



ENTERED

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 28 2012

OFFICE OF
AIR AND RADIATION



Mr. J. R. Stroble
Manager, National TRU Program
Carlsbad Field Office
U.S. Department of Energy
P.O. Box 3090
Carlsbad, NM 88221-3090

Dear Mr. Stroble:

On December 15, 2011, the Carlsbad Field Office (CBFO) requested that the U.S. Environmental Protection Agency (EPA) approve a T1 change to add containers generated from Waste Groups PKE00027/54 and PKE00047 to Waste Stream SNL-HCF-S5400-RH, which EPA approved in November 2011. EPA has reviewed the information provided by the Central Characterization Project (CCP) responsible for characterizing remote-handled (RH) transuranic (TRU) waste at the Sandia National Laboratory (SNL) and approves the addition of these containers to the above mentioned waste stream. The enclosed report, EPA Docket No. A-98-49; II-A4-160, supports EPA's approval decision.

SNL-CCP collected and analyzed samples from both new waste groups to develop scaling factors for characterization by DTC, as described in CCP-AK-SNL-501, Revision 2, Appendices A and B, for PKE00027/54 and PKE00047, respectively. CCP-AK-SNL-500, Revision 4, and related source documents provided additional information and justification that supports (a) why the waste containers in these two waste groups are similar to those waste containers in the waste group PKE00044 which EPA approved in November 2011, (b) why new scaling factors were developed, and (c) why the waste containers in these two waste groups do not warrant designation as separate waste streams as required by the WCPIP, Revision 2.

In the case of PKE00027 waste grouping, SNL-CCP collected five waste samples for radioassay. The analytical results for four out of five waste samples, however, were not RH or TRU. The documentation we reviewed, namely, the post-sampling memorandum, did not adequately describe the use of these data for developing scaling factors and the disposition of waste containers belonging to this waste group. EPA discussed this issue with CBFO and SNL-CCP and stated that SNL-CCP should revise the post-sampling memorandum discussing explicitly how waste sample data were used. At CBFO's suggestion, SNL-CCP added a footnote "data are valid" to one of the tables where the data were presented. EPA informed CBFO that this change was inadequate objective evidence and asked CBFO to provide a better rationale. CBFO's letter explained which waste sample data were used. This CBFO response is satisfactory.

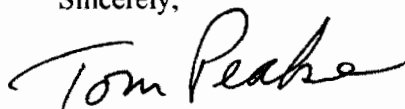
To better support EPA's approval, EPA recommends that changes be made to the WCPIP the next time it is revised. These changes would specify the importance of agreement between the objective evidence



that documents a waste characterization process and the process itself, and would prevent recurrence of the situation EPA encountered with the documentation for PKE00027/54.

If you have any questions regarding this approval, please contact Rajani Joglekar at (202) 343-9462 or Ed Felcorn at (202) 343-9422.

Sincerely,

A handwritten signature in black ink that reads "Tom Peake". The signature is written in a cursive, flowing style.

Tom Peake, Director
Center for Waste Management and Regulations

Enclosure

cc: Electronic Distribution
Christine Gelles, DOE EM
Alton Harris, DOE EM
Joe Franco, CBFO
Ed Ziemianski, CBFO
Marcus Pinzel, CBFO NTP
Tom Morgan, CBFO
Courtland Fesmire, CBFO QA
D K Ploetz, WTS-CCP
Mike Sensibaugh, WTS-CCP
Irene Quintana, WTS-CCP
John Kieling, NMED
Trais Kilphuis, NMED
Tim Hall, NMED
Raymond Lee, EPA HQ
Site Documents

DOCKET NO: A-98-49, II-A4-160

WASTE CHARACTERIZATION REPORT

EPA TIER 1 EVALUATION

OF THE CENTRAL CHARACTERIZATION PROJECT

REMOTE-HANDLED TRANSURANIC WASTE CHARACTERIZATION PROGRAM:

ADDITION OF CONTAINERS GENERATED FROM WASTE GROUPS PKE00027/54

AND PKE00047 TO THE REMOTE-HANDLED DEBRIS WASTE STREAM

SNL-HCF-S5400-RH AT THE SANDIA NATIONAL LABORATORY

December 2011 – January 2012

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
Center for Waste Management and Regulations
1200 Pennsylvania Avenue, NW
Washington, DC 20460

March 2012

CONTENTS

<u>Section</u>	<u>Page</u>
1.0 Executive Summary	4
2.0 Purpose of Tier 1 Evaluations.....	6
3.0 Purpose of This Report	6
4.0 Scope of the Tier 1 Evaluation.....	7
5.0 Evaluation Personnel	7
6.0 Technical Evaluation	8
6.1 Acceptable Knowledge	10
6.2 Radiological Characterization.....	19
6.3 Visual Examination.....	32
7.0 Summary of Results.....	34
Attachment A: List of Documents Reviewed by EPA During T1 Evaluation.....	A-1

TABLES

Table 1. Tier 1 Evaluation Personnel.....	8
Table 2. Summary of PKE Reports.....	9
Table 3. PKE00047 Radionuclide Activity Ratio Comparison	15
Table 4. Radionuclide Activity Ratios for PKE00027/54	16
Table 5. Container Traceability	18
Table 6. Sample Disposition Summary	23
Table 7. ¹³⁷ Cs Scaling Factors for PKE00027/54 and PKE00047, Ci Radionuclide/Ci ¹³⁷ Cs.....	29
Table 8. Overall Uncertainties for PKE00027/54 and PKE00047	30

ACRONYMS AND ABBREVIATIONS

AK	acceptable knowledge
AKSR	acceptable knowledge summary report
Am	americium
Ba	barium
BDR	batch data report
CBFO	Carlsbad Field Office
CCP	Central Characterization Project
CFR	Code of Federal Regulations
CH	contact-handled
Ci	curie
CIS	characterization information summary
Cm	curium
Co	cobalt
CRR	characterization reconciliation report
Cs	cesium
CSSF	Correlation and Surrogate Summary Form
DOE	U.S. Department of Energy
DQO	data quality objective
DR	discrepancy resolution
DTC	dose-to-curie
EPA	U.S. Environmental Protection Agency
Eu	europium
GBL	Glovebox Laboratory
GFPC	gas-flow proportional counting
g/cm ³	grams per cubic centimeter
HCF	Hot Cell Facility
HLW	high-level waste
ID	identification
LCS	laboratory control standard
LCSD	laboratory control sample duplicate
LOQI	List of Qualified Individuals

mR/hr/Ci	milliroentgen per hour per curie
nCi/g	nanocurie per gram
NCR	nonconformance report
ORIA	Office of Radiation and Indoor Air
PKE	process knowledge evaluation
Pm	promethium
Pu	plutonium
QA	quality assurance
QC	quality control
RH	remote-handled
RWNMDD	Regulated Waste/Nuclear Material Disposition Department
SCB	steel containment box
SNF	spent nuclear fuel
SNL	Sandia National Laboratory
SPM	Site Project Manager
Sr	strontium
ST	source term
T1	Tier 1
T2	Tier 2
TMU	total measurement uncertainty
TRU	transuranic
U	uranium
VE	visual examination
WCPIP	Waste Characterization Program Implementation Plan
WIPP	Waste Isolation Pilot Plant
WSPF	Waste Stream Profile Form
WTS	Washington TRU Solutions
Y	yttrium

1.0 EXECUTIVE SUMMARY

This report supports the U.S. Environmental Protection Agency's (EPA's) decision to approve a Tier 1 (T1) change to add containers generated from the PKE00027/54¹ and PKE00047 waste groups to the previously approved remote-handled (RH) transuranic (TRU) debris Waste Stream SNL-HCF-S5400-RH at the U.S. Department of Energy's (DOE's) Sandia National Laboratory (SNL) in Albuquerque, New Mexico.² In November 2011, EPA approved the Central Characterization Project (CCP) to characterize RH waste at SNL.³ The November 2011 baseline approval applied to 19 parcels⁴ of retrievably stored RH TRU waste from the PKE00044 waste group (see EPA Docket No. A-98-49: II-A4-155). Using the EPA-approved waste characterization processes discussed in this report, SNL-CCP can characterize waste containers generated from the PKE00027/54 and PKE00047 waste groups, which were generated during decontamination operations of the Glovebox Laboratory (GBL) at the SNL Hot Cell Facility (HCF). This HCF GBL waste is packaged in 55-gallon containers⁵ and characterized and therefore can be added to SNL Waste Stream SNL-HCF-S5400-RH for emplacement in the Waste Isolation Pilot Plant (WIPP).

The November 2011 SNL baseline final inspection report (discussing 19 parcels) documents the following components. The November 2011 baseline approval includes (1) acceptable knowledge (AK); (2) radiological characterization using dose-to-curie (DTC), in conjunction with radionuclide-specific scaling factors supported by radiochemical analyses of smear⁶ samples from the parcels; and (3) visual examination (VE). These components are used to confirm the physical and radiological contents of waste containers. Table 1 of that report cited the inclusion of the two remaining waste groups (PKE00027/54 and PKE00047) in the approved waste stream as a Tier 1 (T1) change that requires EPA approval prior to implementation. The EPA SNL baseline final inspection report also stated that SNL-CCP needs to provide additional information showing more commonality of experiments and radiological materials between the steel containment box (SCB)/Zone 2A area (PKE00044) and the GBL (PKE00027/54 and

¹ PKE00027 was originally developed assuming that the parcels were low-level waste, but SNL determined that some were TRU and created PKE00054 for wastes originally designated as PKE00027. Different SNL-CCP documents refer to PKE00027 and PKE00027/54. For consistency, this report uses PKE00027/54 to indicate the population of TRU debris waste generated from Glovebox 3.

² SNL also has a site in California. All references to SNL in this report are exclusively to SNL's New Mexico site, unless otherwise stated.

³ In this report, "SNL" refers to the host site and its past and present waste generation, management and storage activities. "SNL-CCP" means the party responsible for the TRU waste characterization activities that are within the scope of EPA's baseline inspection.

⁴ SNL is the only site within the DOE TRU complex that uses "parcel" as a term for a waste package instead of the term "container," commonly used to describe a waste package. More than one parcel may be put into a 30-gallon drum, which in turn goes into a 55-gallon container for WIPP disposal. This report uses the term "parcel" to be consistent with the site usage.

⁵ "Containers" is a generic term that applies to cans, canisters, drums and any other types of waste packaging units that may be characterized individually for their radiological and physical contents.

⁶ A "smear," "wipe" or "swipe" is a nonquantitative test for the presence of removable radioactive materials in which a surface or area is wiped with a filter paper or other substance, which is then assayed for specific radionuclides using destructive or nondestructive techniques. For these samples, the "smear" was a cotton swab.

PKE00047). The baseline also states that more justification for why the distinct radiological populations do not warrant designation as separate waste streams as implied by the Waste Characterization Program Implementation Plan (WCPIP), Revision 2.

On December 15, 2011, the Carlsbad Field Office (CBFO) requested EPA approval of a T1 change to add containers generated from Waste Groups PKE00027/54 and PKE00047 to Waste Stream SNL-HCF-S5400-RH. SNL-CCP collected and analyzed samples from both new waste groups to develop scaling factors for characterization by DTC, as described in CCP-AK-SNL-501, Revision 2, Appendices A and B, for PKE00027/54 and PKE00047, respectively. CCP-AK-SNL-500, Revision 4, and related source documents provided additional information and justification that supports (a) why the waste containers in these two waste groups are similar to those waste containers in the waste group PKE00044 which EPA approved in November 2011, (b) why new scaling factors were developed, and (c) why the waste containers in these two waste groups do not warrant designation as separate waste streams as required by the WCPIP, Revision 2.

Because the T1 request did not include any new equipment or additional new processes on site at SNL, EPA conducted a desktop review of this change, concluding that SNL-CCP's plan to use the EPA-approved system of controls to characterize the debris waste from the PKE00027/54 and PKE00047 waste groups was acceptable. EPA did not identify any findings or concerns during this evaluation. As a result, EPA approves the T1 change request to add containers from the PKE00027/54 and PKE00047 waste groups to the previously approved RH TRU Waste Stream SNL-HCF-S5400-RH.

