DOCKET NO: A-98-49, II-A4-151

WASTE CHARACTERIZATION INSPECTION REPORT

FINAL APPROVAL

EPA BASELINE INSPECTION NO. EPA-BAPL-CCP-RH-04.11-8 OF THE CENTRAL CHARACTERIZATION PROJECT REMOTE-HANDLED TRANSURANIC WASTE CHARACTERIZATION PROGRAM FOR BETTIS ATOMIC POWER LABORATORY: August 30, 2010; September 23, 2010; December 8, 2010; April 12-13, 2011

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

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ATTACHMENTS

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ACRONYMS AND INITIALIZATIONS

AK	acceptable knowledge
AKE	acceptable knowledge expert
AKSR	acceptable knowledge summary report
Am	americium
ATR	Advanced Test Reactor
BAPL	Bettis Atomic Power Laboratory
BDR	batch data report
CBFO	Carlsbad Area Field Office
CCP	Central Characterization Project
CFR	*Code of Federal Regulations*
CH	contact-handled
Ci	curie
Cm	curium
CRR	Characterization Reconciliation Report
Cs	cesium
CSSF	Correlation and Surrogate Summary Form
CTP	Confirmatory Test Plan
DOE	U.S. Department of Energy
DQO	data quality objective
DR	discrepancy resolution
DTC	dose-to-curie
DU	Depleted Uranium
EPA	U.S. Environmental Protection Agency
Eu	europium
EU	Enriched Uranium
FR	*Federal Register*
g	gram or grams
g/cm^3	grams per cubic centimeter
HLW	high-level waste
HIP	high pressure container

in	inch or inches
ICP-MS	Inductively Coupled Plasma-Mass Spectrometry
IDL	instrument detection limit
ITR	Independent Technical Reviewer
kg	kilogram
LANL	Los Alamos National Laboratory
LCS	Laboratory Control Sample
LLW	low-level waste
LOQI	list of qualified individuals
LWA	*WIPP Land Withdrawal Act*
MCNP5®	Monte Carlo N-Particle Transport Code RSICC Computer Code Collection, Oak Ridge National Laboratory
MEL	Materials Evaluation Laboratory
mR/hr/Ci	milli Roentgen per hour per Curie
mrem/hr	millirem per hour
MT	Material Types
nCi/g	nanocurie per gram
NCR	non-conformance report
NNPP	Naval Nuclear Propulsion Program
NOFORN	Not Releasable to Foreign Nationals/Governments/Non-US Citizens (Document Handling Instruction)
NWPA	*Nuclear Waste Policy Act*
ORIA	Office of Radiation and Indoor Air
Pu	plutonium
QA	quality assurance
QAO	quality assurance objectives
QC	quality control
R/hr/Ci	roentgen per hour per curie
RH	remote-handled
RTR	real-time radiography
SCG	summary category group
SNF	spent nuclear fuel
SPM	Site Project Manager

Sr	strontium
T1	Tier 1
T2	Tier 2
Th	thorium
TMU	Total Measurement Uncertainty
TRU	transuranic
U	uranium
VE	visual examination
WCPIP	Waste Characterization Program Implementation Plan
WIPP	Waste Isolation Pilot Plant
WMP	waste material parameter
WSPF	Waste Stream Profile Form

1.0 EXECUTIVE SUMMARY

This report discusses the U.S. Environmental Protection Agency's (EPA or the Agency) approval of a single remote-handled (RH) transuranic (TRU) debris waste stream [initially packaged in 15 high-pressure containers (HIPs) and then emplaced in 55-gallon drums] characterized using the waste characterization program implemented by the Central Characterization Project (CCP) at the Bettis Atomic Power Laboratory (Bettis Laboratory).

In accordance with 40 CFR 194.8(b), the EPA conducted Baseline Inspection No. EPA-BAPL-CCP-RH-04.11-8 of the CCP's waste characterization program for RH TRU waste at the U.S. Department of Energy's (DOE) Bettis Laboratory located in West Mifflin, Pennsylvania. Upon EPA's final approval, DOE can emplace BAPL-CCP RH TRU debris waste in the Waste Isolation Pilot Plant (WIPP).

The inspection took place in four steps: observation of the Visual Examination (VE) process on August 30, 2010, sample collection on September 23, 2010, and dose-to-curie (DTC) measurements on December 8, 2010 at Bettis Laboratory and the baseline inspection at the EPA Office of Radiation and Indoor Air (ORIA) in Washington, D.C. on April 12 and 13, 2011.

On June 8, 2011, in the *Federal Register*, EPA proposed to approve the RH TRU waste characterization program at BAPL-CCP. The *Federal Register* notice also opened a 45-day public comment period on the proposed approval and announced the availability of the inspection report (Air Docket No. A-98-49; II-A4-147). The comment period ended on July 25, 2011. EPA received no public comment on the proposed approval and the accompanying inspection report. As a result, EPA is finalizing the proposed approval of the RH waste characterization elements discussed in this report which have been implemented by the BAPL-CCP.

The inspection scope included a single waste stream, Bettis Laboratory Waste Stream BT-T001. Because additional RH TRU waste is not expected to be generated from decontamination and decommissioning of hot cells in the foreseeable future, any additional RH TRU waste stream beyond the subject of this inspection generated at Bettis Laboratory will require a new baseline inspection and approval.

Waste Stream BT-T001 consists of research and experimental debris generated at Bettis Laboratory from 1973 through 1992. This inspection evaluated acceptable knowledge (AK) records, DTC in conjunction with radionuclide-specific scaling factors supported by radiochemical analyses of smear samples from the hot cells, and VE to confirm the physical and radiological contents of waste containers. The scope of the inspection was limited to the 15 55-gallon drums containing the HIPs.

The EPA inspection team identified one finding related to both the AK and radiological characterization processes that BAPL-CCP implemented to characterize RH Waste Stream BT-T001 (see Attachment C). In response to this finding, BAPL-CCP revised several key documents associated with both AK and radiological characterization and prepared new documents following the inspection (see Attachment D). EPA reviewed the revised and new documents and

determined that they adequately addressed the finding and that the BAPL-CCP RH waste characterization program was technically adequate and appropriately documented.

Some of the revised documents that BAPL-CCP generated were subject to Bettis Laboratory's Public Utterance process (see Section 7.2)[1], which could have affected EPA's planned approval schedule. Given the time constraints, EPA reviewed the modifications to specific documents in the form of *freeze files*[2] serving as objective evidence to address EPA's finding. EPA accepted the freeze files on the condition that the revised formal documents would (a) be identical to the freeze files, (b) undergo the Public Utterance Process during EPA's 45-day public comment period window, and (c) be provided to EPA before the end of the comment period for review so EPA could issue its final approval of the BAPL-CCP RH TRU waste characterization program. The following final revised documents were provided to EPA before the end of the public comment period and are identical to their respective freeze files:

- CCP-AK-BAPL-501, Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report for Bettis Atomic Power Laboratory Remote-Handled Transuranic Fuel Debris Waste, Waste Stream: BT-T001, Revision 1

- CCP-AK-BAPL-502, Central Characterization Project RH TRU Waste Certification Plan for 40 CFR Part 194 Compliance and Confirmation Test Plan for Bettis Laboratory Waste Stream: BT-T001, Revision 1

EPA is approving the BAPL-CCP waste characterization program implemented to characterize RH debris waste belonging to Waste Stream BT-T001 evaluated during this baseline inspection that is described and documented in this report. The approval includes the following:

(1) The AK process for 15 HIPs of RH retrievably-stored TRU debris designated as Bettis Laboratory Waste Stream BT-T001

(2) The radiological characterization process using DTC and scaling factors for assigning radionuclide values to Waste Stream BT-T001 that is documented in CCP-AK-BAPL-501, Revision 1, and supported by the calculation packages referenced in this report

(3) The VE process to identify waste material parameters (WMPs) and the physical form of the waste

Generally, EPA's RH and contact-handled (CH) baseline inspections evaluate a site's waste characterization program for technical adequacy and, when approved, the TRU site continues to use the approved program components to characterize additional wastes on an ongoing basis. However, the subject Bettis Laboratory waste stream has been fully characterized and no further waste characterization activities relative to this waste stream will take place. Therefore, this

[1] All information that contractors (or their subcontractors) generate or acquire to support the Naval Nuclear Propulsion Program (NNPP) is subject to Naval Reactors review and approval for release outside of the NNPP. Documents supporting the certification of TRU waste for transportation to and disposal at WIPP were not exempt from this requirement.

[2] As a result of an inspection-related EPA issue, CCP may have to revise a document. CCP makes the change(s) and provides the revised document to EPA as a freeze file to serve as objective evidence for the inspection. CCP's document control process then generates an official version of the revised document.

approval is limited to the discrete set of 15 HIPs in Bettis Laboratory Waste Stream BT-T001. BAPL-CCP may not characterize any additional RH waste in the future based on this baseline approval. Because no additional waste characterization activities will occur relative to the 15 HIPs of RH debris waste subject to this approval, changes to the waste characterization activities evaluated during the baseline inspection are not expected. Accordingly, this report does not list any Tier 1 (T1) or Tier 2 (T2) designations relative to this waste and the waste characterization components covered by this approval. **EPA does expect to receive copies of the final Waste Stream Profile Form (WSPF) and related attachments and the final AK accuracy report when they are available.** Approval of any future or other past RH waste characterization activities at the Bettis Laboratory would require a new EPA baseline inspection.

EPA must verify compliance with 40 *Code of Federal Regulations* (CFR) 194.24 before waste may be emplaced in the WIPP, as specified in Condition 3 of EPA's certification of the WIPP's compliance with disposal regulations for TRU radioactive waste [63 *Federal Register* (FR) 27354 and 27405, May 18, 1998]. EPA Baseline Inspection No. EPA-BAPL-CCP-RH-04.11-8 was performed in accordance with the provisions of 40 CFR 194.8(b), as issued in a July 16, 2004, FR notice (Vol. 69, No. 136, pp. 42571–42583).

2.0 PURPOSE OF INSPECTIONS

On May 18, 1998, EPA certified that the WIPP will comply with the radioactive waste disposal regulations in 40 CFR Part 191. In that certification, EPA also included Condition 3, which states that "the Secretary shall not allow shipment of any waste from…any waste generator site other than [Los Alamos National Laboratory (LANL)] for disposal at the WIPP until the Agency has approved the processes for characterizing those waste streams for shipment using the process set forth in 40 CFR 194.8." The approval process described in §194.8 requires DOE to (1) provide EPA with information on AK[3] for waste streams proposed for disposal at the WIPP and (2) implement a system of controls used to confirm that the total amount of each waste component that will be emplaced in the WIPP will not exceed limits identified in the WIPP Compliance Certification Application.

The rule applying to this baseline inspection can be found in the FR (Vol. 69, No. 136, pp. 42571–42583, July 16, 2004). Under the changes to 40 CFR 194.8 promulgated in the July 16, 2004 FR notice, EPA must perform a baseline inspection of a TRU waste generator site's waste characterization program. The purpose of the baseline inspection is to approve the site's waste characterization program based on the demonstration that the program's components, with applicable conditions and limitations, can adequately characterize TRU wastes and comply with the regulatory requirements imposed on TRU wastes destined for disposal at the WIPP. An EPA inspection team conducts an on-site inspection to verify that the site's system of controls is technically adequate and properly implemented. Specifically, EPA's inspection team verifies compliance with 40 CFR 194.24(c)(4), which states the following:

[3] As of the FR notice of July 16, 2004, EPA has replaced the term *process knowledge* with *acceptable knowledge*. AK refers to any information about the process used to generate waste, material inputs to the process, and the time period during which the wastes were generated, as well as data resulting from the analysis of waste conducted prior to or separate from the waste certification process authorized by an EPA certification decision to show compliance with Condition 3 of the certification decision.

> *Any compliance application shall: . . . Provide information which demonstrates that a system of controls has been and will continue to be implemented to confirm that the total amount of each waste component that will be emplaced in the disposal system will not exceed the upper limiting value or fall below the lower limiting value described in the introductory text of paragraph of this section.*[4] *The system of controls shall include, but shall not be limited to: measurement; sampling; chain of custody records; record keeping systems; waste loading schemes used; and other documentation.*

In other words, the purpose of the baseline inspection is to implement the requirements of 40 CFR Part 194 by assessing whether DOE sites that characterize TRU waste prior to disposal at the WIPP are capable of characterizing and tracking the waste. EPA may also conduct follow-up inspections to address issues remaining from the baseline inspection or to seek further clarification/discussion related to waste characterization processes evaluated during a baseline inspection. By approving the CCP-implemented waste characterization systems and processes for RH debris waste at Bettis Laboratory, EPA confirms that the Agency has evaluated the capabilities of systems and processes implemented by the site to accomplish two tasks: (1) the identification and measurement of waste components, such as plutonium (Pu), that must be tracked for compliance,[5] and (2) the confirmation that the waste in any given container has been properly identified as belonging to the group of approved waste streams.

3.0 PURPOSE OF THIS REPORT

This report documents the basis for EPA's approval and explains the results of Baseline Inspection No. EPA-BAPL-CCP-RH-04.11-8 in terms of findings or concerns. Specifically, this report does the following:

- Describes the BAPL-CCP waste characterization systems for approval
- Delineates a specific set of RH wastes for approval
- Provides objective evidence supporting the approval basis for all waste characterization systems

[4] The introductory text of 40 CFR 194.24(c) states, "For each waste component identified and assessed pursuant to [40 CFR 194.24(b)], the Department shall specify the limiting value (expressed as an upper or lower limit of mass, volume, curies, concentration, etc.), and the associated uncertainty (i.e., margin of error) for each limiting value, of the total inventory of such waste proposed for disposal in the disposal system."

