destructive Radioassay
Destructive radioassay (DA) is allowed under the CH program but has yet to be used. Under the RH program, destructive radioassay typically involves sampling of the waste material in order to perform radiochemical analysis. The results of the radiochemical analysis are typically isotopic relationships and activities that may be used to provide the isotopic relationships necessary for use in the DTC process, or to directly estimate the total radionuclide concentration in a container. EPA requires that destructive radioassay used to characterize waste for disposal at WIPP must be performed under an approved sampling plan. The requirements for sampling plans are formalized in the WCPIP.

Sites are required to document their measurement capabilities and technically justify the applications of data collected on those systems. Sample collection and analysis will be controlled by the use of written procedures and under the control of an approved QA program. DOE has committed to two QAOs – precision and completeness.

WWIS and Data Validation/Verification

DOE has indicated that the WWIS and data validation/verification will function similarly in both the CH and RH programs, but EPA is concerned about how specific assumptions and information will be input

into the WWIS. EPA will audit and examine data entry into the WWIS at each audit to ensure that the data are appropriately entered, tabulated, and assessed.

EPA EVALUATION AND APPROVAL OF SITE-SPECIFIC RH CHARACTERIZATION PROGRAMS

The WCPIP indicates that waste stream-specific characterization processes shall be invoked that could have different characterization methodologies for each DQO, including different AK data qualification pathways and different supplemental measurement data collection (if necessary). Under the CH program, EPA does not currently require DOE to provide site-specific waste characterization plans for EPA approval. This is because the elements of CH programs are fairly standardized, and their application does not vary greatly from site to site. Thus EPA requires DOE to provide only site procedures and related support documentation and assesses program adequacy and implementation primarily through inspections. Under DOE's proposed RH program, however, characterization components and sequences can change from site to site. Thus, in EPA's preliminary approval, the Agency proposed to require DOE to submit additional, more detailed information for review and approval prior to any site inspection – and in fact, prior to allowing DOE to begin implementing RH characterization plans at a given site. This additional approval step ensures that EPA is involved in the complex process from the start and no issues arise where sites perform actions that EPA ultimately determines as unacceptable. The detailed information and plans to be provided by each site proposing RH characterization include, but are not limited to, the following:

- Site-specific procedures and related documents (note that EPA requires provision of these prior to audit, but EPA approval prior to implementation is not required at this time)
- Any sampling/analysis or other test plans used to collect "additional AK information" when AK data are lacking, or any other plans or procedures used to implement measurements or modeling to meet DQOs
- RH TRU Waste Certification Plans, which shall include the qualification methodology selected for each DQO, rationale for method selection, etc. (pre 194.8 inspection)
- Confirmatory Testing Plans (pre 194.8 inspection)
- Sampling and Analysis Plans (pre 194.8 inspection)
- Peer Review Plans (pre 194.8 inspection)
- QAPD Matrix (pre 194.8 inspection)
- AK Summary (pre 194.8 inspection)
- Characterization Reconciliation Report (acquired during audit)

EPA letter dated December 19, 2003 identifies documentation RH sites-specific plans must contain (8)

If EPA approves site-specific RH characterization plans, the Agency would then expect to issue a written site-specific approval to begin implementation of the program at a given site. Once programs have been established, the Agency would then conduct on-site waste characterization inspections to evaluate whether the program has been adequately implemented and is operating as described in the approved

documents. Only after the Agency approves the adequacy of written plans and their implementation will a site be authorized by EPA to send RH waste from the site for disposal at WIPP.

EPA will apply the inspection procedures authorized by 40 CFR 194 when RH sites seek authorization for waste disposal at WIPP. We will verify, through inspection, that site-specific RH programs are implemented in a technically adequate manner and generate appropriate data to demonstrate compliance with the waste characterization requirements and the programs meet the quality assurance requirements. Following the inspection, EPA will issue a site-specific decision notifying DOE of the RH waste characterization processes that are approved for use and the RH waste stream that are approved for disposal at WIPP. EPA will make the site-specific RH waste characterization plans and inspection reports available in EPA's WIPP dockets and our website.

CONCLUSION

Using the information contained in the latest submission of October 2003, EPA issued its preliminary decision to approve DOE's WCPIP and docketed the letter along with all DOE's proposals and EPA's comments for public review on December 19, 2003. EPA requested public comment specific to its RH decision. The public comment period ended January 30, 2004. We are in the process of considering public comment received and will issue our final decision concerning DOE's RH WCPIP this Spring.

REFERENCES

1 U.S. Environmental Protection Agency. EPA QA/G-4, EPA Guidance for the Data Quality Objectives Process, dated August 2000.

2 U.S. Environmental Protection Agency. Criteria for Certification and Recertification of the Waste Isolation Pilot Plant's Compliance with the Disposal Regulations: Certification Decision (40 CFR Part 194, Appendix A) [63 FR 27353-27406, May 18, 1998] (1998).

3 WIPP Land Withdrawal Act, Pub. L. 102-579, as amended by the 1996 WIPP LWA Amendments, Pub. L. 104-201 (1992).

4 U.S. Environmental Protection Agency. 40 CFR 194 Changes final rule (in progress) [See 67 FR 51930, August 9, 2002 for the proposed 40 CFR 194 changes].

5 U.S. Environmental Protection Agency. Guidance for Quality Assurance Project Plans for Modeling.

6 U.S. Environmental Protection Agency. Guidance on Choosing a Sampling Design for Environmental Data Collection for Use in Developing a Quality Assurance Project Plan.

7 U.S. Environmental Protection Agency. Guidance for Data Quality Assessment.

8 EPA's Preliminary Approval of DOE's RH Waste Characterization Framework Letter from Frank Marcinowski to Inés Triay, December 19, 2003

FOOTNOTES

[i] work performed under EPA Contract 68-D00-210.