In the case of PKE00027 waste grouping, SNL-CCP collected five waste samples for radioassay. The analytical results for four out of five waste samples, however, were not RH or TRU. The documentation we reviewed, namely, the post-sampling memorandum, did not adequately describe the impact of these results on the development of scaling factors and the disposition of waste containers in this waste group. EPA discussed this issue with CBFO and SNL-CCP and stated that SNL-CCP should revise the post-sampling memorandum discussing explicitly how waste sample data were used. At CBFO's suggestion, SNL-CCP added a footnote "data are valid" to one of the tables where the data were presented. EPA informed CBFO that this change was inadequate objective evidence and asked CBFO to provide a better rationale. CBFO's response letter dated March 28, 2012, explained which waste sample data were used. This CBFO response is satisfactory.

To better support EPA's approval, EPA recommends that changes be made to the WCPIP the next time it is revised. These changes would specify the importance of agreement between the objective evidence that documents a waste characterization process and the process itself, and would prevent recurrence of the situation EPA encountered with the documentation for PKE00027/54.

This approval is limited to parcels from the PKE00027/54 and PKE00047 waste groups; however, it does not necessarily limit the number of containers that can be characterized using the radiological process described in CCP-AK-SNL-501, Revision 2. CBFO has informed EPA that SNL-CCP does not expect to characterize additional RH debris waste or add additional RH

debris containers to these two PKEs or the previously approved PKE00044 in the foreseeable future. However, if SNL-CCP resumes RH waste characterization activities, the tiering requirements included as Table 1 in the final baseline inspection report remain applicable, as does the process for adding containers to the approved waste stream described in EPA's final approval. As a result, no specific mention of T1 and T2 changes is made in the remaining sections of this report.

This report serves as EPA's public notification of the results of the proposed T1 change and its evaluation. EPA will provide this information through the EPA website and by sending emails to the WIPPNEWS list, in accordance with 40 CFR 194.8(b)(3).

2.0 PURPOSE OF TIER 1 EVALUATIONS

Certain changes to the waste characterization activities from the date of the site's baseline inspection must be reported to and, if applicable, approved by EPA according to the tiering requirements set forth in 40 CFR 194.8, as amended, and incorporated into the November 2011 SNL-CCP RH baseline final report (Docket No.: A-98-49; II-A4-155).

EPA must perform a single baseline inspection of a TRU waste-generator site's waste characterization program, in order to approve the site's waste characterization program. Following EPA's baseline approval, EPA is authorized to evaluate and approve changes, if necessary, to the site's approved waste characterization program by conducting additional inspections under the authority of 40 CFR 194.24(h). Changes requiring EPA notification and approval prior to implementation (T1) and those requiring post-implementation notification [Tier 2 (T2)] are identified in the site-specific baseline inspection reports. When evaluating proposed T1 changes for approval, EPA may conduct a site inspection to observe firsthand the implementation of the change or can opt to conduct a desktop review of information provided specific to a change. DOE may choose to characterize and dispose of any previously approved TRU waste using processes, procedures and equipment implemented as T2 changes at risk of subsequent EPA disapproval. EPA reviews T2 changes on a quarterly basis and may conduct continued compliance inspections to evaluate implemented T2 changes to verify adequacy.

3.0 PURPOSE OF THIS REPORT

This report presents the results of EPA's evaluation of a T1 change to add containers generated from the PKE00027/54 and PKE00047 waste groups to Waste Stream SNL-HCF-S5400-RH, as described in CCP-AK-SNL-500, Revision 4, and CCP-AK-SNL-501, Revision 2, Appendices A and B. This report presents the technical basis and results of EPA's approval decision. EPA's approval has been conveyed to DOE separately by letter. EPA will also announce the decision on its website at www.epa.gov/radiation/wipp in accordance with 40 CFR 194.8(b)(3).

The DOE documents that EPA reviewed for this evaluation are cited in different sections throughout the report and are listed in Attachment A. Any of these documents can be requested from the following address:

Manager, National TRU Program
Carlsbad Field Office
U. S. Department of Energy
P.O. Box 3090
Carlsbad, NM 88221-3090

4.0 SCOPE OF THE TIER 1 EVALUATION

The scope of this evaluation is the addition of containers generated from the PKE00027/54 and PKE00047 waste groups to Waste Stream SNL-HCF-S5400-RH. Based on criteria set forth by EPA during the SNL-CCP baseline inspection, a T1 request is required for characterization of containers from the PKE00027/54 and PKE00047 waste groups. Therefore, the scope of the T1 request is to evaluate the addition of containers generated from the PKE00027/54 and PKE00047 waste groups to Waste Stream SNL-HCF-S5400-RH, as specified in CCP-AK-SNL-501, Revision 2, Appendices A and B, and CCP-AK-SNL-500, Revision 4.

Sections 6.1 through 6.3 of this report detail the three technical areas assessed during this evaluation:

- AK.
- Radiological characterization.
- VE.

This evaluation involved expanding an existing waste stream to incorporate new containers and not the addition of a new summary category group or waste stream; therefore, EPA did not use inspection checklists.

5.0 EVALUATION PERSONNEL

EPA and its support personnel conducted interviews with SNL-CCP personnel in several disciplines by telephone. The EPA evaluation team members and the personnel contacted are listed in Table 1 with their affiliations and technical areas of expertise. This list includes personnel present at meetings conducted as part of this evaluation.

Table 1. Tier 1 Evaluation Personnel

Personnel Name	Affiliation	Area of Expertise, Function
Rajani Joglekar	EPA ORIA	Tier 1 Evaluation Lead
Ed Feltcorn	EPA ORIA	Tier 1 Evaluation Team
Connie Walker	SC&A	Acceptable Knowledge, Technical Inspector
Kira Darlow	SC&A	Acceptable Knowledge, Technical Inspector
Amir Mobasheran	SC&A	Radiological Characterization, Technical Inspector
Patrick Kelly	SC&A	Radiological Characterization, Technical Inspector
Rose Gogliotti	SC&A	Radiological Characterization, Technical Inspector
Kevin Peters	CCP-TechSpecs	Acceptable Knowledge Expert
Dorothy Gill	SC&A	Visual Examination, Technical Inspector
John Kleckner	CCP-TechSpecs	Acceptable Knowledge Expert
Steve Schafer	CCP-TechSpecs	Acceptable Knowledge Expert
Jene Vance	WTS-CCP	Radiological Characterization, Technical Expert
Irene Quintana	WTS-CCP	Remote Handled Site Project Manager

6.0 TECHNICAL EVALUATION

Waste-Generating Activities

CCP-AK-SNL-500 [the AK summary report (AKSR)], Revision 4, describes Waste Stream SNL-HCF-S5400-RH as consisting of 32 waste parcels packaged in 29 containers, 27 of which are shielded and two unshielded. The 32 waste parcels were generated during decontamination operations in the SNL HCF from 1995 to 1997 (References I1030 and M1016). The waste originated from pre- and post-test processes associated with reactor fuel studies conducted in the HCF SCBs, Zone 2A, and Gloveboxes 1, 2 and 3 between the late 1970s and the mid-1990s. Different experiments were conducted in the SCB/Zone 2A area and Gloveboxes 1, 2 and 3, but source term (ST) experiments were common to all of these areas (References C1004, M1016, M1019, P1015, P1102 and P1104).

The PKE00027/54 portion of the waste stream (two single-parcel drums and one drum containing one PKE00027/54 parcel commingled with two PKE00047 parcels) resulted primarily from ion chromatography studies of fission products, mainly from light-water reactor fuels, in Glovebox 3. The PKE00047 portion of the waste stream (seven single-parcel drums and one drum containing one PKE00027/54 parcel commingled with two PKE00047 parcels) resulted primarily from experiments involving breeder mixed-oxide reactor fuels, including fuel disruption studies, transient axial relocation studies, and effective equation of state experiments, in Gloveboxes 1 and 2.

PKE00027 was originally developed assuming that the parcels were low-level waste, but SNL determined that some were TRU and created PKE00054 for wastes originally designated as PKE00027. Different SNL-CCP documents refer to PKE00027 and PKE00027/54. For consistency, this report uses PKE00027/54 to indicate the population of TRU debris waste generated from Glovebox 3.

Process Knowledge Evaluation and Waste Stream Delineation

SNL-CCP determined that Waste Stream SNL-HCF-S5400-RH should be divided into three separate portions because the radionuclide distributions in waste from the SCB/Zone 2A area and from the gloveboxes were different. Wastes generated during experiments were typically retained in the cells or areas of generation. During decontamination of the HCF, there was little or no commingling between the waste-generating sources (i.e., the SCB/Zone 2A area and the gloveboxes). Regulated Waste/Nuclear Material Disposition Department (RWNMDD) personnel developed and used process knowledge evaluation (PKE) reports to establish the radiological characterization of each parcel based on information provided in the disposal request documentation (Reference M1016). SNL-CCP followed this pattern and developed a separate set of scaling factors for each of the three groups described in Table 2 to account for the three distinct, area-specific radiological signatures.

Table 2. Summary of PKE Reports

Document Number	Waste-Generation Source	Number of Parcels	Number of Drums
PKE00044	SCBs and Zone 2A	19	19
PKE00047	Gloveboxes 1 and 2	7	7
PKE00027/54	Glovebox 3	5	3

Despite the differences discussed above, the AKSR combined waste generated in the gloveboxes, SCBs, and Zone 2A into a single waste stream based on (1) the similarity of waste generation processes and summary category groups, (2) common sample storage areas, and (3) equipment sharing and overall cross-contamination between gloveboxes (References C1004, M1016, M1019, P1015, P1102 and P1104). The portion generated in the SCB/Zone 2A area of the HCF in Building 6800 and designated as PKE00044 was evaluated and approved for characterization during Baseline Inspection No. EPA-SNL-CCP-RH-06.11-8 (EPA Docket No. A-98-49; II-A4-155). Therefore, this current evaluation and approval are limited to the addition of parcels in PKE00027/54 and PKE00047. [See Section 6.1, Item (1) for discussion and acceptance of the waste stream definition.] The total number of containers in both PKEs initially proposed by SNL-CCP is based on the AKSR, Revision 4, and CCP-AK-SNL-501, Revision 1, both prepared in November 2011. The numbers do not coincide with current estimates, which are lower because containers were removed from the RH waste stream, as discussed below.

SNL-CCP initially identified PKE00047 as including nine parcels in eight containers, but one container containing two PKE00047 parcels was found to be commingled with waste from PKE00027/54, and it was reassigned to PKE00027/54 for sampling purposes. EPA found that Gloveboxes 1 and 2 were interconnected and shared experiments and the waste from these two gloveboxes is considered together in this T1 review.

SNL-CCP originally included four parcels in PKE00027/54 but moved a parcel from PKE00047 to PKE00027/54 for radiological sampling purposes because it was in a 30-gallon drum with two other PKE00027/54 parcels. This drum contained three waste parcels, which is why there are more parcels than drums.

Documents, Waste Containers and Batch Data Reports/Calculation Packages Provided

EPA evaluated the documentation that SNL-CCP prepared to support the inclusion of containers generated from PKE00027/54 and PKE00047 in Waste Stream SNL-HCF-S5400-RH. EPA's review identified several technical issues that necessitated revision of the AKSR, CCP-AK-SNL-502, some of the associated AK documentation and CCP-AK-SNL-501. SNL-CCP provided the revised documents to EPA prior to the conclusion of this T1 evaluation. Attachment A lists all documentation and BDRs reviewed by EPA for this evaluation.

6.1 Acceptable Knowledge

EPA examined the AK process and associated information to determine whether SNL-CCP demonstrated compliance with 40 CFR 194.8 requirements and can include the containers generated from PKE00027/54 and PKE00047 in Waste Stream SNL-HCF-S5400-RH.