[5] The potential contents of a single waste stream or group of waste streams determine which processes can adequately characterize the waste. For example, if AK suggests that the waste form is heterogeneous, the site should select the matrix-appropriate radiological characterization technique to obtain adequate radionuclide measurements. VE serves to confirm and quantify waste components, such as cellulosics, rubbers, plastics, and metals. Once the nature of the waste has been confirmed, characterization techniques quantify selected radionuclides in the waste. In some cases, a TRU waste generator site may be able to characterize a range of heterogeneous waste streams or only a few. A site's stated limits on the applicability of proposed waste characterization processes govern the scope of EPA's inspection.

- Identifies all relevant system limitations and/or conditions for each waste characterization system and/or waste containers that are subject to this approval
- Provides objective evidence of EPA's one finding, including its resolution and status

As stated above, this report does not address T1 and T2 elements. The DOE documents that EPA reviewed for this evaluation are cited 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

EPA's final approval decision regarding the BAPL-CCP RH waste characterization program will be conveyed to DOE separately by letter following EPA's review of public comments received responding to the approval discussed in this report. In accordance with 40 CFR 194.8(b)(3), this information is also available on EPA's Web site at www.epa.gov/radiation/WIPP.

4.0 SCOPE OF INSPECTION

The scope of Baseline Inspection No. EPA-BAPL-CCP-RH-04.11-8 included the technical adequacy of the waste characterization systems used by BAPL-CCP to characterize RH Waste Stream BT-T001 contained in 15 high pressure containers (HIPs). The EPA inspection team evaluated these systems with respect to their ability to perform the following:

- Provide adequate documentation regarding the origin and classification of the RH TRU wastes proposed for disposal at WIPP using AK
- Identify and quantify the activities and associated uncertainties of the 10 WIPP-tracked radionuclides [americium-241 (^{241}Am), cesium-137 (^{137}Cs), plutonium-238 (^{238}Pu), ^{239}Pu, ^{240}Pu, ^{242}Pu, strontium-90 (^{90}Sr), uranium-233 (^{233}U), ^{234}U, and ^{238}U] and other TRU radionuclides using a combination of AK and DTC with the application of radionuclide-specific scaling factors
- Assign WMPs correctly for RH, retrievably-stored debris waste that was repackaged using VE

During an inspection, EPA does not approve characterization data; that function is the sole responsibility of the entity being evaluated, in this case, BAPL-CCP. EPA evaluated the site's waste characterization processes to characterize RH TRU debris waste. The evaluation consisted of interviewing personnel, observing equipment operations and waste characterization practices at Bettis Laboratory controlled by CCP procedures, and inspecting records related to each of the waste characterization processes within the inspection's scope. An important aspect of this evaluation is the objective evidence documenting the effectiveness of the waste characterization processes. Objective evidence typically takes the form of batch data reports (BDRs), AK reports, and VE records. During this inspection, EPA selected samples of each of these items, based on the number and variety of items each waste characterization process produced, consistent with

standard auditing techniques. Because the waste characterization activities at BAPL-CCP included a limited number of samples, EPA evaluated the single DTC and VE BDRs and all three sampling BDRs that had been generated, essentially a 100% sample. Based on evaluating the waste characterization processes in conjunction with the objective evidence, EPA determined the technical adequacy of these processes and associated records within the inspection's scope.

DOE's RH Waste Characterization Program Implementation Plan (WCPIP), DOE WIPP-02-3124, should be an accurate representation of the processes implemented to characterize RH TRU wastes for WIPP. Based on previous RH baseline inspections and T1 evaluations, EPA concluded that Revision 0D of the WCPIP, which had been in place since 2003, did not adequately reflect the requirements for the processes currently implemented by CCP and approved by EPA. As a result, the DOE Carlsbad Field Office (CBFO) revised the WCPIP to adequately address RH waste characterization activities and Revision 2 of the WCPIP is effective as of April 21, 2011. In 2010, CBFO was still revising the WCPIP and therefore, EPA requested that all RH characterization activities at Bettis Laboratory that would be subject to this approval be performed according to the WCPIP, Revision 0D.

5.0 INSPECTION-RELATED DEFINITIONS

During the course of an inspection, EPA inspectors may encounter items or activities that require further inquiry into their potential to adversely affect waste characterization and/or isolation within the repository. The two main categories relevant to waste characterization inspections are identified below:

- *Finding*: A determination that a specific item or activity does not conform to 40 CFR 194.24(c)(4). A finding requires a response from CBFO prior to site approval.
- *Concern*: A judgment that a specific item or activity may or may not have a negative effect on compliance and, depending on the magnitude of the issue, may or may not require a response. A concern requiring a response requires a response from CBFO prior to site approval.

6.0 PERSONNEL

EPA and its support personnel conducted interviews with BAPL-CCP personnel in several disciplines during three site visits at Bettis Laboratory and the meeting at EPA ORIA Offices. The members of the EPA inspection team and personnel contacted are listed in Attachment B.

7.0 PERFORMANCE OF THE INSPECTION

7.1 Bettis Laboratory Background

The Bettis Laboratory is located in West Mifflin, Pennsylvania, and is operated under the direction of the Naval Nuclear Propulsion Program (NNPP). Since 1949 it has been dedicated to the design, development, testing, and operational support of naval nuclear propulsion plants used in the U.S. Naval Fleet (References P100, P102, and U201), and its main focus has been the design and development of nuclear power for the United States (U.S.) Navy. Site activities

supported government and commercial programs including research and testing associated with the U.S. naval nuclear program (References P102 and U256). The activities that generated Waste Stream BT-T001 were performed in the Materials Evaluation Laboratory (MEL), which consists of five cell banks: the East Bank, West Bank, Met Cell Bank, and Alpha Bank, all of which contributed to Waste Stream BT-T001, and the Central Bank, which did not contribute any waste. While the specific activities within each bank were different, all wastes were ultimately stored in the East Cell Bank and these wastes comprise Waste Stream BT-T001 (References P103, U207, and U256).

Waste Generation Activities

The materials processed in the MEL were principally naval reactor and thorium (Th) fuels that can be classified as four fuel types: enriched uranium (EU), enriched uranium with thorium (EU + Th), Th, and depleted uranium with plutonium (DU + Pu) (References U231, U259, and U398). Pertinent MEL activities used these fuel types as feed materials. Specific activities were: post-irradiation examination of fuel assemblies and test specimens; lathing of irradiated fuel rods; metallographic specimen mounting, polishing, etching and testing; specimen decrudding and descaling; dye and fluorescent penetrant inspections; fission gas extraction; removal and crushing of fuel prior to testing; and chemical dissolution of samples for subsequent testing and analyses (References P107, P108, P112, P113, P120, U209, and U264). These processes generated swarf[6] which ultimately became BAPL-CCP Waste Stream BT-T001.

Waste Details

The EU, EU + Th, Th, and DU + Pu materials that were processed in the MEL and their radionuclide constituents represent the radionuclide contents of the BAPL-CCP wastes. These materials were loaded into 15 high pressure containers (HIPs), each with a volume of 3.9 liters. Each HIP contains powder and other waste materials derived from the activities described above, and Bettis Laboratory radiation surveys indicated surface dose rates[7] greater than 200 millirem per hour (mrem/hr) for each HIP. Each HIP was inserted in a 55-gallon drum, which is the final configuration and shipping container for all 15 HIPs in Waste Stream BT-T001 (Reference U269). Waste Stream BT-T001 is composed of test residues, test materials, and the resultant test fragments from the fuel specimens, including irradiated fragments and dispersed particulate (fines and dust). The RH TRU wastes in Waste Stream BT-T001 were generated in the MEL during examination of fuel specimens that came primarily from naval reactors and originated from Navy ships, prototype plants, irradiated test specimens [from the Advanced Test Reactor (ATR)], and the Shippingport Atomic Power Station. The ATR and Shippingport Atomic Power Station are commercial facilities not associated with defense activities in general; however, the Naval Reactors Program designed fuel assemblies to be irradiated in the ATR and Shippingport

[6] *Swarf* is material that is produced by a cutting or grinding process.

[7] *Rem* 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 term *dose equivalent* or *dose equivalent rate*. The actual difference among these values for the purpose of this report is negligible.

with the intent that Bettis Laboratory would utilize the fuel examination information to improve nuclear propulsion technology (References P104, U201, and U256).

7.2 Inspection Process Overview

EPA conducted Baseline Inspection No. EPA-BAPL-CCP-RH-04.11-8 of BAPL-CCP's program to characterize RH TRU wastes at Bettis Laboratory on three occasions from September – December 2010 and at EPA ORIA offices from April 12 through 13, 2011. This inspection had the scope described in Section 4.0 for the purpose of determining the site's compliance with 40 CFR 194.24. The inspection was conducted in the following steps:

(1) Obtaining and reviewing site procedures, reports, and other technical information related to RH waste characterization activities used to characterize BAPL-CCP Waste Stream BT-T001

(2) Observing BAPL-CCP personnel perform VE, sample collection, and DTC at Bettis Laboratory on three separate occasions in 2010 in advance of the baseline inspection at EPA ORIA offices in April 2011

(3) Preparing technical questions prior to the inspection based on the activities cited in (1) above

(4) Interacting with CBFO and BAPL-CCP personnel to arrange inspection logistics

(5) Evaluating BAPL-CCP's implementation of waste characterization processes for adequacy and demonstrating compliance with 40 CFR 194.24 requirements

(6) Conducting the baseline inspection to verify the technical adequacy and/or qualifications of RH waste characterization personnel, procedures, processes, and equipment, as documented in BAPL-CCP records

(7) Evaluating the radiometric and spectrometric data used to support the development of radionuclide-specific scaling factors

(8) Evaluating the correlations of high pressure containers (HIPs) for the purpose of identifying common attributes, i.e., "binning"

(9) Recording one finding on an EPA Inspection Issue Tracking Form, which was completed and provided to CBFO and BAPL-CCP personnel as it was generated (see Attachment C for a copy of this form)

(10) Communicating all pertinent information to CBFO and BAPL-CCP personnel

(11) Pursuing resolution of the finding prior to completion of the inspection, when feasible

(12) Conducting entrance, exit, and daily briefings for CBFO and BAPL-CCP management personnel for all four segments of the inspection

(13) Obtaining and reviewing BAPL-CCP documents that were revised and/or created in response to the EPA finding after the inspection, and closing the finding

(14) Issuing the inspection report and approval

Due to the potentially sensitive nature of information concerning site activities at Bettis Laboratory, some of the information supporting the RH TRU program is considered Not Releasable to Foreign Nationals/Governments/Non-US Citizens (NOFORN). This information was not available until the April inspection at EPA ORIA offices. Additionally, all technical information had to undergo the Public Utterance process[8] prior to release to EPA, including key documents that are typically provided to EPA well in advance of the inspection. While this is understandable, it added to the complexity of the inspection process, particularly when BAPL-CCP documents required revision to address the EPA finding discussed in Sections 8.1 and 8.2.[9]

8.0 TECHNICAL EVALUATION

Sections 8.1 through 8.3 of this report detail the three technical areas assessed during this inspection:

- AK
- Radiological Characterization
- VE

8.1 Acceptable Knowledge

EPA examined the AK process and associated information to determine whether BAPL-CCP demonstrated compliance with 40 CFR 194.8 requirements for RH Waste Stream BT-T001.

Waste Characterization Element Description

As part of the inspection, EPA reviewed the following with respect to the use of AK for RH waste characterization by BAPL-CCP:

- Waste stream identification including radiological and physical characteristics
- Verification that the subject waste is of defense origin and is not high-level waste (HLW), low-level waste (LLW), or spent nuclear fuel (SNF)
- Role of AK in the characterization methodology, including radiological and physical composition of the waste and use of AK to support scaling factors derived by BAPL-CCP
- Adequacy of the WCPIP AK process implementation
- Adequacy of the AK Summary Report (AKSR)
- Data traceability
- Sufficiency of source documents

[8] All information that contractors (or their subcontractors) generate or acquire to support the Naval Nuclear Propulsion Program (NNPP) is subject to Naval Reactors review and approval for release outside of the NNPP. Documents supporting the certification of TRU waste for transportation to and disposal at WIPP were not exempt from this requirement.

[9] EPA's evaluation of a T1 change to add INL-CCP Waste Stream IN-ID-NRF-153 in November 2010 involved the same processes with NOFORN and Public Utterance, see EPA Docket No. A-98-49, II-A4-135.

- WCPIP interpretation with respect to AK qualification
- Confirmatory Test Plan (CTP) preparation and plan adequacy
- Preparation and adequacy of the WSPF and Characterization Reconciliation Report (CRR)
- Correlation of Correlation and Surrogate Summary Form (CSSF) and CH-RH
- Personnel training and qualifications
- Non-Conformance Reports (NCRs) and AK discrepancy resolution
- Accuracy
- Plans for load management
- Identification of the method for determining data quality objectives (DQOs) and which DQOs are attained through AK Qualification

Documents and Batch Data Reports Reviewed

Source documents, reports, forms, and other data were provided to EPA, and the relevant sources were reviewed as part of this baseline inspection. All documentation examined is listed in Attachment A and the sampling, DTC, and VE BDRs examined are presented in Table 1.

Table 1. Batch Data Reports Examined

Container No.	Sampling BDR No.	DTC BDR No.	VE BDR No.
HIP-41-23-4	N/A	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-20-1	BARH1001	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-16-8	BARH1001	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-06-10	BARH1002	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-33-9	BARH1002	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-24-7	N/A	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-30-3	BARH1001	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-18-2	BARH1001	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-32-6	BARH1003	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-13-5	N/A	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-28-11	N/A	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-15-12	BARH1003	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-05-13	BARH1002	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-27-14	N/A	BAPLRHDTC11001	RHBAPLVE100001
HIP-41-21-15	N/A	BAPLRHDTC11001	RHBAPLVE100001

Technical Evaluation

EPA evaluated the adequacy of AK information specific to Bettis Laboratory Waste Stream BT-T001 as described in the AKSR, CCP-AK-BAPL-500, Revision 1. Waste Stream BT-T001 consists of TRU debris waste generated from nuclear fuel examination and testing activities conducted at the Bettis Laboratory.

(1) The waste stream definition was examined for Waste Stream BT-T001 and was found to be adequate.

The RH WCPIP, Revision 0D, defines a waste stream as "waste material generated from a single process or activity, or as waste with similar physical, chemical, and radiological properties." The AKSR for Waste Stream BT-T001 did not adequately support the waste stream determination based on this definition. As described in Section 7.1, four different process lines and several different activities in the MEL cell banks contributed to the waste stream. The Radiological Characterization Report (CCP-AK-BAPL-501) states that the radiological compositions of individual high pressure containers (HIPs) are distinct, and can be grouped into at least five general categories. Based on this information, EPA determined during the baseline inspection process that the AKSR did not adequately support the waste stream determination because the radiological composition of the waste is heterogeneous and requires HIP-specific scaling factors. EPA requested that BAPL-CCP revise the AKSR to appropriately reflect the radiological composition of Waste Stream BT-T001.

BAPL-CCP revised the AKSR to include additional information about processes performed in the MEL, clarifying that all activities were associated with fuel pin or sample testing that generated a total of 15 HIPs (e.g., References U214 and U243). The revised AKSR also clarified that wastes were initially collected in Dolly tubes[10] or other containers [see Item (3)] and were ultimately repackaged into 15 HIPs. The HIPs were not generated by intentionally mixing wastes from specific process lines or Dolly tubes to create defined radiological compositions. Instead, HIPs were loaded primarily to meet site nuclear safety criteria. This means that wastes were not intentionally packaged by process line and their heterogeneity is the result of packaging activities, not the intentional generation of separate waste streams.

For perspective, EPA previously accepted the use of multiple scaling factors within a single waste stream for Oak Ridge RH Waste Stream OR-REDC-RH-HET (EPA Docket No. A-98-49; II-A4-111). ORNL-CCP stated, and EPA agreed, that the use of different scaling factors was analogous to individual radioassays of CH drums, which generate unique radiological signatures for each drum. EPA also accepted the use of multiple scaling factors because the radiological characterization process was well supported by the Waste Stream OR-REDC-RH-HET Radiological Characterization Report. Similarly, EPA accepts the use of multiple scaling factors for Waste Stream BT-T001 because the waste stream is limited to 15 containers, the radiological composition of each HIP has been well established [see Item (2)], and the overall processes and radiological composition of waste in individual Dolly tubes and other containers are adequately defined.

(2) Physical and radiological compositions of the waste stream presented in the acceptable knowledge summary report were assessed and found to be adequate.

Physical and radiological attributes of waste are important elements of the waste stream determination [see Item (1)]. EPA found that the AKSR did not adequately define the Summary Category Group (SCG) (Reference U267), and did not adequately associate the physical waste composition presented in the AKSR with the process origins. Source document U267 identified

[10] *Dolly tubes* are straight-right cylinders with threaded ends that were used for interim storage of the RH debris prior to transferring them to the HIPs. They could be combined to form longer tubes and their specific dimensions are not available in the Bettis Laboratory documents reviewed for this baseline inspection.

the contents of each HIP to be primarily powder with "clumps," which is a solid, SCG S3000. BAPL-CCP provided the WMP calculation memorandum (CCP-TP-005, Attachment 6) and explained that the metal HIPs and their contents are considered debris waste; cribbing and shielding are not included as debris waste components in the SCG and WMP calculations. The calculation memorandum adequately verified the appropriate assignment of the S5000 SCG by demonstrating that the waste material is approximately 33% solids and 67% debris by volume. BAPL-CCP representatives also provided the original WMP calculations showing that the majority of the waste stream mass is attributable to metals. Based on the available information, EPA determines that the physical composition of the waste stream is adequately described.

EPA also found that the AKSR presented only a broad radiological composition that appeared to contradict the need to develop HIP-specific scaling factors (References C213 and P127). However, in practice, BAPL-CCP "binned" the HIPs into groups with similar radiological composition, as described in CCP-AK-BAPL-501, and developed the sampling and analysis plan (CCP-AK-BAPL-505A, Revision 0) based on these AK groupings, see Item (7) below. EPA evaluated the original binning based on radiological composition information provided in source documents (References U259 and U212) and in conjunction with EPA's traceability analysis. EPA determined that the original HIP binning performed by BAPL-CCP did not include all wastes present in individual HIPs and could therefore compromise the radiological characterization process. This issue was discussed with BAPL-CCP personnel and EPA formalized it as a finding on an EPA Inspection Issue Tracking Form as No. BAPL-CCP-RH-AK-11-01F, as discussed below (see Attachment C for a copy of this form).[11] BAPL-CCP responded to the EPA finding by modifying the AKSR to include information from additional radiological source documents (References U259, U220, U231, and U241). The AKSR was revised to show the correlation between waste within each HIP and specific radiological Material Types (MT). MTs in Waste Stream BP-T001 are DU (MT 11 and 12), EU (MT 33, 34, 36, 37, 38, and 39), Pu (MT 56 and 57), U enriched in ^{233}U (MT 72), and Th (MT 88). The MTs occur within the HIPs in various combinations. BAPL-CCP determined that each HIP is associated with one of the following radiological groupings:

- ^{233}U + Th
- EU + Th
- Th only
- EU only
- DU + Pu

In response to EPA's finding, BAPL-CCP re-evaluated the binning process and found that the radiological contents of the following HIPs were not adeqately represented in the original binning process due to the presence of additional cans or Dolly tubes:

HIP Number	Additional Container(s)
41-20	AF-1, AF-2, AF-3 and AF-4 (all Dolly tubes)
41-23	Can M042

[11] Because this finding had a bearing on both AK and radiological characterization it is discussed multiple times in Sections 8.1 and 8.2 of this report. Accordingly, it may be described slightly differently in a specific report section to emphasize aspects pertinent to the characterization technique discussed in the section.

41-33 Dolly tube DC11

BAPL-CCP re-examined the AK record to determine the MTs associated with each of the omitted containers. BAPL-CCP determined that HIP 41-20 contains Th, which was not originally considered in the binning process (Reference U231). Bettis Laboratory representatives determined that the fuel specimens in M042 and DC11 consist of only EU, and that neither Th nor ^{233}U type fuel specimens are present in these containers (Reference U398). As a result, accounting for M042 in HIP 41-23 does not alter the original fuel type contribution in HIP 41-23, which was already 100% EU fuel specimens (Reference U259). Similarly, waste in HIP 41-33 is composed predominantly of EU (Reference U398), so accounting for DC11 does not significantly alter the radiological composition of HIP 41-33. However, BAPL-CCP determined that due to inclusion of the omitted Th fuel type, HIP 41-20 no longer accurately represents HIP 41-23. Therefore, HIP 41-20 is not associated with any other HIP, i.e., it became unbinned, and HIP 41-23 will be binned with HIP 41-05, as discussed below.

BAPL-CCP also identified an apparent omission in the record of fuel specimens contributing to HIP 41-32. Upon further review, it was determined that all fuel specimens were accounted for during the original binning effort (Reference U398). EPA evaluated the information presented in Reference U398 and concluded that BAPL-CCP's assumptions used to determine the impact of accounting for M042, M043, and Dolly tube DC11 on the radiological compositions of HIP 41-23, HIP 41-32 and HIP 41-33 are valid. Table 2 presents BAPL-CCP's final binning results and association of HIPs with general radiological categories based on AK, as presented in Attachment D (References U211, U212, U213, U231, U245, U259, and U399).

Table 2. Radiological Composition of HIPs in Waste Stream BT-T001, Results of Final Binning Analyses

	Sampled?	^{233}U + Th	EU + Th	Th	EU	DU + Pu	Combination[1]
Binned							
HIP-41-13	No	0%	67%	0%	33%	0%	---
HIP-41-21	No	0%	40%	10%	50%	0%	---
HIP-41-32	Yes	0%	68%	5%	27%	0%	---
HIP-41-05	Yes	0%	2%	2%	96%	0%	---
HIP-41-23	No	0%	0%	0%	100%	0%	---
HIP-41-24	No	3%	16%	0%	68%	16%	---
HIP-41-28	No	0%	9%	0%	75%	16%	---
HIP-41-33	Yes	0%	14%	0%	62%	24%	---
HIP-41-18	Yes	2%	14%	0%	85%	0%	---
HIP-41-27	No	0%	18%	0%	82%	0%	---
Unbinned							
HIP-41-06[2]	Yes	---	----	----	----	-----	100%
HIP-41-15[2]	Yes	---	----	----	----	-----	100%

	Sampled?	^{233}U + Th	EU + Th	Th	EU	DU + Pu	Combination[1]
Binned							
HIP-41-16	Yes	0%	14%	0%	43%	43%	---
HIP-41-20[2,3]	Yes	---	----	----	----	-----	100%
HIP-41-30	Yes	0%	32%	0%	50%	18%	---

[1]The HIP contents were assumed to be various combinations of MT identified in other HIPs. No data were available concerning the MT in HIP 41-06 and 41-15. MT 36, 38, and 88 are present in HIP 41-20, although the percentages were not specified by BAPL-CCP.
[2]Excluded from binning evaluation because waste generating processes were associated with water that could alter the ^{137}Cs concentrations by dissolution; each HIP was sampled and unique scaling factors were developed.
[3] The AKSR states that HIP 41-20 contains a very high percentage of EU.

EPA examined the binning data and the analysis that BAPL-CCP performed in response to the finding. EPA verified that the composition of HIP 41-20 includes MTs 36, 38 39, and 88, as well as non-fuel waste that would not impact the radiological composition of the HIP's contents. HIP 41-23 contained powder composed primarily of MT 36 and 39 without Th, and HIP 41-05 contained powder composed primarily of MT 39 (88%), with approximately 8% MT 36 and less than 4% MT 88 and 38. BAPL-CCP associated HIP 41-23 with HIP 41-05 because the contents of both are primarily EU, concluding that the small percentage of Th fuel specimens in HIP 41-05 would have a small effect on the overall radionuclide distribution in the HIP. EPA agrees that association of HIP 41-23 with HIP 41-05 is appropriate based on AK information.

EPA found that the response to the finding was adequate because the modified binning was justified based on AK radiological information and sampling data (see Attachment D). Each group or "bin" was sampled, and the HIPs within each bin were of similar radiological composition based on AK; therefore, application of sampling results to each HIP in the bin is technically justified. The AKSR was significantly revised to include information about binning, the different radiological MT, general radiological groupings, MT present in each HIP, and results of the AK-based binning process. The AKSR, as modified in response to EPA's inspection and finding, is technically adequate.

(3) Data traceability was examined and found to be adequate.

Data traceability was evaluated to determine whether radiological data were traceable from the fuel specimens to the final 55-gallon drum packaging and whether the HIPs are attributable to specific fuel types by reviewing available information for five drums. The Dolly tubes/cans[12] contributing waste to each HIP were identified and cross-referenced to interim containers,[13] fuel specimens, and associated fuel types, as summarized in Table 3 (References P129, U212, U213, U231, U236, U245, U259, and BDRs RHBAPLVE100001, BARH1001, BARH1002, and BARH1003).

[12] Wastes were initially packaged in pint or quart cans at the time of generation; however wastes had to be transferred to Dolly tubes for transportation to the East Cell Bank for storage. Wastes generated in the East Cell Bank may have been stored in pint or quart cans.

[13] Interim containers are 3.5-gallon cans or other sealable containers used to temporarily consolidate the Dolly tubes/cans for waste management/accountability within the MEL. The tubes/cans cannot be sealed; therefore they were sealed in the interim containers for temporary storage and were later removed from the interim containers in exactly the same condition with the same identification numbers.

BAPL-CCP assumed that source document U259 contained a complete record of the fuel specimens packaged in each HIP; this was found to not be the case. During the traceability evaluation, EPA identified three occasions where Dolly tubes and/or cans were excluded from U259. HIP 41-20 contains the contents of can M038 and Dolly tubes AF-1 through AF-4. The contents of M038 are listed in U259, but the AF Dolly tubes are not listed. Similarly, M042 (HIP 41-23) and DC11 (HIP 41-33) are missing from source document U259. As discussed in Item (2), EPA determined that since BAPL-CCP had relied solely on source document U259 to develop the comprehensive separation of waste materials into categories (bins), the less than comprehensive binning of sample materials could compromise the technical basis of scaling factor development. EPA documented the issue as finding BAPL-CCP-RH-AK-11-01F (see Attachment C). BAPL-CCP's response to the finding is described in Item (2) and Attachment D. EPA independently examined traceability information for HIPs 41-13, 41-15, and 41-16 to verify BAPL-CCP's response to the finding and found BAPL-CCP's impact assessment to be adequate (References P129, U213, U251, U252, U253, U254, U259, U260, U261, and U262).