Waste Characterization Element Description

As part of the inspection, EPA reviewed the following with respect to programmatic requirements and the use of AK for RH waste characterization:

- Inspection scope and waste stream identification.
- Identification and adequacy of the WCPIP waste characterization process.
- Adequacy of the Certification Plan and other WCPIP documentation.
- Adequacy of training.
- Adequacy of the Waste Stream Profile Form (WSPF) and related attachments.
- Adequacy of nonconformance reports (NCRs) and discrepancy resolution (DR) reports.
- Waste stream definition, including radiological and physical characteristics.
- Verification that the subject waste is of defense origin and is not high-level waste (HLW) or spent nuclear fuel (SNF).
- Role of AK in the characterization methodology, including scaling factors.
- Adequacy of the AK procedure and procedure implementation, including attachments, AK accuracy reports, characterization reconciliation reports (CRRs), and CSSFs.
- Adequacy of the AKSR and associated source documents.
- AK data traceability.
- Attainment of data quality objectives (DQOs).

Technical Evaluation

EPA evaluated the adequacy of AK information for the PKE00047 and PKE00027/54 parcels to determine whether including these parcels in Waste Stream SNL-HCF-S5400-RH was

adequately supported, as described in the ASKR, Revision 4, and CCP-AK-SNL-501, Revision 2. EPA also evaluated the records relative to the programmatic requirements in the WCPIP.

- (1) Several items reviewed by EPA as part of the baseline approval were not affected by the inclusion of PKE00047 and PKE00027/54 in Waste Stream SNL-NCF-S5400-RH. Therefore, this T1 review did not examine the following elements (see the baseline report (EPA Docket A-98-49; II-A4-155) for a full discussion of each of these items):
 - Defense origin was assessed and found to be adequate.
 - Identification of HLW and SNF was assessed and found to be adequate.
 - Interpretation of WCPIP with respect to contents of the Certification Plan and Confirmation Test Plan was evaluated and found to be satisfactory.
 - Personnel training was evaluated and was found to be adequate.
 - Attainment of DQOs was evaluated and found to be adequate.
- (2) The scope of the T1 request and waste stream determination were examined for Waste Stream SNL-HCF-S5400-RH and found to be adequate (WCPIP, Section 3.0, p. 13).⁷

The scope of the T1 request was adequately defined. The purpose of EPA's T1 evaluation was to determine if it is technically defensible and appropriate to include parcels (repackaged in SNL waste drums) originating from PKE00047 and PKE00027/54 in Waste Stream SNL-HCF-S5400-RH. EPA also evaluated the adequacy, implementation and effectiveness of technical processes that SNL-CCP used to characterize debris waste from PKE00047 and PKE00027/54. The WCPIP defines a waste stream as waste material that is (1) generated from a single process or activity and (2) is similar in material, physical form and radiological properties. EPA examined AK information presented in the revised AKSR, Revision 4, and related source documents to determine whether the waste stream was adequately defined.

ST experiments were common to the SCB/Zone 2A area (PKE00044), Gloveboxes 1 and 2 (PKE00047), and Glovebox 3 (PKE00027/54). EPA evaluated the nature of the ST experiments performed, the movement of material between areas, and commonality of activities to determine whether these justify placing all three PKEs in a single waste stream. The ST program investigated fission product release from irradiated and nonirradiated fuel under severe accident conditions. Irradiated fuels were obtained from Belgian Reactor 3 (Mol, Belgium), and nonirradiated fuels were fabricated at Battelle Pacific Northwest Laboratories. Source documents indicate that ST experiments and tests involving irradiated fuel were performed in the SCB/Zone 2A area (PKE00044), Gloveboxes 1 and 2 (PKE00047) and Glovebox 3 (PKE00027/54). Reference P1102 suggests that test material was originally received in the SCB/Zone 2A area. Fuels were then transferred to "shielded glove boxes" (i.e., Gloveboxes 1 and 2) for sectioning and test assembly packaging. The test assembly was transferred to the Annular Core Research Reactor and neutronically heated to 2,400 kelvin. Source documents do not state where post-

⁷ The WCPIP references are examples and are not meant to be an exhaustive list. Many of these requirements are discussed in several places within the WCPIP.

heating experiments were performed, but Reference P1102 states that fission product release observation took place in the SCBs, so EPA assumes that the experiments were conducted in the SCBs. Filters or other material from these tests were sent to Glovebox 3 for ion chromatography, and the heated, irradiated material was sent to Gloveboxes 1 and 2 for further metallurgical analyses (References M1015, M1020b, M1021 and P1105). Source documents suggest that irradiated ST experiments were moved throughout the hot cell facility during the course of experimentation and subsequent analyses, with the SCB/Zone 2A area, Gloveboxes 1 and 2, and Glovebox 3 all used in the ST experimental process. Commonality of experiments between the SCB/Zone 2A area, Gloveboxes 1 and 2, and Glovebox 3 was adequately demonstrated (References P1102 and P1015).

Historical records indicate that the physical compositions of PKE00027/54 and PKE00047 are adequately understood and support the waste stream determination. PKE00027/54 is composed of five parcels, the contents of which are described in accompanying disposal requests generated by SNL-CCP. For example, DR204139, associated with Parcel P2000988 and SNL Drum No. SNLNM007020, says that the parcel is composed of a one-gallon can that contains "GB3" sweepings (References M1016, M1019, M1020 and M1020b). SNL-CCP's VE of the final 30-gallon container (later overpacked into a 55-gallon drum) in which material from the one-gallon container was placed verifies that the waste is composed of various debris, bags, sweepings and shavings. PKE00047 is composed of seven parcels, and the PKE00047 report states that the waste includes decontamination material such as rags and wipes, as well as tools and pieces of metal (e.g., steel, aluminum), trash and debris from the empty gloveboxes, and associated box components (Reference M1020b).

SNL-CCP prepared PKE00044, PKE00027/54 and PKE00047 reports that assign unique radiological signatures to each PKE waste grouping (References M1016, M1020b, M1021 and CCP-AK-SNL-501, Revision 2). However, these reports and other information also show that the PKEs exhibit some radiological similarities. Radiological information in other source documents and obtained through sampling indicates that uranium-235 (^{235}U) and ^{238}U are the predominant isotopes by mass in all three PKEs. Also, PKE reports indicate that the predominant TRU isotope in the three PKEs is plutonium-239/240 ($^{239/240}\text{Pu}$). Based on a review of the radiological distributions assigned to the waste in the three PKEs and excluding cesium-137 (^{137}Cs) and strontium-90 (^{90}Sr), the distribution of the remaining isotopes [americium-241 (^{241}Am), ^{238}Pu , $^{239/240}\text{Pu}$, promethium-147 (^{147}Pm) and ^{241}Pu] in each PKE are relatively similar. Specifically, the three PKEs exhibit similar mass percent $^{239/240}\text{Pu}$, ^{241}Am and ^{241}Pu (References C1038, M1016, P1015, P1102 and P1104). The three PKEs appear to have a similar general radiological composition that supports including all three PKEs in a single waste stream, although sampling of parcels from each PKE is required to obtain PKE-specific radiological distributions. See Section 6.2 for additional information about the radiological composition of PKE00027/54 and PKE00047.

- (3) Example nonconformance documentation and discrepancy resolution reports were examined and found to be adequate (WCPIP, Section 3.4.2.3, p. 24).

SNL-CCP provided an example NCR related to PKE00027/54. NCR No. NCR-RHSNL-2345-11, Revision 0, applied to Drum No. SNLNM007020 and addressed discrepant drum number identification on CCP-TP-005, Attachment 8. SNL-CCP Discrepancy Report DR1004 addressed

the identification of paperwork showing that PKE00047 and PKE00027/54 parcels were combined during repacking and generation of SNL Container No. C080216.

- (4) The acceptable knowledge procedure was examined and found to be adequate and appropriately implemented (WCPIP, Section 4.1, pp. 32–33).

Since the approval of Revision 22 during the baseline inspection, CCP revised CCP-TP-005 twice more, as part of the resolution of CBFO CAR11-043 (Revision 23) and again to incorporate additional WCPIP requirements on November 28, 2011 (Revision 24). EPA found that CCP-TP-005, Revision 24, reflected all applicable WCPIP requirements and expects that all document revisions and procedure implementations will follow the requirements in the revision of CCP-TP-005 that is in place at the time of the activity. AK documents submitted with this T1 request were created under Revisions 22, 23 or 24 depending on when the document was generated, and this is adequate.

CCP-TP-005, Revision 24, includes 15 attachments and requires development and maintenance of an AK Tracking Spreadsheet that presents a running compilation of containers within each waste stream at a site. Many of these attachments were provided with the original baseline inspection, so only those attachments with new information pertinent to this T1 request were provided to and reviewed by EPA. SNL-CCP provided updated versions of Attachments 1, 4, 6, 8, 13 and 14 that included changes incorporating PKE00027/54 and PKE00047.

- Attachments 1 and 4 were adequate, because Attachment 4 had been updated to include recent radiological references.
- Attachment 6 is addressed in Item (5).
- Attachment 8 is also adequate because it includes containers from PKE00027/54 and PKE00047. SNL-CCP also provided the AK Tracking Spreadsheet that identified container and parcel numbers, associated PKE, associated disposal records, and container status. Note that Attachment 8 was prepared in June 2011, while the AK Tracking Spreadsheet was printed in September 2011. The AK Tracking Spreadsheet indicates that several containers are “no longer in the RH population,” but these containers are still presented on Attachment 8. This discrepancy is acceptable but emphasizes that all data sources (Attachment 8, AK Tracking Spreadsheet, and Add Container Memoranda) must be examined to understand the containers in the waste stream at any given time.
- Attachment 13, the waste characterization checklist, was prepared in draft and adequately demonstrates SNL-CCP’s ongoing ability to prepare this attachment.
- Attachment 14, the AK accuracy report, is addressed in Item (8).

Relevant CCP-TP-005 attachments were adequately prepared.

- (5) The acceptable knowledge summary report was examined, along with associated source documents, and found to be adequate (WCPIP, Section 4.1, p. 31).

Since the baseline inspection, SNL-CCP revised the AKSR twice: to modify the hazardous waste numbers assigned to the waste stream (Revision 3), and to change the TRU Content Code assignments (Revision 4). In this T1 review, EPA examined Revision 4, which addressed EPA concerns about whether PKE00044, PKE00027/54 and PKE00047 belonged in the same waste stream.

SNL-CCP created Revision 4 of the AKSR to better identify process areas; include complete radiological information; explain the flow between process areas; identify common processes with respect to the SCB/Zone 2A area, Gloveboxes 1 and 2, and Glovebox 3; and justify the waste stream determination. The AKSR, Revision 4, adequately justifies that waste belonging to PKE00044, PKE00047 and PKE00027/54 constitutes RH Waste Stream SNL-HCF-S5400-RH [see Item (1)]. The AKSR, Revision 4, includes Table 10 that addresses the characterization process. EPA recommends that SNL-CCP revise this table during the next revision cycle to remove mention of the term "qualification."

- (6) The radiological and physical properties of the waste stream were examined and found to be adequately described for PKE00027/54 and PKE00047 wastes based on acceptable knowledge (WCPIP, Section 3.0, p. 13).

The AKSR, Revision 4, describes wastes from Waste Stream SNL-HCF-S5400-RH as organic and inorganic debris generated during the destructive and nondestructive examinations conducted in the HCF, including items from the various cells and gloveboxes. The waste stream includes paper and cloth items, bottles, jars, tubing, glovebox gloves and waste, gaskets, stainless steel hardware, buckets, plates, machinery, tubing and various aluminum items (References C1039, M1016, M1019, M1020 and M1021).