Table 3. Data Traceability

Drum No.	HIP No.	Interim Container	Dolly Tube/ Can Nos.	MEL Process Area(s)	Fuel Type(s)	Source of Fuel Specimen Data
41-05-13	41-05	MS03	M017, M017Q	Met	38, 88	U259
			M041		36, 39	U259
41-20-1	41-20	TB3	M038	East	36, 39	U259
		TB11	AF-1 – AF-4	Alpha	38, 88	U231
41-23-4	41-23	MS03	M039	East	36, 39	U259
			M042, M042Q		not available[1]	U212/U211
41-27-14	41-27	MS04	M036, M036A	Met	33, 34, 36, 38, 39, 88	U259
		Can 1078, then 41-06	Can 1078	East	*COW 1-8*, 76, 92, 93, 89[2]	U259/U236
41-33-9	41-33	MS01	M022 (SL1-SL18)	Met	11, 38, 39, 57, 88	U259
			DC11	East	39[3]	-

[1]Fuel codes for M042 are not included in the source documents. Fuel specimen type is determinable to Bettis Laboratory staff through a code in the specimen ID number (Reference U212); however, this information has been redacted (U211).
[2]This is potentially an incomplete list. Fuel specimen type is provided for only a small portion of the specimens included in Can 1078; for information regarding the other specimens, see note 'A' (Reference U236).
[3]From U398

After the HIPs were packaged, it was determined that HIP 41-06 (packaged from can 1078) had an elevated dose rate. Approximately 60% by volume of the contents of this HIP was subsequently transferred to HIPs 41-06, 41-21, and 41-27, approximately 20% each. This operation is documented (References U396 and U397) and took place prior to sampling and VE activities. EPA determined that the AK record did not include this documentation. BAPL-CCP identified the missing records and added them to the AK record. EPA finds data traceability from fuel specimen to 55-gallon drum to be adequately established.

(4) The identification of the waste as transuranic and not high-level waste, low-level waste, or spent nuclear fuel was examined and found to be adequate.

The Land Withdrawal Act (LWA) prohibits the disposal of SNF and HLW as defined by the Nuclear Waste Policy Act (NWPA) at WIPP. The NWPA and DOE M435.1-1[14] state that spent nuclear fuel is "fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing… [However,] test specimens of fissionable material irradiated for research and development only, and not production of power or plutonium, may be classified as waste, and managed in accordance with the requirements of this Order when it is technically infeasible, cost prohibitive, or would increase worker exposure to separate the remaining test specimens from other contaminated material." The NWPA states that HLW is "the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations, and other highly radioactive material that the commission, consistent with existing law, determines by rule requires permanent isolation."

Waste Stream BT-T001 is composed of test residues, test materials, and the resultant test fragments from the fuel specimens, including irradiated fragments and dispersed particulate (fines and dust). Operations at the MEL did not include the separation or reprocessing of irradiated fuel elements withdrawn from a reactor. As a result, Waste Stream BT-T001 is not composed of SNF or HLW as defined by the LWA and NWPA and is therefore eligible for disposal at WIPP as RH TRU waste (References P100, U201, U256, and U267).

(5) Defense status of the waste was evaluated and found to be adequately documented.

Initially, the AKSR did not include sufficient information to indicate that examination of the ATR and Shippingport fuels discussed in 7.1, above, contributed directly to development of defense technologies. EPA discussed this lack of information with BAPL-CCP, who then revised the AKSR in sufficient detail to clarify the role played by ATR and Shippingport.

(6) The Acceptable Knowledge Summary Report and implementation of acceptable knowledge as required in Attachment A of the Waste Characterization Program Implementation Plan were evaluated and found to be adequate.

Initially, the AKSR did not adequately address the waste stream definition, radiological composition of the waste stream, physical characteristics of the waste stream, defense status of the waste stream, and drum or waste traceability [see Items (1), (2), (3), and (5) for additional detail]. BAPL-CCP revised the AKSR to adequately address these technical deficiencies.

The WCPIP, Revision 0D, is the primary document governing the RH waste characterization program, and Attachment A of this document provides requirements explicit to the assembly, use, and interpretation of AK. These requirements address personnel responsibilities and training, compilation and data acquisition, AK data review, interpretation, qualification and reconciliation, waste stream profile form preparation, and AK records. These requirements are addressed in Items 1-16; refer to these items for EPA's review of the required elements.

[14] DOE M435.1-1 is the Department of Energy's Radioactive Waste Management Manual.

(7) Acceptable knowledge support documents, including the sampling and analysis plan, and related document tracking were evaluated and found to be adequate.

The sampling and analysis plan for Waste Stream BT-T001 describes the basis for the sampling, sampling methods and protocols, sampling and laboratory quality assurance (QA) and is discussed in Section 8.2. The sampling plan was adequate for the purposes of collecting representative sample data for scaling factor development.

Documents are tracked in the Acceptable Knowledge Source Document Reference List (CCP-TP-005, Attachment 4), as well as in individual report reference lists. Comparison of Attachment 4 and references lists in each of these documents indicates that Attachment 4 had not been updated at the time of the inspection to include the calculation packages and other references presented in the revised AKSR and the revised Radiological Characterization Report. Attachment 4 was revised to include references generated in response to EPA's finding (see Attachments C and D).

(8) Implementation of the Waste Characterization Program Implementation Plan requirements was evaluated and found to be adequate.

The WCPIP, Revision 0D, presents the characterization requirements for RH waste necessary to demonstrate compliance with 40 CFR 194.24 (c)(4) which requires that a system of controls be established to ensure that waste emplaced in the WIPP will not exceed upper or lower limiting waste parameters. This system of controls must include measurement, sampling chain of custody records, record-keeping systems, waste loading schemes, and other documentation including AK [40 CFR Part 194 (c)(3)]. See Items (1) through (16) of this section for AK compliance requirements including record-keeping systems in Items (3) and (7) and waste loading schemes pertaining to LLW in Item (15). Sections 8.2 and 8.3 address radiological characterization and VE, respectively.

(9) Content and technical adequacy of the Certification Plan were evaluated and found to be adequate.

The WCPIP, Revision 0D, states that the Certification Plan must include the following:

a. A description of the rationale for attaining each DQO, including the selection of peer review, equivalent QA program, or confirmatory testing as methods of qualifying AK information for each DQO

b. A listing of the DQOs, and identification of which methods will be used to assess compliance with the DQOs, and the rationale for the selection of the method(s), including specific methods of AK qualification

CCP-AK-BAPL-502, Revision 0, is the Certification Plan and Confirmatory Testing Plan (Certification Plan), although confirmatory testing was not performed. BAPL-CCP indicated that AK would be qualified using characterization techniques listed in the WCPIP and a combination of techniques to qualify AK information. The Certification Plan describes the waste stream; waste stream DQOs and Quality Assurance Objectives (QAOs); and how the waste stream will be characterized by sampling and analysis, DTC, and VE. The Certification Plan does not state

that AK will be confirmed and, in fact, BAPL-CCP representatives indicated that while the site provided information allowing waste stream review and HIP radiological grouping [see Item (2)], the technical AK data necessary to develop scaling factors were not provided. Therefore, BAPL-CCP found it necessary to perform sampling and analysis, the results of which were used to identify and determine the relative radiological composition of each sampled HIP. Item (7) and Section 8.2 Items (2) and (3) address sampling and analysis, including applicable QA and quality control (QC) requirements. EPA finds the Certification Plan to be acceptable.

(10) Content and technical adequacy of the draft Waste Stream Profile Form and Characterization Reconciliation Report were evaluated and found to be adequate.

The draft WSPF and CRR were provided to EPA on February 4, 2011, and a revised draft CRR was provided on May 3, 2011, in response to the EPA finding [see Items (2) and (3) and Attachment C]. The WSPF and both CRRs included all the required data fields. These documents were provided for this inspection only and will be revised and finalized as characterization of the waste stream progresses. **EPA expects to receive copies of the final WSPF and related attachments when they are available.**

(11) Personnel training was evaluated and found to be adequate.

The WCPIP, Revision 0D, specifies that AK personnel responsible for compiling AK, characterizing RH TRU waste streams using the AK process, and assessing the AK characterization shall be qualified and trained in the following areas:

- RH WCPIP
- The nonconformance and corrective action processes
- Procedures presented in Attachment A of the WCPIP
- Site-specific training relative to the contents of the site's waste streams
- Determining radiological contents of individual containers

Training records for Jim Luginbyhl [Acceptable Knowledge Expert (AKE)] and Irene Quintana [Site Project Manager (SPM)] were examined and found to be complete. BAPL-CCP representatives informed EPA that they are no longer required to document reading of revised procedures. When procedures are substantially revised, AKEs are required to attend a briefing regarding the change. Attendance sheets document compliance. EPA will revisit the issue of proper documentation of training to new procedures after the new WCPIP is implemented.

Jene Vance and Jim Holderness performed the radiological characterization, including compilation of necessary AK support documents. While this approach appeared appropriate during initial EPA RH inspections, in practice, this has resulted in the inclusion of less radiological characterization information in the related AKSR. Consequently, the AKSR has required consistent revision to include more radiological information. More overlap between CCP-AK-BAPL-500 and CCP-AK-BAPL-501 in terms of the AK radiological composition of the waste was necessary; this was corrected through a freeze file and subsequent revision of CCP-AK-BAPL-500 [see Items (2) and (6)].

(12) The Correlation and Surrogate Summary Form process was evaluated and was found to be not applicable.

BAPL-CCP representatives stated that there is no analogous CH component of Waste Stream BT-T001 so a CSSF was not prepared.

(13) Data limitations, non-conformance reports, and discrepancy resolution forms were examined and found to be adequate.

BAPL-CCP provided DR004, dated June 11, 2010, to address application of EPA hazardous waste numbers to Waste Stream BT-T001, which was previously identified and managed as non-hazardous. BAPL-CCP also provided three NCRs to EPA as part of this inspection. NCR-RHBAPL-0001-10 and NCR-RHBAPL-2143-11 were generated in response to problems with the sampling process, and NCR-RHBAPL-0300-11 was generated in response to a scale mechanical error during the DTC process. As a result of these NCRs, one HIP (HIP 41-33) had to be re-sampled, and all 15 high pressure containers (HIPs) had to be re-weighed. All three NCRs have generation dates that are the same as their final approval dates. NCR-RHBAPL-0001-10 is dated over a month after the sample was declared to have an excessive dose rate and rejected in favor of a new sample. The dates for NCR-RHBAPL-0300-11 indicate that it was generated and completed on January 26, 2011; however, according to DTC BDR BAPLRHDTC11001, all weighing was completed by January 15, 2011 (most took place in early December). EPA finds that BAPL-CCP can adequately prepare DR forms and NCRs when appropriate; however, the delayed NCR generation suggests that the NCRs were prepared retrospectively, and not in response to the actual non-conforming acts. EPA did not investigate this matter further.

Data limitations are included as a line item on Attachment 5 of the WCPIP, Appendix A (Attachment 3 of CCP-TP-005) that is included as a cover page to every source document. EPA did note that a few source documents were identified in this attachment as NOFORN when the documents had been declassified, and that a few NOFORN documents were not identified as such. BAPL-CCP indicated that they are encouraged to avoid identifying the NOFORN documents as such on the Attachment 3s of CCP-TP-005. EPA is not concerned about documents being described at a higher level of classification than they really are.

(14) Acceptable knowledge accuracy was assessed and found to be adequate.

BAPL-CCP provided EPA with a draft AK accuracy report that was prepared solely for this inspection on March 26, 2011. All 15 HIPs have been fully characterized and AK accuracy was found to be 100%. The AK accuracy report contains several typographical errors, and EPA expects that these will be corrected in the final AK accuracy report. The AK accuracy report did not need to be revised due to EPA's finding because the containers were not reassigned to a new SCG and none of the containers failed to meet the DQOs. **EPA expects that a copy of the final AK accuracy report will be provided when it is available.**

(15) Load management was assessed and was found to not be applicable.

BAPL-CCP indicated that load management will not be performed for this waste stream.

(16) Attainment of data quality objectives through acceptable knowledge verification was evaluated and found to be acceptable.

As a result of the analysis presented in Items (1)-(15), above, EPA was able to assess how each DQO will be addressed. The following DQOs must be addressed as per the WCPIP:

- Defense determination
- TRU waste determination
- RH waste determination

- Residual liquids
- Physical form, including metals and cellulose, plastic, and rubber
- Activity determination (total and activity per canister, including quantification and identification of the 10 EPA WIPP-tracked radionuclides)

When evaluated as a whole, CCP-AK-BAPL-500, Revision 2, CCP-AK-BAPL-501, Revision 1, CCP-AK-BAPL-502, Revision 1, and other AK and supporting source documents presented in Attachment A of this report indicate that the WCPIP-specified DQOs have been met.

Summary of Acceptable Knowledge Findings and Concerns

The EPA inspection team identified one finding (BAPL-CCP-RH-AK-11-01F) related to AK, which is discussed in multiple areas [Section 8.1 Items (2) and (3), above and Section 8.2 Item (1), below]. A copy of the EPA Inspection Issue Tracking Form is included in Attachment C and BAPL-CCP's response is included in Attachment D. EPA considers all aspects of this finding to have been adequately addressed, and there are no open findings or concerns related to AK resulting from this inspection.

Baseline Approval

EPA is approving the AK process evaluated during this baseline inspection. This approval is limited to the 15 HIPs packaged in 55-gallon drums in Waste Stream BT-T001. **EPA expects to receive copies of the final Waste Stream Profile Form (WSPF) and related attachments and the final AK accuracy report when they are available.**

8.2 Radiological Characterization

Waste Characterization Element Description

The radiological characterization of BAPL-CCP Waste Stream BT-T001 TRU relies on DTC, in conjunction with radionuclide-specific scaling factors that were developed for Waste Stream BT-T001 based on the following three sources of information:

- AK for Waste Stream BT-T001, as summarized in CCP-AK-BAPL-500 and associated source documents
- Radionuclide-specific laboratory results from the analysis of smear[15] samples collected for nine of the 15 high pressure containers (HIPs)
- Analyses of fuel types to develop scaling factors for the six HIPs that had not been sampled via "binning," i.e., matching the sampled and nonsampled HIPs based on the closeness of the relative contributions to the HIPS from the various fuel types.