The physical composition of the waste stream is adequately defined. SNL-CCP presented estimated waste material parameter weight-percent calculations and distributions by parcel from each PKE in a memorandum to Attachment 6 of CCP-TP-005, Revision 22. This memorandum indicates that the waste stream is composed, on average, of 84.5% inorganic waste and 15.5% organic waste, with the predominant average waste material parameters being iron-based metals (62.1%), aluminum-based metals (10.1%), plastic (8.3%) and other inorganic materials (7.8%). Parcel data show that PKE00047 is composed primarily of metal, consistent with the distribution expected for the waste stream as a whole. PKE00027/54 includes only three containers, and waste material parameter information was missing from the AK record for one parcel used to generate Attachment 6. SNL-CCP representatives verified that the missing container underwent VE and contains waste constituents consistent with the waste stream; the remaining PKE00027/54 AK container data are also consistent with the overall waste stream description.

AK data indicate that the predominant radionuclides in both PKEs include cobalt-60 (^{60}Co), ^{90}Sr , ^{235}U , ^{238}U , ^{137}Cs and small amounts of TRU radionuclides, primarily ^{238}Pu , ^{239}Pu and ^{241}Am (References M1016, M1019, M1020 and M1021). In the late 1990s, SNL RWNMDD waste

handlers initially characterized RH containers with high dose⁸ rates using only a portable gamma system. SNL-CCP confirmed the list of radionuclides in PKE00027/54 and PKE00047 in the early 2000s, based on limited swipe samples collected from the parcels that were analyzed by destructive and nondestructive radiometric analyses. The measurements indicated that PKE00044, PKE00027/54 and PKE00047, while containing many common radionuclides, also showed different quantities and distributions that differentiated the three PKEs. SNL-CCP found that the measurements were sufficiently accurate to differentiate TRU and non-TRU waste based on the 100-nanocuries-per-gram (nCi/g) criterion. Table 3 presents a comparison of the SNL sampling results and the original PKE00047 radionuclide activities (References M1016, M1020 and M1021).

Table 3. PKE00047 Radionuclide Activity Ratio Comparison

Radionuclide	Measured Activity Ratio to ¹³⁷ Cs	PKE00047 Activity Ratio to ¹³⁷ Cs	Measured Activity Ratio to ²⁴¹ Am	PKE00047 Activity Ratio to ²⁴¹ Am
²⁴¹ Am	4.09E-02	1.00E+00	1.00E+00	1.00E+00
²³⁸ Pu	2.56E-02	3.50E-03	6.27E-01	3.50E-02
^{239/240} Pu	4.01E-02	1.30E-02	9.80E-01	1.30E-01
⁹⁰ Sr	6.85E-01	1.00E+00	NA	NA
¹⁴⁷ Pm	2.13E-02	---	NA	NA
²⁴¹ Pu	3.97E-01	---	9.71E+00	---
TRU alpha	1.07E-01	1.17E-01	2.61E+00	1.17E+00

NA: Not applicable because this is not a transuranic radionuclide.

Source: AKSR.

SNL-CCP determined that calculation errors compromised the original PKE00027/54 activity ratios. SNL-CCP performed additional sampling and analysis in 2008 to determine representative radionuclide activity ratios (References M1020 and M1021). Table 4 presents a summary of the 2008 revised ratios used by SNL-CCP to characterize waste generated from Glovebox 3 (Reference M1016).

⁸ “Rem” or “millirem” is a unit of dose equivalent, which is often commonly called “dose” or, when it is expressed per unit time, a “dose rate.” The criterion for RH determination is expressed in terms of a dose rate in rem, which, while technically incorrect, is commonly used. In this report, the terms “dose” and “dose rate” are used in place of the technically correct terms “dose equivalent” or “dose equivalent rate.” The actual differences among these values for the purpose of this report are negligible.

Table 4. Radionuclide Activity Ratios for PKE00027/54

Radionuclide	Measured Activity Ratio to ¹³⁷ Cs	Measured Activity Ratio to ²⁴¹ Am
²⁴¹ Am	8.99E-05	1.00E+00
²⁴³ Am	3.05E-06	3.39E-02
²³⁸ Pu	1.41E-05	1.56E-01
²³⁹ Pu	4.91E-05	5.46E-01
²⁴² Pu	1.41E-06	1.57E-02
⁹⁰ Sr	3.05E-02	NA
¹³⁷ Cs	1.00E+00	NA
¹⁴⁷ Pm	5.63E-05	NA
²⁴¹ Pu	2.67E-04	NA
TRU Alpha	1.58E-04	1.75E+00

NA: Not applicable because the radionuclide is not transuranic.
Source: AKSR.

The radiological composition of the each PKE and related parcels is adequately described in AK source documents. EPA understands that the information in these tables is based on AK source documents and may not correspond to SNL-CCP parcel sampling results presented in CCP-AK-SNL-501. However, AK radiological information adequately demonstrates the availability and use of AK information to describe the general radiological composition of the waste stream.

SNL-CCP used radionuclide information from the DR documents and other AK to develop a summary of the radionuclides in all 32 waste parcels at the time the evaluation was performed; a few parcels have since been removed from the RH population. The evaluation included data for PKE00044, PKE00027/54 and PKE00047. (See the baseline report for further details.) The radiological compositions of each parcel, the groups of parcels in each PKE, and all parcels as a whole are adequately described.

- (7) The Waste Stream Profile Form and attached characterization reconciliation reports were examined and found to be adequate (WCPIP, Section 3.4.2.1, p. 22).

SNL-CCP provided EPA with a draft WSPF and the PKE00047 and PKE00027/54 CRRs; the draft WSPF was dated and signed December 6, 2011. The WSPF states that the waste stream includes 28 containers in 10 RH casks. This container number does not coincide with the number stated in the AKSR or the number presented in the AK Tracking Spreadsheet, which indicates that only 20 containers remain in this RH waste stream. The draft WSPF presents an accurate representation of the waste stream at the time the form is prepared, and additional characterization has caused several containers to be removed from the RH waste stream. See Item (4) above for a description of how the actual number of containers in a waste stream is determined at any given point in time.

The draft WSPF did not specify the batch data report (BDR) numbers supporting waste stream characterization and instead referenced the characterization information summary (CIS). The CIS is not required or mentioned in WCPIP or CCP-TP-005, Revision 24, but preparing a CIS is

necessary to meet WCPIP requirements. On December 20, 2010, SNL-CCP prepared a draft PKE00027/54 CIS for inspection purposes only that will be updated to include additional characterization information as the containers are characterized. Together, the draft WSPF and draft CIS are complete and adequate.

SNL-CCP prepared a draft PKE00027/54 CRR on December 20, 2010. The CRR is a draft document and therefore does not include the Site Project Manager (SPM) signature and date. The revised draft CRR is adequate.

- (8) The acceptable knowledge accuracy report was examined and found to be adequate; a Correlation and Surrogate Summary Form was not required (WCPIP, Sections 4.1, p. 30; and 3.2.2, pp. 17–19).

SNL-CCP prepared a draft AK accuracy report for Lot 2 on May 31, 2011, which included four containers that were associated with PKE00027/54 at that time. The report states that Container Nos. SNLNM007023 and SNLNM007021 were rejected because their TRU activity was below 100 nCi/g. Also, Parcel 9800776 in SNL Container No. C980313 was rejected because the summary category group is S3000, and external dose readings indicate that this container is not TRU waste. As a result, the AK accuracy of Waste Stream SNL-HCF-S5400-RH PKE00027/54 containers was 25% when the AK accuracy report was prepared, and 3 of the 4 PKE00027/54 containers failed to meet the DQOs of CCP-AK-SNL-502. The WCPIP requires EPA notification if the AK accuracy falls below 90%. An SNL-CCP representative stated that EPA will be notified following certification of PKE00027/54. EPA expects to receive this notification when the T1 request is approved.

Waste Stream SNL-HCF-S5400-RH has a companion CH waste stream, but the CH information was not used to characterize this RH waste stream. If CH information is used to characterize RH waste, a CSSF is required.

- (9) Container data are adequately traceable and are in the AK record (WCPIP, Sections 3.4.4.1, p. 20; 3.4.2.2, p. 23; and 4.1, pp. 29–34).

SNL-CCP provided traceability information for CCP Container Nos. SNLNM7020 (PKE00027/54) and SNLNM7024 (PKE00047). A primary source of container traceability information are the Disposal Request Forms in Reference M1016, which include the location and date of parcel packaging, a list of the parcel contents (in some cases this includes information about the contributing experiment), and the date the parcel was transferred to the Manzano Base. The AK Tracking Spreadsheet provided by SNL-CCP also correlated the CCP container number, SNL 30-gallon container numbers, SNL container number and old/new parcel numbers. From packaging to disposal, each parcel was assigned or associated with several different identifiers, including:

- Disposal Request Form.
- Original packaging parcel number.
- New parcel number assigned at a future date.

- SNL-assigned container into which the parcel was placed for storage.
- Number of the 30-gallon drum into which the parcel was or will be repackaged during VE.
- Number of the 55-gallon drum into which the 30-gallon drum was packed (SNL-CCP drum number).

Table 5 presents traceability information for the two containers provided by SNL-CCP. Container data are in the AK record and are traceable to packaging records from the decontamination operations in the HCF.

Table 5. Container Traceability

CCP 55-Gallon Drum Number	30-Gallon Drum Number	Container No.	Original Parcel Number	Parcel No.	Disposal Request Form	Packaging Date and Location	Contributing Experiment (if known)	Transfer Date to Manzano Storage
SNLNM007020	P1110158	C200357	204139	P2000988	204139	Prior to 12/05/97 Glovebox 3	ST	3/01/00
SNLNM007024	P1110156	C980391	TRU-HCF-97-06	P9800962	005940	01/23/83 Gloveboxes 1 and 3	Unknown	6/8/98

Summary of Acceptable Knowledge Findings and Concerns

During this T1 change evaluation, the EPA evaluation team did not identify any AK-related findings or concerns relative to the inclusion of containers generated from PKE00027/54 and PKE00047 in Waste Stream SNL-HCF-S5400-RH.

Changes to Acceptable Knowledge Tiering

There are no changes to the AK tiering based on the results of this T1 evaluation. As stated in the Executive Summary, if SNL-CCP were to characterize additional RH wastes from PKE00027/54, PKE000457 or PKE00044 in the future, the tiering conditions and limitations included in Table 1 of the baseline approval report are applicable.

Acceptable Knowledge Approval

Based on the results of this evaluation, EPA approves inclusion of containers generated from PKE00027/54 and PKE00047 in Waste Stream SNL-HCF-S5400-RH and finds that all procedural requirements have been met.

6.2 Radiological Characterization

Radiological Characterization Overview

The radiological characterization of parcels PKE00027/54 and PKE00047 of SNL-CCP Waste Stream SNL-HCF-S5400-RH relies on DTC in conjunction with radionuclide-specific scaling factors. The scaling factors were developed independently for these two waste parcels, based primarily on two sources of information:

- AK for Waste Stream SNL-HCF-S5400-RH, as summarized in the AKSR and associated source documents.
- Radionuclide-specific laboratory results from the analysis of smear samples collected for all three containers of waste from PKE00027/54 and, separately, for five randomly selected drums from PKE00047, as summarized in CCP-AK-SNL-501, Revision 2, and its supporting calculation packages.

Overviews of the radiological characterization processes used for PKE00027/54 and PKE00047 are depicted separately in CCP-AK-SNL-501, Revision 2, Figures A2-1 and B2-1. EPA combined these in a single flow diagram provided in Figure 1 below.

EPA evaluated the radiological characterization methods used for PKE00027/54 and PKE00047 in terms of the technical adequacy of the approach, as supported by the program's documents, procedures and controls, and the knowledge and understanding of the personnel involved in the RH waste characterization program.

Documents Reviewed

Attachment A includes all documents that were examined to support this T1 evaluation.

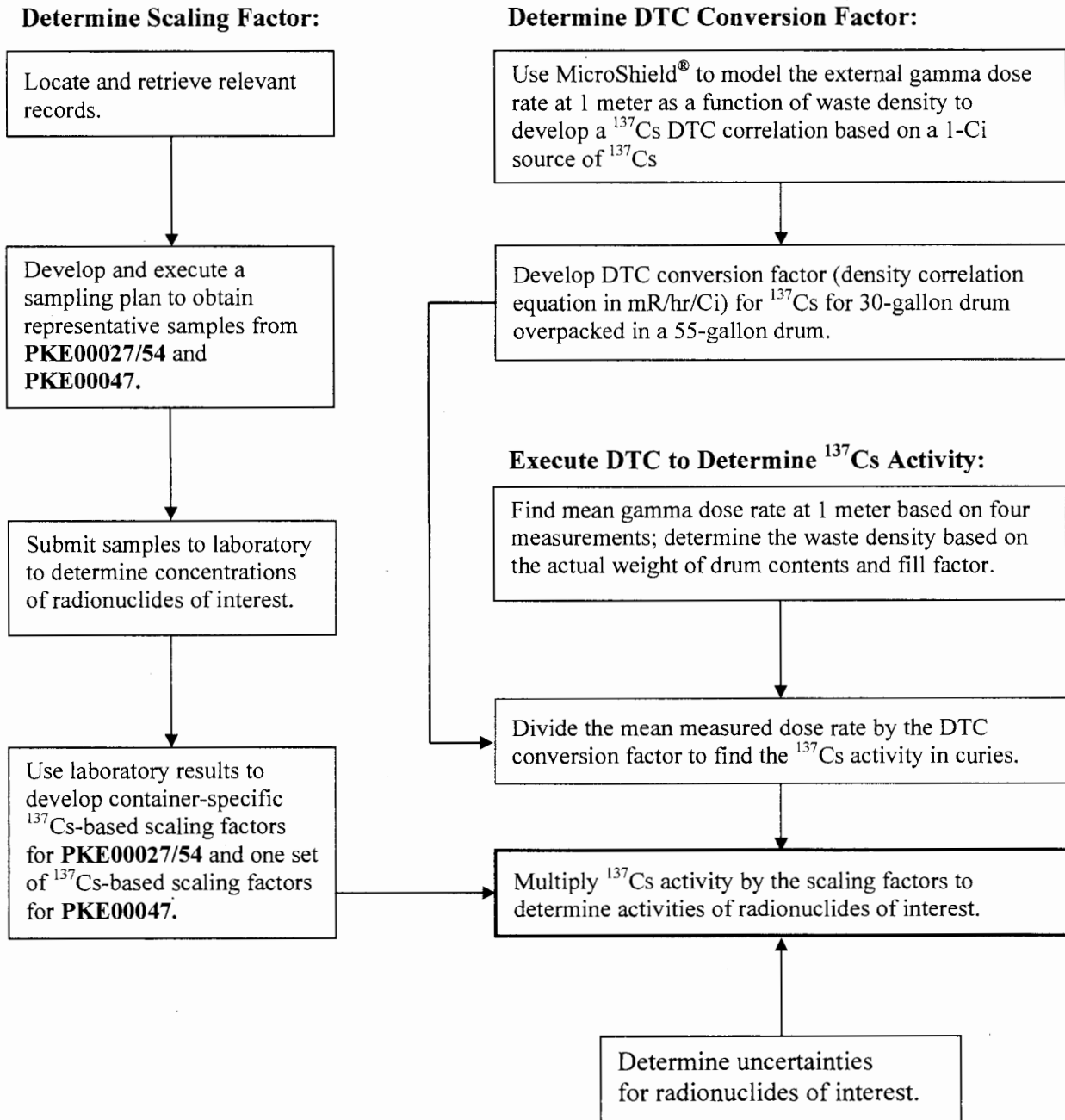


Figure 1. Flow Diagram of the Characterization Process for PKE00027/54 and PKE00047

Technical Evaluation

- (1) EPA evaluated the methodology and the technical approaches used to characterize PKE00027/54 and PKE00047 and determined that they were technically adequate.

EPA reviewed the information that formed the basis of the radiological characterization process, documented in Appendices A and B of CCP-AK-SNL-501, Revision 2, two post-sampling memoranda, and supporting calculation packages. The following aspects were evaluated:

- The methodology and the technical approach.
- The principal sources of the two PKEs and their distinction.
- The sampling procedures implemented by SNL-CCP.
- Collection of smear samples for PKE00027/54: Container No. P1110155 (containing commingled PKE00027 Parcel P2000836 and PKE00047 Parcels P9900533 and P9900534); Container No. P1110158 (containing Parcel P2000998); and Container No. P1110159 (containing Parcel P9800935).
- Collection of smear samples for PKE00047: randomly selected Container Nos. P1110156, P1110157, P1110198, P1110199 and P1110201, containing, respectively, Parcels P9800962, P9900529, P9800958, P9900532 and P9801007.
- Representativeness of laboratory samples, composites of at least three samples taken from each container/parcel sampled.
- The technical adequacy and documentation of the analytical data used to develop scaling factors.
- Use of small sample sizes to characterize the two portions of the waste stream and the impact on the scaling factor uncertainties.
- Derivation of three sets of container-specific, ^{137}Cs -based scaling factors using radiometric and spectrometric analyses of the smear samples from PKE00027/54.
- Derivation of a single set of ^{137}Cs -based scaling factors, using radiometric and spectrometric analyses of smear samples from five, randomly selected single-parcel containers from PKE00047.
- Development of DTC correlation for 30-gallon drums overpacked in 55-gallon drums using waste densities ranging from 0.2 grams per cubic centimeter (g/cm^3) to $1.8 \text{ g}/\text{cm}^3$ based on MicroShield[®] modeling of the container's external dose rate using a one-curie (Ci) source of ^{137}Cs .
- External gamma measurements (DTC) made at SNL, as evidenced by the DTC BDRs.
- Determination of reportable radionuclides and the bounding analyses performed.
- Activity in Ci and mass in grams and the associated uncertainties that were determined for the 10 WIPP-tracked radionuclides (^{233}U , ^{234}U , ^{238}U , ^{238}Pu , ^{239}Pu , ^{240}Pu , ^{242}Pu , ^{241}Am , ^{137}Cs and ^{90}Sr), ^{235}U , ^{241}Pu , curium-244 (^{244}Cm), ^{245}Cm , yttrium-90 (^{90}Y) and barium-137m ($^{137\text{m}}\text{Ba}$).

- The appropriateness of the physical constants and radionuclide-specific attributes (specific activity, physical half-life, decay heat, neutron cross-sections, photon transition probabilities, etc.) and the technical correctness of the values assigned to each attribute.

The constants and other values in the calculation packages were taken from the appropriate sources and were spot-checked for accuracy. Calculations were performed using Excel spreadsheets, as shown in CCP-AK-SNL-501, Revision 2, Figures A5-3 and B5-3, for PKE00027/54 and PKE00047, respectively. The input for these calculations includes:

- Date of characterization.
- Waste stream designation.
- Container number.
- Container gross weight.
- Container net weight.
- Measured container dose rates.

There were no concerns regarding the methodology and the technical approaches used for the radiological characterization of PKE00027/54 and PKE00047.

- (2) Technical aspects and documentation of the radiological characterization process were evaluated and found to be acceptable.

CCP-AK-SNL-501, Revision 2, is the main document that describes the radiological characterization process, supported by a series of calculation packages, which were prepared or reviewed by SNL-CCP radiological characterization personnel J. Holderness and J. Vance. EPA determined that CCP-AK-SNL-501 adequately documented the radiological characterization process for PKE00027/54 and PKE00047 and that the calculation packages in conjunction with the post-sampling memoranda dated August 10, 2011, for PKE00027/54 and August 26, 2011, for PKE00047 adequately supported the activities upon which the radiological characterization is based.

- (3) Technical aspects and documentation of the sample collection were evaluated and were found to be acceptable.

SNL-CCP developed a sampling plan for the containers from both PKEs assuming that all containers were RH TRU, based on available AK. Upon completion of the radiological characterization, some of the containers fell out of the waste stream because they were non-TRU (three from PKE00027/54) or CH TRU (one container from PKE00047). Additionally, in the case of PKE00027/54 one container was not from the same waste matrix. Summaries of the samples collected for both PKEs are provided in Table 6 below, along with their parcel numbers, sample and laboratory identification numbers, 30-gallon and 55-gallon drum numbers and final dispositions.

Table 6. Sample Disposition Summary

PKE	Sample ID Nos.			Parcel /30-Gallon/ 55-Gallon Nos.	Lab. ID No.	Sample Description	Drum Disposition
27/54	SN03081101	SN03081102	SN03081103	P2000998/P1110158/ SNLNM7020	IDG50 & 1DG50D	Primary & laboratory duplicate	RH TRU, Used for SF Development
27/54	SN003241101	SN003241102	SN003241103	P9800935/P1110159/ SNLNM7021	IDG51	Primary sample	Non-TRU, Not Used for SF Development
27/54	SN03301101	SN03311101	SN03311102	P9800776/P1110154/	IDG52	Primary sample	Wrong Matrix, Not Used for SF Development
27/54	SN04141101	SN04151101	SN04151102	P2000836/P1110155/ SNLNM7023	IDG53	Primary sample, (first sample from Container No. P1110155)	Non-TRU, Not Used for SF Development
27/54	SN04151103	SN04151104	SN04151105	P9900534/P1110155/ SNLNM7023	IDG54	Primary sample, (non- collocated, second sample from Container No. P1110155)	Non-TRU, Not Used for SF Development
47	P9800962-1	P9800962-2	P9800962-3	P9800962/P1110156 SNLNM7024	IDG61 & 1DG61D	Primary & laboratory duplicate	CH TRU, Used for SF Development
47	P9900529-1	P9900529-2	P9900529-3	P9900529/P1110157/ SNLNM7025	IDG62	Primary sample	RH TRU, Used for SF Development
47	P9800958-1	P9800958-2	P9800958-3	P9800958/P1110198 SNLNM7012	IDG63	Primary sample	RH TRU, Used for SF Development
47	P9900532-1	P9900532-2	P9900532-3	P9900532/P1110199/ SNLNM7017	IDG64	Primary sample	RH TRU, Used for SF Development
47	P9801007-1	P9801007-2	P9801007-3	P9801007/P1110201/ SNLNM7018	IDG65	Primary sample	RH TRU, Used for SF Development

The post-sampling memoranda for both PKEs were developed prior to the determination of the containers' final status as RH or TRU, which presents two issues.

1. The scaling factors for PKE00047 were based on the analytical results of five samples, but one of the samples is CH TRU, not RH TRU. Since four out of five samples were RH, the impact of one sample being a CH sample is minimal and no revisions were necessary.
2. The scaling factors, for PKE00027/54, however, were based on only a single RH TRU container (No. P1110158) out of five that were sampled. The remaining four samples were either non-TRU or belonged to another waste matrix. As a result only one RH container from this waste group was eligible for WIPP disposal. Accordingly, the post-sampling memorandum for PKE00027/54 should have been revised to document the effects of this change on the quality assurance (QA) objectives, as stated in Section 3.0, and present an accurate description of the data analyses using the actual number of valid samples, i.e., one.

Several sections of the post-sampling memorandum for PKE00027/54 required revision to reflect the actual number of valid RH TRU samples that were used to support the development of scaling factors and their statistical evaluation. EPA communicated these concerns to CBFO via a written memorandum on February 29, 2012, and CBFO provided a written response. EPA commented on the revised post-sampling memorandum stating they were unsatisfactory. EPA arranged for a conference call to convey what revisions would be acceptable as appropriate objective evidence. Instead of fully explaining the impact of non-RH waste samples on the drum-specific radiological content of RH containers in PKE00027/54, the revised post-sampling memorandum contained only two footnotes to Table 2.1, simply stating that the data are valid. This response was not acceptable. The derivation of scaling factors must be based on samples that are representative of the RH TRU wastes intended for disposal at WIPP. The changes made did not reflect this. Subsequently on March 28, 2012, CBFO sent a response which is satisfactory.