The radiological characterization methods used for this BAPL-CCP RH TRU waste stream were evaluated in terms of the technical adequacy, 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. During this RH inspection, the EPA inspection team evaluated the following elements of the BAPL-CCP radiological characterization program:

- Sample collection observed at Bettis Laboratory in September 2010
- External gamma measurements made at Bettis Laboratory in December 2010
- Development of DTC correlations for each drum at a nominal waste density using the Monte Carlo N-Particle Transport Code (MCNP5®) to model the drum's gamma dose rate based on a one-curie source of ^{137}Cs and europium-154 (^{154}Eu), assuming they are the main contributors to the dose
- Derivation of radionuclide scaling factors for the WIPP-tracked radionuclides using the analysis of smear (swipe) samples obtained from the nine sampled HIPs
- Representativeness and technical adequacy of the analytical data used to support the scaling factors
- Determination of radionuclide scaling factors using the "binning" performed for the remaining, nonsampled six HIPs.

Documents Reviewed

All Bettis-CCP RH radiological characterization documents that were reviewed to support this inspection are listed in Attachment A.

Technical Evaluation

[15] A *swipe*, *wipe* or *smear* is a non-quantitative 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.

The EPA inspection team evaluated the following aspects:

(1) The radiological characterization process and its documentation were evaluated and found to be adequate.

The radiological characterization process for Waste Stream BT-T001 was comparable to the processes observed at previous RH TRU sites. A flow diagram depicting the overall radiological characterization process is shown in Figure 1, below. Several aspects of this process required additional documentation; in specific, the manner in which the 15 HIPs were associated based on common attributes, referred to as binning, as discussed in Section 8.1 Items (2) and (3), above. Upon closer examination, the EPA inspection team concluded the information upon which the binning was based was not comprehensive, i.e., that sample containers had been inadvertently excluded. This had the potential to compromise the technical basis of the scaling factor development and was discussed with BAPL-CCP AK and radiological characterization personnel. As a result, EPA generated Inspection Issue No. BAPL-CCP-RH-AK-11-01F (see Attachment C for a copy of this form). BAPL-CCP personnel agreed to reevaluate the records and ensure that the binning was correct, which resulted in the revision of several documents, the DTC BDR, and the generation of a new calculation package (see Attachment D). EPA evaluated the revised documents and accepted that the finding had been adequately addressed with respect to radiological characterization. The AK aspect of the finding is discussed in Section 8.1 Items (2) and (3), above. EPA considers this finding closed.

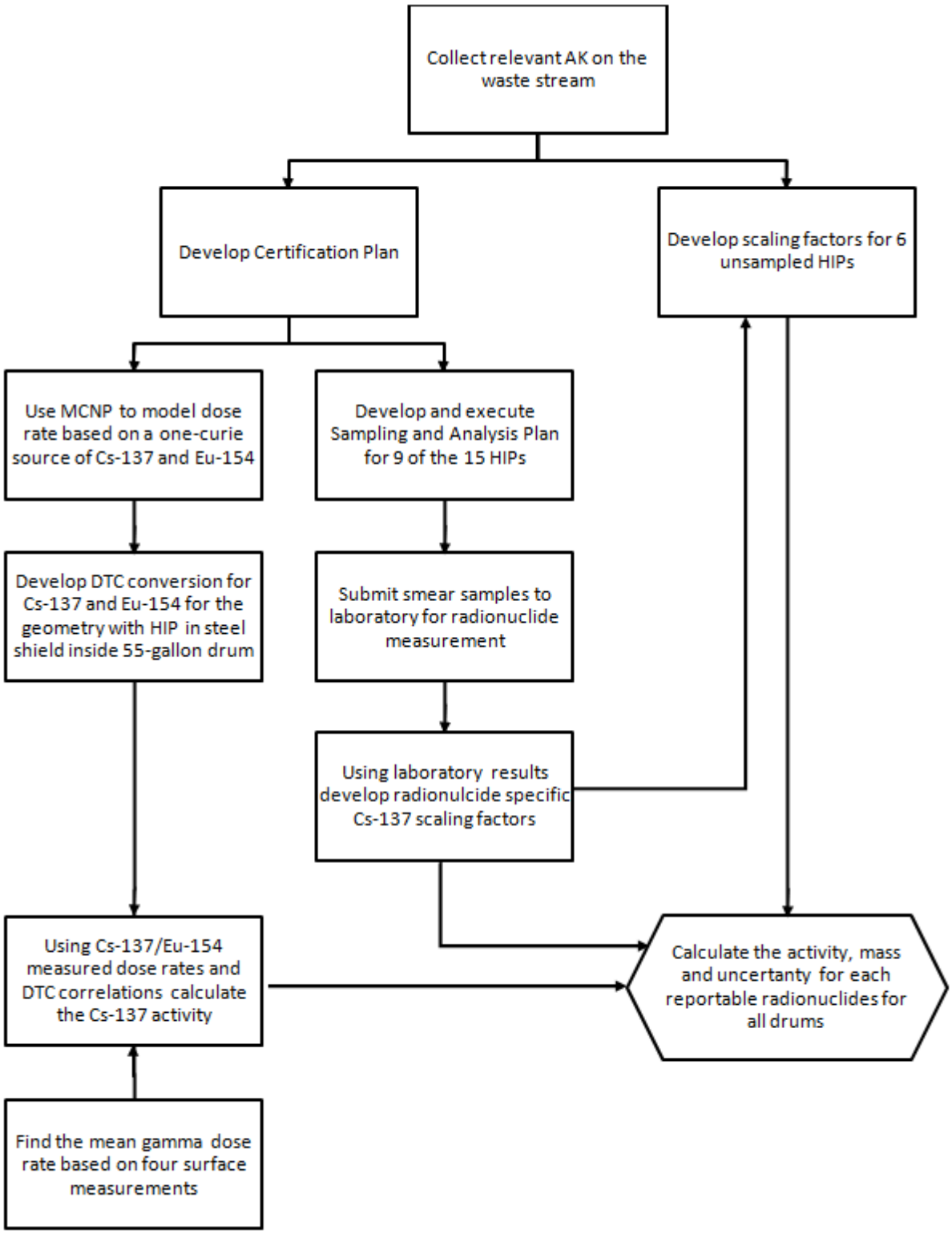

Figure 1. Flow Diagram for the Overall Characterization of Waste Stream BT-T001

(2) The collection of representative samples from the High Pressure Inner Containers was evaluated and found to be adequate and appropriately documented.

The sampling and analysis plan describes the sampling basis, methods, and applicable QA/QC. Procedure CCP-TP-512, Revision 3, presents the sampling procedures implemented by BAPL-CCP for sampling Waste Stream BT-T001. EPA reviewed both of these documents and found them adequate for their intended purposes.

The sampling plan binned the 15 high pressure containers (HIPs) into six categories based on AK and ensured that each category, along with the relative percent contribution of each of the four fuel types, EU, EU + Th, Th and DU + Pu, was represented. The categories and their associated HIPs were as follows:

- Very high EU content (HIP 41-20 and HIP 41-23)
- Relatively high DU + Pu content (HIP 41-16)
- Mid-range DU + Pu content (HIP 41-24, HIP 41-28, HIP 41-30 and HIP 41-33)
- Moderate Th and Th + U content (HIP 41-18 and HIP 41-27)
- Relatively high Th breeder fuel content (HIP 41-13, HIP 41-21 and HIP 41-32)
- Relatively low Th and Th + U content (HIP 41-05)

These groups are somewhat different than those that ultimately defined the waste stream based on sampling results, inspection results, and the EPA finding resolution. As documented in the sampling plan, three smear samples were taken from each of the following nine HIPs: HIP 41-05, HIP 41-06, HIP 41-15, HIP 41-16, HIP 41-18, HIP 41-20, HIP 41-30, HIP 41-32, and HIP 41-33. A co-located sample was also collected, resulting in a total of 28 samples. The sampling plan also documented the methodology for calculating the minimum number of samples required and the QAOs and QC requirements based on the analytical laboratory's criteria. J. Holderness prepared a memorandum summarizing the analytical results, the achievement of the QAOs and pertinent statistical analyses of the data, which are provided in a total of twenty data packages (see Attachment A). The QAOs for sampling were accuracy, precision, representativeness, completeness, and comparability, all of which were achieved, as documented by the Holderness memorandum.

EPA observed the sample collection process at Bettis Laboratory on September 23, 2010, and evaluated these activities against the sampling plan. The sampling activities occurred in the MEL, Hot Cell No. 11 with HIP 41-33 and the VE container, and the Bettis Laboratory manipulator operators worked in the Cell 13 Work Area. The HIP and VE container connect via a threaded connection and the HIP contents were emptied into the VE container and then back into the HIP five times directly prior to sampling, ensuring that all sampled surfaces were adequately coated with residue. Once the sample material was back in the HIP, operators collected three samples, as follows: in the threaded neck of the HIP; in the threaded neck of the VE container; and on the bottom of the VE container. Samples consisted of long-handled swabs which were transferred to a plastic bag directly post-collection. EPA observed all aspects of the sample collection, including the use of contamination barriers, decontamination of the manipulators between samples, preventing cross-contamination of samples, transferring samples to clean containers, and collecting radiation readings in cell and from the three samples. The

sampling personnel consisted of one Bettis Laboratory individual reading the sample collection procedure out loud (M. Crossen) and two manipulator operators who repeated each step prior to executing it (J. Williams and C. Carpenter); the Cognizant Engineer, A. Sammel, author of the procedure, was overseeing the effort. Bettis Laboratory personnel worked from their own procedure and all activities were executed using *step-tracking*, a process that follows this general approach: prior to performing an action, M. Crossen read each procedural step out loud; J. Williams and C. Carpenter acknowledged the specific action directed by the step; J. Williams and C. Carpenter then executed the step; and M. Crossen indicated on a paper copy of the procedure that the step had been executed. This process was repeated for every step. This approach is thorough and time intensive, and the documentation for the process is comprehensive. BAPL-CCP personnel ensured that all aspects of CCP-TP-512 were executed, although they did not actually perform any of the sampling actions. Sampling of all the HIPs was documented in three sampling BDRs, Nos. BARH1001, BARH1002, and BARH1003, all of which EPA evaluated and found to be adequate. BDR No. BARH1001 contained the co-located sample required by the sampling and analysis plan. The Independent Technical Reviewer (ITR) checklist for this batch had the *N/A* (not applicable) answer indicated for question No. 11 which asked: *Was a co-located sample (field duplicate), collected once per sampling batch or every seven days (whichever is more frequent)? (Attachment 1).* This was incorrect as a co-located sample had been collected as required. However, the error was not quality affecting and EPA accepted BAPL-CCP's verbal commitment to correct this entry to *Yes*. BAPL-CCP agreed to provide a copy of the NCR that will be generated to enable this change to be processed. There were no concerns regarding the technical adequacy or documentation of sample collection for Waste Stream BT-T001.

(3) The radiochemical data were found to be representative and technically adequate to support their intended use, the development of radionuclide-specific scaling factors.

The Idaho Project Cleanup Project Analytical Laboratory[16] located at the Idaho National Laboratory in Idaho Fall, Idaho, analyzed a total of 28 smear samples collected from sampling nine of the 15 HIPs, as described above. This included one laboratory duplicate sample per analytical batch. EPA had inspected and approved this laboratory in 2010 in conjunction with a T1 evaluation to add an INTEC RH TRU waste stream to the Idaho National Laboratory's certification (see Docket No. A-98-49; II-A4-130). The suite of analyses performed was as follows:

- Liquid Scintillation Counting for the determination of ^{241}Pu
- Chemical separation and Gas Flow Proportional counting for the determination of ^{90}Sr
- Chemical separation and Alpha Spectrometry for the determination of ^{241}Am, curium-244 (^{244}Cm), ^{245}Cm, ^{238}Pu, ^{239}Pu/^{240}Pu, and ^{228}Th
- Gamma Spectrometry for the determination of ^{154}Eu and ^{137}Cs
- Inductive coupled Plasma-Mass Spectrometry for the determination of ^{233}U, ^{234}U, ^{235}U, ^{236}U, ^{238}U, ^{239}Pu, ^{240}Pu, and ^{242}Pu

[16] This facility was formerly known as the INTEC (Idaho Nuclear Technology Center) laboratory.

EPA reviewed selected analytical data from the 20 BDRs to ensure complete and accurate reporting of the results and verify the use of appropriate QC. This review demonstrated that:

- BDR narratives provided a complete and correct description of the analytical processes
- Appropriate analytical procedures were used for sample preparation and analysis
- Appropriate standards and verification samples were employed
- Acceptance criteria had been established for the pertinent attributes
- Control samples were within acceptance criteria (see NCR No. 105645 below)
- Analytical results were reported in correct units and data were flagged as required
- All data had been subject to review before release, as documented in the BDRs

NCRs were generated as needed. For example, the laboratory initiated NCR No. 105645 because of low Laboratory Control Sample (LCS) recoveries in analytical batch Nos. 101093, 101094, 101095, and 10196. These LCS failures were accepted and the data were used *as is* because they were used as relative determinations to support isotopic ratios. NCR-RHBAPL-2143-11 in BDR No. ALD10053G was initiated because the incorrect sample number was entered on CCP-TP-512, Attachment 1, Sample Tracking Form. This condition was identified during the Independent Technical Review and the final disposition of the NCR was *use as is*. Thirteen of the 27 Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) measurements reported positive values for ^{239}Pu and ^{240}Pu, which were determined by taking the average ratios of ^{239}Pu/(^{239}Pu + ^{240}Pu) and ^{240}Pu/(^{239}Pu + ^{240}Pu) from the 13 samples where both isotopes were measured. These ratios were then multiplied by the ^{239}Pu/^{240}Pu ratio for each sample as determined by alpha spectrometry to derive their fractions as 0.412 for ^{239}Pu and 0.588 for ^{240}Pu. While not measured in any of the samples, the ^{241}Pu value was conservatively estimated to be equal to the instrument detection limit (IDL) for ^{242}Pu, whose typical activity contribution to the total TRU concentration is less than 1%. The QAOs for the laboratory analyses were accuracy, precision, representativeness, completeness and comparability, all of which were achieved.

(4) The determination of scaling factors for sampled and nonsampled High Pressure Inner Containers was evaluated and was found to be adequate.

Developing scaling factors for the sampled HIPs was based primarily on the analytical results from the smear samples collected at Bettis Laboratory, discussed in Items (2) and (3), above. The radiometric and mass spectrometry data from the Idaho Project Cleanup Project Analytical Laboratory were adequate for this purpose.

The nonsampled HIPs were correlated with the sampled HIPs based on their similarities with respect to fuel types, discussed in Section 8.1 Item (2) and summarized in Table 2, above. As discussed in several places throughout this report, the association or binning of HIPs was found to have excluded some containers and had to be revised to ensure it was comprehensive, as captured in the EPA finding (see Attachments C and D). Although this required revising the DTC BDR and several calculation packages, the impact on the actual values was small. Scaling factor development for the nonsampled HIPs was also complicated as a result of apparent differences due to enhancements and/or depletions of ^{137}Cs based on its solubility in water, which was used in some waste-generating operations. This required adjustments to the scaling factors for HIPs 41-24 and 41-28. Scaling factors for a sampled HIP (41-05) and nonsampled

HIP (41-13) are summarized in Table 4, below. There were no concerns regarding the technical adequacy of developing scaling factors for the sampled and nonsampled HIPs.

Table 4. Bettis Scaling Factors for Two HIPs

Radionuclide	HIP 41-05 ^{137}Cs Scaling Factor, Ci Radionuclide/Ci ^{137}Cs	HIP 41-13 ^{137}Cs Scaling Factor, Ci Radionuclide/Ci ^{137}Cs
Th-228	3.39E-04	2.43E-03
U-233	8.11E-05	4.43E-04
U-234	1.06E-04	2.11E-04
U-235	1.25E-06	6.95E-06
U-236	1.83E-05	1.02E-05
U-238	1.48E-08	8.31E-07
Pu-238	1.02E-01	2.72E-02
Pu-239/Pu-240	5.48E-04	2.70E-03
Pu-239	2.26E-04	1.11E-03
Pu-240	3.22E-04	1.59E-03
Pu-241	6.45E-03	9.60E-03
Pu-242	2.22E-04	1.17E-03
Am-241	1.82E-03	6.60E-03
Cm-244	7.58E-04	3.80E-03
Cm-245	4.03E-05	1.14E-04
Sr-90	1.65E+00	8.13E-01
Cs-137	1.00E+00	1.00E+00
Eu-154	1.70E-02	1.23E-02

(5) Computer modeling to develop the dose-to-curie correlation was evaluated and was found to be adequate.

BAPL-CCP used the MCNP5® computer code to develop DTC correlations for the sample material packaged in HIPs, which are placed inside steel shield containers of two thicknesses, 2.5 inches or 3.25 inches. Calculations were performed for a 1-curie (Ci) source of ^{137}Cs and ^{154}Eu at a nominal density of 0.7 g/cm^3 at an assumed fill height of 60% and yielded values in units of roentgen per hour per Ci of ^{137}Cs and ^{154}Eu (R/hr/Ci) [see Item (10), below]. There were no concerns regarding the technical adequacy of this modeling to develop DTC correlations.

(6) Correlation of the radionuclide inventory values to the cesium-137 concentration for each drum was evaluated and was found to be technically adequate and appropriately documented.

The complete list of radionuclides included in the radiological characterization of the BAPL RH TRU waste is as follows: ^{233}U, ^{234}U, ^{235}U, ^{238}U, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Pu, ^{242}Pu, ^{241}Am, ^{244}Cm, ^{245}Cm, ^{228}Th, ^{90}Sr, ^{90}Y, ^{137}Cs, ^{137m}Ba, and ^{154}Eu. The radionuclides that were reported are summarized in Table 5. The application of the DTC correlations developed for ^{137}Cs and ^{154}Eu involved the partitioning of the average total dose rate measured into the contributions of each of these two gamma-emitters, and determining the ^{137}Cs inventory in each drum to be multiplied by the scaling factors for sampled and nonsampled HIPs, as discussed in several areas of this

section. There were no concerns regarding the technical adequacy of this modeling to develop DTC correlations.

Table 5. Summary of the Reported Radionuclides in the 27 Smear Samples

Radionuclide	Number of Reported Values
Th-228	27
U-233	27
U-234	27
U-235	27
U-236	27
U-238	23
Pu-238	27
Pu-239/Pu-240	27
Pu-239	17
Pu-240	13
Pu-241	24
Pu-242	0
Am-241	27
Cm-244	27
Cm-245	26
Sr-90	27
Cs-134	3
Cs-137	27
Co-57	3
Co-60	7
Eu-152	8

(7) The technical basis and documentation of total measurement uncertainty were evaluated and found to be adequate.

The development of Total Measurement Uncertainty (TMU) for Waste Stream BT-T001 is based on the propagation of uncertainties present in specific aspects of the determination of the radiological constituents of RH TRU waste. These aspects are assumed to be independent, which allows them to be added in quadrature.[17] The TMU determination included contributions of the following:

- ^{137}Cs DTC correlation – MCNP5® code, and modeling uncertainties
- ^{137}Cs and ^{154}Eu dose measurement uncertainty

[17] 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 if the values had been simply added. For example, the ^{239}Pu total uncertainty for HIP 41-05 is derived by taking the square root of $(27.1\%)^2$ plus $(20.3\%)^2$, which equals 33.9%, which is smaller than if the values had simply been added, i.e., 47.4%.

- Scaling factor uncertainty – including sample data uncertainty (except ^{242}Pu)
- Uncertainty in the isotopic fractions (^{239}Pu and ^{240}Pu)
- Uncertainty in the ^{242}Pu scaling factor due to use of the ICP-MS IDL values
- Composition of the fuels in nonsampled HIPs

A general treatment of TMU is presented in CCP-AK-BAPL-501, Section 6, and in *Uncertainty Analysis for BAPL HIPs*, BAPL-RH-03 (Reference U352). The overall uncertainties for the sampled and nonsampled HIPs are consistent with what EPA has observed for RH determinations at other RH TRU generator sites, and are summarized for a sampled HIP (41-05) and a nonsampled HIP (41-13) in Table 6, below. As expected, the scaling factor and total uncertainty are greater for the nonsampled HIPs. There were no concerns regarding the technical derivation and documentation of TMU for Bettis-CCP Waste Stream BT-T001.

Table 6. Overall Uncertainty of Two HIPs at the Nominal Density of 0.7 g/cm^3

Radionuclide	HIP 41-05 Total ^{137}Cs Uncertainty	HIP 41-05 Total Scaling Factor Uncertainty	HIP 41-05 Total Uncertainty	HIP 41-13 Total ^{137}Cs- Uncertainty	HIP 41-13 Total Scaling Factor Uncertainty	HIP 41-13 Total Uncertainty
Th-228	27.1%	8.9%	28.5%	27.1%	51.1%	57.8%
U-233	27.1%	17.2%	32.1%	27.1%	51.7%	58.4%
U-234	27.1%	1.5%	27.2%	27.1%	52.3%	58.9%
U-235	27.1%	2.4%	27.2%	27.1%	53.7%	60.2%
U-238	27.1%	58.5%	64.5%	27.1%	55.1%	61.4%
Pu-238	27.1%	1.7%	27.2%	27.1%	57.0%	63.1%
Pu-239	27.1%	20.3%	33.9%	27.1%	57.9%	64.0%
Pu-240	27.1%	14.3%	30.7%	27.1%	56.2%	62.4%
Pu-241	27.1%	8.9%	28.6%	27.1%	51.4%	58.2%
Pu-242	27.1%	100%	103.6%	27.1%	111.8%	115.1%
Am-241	27.1%	7.3%	28.1%	27.1%	53.0%	59.5%
Cm-244	27.1%	2.5%	27.2%	27.1%	54.4%	60.8%
Cm-245	27.1%	47.4%	54.6%	27.1%	63.2%	68.8%
Sr-90	27.1%	3.1%	27.3%	27.1%	17.0%	32.0%
Cs-137	27.1%	0.0%	27.1%	27.1%	0.0%	27.1%
Eu-154	27.1%	7.3%	28.1%	27.1%	20.3%	33.9%
Y-90	27.1%	3.1%	27.3%	27.1%	17.0%	32.0%
Ba-137m	27.1%	0.0%	27.1%	27.1%	0.0%	27.1%
Total Activity	**27.1%**	**1.9%**	**27.2%**	**27.1%**	**7.6%**	**28.2%**

(8) Execution and documentation of the dose-to-curie technique were assessed and found to be adequate.

EPA observed the DTC technique on December 8, 2010, in the Crane Aisle of the East High Bay of the MEL at Bettis Laboratory. Bettis Laboratory personnel had set up a manually operated crane on the north-south axis of the building to hoist the drums containing HIPs onto the DTC assembly. EPA observed the DTC process for Drum No. 41-13-5 beginning with Bettis Laboratory personnel loading it on the Mettler Toledo General Scale GE25, Serial Number DCO918, for weighing. This scale had a current calibration that was valid until February 28, 2011, and it was checked with reference weights prior to use, as documented on the scale's

calibration certificate obtained at Bettis Laboratory. The drum was weighed and the weight (302.10 kg) recorded. Bettis Laboratory personnel then lifted the drum into the DTC assembly. BAPL-CCP personnel Tommy Mojica and James Rowsell observed Bettis Laboratory personnel perform this process and ensured that it was performed in accordance with CCP-TP-504, Revision 10. Both Mojica and Rowsell were listed on the list of qualified individuals (LOQI) and were current on relevant training. Background and detector checks were performed and recorded prior to taking drum measurements; the values were recorded using the appropriate gamma detector (Thermo Electron Model FH 40 G Dose Rate Measuring Unit with FHZ 612 Probe). A copy of the Measurement Control Report was provided to EPA and it included all pertinent information. Measurements were made in four locations on the drum's circumference (0°, 90°, 180°, and 270°) and all measurements were recorded on the Container Data Sheet, a copy of which was provided to EPA. The measurements and all accompanying parameters were acceptable and a copy of this and the other forms cited above are contained in DTC BDR BAPLRHDTC11001, as discussed in Item (9), below. BAPL-CCP personnel consulted an operator aid that was posted in the area, *CCP Operator Aid: RH-DM-BAPL-001, 12/10/10*. This listed tolerances for the Test Drum Weights, Scale Error, Operational Ranges for the Geiger Mueller Probes, and Acceptance Criteria for the Source Checks. There were no issues regarding the execution and documentation of DTC for Waste Stream BT-T001.

(9) Radionuclide documentation in dose-to-curie batch data reports was assessed and found to be adequate.

The DTC results for all 15 HIPs were documented in a single BDR, BAPLRHDTC11001. The EPA inspection team verified that this BDR included the following:

- SPM Checklist, Attachment 8
- BDR Cover Sheet, Attachment 4
- BDR Table of Contents, Attachment 5
- BDR Narrative Summary, Attachment 6
- ITR Review Checklist, Attachment 7
- Measurement Control Report with all parameters acceptable, Attachment 1
- Container Data Sheets for 15 containers, Attachment 2
- Evidence of signatures by the ITR on Attachment 7 and an SPM on Attachment 8
- Type of waste in each container on Attachment 3, steel
- TRU determination for all containers on Attachment 3
- Correct revision of CCP-TP-504 (Revision 10)
- Waste Container DTC Conversion Records with all required parameters for 15 containers, Attachment 3

There were no concerns regarding the technical adequacy of the radionuclide documentation in DTC BDR BAPLRHDTC11001 for the 15 HIPs in Waste Stream BT-T001.

(10) Remote-handled determinations were evaluated and found to be adequate.

The determination that the HIPs were RH, i.e., had contact dose rates in excess of 200 mrem/hr, must be based on unshielded dose rates. This required the use of a surface dose multiplier,

defined as the ratio of the surface dose rate where no credit is taken for shielding to the shielded dose rate. This was done using MCNP® to model the unshielded dose on the drum top, bottom and sides for two shielding thicknesses, 2.5 inches and 3.25 inches, and dose rate multipliers were developed for both configurations, as documented in calculation package BAPL-RH-07, *Calculation of Drum Surface Dose Rate* (Reference U356) [see Item (5), above]. The measured (shielded) dose rate was corrected using the surface dose multiplier to make the RH determination. These multipliers were then used by Bettis Laboratory to establish the waste's classification as RH, as documented in the Bettis Laboratory Memorandum B-NEO(NE)DNE-64E, dated April 12, 2011, titled *Erratum: Surface Dose Rates for 55-Gallon drums Loaded with Bettis Laboratory Remote Handled Transuranic Debris Waste Stream BT-T001*. There were no concerns regarding the RH determination of the 15 HIPs in Waste Stream BT-T001.

(11) TRU determinations were evaluated and were found to be adequate.

DTC BDR BAPLRHDTC11001 contained values and the associated uncertainties for the 10 WIPP-tracked radionuclides plus other radionuclides, as appropriate, for all 15 HIPs. In all cases the TRU alpha concentration exceeded 100 nCi/g. There were no concerns regarding the TRU determinations of the 15 HIPs in Waste Stream BT-T001.

Summary of Radiological Characterization Findings and Concerns

The EPA inspection team identified one finding and did not identify any concerns related to radiological characterization. The finding had bearing on AK and aspects of it are discussed in Section 8.1 Items (2) and (3), above. The finding is also briefly discussed in Section 8.2 Item (1). A copy of the EPA Inspection Issue Tracking Form recording the finding is provided in Attachment C. EPA considers this finding to have been adequately addressed upon submission of revisions of calculation packages, one new calculation package, the DTC BDR and revision of CCP-AK-BAPL-501. The formal response submitted by CBFO is included as Attachment D to this report. There are no open findings or concerns related to radiological characterization resulting from this inspection.