EPA approvals are based on documented objective evidence that reflects the actual events and conditions that form the characterization process, and not solely on subjective judgment, namely, that the drums came from the same waste stream, as asserted by CBFO. Documentation of a waste characterization process that CBFO presents for EPA's approval must represent the actual conditions for which the approval is sought. For PKE00027/54, all of the samples except one were ultimately classified as non-TRU wastes, yet the document of record (post-sampling memorandum) presented information to the contrary. This mistake was eventually clarified but until it was, it created confusion and delayed the approval of the request.

To better support EPA's approval, EPA recommends that changes be made to the WCPIP the next time it is revised. These changes would specify the importance of agreement between the objective evidence that documents a waste characterization process and the process itself, and would prevent recurrence of the situation EPA encountered with the documentation for PKE00027/54.

- (4) Technical aspects and documentation of the sample analysis were evaluated and were found to be acceptable.

The same radiometric and spectrometric techniques were used for samples from PKE00027/54 and PKE00047. The results were documented in technique-specific BDRs, which EPA evaluated for technical content. These are discussed separately below.

PKE00047

General Comments

The tamper-indicating ratchet-type caps on 11 of the 15 swab samples were ineffective in demonstrating sample integrity, and the laboratory initiated NCR No. 63602 to address this issue. The disposition of the NCR was “Use As Is” because the shipping container tamper-indicating device was intact when the container was received by the laboratory. The laboratory composited each set of three swabs into a single sample for analysis, one of which was designated as a laboratory duplicate in the post-sampling memorandum. However, the laboratory analyzed duplicate laboratory control standards (LCSs) as allowed by its own QA program for all analyses except gamma spectrometry, for which a duplicate sample was processed and identified as such in the post-sampling memorandum. Section 4.3.4.3 of the WCPIP allows a laboratory to defer to its own QA requirements if the laboratory has an established QA program, so this was acceptable.

The sample swabs were composited and leached in acid with a laboratory blank, LCS, and duplicate LSC (LSCD), unless noted below. The following sections discuss the pertinent details of each analytical technique.

Alpha Spectrometry, BDR No. ALD11021A – ²⁴¹Am and Isotopic Cm, Pu and U

The BDR narrative stated that all quality control (QC) requirements were met. The analyses performed on the sample leachates also included Am/Cm, ²⁴⁵Cm, isotopic Pu, and isotopic U fractions. The report narrative did not identify any problems with these analyses. The BDR contained a completed “Sample Receiving and Custody Review Checklist – Analytical Laboratory,” in which initiation of NCR No. 63602 was recorded. The BDR also contained a completed “Independent Technical Review Checklist – Actinides by Alpha Spectrometry.” “Attachment 7 – Site Project Manager Radiochemistry or ICP-MS Analytical Batch Data Report Checklist” was attached and completed as required.

Gas Flow Proportional Counting, BDR No. ALD11021B – ⁹⁰Sr

The BDR narrative stated that all QC requirements were met. The BDR contained a completed “Sample Receiving and Custody Review Checklist – Analytical Laboratory” form, in which initiation of NCR No. 63602 was recorded. The BDR also contained a completed “Independent Technical Review Checklist, Radiostromium by Gas-Flow Proportional Counting (GFPC).” “Attachment 7 – Site Project Manager Radiochemistry or ICP-MS Analytical Batch Data Report Checklist” was attached and completed as required.

Gamma Spectrometry, BDR No. ALD11021G – ¹³⁷Cs and Gamma-Emitting Radionuclides

The sample swabs were composited and leached in acid with a laboratory blank. The post-sampling memorandum for PKE00047 identified Sample No. 1DG61 as the laboratory duplicate, but the laboratory analyzed Sample No. 1DG65 as a duplicate to assess precision. The BDR narrative stated that all QC requirements were met except for the detection limits for ¹³⁴Cs in one sample. Gamma spectrometry was performed for ⁶⁰Co, ¹³⁴Cs, ¹³⁷Cs, europium-154 (¹⁵⁴Eu) and other gamma-emitting radionuclides. The BDR contained a completed “Sample Receiving and Custody Review Checklist – Analytical Laboratory” form, in which initiation of NCR No. 63602 was recorded. The BDR also contained a completed “Independent Technical Review Checklist, Gamma Spectroscopy” and an “Attachment 7 – Site Project Manager Radiochemistry or ICP-MS Analytical Batch Data Report Checklist,” which was completed as required.

Inductively Coupled Plasma-Mass Spectrometry, BDR No. ALD11021I – Isotopic U and Pu

²³⁹Pu was detected in the laboratory blank and in one instrument verification blank but the level was below required acceptance levels. LCS/LCSD duplicate analyses demonstrated acceptance precision. A post-digestion spike was prepared, one for Pu and one for U, and analyzed with acceptable recoveries. The BDR contained a completed “Sample Receiving and Custody Review Checklist – Analytical Laboratory” form, in which initiation of NCR No. 63602 was recorded. The BDR also contained a completed “ITR Checklist, Pu and U Isotopes by Inductively Coupled Plasma Mass Spectrometry.” “Attachment 7 – Site Project Manager Radiochemistry or ICP-MS Analytical Batch Data Report Checklist” was attached and completed as required.

Liquid Scintillation Counting, BDR No. ALD11021L – ²⁴¹Pu

The Pu fraction of the leachate was separated using an approved laboratory method and was also used for the alpha spectrometry analyses discussed above. The BDR narrative stated that all QC requirements were met, although a spiking error required that a blank and an LCS be leached in acid a second time. The BDR contained a completed “Sample Receiving and Custody Review Checklist – Analytical Laboratory” form, in which initiation of NCR No. 63602 was recorded. The BDR also contained a completed “ITR Checklist, Determination of Pu-241 by Liquid Scintillation Counting (LSC).” “Attachment 7 – Site Project Manager Radiochemistry or ICP-MS Analytical Batch Data Report Checklist” was attached and completed as required.

EPA did not identify any issues with the analytical data for PKE00047.

PKE00027/54

General Comments

The laboratory received sample containers with tamper-indicating caps; however, the laboratory determined that the containers could be opened without breaking the seal. The laboratory initiated NCR No. 63436 to address the ineffective sample seals that could not demonstrate sample integrity. The NCR was dispositioned as “Use As Is” because the shipping container tamper-indicating device was intact when the container was received by the laboratory. The laboratory composited each set of three swabs into a single sample for analysis. A sample consisting of three swabs was designated as a laboratory duplicate in the post-sampling memorandum, but the laboratory analyzed duplicate LCSs as allowed by its own QA program except for gamma analysis, for which Sample No. 1DG50 was processed in duplicate as required.

by the post-sampling memorandum. Section 4.3.4.3 of the WCPIP allows a laboratory to defer to its own QA requirements if the laboratory has an established QA program, so this was acceptable.

The sample swabs were composited and leached in acid with a laboratory blank and duplicate LCSs, unless noted below. The following sections discuss the pertinent details of each analytical technique.

Alpha Spectrometry, BDR No. ALD11019A – ^{241}Am and isotopic Cm, Pu and U

The BDR narrative stated that all QC requirements were met. The analyses performed on the sample leachates also included Am/Cm, ^{245}Cm , isotopic Pu and isotopic U fractions. The report narrative identified a possible positive bias for $^{233}\text{U}/^{234}\text{U}$ for Sample Nos. 1DG51 and 1SG52 and a possible high bias for $^{239}\text{Pu}/\text{Pu}^{240}$ for Sample No. 1DG51. The BDR contained a completed “Sample Receiving and Custody Review Checklist – Analytical Laboratory,” in which initiation of NCR No. 63436 was recorded. The BDR also contained a completed “Independent Technical Review Checklist – Actinides by Alpha Spectrometry.” “Attachment 7 – Site Project Manager Radiochemistry or ICP-MS Analytical Batch Data Report Checklist” was attached and completed as required.

Gas Flow Proportional Counting, BDR No. ALD11019B – ^{90}Sr

The BDR narrative stated that all QC requirements were met. The BDR contained a completed “Sample Receiving and Custody Review Checklist – Analytical Laboratory,” in which initiation of NCR No. 63436 was recorded. The BDR also contained a completed “ITR Checklist, Radiostrontium by Gas-Flow Proportional Counting (GFPC).” “Attachment 7 – Site Project Manager Radiochemistry or ICP-MS Analytical Batch Data Report Checklist” was attached and completed as required.

Gamma Spectrometry – BDR No. ALD11019G, ^{137}Cs and Gamma-Emitting Radionuclides

The sample swabs were composited and leached in acid with a laboratory blank, sample duplicate and LCS/LSCD. The post-sampling memorandum for PKE00027/54 identified Sample No. 1DG50 as the laboratory duplicate, and this was used to assess precision. The BDR narrative stated that all QC requirements were met except for the detection limit for ^{134}Cs in Sample Nos. 1DG50, 1DG50D and 1DG52. Gamma spectrometry was performed for ^{60}Co , ^{134}Cs , ^{137}Cs , ^{154}Eu and other gamma-emitting radionuclides. The BDR contained a completed “Sample Receiving and Custody Review Checklist – Analytical Laboratory,” in which initiation of NCR No. 63436 was recorded. The BDR also contained a completed “ITR Checklist, Gamma Spectroscopy” and “Attachment 7 – Site Project Manager Radiochemistry or ICP-MS Analytical Batch Data Report Checklist,” which was completed as required.

Inductively Coupled Plasma-Mass Spectrometry – BDR No. ALD11019I, ^{239}Pu , ^{240}Pu , ^{242}Pu , ^{233}U , ^{234}U , ^{235}U and ^{238}U

^{239}Pu and ^{240}Pu were detected in a laboratory blank and in one instrument verification blank, but ^{239}Pu was at a level below required acceptance levels. The level of ^{240}Pu detected in the laboratory blank was such that a positive bias in the reported result for Sample Nos. 1DG50, 1DG51 and 1DG52 may be present. LCS/LSCD duplicate analyses demonstrated acceptance precision. A post-digestion spike was prepared, one for Pu and one for U, and analyzed with

acceptable recoveries. ^{239}Pu was not detected in Sample Nos. 1DG51 and 1DG52. The BDR contained a completed "Sample Receiving and Custody Review Checklist – Analytical Laboratory," in which initiation of NCR No. 63436 was recorded. The BDR also contained a completed "ITR Checklist, Pu and U Isotopes by Inductively Coupled Plasma Mass Spectrometry." "Attachment 7 – Site Project Manager Radiochemistry or ICP-MS Analytical Batch Data Report Checklist" was attached and completed as required.

Liquid Scintillation Counting, BDR No. ALD11019L – ^{241}Pu

The Pu fraction of the leachate was separated using an approved laboratory method and was also used for the alpha spectrometry discussed above. The BDR narrative stated that all QC requirements were met, although a spiking error required that one blank and an LCS be leached in acid a second time. The BDR contained a completed "Sample Receiving and Custody Review Checklist – Analytical Laboratory," in which initiation of NCR No. 63436 was recorded. The BDR also contained a completed "ITR Checklist, Determination of Pu-241 by Liquid Scintillation Counting (LSC)." "Attachment 7 – Site Project Manager Radiochemistry or ICP-MS Analytical Batch Data Report Checklist" was attached and completed as required.

EPA did not identify any issues with the analytical data for PKE00027/54.

(5) Technical aspects and documentation of the development of scaling factors were evaluated and were found to be acceptable.

The scaling factors for Container No. SNLNM007023 from PKE00027/54 (containing three commingled parcels) were different from those developed for the two single-parcel waste containers, resulting in three sets of scaling factors for PKE00027/54. However, the only container to be promoted as RH TRU waste from PKE00027/54 is Container No. SNLNM007020, as discussed above, and this container had its own scaling factor. For PKE00047, a single set of scaling factors was developed for all seven containers based on the five samples collected. As discussed above, Container No. SNLNM007012 was determined to be CH TRU. Scaling factors for both parcels are provided in Table 7 below. The PKE00027/54 values are listed according to their 30-gallon drum number.