Baseline Approval

EPA is approving the radiological characterization process consisting of DTC as described in CCP-TP-504 in conjunction with the radionuclide-scaling factors documented in CCP-AK-BAPL-501, Revision 1, that were evaluated during this baseline inspection. This approval is limited to the 15 HIPs containing Waste Stream BT-T001.

8.3 Visual Examination

Waste Characterization Element Description

As part of the inspection of the VE activities, the EPA inspection team focused on overall procedural technical adequacy and implementation, as well as the identification of WMPs and prohibited items, in reviewing the following VE elements:

- Documentation of VE activities through use of an approved procedure
- Proper execution through observation of VE activities at Bettis Laboratory
- Management oversight and independent review of VE activities
- Training of VE personnel

VE was used to determine the following aspects of TRU waste characterization:

- Types and amounts of WMPs
- Confirmation of the Waste Matrix Code
- Presence or absence of prohibited items

Documents Reviewed

All Bettis Laboratory and BAPL-CCP VE documents that were reviewed to support this inspection are listed in Attachment A.

Technical Evaluation

During the inspection, the EPA inspection team evaluated the technical elements of the VE process. These areas are summarized as follows:

(1) Overall procedural technical adequacy and implementation were assessed and found to be adequate.

The VE procedure is documented in CCP-TP-500 and contains specific information on performing VE, including identification of prohibited items, assignment of WMPs, data recording and technical review of examination results. The EPA assessed this procedure for technical adequacy and completeness and did not identify any issues.

(2) Characterization of waste material parameters and prohibited items was assessed and found to be adequate.

EPA observed the VE process at Bettis Laboratory on August 30, 2010. All VE activities occurred in the MEL, Hot Cell No. 11 with HIP 41-33, in conjunction with the sampling activities described in Section 8.2 Item (2), above, with the Bettis Laboratory manipulator operators working in the Cell 13 Work Area while being observed by BAPL-CCP VE operators. The HIP was attached to a VE container via a threaded connection and the HIP contents were emptied into the VE container. Bettis Laboratory personnel and BAPL-CCP VE operators examined the HIP's contents in accordance with Bettis Laboratory procedure MEL-10-016-NEO-TWD using step-tracking described in Section 8.2 Item (2), above. The two BAPL-CCP VE Operators, Tommy Mojica and Spencer Pattee, performed VE in accordance with the sampling plan during this operation and recorded their activities in Notebook OLB RHBAPL-VE-001, 2010. The sample material resembled a coarse dust and was the only item in the HIP. Bettis Laboratory and BAPL-CCP personnel performed and documented VE comprehensively for HIP 41-33. VE was also performed when each HIP was placed in a 55-gallon drum for final disposal. EPA examined records generated for these two events and determined that both had

been generated in accordance with procedure requirements and were technically adequate. Data sheets were completed and signed as required, and reviews by the ITR and SPM were adequately performed and appropriately recorded. There were no concerns relative to the characterization of WMPs and prohibited items.

(3) Documentation of visual examination activities was examined and found to be adequate.

EPA reviewed BDR No. RHBAPLVE100001 containing VE data for the HIP containers examined during this campaign. WMP weights were not assigned during VE of RH waste because all waste items are reported into the WIPP Waste Information System/Waste Data System as "plastic." Waste item categories were identified, for example, "cellulosics" (C) and "other metal" (OM), and recorded on the VE data sheets. Table 2 of CCP-TP-500 provides a complete listing of WMPs. A listing of prohibited items is provided in Table 1 of the procedure and the absence/presence of these items was recorded on VE data sheets. No prohibited items were identified during VE of the subject high pressure containers (HIPs). There were no concerns relative to the documentation of VE activities.

(4) Training of visual examination personnel was adequate.

The two BAPL-CCP VE Operators, Tommy Mojica and Spencer Pattee, were listed on the current CCP LOQI and training records for both indicated that they were current on all VE and all other required training.

Summary of Visual Examination Findings and Concerns

The EPA team did not identify any findings or concerns related to VE during this baseline inspection.

Baseline Approval

EPA approves the VE process for RH TRU Waste Stream BT-T001 as observed at Bettis Laboratory and as documented in the VE BDR No. RHBAPLVE100001 evaluated for this baseline inspection.

9.0 RESPONSE TO COMMENTS

EPA did not receive any comments concerning the proposed approval of the BAPL-CCP RH waste characterization program during the 45-day comment period.

10.0 SUMMARY OF RESULTS

10.1 Environmental Protection Agency Findings and Concerns

The one finding identified during this inspection related to the waste characterization processes BAPL-CCP implemented to characterize RH TRU debris waste. A copy of the EPA Inspection Issue Tracking Form that captures the finding is included in Attachment C of this report. The

documents BAPL-CCP/CBFO submitted to address the finding are included or summarized in Attachment D. The specific AK and radiological characterization items from the finding and relevant BAPL-CCP responses are discussed in the preceding sections of this report [Section 8.1 Items (2) and (3) and Section 8.2 Item (1)]. The EPA inspection team completed their review of the *freeze files* or revised documents and determined that they adequately addressed all aspects of the finding; EPA considers the finding to be closed. No issues related to this inspection remain open at this time.

As stated in Section 1.0 of this report, BAPL-CCP provided to EPA all final revisions of relevant AK and radiological characterization documents before the end of the public comment period for the proposed approval of the BAPL-CCP RH waste characterization program.

10.2 Conclusions

This approval is based on EPA's baseline inspection conducted on four occasions: at the EPA ORIA offices in Washington, D.C. on April 12 through 13, 2011 and at Bettis Laboratory to observe the VE process on August 30, 2010, sample collection on September 23, 2010, and DTC measurements on December 8, 2010. EPA determined that the BAPL-CCP RH waste characterization program is technically adequate. EPA, therefore, is approving the BAPL-CCP RH waste characterization program for RH Waste Stream BT-T001 that was evaluated during this baseline inspection, as described and documented in this report. The approval includes the following:

(1) The AK process for BAPL-CCP RH TRU debris Waste Stream BT-T001

(2) The radiological characterization process using DTC and radionuclide scaling factors for assigning radionuclide values to Waste Stream BT-T001, as documented in CCP-AK-BAPL-501, Revision 1, and supporting calculation packages detailed in this report

(3) The VE process to identify WMPs and the physical form of the waste

This approval is limited to the 15 high pressure containers (HIPs) of RH TRU debris wastes from Bettis Laboratory Waste Stream BT-T001. Wastes other than these are excluded from this approval. Characterization of any additional RH wastes by BAPL-CCP will require a new baseline inspection and approval. **EPA expects to receive copies of the final Waste Stream Profile Form (WSPF) and related attachments and the final AK accuracy report when they are available.**

11.0 REFERENCES

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ATTACHMENT A: DOCUMENTS REVIEWED

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ALD 10053I, ICP-MS Isotopic Data Report Narrative, Revision 0, January 13, 2011

ALD 10054A, Actinides by Alpha Spectrometry, Radiochemical Analysis Data Report and Narrative, Revision 0, January 20, 2011

CCP-AK-BAPL-500, Central Characterization Project Acceptable Knowledge Summary Report for Bettis Laboratory Remote-Handled Transuranic Debris Waste, Waste Stream: BT-T001, Revision 1, January 25, 2011

CCP-AK-BAPL-500, Central Characterization Project Acceptable Knowledge Summary Report for Bettis Laboratory Remote-Handled Transuranic Debris Waste, Waste Stream: BT-T001, Revision 2, May 16, 2011

CCP-AK-BAPL-501, Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report for Bettis Atomic Power Laboratory Remote-Handled Transuranic Fuel Debris Waste, Waste Stream: BT-T001, Revision 0, March 29, 2011

CCP-AK-BAPL-501, Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report for Bettis Atomic Power Laboratory Remote-Handled Transuranic Fuel Debris Waste, Waste Stream: BT-T001, Revision 1, May 24, 2011

CCP-AK-BAPL-502, Central Characterization Project RH TRU Waste Certification Plan for 40 CFR Part 194 Compliance and Confirmation Test Plan for Bettis Laboratory Waste Stream: BT-T001, Revision 0, March 10, 2011

CCP-AK-BAPL-502, Central Characterization Project RH TRU Waste Certification Plan for 40 CFR Part 194 Compliance and Confirmation Test Plan for Bettis Laboratory Waste Stream: BT-T001, Revision 1, July 11, 2011

CCP-AK-BAPL-505A, Sampling and Analysis Plan for Bettis Atomic Power Laboratory Remote-Handled Transuranic Debris Waste, Waste Stream BI-T001, Revision 0, August 27, 2010

CCP-QP-002, Training and Qualification Plan, Revision 30, December 29, 2010

CCP-QP-005, TRU Nonconforming Item Reporting and Control, Revision 19, October 14, 2010

CCP-QP-008, Records Management, Revision 18, March 30, 2011

CCP-TP-005, Attachment 4, Acceptable Knowledge Source Document Reference List, October 29, 2010

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CCP-TP-005, Attachment 6, Waste Form, Waste Material Parameters, Prohibited Items, and Packaging, December 2, 2010

CCP-TP-005, Attachment 8, Waste Containers, Revision 1, January 27, 2011

CCP-TP-500, Revision 10, CCP Remote-Handled Waste Visual Examination, December 29, 2010

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

Characterization Reconciliation Report for Waste Stream BT-T001, Draft for Audit Purposes, Provided April 4, 2011 and May 3, 2011

DTC BDR No. BAPLRHDTC11001

ICP-MS-3 Standard Preparation Record, pages ALD 1301-38 to 43

Inter-Office Correspondence, from C. M. Gomez to M. Sensibaugh, Acceptable Knowledge Accuracy Report, Bettis Atomic Power Laboratory, Waste Stream BT-T001, Lot 1, For Audit Purposes Only, March 26, 2011

List of currently qualified VE personnel (LOQI), January 26, 2011

Memorandum: Analysis of Sample Data for Bettis Atomic Power Laboratory (BAPL), Waste Stream BT-T001, J. Holderness, February 14, 2011

Qualification cards and training records for VE operators/ITRs

Raw data, analytical batch 101093

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Training documentation, Qualification Cards and Site-Specific RH Training for J. Luginbyhl and I. Quintana, provided March 30, 2011 and March 25, 2011

VE BDR No. RHBAPLVE100001

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P113, Sectioning Specimens on the Precision Cut-Off Wheel, W. Vitvitsky, MEL (T) 3-6, Revision 6, June 18, 1987

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P129, Repackaging of MEL TRU Waste Material, R. Pleiler, HLP-433 RCE# 2005-781-MEL, Revision 0, December 14, 2005

U201, News Release: Bettis Atomic Power Laboratory Celebrates 50th Anniversary, B.J. Schramm, BET-3-U

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U211, Bettis Irradiation Test Planning Guide, Irradiation Material Technology, WAPD-MT(I)-244, Revision 3, August 1989

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U214, Book #1 Ultrasonic Cleaning Logbook, Various, Book 1, March 12, 1975

U220, Technical Work Record No. 70084 - Depletion Reviews, Terry Carper, TWR 70094, May 1995

U231, Sludge Information Data Sheet, W.G. Smert, March 18, 1993

U236, COW Logbook #2, Waste Disposal Log, COW #2, January 1973 through November 1979

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U351, Scaling Factor Development, J. Vance, BAPL-RH-02, Revision 1, April 18, 2011

U352, Uncertainty Analysis, J. Vance, BAPL-RH-03, Revision 1, April 18, 2011

U353, Evaluation of Radionuclide Reporting Requirements, J. Vance, BAPL-RH-04, Revision 0, March 18, 2011

U354, DTC Derivation for Cs-137, J. Vance, BAPL-RH-05, Revision 1, April 18, 2011

U355, DTC Spreadsheet, J. Vance, BAPL-RH-06, Revision 1, April 18, 2011

U356, Calculation of Drum Surface Dose Rate, J. Vance, BAPL-RH-07, Revision 1, April 18, 2011

U390, Response to EPA Finding, Jene Vance, April 22, 2011

U396, Technical Work Record 23219: Memo from BAPL re: TWR 23120 Completion Date (for drum splitting operations), BAPL, 23219, April 20, 2011

U397, Technical Work Record re: Splitting of MEL East Transuranic Waste in HIP-41-06 into Additional Containers, BAPL, 23120, August 3, 2010

U398, Technical Work Record 23008; RE: Fuel Type in MEL TRU Material, R. Pfeifer, TWR 23008, April 15, 2011

U399, Fuel Type Relative Contribution to the HIPs, J. Vance, BAPL-RH-08, Revision 0, April 18, 2011

ATTACHMENT B: PERSONNEL CONTACTED DURING INSPECTION

Personnel Name	Affiliation	Area of Expertise, Function	VE	Sampling	DTC	EPA HQ
Edward Feltcorn	U.S. EPA ORIA	Inspection Team Leader	✓	✓		✓
Rajani Joglekar	U.S. EPA ORIA	Inspection Team				✓
Lindsey Bender	U.S. EPA ORIA	Inspection Team	✓	✓	✓	
Connie Walker	SC&A	Inspection Team, AK				✓
Kira Darlow	SC&A	Inspection Team, AK				✓
Dorothy Gill	SC&A	Inspection Team, VE				✓
Rose Gogliotti	SC&A	Inspection Team, RC				✓
Patrick Kelly	SC&A	Inspection Team, RC	✓	✓	✓	✓
Amir Mobasheran	SC&A	Inspection Team, RC				✓
S. Corey Boland	CCP	DTC Lead			✓	
Justin Breauchy	BMPC-Bettis	Manager Nuclear Production	✓			
Michael Brown	BMPC-Bettis	Site Technical Representative - Manager MEL Project	✓	✓	✓	✓
Donna Di Renna	BMPC-Bettis	Environmental Controls Environmental Safety and Health	✓		✓	
Jason DiVecchio	BMPC-Bettis	Manager Design Nuclear Engineering			✓	
Mark Doherty	CCP-TechSpecs	AKE				✓
Marvin Garrett	BMPC-Bettis	Manager Radiological Controls	✓			
Paul C. Gomez	CBFO/CTAC	STL – Technical Specialist			✓	
Dan Hagerty	BMPC-Bettis	ESH Director			✓	
Jim Holderness	WTS-CCP	Radiological Characterization				✓
Robert Kebe	BMPC-Bettis	Manager Environmental Controls	✓			
Kelly Kopchinsky	NRLFO-Pittsburgh	Environmental Safety Health and Radcon	✓			
John Koury	NRLFO-Pittsburgh	Assistant Manager for Operations	✓			
Chris Labee	NRLFO-Pittsburgh	Environmental Safety Health and Radcon	✓	✓	✓	✓
Jim Luginbyhl	LANL-CCP	BAPL-CCP AKE				✓
Todd McIntyre	NRLFO-Pittsburgh	Environmental Safety Health and Radcon	✓			
Bill Mihalco	BMPC-Bettis	Manager Environmental Engineering			✓	
Tommy Mojica	CCP-WTS	VPM CEE HSGS			✓	
Jeremy Molitoris	BMPC-Bettis	Manager Nuclear Engineering	✓		✓	
Tom Morgan	DOE CBFO	Observer	✓	✓	✓	✓
Paul Moritzky	NRLFO-Pittsburgh	Environmental Safety Health and Radcon	✓		✓	
Todd Munther	DOE FO	FA Program Director			✓	
Jim Oliver	DOE/CBFO-CTAC	Observer			✓	✓
Spencer Pattee	WTS-CCP	VE HSG Operator			✓	
D.K. Ploetz	WTS-CCP	CCP Manager				✓
Irene Quintana	WTS-CCP	SPM	✓	✓	✓	✓
David Riley	BMPC-Bettis	Manager Nuclear Engineering and Operations	✓		✓	
Michael Sensibaugh	WTS-CCP	CCP Projects Manager				✓
Jene Vance	WTS-CCP	Radiological Characterization			✓	✓
Louis Wade	WTS-CCP	CCP-QAE			✓	
Lisa Watson	LANL-CCP	AKE				✓

ATTACHMENT C: EPA INSPECTION ISSUE TRACKING FORM,
ISSUE NO. BAPL-CCP-RH-AK-11-01F

Inspection No. EPA-BAPL-CCP-RH-04.11-8	**Issue Number:** BAPL-CCP-RH-AK-11-01F **Date:** April 13, 2011-Final
Inspector: Kira Darlow **Attachments?** ☐ YES ☒ NO	**Sample Size:** 5 **Population size (if known):** 15

Description of Issue: BAPL-CCP used AK source document U259 to develop a comprehensive separation of waste materials into categories (bins). Separating the HIPs into bins (binning) was based on identifying common radiological attributes based on AK and was the foundation for the development of radionuclide-specific scaling factors. It was assumed that source document U259 contained a complete record of the fuel specimens packaged in each HIP but this was found to not be the case. EPA identified three instances where sample containers (Dolly Tubes and/or cans) were excluded. EPA finds that the less-than-comprehensive binning of sample materials could compromise the technical basis of scaling factor development. EPA requires that BAPL-CCP do the following:

- Confirm that issue identified by the EPA Inspection Team is valid
- Bound the extent of the issue and present documentation that the contents of all 15 HIPs have been reviewed and that all are, in fact, appropriately accounted for
- Identify the impact of this issue on the characterization process
- Identify all Bettis Laboratory CCP documents (e.g., CCP-AK-BAPL-500, CCP-AK-BAPL-501, calculation packages, and Batch Data Reports) that do and do not require revision and a justification of these decisions
- Provide a written response documenting the results of BAPL-CCP's impact analysis and include this as a source document, including a table(s) comparing the association of all waste materials and HIPs before and after BAPL-CCP addresses this issue
- Complete document revisions and provide revised documents to EPA for review

B. Regulatory Reference: 40 CFR 194.24(c)

C. Site requirement(s): Not applicable

D. Discussed with: J. Vance, J. Holderness, M. Brown, C. Labee, M. Sensibaugh, I. Quintana, M. Doherty, and J. Luginbyhl

E. Additional Comments: None

F. Site Response Information:

Site Response Required? ☒ YES ☐ NO
Site Response Due Date: 4-22-11

ATTACHMENT D: CCP RESPONSE TO EPA'S ISSUE BAPL-CCP-RH-AK-11-01F

Identification of Issue

As discussed in the Radiological Characterization Technical Report prepared for the EPA baseline inspection for the Bettis Atomic Power Laboratory RH TRU Waste Stream BT-T001, nine of the 15 high-pressure containers (HIPs) containing the fuel examination debris waste were sampled and 6 were not. It was expected that the HIPs that were not sampled would have a similar radionuclide distribution to another HIP that was sampled if the relative contribution of the fuel types to the two HIPs were nearly equal. Accordingly, the AK records were reviewed to identify the fuel type of each fuel specimen that had contributed to the waste within a given HIP. Specifically, the AK Source Document **U259** was used to extract the fuel type information. The number of specimens of a given fuel type in each HIP were counted and entered into a spreadsheet. The relative contributions of the fuel types were then calculated as a basis for the binning.

In the inspection it was determined that the AK record showing the listing of the specimens contributing to the HIPs was not complete. Specifically, the fuel specimens associated with five Dolly Tubes and two cans were potentially omitted from the specimen listing. The containers of fuel debris waste that were potentially missing from the specimen listing are as follows:

HIP Number	Container
41-20	AF-1, AF-2, AF-3 and AF-4 (all Dolly Tubes)
41-23	Can M042
41-32	Can M043
41-33	Dolly Tube DC11

Confirmation and Extent of the Issue

It was confirmed that, with the exception of can M043, the AK records show these containers as being added to the identified HIPs. This is shown on the following extract which is the first page from AK Source Document U259 showing the containers and Dolly Tubes added to the HIPs.

CONTAINERS

HIP NUMBER	WASTE CAN
41-33	SL 1-SL-18 DC11
41-28	SL 19-SL36 FG01
41-21	SL 37 – SL 58
41-32	SL 59 – SL 77 SL 78, SL 79, SL 80 and SL 81
41-23	MO39, MO42
41-05	MO41, MO17
41-27	MO36
41-16	MO29, MO30
41-18	F5, F10, F11, F15 F3, F4, F6, TF5
41-15	AC 93 1L –AC 93 7L
41-24	MO23, MO34
41-13	F1, F2, F9, TF-2 WX3, WX5
41-29	F8, F12, F13, F14 WX1, WX2, WX4, WX6
41-20	MO38, AF-1, AF-2 AF-3, AF-4
41-06	1078

A Technical Work Record (AK Source Document **U398**) from Bettis subsequently determined that the material from can M043 had been placed into Dolly Tubes SL37 through SL8,1 which are accounted for in the above HIP loadings. This, in effect, eliminates can M043 as a contributing source to the HIPs. The Dolly Tubes that contained the material from can M043 were added to HIPs 41-21 (SL37 through SL58) and 41-32 (SL59 through SL81). The 22 fuel specimens that contributed to the 23 Dolly Tubes that were added to HIP 41-32 were already accounted for in the original binning.
Further investigation showed that the Dolly Tubes AF-1 through AF-4 contained fuel debris waste predominantly from thorium fuels specimens. (AK Source Document Number **U231**) The original fuel

type contributions to HIP 41-20 indicated all enriched uranium and no thorium fuel. With the inclusion of the omitted thorium fuel type, the fuel type contributions would be altered to the extent that HIP 41-20 would no longer be representative of HIP 41-23, which the records indicate is all enriched uranium. It should be noted that HIP 41-20 was sampled and consequently the presence of thorium fuels was accounted for in the sample results. However, it would be necessary to associate HIP 41-23 with another HIP that is predominantly enriched uranium. HIP 41-05 was identified as a suitable replacement for HIP 41-20 in the binning process. HIP 41-05 contains fuel debris waste from 96% enriched uranium specimens and only 4% thorium fuel specimens, which would have a small effect on the overall radionuclide distribution in the HIP.

The investigation into grinding loss records (AK Source Document Number **U212**) for can M042 uncovered information showing the specific fuel specimens and associated fuel types contributing to the debris in this can. A total of 91 fuel specimens were included in this can, all of which were enriched uranium. This was confirmed by Bettis in a Technical Work Record dated 4/15/11. (AK Source Document Number **U398**) This did not alter the original fuel type contribution, which was already 100% enriched uranium.

Records identifying the specific fuel specimens and associated fuel types could not be located for Dolly Tube DC11. However, Dolly Tube DC11 is just one of 19 Dolly Tubes added to HIP 41-33. Accordingly, the impact on the fuel type contributions from a single Dolly Tube would be small.

Impact of Issue on Characterization Process

Overall, the impact on the binning process described in the Radiological Technical Report to associate the non-sampled HIPs with the sampled HIPs by the fuel type contributions requires only one change to that described in the report. Namely, HIP41-23 has now been associated with HIP 41-05 rather than HIP 41-20 as was done in the original binning. The result of the binning effort provided in the RCTR is shown below:

	Sampled	Enriched Uranium and Thorium	Thorium	Enriched Uranium	Depleted Uranium and Plutonium
HIP-41-13	No	67%	0%	33%	0%
HIP-41-21	No	40%	10%	50%	0%
HIP-41-32	Yes	68%	5%	27%	0%
HIP-41-20	Yes	0%	0%	100%	0%
HIP-41-23	No	0%	0%	100%	0%
HIP-41-24	No	16%	0%	68%	16%
HIP-41-28	No	9%	0%	75%	16%
HIP-41-33	Yes	14%	0%	62%	24%
HIP-41-18	Yes	14%	0%	86%	0%
HIP-41-27	No	18%	0%	82%	0%

The final binning resulting from the omission is shown below:

	Sampled	U-233 and Thorium	Enriched Uranium and Thorium	Thorium	Enriched Uranium	Depleted Uranium and Plutonium
HIP-41-13	No	0%	67%	0%	33%	0%
HIP-41-21	No	0%	40%	10%	50%	0%
HIP-41-32	Yes	0%	68%	5%	27%	0%
HIP-41-05	Yes	0%	2%	2%	96%	0%
HIP-41-23	No	0%	0%	0%	100%	0%
HIP-41-24	No	3%	16%	0%	68%	16%
HIP-41-28	No	0%	9%	0%	75%	16%
HIP-41-33	Yes	0%	14%	0%	62%	24%
HIP-41-18	Yes	2%	14%	0%	85%	0%
HIP-41-27	No	0%	18%	0%	82%	0%

The binning process is further described in Calculation BAPL-RH-08, which has been generated to support this response to the EPA finding.

Identification of CCP-BAPL Documents Revised and Non-Revised

The documents that have been revised as a result of this finding are:

CCP-AK-BAPL-500 (Revision in process – summary of changes in attached file "Response to EPA Finding)
CCP-AK-BAPL-501 (Revision in process – summary of changes in attached file "Response to EPA Finding)
BAPLRHDTC11001
Calculation BAPL-RH-02 Rev. 1
Calculation BAPL-RH-03 Rev. 1
Calculation BAPL-RH-06 Rev. 1
Draft CRR – correction to TRU Alpha Activity Concentration and Total Activity Determination for HIP41-23-4 were updated based on the reassigned scaling factor. The surface dose rates have not been publicly released based on the reassignment of the scaling factor for this HIP and the values are not included.
CCP-TP-005 Attachment 4 updated to reflect newly referenced AK source documents.

The documents that have not been revised as a result of this finding are:

Calculation BAPL-RH-01, Radiochemistry and Mass Spectrometry Data Input Check. The binning process does not change the analysis data reported for the sampled HIPs.

Calculation BAPL-RH-04, Determination of Reportable Radionuclides. The scaling factors were used to evaluate the relative contribution of the individual radionuclides to the radiological hazard. The scaling factors were not changed for the 15 HIPs.

AK Source documents referenced in CCP-AK-BAPL-500 were not changed due to this finding as the records were provided from Bettis.

Draft AK Accuracy Report has not changed as the containers were not reassigned to a new summary category group nor did any containers fail to meet the Data Quality Objectives.

The Radiochemistry and RH Waste Sampling BDRs were not changed due to this finding as the scaling factor for HIP41-23-4 was reassigned and this HIP was not sampled.

RHBAPLVE100001 – the visual examination characterization data were not changed as the containers met the RH VE quality assurance objectives.

CCP-AK-BAPL-502 – the characterization approach for Waste Stream BT-T001 did not change as a result of this finding.

Additional documentation included to support revision to CCP-AK-BAPL-500 includes source documents U396 and U397.

Additional documentation included to support revision to CCP-AK-BAPL-501 includes BAPL-RH-05 Rev. 1, BAPL-RH-07 Rev.1, and BAPL-RH-08. BAPL-RH-08 was prepared to document the binning of the various fuel types contributing to the waste in each of the 15 HIPS to determine the relative contribution of each fuel type in the HIPs.

Waste Material Parameters were calculated.

HIP41-15 RESEARCH RESULTS

Research through the AK records for HIP-41-15 revealed that reference to 97-7L in source document U259 is a typographical error. The correct number is 93-7L and is supported by source documents P129, page 15; U259 page 1; U259 page 46; and U220 page 6. Page numbers are referencing the pagination at the bottom of each page of the document. The traceability of HIP-15 uses the route card in U260 to go back to the generation of the waste for the fuel types.