Table 7. ¹³⁷Cs Scaling Factors for PKE00027/54 and PKE00047, Ci Radionuclide/Ci ¹³⁷Cs

Radionuclide	Scaling Factors PKE00027/54			Scaling Factors PKE00047
	P1110158	P1110159	P1110155	
²⁴¹ Am	6.99E-04	4.38E-03	2.38E-03	8.79E-02
²⁴² Cm	4.96E-06	5.59E-05	1.92E-05	7.49E-04
²⁴⁴ Cm	2.35E-05	4.43E-05	1.16E-04	6.08E-04
²⁴⁵ Cm	1.29E-05	2.35E-04	1.30E-04	3.84E-03
²³⁸ Pu	1.11E-03	9.93E-04	7.58E-03	2.28E-02
²³⁹ Pu	6.02E-05	1.41E-04	3.20E-04	6.74E-02
²⁴⁰ Pu	8.43E-05	1.98E-04	4.49E-04	4.05E-02
²⁴¹ Pu	4.32E-03	1.05E-02	1.95E-02	4.66E-01
²⁴² Pu	5.64E-06	3.29E-04	4.64E-04	5.23E-06
²³³ U	3.57E-07	2.09E-05	2.94E-05	2.08E-05
²³⁴ U	3.56E-05	3.22E-05	3.89E-04	1.56E-04
²³⁵ U	1.10E-06	6.68E-07	1.09E-05	4.73E-06
²³⁶ U	-	-	-	4.80E-06
²³⁸ U	2.01E-07	2.05E-07	1.18E-06	3.98E-06
¹³⁷ Cs	1.00E+00	1.00E+00	1.00E+00	1.00E+00
⁹⁰ Sr	2.84E-01	2.55E+00	4.73E-01	4.36E-01

- (6) The technical basis and derivation of total measurement uncertainty were evaluated and were found to be adequate.

The development of total measurement uncertainty (TMU) for both PKEs is based on the propagation of uncertainties present in all aspects of the radiological characterization process. These aspects are assumed to be independent, which allows them to be added in quadrature.⁹ The TMU determination included contributions of the following sources of uncertainties:

- ¹³⁷Cs DTC correlation – MicroShield® code, MicroShield® modeling, and waste density uncertainties.
- ¹³⁷Cs activity measurement – dose rate measurement uncertainty and uncertainty due to the contribution of other gamma-emitting radionuclides.
- Scaling factor uncertainty – uncertainties in the mean scaling factors from the sample data.

Because the measurement of ¹³⁷Cs is common to the activity determinations for all radionuclides, a statistical dependency exists for derived parameters (e.g., TRU determination) that are summations over multiple radionuclides. The use of effective scaling factors (i.e., the sum of the individual scaling factors multiplied by appropriate weighting factors) addresses this.

A general treatment of TMU for PKE00027/54 and PKE00047 is presented in Sections A.6.0 and B.6.0 of CCP-AK-SNL-501, Revision 2, respectively, and the detailed treatment of TMU is

⁹ Adding in quadrature is a standard statistical technique that allows one to combine the square root of the sum of each contributor to uncertainty squared, resulting in a lower value than what would be obtained if the values were simply added.

provided in Calculation Package SNL-RH-10, Revision 0 (Reference U1038), and in Calculation Package SNL-RH-15, Revision 0 (Reference U1043). The overall uncertainties are consistent with what EPA has observed for RH determinations at other RH TRU generator sites. The overall uncertainties for PKE00027/54 and PKE00047 containers are provided below in Table 8. There were no concerns regarding the technical derivation and documentation of TMU for PKE00027/54 and PKE00047.

Table 8. Overall Uncertainties for PKE00027/54 and PKE00047

Radionuclide	Total ¹³⁷ Cs Uncertainty		Total Scaling Factor Uncertainty		Total Uncertainty	
	PKE00027/54	PKE00047	PKE00027/54	PKE00047	PKE00027/54	PKE00047
²³³ U	28.0%	28.0%	100.0%	100.0%	103.8%	103.8%
²³⁴ U	28.0%	28.0%	37.7%	57.8%	46.9%	64.2%
²³⁵ U	28.0%	28.0%	45.9%	52.3%	53.7%	59.3%
²³⁸ U	28.0%	28.0%	51.4%	16.8%	58.5%	32.6%
²³⁸ Pu	28.0%	28.0%	18.4%	10.1%	33.5%	29.7%
²³⁹ Pu	28.0%	28.0%	39.6%	32.7%	48.5%	43.1%
²⁴⁰ Pu	28.0%	28.0%	38.8%	32.4%	47.9%	42.8%
²⁴¹ Pu	28.0%	28.0%	26.7%	20.0%	38.7%	34.4%
²⁴² Pu	28.0%	28.0%	100%	100%	103.8%	103.8%
²⁴¹ Am	28.0%	28.0%	36.2%	26.3%	45.7%	38.4%
²⁴⁵ Cm	28.0%	28.0%	52.7%	29.1%	59.7%	40.4%
⁹⁰ Sr	28.0%	28.0%	31.8%	20.8%	42.3%	34.8%
¹³⁷ Cs	28.0%	28.0%	0.0%	0.0%	28.0%	28.0%
⁹⁰ Y	28.0%	28.0%	31.8%	20.8%	42.3%	34.8%
^{137m} Ba	28.0%	28.0%	0.0%	0.0%	28.0%	28.0%

- (7) Remote-handled and transuranic determinations were assessed and were found to be adequate.

The determinations that the containers were RH were based on radiological survey reports provided by SNL-CCP. These reports showed the external dose rates.

- (8) The technical basis of the dose-to-curie correlation and its documentation were evaluated, and both aspects were acceptable.

The DTC correlation was evaluated based on DTC BDR Nos. SNLRHDTTC11001 and SNLRHDTTC11002, which addressed containers from PKE00027/54, PKE00047 and PKE00044. The EPA evaluation team verified that both DTC BDRs contained the following:

- “Attachment 2 – Container Data Sheets” for all containers.
- “Attachment 8 – SPM Checklist.”
- “Attachment 4 – Batch Data Report Cover Sheet.”
- “Attachment 5 – Batch Data Report Table of Contents.”
- “Attachment 6 – Batch Data Report Narrative Summary.”
- “Attachment 7 – ITR Checklist.”

- “Attachment 10 – Duplicate Container Data Sheet” and “Attachment 11 – Relative Percent Difference” for Container Nos. SNLNM007121 (SNLRHDTC11001) and SNLNM007021 (SNLRHDTC11002).
- “Attachment 1 – Measurement Control Report,” with all parameters acceptable.
- Container data sheets for all containers (Attachment 2).
- Waste container DTC conversion records with all required parameters for all containers, including TRU determinations.
- “Attachment 1 – CCP Nonconformance Report (NCR).”
- Evidence that the correct revision of CCP-TP-504 was used: Revision 11.
- All forms had the correct signatures, i.e., ITR, SPM, DTC Operators and NCR Originators.
- The DTC conversion records for all containers indicated that the correct PKE-specific version of the DTC spreadsheet was used.

Additionally, the EPA evaluation team verified that all DTC operators and ITRs were listed on the list of Qualified Individuals (LOQI) for the time periods they conducted measurements.

Four of the containers from BDR No. SNLRHDTC11001 were determined to be non-TRU by virtue of having TRU alpha concentrations less than 100 nCi/g, as documented in NCR Nos. NCR-RHSNL-2352-11 and NCR-RHSNL-2353-11. The BDR also contained NCR No. NCR-RHSNL-2347-11, which addressed the use of the incorrect DTC spread sheet. The BDR was technically adequate.

Four of the containers from BDR No. SNLRHDTC11001 were determined to be non-TRU by virtue of having TRU alpha concentrations less than 100 nCi/g, as documented in NCR No. NCR-RHSNL-2354-11. The BDR was technically adequate.

There were no issues related to the DTC correlation and its documentation for containers from PKE00027/54 and PKE00047.

Summary of Radiological Characterization Findings and Concerns

The EPA evaluation team did not identify any radiological characterization-related findings or concerns relative to the addition of the PKE00047 and PKE00027/54 containers to Waste Stream SNL-HCF-S5400-RH during this T1 evaluation. However, EPA raised an issue concerning how RH waste sample data for PKE00027 group (see Item #3 in Section 6.2) were used. CBFO provided a response letter, which is satisfactory.

To better support EPA’s approval, EPA recommends that changes be made to the WCPIP the next time it is revised. These changes would specify the importance of agreement between the objective evidence that documents a waste characterization process and the process itself, and would prevent recurrence of the situation EPA encountered with the documentation for PKE00027/54.

Changes to Radiological Characterization Tiering

There are no changes to the radiological characterization tiering based on the results of this T1 evaluation. As stated in the Executive Summary, if SNL-CCP were to characterize additional RH wastes from PKE00027/54, PKE000457 or PKE00044 in the future, the tiering conditions and limitations included in Table 1 of the baseline approval report are applicable.

Radiological Characterization Approval

Based on the results of this evaluation, EPA approves the process of determining the radiological content of the PKE00027/54 and PKE00047 portions of Waste Stream SNL-HCF-S5400-RH, as described in this report.

6.3 Visual Examination

EPA examined three VE BDRs to determine whether SNL-CCP demonstrated continued compliance with the approved process during characterization of the containers generated from PKE00027/54 and PKE00047. These are discussed separately below

PKE00047

The VE data for PKE00047 were reported in VE BDR Nos. SNLRHVE110006, SNLRHVE11007, and RHSNLVE110101. SNL-CCP stated that the reason for the inconsistent numbering format between BDR Nos. SNLRHVE11007 and SNLRHVE11010 (year designator followed by 3 numbers) and RHSNLVE110006 (year designator followed by four numbers) was a process change. EPA used an Excel spreadsheet, "SNL HCF RH Container Info Matrix 9-19-11," supplied by SNL-CCP to verify that the container data reviewed belonged to PKE00047. VE data for the following containers were reported in the following BDRs:

- BDR No. SNLRHVE110006 contained VE data for one container, SNLNM007023. This container was determined not to be TRU waste and was removed from the waste stream.
- BDR No. SNLRHVE11007 contained VE data for four containers, SNLNM007024, SNLNM007025, SNLNM007017 and SNLNM007018.
- BDR No. SNLRHVE11010 contained VE data for two containers, SNLNM007098 and SNLNM007099.

The VE data were generated using CCP-TP-500, "CCP Remote-Handled Waste Visual Examination"; Revision 10 (December 29, 2010) of this document was used for BDR No. SNLRHVE110006, and Revision 11 (April 21, 2011) was used for BDR Nos. SNLRHVE11007 and SNLRHVE11010. EPA had previously reviewed Procedure CCP-TP-500 and determined it to be adequate for the generation of VE data for RH TRU waste containers. A change was made to the data sheets in Revision 11, so that operators are no longer required to determine the "Primary Contents" of containers. This change did not affect EPA's determination about the adequacy of the procedure for the generation of VE data for RH TRU waste containers.

The waste in the 30-gallon containers, loaded into 55-gallon drums, consisted of general debris items, and SNL-CCP verified that the waste was consistent with the waste stream description/waste matrix code. Both BDRs had been reviewed at both the data generation and project level as required by CCP-TP-500. No nonconformance reports were generated for BDR Nos. SNLRHVE11007 and SNLRHVE11010. The SNL-CCP LOQI that EPA reviewed demonstrated that VE data were generated by qualified personnel. EPA reviewed selected training records for the VE operators generating the data contained in the BDRs listed above and determined that they were trained in accordance with SNL-CCP requirements.

PKE00027/54

The VE data for PKE00027/54 were provided in VE BDR No. RHSNLVE110003, which contained data for one container, SNLNM07020. EPA used an Excel spreadsheet, "SNL HCF RH Container Info Matrix 9-19-11," supplied by SNL-CCP to verify that the container data reviewed belonged to PKE00027/54.

The VE data were generated using CCP-TP-500, Revision 10. EPA had previously reviewed Procedure CCP-TP-500 and determined it to be adequate and effective for the generation of VE data for RH waste. The 30-gallon Container No. P1110158 was packaged into 55-gallon Container No. SNLNM07020 and included general debris items; the primary contents were designated as "Steel." NCR No. NCR-RHSNL-2345-11 was generated for this container on April 4, 2011, and revised on April 12, 2011. The NCR was initiated because the parent container was not listed in the comments section of the data sheet. The data sheet was corrected and the revised data sheet was included in the BDR. The SNL-CCP LOQI reviewed by EPA demonstrated that VE data were generated by qualified personnel. EPA reviewed selected training records for the VE operators who generated the data contained in the BDR above and determined that the operators were trained in accordance with SNL-CCP requirements.

EPA did not identify any concerns or findings relative to the VE data for PKE00047 and PKE00027/54.

Summary of Visual Examination Findings and Concerns

The EPA evaluation team did not identify any VE-related findings or concerns relative to the addition of PKE00027/54 and PKE00047 to Waste Stream SNL-HCF-S5400-RH.

Changes to Visual Examination Tiering

There are no changes to the VE tiering based on the results of this T1 evaluation. As stated in the Executive Summary, if SNL-CCP were to characterize additional RH wastes from PKE00027/54, PKE000457 or PKE00044 in the future, the tiering conditions and limitations included in Table 1 of the final baseline approval report are applicable.

Visual Examination Approval

Based on the results of this evaluation, EPA approves the process of VE for determining the physical contents of the PKE00027/54 and PKE00047 portions of Waste Stream SNL-HCF-S5400-RH, as described in this report.

7.0 SUMMARY OF RESULTS

EPA concluded that the waste characterization processes of AK, radiological characterization, and VE used to characterize RH TRU containers generated from PKE00027/54 and PKE00047 as part of SNL-CCP Waste Stream SNL-HCF-S5400-RH are adequate, as evidenced by the records evaluated. There are no open issues relative to this T1 evaluation.

Findings and Concerns

The EPA evaluation team did not identify any findings or concerns related to AK, radiological characterization or VE. EPA personnel worked interactively with their SNL-CCP counterparts to answer questions, identify information needs and acquire necessary data and references; all potential issues were resolved in a timely fashion. There are no open issues related to AK, or VE resulting from this T1 evaluation.

To address EPA's issue concerning the post-sampling memorandum for PKE00027/54 [see Item (3) in Section 6.2] to support the development of scaling factors, CBFO provided a response letter which is satisfactory. To better support EPA's approval, EPA recommends that changes be made to the WCPIP the next time it is revised. These changes would specify the importance of agreement between the objective evidence that documents a waste characterization process and the process itself, and would prevent recurrence of the situation EPA encountered with the documentation for PKE00027/54.

Tiering Changes

Based on the results of this evaluation, there are no significant changes to the SNL-CCP tiering table included in the November 2011 EPA final baseline approval report. As stated in the Executive Summary, if SNL-CCP were to characterize additional RH wastes from PKE00027/54, PKE000457 or PKE00044 in the future, the tiering conditions and limitations included in Table 1 of the final baseline approval report are applicable.

Approval

EPA determined that the procedures and processes used by SNL-CCP for the addition of PKE00047 and PKE00027/54 to RH Waste Stream SNL-HCF-S5400-RH were adequate. Therefore, EPA approves the addition of PKE00047 and PKE00027/54 to RH Waste Stream SNL-HCF-S5400-RH as a T1 change.

ATTACHMENT A

LIST OF DOCUMENTS REVIEWED BY EPA DURING T1 EVALUATION

Acceptable Knowledge Accuracy Report, Sandia National Laboratory/New Mexico Waste Stream Number SNL-HCF-S5400-RH, Lot 2, for Audit Purposes Only, May 31, 2011

AK Container Tracking Spreadsheet SNL RH AK Container Matrix, September 19, 2011

Analytical Laboratory Batch Data Reports ALD11021A, ALD11021B, ALD11021G, ALD11021H, ALD11021L, ALD11019A, ALD11019B, ALD11019G, ALD11019I and ALD11019L

Batch Data Reports SNLRHDTC11001, SNLRHDTC11002, SNLRHVE110006, SNLRHVE11007 and SNLRHVE11010

CCP-AK-SNL-500, Central Characterization Project Acceptable Knowledge Summary Report for Sandia National Laboratories/New Mexico Remote-Handled Hot-Cell Facility Transuranic Waste (Debris), Waste Stream: SNL-HCF-S5400-RH, Revision 4, November 30, 2011

CCP-AK-SNL-501, Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report for Sandia National Laboratories/New Mexico Hot-Cell Facility Remote-Handled Transuranic Debris Waste, Waste Stream: SNL-HCF-S5400-RH, Revision 2, November 4, 2011

CCP-AK-SNL-502, Central Characterization Project RH TRU Waste Certification Plan for 40 CFR Part 194 Compliance for Sandia National Laboratories/New Mexico Laboratory Remote-Handled Transuranic Debris Waste, Waste Stream: SNL-HCF-S5400-RH, Revision 1, August 10, 2011

CCP-AK-SNL-505, Central Characterization Project Sampling and Analysis Plan for Sandia National Laboratory Remote-Handled Transuranic Debris Waste, Waste Stream: SNL-HCF-S5400-RH, Revision 0, November 29, 2010

CCP-TP-005, Attachment 1, Acceptable Knowledge Documentation Checklist, August 15, 2011

CCP-TP-002, Attachment 2, CCP Waste Stream Profile Form, Waste Stream SNL-HCF-S5400-RH, Draft for Audit Purposes, November 10, 2011

CCP-TP-005, Attachment 4, Acceptable Knowledge Source Document Reference List, December 6, 2011

CCP-TP-005, Attachment 6, Waste Form, Waste Material Parameters, Prohibited Items, and Packaging, April 21, 2011

CCP-TP-005, Attachment 8, Waste Containers, July 1, 2011

CCP-TP-005, Attachment 13, CCP Waste Stream Characterization Checklists, PKEs 00047 and 00027/54, Example Forms, provided January 12, 2012

CCP-TP-512, CCP Remote-Handled Waste Sampling, Revision 4, December 29, 2010

Characterization Reconciliation Reports for Waste Stream SNL-HCF-S5400-RH, Draft for Audit Purposes, PKEs 00047 and 00027/54, files dated December 20, 2011, and January 12, 2012, respectively

Characterization Information Summary, Waste Stream SNL-HCF-S5400-RH, Draft, file dated December 20, 2011

C1004, Reactor Accident Experiments and Funding, Sandia National Laboratories, Summer 1978

C1038, Ken Reil Interview; J. Kleckner, February 3, 2010

C1039, Memorandum, Waste Material Parameter for Waste Stream SNL-HCF-S5400, SNL Hot Cell Facility, Mixed Heterogeneous Debris Waste, J. Kleckner, February 2, 2010

DR1004, Discrepancy Resolution re: The SAP for Waste Stream SNL-HCF-S5400-RH Segregates the Three Principal Sources of Waste Generation into Three Radiological Categories, J. Kleckner, June 29, 2011

I1020, Hot Cell Facility (HCF) Decontamination Plan, December 1994

M1015, Miscellaneous Articles and Public Extracts, 1976 through 2008

M1016, TRU Waste Disposal Requests from the 2007/2008 Repackaged Containers, 2007 through 2008

M1019, Collection of Spreadsheets Pertaining to TRU Waste Generated at the AHCF and Other Locations on TA-V, 2007 through 2009

M1020 and M1020b, Process Knowledge Evaluations (PKE) for Radiological Ratios, PKE00044, PKE00047, and PKE00027/54, March 1980 through March 2004

M1021, Memo to Record, re: Evaluation of Radionuclide Activity Ratios for Hot Cell Facility Wastes (PKE00044 and PKE00047); Memo to Record, re: PKE00047 Radionuclide Activity Ratios, M. Enghauser, June 24, 2004

P1015, Sampling and Analysis Plan for Characterization of Waste Arising from Hot Cell Facility Glovebox, Revision 1, PLA 95-28, October 12, 1995

P1102, Building 6580 Hot Cell Facility, Steel Containment Boxes and Zone 2A Process Knowledge Documentation: Isotope Production Program, Hot Cell Facility Decontamination Project, L. Fugelso, S. Longley, L. Bourcier, June 28, 1996

P1104, Hot Cell Facility (HCF) Safety Analysis Report, Main Report and Appendices, L.F. Restrepo, SAND94-2650, October 21, 1994

P1105, Series of Procedures Titled AHCF Campaign Operating Procedure for TRU Waste, C. Barch, M. Wasiolek, AHCF-AP-003.02 and AHCF-OP-008.00, Revisions 2 and 00, respectively, August 30, 2010, and December 22, 2010

Post-Sampling Analysis Memorandum "Analysis of Sample Data for Sandia National Laboratory/New Mexico (SNL/NM) Waste Stream SNL-HCF-S5400-RH, PKE00027/54," from J. Holderness to I. Quintana, August 10, 2011 and Revision 1, February 29, 2012

Post-Sampling Analysis Memorandum "Analysis of Sample Data for Sandia National Laboratory/New Mexico (SNL/NM) Waste Stream SNL-HCF-S5400-RH, PKE00047," from J. Holderness to I. Quintana, August 26, 2011

Radiological Characterization Concern for SNL-CCP: PKE00027/54 and PKE00047 with CBFO's Response and EPA's Assessment of CBFO's Response, February 29, 2012 and March 6, 2012

RH Program – SNL List of Qualified Individuals, April 27, 2011

RH Program – SNL List of Qualified Individuals, May 19, 2011

RH Program – SNL List of Qualified Individuals, June 8, 2011

RH Program – SNL List of Qualified Individuals, July 22, 2011

RH Program – SNL List of Qualified Individuals, October 22, 2011

SNL Radiological Survey Report: Survey M-20110526-4; Survey M-20110526-13 through Survey M-20110526-21

SNL Radiological Survey Report: Survey M-20110711-22; Survey M-20110711-25; Survey M-20110711-27; Survey M-20110711-28

SNL Radiological Survey Report: Survey M-20111004-4; Survey M-20111004-7 through Survey M-20111004-9; Survey M-20111004-11; Survey M-20111004-13

SNL Radiological Survey Report: Survey M-20111005-8 through Survey M-20111005-10

U1032, Drum Dose-to-Curie Derivation for Cs-137, J. Vance, SNL-RH-04, Revision 1, May 31, 2011

U1035, Radiochemistry and Mass Spectrometry Data Input Check, J. Vance, SNL-RH-07, Revision 0, September 30, 2011

U1036, Scaling Factor Development Debris – PKE00027, J. Vance, SNL-RH-08, Revision 0, September 30, 2011

U1037, Determination of Reportable Radionuclides, J. Vance, SNL-RH-09, Revision 0, September 30, 2011

U1038, Uncertainty Analysis for Drums – PKE00027, J. Holderness, SNL-RH-10, Revision 0, September 30, 2011

U1039, DTC and Related Calculations for Drums – PKE00027, J. Holderness, SNL-RH-11, Revision 0, September 30, 2011

U1040, Radiochemistry and Mass Spectrometry Data Input Check, J. Vance, SNL-RH-12, Revision 0, November 9, 2011

U1041, Scaling Factor Development Debris – PKE00047, J. Vance, SNL-RH-13, Revision 0, September 30, 2011

U1042, Determination of Reportable Radionuclides, J. Vance, SNL-RH-14, Revision 0, September 30, 2011

U1043, Uncertainty Analysis for Drums – PKE00047, J. Holderness, SNL-RH-15, Revision 0, September 30, 2011

U1044, DTC and Related Calculations for Drums – PKE00047, J. Holderness, SNL-RH-16, Revision 0, September 30, 2011